Fuel Pellets in New Zealand
Bioenergy Workshop

Venue: **Rimu Room, *Forest Research*; November 6, 8.30 am**

Programme

8.00- 8.30: Registration and coffee

8.30: Welcome to Forest Research, Bryce Heard, CEO Forest Research

8.35: Welcome by Mayor Graham Hall, Rotorua District Council.

Chair: Roger Fairclough, Executive Officer of Bionergy Association of New Zealand

8.45: The role of fuel pellets in New Zealand future bioenergy market. John Gifford, Forest Research

9.05: Recent international advances in fuel pellet markets. Report from the 1st World Conference on Pellets, Sweden, September 2002. Peter Fredricsen, Materials Processing Ltd.

9.25: The status of the wood pellet market in New Zealand. Steve Cunningham, Pellet Fuels NZ Ltd

9.45: Resources for fuel pellet production in New Zealand, John Lavery, Forest Research

10.05: Morning tea

10.35: Application of fuel pellets for institutional/industrial energy users, district heating and CHP – European experiences. Per S. Nielsen, Forest Research

11.00: Opportunities for the waste management sector in New Zealand, Peter Fredricsen, Materials Processing Ltd.

11.25: Recent government policy development, which will encourage substitution of fossil fuels with renewable fuels or waste. Emily Rudkin, EECA

11.50: International pellet markets – lessons for New Zealand, Gary Wilson, Garnet (New Zealand) Ltd.

12.15: Concluding Remarks

Wood pellet market development

Introduction: What is the potential size of the pellet market in New Zealand? How much could New Zealand participate in the international market? How could a market develop in New Zealand? What political initiatives are necessary? What are the resources and the opportunities for New Zealand industry? The Bioenergy Workshop on Fuel Pellets in New Zealand will not be able to answer these questions in full, but in a combined effort, we will try. What has been achieved in these areas in Austria and Sweden? (with a references from the 1st World Conference on Pellets, Stockholm, Sweden, September 2-4, 2002).

Austria

Production of pellets: Twelve producers with a capacity of about 200,000 t/a. The annual production has risen from 15,000 in 1996 to 120,000 tons in 2001. Estimates of future production for 2010 range between 200,000 and 900,000 t/a.

Production of pellet stoves/furnaces/boilers: Austria has about 30 manufacturers of small-scale pellet appliances.

Use of pellets: The residential sector (space heating and hot water) is the most rapidly expanding market. The number of new pellet fired installations have been growing significantly since 1997 and reached 4930 installations in 2001. 12,270 central heating systems use pellets, which have a combined total capacity of 220 MW (to the end of 2001). At present the use of pellets in Austria is largely confined to small-scale systems with a power range below 100 kWth.

Drivers: The rapid growth of pellet applications in Austria has been driven by the introduction of investment subsidies granted at the provincial level for new pellet furnaces and for the changeover to pellet furnaces (on average 25% of investment costs). Furthermore, increased price of oil for heating has contributed to the market growth over recent years.

Sweden

Production of pellets: The production capacity of pellets in Sweden was around 1 million t/a in 2001. The market reached around 800,000 tons in 2001.

Production of stove/furnaces/boilers:

A large number of manufacturers in Sweden produce pellet appliances.

Use of pellets: The use of pellets expanded during the 1990's for replacement of coal in the industrial market. And this remains the largest market today. But the expansion of the large scale market also paved the way for developing the small scale industrial and domestic market. These latter two markets have grown by around 100% over the last year and this pattern is similar to that in Denmark. 25,000 pellet burners are estimated to be in use in the residential market in Sweden, which are dominated by pellet stoves. The total capacity is estimated to be greater than 500 MW. Strong growth in the Swedish pellet market is expected and more than 50,000 units are likely to be in use by 2005. These will substitute for oil boilers, wood boilers and electric heating.

Drivers: A carbon tax was introduced in early 1990's, which increased the cost of alternative fuels such as oil. The production cost of wood pellets is low, down to $120/t. Sweden had developed a quality standard for pellets.

THE ROLE OF FUEL PELLETS IN NEW ZEALAND'S FUTURE BIOENERGY MARKET "SETTING THE SCENE"

John Gifford
Project Leader, Climate Change and Energy
Forest Research
Private Bag 3020, Rotorua

The New Zealand Government wants to increase the amount of renewable energy used in New Zealand from 133.5 PJ to 163.5 PJ by 2012, an increase of 30 PJ. In deriving this renewable energy target additional industrial heat as been identified as contributing an additional 12-16 PJ. 9 PJ would come from "Business as usual", 3-5PJ arising from the implementation of the climate change and renewable energy policy specific measures and an additional 2PJ from the increased processing from a greater log harvest (EECA 2002). The Bioenergy Association of New Zealand has indicated that there is sufficient biomass fuel resource to realistically contribute around 14PJ. In addition to contributing energy into the industrial heat market a range of other sectors can also use biomass as an energy source. These include the domestic heating and hotwater markets, space heating for commercial and institutional buildings and potentially for liquid transport fuels. Where biomass is used to substitute for existing electricity or fossil fuels for heating markets then substantial energy efficiency gains can be achieved as well as greenhouse gas reductions.

A number of barriers have been identified affecting the uptake and implementation of bioenergy including security of biofuel supply, cost of labour, technology selection, ease of use compared to gas and coal, and the life time of investment. The development of a fuel pellet industry in New Zealand would assist in overcoming these barriers. Pellets can be a more predictable fuel, used in many different situations in particular those outside the forestry and wood processing sectors, can readily substitute into existing solid fuel systems and are suitable for automated energy supplies.

The pellet market has seen dramatic growth over a relatively short period of time. In Sweden between 1992 and 2001 national deliveries of pellets increased from 5,000 to around 700,000 tonnes and in addition to this around 50,000 tonnes were exported and 150,000 tonnes were imported. In North America a similar trend has been observed with the trade in bagged pellet fuels growing from 200 tonnes in 1984 to over 750,000 tonnes in 2001 representing about a 14% growth in the market per year. With an increased demand for pellets will come the need to look for alternative feedstocks other than sawdust and shavings from wood processing operations. Other potential feedstocks may include clean organic waste streams from municipalities and agricultural wastes. The development of a pellet industry may encourage the reuse of organic waste for energy production.

This paper provides an overview of the developing bioenergy market in New Zealand discuss drivers and options for using waste streams for energy and considers why a developing pellet market will assist the implementation of bioenergy into markets outside the traditional forestry and wood processing sectors.

John Gifford is Project Leader for the Climate Change and Energy Project at ***Forest Research*** and is a senior research scientist who has worked in the areas of environmental impacts of wood processing, solid waste management for forest industries life cycle analysis, implementation of bioenergy and climate change issues. John has published over 20 research papers and prepared over eighty five reports on these topics. John is the chairman of the Bioenergy Association of New Zealand and the Executive Member for New Zealand for IEA Bioenergy.

Recent international advances in fuel pellet markets, Report form the 1st World Conference on Pellets, Sweden September 2002.

Peter Fredricsen, Materials Processing Ltd

The 1st world conference on Pellets took place just two months ago in Sweden (September 2-4, 2002). The conference was organised by The Swedish Bioenergy Association and main sponsors being the EU and the Swedish energy Agency. The conference participants form all over the world including three from New Zealand, Steve Cunningham, Gary Wilson and myself. In sense of professional areas, the participants covered mainly researcher, forest industry, the energy sector and the waste management sector.

The conference came up with a resolution, which basically said that the biomass can grow to become a major source of global energy supply in the long term and that biomass refined into fuel pellets and briquettes have opened new opportunities. These fuels:

- may be utilized in controlled combustion processes over a wide power-range with excellent environmental performance,
- can be efficiently transported and stored,
- are creating a global bioenergy market.
- Is carbon neutral
- Urge politicians to remove subsidies to conventional non-sustainable sources of energy, which would be an important step to strengthen the bioenergy industry. Making polluters pay for environmental costs would decisively increase the bioenergy contribution to global energy supply.

The conference highlighted The importance of International Cooperation for the development of bioenergy – Research and technological developments. Country reports were presented from a broad range of countries, including the European countries where implementation ahs been successful and countries where is has not been successful. But country report was also present from all other countries especially form the Asian region.

The exhibition mostly presented the type stove, boiler sand conversion techniques to change oil and gas boilers. Pellet press manufacturers were conspicuous by their absence from the exhibition, although several representatives appeared at the last day of the conference

Two days of site tours showed a broad range of applications, from the large combined heat and Power plants in Hasselby with 3x100 MW boilers burning wood pellets to conversion of a 1MW oil boiler at a school at Boras. The Boras energy conversion incorporated a 2km district heating scheme as well as enhancing the heating of the school and swimming pool. Furthermore a number of pelletising plants were visited from plants with a capacity of 45,000 tons a year to a small pelletiser machines with 10 times less capacity (250-350 kg per hour). The study tour ended after visit to the Swedish National Testing and Research Institute where product development and testing for certification of pellet boilers and stoves is carried out.

Lasting impressions, for me, were the versatility of wood pellets, the clean automated systems, the consumer friendly logistics systems and the potential for New Zealand to become an energy exporter of biofuels, particularly wood pellets.

Pellet Fuel New Zealand Ltd

Steve Cunningham

The Pellet Industry was first introduced into Canterbury in 1998 and has grown slowly throughout New Zealand.

Pellet Fires imported from Canada by our company, have had all the market share until recently, where in Christchurch, two new companies have designed their own Pellet Fire. These units are now available in the market.

Pellet Fuels built a purpose built factory in Rolleston in 2002, installing the necessary equipment to double production.

Pellet Fuel Supplies fuel for the following uses:

- Pellet Fireplaces
- Pellet Barbecues
- Industrial Boilers
- Animal Litter
- Export to Australia

Steve Cunningham has been involved for 5 years in pelletising sawdust and other waste materials in New Zealand. He has travelled throughout Canada and the USA looking at different pellet operations and attended several conferences on wood pelletising. He recently returned from Sweden after attending the first world Pellet Conference, with fellow New Zealanders Peter Fredricsen and Gary Wilson.

A guide to potential resources for fuel pellet production in New Zealand

John M. Lavery, John Gifford, Per S. Nielsen
Forest Research

Although currently fuel pellet production in New Zealand is limited to wood fibre residuals, there are several other potential waste streams that could be added to production, significantly increasing the total fuel masses available, as well as improving the distribution of pellet resources, making many sources closer to main industrial and urban centres.

Apart from sawdust and wood chip residuals, potential sources for fuel pellet production include: raw wood residuals currently left on site, agricultural fiber residuals, municipal biosolids, landfill organic deposits, and some agricultural sludges (piggery effluent, for example).

Little or no formal research has been conducted in New Zealand in terms of the reuse of these waste streams for bioenegy consumption. This presentation concludes with two case studies of traditional forestry residuals and municipal biosolids as potential sources for fuel pellet production.

John M. Lavery is the Technical Manager of the New Zealand Land Treatment Collective, and a Scientist with the Sustainable Forest Management Team at Forest Research. He currently focuses his time in land treatment and management of residuals, soils and tree nutrition, and sustainable ecosystem modelling.

Application of fuel pellets for institutional/industrial energy users, district heating and CHP – European experiences

Per S. Nielsen, Forest Research

Abstract
In a simple model energy demand, raw materials for production of pellets, manufacturing and engineering skills and environmental awareness have been identified as prerequisite barriers or drivers for the up take of fuel pellets in the energy sector.

The Swedish and Danish district heating model, which covers residential areas, can not easily be copied to New Zealand. However there are still public and private institutions and industrial users, which can benefit of establishment of a common district heating system. Furthermore it may be attractive to establish small-scale district heating system (neighborhood heating systems) in development of new subdivisions. There are also a large number of boilers used for space heating and hot water heating in the industry and the public sector, which may be converted into use of wood pellets. These applications could be a target following the Austrian development model. The recent development in Swedish pellet market has been to implement pellet stoves for residential heat demand – an area where the market has started in New Zealand during the last years.

For the other prerequisite barriers and drivers, raw materials for pelletising is abundant in New Zealand but is not further analysed in this paper. Manufacturing and engineering skills are also assumed to be at a high level in New Zealand both for production of new pellet based conversion technologies and for converting old fossil fuel systems into use of pellets, although there is no experience is this area at the moment.

Environmental awareness as a driver has proven difficult. There seems to be a high level of environmental awareness and a political will to be 100% pure in New Zealand. However it is still difficult to establish renewable energy projects due to environmental policies, especially due to the RMA process.

In the New Zealand case, a group of political initiatives should be able to help the decision making process, including the Renewable Energy Target, the NZ Waste Minimisation Strategy, the Preferred Climate Change Policy and the Energy Efficiency and Conservation Strategy. There are many good political intentions in all of these plans and it is possible to see them be working together towards increased uptake of renewable energy including bioenergy. The energy market including the bioenergy market need that strong signal from the government to move forward and help make the new technologies and new applications of existing renewable energy technologies viable.

Per S. Nielsen, has been working for Forest Research during the last 2 years, as a Rotorua Energy Charitable Trust Fellow. Has been involved in a number of activities all related to the use of wood waste for energy with a strong focus on development of bioenergy in the Rotorua area. He obtained his PhD degree and master degree at the Technical University of Denmark.

Update on Government policy on renewable energy, and how the wood pellet market can benefit.

Emily Rudkin, EECA

Abstract

Last month the Government released its Climate Change Policy Package, and the Renewable Energy Target and mechanisms required to achieve the target. The renewable energy target is for an additional 30 PJ of consumer energy from renewable sources by 2012. It is anticipated that bioenergy will make a significant contribution to this target, particularly for process heat applications.

The renewable energy programme is designed to expand on EECA's current programme and is split into four sectors – electricity, process heat, transport and low temperature heat. There are possibilities to expand the use and application of fuel pellets through actions in these programmes, in particular investigations of the heat demand across the breadth of industry in New Zealand; communication of information, ideas and approaches; and trials and demonstrations of renewable energy technologies and applications.

International Pellet Markets
Lessons for New Zealand

Pelletising wood waste began in the early to mid seventies as a response to the oil crisis using technology borrowed from the agricultural feed stock industry. It's popularity as a fuel has varied depending mainly on the price and availability of oil fuels. In the mid 90's as oil prices climbed again and concerns over global warming intensified pellet use began growing rapidly.

Today Europe and North America are the powerhouses in the pellet fuel market with the European market at around 1.3 million tonnes and North America at 0.85 million tonnes annually. Growth, particularly in Europe is currently very strong.

Pellets are clean burning, easily transported, renewable and international trading is now an established part of the market. Pellets can be used as a replacement fuel for fossil-fueled equipment, particularly oil or coal fired boilers. Conversion of domestic oil fired hot water boilers from oil to pellets is currently extremely popular in Sweden. Since the mid 90's pellets have been burned in large scale power plant boilers as a coal substitute and this trend is accelerating.

Domestic space heating using pellet fires is now well established in NZ and will continue to grow.

The potential exists in New Zealand for the conversion of medium sized commercial and industrial combustion units to burn pellets. The uptake of pellet use in this sector will be hastened if the Government choose to take a proactive role in the process.

Large scale production for export as a power plant fuel (e.g. Japan) is a possibility.

Gary Wilson began his working life in the power generation industry before moving into general engineering. In the mid 80's he became involved in the rapidly growing MDF industry, spending the last four years managing a US MDF manufacturing plant. He returned to NZ in 1999 and is now a consultant working in the capital equipment supply business.