

The Risk Communication Challenge

At the end of November, CAE further extended its developing platform in Risk Management by running a successful, two-day conference entitled "The Risk Communication Challenge". The venue for the conference, Te Papa, Museum of New Zealand, was kindly provided by the Earthquake Commission, and CAE is also grateful to have received additional support from Optimx.

CAE Board Chairman, Dr Francis Small, welcomed delegates and introduced Dr Liz Gordon MP, who gave the opening address. Dr Gordon, is the Alliance Party spokesperson on

Research, Science and Education, and is also Chair of Parliament's Education and Science Select Committee.

More than 70 people, representing a wide cross-section of New Zealand business, heard a variety of excellent presentations focusing on issues, techniques and practice of risk communication. This topic has, until recently, traditionally been seen as the end result of the decision-making process — the point where media, stakeholders, and the public were informed of the outcome of an action or, perhaps, a regulatory decision. Increasingly, risk communication is becoming recognised as an essential element of an effective risk management programme.

Two addresses were given by the keynote speaker Dr Bernd Rohrmann, University of Melbourne. Dr Rohrmann is a psychologist with substantive interests in risk perception and communication; impacts of environmental stressors (eg, noise); hazard appraisal and disaster preparedness; decision processes; and decision-aiding technologies. In his presentation on risk perception he explained why risk is a multi-faceted concept and why interpretations of risk issues tend to clash when looked at from differing points of view. He said the extent to which people are prepared to accept risk will depend on many factors including the type of hazard, personal experiences, beliefs and attitudes and on societal influences. Fear associations, catastrophic potential, unfamiliarity, uncontrollability, and possible long-term health effects can be stronger influences than an assumed probability of death.

The second day was devoted mainly to case studies and ended with a panel discussion, ably moderated by David

Elms. The case studies, including presentations on: developing a risk communication strategy for the management of the Ashburton floodplain; resolution of issues surrounding the Alexandra flooding; the White-spotted Tussock Moth experience; and the Rabbit Haemorrhagic (Cilicivirus) Disease, provided practical examples on how some of the theory presented during the first day can be used in practice.

Feedback from participants has confirmed the value of CAE continuing to work in this area. The prospect of organising a second conference in 2001 is being considered. It is also intended that papers from the recent conference will be included in a new CAE risk management book.

CAE Board members, Professor David Elms and Mr Patrick Helm (Department of the Prime Minister and Cabinet) made significant contributions to the organising and running of this final CAE event for 2000.

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CAE Projects Director, John Lumsden, speaking at the Conference

Paradise Lost: A Commentary on New Zealand's Future and Choosing a New Infrastructure

CAE is always keen to seek views and opinions from as a wide range of contributors as possible. CAE thanks Piet Beukman FIPENZ, Director, Engineering Management Programme at the University of Canterbury, for the following article. We hope to include contributions from other commentators in future issues of the Information Bulletin. The opinions expressed in this article are, naturally, those of the author.

Someone who arrived in New Zealand at the end of 1993 would now definitely suffer from post-immigration stress syndrome. Low inflation has turned into the threat of high inflation, the exchange rate is largely dependent on externalities, a fragile business confidence sees top brains draining overseas, and economic growth is showing signs of stagnation.

Yes, some of our woes are due to external factors, oil prices not being the least. But we have no real buffer. No real capability to add value. No national strategy. New Zealand, it could be claimed, is weathervaning.

There is no real national strategy for growth

In the meantime there is talk amongst business circles that the low exchange rate is actually good for exports. Most definitely it is, in the short-term at least, but if one regards the total economy, represented by NZ Inc., it would be quite apparent that domestic prices are climbing – the threat of inflation is showing its ugly spectre. Those who heard Professor Michael Porter's talk in the Wellington City Hall in November 1998, will remember his assertion that a low-wage, low exchange rate economy is doomed to be second rate.

Where have we lost the plot?

To cite Porter again, there was his famous visit to New Zealand in 1991; pity no one here listened. We also did not capitalise on the commercialisation of the web in 1994 and we missed the mainstreaming of the Internet in 1998. Oh yes, the knowledge economy has been bandied about and a few high-tech companies have been held to be our saviours. In the meantime the 1990s are the lost years for New Zealand; not only did we miss the three key strategic inflexion points mentioned

above, but we continue to be complacent.

We are price takers, blessed with abundant natural resources, a good lifestyle and plenty of natural beauty. This will still doom us to a future of being commodity traders and the makers of beds and carriers of golf clubs for rich tourists from knowledge economies. The Land of the Long White Cloud is also the Land of the Tiny Strategic Thinking. Only in New Zealand could nine times more money than that allocated to high-tech business incubation be given to stop the smoking habits of a sector of our society. This amount is also 56% more than that allocated to e-commerce development.

Why is New Zealand a technology colony?

On the technological front, we are at best a technology colony. There is a gap between our research institutions and industry. Industry, except for a few exceptions, is looking mostly offshore for technology, inputs and product ideas. The New Zealand research sector is mostly focused on applied research, largely funded from centrally orchestrated and bureaucratic government funding. The vast majority of small businesses, who are in desperate need and make up 85% of the enterprise base, are effectively excluded from these processes. There is far too little development of new businesses from within the research community.

Above all, our education system sadly lacks encouragement for the future development of scientists, engineers and entrepreneurs that we so desperately need. The statistics speak for themselves: New Zealand is among the worst performing of all OECD countries in terms of technical graduates.

Why do we need a new infrastructure?

Individual or national wealth comes from three sources. It is created through growing something (farming), finding something (mining and fishing), or by creating something by adding value (technology and manufacturing).

From the 1850s towards the middle of the 20th century, New Zealand's infrastructure was developed to enable its agriculturally-based economy to function. Roads, ports, railways, electrification, telegraph lines, telephones, power generation and distribution were all developed. This infrastructure was generally regarded as a public good, which enabled economic growth and overcame the constraints that would otherwise impede the flow of produce to markets.

In order to pursue a knowledge-based economy, a term often bandied about with little understanding, a very definite infrastructure is required. Unlike the tangible infrastructure supporting the "old economy", the new infrastructure is





mostly tacit, even virtual. It is nevertheless just as important as the old infrastructure was in establishing this country in supporting a new economy based on New Zealand's intellectual capabilities.

What are the components of a new infrastructure?

The first component of the new infrastructure is a skilled workforce. No longer can one enter the workforce without the necessary skills. In the new knowledge infrastructure, knowledge and specific skills are power. The unskilled will be marginalised. Central to the acquisition of skill and knowledge lies an appropriate education system. The disciplines of science, engineering, technology and information technology lie at the core of skills and knowledge that will add the necessary value to ensure economic and social development.

The second component is access to capital. Economic growth in the USA, Israel, Ireland and elsewhere is fuelled by the availability of risk capital. Investment in start-up ventures and business expansion drive the creation of new wealth. Emphasis must be placed on investment in productive assets and knowledge, rather than bricks and mortar. Risk is higher, but so are the rewards. There is need to change the current risk-averse attitude to investment in New Zealand. Government could take a leaf from the Israeli

book on how to catalyse investment by seeding venture funds and enabling a culture of entrepreneurship.

The third component is information. The very essence of a knowledge economy is the availability, trading, exchange and enhancement of information. Information has now become the key component of all tradable goods, from commodities and farm produce to high-tech products and services. Without appropriate knowledge, in all stages of the value chain, all forms of economic activity are relegated to that of subsistence.

The fourth component is communication. In a connected world, it is essential to exchange information. Communication has overcome the tyranny of distance; the internet can be the freezer ship of the 21st century for New Zealand.

The fifth component is management. Although strictly a skill, management is a key enabler of business and resulting growth and is therefore singled out. Management is the essential component that can turn an idea and investment into a profitable business. In many cases entrepreneurs and technology experts lack the essential management and business knowledge needed to drive a venture upward along the value curve.

What is the bottom line?

New Zealand continues to fall further behind other nations in economic performance. The following issues hold the key to reversing that trend (with some reference to John Walley, CEO of the Canterbury Manufacturer's Association):

- Change our attitude from the short-term to a long-term view, based on economic rationalism and bipartisan support.
- Accept that the economy enables social policy, not the reverse.
- Develop a national growth strategy, driven by value-added industry and not commodities.
- Recognise the benefits and contribution that technology can

make to New Zealand's economic and social wellbeing.

- Develop policies that properly align the economy towards effective research and development.
- Focus on the tradable sector as the new economy growth engine.
- Minimise compliance costs and regulation blockages; understand the demographic impact where 99% of our companies have less than 50 people.
- Realise that education and appropriate skill sets need to be nurtured.
- Realise that our ample natural resources and production of commodities present a real danger by lulling us into a state of complacency. Knowledge, human capital and appropriate investment hold the key to becoming an enlightened and enterprising economy.

Does the engineering profession have a role to play?

In all of this, the Centre for Advanced Engineering, together with IPENZ, have a moral duty and a definite role to play. Now, like never before, we need leadership and direction from the engineering profession. Engineers have provided the infrastructure since Roman times. We need to plan and facilitate a new infrastructure – now.



Opportunities for Renewable Energy from Woody Biomass – A New Zealand Perspective

An abridged version of a paper presented by George Hooper to CHEMECA 2000 Perth, Australia, May 2000. A copy of the paper is available from the CAE office.

Introduction

Woody biomass, for heat and power generation, is becoming increasingly recognised as offering excellent prospects as a renewable energy resource available to meet New Zealand's future energy needs. Already woody biomass contributes approximately 5% of New Zealand's total primary energy demand, and just under 1% of electricity production, but recent studies indicate that the contribution from these sources could grow to provide in the vicinity of 10% -15% of New Zealand's primary energy requirements.

Overall, the demand for energy in New Zealand is projected to increase by 1.1% per annum to the year 2020. From an environmental perspective, one of the issues of concern for New Zealand has been the increase that has occurred in greenhouse gas emissions since 1990, with the energy sector showing an almost 20% increase in CO₂ emissions over the period from 1990-1998. Whilst by far the largest share of this has been from domestic transport, the contribution from thermal generation has also been significant and projections are that carbon dioxide emissions from electricity generation will increase at around 2.1% pa

between 1995 and 2020.

Renewable energy from biomass offers excellent prospects for offsetting these increases in greenhouse gas emissions as well as providing opportunities for diversifying the energy mix available to consumers.

Biomass Resources

By far the predominant resources of biomass in New Zealand are the wood residues arising from this country's production forestry estate. Forest production currently stand at 17 million m³/y and, at a per capita planted forest land area of nearly 0.5 ha/person, New Zealand is one of the richest planted forest countries in the world.

The projected future harvest from our forests is expected to increase rapidly from the year 2000 onwards. Projections for the year 2020 indicate harvest levels greater than twice current levels.

This is a significant potential resource base. The extent and range of these biomass sources are considerable, but are well described and readily quantifiable, as summarised in Table 1. An estimated 4.2 million cubic meters (Mm³) of forestry residues are calculated to be economically recoverable by the year 2000 as by-products from normal forest activity, and thus avail-

able for new uses, rising to 6.7 Mm³ by the year 2020.

Status of Bioenergy Deployment in New Zealand

Whilst biomass combustion has been used extensively in New Zealand by the wood processing industries for many years, experience has been variable and plants have not been operated to maximise efficiency or optimise energy recovery. Many of the plants are at wood processing sites and producing heat for lumber drying, where energy efficiency has been a lower priority. In addition, there has been a general reliance on utilising modified coal-fired plant (often second-hand) and also minimal attention has been given to optimising the overall fuel supply system.

Table 2 presents an overview of the current status of bioenergy sites in New Zealand. Sources of biomass to these facilities include some forest arisings, but mostly the fuels are derived from wood-processing residue streams. The future, however, could well be very different.

Combustion

These days much of the timber produced for export is either partially or

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Supply Region	Wood processing residues			Forest residues			All residues		
	1996-00	2006-10	2016-20	1996-00	2006-10	2016-20	1996-00	2006-10	2016-20
Northland	54	222	218	103	424	418	156	646	637
Auckland	83	109	108	160	208	207	243	317	315
Central North Island	697	783	786	1863	2092	2101	2560	2875	2887
East Coast	47	167	211	91	320	405	138	487	616
Hawkes Bay	59	146	151	114	279	289	173	425	439
Southern North Island	72	137	172	138	261	330	210	398	502
Nelson & Marlborough	107	172	182	197	316	335	304	487	517
West Coast	19	23	26	35	43	48	53	67	73
Canterbury	50	77	81	93	142	148	143	219	229
Otago & Southland	87	144	169	161	265	311	248	409	481
New Zealand Total	1277	1979	2105	2953	4351	4591	4230	6329	6695

Table 1: Trends in regional forestry by-products (000 m³/year)

Location	Manufacturing Type	Energy capacity (MW)	Grate Type	Cogeneration
Kaitaia	Fibre Panel	38		No
Kumeu	Particle board	4	Dutch oven	No
Kawerau	Pulp and paper	100	Travelling	Yes
Gisborne	Laminated Veneer Lumber	34	Tipping	No
Tokoroa	Pulp and paper	70	Kablitz, reciprocating	Yes
Rotorua	Sawmill	27 + 25	Pin hole grate and Kablitz sloping grate	No
Rotorua	Sawmill	10	Hydrograte	No
Rotorua	Remanufacturing plant	4	Suspension	No
Taupo	Fibre panel	17		No
Napier	Pulp and sawmill	25	Pin hole grate	No
Ohakune	Pulp mill	7	Kablitz	No
Masterton	Laminated Veneer Lumber	28	Tipping	No
Nelson	Sawmill	15		No
Nelson	Fibre panel	19 +22	Kablitz, reciprocating	No
Christchurch	Fibre panel	40	Travelling	No
Blue Mountain	Sawmill	20	Hydrograte	Yes
Mataura	Paper mill	55		No
Mataura	Fibre panel	35		No
Total		595		

Table 2: Major biomass fired energy plant in New Zealand

between Carter Holt Harvey Pulp and Paper (CHH) and the (previous) Electricity Corporation of New Zealand (ECNZ).

At Kineith, CHH processes whole logs into pulp and paper products. The plant is a world-scale manufacturing facility utilising more than 2 million tonnes per year of wood chips to produce 400,000 tonnes per year packaging papers and linerboard products, plus 150,000 tonnes per year of high-strength pulp for export. Prior to the cogeneration development, large amounts of wood residue materials unsuitable for process input, were either burnt in old modified coal boilers or dumped in land fill sites. The project involved decommissioning of the existing wood waste boilers and erection of a new biomass fired boiler delivering steam to a common header taking steam from two black liquor recovery boilers as inlet to a new pass-out turbine delivering an electrical output of 40 MW.

The project has enabled the mill to reduce total energy costs by utilising all waste wood products efficiently and has also resulted in an overall improvement in air emissions from the company's energy plants. Improvements to the steam system and plant energy

fully remanufactured for specific export markets. To achieve high quality manufactured product, wood processors have to first dry the timber to ensure consistency of performance. This, in turn, has meant substantial new investment has been required in increased kiln capacity throughout the industry. Typically hog fuel provides some 90% of the enthalpy of the steam required for drying.

A project typical of many under development has recently been commissioned at the Blue Mountain Lumber sawmill in southern New Zealand. Blue Mountain Lumber has two sawmills and a remanufacturing plant on a single site.

The company has recently changed its product mix and is moving to 100% kiln-dried output. To meet this demand a new 10 MW Babcock and Wilcox water wall boiler with a Detroit water-cooled vibrating grate (built by Easteel Energy Systems) has been installed burning a mix of green and dry sawdust with some added bark. The boiler capacity is 10,000 tonnes of steam/year supplying at a maximum steam rate of 12 tonnes/hr. Surplus steam is fed to a

condensing steam turbine for generation of electricity for on-site use.

An innovation with the Blue Mountain Lumber project has been with the funding and ownership of the new boiler. The new boiler has been built for, and will remain owned by, Meridian Energy who sell the steam to Blue Mountain Lumber for drying purposes. Meridian takes all operating and maintenance responsibility for the boiler and generator set. Blue Mountain Lumber is responsible for the supply of wood waste fuel.

Co-generation

The most recent significant wood waste cogeneration plant in New Zealand is the 40 MW Kineith project. This project resulted from several years investigation, analysis and negotiation



CHH Pulp & Paper, Kineith Plant

balance have reduced the overall energy intensity of the mill to be in-line with similar international operations. Natural gas is also burnt in the boiler as a supplementary fuel.

The Kinleith project provides a credible example of how the commercial and technical risk elements of cogeneration can be successfully managed in the New Zealand context. This project was the first significant investment of its type in New Zealand with a key feature of the project the design of the new wood waste boiler, which needed to be tailored to burn the type and quality of fuel available at the mill. In addition, the power purchase arrangements provides incentives for both the plant operator and the utility company (who remain the owner of the plant) to ensure the efficient operation of the facility.

Gasification and Reconstituted Fuels

In circumstances where there is perhaps not the heat demand required for combustion processes, and costs for conventional disposal of waste sawdust or other materials are significant, gasification or the manufacture of specialist solid fuels (for example pellets and briquettes) offer a new bioenergy opportunity.

There are two significant New Zealand gasification developers/manufacturers active in New Zealand — Fluidyne Gasification Ltd., Auckland, and Renewable Energy Corp. Ltd., Hastings.

- The Fluidyne systems are a downdraft gasifier designed and developed for remote areas, especially targeting the Pacific Islands where most of the systems have been sold. A few demonstration systems are also located in New Zealand, England, Germany, Uruguay and South Africa. The largest systems designed are rated 500 kW (Mega Class) but there are opportunities to couple the systems to increase capacity.
- Renewable Energy Corp manufacture the Waterwide Gasification systems. The vendor describes

these as a fixed-bed, close-coupled gasifier (CCG), primarily designed to supply clean combustion gases for heat purposes. Commercial units range from between 4 and 15 MW heat output with a turn-down ratio typically able to be modulated down to about one sixth of full output. The company has enjoyed considerable success in marketing the units within Australia and New Zealand, especially for providing process heat to lumber drying kilns in the wood processing industries, and has recently moved to Australia as part of a major expansion and development strategy.

The production of solid fuel using wood waste is proven technology, with fuel opportunities including domestic heat logs, industrial boiler pellets and biomass fuel for co-generation plants. In North America and Western Europe the utilisation of biomass wastes for the production of solid-fuel products is well established, but in New Zealand, whilst there is a growing market demand for these products, the industry is yet to develop to any great extent.

Biomass extrusion processes typically form a dense, high-quality fuel having a heat output of between 4-8 kcal/g. Classed as a smokeless fuel, the fuel offers superior combustion characteristics over normal grades of coal and is suitable for most appliances.

Conclusion

The key to the future successful exploitation of bioenergy as an energy source is achieving a better understanding of the factors that influence the cost-effectiveness and efficiency of operation of the entire energy supply chain (from fuel supply, through to supply chain management and fuel conversion) in a bioenergy system.

The New Zealand case studies described in this paper demonstrate that there already exists economic opportunities for the use of biomass fuels and that fuel availability in the future offers good prospects for increased investment in these fuels.

New Address for CAE Website

The CAE Website has now got its own 'dot com' address, www.caenz.com. The current, university-based, address (www.cae.canterbury.ac.nz) will, however, still work.

The CAE Website has extensive coverage of CAE's activities and publications, and will be undergoing a major revamp early next year to allow, amongst other things, secure on-line ordering facilities.

In the meantime, publications can still be ordered via the website. Each publication is fully described and sample chapters and contents pages can be downloaded for most of our recent titles. Previous issues of the *Information Bulletin* can also be downloaded.

Contacting CAE

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