SRC in New Zealand: Policies and Research - a brief overview

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1. INTRODUCTION

Bioenergy in New Zealand is developing a higher profile than it has had in the past. This is the response to a number of factors, in particular:

- Reducing dependence on fossil fuels
- Reducing CO_2 emissions (Kyoto Protocol)
- Diversifying the energy supply mix
- Reducing susceptibility to price shocks
- Utilising waste or residues for energy
- Deregulation within the energy sector
- Distributed energy systems
- Sustainable production/green energy
- Government strategy

New Zealand's interests in short rotation crops primarily relate to the following:

- New Zealand has well established short rotation eucalypt plantation forests used for pulpwood production and several attempts have been made to establish eucalypt firewood and bioenergy ventures. The current eucalypt plantation resource in New Zealand is approximately 40,000 ha.
- Short rotation crops, although currently used to a minor extent for energy production, are viewed as being strategically important for the long-term implementation of bioenergy projects to supplement other biofuel sources such as the residues from the processing of the 1.5 million ha of pine forests.
- Short rotation crop regimes will increasingly provide integrated solutions for land management (e.g. wastewater renovation etc), renewable supply of woody biomass for bioenergy and other amenity values.
- Short rotation crops will allow diversification of New Zealand's forest resource and reduce the country's dependence on single species plantation forests.
- Short rotation crops will diversify current land use within New Zealand and provide opportunities for new economic development and employment.

Short Rotation Crops for Bioenergy: New Zealand, 2003

New Zealand is a temperate climate with a strong hydro energy base and strong fossil fuel supply (Figures 1 and 2).

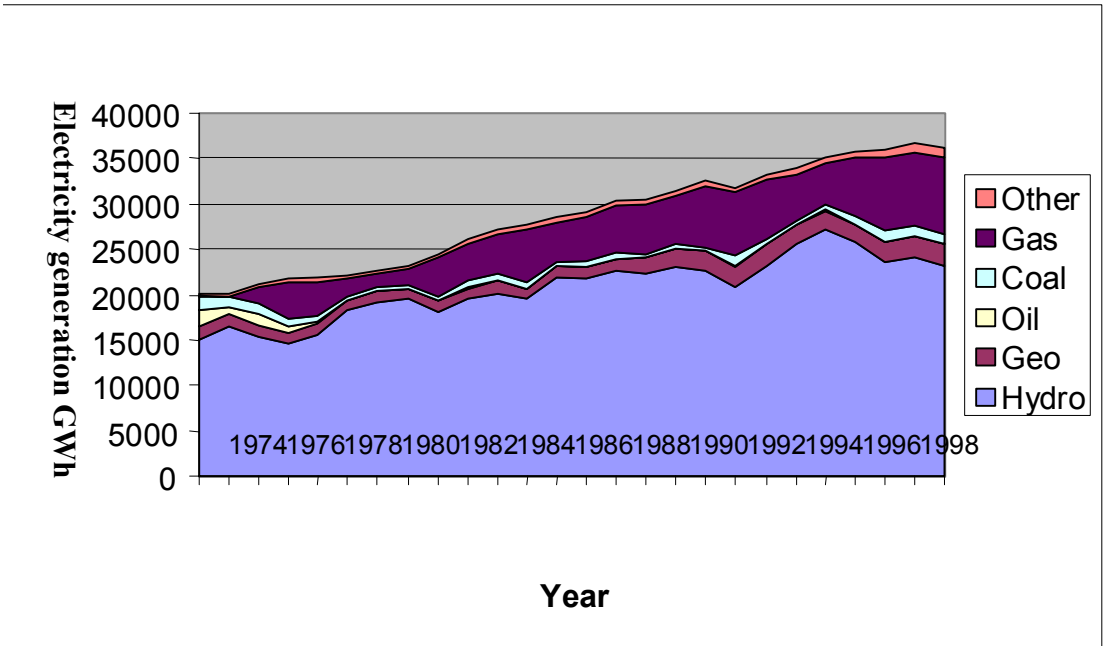

Figure 1. Total electricity supply in New Zealand by fuel type; 1974-1999 (includes transport fuels)

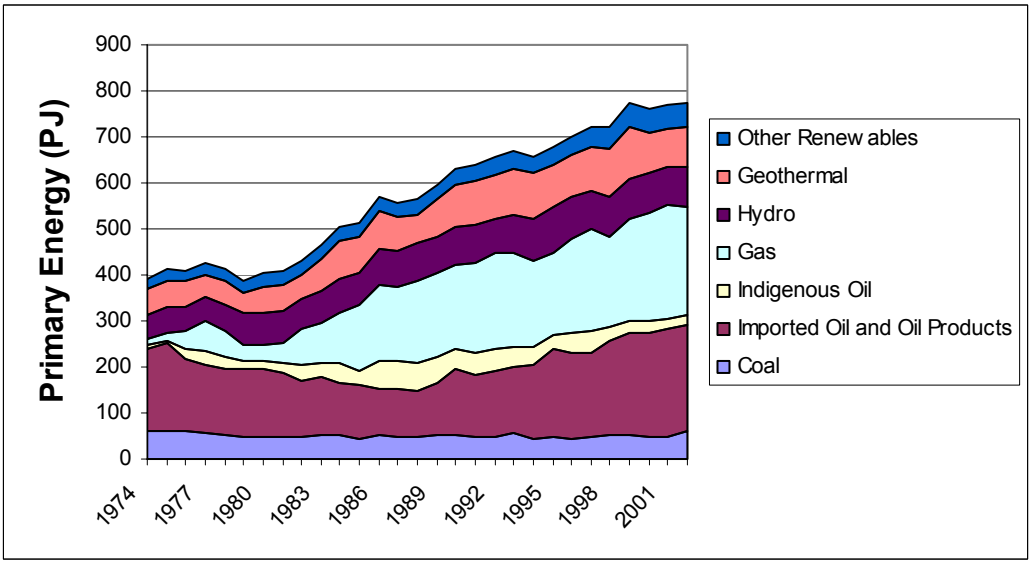

Figure 2. Total primary energy supply in New Zealand 1974-2003 (includes transport fuels)

Renewable energy sources include hydro, geothermal, biomass (mainly wood and landfill gas), waste heat, wind and solar. Renewable energy contributed about 29% of total primary energy supply in New Zealand for the year end March 2003. Of the total renewable energy supply, wind, biomass and wastes contributed 23%, while hydro contributed 39%, and geothermal 38% .

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The potential of bioenergy in New Zealand is based on the production residues from the plantation estate. There is the potential to increase energy from wood process residues by 53%. It is also predicted that there will be a doubling in the lumber drying market (based on a doubling of sawlog production) as well as a 250% increase in surplus wood process residues. These figures suggest that there will be a substantial resource of raw material for bioenergy available in New Zealand.

New Zealand has a large number of different energy users, including the forest industry itself, other industries, public institutions, and domestic houses. The link between the energy users and the fuel producers is not very well developed in New Zealand. here are many reasons for this, mainly of an economic nature, but other barriers including lack of information on bioenergy options, a lack of focus on markets outside the forest sector and lack of availability of new bioenergy technologies. Any step to penetrate the energy market will have to challenge these barriers.

The forest industry in New Zealand is large and produces a large amount of wood waste. These include residues in the forest and also residues arising from the wood processing industry. Only a part of this wood waste is used for energy. A significant part of the wood waste ends up in stockpiles in the forest or is disposed of in cleanfills or landfills.

2. GOVERNMENT POLICIES

In September 2001, the New Zealand government released the National Energy Efficiency and Conservation Strategy. This has a policy of continuing improvement in New Zealand's energy efficiency and in progressive transition to renewable sources of energy.
It has a target for:

(i) ***Energy efficiency*: at least a 20% improvement in economy-wide energy efficiency by 2012.**

(ii) ***Renewable energy***: **increased renewable energy supply to provide a further 30 PJ of consumer energy by 2012.**

The 30 PJ target is additional to the supply of consumer renewable energy in 2000. In 2000, renewable energy supplied 134 PJ, or 29% of consumer energy. This means that by 2012 a minimum of 164 PJ of consumer energy should be supplied by renewable sources.

Yearly progress will be assessed against a uniform average increase in renewable consumer energy of 2.5 PJ pa as implied by the target.

Little significant change in consumer renewable energy supply has been recorded in the last decade. Despite 10-20 PJ of new renewable energy supply being predicted in the next decade under business as usual, the renewable share of total consumer energy is expected to decline further.
The target represents a 19-42% increase over the current renewable energy supply, and would most likely increase renewables market share to 30-35%. The 30 PJ target includes the renewable supply expected to occur under business as usual.

The target is expected to be met by a combination of geothermal, woody biomass, hydro and wind options providing electricity and process heat. Further expansion of process heat and electricity sources are predicted as well as a contribution from solar water heating. Although

the target does not exclude transport fuel options (such as biofuels) at present, they are not yet available at relatively low net costs and are not anticipated to be part of the least cost mix.

The interaction of the energy efficiency target with the renewable energy target also needs noting. Lower energy growth in the future (as implied by achieving the energy efficiency target) is likely to make achievement of the upper end of the renewables target more expensive because market opportunities for low cost renewables supply will be reduced. Thus while analysis suggests that with higher energy growth an upper end renewables target could be achieved with an increase in overall energy prices of 1 % or less, there are many uncertainties about costs at this stage.

Some of the policies are being implemented as part of the Governments Climate Change Policy and through the governments Renewable Energy Programme. With New Zealand a signatory to the Kyoto Protocol, the leadership of the Climate Change Policy is very important in the development of renewable energy.

3. RESEARCH ACTIVITIES

Forest Research in collaboration with Coal Research, Massey University and Lincoln University have conducted a research programme on bioenergy since 1996.(Figure 3).

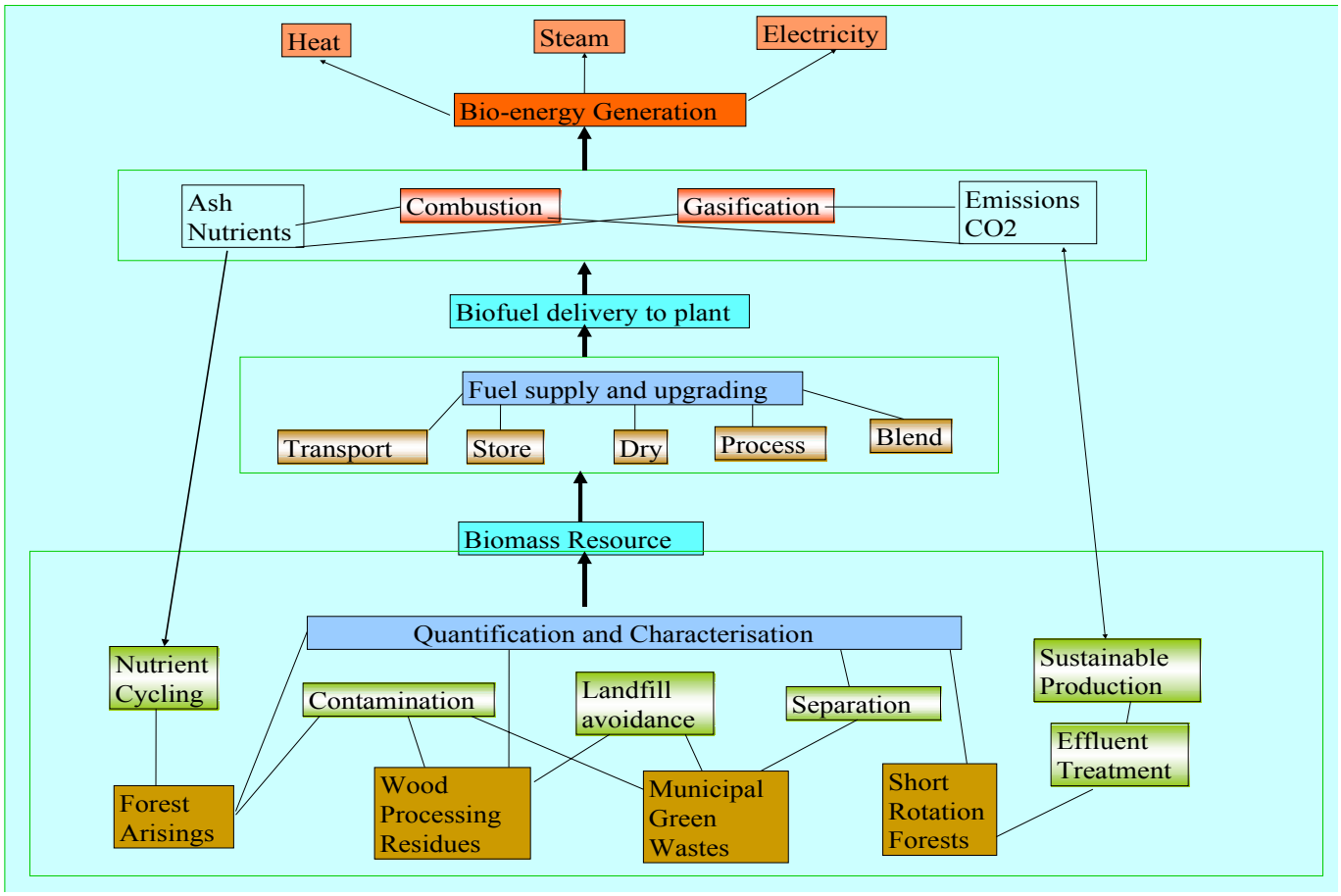

Figure 3. Overview of Government funded bioenergy research programme 1996-2002

4. INDUSTRY LINKS

The formation of The Bioenergy Association of New Zealand (BANZ) in October 2001 (www.bioenergy.org.nz), has provided an industry voice for bioenergy. This association has very close links to the Energy Efficiency and Conservation Authority (EECA).

5. HISTORICAL BIOENERGY OVERVIEW

After the oil shock of the early 1970s New Zealand considered other fuel options, to the extent of developing a pilot ethanol plant. However, economic considerations prevented further developement. In the meantime bioenergy was considered in New Zealand as a harvesting and main-stream forestry issue. Hence research on forest residues and sustainability issues were paramount. For these reasons New Zealand, through ***Forest Research,*** has been most active in the IEA TASK "Conventional Forestry Systems for Sustainable Production of Bioenergy" (Task 31).

6. CURRENT SRC BIOENERGY OVERVIEW

There has been considerable research into plantation forestry which has included species suitability for bioenergy.There has been until recently no specific bioenergy research programmes. In order to summarise research activity, a number of research groups must be canvassed. There is considerable collaboration between many of these research programmes (Table 1). Support for Task 30 in New Zealand is currently based on the activities of six separate research programmes at ***Forest Research*** supported by the activities from a range of other contributors. The combination of these provides the framework for the national research programme. These organisations and activities are summarised in Table 1.

7. CONCLUSION

While Radiata pine residues from harvesting operations and log processing are likely to be the main feedstock for bioenergy in New Zealand, purpose grown species also have a role to play as a feedstock for bioenergy plants, which may be relying on other providers for material. The preferred species, E*ucalyptus nitens,* currently planted for short fibre pulp, may not be the best bioenergy feedstock. Thus considerable research is required to evaluate denser and moderately productive species, either in growth rate or biomass production, to widen the data base on alternative species for bioenergy. In particular, the interaction of biomass production with species, planting density, age and management needs to be well understood. In New Zealand conditions well grown hardwood bioenergy stands could be expected to produce from 15-25 ODT/ha/yr.

The successful implemenation of SRC in New Zealand needs to be allied with a bioenergy market, then its proper role in the market will be more transparent.

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Table 1. Overview of New Zealand SRC and participants (1996-2000)

Organisation/group	Activities	Priorities	Collaborators
Forest Research/Energy	Evaluation of purpose grown bioenergy crops (including land treatment), systems analysis, regional studies of bioenergy resource potential, combustion trials, gasification evaluation, fuel identification, system co-products.	Fuel cost and performance, Systems analysis, Co-products, Regional evaluations.	Coal Research, Massey University, Lincoln University, EECA, BANZ, Rotorua Charitable Energy Trust.
Forest Research/Carbon	LCA analysis of typical production systems (tree, agronomic crops etc), carbon components of alternative species, carbon sinks	Systems analysis, LCA, Analytical tools, Carbon inventory tools,	Land Care, AgResearch, IEA Bioenergy Task 38, Ministry for Environment.
Forest Research/ Sustainable Forest Management	Ability of sites to meet demands of highly productive crops, forest residue management.	Sustainability, Land use.	IEA Bioenergy Task 30, Site management Cooperative, Forest companies.
Forest Research/ Land Treatment	Guidelines for best practices, opportunities to use solid and liquid waste, environmental monitoring, linkages to sustainability, municipal, industrial and community schemes.	Sustainability, Utilisation of wastes, Co-products.	Land Treatment Collective, Regional Councils.
Forest Research/ Alternative Species	Species choice, genetic improvement, siting, management and growth models for short rotation eucalypts.	Species/site interactions, Species choice, Crop management.	Eucalypt breeding and management Cooperative, NZ Farm Forestry Association, Hort Research.
Forest Research /Forest Health	Species choice, site and crop health interactions, mmanagement of production systems including IPM (Integrated Pest Management).	Species/site/health interactions, Crop management	Forest Health Cooperative, Forest companies.
Coal Research	Combustion studies of SRC and range of biofuels, co-firing with coal, gasification evaluation.	Fuel evaluation, Co-firing, Gasification.	***Forest Research***, Massey University.
Massey University	Renewable energy, remote energy systems, eucalypt crop management, fuel management.	Fuel assessment, Species performance.	***Forest Research***
Lincoln University	Eucalypt crop management.	Species performance.	***Forest Research***
Hort Research	*Salix* and *Populus* management, water use, land use, phytoremediation.	*Salix* and *Populus* management.	***Forest Research***, Willow and Poplar Research Collective, Regional Councils.
AgResearch	Crop management, crop selection.	Agronomic performance.	District Councils,

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