WOOD PROCESSING STRATEGY:
FUTURE ENERGY SUPPLY and DEMAND

Report to

Forest Industries Council

and

Energy Efficiency and Conservation Authority

By

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Contents

Disclaimer

WOOD PROCESSING STRATEGY: FUTURE ENERGY SUPPLY and DEMAND

EXECUTIVE SUMMARY AND RECOMMENDATIONS

Energy Supply

Gas

All reports on projected energy supply and demand from a number of different analysts contribute to the conclusion that there is a potential energy supply gap arising between 2005 – 2008. Regardless of whether the depletion occurs in 2005 or 2008 the effect is still the same. It is only a matter of timing, and actions to be taken are required regardless of timing.

While NZ has a wide range of long-term solutions available to it many of these cannot be instituted in the time available. The energy market has a large number of participants many of whom have planned actions to manage the uncertainties provided by a change in availability and price of energy.

To cover the possibility of planned or possible action not eventuating in adequate time, or not at all, the wood processing industry needs to identify and prepare short-term contingency solutions. The short-term actions will contribute significantly to easier implementation of the longer-term solutions.

The energy market issues are as much political as technical and will require action on a number of fronts. There is no single long-term solution.

The large size of the Maui gas field has shielded and deferred the need for the energy market to take actions that will now need to be taken. The size and nature of the field has reduced the drivers to invest in new fields or find alternative solutions. The size of Maui also provided flexibility for supply which will now have to be provided by a number of smaller gas fields, coal and other resources. This will be more difficult. The complexity of energy supply will increase but at the same time a number of opportunities that have been dormant will be assisted to emerge.

Substantial gas reserves are potentially available but these tend to take up to 10 years to develop. The Pohokura gas field is expected to come on stream around 2006 and the Kupe field is awaiting decisions on development. These plus other smaller fields will not however make up for a decline in Maui output. If an early decision was made on Kupe there may however be an overlap but this could be a difficult and expensive field to develop. A shutdown of Methanex, may extend gas available to generation and reticulation for a period.

Electricity Supply

All scenarios show the surplus electricity generation capability enjoyed over the past decade is rapidly disappearing. This is particularly noticeable in the dry year scenario where there is a significant risk of an electricity supply shortage. The depletion of Maui will increase supply risks in serious dry years.

Under normal hydro conditions Transpower forecast electricity generation capacity is projected to exceed demand until 2010 with a deficit occurring in 2011. However when spinning reserve and units out for maintenance are taken into account a deficit occurs in 2006 for the high and medium scenarios and 2008 for the low scenario.

Electricity - Dry Year Risk

Because the electricity market is hydro-dominated the potential for dry year shortfalls can be very significant for the availability and price of electricity. Over the last few years 900 MW of peaking electricity generation capacity has been withdrawn from service. The result is that NZ now has a very thin capacity margin to meet dry year shortfalls.

Even today few electricity industry participants have demand response mechanisms available that could be brought into action.

Another option available for the short/medium term to provide dry year security is coal use at Huntly.

Energy Prices

Related to but more important than the physical supply of energy is its price.

With the decline of delivery of gas from the Maui gas field, gas prices are expected to rise dramatically and also coal prices to a lesser extent. It can be seen that with these cost increases, biomass process residue will be competitive with coal in all areas, and biomass landing material will be competitive with North Island coal and gas.

The implementation of a carbon tax will have a similar effect.

The Government's Climate Change policy will also increase energy costs for wood processing using fossil fuels for heat energy and may make it difficult to justify additional capital expenditure in operations made more marginal by the policy, even if at the new prices it is "efficient" to do so.

Fuel price sensitivities need to be factored into any investment proposals especially where the fuel cost is a significant component. Increases in fuel prices should also be factors in future risk management strategies.

A number of the wood processing regions align with areas where there are electricity transmission constraints and thus even higher electricity prices will occur in these regions. While there are alternative energy resources in some of these regions there are a number of issues that indicate that transfer of energy source will not occur in the short/medium term.

For large energy projects obtaining consents through the Resource Management Act (RMA) process takes a long time, particularly if the consents are appealed. This can take from four to ten years so will be a significant constraint to the development of regional energy supplies.

There are a number of onshore gas fields in areas such as Wairoa which could be developed for wood processing energy. However, there is a time lag of up to 10 years between gas discovery and gas to the market. Future gas discoveries are unlikely to be available to meet the shortfall in supply if Maui delivery starts to decline rapidly in 2006.

Heat production is generally the primary reason for investment in boiler plant and cogeneration plant is generally unlikely to be economic at present. However to allow for possible future cogeneration capability, provision should be made for the addition of generation plant at a later date. This is particularly so in regions like Northland and the Bay of Plenty where electricity transmission is constrained.

Regional Electricity Supply

The regional costs of energy are affected greatly by national grid transmission constraints. Transpower's approach to overcoming these constraints is not conducive to their resolution. Until Transpower's Statement of Corporate Intent is changed the costs imposed will remain. The constraints are getting worse and it is expected that they will have to be addressed within the next few years. These constraints are most significant in the northern half of the North Island. Financial Transmission Rights (FTRs) may address some of these issues for larger energy users but will not improve physical supply.

From a wood processing industry perspective it will be important that the industry involve itself in the development of transmission policy in order to get the problems addressed.

Clusters of energy users can achieve a balancing of peak loads, economies of scale for fuel management, and make cogeneration economic. The RMA could be used to facilitate such clusters and assist in the economics of distributed generation and process heat from bio-fuels.

The network connection costs for embedded generation usually reflect the cost of network connection with a credit for the benefits embedding can provide the network for voltage support and supply security. The costs are based on peak capacity. Some network companies have posted costs which provide transparency to an installer of embedded generation. Other network companies work on a negotiated arrangement in order to identify the best win/win benefits for both parties. This latter approach adds to the transaction costs for cogeneration.

Where excess electricity is produced and is available for sale to a third party the electricity industry structure makes it difficult to find a buyer and to get a good price. At present the electricity market is dominated by electricity sector participants who have no incentive to contract with other small generators.

Energy Efficiency Programmes

Achievement of a 20% improvement in energy efficiency is expected to reduce energy demand potentially by the equivalent of a fifth of a Kupe sized gas field.

A focused energy efficiency research programme for the wood processing sector would contribute to a portfolio of actions that could cumulatively offset some of the effects of increasing gas and electricity prices and complement work being undertaken within the National Energy Efficiency and Conservation Strategy work programmes.

Demand Side Management

Demand-side management increases the available energy reservoir. There are also benefits in terms of market efficiency and price stability. Other benefits include system reliability, cost reduction, improved risk management, lower environmental effects, improved customer service, and market power mitigation.

Recommendations For Industry

In order to ameliorate the effects of the anticipated energy price increases arising from the drop off of availability of gas from the Maui gas field, the wood processing industry can take a number of short term initiatives that will assist push out current low energy prices, while creating a period to improve energy use and create other supply options.

These include:

- Optimisation of all site or nearby related biomass waste streams for use in bioenergy plant
- Identification of processing plant energy management measures to reduce on-site total and peak energy requirements in order to reduce energy and electricity network connection costs
- Allowing in the design for new energy plant to be based on multifuel supply eg gas and bioenergy, or coal and bioenergy
- Consider the location of new wood processing plant adjacent to geothermal, small hydro, and wind energy sites so as to allow embedding of energy facilities
- Identify opportunities for clustering wood processing sites to obtain economies of scale and peak energy or fuel management benefits
- Establishing a database of wood processing heat plant that will allow learning from experience to occur
- Gaining experience of the hedge market to cover electricity dry year events
- The wood processing industry working with Government officials to maximise the opportunities for bioenergy arising from the development of the Climate Change Policy, in particular the funding of ‘projects’ to showcase bioenergy
- Assisting the Bioenergy Association to work with EECA to establish and implement a bioenergy programme under the Renewable Energy Policy
- The wood processing industry working with the Bioenergy Association and the Wood Processing Strategy to identify, prioritise and promote research and information projects that will assist reduce the costs of bioenergy, and assist small/medium wood processors evaluate bioenergy opportunities, in particular research:
    - on the handling and storage of wood waste for bioenergy fuel
    - on treatment of wood waste to have consistent homogenous characteristics
- Working with the Major Energy Users Group to:
    - Encourage Transpower to remove electricity transmission constraints
    - Ensure that the Electricity Governance Board has provision for industrial electricity users
    - Work with the electricity network industry to establish policies and procedures that encourage embedded or distributed electricity generation

- Encourage the electricity retail providers to establish electricity demand response contingency initiatives that can be activated when the next dry year event occurs
- Encourage Government to review the current electricity market structure so that retailer / generator constraints are removed

Recommendations for Government

In order to improve the prospects for securing investment in wood processing, government needs to explicitly recognise objectives of security of supply and competitive pricing. Specific policy work is required on the following matters:

- Encouraging additional gas exploration and development
- Acknowledging the short term role and acceptability of coal even though not consistent with government's longer term objectives
- Ensuring access to and supply of residual Maui Gas
- Improving the RMA consent process to reduce timeframes without reducing environmental standards
- Ensuring that suppliers have a competitive open access regime for pipelines and that government facilitates the development of standards for the common carriage of gas
- Work with the Wood Processing industry to develop a focused energy efficiency and bio-energy research and development programme
- Facilitate the implementation of demand side management

WOOD PROCESSING STRATEGY: FUTURE ENERGY SUPPLY and DEMAND

1 Introduction

This report is stages one and two of the brief set out below.

Stage One

1. Review literature documenting energy supply options for New Zealand to 2015, prepared during 2002.
2. Identify and document the range of supply scenarios contained in these reports.
3. Identify assumptions giving rise to variation in the range.
4. Comment on implications of the range for energy supply in the regions in which wood harvest is forecast to increase over the period.

Stage Two

5. Make recommendations for government or industry action necessary to ensure that any projected shortfall in sustainable and secure supplies of energy are available over the period to 2015 in those regions.

The New Zealand energy market is entering a period of significant uncertainty with regard to the availability and price of gas and electricity. The uncertainty is driven by the projected decline of the availability of gas from the Maui gas field.

Various analyses have been undertaken of the effects on energy availability and prices over the next decade. This report collates a number of projections from those analyses and comments on the possible implications for the wood processing industry.

The report also outlines actions that the wood processing industry can take in order to manage both industry and individual company energy price risk.

While the effect of projected large increases in the cost of energy for wood processing will be severe, there are a large number of actions that companies and the industry collectively can do to help increase the international competitiveness of New Zealand wood processors.

2 Background

The base supply curve used in this report is sourced from the report “Availability and Costs of Renewable Sources of Energy For Generating Electricity and Heat” produced by East Harbour Management Services and available from the Ministry of Economic Development website.

For the analysis in this report the base information has been adjusted according to a number of scenarios for further gas cost, carbon charge and woody waste disposal cost. The analysis is based on the best information available but because of the poor nature of some data the results should be considered as indicative only.

The analysis is by its nature based on representative data that will not reflect many specific situations. It is recommended elsewhere that further work be undertaken to improve the quality of some base data.

3 Wood Processing Energy Demand Scenarios

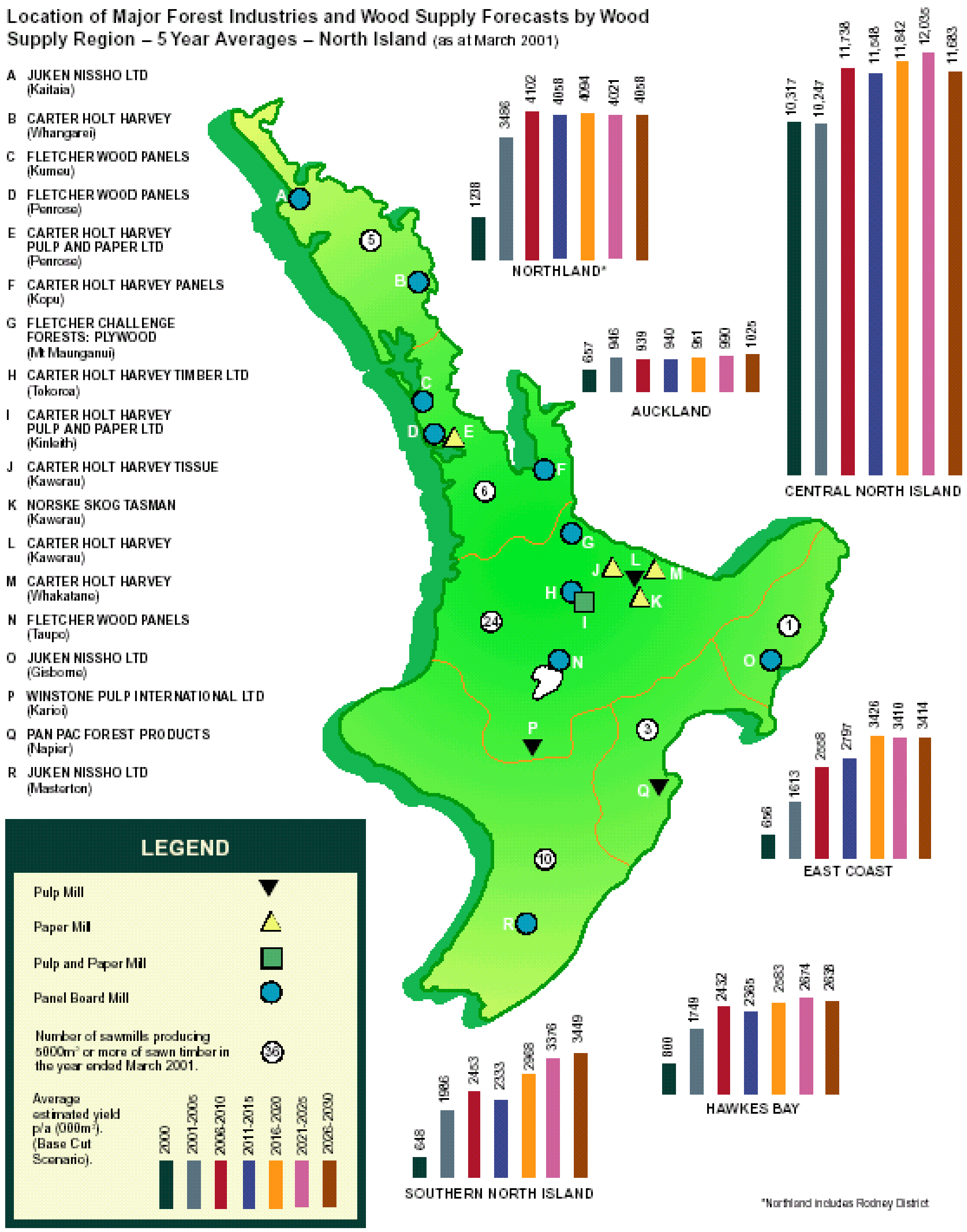
3.1 Wood Processing Projections

Harvested wood volumes are predicted to increase by 50% over the next five years and then grow by a third over the following 25 years. The forests and their growth rates are shown on the following maps.

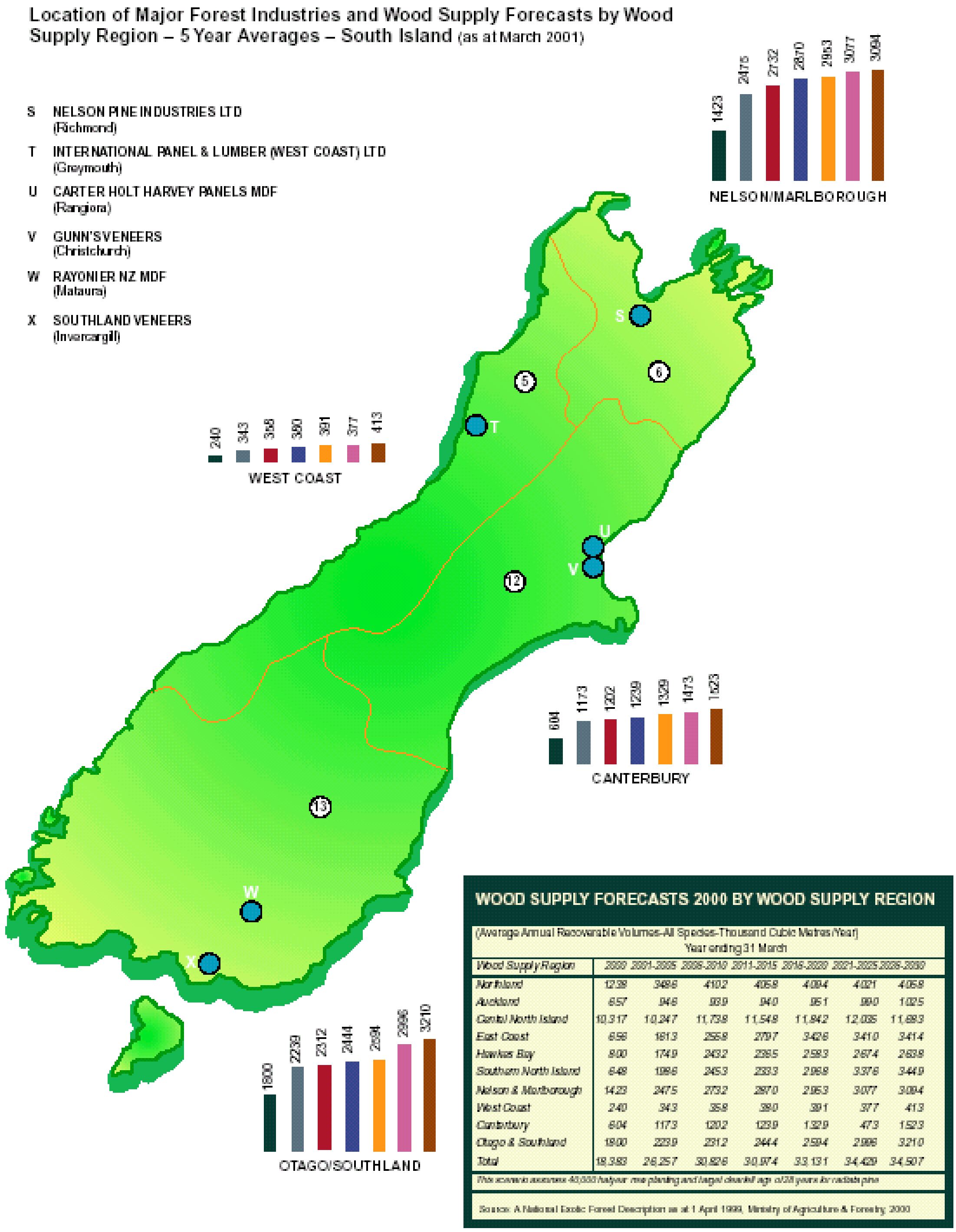
Forest processing areas align with some areas where energy price increases are projected to increase. However they also align with areas where specific solutions are available.

industry statistics

Location of Major Forest Industries and Wood Supply Forecasts by Wood Supply Region – 5 Year Averages – North Island (as at March 2001)



Source: NZ Forest Industries Directory 2002



WOOD SUPPLY FORECASTS 2000 BY WOOD SUPPLY REGION

(Average Annual Recoverable Volumes-All Species-Thousand Cubic Metres/Year)
Year ending 31 March

Wood Supply Region	2000	2001-2005	2006-2010	2011-2015	2016-2020	2021-2025	2026-2030
Northland	1238	3486	4102	4058	4094	4021	4058
Auckland	657	946	939	940	951	990	1025
Central North Island	10,317	10,247	11,738	11,548	11,842	12,035	11,683
East Coast	656	1813	2558	2797	3426	3410	3414
Hawkes Bay	800	1749	2432	2365	2583	2674	2638
Southern North Island	648	1986	2453	2333	2968	3376	3449
Nelson & Marlborough	1423	2475	2732	2870	2953	3077	3094
West Coast	240	343	358	380	391	377	413
Canterbury	604	1173	1202	1239	1329	473	1523
Otago & Southland	1800	2239	2312	2444	2594	2996	3210
Total	18,383	26,257	30,826	30,974	33,131	34,429	34,507

This scenario assumes 40,000 ha/year new planting and target clearfell age of 28 years for radiata pine

Source: A National Exotic Forest Description as at 1 April 1999, Ministry of Agriculture & Forestry, 2000

Source: NZ Forest Industries Directory 2002

The forecasts show increases in potential wood supply in all parts of New Zealand. The largest increases are in Northland, the East Coast, Hawkes Bay, and the southern North Island regions. These increases occur over relatively short periods of time, mostly in the next five years. Wood volume increases range from 950,000 cu m pa in Hawkes Bay and East Coast to 2,270,000 cu m pa in Northland. The increases in the central North Island are delayed by five years but represent another 1,250,000 cu m pa.

The forecast increase in wood supply will mean some increase in the volume of wood being processed which in turn will mean increased energy demand.

Electricity supply to several of these regions, particularly Northland and the central North Island, suffer from transmission constraints. This extra energy demand from higher wood volumes will aggravate the situation in areas such as Bay of Plenty where recent action may reduce the constraint. The introduction of Financial Transmission Rights (FTRs) may assist in some areas for large industry participants.

3.2 MAF Wood Supply Forecast 2000, Assumptions

The maps above were based on forecasts made by MAF in 2000. Their forecasts were based solely on the available supply of wood. There was no attempt to match this supply to the international demand for forest products. They were developed using models with the objective of maximising future volume harvested, subject to certain constraints.

Their study used six scenarios to show the outcome of a range of options for the sustainable supply of wood. Three clearfell age scenarios:

- base cut
- early cut
- late cut

were based on the age of harvesting and assume no new planting.

Three new planting scenarios:

- plant 20,000 ha/year
- plant 40,000 ha/year
- plant 60,000 ha/year

were based on a range of new planting levels. The primary assumptions for each of these scenarios are shown in table 3.1.

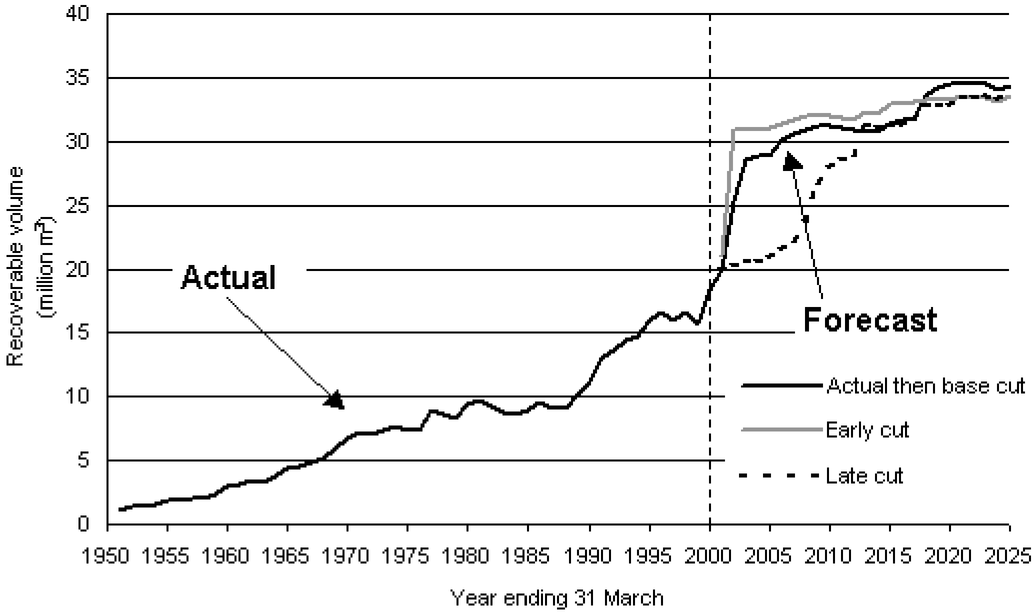
Table 3.1: Primary Assumptions for Each Scenario

Scenario	**Target Clearfell Age for Radiata Pine (years)**	**Area of National New Planting (ha/year)**
Base cut	28	0
Early cut	25	0
Late cut	35	0
Plant 20 000 ha/year	28	20,000
Plant 40 000 ha/year	28	40,000
Plant 60 000 ha/year	28	60,000

Radiata pine was modelled on a non-declining yield basis in all scenarios, and all clearfelled areas were assumed to be replanted in the year following clearfelling.

Results of the clearfell scenarios are shown in graph 3.1.

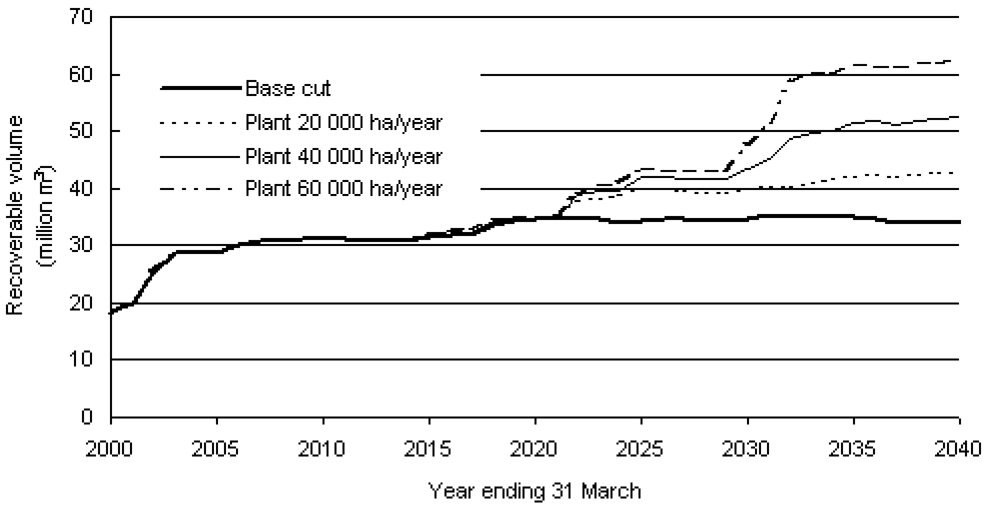
Graph 3.1: Actual and Forecast Harvest from New Zealand's Planted Forests



Notes:
1. The vertical line indicates the beginning of the forecasts (2000). 2. Source of actual harvest volumes: 1997 New Zealand Forestry Statistics (1951 to 1996), Ministry of Agriculture and Forestry, 1998. Statistical Release 17/2000 (1997 to 2000), Ministry of Agriculture and Forestry, 2000

The wood supply forecasts for the new planting scenarios increase since new areas of forest are continuously established (see Graph 3.2).

Graph 3.2: Forecast Wood Supply from New Zealand's Forests Assuming Constant New Planting



3.3 Potential Wood Processing Capacity in New Zealand to 2025

To estimate the potential for extra wood processing capacity, the following assumptions were made.

- Harvest levels would increase at about the same rate over 2009 – 2013 (March years) as the forecast rate for 2002 – – 2010. From 2013 to 2020 the harvest will roughly follow the NEFD Wood Supply "late cut" scenario. From 2020 to 2025 the harvest rises, as more wood becomes available under the NEFD "new planting 40,000 ha/yr scenario".

- The first period for the estimate is (March yrs) 2003 – 2009, and in lustrums thereafter (2010-2014, 2015-2019, 2020-2024).
- Announced wood processing investments for calendar 2002-2009 (Annex A) are allowed for in the first period.
- The types of wood processing are shown in Table 3.2. These types of plants are put forward as "users of power" to calculate possible electricity requirements. It is not to imply they will be built, either as configured in Table 3.2, or at all.

Table 3.2: Potential Wood Processing Plants

	Log (or RWE) input 000 m3/yr	**Electricity requirements per year GJ (1)**
Large sawmill	375	14,400
Medium sawmill	190	7,200
"Small" sawmill	72	2,880
TMP pulpmill	750	4,536,000
Large MDF mill	470	308,900
Medium MDF mill	240	157,700
Particleboard mill	70	144,000
Remanufacturing plant	30	3,800

Notes:RWE = roundwood equivalent (1) From "Regional Studies Overview" Ministry of Forestry, June 1997. More up-to-date data may be available from EECA.

Table 3.3 shows the potential "extra" plants that could be built additional to those already established and those publicly announced.

Table 3.3: Potential Wood Processing Plants (no pulpmill option)

	2003-2009	**2010-2014**	**2015-2019**	**2020-2024**
Large sawmills	2	6	1	3
Medium sawmills	0	1	1	0
Small sawmills	0	1	1	1
Large MDF mills	1	3	0	1
Medium MDF mills	0	0	1	1
Particleboard mills	0	1	2	1
Reman plants	1	5	0	1

Prepared by John Eyre, MAF Policy

3.4 Possible Wood Processing Electricity Needs to 2025

The potential additional electricity needs of these processing plants are shown in Table 3.4.

Table 3.4: Potential Wood Processing Plants Additional Electricity Needs

	Electricity Requirements per year GJ			
	2003-2009	**2010-2014**	**2015-2019**	**2020-2024**
Large sawmills	28800	86400	14400	43200
Medium sawmills	0	7200	7200	0
Small sawmills	0	2880	2880	2880
Large MDF mills	308900	926700	0	308900
Medium MDF mills	0	0	157700	157700
Particleboard mills	0	144000	288000	144000
Remanufacture plants	3800	19000	0	3800
Total	341500	1186180	470180	660480

These total energy requirements converted to MW are given in Table 3.5. These resulting values are approximate only. It is expected that another pulp mill will be built during this period that would add another 150 MW to the energy demand.

Table 3.5: Potential Wood Additional Processing Plants Energy Needs in MW and GWh

Electricity Requirements per year (MW)						**GWh Total**
	2003-2009	**2010-2014**	**2015-2019**	**2020-2024**	**Total**	
Sawmill/Manufacturer	12	43	16	24	95	3900
Pulpmill	150				150	1250
Total					245	5150

Currently the electricity demand from the wood processing industry is around 3000 GWh. The assessed total gas demand from plants owned by Carter Holt Harvey, Norske Skog, Pan Pac, Fletcher Forests, Fletcher Building (Taupo), Rayonier, Juken Nisho and others is approximately 8 PJ pa. The volume of wood is expected to double and assuming that the product mix remains the same the energy demands will double.

This is possibly the worst case scenario as there is likely to be increased use of bioenergy, process efficiency improvements, and changes to the product mix. Another pulp mill is likely to be built, which is likely to be a thermo-mechanical type because of environment sensitivities which will further increase energy demand.

3.5 Possible Wood Processing Heat Needs to 2025

There is no information available on projected heat requirements.

4 Energy Supply Resources

There is a wide range of energy resources available to provide sources of energy to replace the supply from the Maui gas field. These are outlined in this section to show the location of some of these resources relative to demand for energy by wood processors.

4.1 New Zealand Coal Deposits

New Zealand's total in-ground coal resource is approximately 15.5 thousand million tonnes of coal. The South Island contains just over 13 thousand million tonnes (84%) of the total due largely to a huge lignite resource in the Southland Coal Region (9.2 thousand million tonnes).

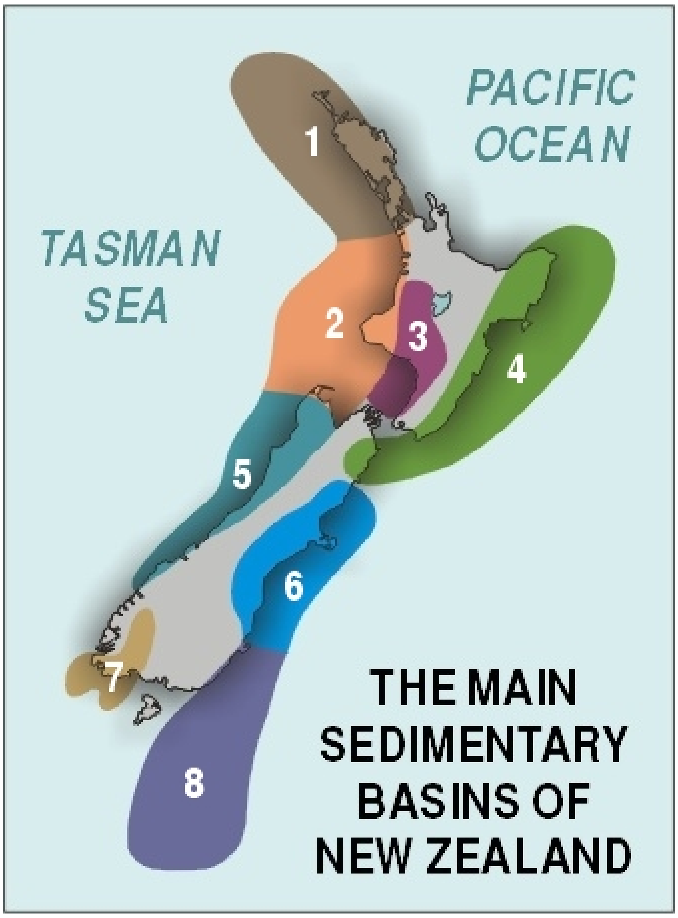
Source Crown Minerals

Just over half (55%) of the coal is considered to be recoverable, most of which (88%) occurs in the South Island. The bulk of the recoverable resources are in four regions, sub bituminous coals in Waikato and Taranaki in the North Island, West Coast bituminous coal and Otago/ Southland lignites in the South Island.

Most of New Zealand's coal demand is in the North Island and is met by sub-bituminous coals from the Waikato fields. There is a significant amount (by New Zealand's standards) of coal exported from the West Coast.

Coal demand from Waikato coalfields is increasing and is expected to increase further to fuel Huntly Power station. Increased gas prices will encourage some enterprises to switch to coal adding to the demand. However this increased demand is also likely to put pressure on coal prices as the more easily won coal is mined out.

4.2 New Zealand Gas Basins



Legend

1. Northland Basin
2. Taranaki Basin
3. Wanganui Basin
4. East Coast Basin
5. West Coast Basin
6. Canterbury Basin
7. West Southland Basin
8. Great South Basin

Source PEANZ

Hydrocarbon exploration and production in New Zealand has generally been focussed on the Taranaki Basin. Other basins have been explored to some degree. Onshore gas has been found in the East Coast Basin. Sub-commercial discoveries have been made in the offshore Canterbury and Great South Basins. Table 4.1 summarises the basins.

All basins are both on and offshore except for the offshore Great South Basin.

Table 4.1 New Zealand Gas Basins

Basin	Area sq km	Exploration
Northland	Over 120,000	One deepwater offshore and nine onshore wells drilled
Wanganui	30,000 (approx)	22 wells drilled, all onshore
East Coast	120,000 (approx)	90 wells drilled, two offshore onshore gas discoveries
Taranaki	100,000 (approx)	400 wells drilled, on and offshore, nine producing fields, on and offshore
West Coast	Over 30,000	50 wells drilled, on and offshore, oil and gas shows in wells
West Southland	20,000 (approx)	10 wells drilled, gas seeps onshore
Canterbury	55,000 (approx)	11 wells drilled, four offshore. Gas/condensate column in Galleon-1 and gas/condensate shows in Clipper-1
Great South	Over 100,000	Eight wells drilled, sub-commercial discovery in Kawau-1A (gas/condensate). Oil and gas shows in other wells and an oil seep on Stewart Island

4.3 Biomass Supply Opportunities

Wood Waste Fuel

Wood waste as a fuel contributes around 45% of the energy currently used to dry timber, followed by gas, coal and other forms of heat. There are considerable regional variations to the fuel type used particularly where there are large industry participants. These variations are shown in Table 4.2, which compares the volume of timber dried by region in 1998.

Table 4.2. Annual Volumes of Timber Dried (m^3) by Fuel Type and Region as at 1998

Region	Fuel Type						
	Wood/ bark	Gas	Coal	Electricity	Geothermal	Oil and diesel	Other (solar)
Northland	6,720	1,800	480	9,500	0	6,950	0
Auckland	12,825	19,700	675	12,800	0	3,000	0
Waikato	178,690	386,400	72,000	9,150	0	77,000	0
Bay of Plenty	307,270	106,350	34,850	10,330	160,000	0	0
Hawkes Bay	45,528	0	0	1,125	0	7,300	0
Gisborne	21,600	5,400	0	0	0	0	0
Taranaki	17,200	7,000	8,775	24,740	0	0	0
Manawatu	35,000	24,100	15,240	7,560	0	0	0
Wellington	29,700	28,710	0	540	0	3,000	0
Nelson	295,069	0	6,700	303	0	6,675	0
West Coast	18,750	0	22,900	1,690	0	0	2
Canterbury	49,804	5,000	66,830	24,662	0	76,250	126
Otago	100	0	21,340	60	0	0	0
Southland	68,850	0	122,050	2,700	0	0	0
Total	1,087,106	584,460	371,840	106,160	160,000	180,175	128
Percentage	45	23	15	4	6	7	0

With the expected price increase in gas, and to a smaller extent coal, wood waste will become a more economic fuel. There will be some opportunities for co-firing of coal and woody biomass.

Heat production is generally the primary reason for investment in boiler plant and cogeneration plant is generally unlikely to be economic at present. However to allow for possible future cogeneration capability, provision should be made for the addition of generation plant at a later date. This is particularly so in regions like Northland and the Bay of Plenty where electricity transmission is or has been constrained.

Process Waste

Wood processing residues arise from sawmilling, pulp and paper manufacturing and panel production processes. Typical residue streams consist of sawdust, shavings, off-cuts, chip fines, bark, chip and log-ends. Opportunities for use as a fuel will arise similar to those of the woodwaste.

This is discussed in greater detail in the companion report on the “Drivers for Bioenergy in New Zealand”.

5 Energy Supply and Demand Scenarios

Recent scenarios for future overall New Zealand energy supply and demand give a range of views and outcomes. When viewed collectively they present a reasonably consistent picture.

5.1 National Energy Efficiency and Conservation Strategy, Energy Supply Programme

In the National Energy Efficiency and Conservation Strategy Energy Supply Programme, New Zealand’s primary energy supply is forecast to increase at 1.7 percent p.a. for the next decade. The assumed rate of energy growth is 1.4% pa in the “Renewable Energy: The Proposed Target for New Zealand Consultation Document” April 2002. This growth is spread over 12 years so both forecasts end up with the same annual energy demand in 2012.

While projected electricity growth is not mentioned in Government papers it is expected that this will be close to but higher than 1.7% pa. Current demand growth is around 2% pa.

5.2 Gas

CAE Sinclair Knight Merz Study

The CAE study is based on known gas resources and consumption patterns to provide a future gas usage profile.

Graph 5.1 shows the decline in Maui production and the coming on-stream of new gas facilities. Whilst the timing of the decline in Maui may not be known the graph illustrates the dramatic effect it will have on the gas supply when it does occur.

As can be seen the two large fields already discovered, Kupe and Pohokura, are small compared to the size of the Maui field.

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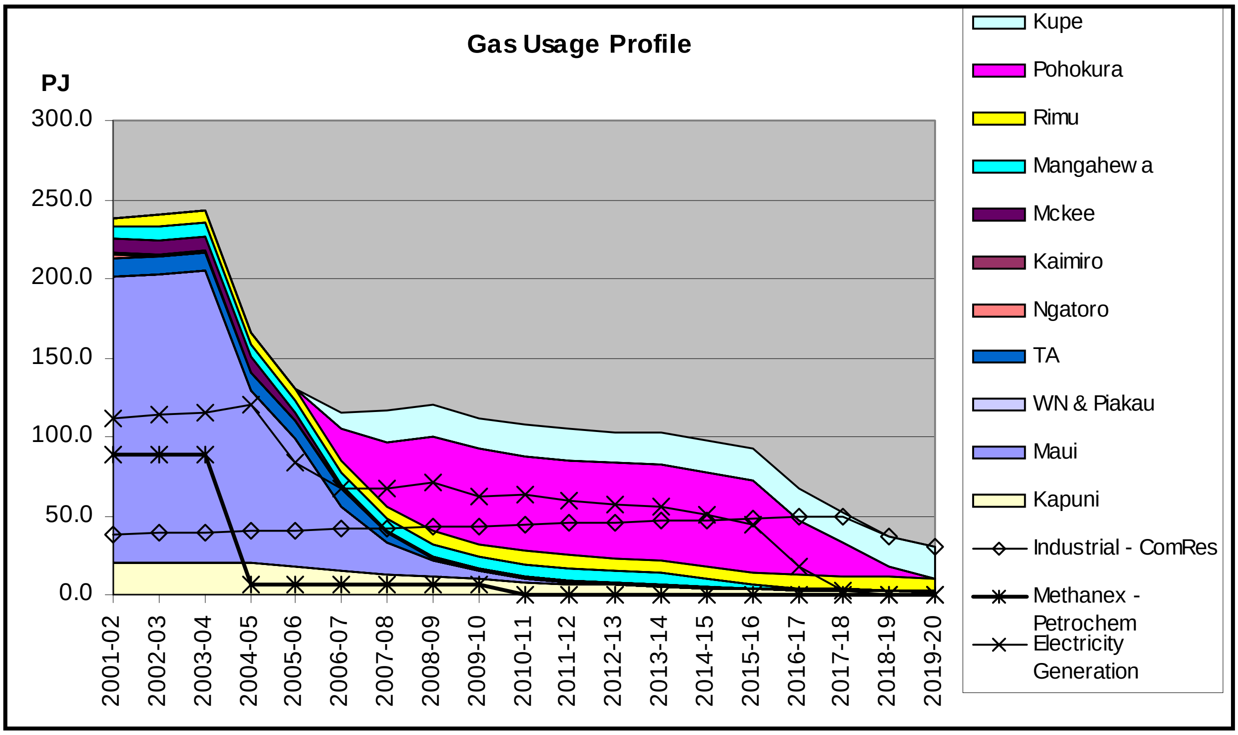
[1] Note: The electricity generation margin is defined as the surplus forecast generation capacity available after forecast demand plus transmission losses (assuming 5 per cent). A positive margin means available generation is more than forecast demand. A negative margin means available generation is less than forecast demand.

Graph 5.1 Gas Usage Profile



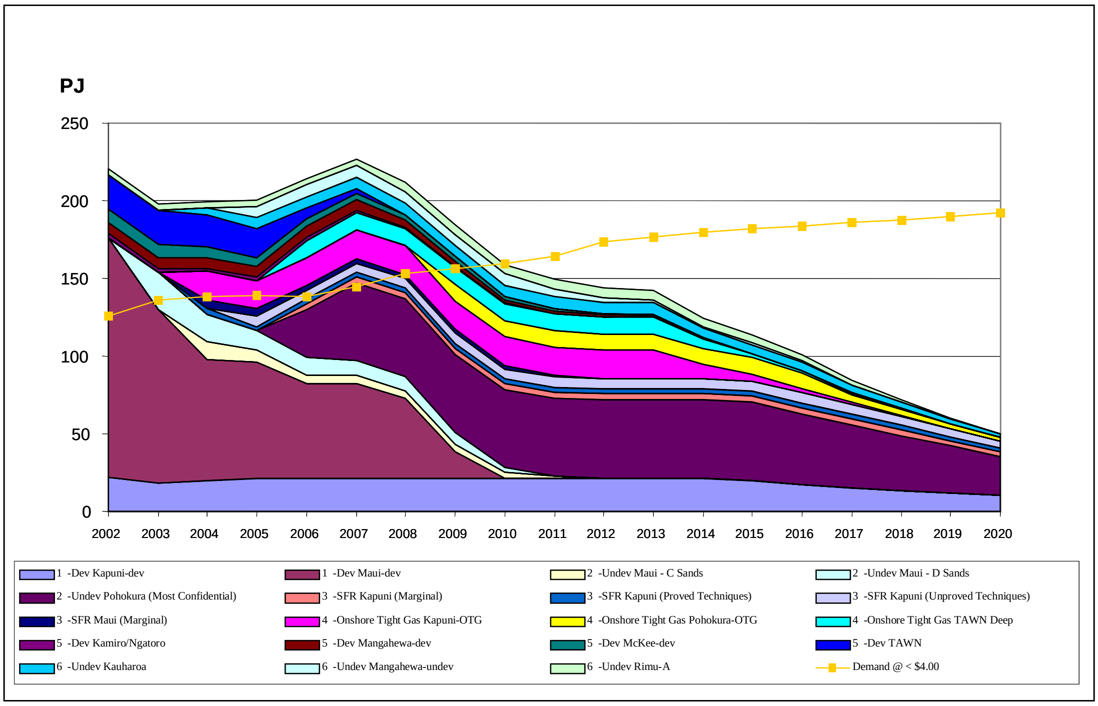
Shell Petroleum Mining Co Ltd

In a presentation to Utilicon 2002 "The future of the New Zealand gas Industry" by Peter Hazledine of Shell, he presents a similar picture. Shell show gas demand exceeding gas supply (P50) (with no petrochemicals after 2005) in 2010. For the P90 case, gas demand exceeds supply after 2006.

More recently Shell suggested that gas reserves are sufficient to meet demand at a wellhead price of $4/GJ until 2010 (excluding Methanex). This is shown in Graph 5.2.

This forecast does not include any allowance for new discoveries or Kupe. Exploration activity is currently high and is expected to increase. This will be facilitated when open access to the Maui pipeline is achieved.

Graph 5.2. Gas Supply and Demand (Unrisked at $4/GJ ex-field)



Source Shell NZ

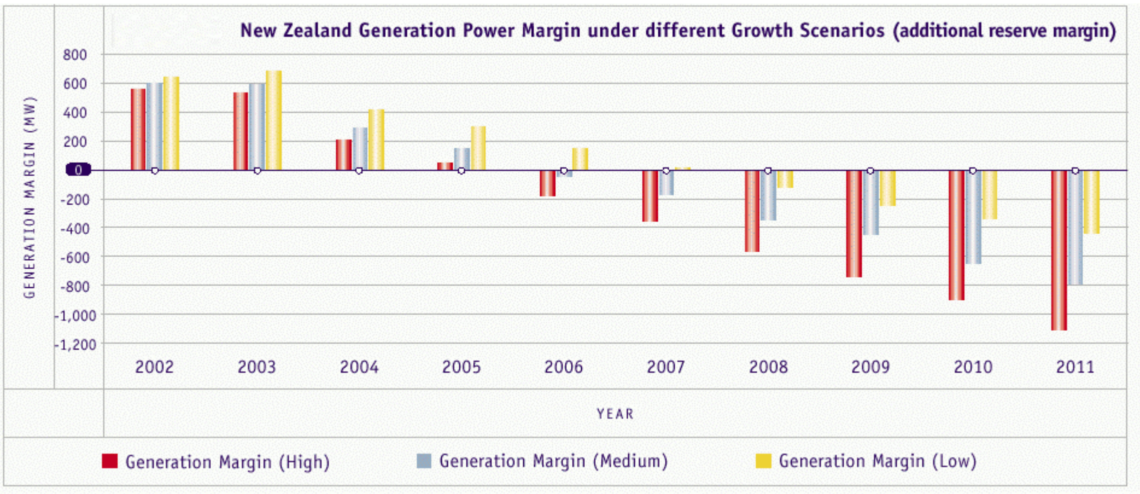
5.3 Electricity

Transpower System Security Forecast 2001/2002

Transpower's forecast for 2002 to 2011 has three electricity demand scenarios representing compound growth rates of 2.6% (High), 2.2% (Medium) and 1.8% (Low). Forecast electricity demand was taken from 30 years historical demand corrected for temperature and other weather dependant parameters. They assumed that generation in operation at the end of 2001 remained in operation to the end of the period (except for the reduction in output from New Plymouth). Net electricity demand was based on the assumption that at any point of supply, recorded demand is equal to the total actual demand, less any embedded electricity generation. Existing and forecast embedded generation was deducted from the forecast.

Under normal hydro conditions forecast electricity generation capacity is projected to exceed demand until 2010 with a deficit occurring in 2011. However when spinning reserve and units out for maintenance are taken into account a deficit occurs in 2006 for the high and medium scenarios and 2008 for the low scenario. These are shown in Figure 5.3.

Figure 5.3 Electricity Generation Margin [2]

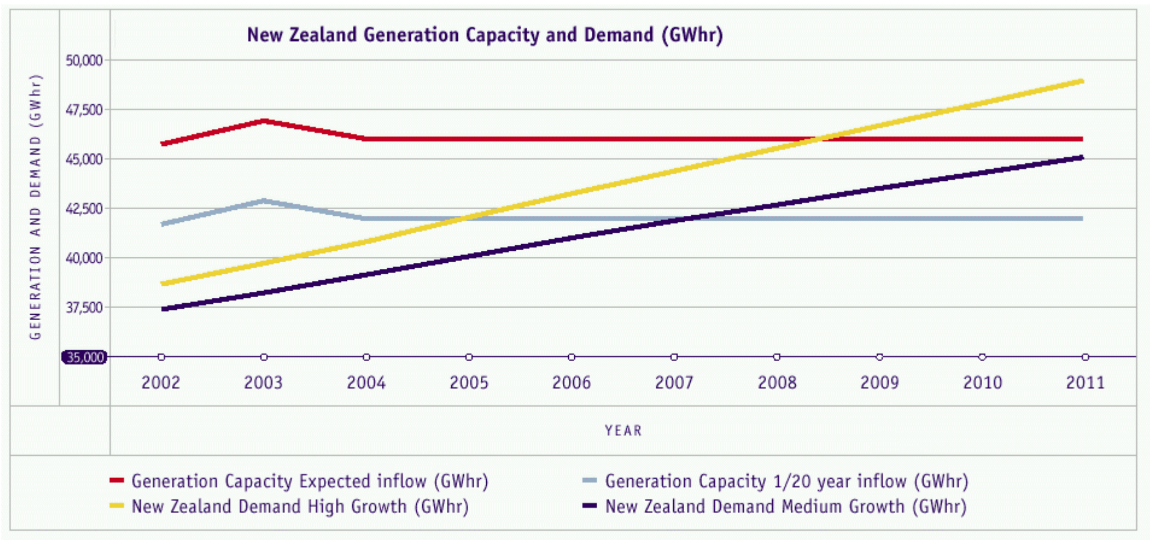


Source Transpower

Transpower's forecast electricity balance is shown in Figure 5.4. This shows two load scenarios (high and medium growth) and two generation scenarios (expected/average hydro inflows and the 1/20 dry year forecast).

It can be seen in Figure 5.4 the electricity capacity can meet the electricity demand with a high demand growth scenario until 2008 based on average generation inflows. In the 1/20 dry year inflows scenario, demand could exceed the electricity capacity in 2005.

Figure 5.4 Electricity Capacity and Demand



Source Transpower

[2] Note: The electricity generation margin is defined as the surplus forecast generation capacity available after forecast demand plus transmission losses (assuming 5 per cent). A positive margin means available generation is more than forecast demand. A negative margin means available generation is less than forecast demand.

A forecast of electricity supply and demand under various scenarios has been made in the latest CAE Electricity Supply and Demand Report. Estimates of the effects of an average and dry year are shown in Graphs 5.5 and 5.6.

These scenarios include "Project Aqua" and Huntly CCGT.

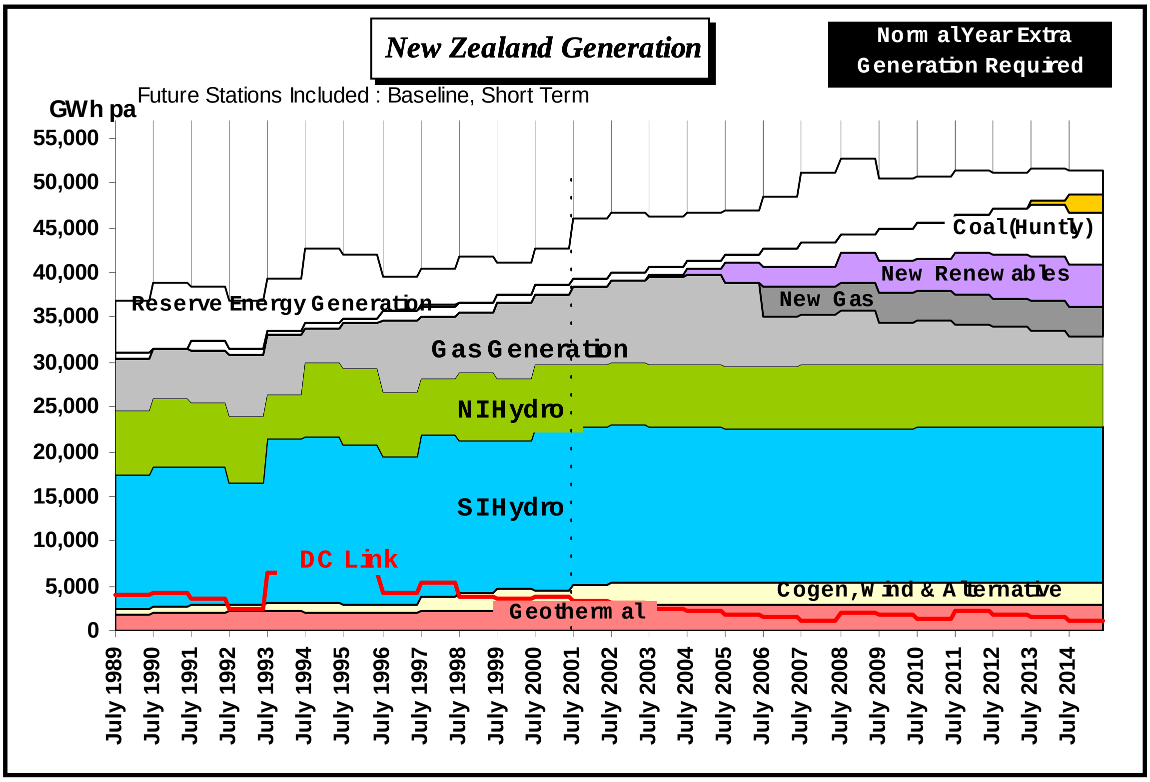
These scenarios show the surplus generation capability enjoyed over the past decade is rapidly disappearing. This is particularly noticeable in the dry year scenario where there is a significant risk of an electricity supply shortage.

It should be noted that it is assumed that significant amounts of electricity will be generated from new renewable energy sources from around 2005. This will generally be wind but can be an opportunity for bioenergy.

An independent review of CAE's forecasts suggests that it is based on pessimistic assumptions whereas Transpower's were optimistic

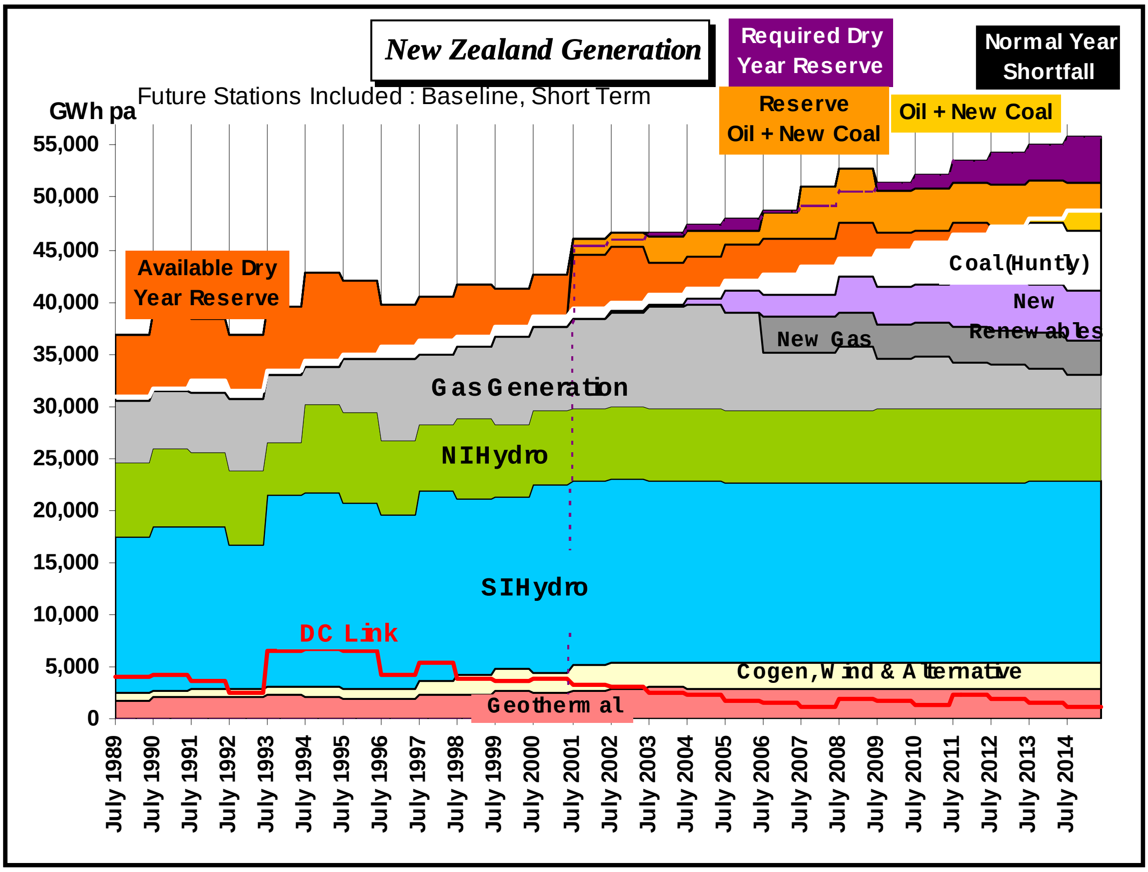
Average Year (CAE Sinclair Knight Merz)

Graph 5.5 Average Year Electricity Generation



Dry Year (CAE Sinclair Knight Merz)

Graph 5.6 Dry Year Electricity Generation



5.4 Demand Side Management

Electricity demand is predicted to grow around 150 MW annually in the next few years. No new generation is likely to be added until 2005, so the margin of safety provided by reserves is decreasing every year. However, the available energy reservoir can be increased through demand-side management.

There are also benefits in terms of market efficiency and price stability. Demand side participation is a natural price safety valve. Just a little participation can realise large benefits. If even a small number of consumers participate the effects on price spikes, price volatility and reliability issues will be substantial.

Other benefits include system reliability, cost reduction, improved risk management, lower environmental effects, improved customer service, and market power mitigation.

6 Economics of Delivered Energy

6.1 Gas

Because of the predominance of Maui gas it tends to set the wholesale price of gas. Currently wholesale gas prices for large customers close to the Maui hub are around \$3/GJ. Transmission and distribution costs will be additional for those customers further away. However prices will rise significantly in future when Maui starts to decline, and probably before that in anticipation of the decline, and to meet the costs of new gas supplies.

Gas transmission and the use of the Maui line for non-Maui gas is becoming an issue. Contractually only Maui gas can be transported through the Maui pipeline, other gas has to use the smaller Kapuni line.

A recent draft Government Policy Statement on gas sets out in detail the Government's views on gas industry governance and it's expectations for the industry. It invites the gas industry to set up a governing entity that will need to develop arrangements relating to production, wholesale markets, transmission and distribution networks, and retail markets. The Government expects that the industry arrangements will be in place by December 2004.

One of the required initiatives is to develop an open access regime for all transmission pipelines including the Maui pipeline. When implemented, transport of non-Maui gas through the Maui line may allow some of the future delivered gas price rise to be offset to some degree through lower transmission prices.

6.2 Coal

In the North Island coal prices are influenced by the price of competing fuels, mainly gas. Coal prices are therefore set at a margin below gas.

Coal has very limited competition from gas in the South Island. Prices will be set by mining and transport costs.

6.3 Geothermal

Geothermal energy availability is limited to the Central North Island and Northland, with minor heating potential elsewhere. Heat loads must be within a limited radius of the resource and preferentially be located immediately adjacent.

Costs for heat plant are site specific but generally attractive for a company prepared to locate on a field.

6.4 Solar

Solar thermal energy technology is sufficiently advanced and cost effective to provide hot water to processing plant.

Photovoltaic production of electricity is relatively expensive but there is a very large research and development effort worldwide so costs are expected to reduce significantly in future years.

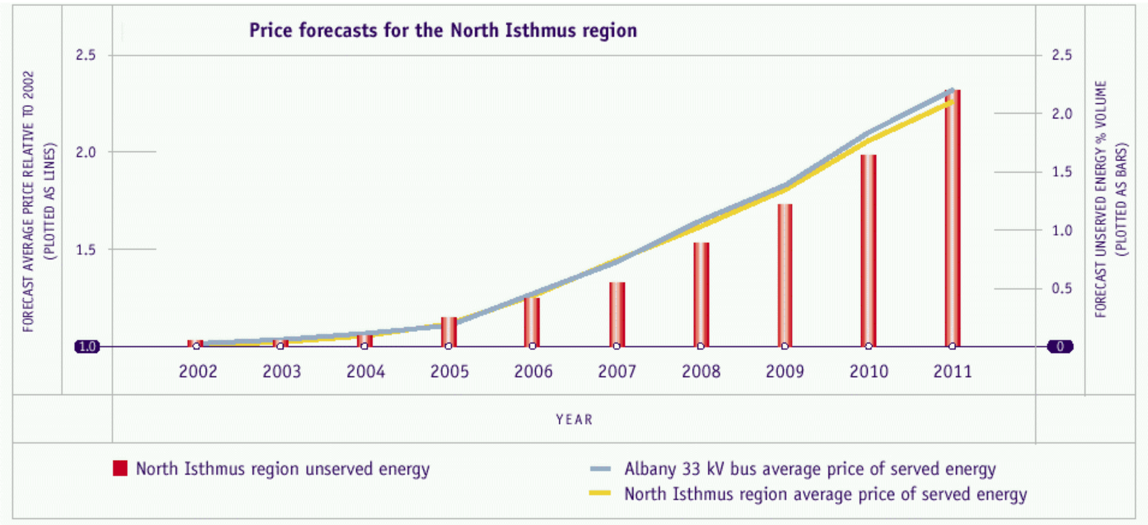
6.5 Transmission Nodal Prices

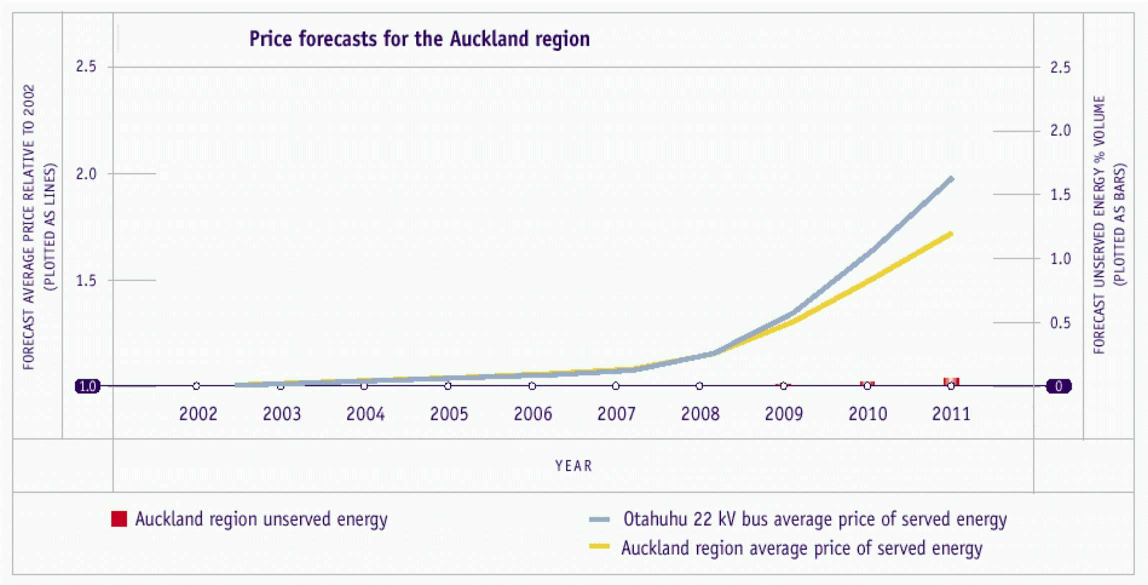
Transpower’s forecast annual average nodal prices of served energy for 2002 to 2011 are presented in regional figures. The regions are shown in Figure 6.1. Average prices of served energy are shown relative to the 2002 forecast prices so the 2002 price is normalised to one. Average prices for one grid exit point in each region are also shown. The relative annual average prices are shown as lines in the figures. Also shown are the forecast annual proportions of unserved energy by volume, namely the portion of unserved energy to total demand. [3]

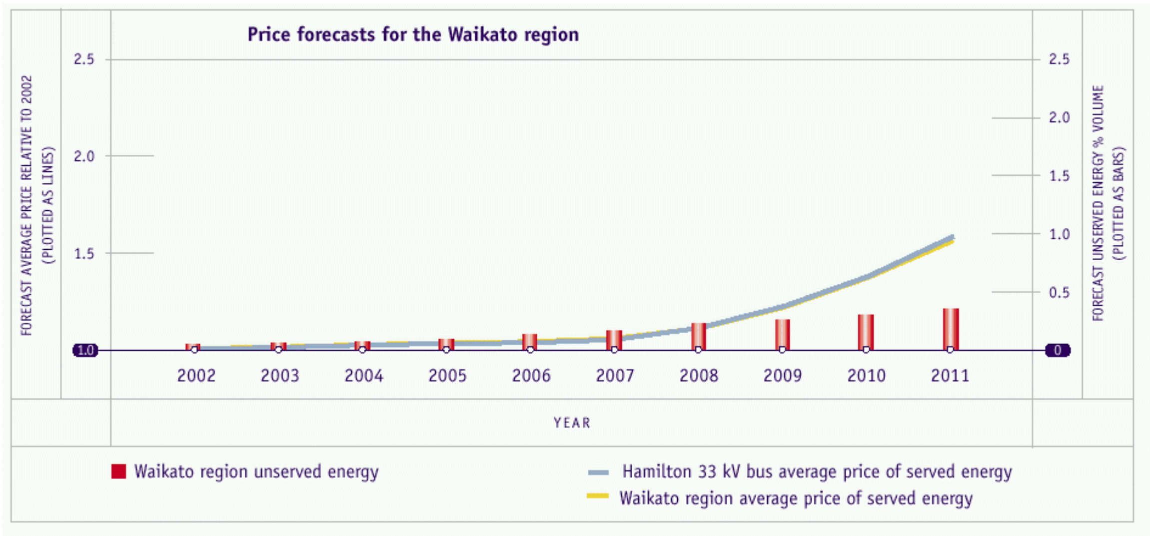
This indicates the timing and extent of likely requirements to invest (whether in transmission, generation or demand-side management). These are displayed as bars in the figures.

Figure 6.1 Transmission Regions

[3] Note: Unserved Energy is Transpower's best estimate of the amount of electricity that would have been conveyed from a Customer Point of Service to the Customer's assets during a specified period, but due to any Interruption, was not conveyed.
Generally, it is expressed as a percentage of the total amount of electricity conveyed to the Customer's assets from that Customer Point of Service during the same period.


Price forecasts for the North Isthmus region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
2.5
2.0
1.5
1.0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
YEAR
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
North Isthmus region unserved energy
Albany 33 kV bus average price of served energy
North Isthmus region average price of served energy


Price forecasts for the Auckland region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
2.5
2.0
1.5
1.0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
YEAR
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
Auckland region unserved energy
Otahuhu 22 kV bus average price of served energy
Auckland region average price of served energy


Price forecasts for the Waikato region
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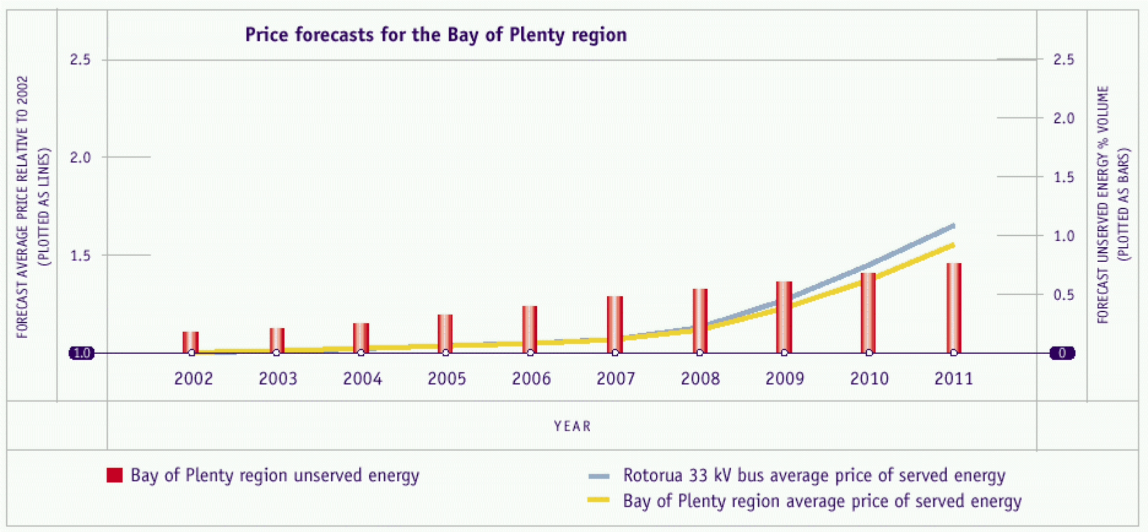
2.5
2.0
1.5
1.0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011
YEAR
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
Waikato region unserved energy
Hamilton 33 kV bus average price of served energy
Waikato region average price of served energy


Price forecasts for the Bay of Plenty region
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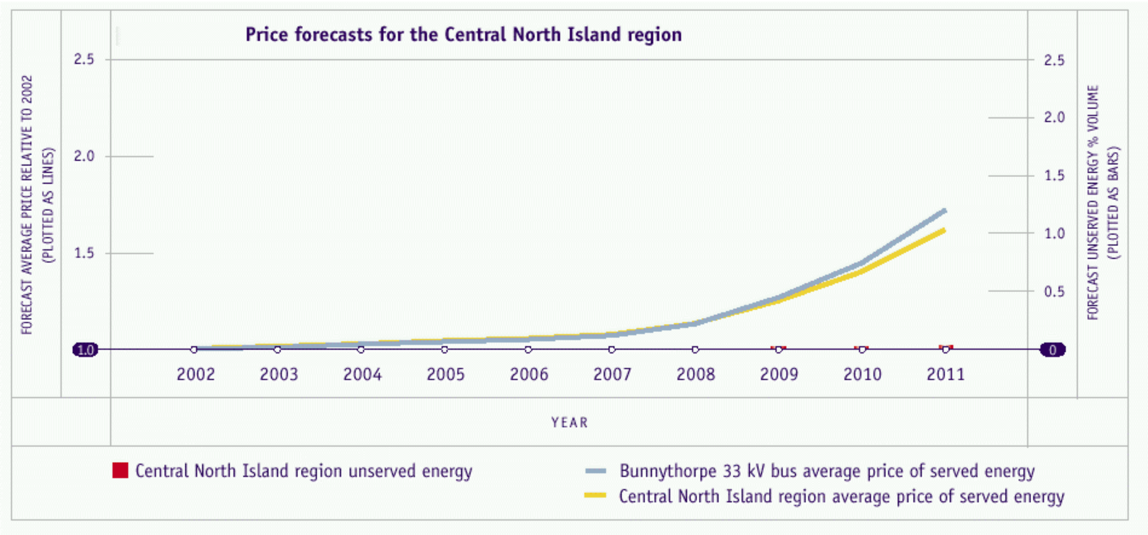
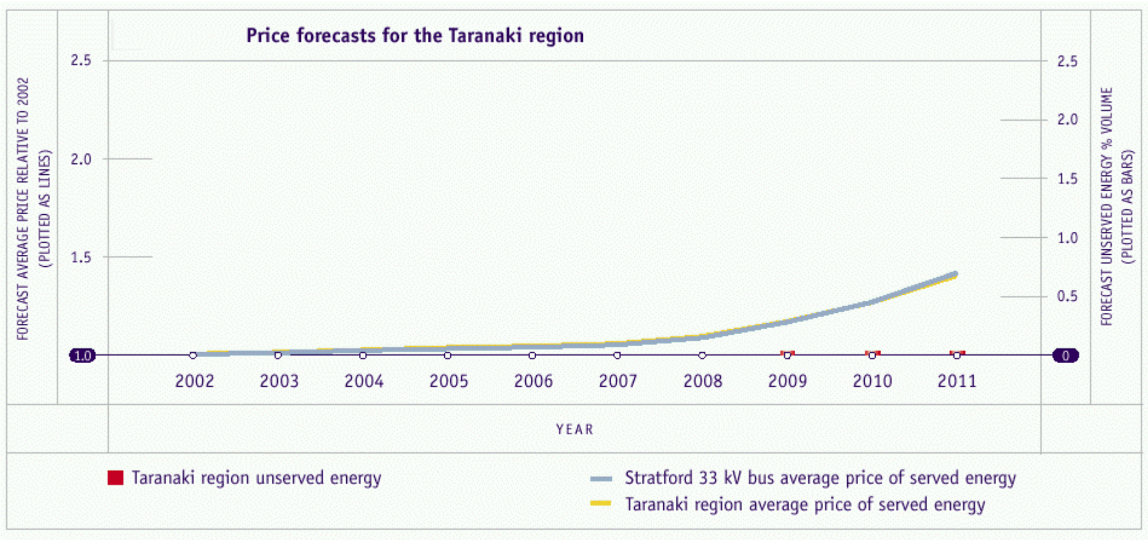
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Bay of Plenty region unserved energy
Rotorua 33 kV bus average price of served energy
Bay of Plenty region average price of served energy


Price forecasts for the Central North Island region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Central North Island region unserved energy
Bunnythorpe 33 kV bus average price of served energy
Central North Island region average price of served energy


Price forecasts for the Taranaki region
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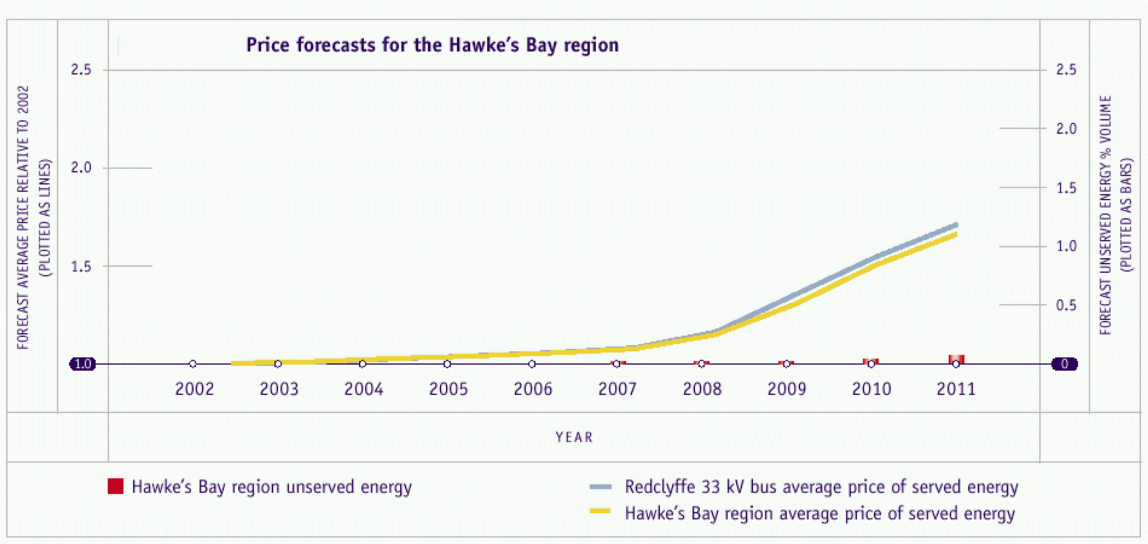
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Taranaki region unserved energy
Stratford 33 kV bus average price of served energy
Taranaki region average price of served energy


Price forecasts for the Hawke's Bay region
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FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
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2002
2003
2004
2005
2006
2007
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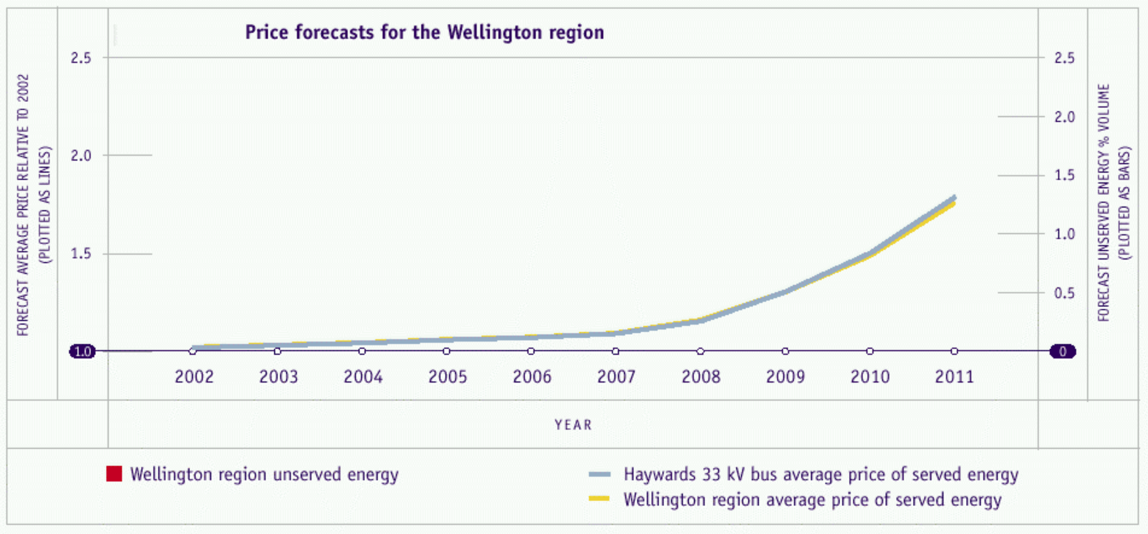
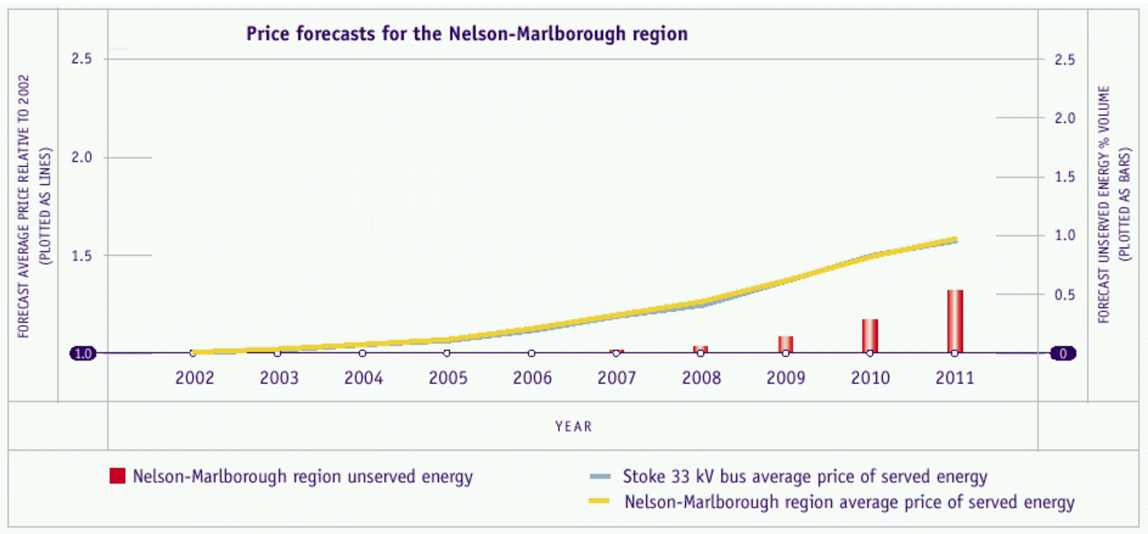
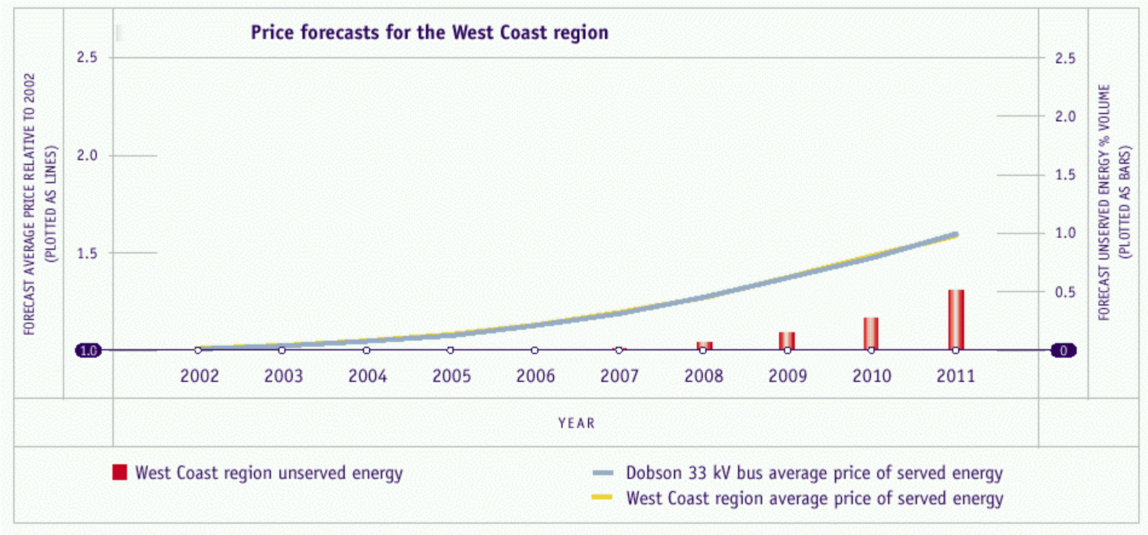
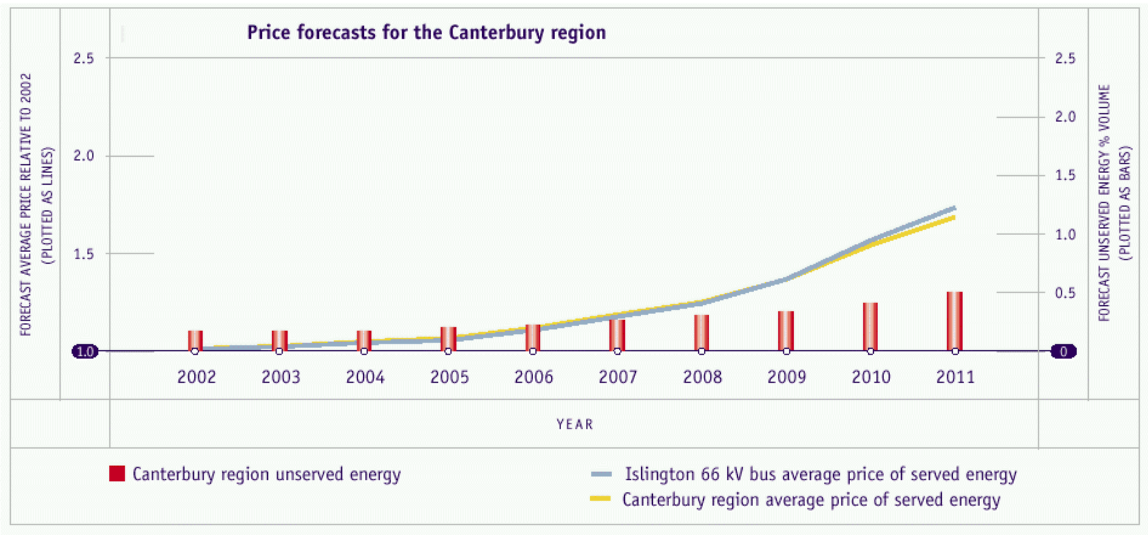
2009
2010
2011
YEAR
Hawke's Bay region unserved energy
Redclyffe 33 kV bus average price of served energy
Hawke's Bay region average price of served energy


Price forecasts for the Wellington region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Wellington region unserved energy
Haywards 33 kV bus average price of served energy
Wellington region average price of served energy


Price forecasts for the Nelson-Marlborough region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
Nelson-Marlborough region unserved energy
Stoke 33 kV bus average price of served energy
Nelson-Marlborough region average price of served energy


Price forecasts for the West Coast region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
YEAR
West Coast region unserved energy
Dobson 33 kV bus average price of served energy
West Coast region average price of served energy


Price forecasts for the Canterbury region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
0.5
0
2002
2003
2004
2005
2006
2007
2008
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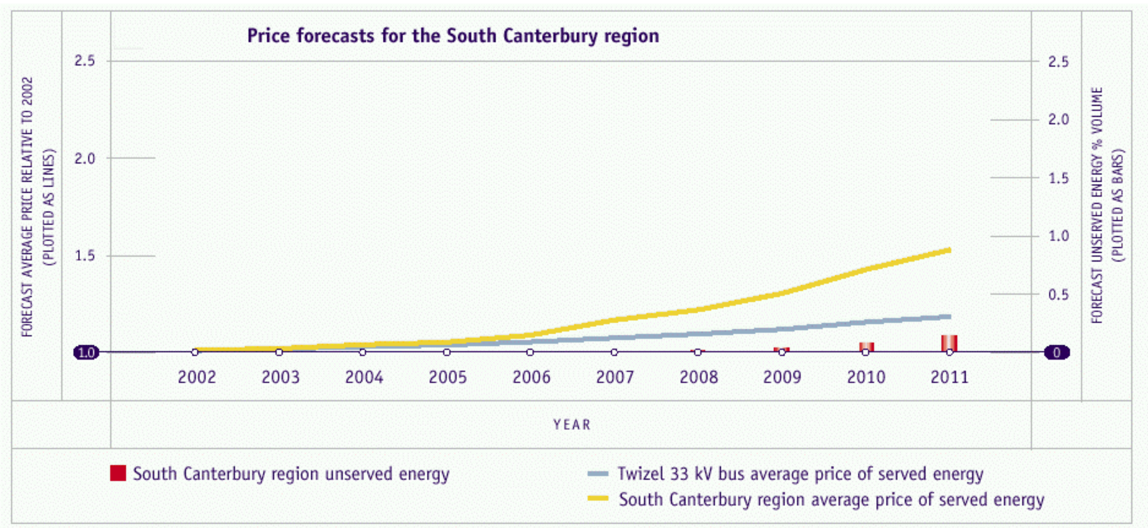
2010
2011
YEAR
Canterbury region unserved energy
Islington 66 kV bus average price of served energy
Canterbury region average price of served energy


Price forecasts for the South Canterbury region
FORECAST AVERAGE PRICE RELATIVE TO 2002 (PLOTTED AS LINES)
FORECAST UNSERVED ENERGY % VOLUME (PLOTTED AS BARS)
2.5
2.0
1.5
1.0
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2002
2003
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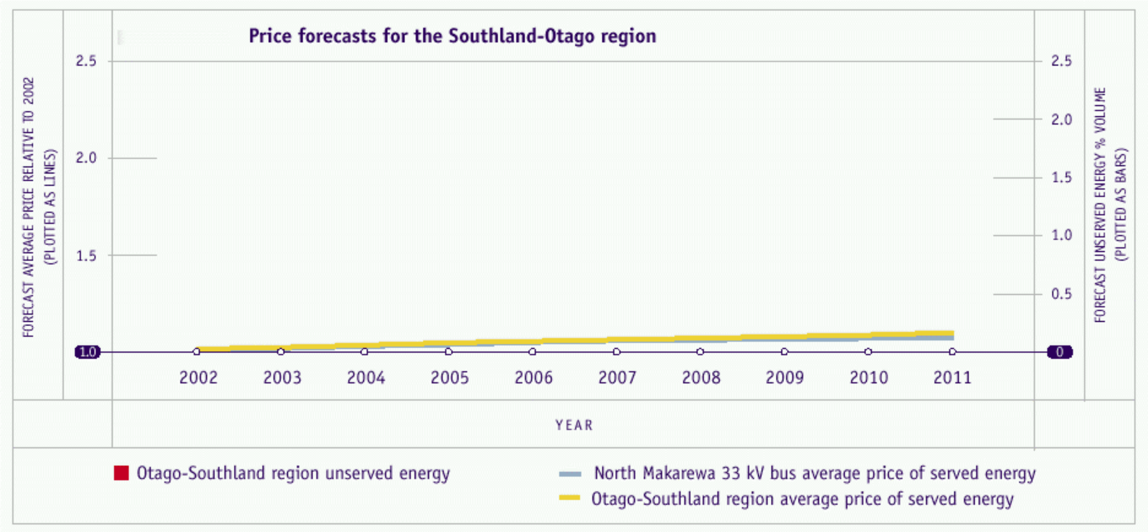
2005
2006
2007
2008
2009
2010
2011
YEAR
South Canterbury region unserved energy
Twizel 33 kV bus average price of served energy
South Canterbury region average price of served energy



(Source Transpower)

In the North Island nodal prices rise gently until 2007 and more steeply after that. The exception is the North Isthmus region where significant price rise starts to occur in 2005. Nodal prices in the South Island follow a similar pattern to the North Island, but are lower for South Canterbury and lower still for the Southland Otago region.

Unserved energy is greatest in the North Isthmus region with much lower levels in Bay of Plenty and Waikato regions. In the Canterbury region the present level of unserved energy slowly increases throughout the period while in Nelson Marlborough and the West Coast levels rise from 2008.

6.6 Electricity Transmission Constraints

North Island Core Grid

The North Island core grid includes the 220 kV circuits from Haywards to Otahuhu, the Wairakei ring circuits and the circuits from Bunnythorpe to Huntly through the Taranaki region. Electricity transfer is normally from south to north.

The Tokaanu-Whakamaru 220 kV circuits are major circuits normally transferring electricity north. When one of the Tokaanu-Whakamaru circuits is out, the other circuit can overload under certain operating conditions. Overloading can be avoided by reducing generation at Tokaanu or south of Tokaanu and scheduling more generation on the other side of the constraint.

An outage of the Ohakuri-Wairakei 220 kV circuit limits electricity transfer due to overloading of the Poihipi-Wairakei 220 kV circuit under certain operating conditions. Overloading can be avoided by reducing generation south of Whakamaru and scheduling more generation north of Whakamaru.

Electricity is transferred to Auckland and northwards over four 220 kV transmission circuits from Whakamaru and two 220 kV transmission circuits from Taranaki. The worst case transmission circuit outage constraining electricity transfer north is the outage of the Otahuhu-Whakamaru-3 circuit, which could either overload the other Otahuhu-Whakamaru circuits, or lead to voltage collapse. The overload can be avoided by reducing generation from the Waikato area and south of Whakamaru and scheduling more generation north of Whakamaru. If sufficient generation is not available in the north, the only alternative to provide N-1 security of supply to the Auckland and North Isthmus regions is by load management in consultation with the customers.

The Bay of Plenty area supply is significantly constrained and price is affected by generation from Matahina.

An outage of the Ohakuri-Wairakei 220 kV circuit can limit power transfer to the Bay of Plenty region under certain conditions by overloading the Atiamuri-Whakamaru 220 kV circuit.

Loading of the Atiamuri-Whakamaru circuit is, dependent on the Bay of Plenty load and the combined generation in the Bay of Plenty region. Studies show that during winter with a combined local generation of 100 MW, the demand in the region could be constrained to 320 MW for up to 45 per cent of the time in 2002, increasing to 90 per cent of the time in 2011. With 300 MW of combined generation, the regional demand can be met fully beyond 2011.

In summer, with 100 MW of combined local generation, the demand in the Bay of Plenty region could be constrained to 330 MW for up to 80 per cent of the time in 2002, increasing to 95 per cent of the time in 2011. With 300 MW of combined generation, the regional demand can be met beyond 2011.

South Island Core Grid

The South Island core grid is mainly longitudinal, consisting of 220 kV circuits from Tiwai in the south of the island to Kikiwa in the north of the island. Electricity transfer between the North and South Islands is through a hybrid HVDC bipole link running between Benmore substation in the South Island to Haywards substation in the North Island.

The major events that affect security of supply are shown in Table 6.1.

Table 6.1 Security Issues Identified in the South Island Core Grid

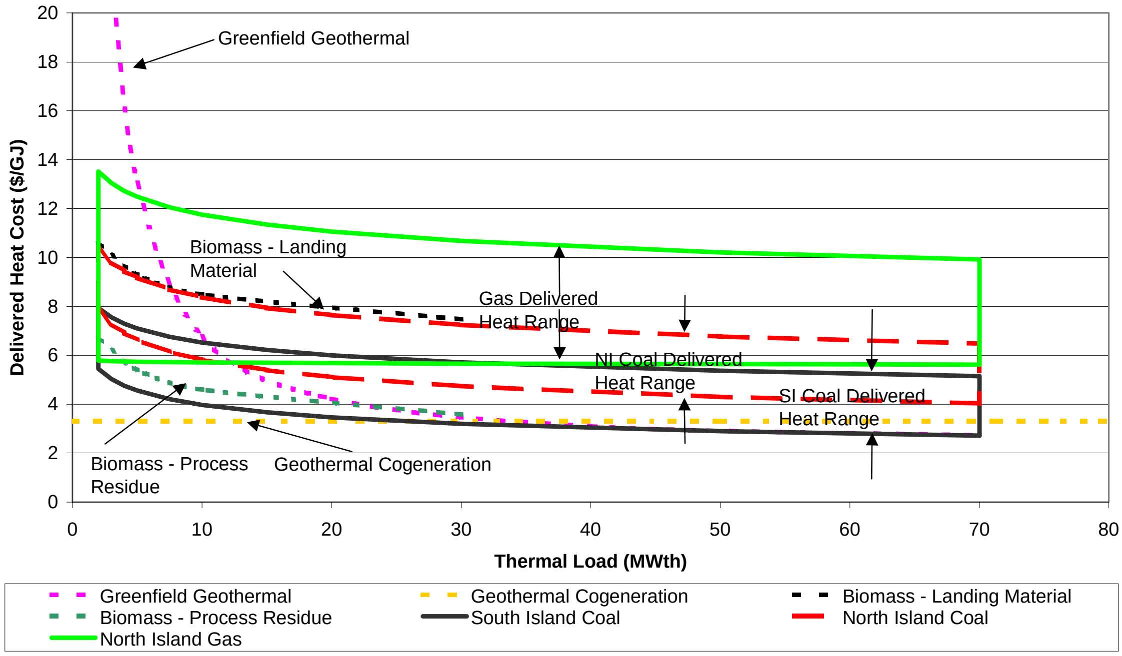
N-1 Contingent Events	**Issue**
Loss of 220kV circuit between Twizel and Islington	Voltage stability and circuit overloading issues arise from 2003. These limit the power transfer north of Waitaki.
Loss of 220kV circuit between Invercargill and Roxburgh	Voltage instability and circuit overloading during low Manapouri generation.
Loss of 220kV circuit between Islington and Kikiwa	Voltage instability during low Cobb generation from 2002.
Loss of 220kV circuit between Waitaki Valley and Roxburgh	Dynamic stability and circuit overloading issues during low Manapouri generation.
Maintenance Outages & N-1 Events	
Loss of two 220kV circuits between Waitaki Valley and Islington.	Voltage stability and overloading issues. This is a problem now, and causes difficulty with scheduling maintenance outages.
Loss of two 220kV circuits between Roxburgh and Twizel.	Transient stability and thermal overload.
Loss of the double 220kV circuits between Clyde and Invercargill.	Dynamic stability and thermal overload problems depending on the generation at Manapouri, Roxburgh and Clyde.
Loss of the double 220kV circuits between Islington and Kikiwa.	Loss of supply to the Nelson-Marlborough region and part of the West Coast region down to Dobson. This is a problem now and causes difficulty with scheduling maintenance outages.

(Source Transpower)

6.7 Energy Cost Comparison

Future heating costs for biomass based technologies are compared with those from coal, gas and geothermal plant and shown in Graph 6.1. These costs are based on plant with an 85% load factor 10% WACC and 25 year life. Wood processing industry investments may have a much higher WACC than this so the costs will rise accordingly. Note that a unit cost for heat of \$25/GJ is equivalent to a unit cost of 9c/kWh.

Graph 6.1 Future Heating Costs without Carbon Dioxide Charge or Gas or Coal Price Rises



Source: "Availabilities and Costs of Renewable Sources of Energy For Generating Electricity and Heat" prepared by East Harbour Management Services. Available from the Ministry of Economic Development website

With the decline of delivery of gas from the Maui gas field, gas prices are expected to rise and also coal prices to a lesser extent. A carbon charge is also likely to be imposed by the Government. The effects of both of these are shown in Graph 6.2. Graph 6.2 is the same as Graph 6.1 except gas has been increased in price by \$2/GJ, North Island coal by \$1.5/GJ and South Island coal by \$1/GJ and a \$25/t of carbon dioxide charge added. It can be seen that with these cost increases biomass process residue will be competitive with coal in all areas, and biomass landing material will be competitive with North Island coal and gas and much of the South Island coal.

Additional heating costs imposed for each scenario are shown in Table 6.2. These costs will vary according to individual circumstances but give an indication of the magnitude of the increase. A carbon charge of \$10/t of carbon dioxide has been included for comparison.

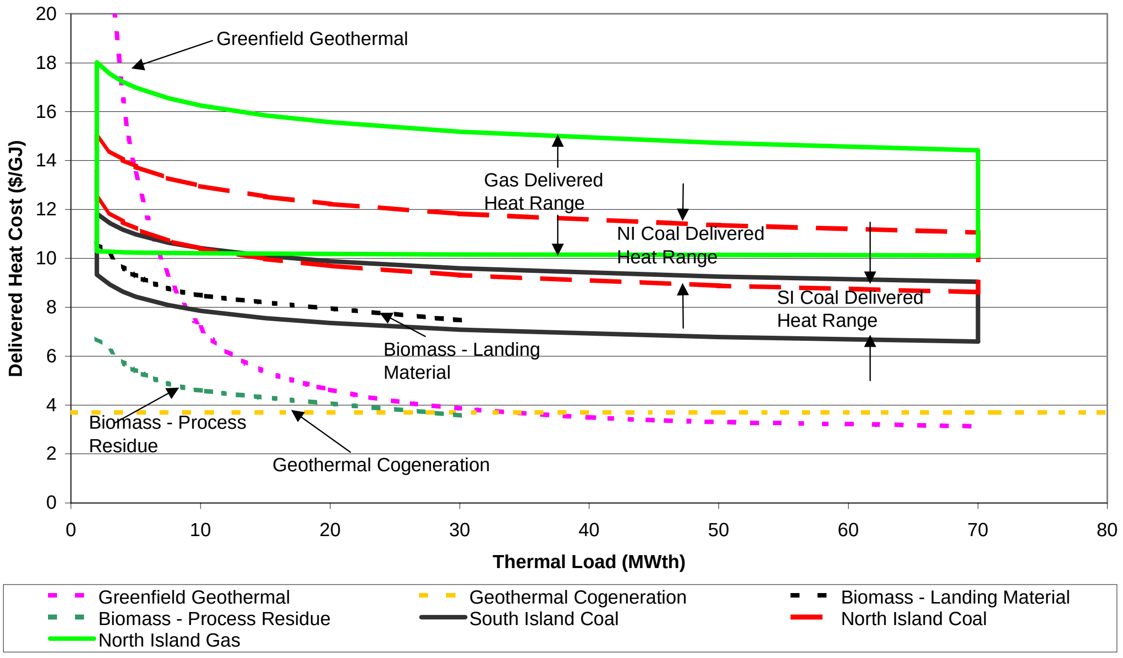
Table 6.2 Additional Heating Costs *

Individual Cost Increases	Additional Heating Costs * $/GJ [4] South Island Coal	North Island Coal	North Island Gas	Geothermal
Increased gas and coal cost only	1.43	2.14	2.50	0.00
$25/t CO_2 charge only	3.09	3.01	1.65	0.41
$10/t CO_2 charge only	1.24	1.21	0.66	0.16
Combined Increased costs $/GJ				
Gas $2/GJ plus $25/t CO_2	4.52	5.16	4.15	0.41
Gas $2/GJ plus $10/t CO_2	2.67	3.35	3.16	0.16

*These heating costs are based on boiler efficiencies of 70% for coal and 80% for gas and geothermal

These combined increased costs represent significant increases in current heating costs of around 50% to 90%.

Graph 6.2 Future Heating Costs with Increased Gas and Coal Prices and a $25/t Carbon Dioxide Charge



In the case of the imposition of a $25/t CO_2 charge combined with the gas and coal cost increases, this will place increased cost pressure on those companies using North Island coal in particular.

All these increases increase the attractiveness of using biomass as a process fuel.

Fuel price and carbon charge sensitivities need to be factored into any investment proposals especially where the fuel cost is a significant component. Increases in fuel prices should also be factors in future risk management strategies.

[4] Conversion factor: 1 $/GJ =0.36 c/kWh

7 Climate Change, Government Preferred Policy

7.1 Preferred Policy for the Forestry Sector

In developing its Preferred Policy Package, the Government has identified aspects related to the wood processing sector.

Summary of Preferred Policy

Climate change and renewables policy includes recognition of a group of industries classed as “carbon-at-risk” especially if their exports may have to compete with goods not exposed to a carbon charge.

Wood processors and potential new investors in wood processing who meet the criteria for being Competitiveness-at-risk would be able to enter into Negotiated Greenhouse Agreements with the Government.

All forestry sector participants will have access to the Projects mechanism.
The Government will provide incentives for Projects in any sector of the economy that will deliver defined reductions in greenhouse gas emissions. Incentives can include money or the allocation of emission units. The Government will seek bids from firms or groups. To qualify for an incentive, Projects must be additional to business-as-usual.

Negotiated Greenhouse Agreements

The Government proposes to use Negotiated Greenhouse Agreements (NGAs) as the primary policy approach for the Competitiveness-at-risk group. An NGA involves an agreement between the Government and a firm, sector, (or group of firms) in which the firm or sector agrees to manage its greenhouse gas emissions to an agreed level. These agreements will set a pathway for the firm or sector to move to international best practice in managing their emissions per unit of production.

A Price on Emissions

In the first commitment period, 2008-2012, the Government proposes the General Energy Users group will be subject to a price on emissions. This group will face an emissions charge on carbon dioxide emissions from fossil fuels, which will approximate the international price of carbon but will be capped at NZ$25 a tonne of CO_2 equivalent.

Emissions Trading

The Government retains the option of introducing emissions trading, rather than an emissions charge, if the international carbon market is functional and the price is reliably below the NZ$25 cap. This mechanism allows firms to take on and manage an emission obligation and their price exposure directly, with the potential to reduce their costs or add value through trading emissions units, either domestically or internationally.

Revenue Recycling

The net revenue gathered from an emissions charge or from the selling of emissions units or sink credits, and after funding policies such as Projects, and NGAs will be recycled back into the economy. For example this may be done through the tax system.

7.2 Carbon Charge

Assuming the Government's policy of an emissions charge in the first commitment period will be capped at $25 per tonne of carbon dioxide (CO_2) equivalent, the effect of applying this to electricity prices will mean an increase in electricity costs as shown in Table 7.1. Bioenergy is assumed to be carbon neutral and does not attract the carbon charge.

Table 7.1 Increase in Electricity Prices with a $25/t Carbon Dioxide Charge

Fuel	Coal	Gas	Oil	Geothermal
c/kWh	2.4	1.1	2.0	0.1 to 0.7 *

* The effect of the carbon charge on the cost of electricity from geothermal energy will be in the lower part of the range. The carbon charge from using steam from Kawerau will be around 0.6 c/kWh.

8 Implications of the Range for Energy Supply in the Regions in which Wood Harvest is Forecast to Increase Over the Period.

A number of the wood processing regions align with areas where there are electricity constraints and thus high electricity prices will occur. While there are alternative energy resources in some of these regions there are a number of issues that indicate that transfer of energy source will not occur in the short/medium term. Northland is a particular case with high forestry growth and electricity transmission constraints.

In the Bay of Plenty and central North Island regions increased wood production starts around 2006 and so does the increases in nodal pricing. Unserved energy is comparatively high for the regions. There is a lag of a couple of years between increased forestry output and increased nodal prices in the East Coast, Hawkes Bay and southern North Island regions.

Increased nodal prices start around 2006 for the Nelson/Marlborough area coinciding with increased forestry output. Unserved energy also features in this region. The position is similar in Canterbury. Otago /Southland appear to be free of constraints.

There are a number of onshore gas fields in areas such as Wairoa which could be developed for wood processing energy. However, there is a time lag of up to 10 years between gas discovery and gas to the market. Future gas discoveries are unlikely to be available to meet the shortfall in supply if Maui delivery starts to decline rapidly in 2006.

For large energy projects obtaining consents through the Resource Management Act (RMA) process takes a long time, particularly if the consents are appealed. This can take from four to ten years so will be a significant constraint from a move to regional energy supplies.

Government focus is on renewable and sustainable energy and this has a lot more flexibility and is likely to occur in small manageable investments.

As the price of gas rises in future the price of coal will also rise as more expensive coal will need to be mined. This will have an effect on regional coal prices.

Government or industry action is necessary to ensure that where there is a projected shortfall in regions that sustainable and secure supplies of energy are made available over the period to 2015, particularly in the northern half of the North Island.

Nodal prices and the discussion on ways of reducing transmission constraints give an indication of where and when energy related decisions could be made in the forestry sector. For example north of Whakamaru embedded generation should be looked at, while in Southland nodal prices are very flat so there is more certainty there for planning. However, the effect of having embedded generation and how this can affect local costs and connections to the grid need to be taken into account when considering embedded generation.

9 Discussion

9.1 National Energy Shortfall

From whichever aspect you consider it, all reports from a number of different analysts contribute to the conclusion that there is a potential energy supply gap arising between 2005 – 2008. While NZ has a wide range of long-term solutions available to it many of these cannot be instituted in the time available. There is a need to identify and prepare short-term contingency solutions to cover the possibility that actions proposed or being undertaken do not eventuate or are less effective. The short-term actions will contribute significantly to easier implementation of the longer-term solutions.

The energy market issues are as much political as technical and will require action on a number of fronts. There is no single long-term solution.

The reality of the early depletion of the Maui gas field is publicly unknown. The redetermination of the gas allocation has been triggered by the gas field depletion. However as the outcome of the redetermination has very major commercial implications for the gas industry, public positioning and expectations will be fostered by the respective players.

Regardless of whether the depletion occurs in 2005 or 2008 the effect is still the same. It is only a matter of timing, and actions to be taken are required regardless of timing. Ongoing gas discoveries will continue to be made and the longer the delay the greater the chance of securing more gas.

The large size of the Maui gas field has shielded and avoided the need for the energy market to take actions that will now need to be taken. The size and nature of the field has reduced the drivers to invest in new fields or find alternative solutions. The size of Maui also provided flexibility for supply which will now have to be provided by a number of smaller gas fields, coal and other resources. This will be more difficult. The complexity of energy supply will increase but at the same time a number of opportunities that have been dormant will be assisted to emerge.

Substantial gas reserves are potentially available but these tend to take up to 10 years to develop. The Pohokura gas field is expected to come on stream around 2006 and the Kupe field is awaiting decisions on development. These plus other smaller fields will not however make up for a decline in Maui output. If an early decision was made on Kupe there may however be an overlap, but this could be a difficult and expensive field to develop.

Short-term actions that will contribute to a wood processor's long-term energy supply security include:
- Optimisation of biomass waste streams for use in bioenergy plant
- Institution of processing plant energy management measures to reduce total and peak energy requirements
- Decisions on new energy plant based on multifuel supply eg gas and bioenergy
- Consideration of location of plant adjacent to geothermal, small hydro, and wind energy sites so as to allow embedding of energy facilities
- Clustering wood processing sites to obtain economies of scale and peak energy or fuel management benefits.

The short-term initiatives will assist push out current low energy prices while creating a time to learn how to use energy efficiently and create other supply options.

9.2 Additional Wholesale Market Electricity Generation

The proposed Huntly CCGT electricity generating station could be built in time to meet increased demand for electricity but this needs a large gas contract. While Genesis Power owns a substantial part of Kupe, contracts for gas from Pohokura are not yet available. Decisions on both of these are likely to be delayed until the completion of the Maui redetermination. In the meantime Genesis Power is stockpiling coal in anticipation of increased coal usage to meet electricity demand. This will be a hedge against both the availability and price of gas. However generation from coal from Huntly Power Station is likely to be restricted because of the site carbon dioxide emission cap.

Contact Energy has deferred a decision on Otahuhu C until it can secure a long-term gas contract.

NZ is potentially gas rich but the gas fields are not expected to be of Maui size. They are likely to be small and require cleanup and processing to get them to a specification that could allow adding to the gas reticulation system. The non-Maui specification gas could be used in a proposed second Taranaki Combined Cycle power station for which consents are currently being sought. The rationale for the location of the Taranaki gas power stations has been that by locating them within the gas fields they are able to take gas directly from the field without incurring the cost of cleanup which would be required to get the gas to Huntly or Otahuhu.

Other than the proposed 39 MW extension to the Mokai geothermal power station, a second unit at the Taranaki Power Station site, the proposed Huntly CCGT and CCGT at Otahuhu there is no other planned new generation that could be commissioned to meet an early shortfall in Maui gas, or to meet increased electricity demand in the short term. There will be some additional generation from the Manapouri Power Station upgrade and transmission line upgrades. The difficulty for the gas-fired stations will again be the ability to negotiate gas contracts until the redetermination is completed. There is also a limit to how much generation can be built in Taranaki, as already under certain flow conditions, transmission constraints occur.

A recent draft Government Policy Statement on gas sets out in detail the Government's views on gas industry governance and it's expectations for the industry. It invites the gas industry to set up a governing entity that will need to develop arrangements relating to production, wholesale markets, transmission and distribution networks, and retail markets. The Government expects that the industry arrangements will be in place by December 2004.

One of the required initiatives is to develop an open access regime for all transmission pipelines including the Maui pipeline. When implemented this will enhance the capabilities of the transmission system for non-Maui gas at a potentially lower cost.

9.3 National Dry Year Electricity Shortfall

Because the electricity market is hydro-dominated the potential for dry year shortfalls can be very significant for the availability and price of electricity. Over the last few years 900 MW of peaking electricity generation capacity has been withdrawn from service. The result is that NZ now has a very thin capacity margin to meet dry year shortfalls.

The latest update of the CAE Electricity Supply Demand Report states that there is a significant risk of electricity shortages in dry years after 2004. Shortfalls in future gas supplies for electricity generation will be met by coal fired generation at Huntly Power Station. However the site carbon dioxide emission cap may restrict generation using coal. There is a significant risk that Huntly may be generating to meet the gas supply shortfall and have insufficient capacity to meet a dry year hydro shortfall.

In this case consideration would need to be given to restoring New Plymouth Power Station's oil burning capability, a costly process and one that may not be ready in time if the agreement with Greenpeace is upheld.

9.4 Energy Price Increases

No one knows or can predict what may happen to gas prices but some scenarios can be assumed. A common scenario is that the price of gas could increase by $2/GJ which could result in a 2 c/kWh increase in the price of electricity.

9.5 Energy Demand Reduction

In each of the last two major dry year electricity shortfalls the electricity market has resorted to demand reduction. This is a valid response but because of the current organisation of the electricity market none of the electricity suppliers had plans available to undertake demand response. The electricity retail companies addressed the low hydro storage from a crisis approach rather than as an expected event every few years. Even today few electricity industry participants have demand response mechanisms available that could be brought into action.

The Government has established a National Energy Efficiency and Conservation Strategy (NEECS) which has five workstreams; Central and Local Government, Energy Supply, Industry, Building and Appliances, Transport. Each work stream has an extensive work programme of initiatives aimed at improving energy utilisation. The target for these programmes is to achieve a 20% improvement in economy-wide energy efficiency by 2012.

Achievement of a 20% improvement in energy efficiency is expected to reduce energy demand potentially by the equivalent of a fifth of a Kupe sized gas field. On the other hand energy efficiency improvements in the past have generally lead to increased total energy use so the on-site energy utilisation may improve while the national aggregate energy demand continues to increase.

Despite NEECS being the most significant government energy policy introduced probably ever, achievement of these policy goals looks weak while industry generally does not recognise its potential for business sustainability and even for reducing product costs. EECA is making significant progress on many of the work streams but their work is often in isolation and underfunded despite the opportunities it provides industry and the energy sector.

A focused energy efficiency research programme for the wood processing sector would contribute to a portfolio of actions that could cumulatively offset some of the effects of increasing gas and electricity prices.

9.6 Government Renewable Energy Policy

The Government has also released a policy for increasing renewable energy supply to provide a further 30 PJ of consumer energy by 2012. This policy is far reaching but despite strong submissions from industry was ignored by the media when released along with the draft Climate Change policy.

The policy provides significant opportunities for the wood processing industry. Bioenergy has a significant place in the policy and along with the support for other renewable energy initiatives each can contribute to the portfolio of opportunities for the wood processing industry.

Government is seeking industry involvement in the implementation of renewable energy policy and has indicated to the Bioenergy Association in particular that it will only provide increased funding of the policy initiatives if it sees that industry is behind the policy and pushes for its need.

9.7 Government Climate Change Policy

The Government's Climate Change policy will likely increase wood processing costs and make it difficult to justify additional capital expenditure in operations made more marginal by the policy, even if at the new prices it is "efficient" to do so.

The markets for all products arising from the wall of wood, are international, and compete with products from non Annex B countries. The "benefits" for a forest wood processor may therefore be illusory as the government has nationalised the benefits to the forest owner.

Climate Change policy can be dealt with simply by acknowledging that it increases the relative cost of both energy and fibre to New Zealand growers and wood processors. Increases in energy cost arising from market structure, supply and transmission limitations simply exacerbate the effect.

The policy will however provide incentives for wood processors investing in bioenergy. There are three areas of interest and each will provide financial benefits that will encourage wood processors to utilise renewable energy as a substitute for gas or coal. The wood processing sector has more opportunities to pick up benefits of energy substitution from this policy than probably any other industrial sector. These benefits may be acquired by direct action or by treaty with other parties.

Direct benefits will arise from the support for projects many of which will assist the wood processing sector, and the ability of wood processors to avoid carbon charges by use of fossil fuel free technologies for heat or electricity production. Negotiated Greenhouse Agreements may eventually allow trades by private treaty from wood processors to those less able to avoid carbon charges.

The key to maximising the benefits to wood processors will be involvement of the industry to ensure that the processes and criteria developed by Government maximise energy opportunities for wood processors. Currently there has been more focus on the interactions of the policy on forestry rather than the energy issues for the wood processing sector. This will be an area for industry associations to act on behalf of the industry.

9.8 Energy Market Structure

The fragmentation of the energy market makes it very difficult for wood processors to implement initiatives that will reduce costs of energy.

Areas where wood processors can reduce costs are in the reduction of peak electricity demand where network connection costs can be reduced, and from on-site heat and electricity production. Cogeneration is currently not economic in most situations, but as the cost of waste disposal increases and gas and electricity prices increase, on-site generation will become more financially attractive just to meet on-site energy needs. An extension is where heat or electricity can be exported from the site to neighbouring energy users. Such clusters of energy users can achieve a balancing of peak loads, economies of scale for fuel management, and make cogeneration economic.

Reduced electricity network costs can be achieved if the electricity supply can be embedded into the users local distribution system. This also avoids the need to involve third parties. The network companies have a range of different policies for establishing arrangements with embedded generators with some policies being very unfriendly to the embedded generator.

The network connection costs for embedded generation usually reflect the cost of network connection with a credit for the benefits embedding can provide the network for voltage support and supply security. The costs are based on peak capacity. Some network companies have posted costs which provide transparency to an installer of embedded generation. Other network companies work on a negotiated arrangement in order to identify the best win/win benefits for both parties. This latter approach adds to the transaction costs for cogeneration.

Where excess electricity is produced and is available for sale to a third party the electricity industry structure makes it difficult to find a buyer and to get a good price. At present the electricity market is dominated by electricity sector participants who have no incentive to contract with other small generators.

The electricity market rules have been written for large industry players and it is difficult for small energy generators to understand these rules let alone comply with them. There are opportunities for lines companies to invest in renewable generation e.g. using wood waste. These are the subject of a companion paper and will not be covered here.

The electricity market is in the process of establishing a self governing body and market rules. Involvement of the wood processing industry associations in these developments will help ensure that they do not continue to disadvantage wood processors with regard to their energy costs.

9.9 Electricity Transmission Constraints

Reference to section 5 shows that the regional costs of energy are affected greatly by national grid transmission constraints. Transpower has made some attempts to find a mechanism to deal with constraints however until Transpower's Statement of Corporate Intent is changed the costs imposed will remain. The constraints are getting worse and it is expected that they will have to be addressed within the next few years. The introduction of FTRs may assist in some areas for large industry participants.

From a wood processing industry perspective it will be important that the industry involve itself in the development of transmission policy in order to get the problems addressed.

9.10 Energy Requirements for the Wood Processing Industry

A study previously undertaken for Forest Industry Council indicated that around 250MW of additional electricity may be required over the next few years. The study indicated that 550 MW would be required if the expanded harvest over the next 25 years were to be processed into the same products in the same proportions as at present. This probably represents the upper limit of likely energy demand.

9.11 Gas Based Energy Supply Opportunities

There are a number of small gas fields that have been discovered but closed up again as at the time they were not considered economic to develop. With the demise of the Maui field these small fields will become more attractive. Some are on-shore such as at Wairoa, Canterbury, Wanganui, and Taranaki and near wood processing areas.

Locating new wood processing facilities near to these small gas fields will provide an opportunity to use the gas for on-site heat or electricity production. Direct use avoids the need for gas cleanup as it can often be used directly in boilers or cogeneration plant.

Where a wood processor uses bioenergy or wind energy the gas can be a valuable fuel for energy supply trimming as it has the flexibility and speed of response that means that the energy user can have more confidence on energy deliverability. Gas can also be a valuable standby fuel for direct firing in boilers in the event of a shortage of biofuel.

Gas can be supplied by pipeline or as LPG. As a contingency fuel the form of the contract for supply can have a marked effect on total energy costs.

Gas can be a good risk management tool.

9.12 Coal Based Energy Supply Opportunities

Coal is readily available throughout NZ and is ideal for mixing with biomass in the event of biomass shortfall. Coal is easily transported to most wood processing areas and its characteristics are well known. As a future supply opportunity it will continue to be used, however the climate change policies and increasing cost will make it less attractive.

9.13 Hydro Electricity Generation Opportunities

Many forest areas are located in areas where there is an opportunity to embed generating facilities into the plant. The land adjacent to rivers with hydro potential is often owned by forestry companies. Consideration should be taken for location of new wood processing sites adjacent to hydro energy sources in order to reduce transmission costs. While hydro generated electricity has a high capital cost the long term low operating cost can provide cost competitive electricity supply for embedded plant.

9.14 Geothermal Based Energy Opportunities

Many forest areas in the Central North Island are located in areas where there is an opportunity to embed geothermal electricity generating or process heat facilities into a wood processing plant. The economics of geothermal energy are such that many fields are more suited for the supply of process heat rather than electricity generation. The up-front capital costs can be spread over time by staged development and exploitation of the geothermal resource. This also allows knowledge and experience of the characteristics of the resource to be gained before larger developments are undertaken.

The size and economics of geothermal energy and the proximity of the geothermal fields to the wood processing areas makes this the most attractive future energy source once gas prices increase.

9.15 Wind Electricity Generation Opportunities

Many forest areas are located in areas near the coast where there is an opportunity to embed wind generating facilities into the wood processing plant. While wind energy is non firm it is reliable and is reaching the point where it could make a good contribution to meeting a wood processors electricity demand. The economics would only be attractive if the windfarm can be located near the wood processing site and embedded into the site.

9.16 Solar Energy Opportunities

In many areas of NZ solar thermal energy can be economically utilised as a pre-heater for processes such as warming water used for log peeling, or feedwater to a boiler.

9.17 Bioenergy Opportunities

The most strategic and financially attractive energy supply options for wood processors to manage increased energy costs relate to use of waste biomass. The fuel is within a wood processor's control and will invariably cost them money to dispose of otherwise. Contingency backup sources of supply can be arranged and the supply can be developed as demand increases.

9.18 Energy Risk Management

Between 5 and 30% of wood processing costs arise from energy.

All wood processors will at some time, and probably steadily over a period of time face large increases in gas and electricity costs. Knowing that this will occur but not knowing when or by how much, wood processors will each need to develop a portfolio of strategic measures. Many of these measures will be solely in their hands, while others will have to be undertaken collectively so that costs can be shared.

Individual portfolios of energy price risk strategies will need to be prepared ready for quick implementation according to when specific measures become most economic to implement. Some measures such as on-site energy management initiatives will become economic in a steady stream over time. Other initiatives such as cogeneration will most appropriately be installed when plant upgrade investments occur. Other local embedded generation opportunities may take years of investigation and the securing of land or resources, and then be held until appropriate for investment.

An energy price risk strategy may also involve other parties such as neighbouring industries. Economies of scale can be achieved if energy users locate in clusters and share energy facilities. Such clusters can also provide opportunities for energy load management. Electricity network connection costs can be reduced significantly if a peak demand by one party can be staggered with a neighbours peak demand thus reducing peak loadings on grid or network exit points.

The impediment to implementation of energy price risk strategies will invariably be access to capital. Import of electricity, gas or coal to a site is an operating expense. The solutions to ameliorate increased costs of these will usually require capital expenditure which from an energy efficiency point of view may be very sound but financially a non starter. In many situations the wood processor will be forced to pay the higher fuel cost rather than incur capital expenditure to reduce long term operating costs by implementing the energy efficiency measure. Thus the increased energy costs will result in the industry becoming less competitive.

10 Conclusions

Regardless of the timing of the drop off of availability of gas from the Maui gas field the wood processing industry needs a collective energy strategy and individual risk management measures to either gradually implement, or to have ready for implementation, in the event that the price of gas and electricity increases earlier rather than later.

Forecast new generation is needed for the winter of 2005 or 2007 at the latest. Acquisition of resource consents takes five to seven years under the RMA. This means that these projects should be underway now. Any delay in getting the plant online will have significant supply side consequences, even in an average year.

Electricity transmission constraints are a limiting factor between the generation sources and in meeting the demand from forestry processing facilities. This is noticeable in the top half of the North Island. Currently there is no incentive for Transpower to overcome these constraints. This not only has a significant effect on the forestry industry but all electricity users.

The industry needs to work collectively on a number of government policy developments to ensure that they encompass the industry’s interest, and individual wood processors will require a portfolio of initiatives that can be implemented at each site.

11 Recommendations

11.1 Recommendations For Industry

In order to ameliorate the effects of the anticipated energy price increases arising from the drop off of availability of gas from the Maui gas field, the wood processing industry can take a number of short term initiatives that will assist push out current low energy prices, while creating a period to improve energy use and create other supply options.

Initiatives that can be taken include:

- Optimisation of all site or nearby related biomass waste streams for use in bioenergy plant
- Identification of processing plant energy management measures to reduce on-site total and peak energy requirements in order to reduce energy and electricity network connection costs
- Allowing in the design for new energy plant to be based on multifuel supply eg gas and bioenergy, or coal and bioenergy
- Consider the location of new wood processing plant adjacent to geothermal, small hydro, and wind energy sites so as to allow embedding of energy facilities
- Identify opportunities for clustering wood processing sites to obtain economies of scale and peak energy or fuel management benefits
- Establishing a database of wood processing heat plant that will allow learning from experience to occur
- Gaining experience of the hedge market to cover electricity dry year events
- The wood processing industry working with Government officials to maximise the opportunities for bioenergy arising from the development of the Climate Change Policy, in particular the funding of 'projects' to showcase bioenergy
- Assisting the Bioenergy Association to work with EECA to establish and implement a bioenergy programme under the Renewable Energy Policy
- The wood processing industry working with the Bioenergy Association and the Wood Processing Strategy to identify, prioritise and promote research and information projects that will assist reduce the costs of bioenergy, and assist small/medium wood processors evaluate bioenergy opportunities, in particular research:
    - on the handling and storage of wood waste for bioenergy fuel
    - on treatment of wood waste to have consistent homogenous characteristics
- Working with the Major Energy Users Group to:
    - Encourage Transpower to remove electricity transmission constraints
    - Ensure that the Electricity Governance Board has provision for industrial electricity users
    - Work with the electricity network industry to establish policies and procedures that encourage embedded or distributed electricity generation
    - Encourage the electricity retail providers to establish electricity demand response contingency initiatives that can be activated when the next dry year event occurs

- Encourage Government to review the current electricity market structure so that retailer / generator constraints are removed

11.2 Recommendations for Government

In order to improve the prospects for securing investment in wood processing, government needs to explicitly recognise objectives of security of supply and competitive pricing. Specific policy work is required on the following matters:

- Encouraging additional gas exploration and development
- Acknowledging the short term role and acceptability of coal even though not consistent with government's longer term objectives
- Ensuring access to and supply of residual Maui Gas
- Improving the RMA consent process to reduce timeframes without reducing environmental standards
- Ensuring that suppliers have a competitive open access regime for pipelines and that government facilitates the development of standards for the common carriage of gas
- Work with the Wood Processing industry to develop a focused energy efficiency and bio-energy research and development programme
- Facilitate the implementation of demand side management

12 Annex A

Company Name	Year of Completion	Publicly Announced Investment Details > $1 million As-at July 2002	Estimated Extra Input (RWE) km^3	Electricity requirements per year GJ
Craigpine	2002	Winton Phase II expansion to from 120k to 200k m^3 input capacity	80	
East Coast Lumber	2002	Mill expansion at Wairoa	10	
Nelson Pine Industries	2002	New LVL plant (200 k m^3/yr input)	200	
Norsk Skog Tasman	2002	Kawerau paper mill fibre recovery upgrade	na	
Pan Pacific Forest Industries	2002	Pacific Wood Products PanPac reman subsidiary	na	
Prime Sawmills	2002	Upgrades of the old Rayonier mill at Gisborne	5	
Rosvall Sawmill	2002	Sawmill upgrade - Whangarei ($5 million over time to 2002)	58	
Winstone Pulp International	2002	Sawmill expansion 40k to 120km^3 input (estimate)	80	
Carter Holt Harvey	2002	First stage of 80K m^3/yr LVL plant in Northland	160	
Waimate Timber Processing	2003	New sawmill	30	1,100
Bright Wood	2004	Timber processing plant - Milburn	100	3,800
Carter Holt Harvey	2004	New sawmill at Whangarei (advertised - $80M = estimate ex NZ Pine article)	150	5,700
Weyerhaeuser	2004	Expansion of Kaituna mill from 45K to 220k m^3 input ($30k = estimate)	165	6,200
Flight Timbers	2005	Tripling production from 40K to 120k m^3 input	80	3,000
Carter Holt Harvey	2007	Proposed second stage of LVL plant in Northland	100	3,800
Hikurangi Forests	2009	New sawmill at Gisborne (announced as "bigger than Waipa")	450	17,100
				40,700