

WOOD PROCESSING STRATEGY

Energy Market Structure Issues in NZ

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1. Executive Summary

Energy cost has long been a comparative advantage to industry in New Zealand. It is a significant input to the wood processing industry (WPI), varying between 5% and 30% of cash costs.

Even at the 5% end of the scale, energy represents a significant input cost. The reason for this is that the industry exports a high and increasing proportion of its products to highly competitive export markets where margins are small, and commodity price cycles are volatile. The high fixed costs of wood processing mean that there is pressure for mills to maintain production by achieving revenues that exceed their cash costs throughout the commodity price cycle, including allowances for significant movements in exchange rates. **Security of Supply, Long Run Price and Short Run Volatility** are therefore all critical to the future of investment in the wood processing industry.

The WPI purchases 3300 GWhpa equal to **9%** of New Zealand's total electricity demand. It also consumes some 8 PJ pa of natural gas which is about **45%** of the industrial/commercial load in NZ. (see Appendix A)

The **key measure of production efficiency** is the lowest delivered cost for a given mill output over a year, on a sustainable basis and within acceptable price and security risk criteria.*

Improvements in efficiency will encompass:

- energy efficiency measures where the investment to achieve them has a payback typically of under two years
- energy source substitution where it is cheaper to move to a cheaper input mix (eg. Change heating fuel from natural gas to butane or biomass)
- In-plant generation, particularly co-generation and frequently biomass fuelled load shifting and shedding in response to price signals.
- conservation

The structure of energy markets therefore becomes of importance to ensure mills can operate with some semblance of certainty in regard to optimising cost and calculating exposure to fluctuating short term and increasing long term energy costs.

* The energy efficiency of various grades of pulp and paper, panels and timber is not easy or is it necessarily productive to establish. This is because the two largest mills in the country have integrated energy sources (including natural gas, biomass, black liquor, geothermal, coal, in-plant co-generation and purchased electricity), and also because production grade mixes are constantly changing and various products are being produced at the same time.

The price signals that the nodal pricing system provides at present are far stronger and far more volatile than is necessary to effect the consumer behaviour required. There are a number of reasons that contribute to this which include:

- Modelled grid constraints used to manage security can create dominant generators
- Vertical integration has caused regionalisation and reduced competition in various regions
- The national averaging system for the return of constraint rentals
- A lack of incentive on Transpower to manage the Grid to fulfil its function of facilitating competition through minimising constraints
- Illiquid primary hedge markets (price, volume and location)

Investments in the Wood Processing Industry are long term usually with a 30 to 50 year horizon. Therefore, the long-term stability of the energy cost structure in a country is of considerable importance when deciding on a new investment's location.

The proposed carbon tax, which is a consequence of the ratification of the Kyoto protocol, would add to the WPI energy costs in NZ to the tune of **\$62 Million pa** (at \$25 per tonne). Exemptions from the tax will only be available to those able to negotiate an NGA with the Government. There are a number of hurdles to achieving this, not least of which includes proving 'Competitiveness at Risk'. The availability of the exemption to the Wood Processing Industry is highly uncertain and poses a significant barrier to investment when the price effects are combined with both supply related price increases and excessive short term price volatility.

The electricity market design was based on the competitive model but, in our view, a number of actions recently have seen that model debased. Issues include:

- Vertical integration of generators and retailers which has led to regionalisation, reduced competition for physical supply and financial risk management instruments, as well as increased spot price volatility.
- A lack of Grid investment over a number of years, coupled with a disconnect between Transpower as 'Asset Owner' and 'System Operator' and any responsibility or seeming interest in the *delivered* energy price.
- There is no incentive on Transpower to minimise modelled constraints or propose optimal solutions for Grid improvement. Much of this will be addressed through Part F of the new rule book when the Electricity Governance Board (EGB) is formed. However, this is unlikely to occur before April 2003.

The grid is the means by which competition is created. Therefore the minimisation of constraints is of considerable significance and this is particularly so for 'modelled constraints' to manage security as opposed to actual constraints limiting power flow. There are other options to achieve security which result in lower costs to consumers.

NZ demand for electricity will increase between 1.7% and 2.5% per year. This equates to between 600 and 900 GWhpa, or about one CCGT of 400MW every 3-4 years. If we are to cover 1:20 dry year risk, the first 400MW will need to be commissioned by 2004. As a rule of thumb we need to install about 140+ MW per year of electricity generation.

In the gas sector, industrial consumers are serviced effectively by either NGC or Contact although Todd does supply particular plants via a dedicated pipeline. The gas supply situation is tightening with the imminent demise of Maui. While New Zealand is blessed with exciting gas field potential, bringing these fields in on time and at a reasonable cost is of concern.

Given current gas supply and demand projections (see Appendix C) we believe that unless the Methanex plant closes by 2004 and new sources of gas (not currently in the public domain) are proved, we will see a gas shortfall in 2007. Since New Zealand has a nuclear free policy and since renewables are by their nature typically smaller distributed generators (with the exception of Meridian's Project Aqua), the wood processing industry believes that coal fired power stations are the only realistic, short to medium term alternative. Unfortunately project Aqua is in the South Island when projected load growth and all thermal stations are in the North Island.

In this regard the HVDC link is coming to the end of its life and some expensive decisions need to be made soon.

The wood processing industry is concerned at the resource consent limits placed on Huntly Power Station in this regard as a condition of their new CCGT consent. (refer Appendix F for relative prices of alternative generation).

There is potential for more geothermal and wind generation (possibly 400MW of Geothermal) *. The wood processing industry is of the view that once economic instruments are considered necessary to achieve renewable and climate policy objectives, the introduction of a renewable energy certificate scheme (REC), is the least cost means to achieve early investment in renewables and meet government growth strategies.

The industry's view is that urgent expansion of biomass co-generation will be required. However suitable host operations are limited (ie large heat sinks). In the same category is the conversion of existing Huntly plant to co-fire biomass and coal.

The Government has to face the fact that the current scenario indicates that the country will find itself short of energy unless coal fired generation is increased. We also believe that a commodity such as biomass should be allowed to find its own market price, and if this means residues for say MDF increase then so be it. However there is a case over the short term where if an incentive tips the balance in favour of *say* biomass electricity generation then some short term protection may be given to biomass as input to MDF.

As far as market structure is concerned, the wood processing industry considers that the following actions are required urgently.

- An EGB (Electricity Governance Board) for the electricity Industry run by independents with executive decision ability to arbitrate rather than mediate.
- The sooner part F and part C of the new rules come into effect, the sooner we will have a coordinated and more effective means to achieve optimal grid investment and security levels commensurate with the price customers are prepared to pay for the service.

- Loss and constraint rental rebates should be allocated back to the regions where they were generated. This will not change the desirable short term nodal signal to load shed, but will, with a time delay, reduce the impact of the excessive price volatility as experienced over the last two years. This volatility makes running a mill cost effectively, sufficiently difficult that WPI management has had serious doubts about new investment in this country.
- The provision of a liquid energy hedge market is vital (price, volume, location)
- The provision of transmission (location) hedges is also a vital component in the mix of effective risk management tools. FTR's as currently promoted are not the right instrument to achieve this.
- Regional rebating (vs national rebating) of transmission rentals is important to modify the effect of the volatility of the uncapped spot price

Sinclair Knight Mertz and CAE –June 02

2. Background Environment

New Zealand's electricity system is predominantly hydro (60-70%) with natural gas fired thermal generation (37%-27%) making up most of the remainder. Geothermal makes up about 5% of annual energy production and wind and industrial co-generation about 2%.

System hydro storage is only 6 weeks, so prolonged drought puts heavy reliance on the thermals. The price of Gas is a key determinant of the electricity price and NZ's main source of Gas, the offshore Maui Gas field, is coming to the end of its life.

Without further new gas finds, under current projections we will be forced to move to more coal fired thermal generation before 2008.

New gas will certainly be priced higher and the electricity price will certainly rise.

New Zealand's Government has stated it will ratify the Kyoto protocol. This country's obligations can be satisfied mainly by the Government using the sink credits available from our post 1990 Forests, and/or using the revenue from the proposed carbon tax to purchase credits on the international market. The WPI is concerned that carbon credits nationalised from the WPI are to be used to cross subsidise the sector's competitors; steel, aluminium and cement.

The globalisation of our product markets has intensified competition and while energy used to be one of New Zealand's comparative advantages to offset our disadvantages of distance from major markets, and a small domestic market, this advantage is diminishing.

The wholesale electricity market is a full nodal system. That is, there are 250 dynamic nodes on the Grid which each have a spot price set every half hour. In comparison Australia has only 5 dynamic nodes and fixed location factors from these dynamic nodes out to the various other nodes in the states. This simplified system

makes risk management for consumers easier.

ECNZ (the state owned generator prior to reform of the market) used to generate about 97% of the country's electricity. On 1 April 1999 this was transformed into 3 SOE's (Meridian, Genesis and Mighty River Power) and Contact Energy, a publicly listed company. Other smaller players include NGC and Trustpower, although in August 2002, NGC announced it was selling its electricity generation assets and electricity retailing arm.

The transmission system (High Voltage Grid) is owned by Transpower who also act as the system operator, dispatching generators in real time to match supply and demand and system security requirements.

There are 29 local line companies (distributors) the majority of which are Trust owned.

3. Key Risks in the NZ Energy Markets

- **The Rules**

The wholesale electricity market is based on a pool where generator offers and consumer bids are matched on a least cost basis. The governance of this market is characterised by light handed regulation and strong electricity sector input. The danger is supply side capture of the EGB and the Rules by suppliers.

- **Hydrology**

The limited storage of our lakes (6 weeks if no inflows) means a drought can put prices up to 6 times their normal monthly average. Similarly a deluge can depress prices as hydro generators try to avoid spilling water. However the risk is asymmetric in that the normal average monthly price ranges from 4 to 5 c/kWh. A deluge may bring it down to 3 c/kWh average for a month but a drought can take it to 24 c/kWh

- **Gas Availability and Price**

See Appendix C. By far the largest share of the wholesale gas market is taken up by electricity generation and the petrochemicals industries. Industrial and residential gas off-take accounts for only about 22% of current usage. Experts believe that there is sufficient gas both on and offshore NZ to more than meet our requirements, however the price to bring in these supplies is high and inevitably the price of gas will rise. This has a flow on effect to electricity prices particularly as the next two generators built are likely to be CCGT's (combined cycle gas turbines). The WPI considers that there is a strong case for Government involvement in the delivery of the cheapest possible replacement gas supplies, similar to the part it played in the Maui development.

- **Transmission Constraints**

The Grid is the means whereby competition in the Generation market is achieved. Minimisation of Grid constraints is therefore critical if a competitive market model is to operate.

Transpower manage grid security by putting modelled constraints on lines to ensure that if any line fails the remaining lines can take the load without overheating, disconnecting and blacking out a region. This is known as maintaining N-1 security. These modelled constraints frequently allow only half the power through a line that the line's actual thermal rating would allow. Any constraint can create the possibility for a generator downstream of the constraint to be put in a dominant position. Because there is no cap on the price that a generator can charge, there is therefore a serious risk of a catastrophic cost blow out to customers down stream of the constraint. Appendices D and G outline the situation in the Bay of Plenty where the Whakamaru-Atiamuri+ Wairakei-Ohakuri constraint has bound more than constraints anywhere else in the country.

The last issue under the Transpower banner is that of 'infeasible solutions'. The System Operator dispatches the generators via a stack ranked in least cost order. The System Operator is required to take into account 'available generation', 'line constraints' and estimated demand by node to solve the optimum dispatch solution. Should the three inputs not provide a solution, very high priced 'virtual' generation is added. This produces what is called an infeasible solution.

While this extremely high price is easy to spot, one cannot ignore it. Either the lights will go out because of insufficient generation, or the lights will stay on and the infeasible solution will not stick. However, a plant manager does not know what price will stick. One can assume there is a problem so it could be high, but will it turn out to be above the shut down price for that Mill. These "phantom spikes" make managing a mill extremely difficult and uncertain. The likelihood of their regular occurrence in the new wood processing regions acts as a disincentive to new investment. Minimising modelled constraints will significantly reduce the incidence of 'infeasibilities'.

- **Transmission Loss and Constraint Rentals (Rentals).**

These are a direct result of the nodal pricing system adopted in New Zealand, where the spot price is set by the last dispatched generator in the region. The rental pool is the difference between the marginal and average losses and constraints and these are rebated currently to line companies and direct connects to the grid in proportion to the transmission charges that they pay on a national (not regional) averaging basis. Essentially, the size of the transmission rental is the inter-nodal price difference less average losses on the line between the nodes. The effect of this is that a highly constrained region subsidises an unconstrained region. This amplifies the already severe nodal signal.

Most major industrial users support regional rebating rather than national rebating. This means returning the rentals to the region in which they were generated.

There is a serious debate proceeding in relation to FTR's (Financial Transmission Rights) promoted by Transpower. FTR's are effectively underwritten by the rental pool and were developed ostensibly as a panacea to location risk. However, the designs proposed by Transpower have two concerning characteristics:

- There is still no incentive/risk on Transpower to minimise grid constraints. That is

the FTR is by definition a financial instrument which does not of itself effect any physical change by Transpower because the Transmission provider's risk is satisfied by the consumer's payments not Transpower's.

– There is every incentive for generators to own the FTR's where a constraint is able to be gamed. That is, where the generator owns the generation downstream of a constraint.

- **Plant Failure.**

A failure of one of the major thermal generators and /or a failure of the HVDC or the Maui platform, constitute the greatest risks to physical supply.

The wood processing industry normally requires about 5000 MW of capacity. System stability starts to be threatened if 5% of load trips. This equates to only 250 MW. Huntly's units are 250MW each, the CCGTs are 360MW and the HVDC has two poles each rated at 250MW. So depending on what is running, cascade failure can occur if any two of the above fail in quick succession.

- **Spot Price**

The nodal signals are far stronger than they need to be to effect the behaviour of consumers that is desired. In 2002 the average monthly prices were far in excess of what was necessary or reasonable. In 2003 the spot price has been lower than it would be expected to be if one were considering physical constraints and hydrology. The conclusion is simply that in neither case was there a physical supply problem, but rather a financial opportunity that dictated behaviour. More succinctly, last year at crucial times generator hedge books were thin, hence there was an advantage in pumping up the spot price. This year because of the memory of last year and generator threats that the market was now set at higher levels, hedge books are full and generators are competing to be dispatched, hence reducing the spot price.

The level of volatility and generator behaviour does not encourage new wood processing investment. The LRMC (Long run marginal cost) of new Generation is in the 5.0-5.4 c/kWh range dependent mainly on long term Gas price. However, the *current* LRMC of generation is closer to 4c/kWh.

The probability of the spot price in any month averaging less than ~9.8 c/kWh is 99%, however last year the average price in July was 23.4 c/kWh. Appendix E shows the spot price duration curves for Haywards from 1996 to the present. The red curve (since April 1999) shows a greater slope (higher volatility) and rapid escalation after 90% (reflecting very high prices for 10% of the time).

The spot price is not a good predictor of the real price of electricity. If one considers the average price in July 01 of 23.4c/Wh against the average price in July 02 of 3.3 c/kWh and appreciates that hydrology was worse in 01 but demand was higher in 02, one is left with the view that it is the generator hedge books rather than the physical supply issues which most effect the spot price.

- **Availability of Risk Management products**

Hedge liquidity in our market is poor. Last year primary hedge products were virtually unavailable from April to September and were unavailable at important locations and in volumes required by customers. Part of the problem was a double dip on dry/wet year risk to start with, then later when dry year risk was evident, there was no incentive for under-hedged Thermals to provide hedges as spot prices soared.

- **Transmission pricing methodology**

This is a difficult area but one which the industry considers, now has an acceptable framework contained in Part F of the proposed new rules. Part F addresses new grid investment and on-going service delivery plans to provide a quality definition and level of service agreed with the customer. This is a huge leap forward in terms of the correct level of ongoing grid investment required to provide the infrastructure necessary to promote new wood processing investment in New Zealand.

It is of great importance that the new methodology does not disincentivise co-generation as the most recent pricing methodology has done.

- **Kyoto**

The analysis described in Appendix B suggests that a \$25/Tonne CO₂ Tax would add an impost of 1.5 c/kWh to electricity (cf. Governments view of 1.1 c/kWh) and a \$/GJ impost on Gas. Depending on what a company's base cost is, the percentage increase can be calculated. The key difference between the industry's and the governments view of the cost increase is the industries view that during the period 2008 to 2012 when the tax takes effect, there is a likelihood of more coal fired generation.

4. Major National issues

The current market structure was based on a competitive model. Over the past year however, the combined effect of a number of structural factors, particularly vertical integration, which was exacerbated by the demise of On-energy last winter, has debased the competitive market model.

Vertical integration has caused the market to become regionalised. This has contributed to a lack of liquidity in hedge markets, and where constraints bind, regional monopolies are able to game the spot price.

The lack of meaningful demand side participation also contributes to the huge price volatility in the market. Relatively few end consumers are exposed to the spot market price and therefore have no incentive to react to shorter term market signals.

Supply side capture of the NZEM rules has further slowed the transition to a competitive market. The current market is such that no one body is responsible for providing 'competitively priced delivered electricity on a sustainable basis'.

The demise of Maui and lack of new Generation points to increasing electricity prices.

The combination of these factors with the added implications of the Kyoto Protocol and the future of energy supply post-Maui, does not bode well for the future of the wood processing industry in New Zealand.

5. Possible Solutions

Market Structure

To improve the amount and pricing of hedges offered to spot price buyers, The wood processing industry recommends one of two alternatives:

Alternative 1.

A non-partisan task team should review the benefits and costs of an SOE split from Retail. This would, we believe, improve the competitive market by:

- Reducing regionalisation and allowing retailers to broaden their location base and improve competition.
- Improving hedge liquidity and pricing – which requires generators to compete in a broader, more competitive market.

It is acknowledged that this change in industry structure possible downsides such as retailer credit risk that these would have to be worked through before any change is made.

Alternative 2

Implement a *mandatory gross hedging* market where generators would have to put all primary hedges out to market, even hedges to be purchased by their own retailers. It would be designed as a blind auction to insure price transparency and counter-party anonymity. We have attached as **Appendix B** our interpretation of how a Mandatory Gross Hedging Pool might work.

The WPI recommend consideration of the mandatory gross hedging mechanism outlined in Appendix B. This arrangement provides liquidity, obviates dry/wet year double dip risk (cross insurance) and provides a means to obtain effective transmission hedges (basis hedges) in place of FTR's. We have assumed that regional rebating will be put in place.

Post Contingent Support

Transpower, as system operator, manages system security by placing modelled constraints on various lines of the grid to restrict power flow. The concept is that if a line should fail, the remaining parallel line(s) can accommodate the power flow without overloading. A grid fault is known as a contingency, and modelled

constraints are put in place on a pre-contingent basis. However the effect of these modelled (as opposed to actual) constraints can be to create a dominant generator downstream of the modelled constraint, which must generate to meet supply requirements and as such can theoretically ask any price it likes.

Another option, useful when modelled constraints bind too often (say > 3% over the year's operation of that line) is to consider **post-contingent support**. This means that when a fault actually occurs, automatic load shedding and dedicated, location specific fast ramp-up generators are brought on to meet the remaining load.

There are other advantages in using this option, particularly when the generator downstream of a modelled constraint is part of a river chain where, for water management reasons, it prefers not to run. Hence a post contingent support regime will reduce the delivered price to consumers and will allow more efficient use of water over a river chain. This initiative does however require the co-operation of the generator to cede governor control to the system operator and all control links need to be upgraded to 'protection grade'.

Customers also want to be in a position where they can make price/security trade offs. This is particularly the case when a modelled constraint creates a cost blowout (as above) which could be alleviated by a judicious temporary grid re-configuration (eg opening a line elsewhere) to prevent loop flows. Under the current rules this is not an option. Only if the grid is under threat can the asset owner reduce security in this way.

Exposure to Relevant Price Signals

It is an unfortunate characteristic of the New Zealand electricity market that spot price is faced by only 15% of end consumers. This 15% comprises those consumers least able to respond quickly to it without adversely affecting productivity. This is the reason that excessive volatility will have such a significant impact on wood processing investment.

The spot price signal needs to be seen more quickly by more consumers so that significant demand response is generated by the market. Waiting until a water storage crisis has emerged and then relying on political signals may avoid brown outs, but it does not reduce price volatility to the industrial consumers who face it. Also by damping demand volatility, by effective demand response, assets are better utilised.

The industry recommends that all end-users consuming over *say* one GWhpa should be required to have at least 20% of their consumption exposed to the spot price. For smaller commercial and residential consumers a simpler signal is required. An example would be a two-tariff meter. Profiling systems may provide an easy answer to switching but do not reward **individual** demand response efforts. Worse, profiling actually delays take-up of time of use metering and consequently effective demand response. However, this would be achieved if individuals could see the benefit to themselves of behavioural change.

All new residential and small commercial meters should be required to have at least two channels and Retailers to provide a two tier tariff.

The requirement for demand side bidding as currently required by NZEM rules should be removed and replaced by a centralised demand forecast created and used by Transpower as system operator for pre-dispatch prices. This demand estimate should incorporate a hybrid system based on conforming and non-conforming loads, where non-conforming loads bid in every half hour and conforming loads are estimated using historical data and correction factors. This would increase demand side participation, moderate Generator behaviour and improve the accuracy of pre-dispatch prices on COMIT.

Regulatory Options

The industry continues to be concerned about supply side capture of the Rules. As a result, it is imperative that the EGB is comprised of independents who have the power to **arbitrate** issues of market methodology created by the various parties – Transpower, Generators, Distributors and Consumers. In particular the EGB must be able to overrule a Chapter vote arising out of the new proposed mandatory rule book, if that rule does not enhance the objectives of the Government Policy Statement in respect of end consumer welfare.

As a catch all the industry recommends that a cap on any half hour spot price of *say* 10xLRMC (approx \$500/MWh) would reduce the risk of price gaming. It would not however, increase the risk of volume based rationing leading to brown out situations, or reduce customers' demand responses.

Financial Transmission Rights (FTR's)

The significance of the role of constraints in nodal pricing and their detrimental effect on pricing is such that Transpower must take a more active role in the relief of constraints.

Recent experience with constraints on the Upper Waikato ring, which cost the Wood Processing Industry \$8Million over two weekends illustrates the significance of this issue.

The nodal pricing system creates the loss and constraints rental pool. The ownership and allocation of these rentals is causing considerable concern for consumers. The design of FTR's with the current market does not provide any comfort to the wood processing industry.

The industry recommends that transmission rental rebates should be allocated back to the region where they were generated, then allocated to consumers in proportion to their transmission costs paid. For consumers using less than *say* 1 GWhpa, the rebate could be used by the local lines company to reduce over-all charges. For those consumers using more than 1 GWhpa it should be a direct rebate clearly identified on the bill.

The proposed design of FTR's should be delayed indefinitely until the previous issue has been fully debated and agreed. However, high priority should be given to immediate implementation of regional rebating as opposed to the National rebating currently being practiced. This initiative does not require FTR's to allow it to be accomplished.

FTR's can provide one thing, a long-term investment signal. To do this they need to be long term instruments. The only reason to change ownership of an FTR is if a consumer reduced the size of its plant or possibly if its relative share of energy use in the area changed significantly. The complexity and cost of the current proposed instrument appears to exceed customer needs and the protection value afforded appears to be below customer needs.

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Appendix A

Kyoto cost assessment .

The Government has announced that they intend introducing a Carbon tax in 2007 which will be capped at \$25/Tonne CO₂e. This level would have the following impost on Energy costs.

Natural Gas Prices

The gas price would rise by \$1.32/GJ.

Electricity Prices

The electricity market price is based on the price of the last dispatched generator. Therefore the price depends on whether the marginal Generator is a gas or coal fired thermal station. We assume that where a hydro station is on the margin, the hydro has a price which is above that of the thermal generator (which has to incorporate the tax in its offer price). Therefore the hydro offer effectively prices in the carbon tax.

So the question is what thermal station is on the margin, a coal fired or gas fired plant?

We know the additional cost of gas from the Carbon tax (\$1.32/GJ) so for a 50% efficient Combined cycle Gas turbine we know the cost of electricity generated **would rise by 0.95 c/kWh**. (=132/278/0.5)

The cost of Coal would rise by \$2.26/GJ with the \$25/Tonne CO₂. Now a modern condensing Coal fired station is about 37% efficient so the price of electricity **would rise by 2.2 c/kWh** (= 226/278/0.37).

Future Generation

By 2007 with increasing demand at between 1.7% and 2.7% pa (which is between 600 –900 GWhpa), and, given that:

- Gas supplies and gas price are uncertain,
- We are a nuclear free nation and
- The government is not incentivising significant renewables, (in particular biomass co-generation), although there are available small funds for grants.

it seems inevitable that coal fired stations will need to be built and will frequently be on the margin after 2007. Wind, biomass, fuel cell and tidal generation will appear but will not be likely to be sufficient to fill the gap.

We therefore anticipate an **additional** price increase on electricity (due to a \$NZ25/Tonne CO₂ tax) of **1.5 c/kWh as gas fired thermals and coal fired thermals vie for marginal generator.**

A tax at this level would cost the NZ wood processing Industry **about \$62 Million pa.**

To be immune from the Tax, because of entering into an NGA, the Government would need to reimburse the companies for this amount each year under an NGA.

Below is a rough estimate of the additional cost imposition to this county's major wood processing businesses of a \$NZ25/Tonne CO₂ Tax.

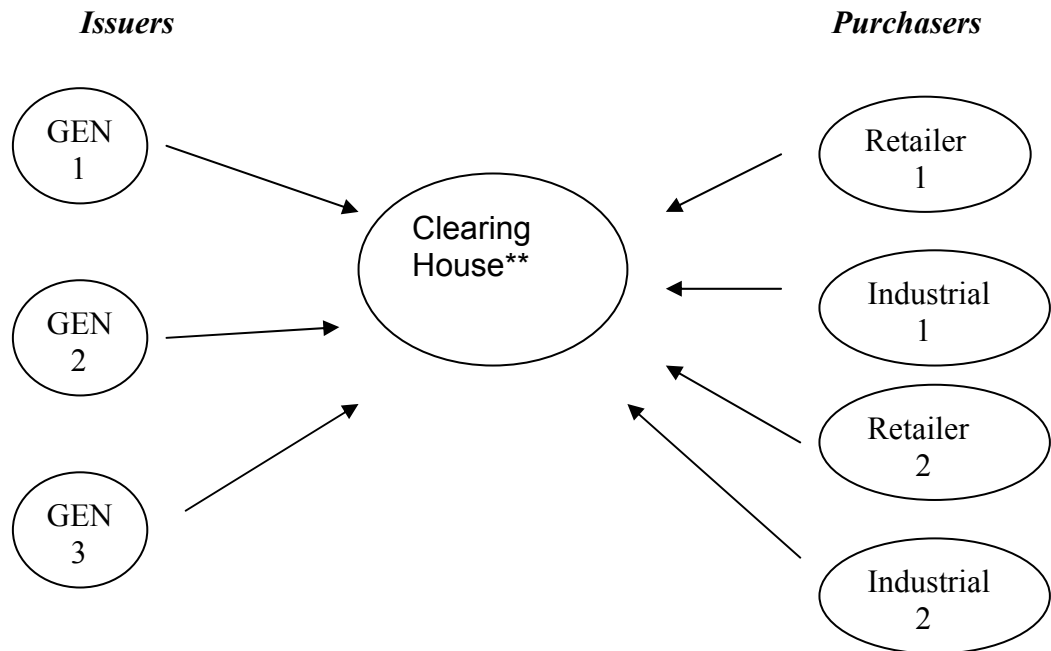
Using 1.5 c/kWh additional cost for electricity and using \$1.32/GJ additional cost for gas.

<i>Business</i>	<i>GWh pa p'chased</i>	<i>Additional Elec Cost \$Mpa</i>	<i>PJ pa Gas p'chased</i>	<i>Additional Gas Cost \$Mpa</i>	<i>Total</i>
CHH (incl Tasman)	880	13.2	6.1	8.0	\$21.2 Mpa
Norske Skog	1300	21.5	0	0	\$21.5 Mpa
Pan Pac	400	6.6	0	0	\$ 6.6 Mpa
Winstone Pulp	340	5.1	0	0	\$ 5.1 Mpa
Fletcher forests	55	0.8	1.0	1.3	\$ 2.1 Mpa
Fletcher Bldg Taupo	100	2.3	0.4	0.5	\$ 2.8 Mpa
Rayonier	80	1.2	0	0	\$ 1.2 Mpa
Juken Nisho	65	1.0	0.1	0.1	\$ 1.1 Mpa
Other	20	0.3	0.4	0.5	\$ 0.8 Mpa
total	3302		8.0	Total	\$62.4 M pa

Additionally there are small quantities of coal (~1.5PJpa) and Geothermal (~5.4 PJ pa) and large amounts of biomass including black liquor used (~23PJpa).

Appendix B

MANDATORY GROSS HEDGING



- All Generators must offer all their hedges into the clearing house. Location, Quantity, Term and Price. A certain percentage (e.g. 75%) should be out on offer.
- The offers would be on a screen accessible by Purchasers but the Issuer would not be identified.
- Purchasers constitute all Retailers and Industrials.
- Purchasers accept offers on a first come first served basis as required.

** Blind offers but transparent process

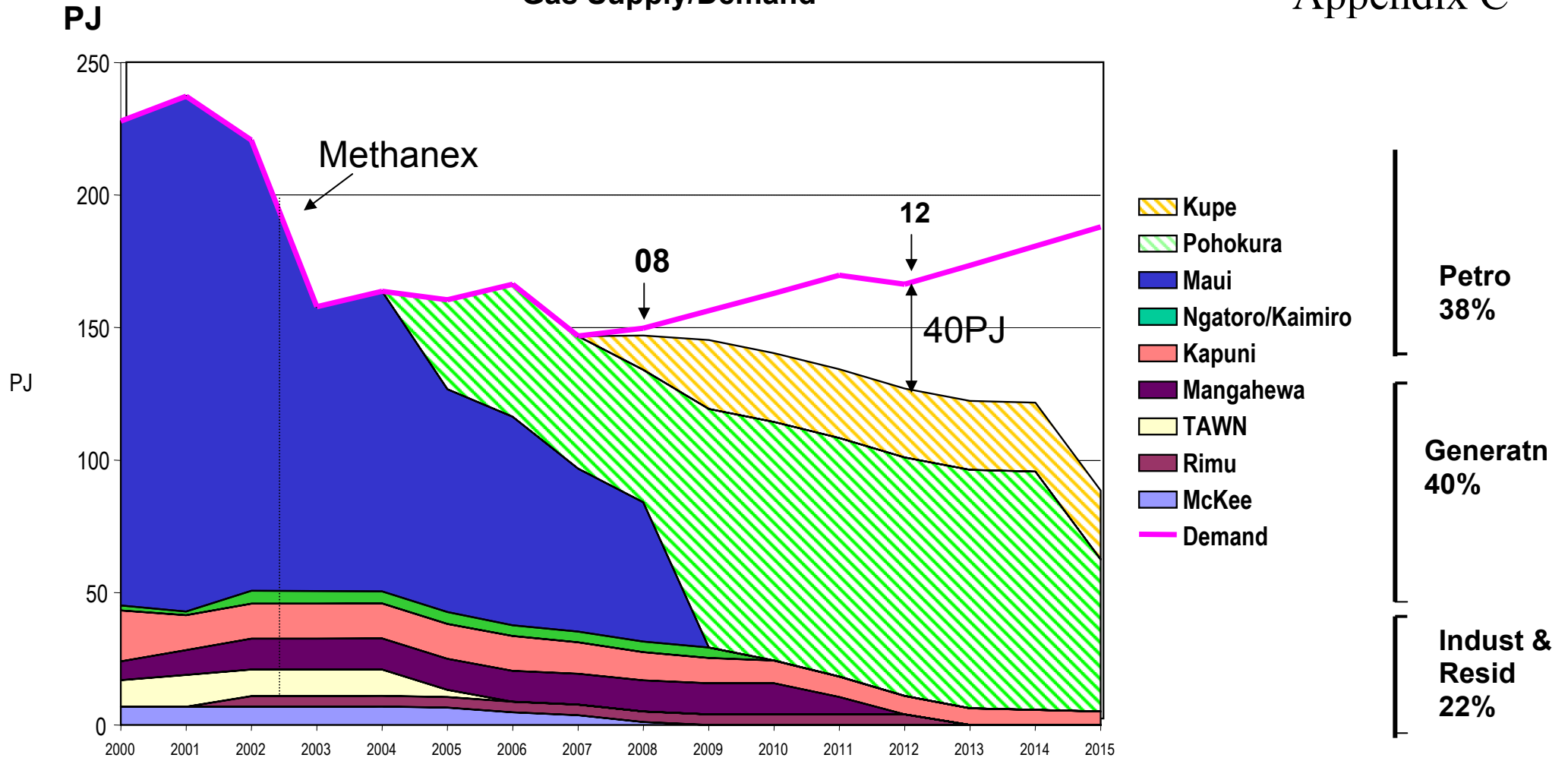
This concept allows cross hedging, enhances Retail competition and levels the playing field for all wholesale market participants.

(It can also be extended to provide a more consumer focused alternative to

New gas sources are needed

Gas Supply/Demand

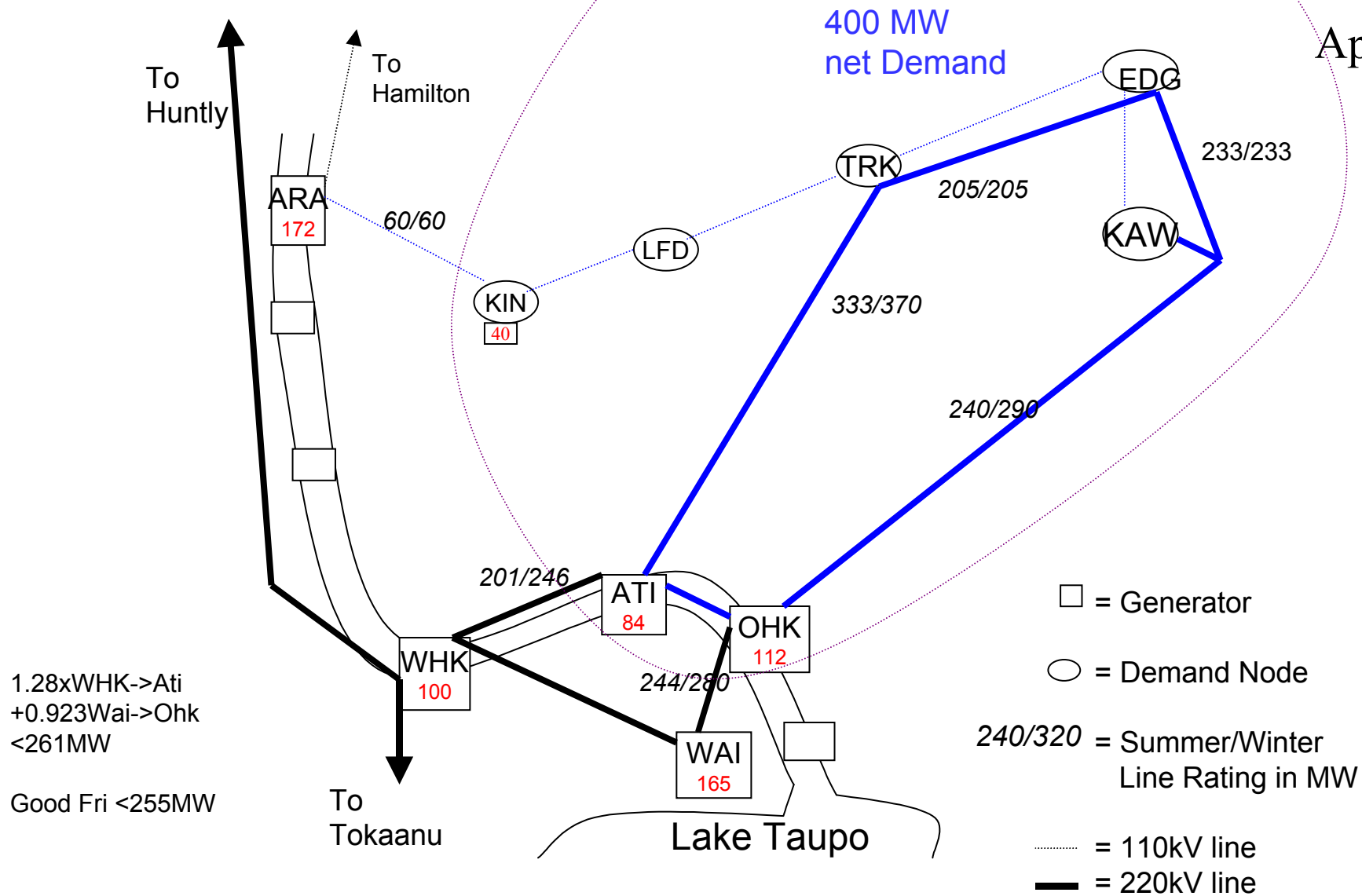
Appendix C



Source Contact Energy - Estimates

BoP Line Feeds

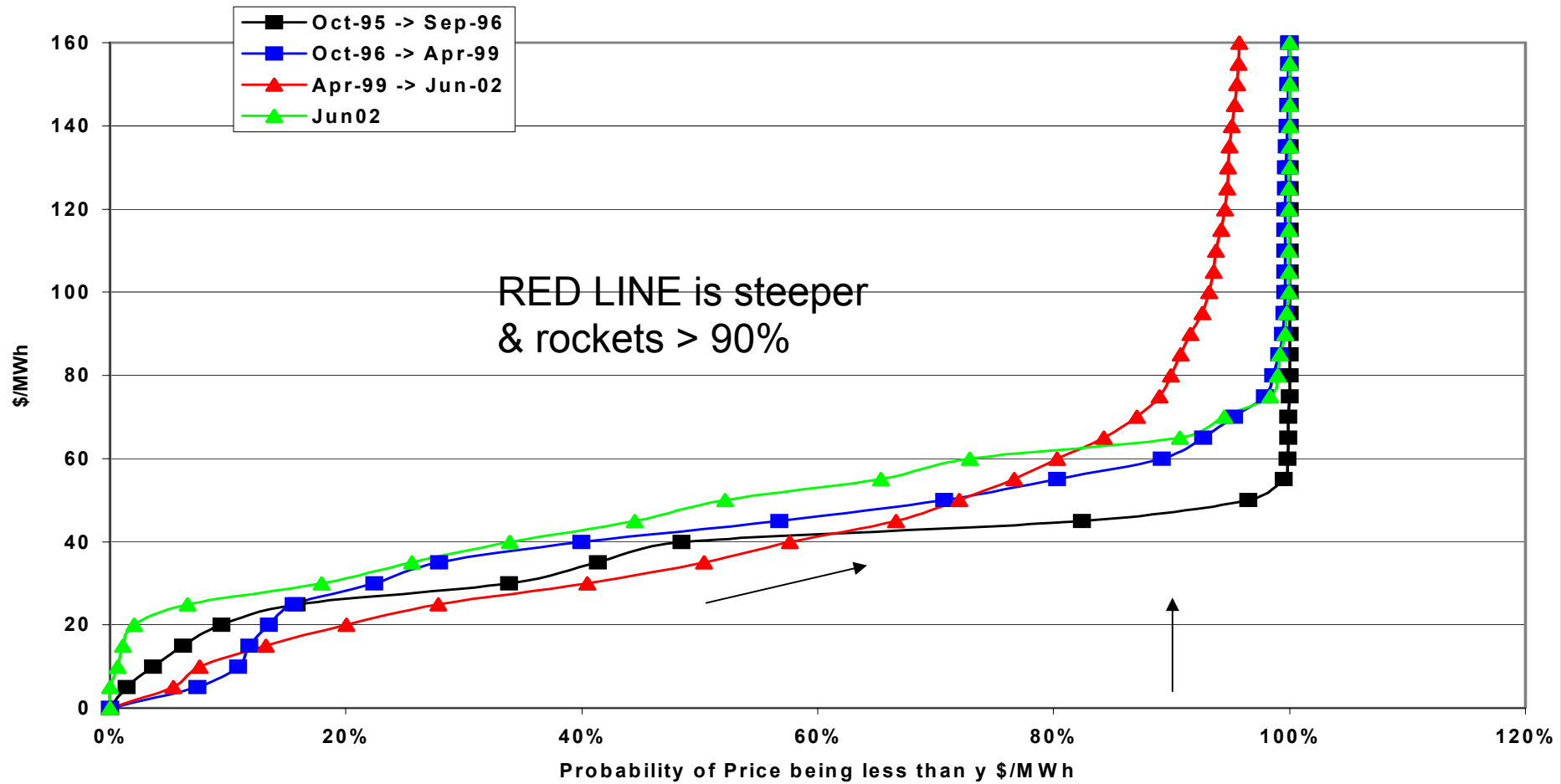
Appendix D



1.28xWHK->Ati
+0.923Wai->Ohk
<261MW

Good Fri <255MW

Haywards Price Duration Curves June 2002



Appendix E

Source: Phoenix Energy

New generation can't be built at current prices

Appendix F

Type	Quantity	Estimated cost	Comment
Wind	2-3,000 GWh	7 - 10+ c/kWh	Currently high cost
Geothermal	3,000 GWh	5.5 – 7+ c/kWh	Limited by suitable sites
Hydro	2-3,000 GWh	5.5 - 8+ c/kWh	Limited by suitable sites
New thermal	??	>5 c/kWh?	Dependent on fuel cost and availability

BoP v Huntly & Haywards Spot Prices

