ENERGY OVERVIEW

Residues to Revenues Conference
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Rotorua

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Outline

• Positioning the Wood Processing sector in the Energy sector
• Is expansion, retraction or ‘as you were’ the likely projection
• Energy sector price drivers – (Gas, LRMC’s, Supply and Demand)
• The electricity market (physical-financial, marginal pricing, constraints)
• Effect of C tax – and NGA’s
• Some Biomass metrics – toward an economic fuel alternative
The NZ Forestry and Wood Processing Industry

- One of NZ’s most sustainably run sectors
- Providers of carbon sequestration → carbon credits
  (to meet the Gvts external obligations under Kyoto)
- Govt wants this Industry to prosper, grow and replant more trees
  (but a perverse incentive to deforest pre1990 forests before 2007)
- Forest Industry is NZ’s 3rd largest exporter → >$3 Billion/yr
- But hi exchange rates and shipping cost increases and rapidly increasing gas and electricity prices have not helped this sector’s competitiveness
- Fair to say the NZ Forestry and Wood Processing Industry is suffering at the moment

Wood Processing Energy consumption in NZ

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Amount</th>
<th>% NZ demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Electricity</td>
<td>3.83 TWh pa</td>
<td>~11%</td>
</tr>
<tr>
<td>Net Electricity from Grid</td>
<td>3.27 TWh pa</td>
<td>~ 9%</td>
</tr>
<tr>
<td>Gas purchased</td>
<td>7.3 PJ pa</td>
<td>~ 5%</td>
</tr>
<tr>
<td>% NZ demand (excluding petrol &amp; generation)</td>
<td>~20%</td>
<td></td>
</tr>
</tbody>
</table>

Biofuel used ~ 39PJ pa for heat – mainly steam raising

In 2003 energy use survey
- ~ 53% comes from Biomass
- ~ 18% from electricity
- ~ 17% from natural gas
- ~ 12% geothermal, oil and coal
Wood Processing Net Annual Energy Consumption

- **Elec**:
  - 1.0%
  - 2.3%
  - 89%

- **Gas**: 3%

- **Biomass used in all locations**: 97%

- ~53% of all energy used in sector

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Expand, Contract or Continue
Kraft process in CNI

- **Pulp Price** $US/T Invest
- **Pulp Price** $US/T B/E
- **Exchange Rate** $NZ1/$US

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Residues to Revenues 2005
Electricity supply/demand in NZ

- Need ~800 GWh pa to meet ~2%pa growth in demand in electricity

- Where is the potential?
  - E3P 380MW CCGT, duty cycle ~8000hrs/yr (2006)
  - Geothermal ~300MW in CNI duty cycle 8000hrs/yr (2006-2009)
  - Coal ~300MW duty cycle ~6000 hrs/yr Marsden and Buller
  - Second CCGT ~380MW ~8000 hrs/yr at Otahuhu or Helensville

_We need therefore about 100MW /yr of CCGT/Geothermal installed, or at other extreme 250MW/yr of Windmills installed._

_Reality is a mix of plant - something in between - (~150 MW/yr)_

Indigenous Gas supply is the biggest constraint to new CCGT’s, and the big unknown in the likely new generation investment mix.
Options
There are many options/possibilities out there:

On supply side:
- imported LNG if sufficient indigenous gas is not proved (2007 decision?)
- move to more renewables (wind, geothermal, hydro, biomass)
- Strengthen/upgrade the Grid to better support wind/hydro - reduce losses

On demand side:

*Industrial*
- Build increased buffer capability (water, chips etc) - to improve ability to load shift
- VSD’s on pumps and fans
- Heat pumps and heat recovery
- Cogeneration in Industry - preferably biomass fuelled
- Power factor correction
- Economisers on boilers
- Stopping steam and compressed air leaks

*Residential/Commercial*
- Solar hot water heaters in all new homes & more efficient appliances
- Small CHP in buildings and houses and/or heat pumps.
- Vastly improved insulation standards and practice

### Av Weekly Spot Price c/kWh - Yr on Yr, 2001 to 2004

![Graph showing Av Weekly Spot Price c/kWh from 2001 to 2004 with different years and benchmark level of 6.5 c/kWh highlighted.]
So where is this leading?

- Energy used to be a competitive advantage to the NZ wood products sector.
  No more…

- Gas prices have doubled in last two years, gas supply for Generation is not secure

- Additional costs are going to be added to gas with
  - the Maui Open access regime (0.3-0.45$/GJ) and
  - the C tax ($0.8/GJ) at $15/T Ctax.

- Gas prices feed directly into electricity prices

- We have more of a fuel crises than one of generation investment
So...

- Perhaps there are improving opportunities for Biomass, but it will be competing with coal. Geothermal and wind are looking more attractive.

- Large Wood processing operations will be negotiating an NGA which should provide a partial rebate of the C tax.

- However, the **Exchange rate** and **commodity prices** have conspired to make major energy using plant (pulp & paper) only marginal in NZ.

- Add Energy cost increases and Mechanical pulp mills are not breaking even and new plant investment is unlikely. Norske Skog will probably close two out of three machines - meaning that the **energy demand outlook** for the wood processing sector is likely to remain restrained.
  (less than 0.8% pa over next 10 years is my estimate)

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**Carbon Tax Effect - $15/T Ctax**

But you can keep Huntly warm at 4.3 c/kWh - (new SRMC)
Carbon Tax at $15/T CO₂

Supply side 40 TWhpa
Demand Side 37.5 TWhpa

<table>
<thead>
<tr>
<th></th>
<th>@ X$/MWh</th>
<th>Direct Cost</th>
<th>@ $9/MWh av Pool Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renewables 65%</td>
<td>0</td>
<td>$ 0 M</td>
<td></td>
</tr>
<tr>
<td>Coal 12%</td>
<td>13.2</td>
<td>$63 M</td>
<td>9 $337 M (Marginal)</td>
</tr>
<tr>
<td>Gas 23%</td>
<td>5.8</td>
<td>$53 M</td>
<td>$116M (Average)</td>
</tr>
</tbody>
</table>

Roughly, the cost to consumers is 3 times the direct cost to Generators

Biomass - Rough Metrics

<table>
<thead>
<tr>
<th></th>
<th>Steam sink</th>
<th>Biomass Fuel (Heat only) KT/yr</th>
<th>Biomass Fuel if co-gen (KT/yr)</th>
<th>As BP Co-gen (MWe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Putaruru Medium sawmill</td>
<td>10 t/hr</td>
<td>35</td>
<td>41</td>
<td>0.9</td>
</tr>
<tr>
<td>Big Sawmill Large kilns</td>
<td>50 t/hr</td>
<td>177</td>
<td>207</td>
<td>4.8</td>
</tr>
<tr>
<td>Kinleith Pulp &amp; paper</td>
<td>320 t/hr</td>
<td>1,120</td>
<td>1,350</td>
<td>34.0</td>
</tr>
</tbody>
</table>

A sawlog becomes (approx):
20% Fuel (bark, wet sawdust, planer dust and offcuts)
20% chip
60% timber
Summary 1/2

- The physical market works as it should giving early signals to bring in Thermals when hydro inflows are low, but the extent of the signal....

- Gas Prices have doubled in last two years and directly effect the electricity spot price. Effective risk management is difficult with limited hedging instruments available and a reducing Supply/Demand margin

- Vertical integration and its effects on primary hedge markets needs improving – all hedges, standardised, going transparently through a single market place/exchange could work.

- We need some form of Transmission hedge to reduce basis risk. (Generators provide hedges at injection nodes, consumers take at offtake nodes and constraints in between can mean hedges are ineffective)

Summary 2/3

Newer risks include:
- the C tax and its affect on any new generation investment mix and energy prices. Also the level of NGA rebates. (A $15/T C tax will increase the spot price to consumers by ~0.9 c/kWh and ~$0.8/GJ for gas)

- The ability of a firm to obtain and then meet an NGA and what happens post 2012

- The large projected increase in wind generation and reducing Hydro (Aqua). (intermittency and back-up)

- RMA issues around consents for new Generation & renewal of existing water rights (Wanganui & Waitaki)

- Gross pool (a net pool removes barriers to Industrial co-gen)
Summary 3/3

- Average annual spot prices should lie between SRMC and LRMC (they have been above LRMC for extended periods which suggests a fuel shortage (gas, water, geothermal) or a constrained grid allowing extraction of monopoly rents (BoP)

- Supply side dominance in electricity and gas markets remain.

- An improved grid (400kV) assists competition and reduces losses

- Over the last 3 years, the value of delivered woodwaste to the user has doubled, creating new possibilities.

I now look forward to hearing about the international as well as local initiatives that are taking place which are making woody residue use economic.