What might tomorrow bring?

Downstream 2013

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Nobel Prize Winner
Neils Bohr:

*Prediction is very difficult – especially about the future*
Today’s talk will look at three different influences on NZ energy industry …

- **Global ‘mega’ factors**
- **Technology**
- **Customers**
Global ‘mega’ factors...

...all roads lead to China?
NZ energy industry will be affected by wider forces – especially the emerging economies
Emerging economies pack a punch ...

GDP per capita $US

5 yr ave growth rate

Share of global pop.

Source: World Bank
Habits change with rising incomes

Per capita livestock meat consumption (Kg/year)

Source: FAO, World Bank and Nomura Global Economics (quoted in RBNZ report)
Growing wealth in BRICs is driving up soft commodity prices

Source: FAO
Continuing strength in soft commodities will affect NZ energy sector
Continuing growth in emerging economies is raising demand for oil – despite GFC

Chinese oil consumption

Source: BP statistical review of world energy
Oil prices supported by emerging economy demand – offsetting GFC

Sources: World Bank, RBNZ
And higher oil prices are driving exploration in NZ

- Increased oil prices have stimulated exploration in NZ
- Significant step up in activity
  - Onshore Taranaki
  - Offshore Taranaki
  - New basins

Source: NZPAM
But NZ is gas prone...

- Many explorers seek oil but find gas
- Gas accounts for ~70% of NZ discoveries by volume and ~46% by value
- In effect, gas is a ‘by-product’ for oil producers

Source: MBIE. Assumes $6/GJ, $100/bbl, 0.80 USD/NZD
Paradoxically, higher oil prices are putting downward pressure on NZ gas prices

Source: Company reports and disclosures, Concept analysis
Chinese aluminium production has skyrocketed - tipping market into oversupply

- China’s demand for aluminium has grown rapidly...
- But so has supply – 400%+ since 2000
- Post GFC, demand growth has slowed – leading to over capacity

Source: International Aluminium Institute
Supply overhang has depressed aluminium prices

Sources: World Bank, RBNZ, company reports
Future price is very uncertain – more capacity coming to market - but may not be economic

Reported breakeven price for new Chinese capacity

Sources: World Bank, company reports
Effects ripple back to New Zealand

Source: Concept analysis based on public data
Any Tiwai scale back or closure could have major impact on market

- Tiwai consumes around 13% of NZ production
- Any cut in demand would impact directly on supply margin
- Implications for:
  - Prices
  - Fuels market
  - New investment

Source: EA centralised dataset, Concept analysis
Exchange rate effects can also be important for cost of new plant.

Higher exchange rate = higher construction cost
Lower exchange rate = lower construction cost

Note: Assumes 100 MW wind project will break even if committed when exchange rate at long term average level

Source: Company reports, Concept analysis
Technology...

...what’s cooking in the lab?
‘New’ techniques are unlocking vast new oil and gas reserves

- Deviated drilling – steering drill bit along target seam
- Fracking – using pressurised fluids to fracture rock and increase flow rates
- Neither technology new – e.g. 1 million fracking operations in United States since 1947
- But techniques now being deployed on mass scale

Source: EIA, DOE forecast
Shale production having dramatic effect on US gas prices

Source: World Bank
NZ also has unconventional reserves

- **Shale resources:**
  - East coast

- **Coal seam gas:**
  - Ohai, Southland
  - Waikato/Taranaki
  - Greymouth, West Coast
  - Dunedin
  - Whanganui

- **Underground coal gasification:**
  - Waikato

Source: NZPAM
Rapid improvement in battery technology offers significant promise

- Technology improving rapidly
  - Capacity
  - Cycles
  - Cost
- Ambri – liquid salt
- Envia – SiC
- Prieto - nanotechnology

- Top Energy – successfully trialled household battery storage to shift evening peak demand, and back up solar
- Vector – soon to start pilot of a large-scale battery, and has plans to trial smaller storage batteries for houses
- Powerco – currently trialling household battery storage for managing peak demand
Electric vehicles may be a little way off – but offer some intriguing possibilities

Filling-in the troughs will:

• increase the demand for baseload generation (i.e. renewables); and
• decrease the need for mid-merit / peaking generation (i.e. thermals)

Charging EVs over-night will mean EV electricity demand met by baseload generation

Sources: Concept analysis
Photovoltaic costs for utility scale plant

Aust Govt forecast for 2035: 22c/kWh
ACT auction 2012: 18c/kWh
ACT effective cost: 11-13c/kWh

Sources: ABARE, media reports
Strong uptake of PV in Australia – even once incentives scaled back

- Estimated at 1,450 MW in Feb 2012
- Growing despite reductions in incentives

Source: AEMO
If you think that’s impressive, consider the leaf being developed at MIT

- Solar cell bonded to catalytic materials
- Drop into water in sunlight & it generates oxygen and hydrogen gases
- Already being tested
Customers...

...they’re always right?
Demand trends (% change since 2004)

Source: Electricity Authority data
Similar picture internationally

Source: National Grid UK, Eirgrid, AEMO, Electricity Authority
Similar picture at ‘micro’ level – consumers are more frugal

Network Tasman - average domestic consumption

kWh/yr

7,600

2007

7,000

2012

Sources: Media reports. Information Disclosures
What might this mean for supply margin and prices

Source: Concept estimates based on data published by Electricity Authority, Transpower
Web could change the face of retailing

- Web transforming some retail sectors
- ‘Virtual’ products
  - Music
  - Media
  - Movies
- ‘Real’ products
  - Books
  - Electronics
  - Sports goods
Electricity and gas have many of the characteristics that suit web-based commerce...

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Electricity/gas</th>
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<tbody>
<tr>
<td>Limited product differentiation</td>
<td>✓ Classic commodity</td>
</tr>
<tr>
<td>Easy to fulfil web-based delivery</td>
<td>✓ No change required</td>
</tr>
<tr>
<td>Low cost to change suppliers</td>
<td>✓</td>
</tr>
<tr>
<td>Low regrets risk</td>
<td>✓? But perception may be different</td>
</tr>
<tr>
<td>Reduced costs in e-channel</td>
<td>X Limited reduction</td>
</tr>
</tbody>
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And there are influences we haven’t even talked about

Carbon
Energy efficiency
Mixed ownership
Energy security
Smart meters
Maori presence
Take-back
Water reform
Green issues
What do we make of all of this?

1. Energy industry increasingly ‘connected’ to global economy

2. Old certainties may no longer hold

3. Pace of change is increasing

4. Web has power to revolutionise the industry
Implications for industry, investors & regulators

1. Understand the fundamentals – including ‘global’ factors

2. Consider the implications if old ‘certainties’ do not hold

3. Prepare for many futures – options and agility will be increasingly important

4. Get ready for the web revolution
Concept Consulting Group Ltd

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