

## Why Do Electricity Prices Keep Rising?

**The threat of a 2006 winter electricity shortage has come and gone but questions remain about the operation of the electricity market under such circumstances.**

In early May the Minister of Finance, Dr Cullen, said "I still have grave doubts about the current framework of this (electricity) market to deliver the kind of certainty we need and also the emphasis on renewable energy we need, given other factors such as the Kyoto agreement".

What Dr Cullen didn't say was that the current market framework also does not seem to be creating enough competition between electricity suppliers in order to keep prices down to a fair and reasonable level, especially for heavy manufacturing and processing companies striving to remain competitive against overseas competition in their marketplace.

It is well remembered that when the Electricity Corporation (ECNZ) was split into three different state-owned generating companies in April 1999, the then Minister of Energy, Max Bradford, said that more competition in the marketplace would bring prices down.

Even in late 1999 when doubts were first being expressed as to whether this was going to happen, the government was still saying "it is early days yet to assess the benefits of the electricity reforms to consumers, but there are many more benefits still to come".

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Instead the opposite has occurred with steadily rising electricity prices. Figures released by Statistics New Zealand in early March show that average electricity prices for household consumers rose 4.1 percent over 2005, following price rises of 8.8 and 9.3 percent over the previous two years.

In the case of commercial consumers, the average price increase was 9.8 percent in 2005 on top of 11.7 percent in 2004 and 6.1 percent in 2003. Such price rises can very clearly be seen to be significantly above the annual rate of inflation.

One of the factors which seems to keep pushing power prices up is the potential risk of future shortages. Electricity generating and retailing companies do not like surplus capacity being available because this will tend to push prices down. They greatly prefer a “just in time” philosophy when additional generating capacity is provided just as it becomes needed.

The problem is that because of the annual variability of our climate, available hydro generation capacity can fluctuate considerably. During a “normal” year, hydro electricity generation produces 60-65 percent of our annual electricity requirements, around 25,000 gigawatt hours (GWh) of electricity out of a total of 40,000 GWh.

**Compared with a “normal” year, available hydro generation is up 7,500 GWh in a “wet” year and down as much as 5,000 GWh in a “dry” year, a fluctuation of between plus 18.7 percent and minus 12.5 percent of total annual electricity generation requirements.**

Under such circumstances it is very difficult to apply a “just in time” philosophy in providing for our future electricity generation needs with an average annual load growth of around 2 percent. It appears that the present electricity market system does encourage generators to maximise profits by keeping the country “on the edge of a shortage”.

In recent months we saw such an “edge of shortage” situation develop with low storage levels in the South Island hydro lakes and electricity spot

prices reaching two to three times normal levels. Fortunately significant rain in the early part of April raised the level of the South Island hydro lakes to the point where the risk of a 2006 winter power crisis disappeared, and electricity spot prices have since returned to normal.

However during March, when the risk of future shortage was still being actively talked about, several industries in the heavy manufacturing and processing sector advised that they were having to cut back on their production because high electricity prices were once again making production uneconomic.

This was similar to the situations which developed in 2001 and 2003 when with future electricity shortages being predicted, many companies simply stopped producing goods because the high cost of power meant that those goods would be made at a loss.

A spokesman for the country’s biggest company, Fonterra, said in March this year that when electricity prices suddenly rise, his company can’t stop processing milk which arrives at its factories, but there is a price to pay and the company was concerned about the effect rising electricity prices have on its margins in an internationally competitive market.

In a statement on 17 March, the Chairman of the Major Electricity Users Group, Terence Currie, stated that “Energy intensive users have faced high prices in 2001, 2003 and now in 2006. These high prices are destroying the credibility of New Zealand for investment. It is doubly ironic when the electricity generating companies continue to make record profits”.

While industry is immediately subject to high spot prices on the electricity market brought about by suggestions of future shortages, 70 percent of electricity consumers (those in the domestic sector) are shielded from these increases so are not initially affected by the price signals on the electricity spot market.

However Mr Currie’s statement went on to say “Households are not immune to the (then) current extreme spot prices because retail tariffs when

reset by retailers should reflect the huge increase in wholesale costs. The difference is that households will see this as a lagged increase over the next few months to a year, whereas large manufacturing and commercial consumers see the price impact immediately. Households are likely to see the impact as higher retail tariffs later this year”.

**It will be ironic if New Zealand’s households see electricity price rises later this year as a result of a suggested impending electricity shortage months earlier which in fact never actually happened.**

In January this year, the Chairman of the Electricity Commission, Roy Hemmingway, said that he did not think that there is enough competition in the electricity market but he did not know exactly why. “We certainly know that the market is providing incentives to (new) generation, but it’s not clear the market is providing incentives for companies to keep their prices as low as possible in order to be able to compete” he said.

A study in late 2005 suggested that the average New Zealand householder uses about 8,000 kilowatt hours (kWh) of electricity a year. In 1999 the price to consumers was around 14 cents/kWh. In 2005 the price to consumers was around 18.5 cents/kWh which means a higher electricity bill to the average consumer of \$358 per year over that five year period.

As an example, taking an average home in Christchurch with 3-4 people and no gas supply, there was a \$20 difference in annual electricity cost between the cheapest and most expensive provider. Similarly there is only a \$24 difference in Wellington and a \$41 difference in Auckland.

On the face of it, there is no competition between providers. Until we come to grips with the problem of this lack of competition in the electricity market, and that of potential future electricity shortages causing subsequent price increases for consumers, regardless of whether or not such a suggested shortage actually eventuates, then electricity prices will continue to rise much faster than the rate of inflation over the next few years.

*John Blakeley*

#### **Footnotes:**

1. Parliament has been told that power prices increased by 32.4 percent between 2000 and 2005.

National’s energy spokesperson, Nick Smith, asked Energy Minister, David Parker, why that had happened when the increase between 1995 and 2005 - before Labour came to power - was 14 percent.

Mr Parker said that the main reason was that Maui gas was running out. “Until Maui gas ran out, it was an artificial suppressant to the price of power, because the price of gas, which set the market price of electricity, increased at half the rate of inflation. Because there was a need for more gas exploration, it was necessary to remove the price controls”, he said.

Jim Lamb, co-ordinator for the Beneficiary Advisory Service, said the full effect of (rising) electricity prices would begin to seriously affect people on low incomes from next month.

Source: NZ Herald, Wednesday 26 July 2006, pg A3

2. An indicator price (Haywards reference) provides interesting information on average prices of bulk electricity sold under contract. Such prices fluctuate much less than the spot price, as contract prices generally last for a reasonably long term (of around 12 months ahead).

From 1996 to mid-2001, there was a general downward trend from around 4.50 to 3.20 cents/kWh, but then a sharp rise to prices between 5.00 and 6.00 cents/kWh until mid-2003. Since then, the general trend has been upward (but with fluctuations) from 6.50 to 8.00 cents/kWh.

**Note that mid-2001 and mid-2003 approximately coincided with the timing of winter electricity “shortages”.**

# Letters to the Editor

## The 12 June Auckland Electricity Failure

While the physical cause of the latest power failure is already clear, the underlying cause needs exposure. In a well-designed market, the benefit and the cost of an action, or inaction, must fall to the same entity, usually the supplier.

In contrast, the electricity industry was allowed to set up the market to its own liking, and so a fatal flaw was designed into it. **The benefit of running too tight a system falls to the owners** because it guarantees a high utilisation rate. This applies to generating companies and to Transpower. **The cost of running too tight a system, and the outages following from that, are borne by the powerless (pun intended) consumers**

As long as this fundamental law of capitalism is violated, we will see the system fail.

*K.H. Peter Kammler  
Warkworth*

Originally published in NZ Herald, 15/6/06, pg A14

## Is Infrastructure the Right Target for Campaigning?

I have recently observed debates about various infrastructure issues.

A common argument for expenditure on infrastructure follows the lines of *“There is going to be growth in demand. In order for that growth in an efficient, safe and reliable manner, infrastructure needs to be in place before what are relatively small problems at present become larger problems in the future”*.

A common argument for delaying expenditure on infrastructure follows the lines of *“Provision of infrastructure removes barriers to growth and encourages unsustainable growth. Therefore, if the provision of infrastructure is delayed, rapid growth will be inhibited and more sustainable alternatives will be fostered”*.

Both arguments have their merits and anecdotal evidence to support them. However, I suggest that the type of growth to which they relate is fundamentally different. If the growth is in essential services, then early provision of necessary infrastructure is desirable and its absence will lead to inappropriate less efficient choices being made to meet the essential needs. However, if the growth is in non-essential activities, then unfettered growth will have adverse consequences and inhibiting that growth might result in more sustainable outcomes.

There are also competing economic arguments on the lines of *“Early investment will have a lower capital cost”* balanced against *“Just-in-time investment is the most economically efficient”*.

Against this background, I am concerned that the provision, or otherwise, of infrastructure is being used to try to influence outcomes that depend on a wide range of factors. I suggest that if sustainable development in its broadest sense is the objective, then provision of infrastructure should be considered as a means to support the achievement of that objective. Attempting to use the provision of infrastructure as a means of **controlling** development is unwise. I suggest that development policy should focus directly on the objectives to be achieved and not on the indirect use of infrastructure as a tool.

The three particular infrastructure issues on which my above observations are based are electricity transmission, roading, and reticulated sewerage in Waipu. Are there other infrastructure issues that fit this line of analysis?

*Steve Goldthorpe, Waipu, 31 May 2006*

## And a Response

Steve Goldthorpe raises some important points in his letter. In it, he mentions roading as one of the issues for consideration.

I think that roading is a suitable topic for campaigning on transport, but a better choice is to campaign on the provision of transport infrastructure as a whole. Here is my line of reasoning:

1. The money available for infrastructure spending is finite. Only some of this will be allocated to transport infrastructure.

2. If there is only a certain amount to be spent on transport infrastructure, the question then becomes: what to spend it on?

3. In an era of rising oil prices and possible future scarcity of transport fuels, and of mounting concern about the rapidly rising greenhouse gas emissions from transport, I consider that it is appropriate to direct investment towards infrastructure that will reduce dependence on and use of fossil fuels. This can be done by investing in forms of transport that are less fossil-fuel-intensive; or that use non-fossil fuels; or investing in alternatives to transport e.g. investing in broadband infrastructure, on the (untested?) assumption that this will promote, or at least enable, telecommuting.

4. A common argument for building new roads is to reduce congestion on existing roads. It is true that cars driving in congested traffic operate less efficiently than those driving in freely moving traffic, and that bus services are able to operate more reliably on uncongested roads. However, evidence to date shows that any improvements in transport flows are soon lost, as the consequence of building new roads is to encourage more people to take to their cars. Before long, the new roads become congested, and lobbying starts to build yet more new roads.

5. Recent evidence of reduction in motorway use in Auckland in the wake of rising fuel prices calls into question whether new roads (or at least, new motorways in Auckland) can be justified on the grounds of demand, notwithstanding any congestion arguments. However, this lack of demand may also mean that any congestion benefits of building new roads are not so quickly overtaken by increased traffic.

6. Historically, building roads for private vehicles has been privileged within transport planning, so that other modes of transport are left to pick up the crumbs from the transport budget. That this is still the case is clear from the transport spending announced in the 2006 Budget. To ensure that other modes of transport are funded adequately to meet the demand that has recently

been shown to exist (at least in Auckland and Wellington), this bias towards roading in the funding system needs to be changed.

7. However, there may be some circumstances in which spending on new roads, or on alterations to existing roads, is appropriate. Therefore, in recent contact with politicians, SEF has been calling for “a moratorium on all new roading projects unless and until it can be shown that they can meet a stringent set of national environmental, health and safety, and energy efficiency improvement criteria”. Exactly what these criteria should be will doubtless be a matter of vigorous debate! The key is to remove the assumption that the answer to transport problems is bigger and better roads.

*Tim Jones, Wellington. 26 June 2006*

## **SEF 2006 Conference**

*The SEF Annual Conference (including AGM) will be held in Wellington on Monday 20th November 2006.*

*The theme of the Conference will be “Strategies for New Zealand’s Energy Future”. Further information will be available shortly. It is envisaged that the SEF AGM will be held during the lunch hour.*

*The timing of this Conference is significant in that the NZ Energy Strategy, the replacement Energy Efficiency and Conservation Strategy, and the Government’s proposed Climate Change Action Programme should all be available to focus our attention on implementation policies and measures.*

*Registration details will be available on the SEF web site shortly. Offers of papers related to the implementation of sustainable energy strategy welcome to [conference@sef.org.nz](mailto:conference@sef.org.nz)*

## SEF Meetings with Politicians

Early this year, SEF requested a meeting with Hon. David Parker to discuss issues related to energy, climate change, and transport policy. After these portfolios were reallocated, we requested and were granted separate meetings with Minister Parker on energy and climate change issues, and Hon. Annette King on transport issues. In addition, we requested meetings with the energy and transport spokespeople of a number of other parties represented in Parliament, and have subsequently met with Peter Brown MP, the New Zealand First Energy and Transport Spokesperson. We have had positive responses to our letters from United Future, the Maori Party and the Greens, but have not (so far) met with them.

Reports on the meetings with David Parker and Peter Brown follow. Both meetings took place on 22 June, shortly before the release of the Terms of Reference and other related documents for the NZ Energy Strategy.

The SEF delegation comprised John Blakeley, Tim Jones and Steve Goldthorpe. Both meetings followed a similar pattern, in that John introduced the delegation and SEF, I spoke about SEF's concerns on oil supply and transport (with more of a focus on the latter in the meeting with Peter Brown), and Steve discussed the points in his document "Greenhouse Gas Consequences of Alternative Fossil-derived Transport Fuels", highlighting the high emissions that would arise from converting coals to liquid fuels without CO2 sequestration.

### 1. Meeting with Hon. David Parker.

The meeting with David Parker was also attended by an official, who is working on the New Zealand Energy Strategy for the Ministry of Economic Development. It was obvious that David Parker is well up with the play on the New Zealand Energy Strategy and related work on climate change and energy efficiency. He said that the consultation period on the NZES was just about to start (and the Terms of Reference for this have since been made available).

Consultation would initially be with selected stakeholders (the implication being that this would include SEF), and wider public consultation wouldn't start until September, when a draft NZES would be released for comment. The aim was to have the NZES finalised and signed off by May 2007. Climate Change strategy relating to the energy and transport sectors will be dealt with under the NZES; climate change strategy in other areas, such as agriculture and forestry, will be dealt with separately.

David Parker said that he wasn't too concerned about potential shortfalls in oil supply, as he was confident that alternative fuels could bridge this gap. However, he was strongly in favour of moving away from fossil fuel dependence in order to reduce greenhouse gas emissions, and was very positive about the ability of alternative fuels and vehicle types to fill the gap, following a recent OECD meeting on the topic that he had attended. He appeared especially enthusiastic about the potential of plug-in electric vehicles from about 2008 onwards, and we discussed the implications of this for electricity generation and supply.

David Parker mentioned, without prompting from us, that a better modelling capability was needed to model the effects of various mixes of fuels, vehicle types, and transport modes on the transport system.

**He was asked specifically what his opinion was on potential coal-to-liquid fuels plants being set up in New Zealand, and replied that, if it was up to him, he wouldn't give permission for a lignite-to-liquid fuels plant in Southland that didn't have CO2 sequestration. (Steve's paper pointed out that, of the various alternative transport fuel options, this option had the worst greenhouse gas emission consequences).**

John again emphasised SEF's interest in being involved in the NZES and David Parker assured us that we would get the chance. Overall, the tone of this meeting was very positive, although, as always, the proof of the Government's strategy will be in good outcomes rather than good intentions.

## 2. Meeting with Peter Brown MP

Peter Brown said that New Zealand First (NZF) supports the Kyoto Protocol, but not the carbon tax. Our discussions didn't cover what ways of meeting NZ's Kyoto Protocol commitments NZF might support. He also said that NZF saw enhancing electricity supply as a high priority, so that the poor and elderly could afford adequate supply. On transport, he said that it would be very hard to get people out of their cars, but that price would be the main driver of changes to the transport system and to people's usage of it; however, he wasn't receptive to arguments that more money should be put into public transport, particularly in Auckland. John stressed the importance SEF puts on the development of a meaningful New Zealand Energy Strategy with measurable targets, but Peter Brown responded that NZF would have little influence on that. We pointed out that there may be a chance to influence the NZES via the select committee process.

Overall, he was interested in what we had to say, and prepared to listen, but I got the sense that NZF saw enhancing the supply of energy (especially electrical energy) as their major priority, and that the source of this supply - renewable or otherwise - was of comparatively little concern to them. However, his willingness to listen was encouraging.

*Tim Jones*

## 3. Meeting with Hon. Annette King

On 5 July, Tim Jones and Ian Shearer from the SEF Management Committee met with newly-appointed Minister of Transport, Annette King, to talk about the state of New Zealand's transport system and SEF's suggestions for improving it. The presentation is available on the SEF web site at <http://www.sef.org.nz/papers.html>.

The presentation is prefaced with a quote from Secretary for Transport, Dr Robin Dunlop: *"It's time to recognise that we cannot pave our way out of traffic congestion"*. Taking up this theme, the presentation discusses the vulnerabilities of New Zealand's land transport system - the almost total dependence on oil, the poor state

of public transport and its unpreparedness to cope with rising demand, and the way in which New Zealand's urban design (or the lack of it) worsens our transport problems.

While we did not receive any concrete assurances of a change of policy in response to our presentation, the Minister did respond favourably to it, and subsequent events (such as the Ministry's recently-begun study of sustainable transport futures) suggest that the Ministry is taking another look at the shape and future of New Zealand's transport system, and starting to pay real attention to strategic planning in response to the threats of peaking oil production and of climate change.

*Tim Jones*

## Ministerial Cars

The Government's own Fuelsaver website indicates that its ministerial chauffeur-driven car fleet is made up of some of the thirstiest types of car in the country, using up to 14.5 litres of petrol per 100 km.

In a parliamentary question, Green Party Co-Leader, Jeanette Fitzsimons, noted that most of these cars have been purchased since the Government announced ratification of the Kyoto Protocol in 2002 and since the start of the Government's own fuel conservation programme in 2003.

In reply, the Deputy Prime Minister, Michael Cullen, said that he expected the Government's fuel conservation programme would be reflected "over time" in vehicle purchases and that some of the cars now run on LPG. Ms Fitzsimons later disputed that, and said that none of the vehicles were listed as running on LPG.

Source: NZ Herald, Friday 1/9/06, pg A6

# Climate Change

## Has NZ Given Up on Kyoto Targets?

The Government appears to have all but abandoned efforts to meet NZ's contentious Kyoto targets by 2012 amid growing political cautions about the international agreement on greenhouse gas emissions.

It has now been acknowledged in Cabinet papers that NZ was unlikely to meet the targets agreed to when the protocol was ratified in 2002 - a failure that could cost taxpayers \$500 million in 2012, the deadline for making up the shortfall in the first five-year commitment period.

Last December when the Government scrapped plans for a broad-based carbon tax, which would also have applied to transport fuels, the option of a narrow-based tax was left on the table. This tax would be limited to major emitters of greenhouse gases such as thermal power stations and big smokestack industries.

While officials are looking at short-term measures to cut greenhouse gas emissions, including a tax on thermal power stations and import controls on gas-guzzling cars, decisions could be up to 18 months away.

Those taxes could push up power prices and the cost of buying cars, with one option being to impose an age limit on imported vehicles.

Options other than a carbon tax are also under consideration as a transitional measure to prepare large emitters for whatever regime is adopted post-2012. These include emissions trading, voluntary agreements, or regulation through the Resource Management Act.

Climate Change Minister, David Parker, said that NZ was standing by its Kyoto commitment, **but there appeared to be growing government doubt about the number of countries likely to stick to the deal.** NZ will not be the only country facing a hefty bill for failing to meet targets.

Mr Parker said that the Government had not abandoned plans to introduce a broad-based tax but not till after 2012, and it was difficult to give businesses the policy certainty they

wanted when it is still unclear what the post-2012 international framework will be.

Sources: Dominion Post, Wednesday 5/7/06, pg A1  
NZ Herald, Wednesday 5/7/06, pg C4

## Shrinking Forests Hit Kyoto Targets

NZ's plantation forest estate could shrink by up to 7,000 hectares during 2006, making it even more difficult for NZ to meet its Kyoto Protocol obligations.

At present 9,000 hectares of Canterbury forestry is in the process of being converted to pasture and 30,000 hectares in the central North Island from trees to dairy farms.

After allowing for new forest plantations which are going ahead, the net effect during 2006 is likely to be an expected 7,000 hectare decline in the nation's exotic forest plantation.

During 2005, the area of plantation forestry in NZ shrunk by 1,000 hectares, the first time in two decades that more land was taken out of forestry than planted in trees.

Kyoto was originally forecast to be a net \$500 million earner for NZ during the first five year commitment period from 2008 to 2012, but the unprofitability of the forestry sector has seen new planting decline and the protocol is now forecast to cost the NZ economy \$562 million over that five year period.

Otago-based City Forests chief executive, Grant Dodson, said it was a concern that 18 months out from the start of the Kyoto Protocol's first commitment period, the NZ forest industry was not increasing the area of land in trees.

**“The country could not afford to pull a carbon sequestering industry out of the ground and replace it with a greenhouse gas emitting one like dairy farming”.**

Dobson said that the Government had a forest policy vacuum at the time it needed one most. The country needs to increase the area under forests to meet its Kyoto commitments.

Source: NZ Herald, Monday 19/6/06, pg C14



## Meridian Backs Green's Climate Change Bill

Hydro and wind-power generator, Meridian Energy, is backing a Green Party bill designed to overcome gaps in greenhouse gas control caused by the scrapping of the carbon tax.

This bill would return to Regional Councils the powers which Parliament removed in 2004 which previously allowed these councils to take climate change into account when granting air discharge consents under the Resource Management Act (RMA). The Government removed those provisions because it had planned to deal with carbon emissions with a carbon tax.

But the carbon tax plan was abandoned in December 2005 and the Greens have blamed the absence of the old provisions for resource consents being granted for the proposed Marsden B coal-fired power station.

The member's bill by Green's co-leader, Jeanette Fitzsimons, aimed to reinstate these powers to Regional Councils, has won Labour's backing to the select committee stage, where 86 out of nearly 1800 public submissions are now being heard.

Meridian told the select committee that while the Government worked on national measures to deter carbon emissions, the Resource Management (Climate Protection) Amendment Bill was a step in the right direction. Meridian noted that at the moment, all of the effects of wind-farm, geothermal or hydro proposals need assessment under the RMA whereas one of the effects of a thermal generation plant is specifically excluded.

However, other energy industry submitters argued that climate change should not be dealt with at regional level and was an international problem needing a national response.

The Government is at present working on a narrower carbon charge, targeting big carbon emitters as part of its climate change work programme.

Source: Newsroom, Thursday 3 August 2006.

## NZ's Greenhouse Gas Percentage Increase

There is often confusion over the percentage increase since 1990 in NZ's greenhouse gas emissions. Increase in **total greenhouse gas emissions** is now around 22.5 percent whereas the increase in **carbon dioxide emissions** is now 37 percent more than in 1990.

The MED publication "*NZ Energy Greenhouse Gas Emissions 1990-2003*" (June 2004) shows that as at 31 December 2003, NZ's gross carbon dioxide emissions had increased by 39.7 percent since 1990. About nine-tenths of these emissions come from energy and the other tenth from industrial processes. (The energy related emissions had actually gone up by 40.7 percent since 1990 but this was offset by the fact that the industrial processes emissions had gone up by only 30.4%.

In the following year (2004) gross carbon dioxide emissions actually fell for the first time since 1990, so that the increase in gross carbon dioxide emissions was then around 34 percent more than in 1990.

The Ministry of Economic Development (MED) has just released the figures for 2005 showing that gross carbon dioxide emissions have increased again to about 37 percent above the 1990 level. The main change during 2005 was an increase in carbon dioxide emissions from thermal electricity generation but for the first time since 1990, there was a slight decrease in transport emissions.

**Total greenhouse gas emissions have increased considerably less than this because methane emissions have been increasing at a much slower rate.**

A recent UN report stated that NZ's **total greenhouse gas emissions** have risen by 22.5 percent over the 15 years from 1990-2004.

This was the eighth highest emissions increase over that period among the developed countries. Spain topped the list at 41.7%, Australia was just above us at 23.3%, the USA had a 13.3 percent increase, Japan had 12.8% and Italy 11.5%.

(Source: NZ Herald, Monday 21/11/05).

The three major greenhouse gases in NZ make up about 99 percent of the total greenhouse gas emissions. With carbon dioxide up by around 34 percent and nitrous oxide up around 28 percent from 1990 to 2004, I calculate that methane must only have been up by 11 percent above 1990 in order to get an overall increase of 22.5 percent from 1990 to 2004.

This would be reasonably consistent with figures from the Climate Change Office (CCO) which showed that at the end of 2002, carbon dioxide was up 33.7 percent, methane was up 7.8 percent and nitrous oxide was up 27.9% .

Note that for the first few years after 1990, methane emissions actually went down because of a downturn in the agricultural sector before they started to rise again, whereas carbon dioxide emissions have risen very steadily at an average of a little over 2 percent per year since 1990 (until the downturn in 2004).

Also note that New Zealand's annual methane emissions figures appear to have been revised downward a few years ago by the CCO in relation to the other two major greenhouse gases. This meant that instead of the greenhouse gas proportions in 1990 being about half methane, a third carbon dioxide and a sixth nitrous oxide (as had been stated during the 1990's), the 1990 proportions were actually amended to 41.5 percent methane, 40.9 percent carbon dioxide and 16.7 percent nitrous oxide.

The CCO now states that carbon dioxide is the major greenhouse gas in NZ's emissions profile. I calculate that at the end of 2004, the actual proportions would have been about carbon dioxide 45 percent, methane 38 percent and nitrous oxide 17 percent.

**The four sectors of the NZ economy where most of the greenhouse gas emissions come from are agriculture, energy, industrial processes and waste.**

When the methane and nitrous oxide emissions are added together, the agricultural sector is still the largest emitter in NZ. The CCO states that in 2002, 49.2 percent of the total

greenhouse gas emissions came from the agricultural sector and 42.8 percent came from the energy sector. **Emissions from industrial processes and the waste sectors are very much smaller** comprising 4.7 percent and 3.2 percent respectively of all of NZ's greenhouse gas emissions in 2002.

*John Blakeley*

## NZ's Kyoto Obligations

### Background

On 16 June 2005, the then Climate Change Minister, Pete Hodgson, announced a dramatic turnaround from a projected 33 million tonnes credit situation to a **36 million tonnes deficit situation** in the carbon dioxide credits which NZ has available to meet its obligations under the Kyoto Protocol during the first five-year commitment period from 1 January 2008 to 31 December 2012.

A key factor in the turnaround was stated to be an increase of 38 million tonnes in the emissions forecast over the five-year period, particularly from transport but also from electricity generation.

Also, the benefit of forest sink credits had been revised downwards by 24 million tonnes, or 25 percent. Most of that, 15 million tonnes, was because pine trees planted on land previously growing scrub (especially manuka/kanuka) was no longer being counted as eligible for credits.

But it also reflected a collapse in the rate of planting of new commercial forests and an increase of deforestation, to the point where the latest information suggested that the total exotic forest plantation area was now shrinking.

(Refer to EnergyWatch 38, pp 13-15).

### Subsequent Developments

1. An article by Gary Taylor, chairman of the Environmental Defence Society (NZ Herald, Monday 13 February 2006) entitled "*Dumping carbon tax a mad move*" suggested that the

Government's "hasty and ill-judged decision" to drop the proposed carbon tax announced just before Christmas in 2005 was likely to see NZ's greenhouse gas emissions over the first five-year Kyoto commitment period rise by 36 percent. After analysing the figures in the 475-page report prepared by the Ministry for the Environment, he noted that NZ's excess emissions during that commitment period **would rise from 36 to 49 million tonnes**, an increase of 13 million tonnes. He suggested that this was "quite extraordinary" given the commitment to put NZ on a downward path in gross emissions by 2012 and observed that the Ministry's report had conceded that instead of this, gross emissions will continue to grow.

2. An article the following month noted that an estimate by Treasury had increased the estimate still further to a deficit during that first Kyoto commitment of **64 million tonnes** of carbon dioxide credits which would be required to meet NZ's obligations. Treasury conceded that the removal of the carbon tax would increase the predicted net liability by 13.1 million tonnes, but in addition, explained further that the deforestation forecast had increased by 14.7 million tonnes of carbon dioxide equivalent from that given in June 2005, to give a total revised forecast of deforestation of 21 million tonnes.

Source: NZ Energy and Environment Business week, 15/3/06, pg 3.

### Latest forecast

The latest projection of NZ's emissions balance for the first Kyoto commitment period is a deficit of **41.2 million tonnes** of carbon dioxide equivalent noting that this is an improvement in the 64 million tonnes calculated in December 2005.

Climate Change Minister, David Parker, said that the lower expected deficit is due mainly to the impact of higher energy prices. He said that the projection is based on many variables, and change in any one of them will affect the total. He also said that he expected this volatility to reduce over time as NZ moves from projections

to measuring actual emissions during the first Kyoto commitment period.

Source: NZ Energy and Environment Business Week, 26/7/06, pg 1.

### Conclusion

During the 13 month period June 2005 to July 2006, the estimated deficit for NZ over the first five-year Kyoto commitment period **has gone from 36 million to 49 million to 64 million and then back to 41.2 million tonnes of carbon dioxide equivalent.**

In monetary terms, Treasury has assumed an exchange rate of \$US0.68 = \$NZ1.00 and a carbon price of US\$6 per tonne. At the present exchange rate of \$US0.62 this would give NZ a monetary liability of \$398 million over the first five-year Kyoto commitment period, compared with Treasury's earlier estimate of \$563 million and their initial estimate of \$310 million. Many commentators believe that Treasury's \$US6 per tonne carbon price estimate is much too low and that the forecast liability should be in the \$1.0 billion to \$1.5 billion range, but it nevertheless means that a future financial liability is included in NZ's forecast expenditure estimates in the years ahead.

This has tended to focus the minds of the Government's finance ministers much more on Climate Change issues than would otherwise be the case.

*John Blakeley*

### An Inconvenient Truth

This feature length film (95 minutes) was presented to a large audience who had come to see it on a beautifully fine Sunday morning (15 July) at the Civic Theatre, as part of the 2006 Auckland International Film Festival. Those attending were obviously sympathetic to the message on climate change/global warming being presented and expressed their appreciation by applause at the end. The presentation was repeated at 6.15pm on Wednesday 19 July when the Civic Theatre was almost full.

It is based on a slide show presentation which Al Gore has given in recent years to over 1000 audiences around the USA and throughout the

world and he is now reaching a potentially much larger audience through this film, which combines excellent presentation of Gore's message with high quality cinematography and excellent additional pictorial material.

Gore combines a good presentation of the facts of climate change/global warming with an almost evangelical zeal in putting his message across, and includes a list of response actions which viewers can now consider taking which is integrated with the credits at the end of the film.

Gore argues a strong case for his overall message that irreversible global climate change is now occurring and visual material is presented for all to see, including melting polar ice caps and retreating glaciers and large dried up lakes.

Perhaps I could take issue with Gore's over-dramatisation of the effects of climate change/global warming. As an example, there is dramatic filming of the aftermath of Hurricane Katrina, but the US Corps of Engineers had been warning for many years about the vulnerability of the levees around New Orleans to a large flood, and is it really yet proven that this particular hurricane was an extreme event, or that the recent upsurge of frequency of hurricanes in the Gulf of Mexico is more than a cyclical natural event? Also, there are dramatic pictorial graphics of the potential impact of sea level rise caused by the complete melting of a large part of the Antarctic ice shelf and/or the Greenland ice shelf, but what is the probability of this occurring? (See Footnote).

This film takes its name from what may happen when Government-funded or private-sector-funded scientists come up with findings from their research which the funder finds to be awkward or inconvenient and as a result, the scientists come under a great deal of pressure to alter or reverse these research findings, and often with severe penalties for those who will not do this.

Gore includes some of his own personal experiences in the film, such as the near-death of his six-year old son in a car accident which led him to focus his life more on important goals he wanted to achieve. In particular, the death from

lung cancer of his elder sister who had begun smoking as a teenager is related to his father growing tobacco as a crop on the family farm, where Gore worked as a boy during vacations. Gore notes that when the link between smoking and lung cancer was established in the 1960's many people wanted to ignore it including Gore's own father (himself a long-time member of the US Senate). Presumably Gore senior found this link an "inconvenient truth" in his farming operation but eventually, quietly gave up growing tobacco without giving any public explanation.

Gore expresses regret that it took people so long to "connect the dots" in the link between smoking and lung cancer. He gives his view that the link between greenhouse gases in the atmosphere and climate change/global warming is now well established and the hope that many more people will now "connect the dots" on this issue and change their actions as a result.

Theatrical props are used in Gore's presentation including a mechanical hoisting device placed in front of a large graph showing concentrations of carbon dioxide in the atmosphere for the last 650,000 years. Gore is then hoisted up to show where carbon dioxide concentrations are now, and again hoisted much further up to show where they are likely to be in 50 years time. For me, the only problem with this presentation was that the y-axis of the graph started at about 100 parts per million concentration rather than zero, whereas in my mind it would have been a more correct depiction for the hoist to be based at the zero concentration level. The same presentation could still have been used but it would not have been quite as dramatic.

The film is not overly political as far as US politics are concerned but it does briefly cover Gore's loss of the 2000 US presidential election and its aftermath, when Gore had to decide whether or not he would contest a US Supreme Court ruling, but in the end decided he had nowhere further to go.

There are some criticisms of the present Bush Administration in the White House including

reference to a particular environment official with no suitable background (he was previously employed by an oil and gas industry lobby group) who took it upon himself to edit and alter a report on climate change/global warming being produced by a large number of distinguished scientists.

The official was eventually found out when the alterations which he had made became public. He then promptly resigned to try and avoid any further embarrassment to the Bush Administration and the very next day started a new job with Exxon Mobil.

One chart I was particularly interested in showed the particular states within the USA, in the north east corner and on the west coast, which are now taking some actions in support of the Kyoto Protocol. But that leaves a very large number of apparently unmoved states in "Middle America". There was also a list of a large number of cities within the USA which have signed a petition asking the US Government to sign up to the Kyoto Protocol.

Gore also presents a graph showing the appallingly low minimum fuel consumption requirements for new US automobiles and light utility vehicles and compares these requirements with the proposed higher standard which the State of California intends to introduce over the next few years (and which the US auto industry strongly opposes). These standards are in turn lower than the present Chinese minimum fuel consumption standards in what is becoming the world's fastest growing automobile market, and much lower than the proposed minimum fuel consumption standards proposed in both Europe and Japan to be brought into operation over the next few years.

Gore states that US auto makers claim that if the US minimum fuel consumption standards are raised, it would have an adverse economic impact on the country but he then presents a graph showing the most financially successful auto manufacturers in the World, Toyota and Honda, making very large profits in recent years whereas the two largest US auto makers,

General Motors and Ford are making very large losses. Gore leaves viewers to reach their own conclusion on this.

One final point which Gore makes in the film is the strong link between increasing global human population and increasing carbon dioxide concentrations in the atmosphere. He notes that after tens of thousands of years of existence, human population reached 2 billion people in 1925. The present figure is 6.4 billion, more than trebled within about one human lifetime, and is expected to reach around 9.5 billion by 2050. **This is an extraordinary increase in such a short space of time** and combined with the industrialisation and transportation revolution which has occurred over the last two centuries, offers a ready explanation of the rapidly increasing carbon dioxide concentrations in the atmosphere.

Overall, I would warmly recommend this film to those who may be considering going to see it.

*John Blakeley*

#### **Footnote**

Available information suggests that the huge Antarctic ice sheet, which contains nearly 90 percent of the world's ice has actually been **thickening** over the last 150 years. Between 1972 and 2003 it has been gaining about 45 billion tonnes of water per year because the planet has warmed enough for snow to fall at the coldest place on earth.

Thickening of the Antarctic ice sheet is, in fact, just about offsetting the meltwater being released from the edges of the Greenland ice sheet, which has also been thickening at its centre. This leaves us with a global warming sea level gain of only about 0.25mm per year, or 1 inch per century due to polar ice cap melt. The total amount of sea level rise has remained relatively constant during the 20<sup>th</sup> century, despite the modest 0.6 degree warming of the planet and was a rise of about 180mm (7 inches).

So in this movie, Gore is implying that Greenland and/or Antarctic ice sheet melting might suddenly raise sea levels by 20 feet (6

metres) and the experts are saying 7 inches (180mm) in the last century!

Source: Dennis T Avery, former senior policy analyst for the U.S. State Department.

## Chinese Coal Casts Global Shadow

As China's industrial expansion gathers pace, it has, as a country, already become the world's largest consumer of coal and second only to the USA for consumption of oil.

Unless China finds a way to clean up its coal plants and the thousands of factories that burn coal, pollution will soar both at home and abroad.

**The increase in global-warming gases from China's coal use will probably exceed that for all other industrialised countries combined over the next 25 years, surpassing by five times the reduction in such emissions, that the Kyoto Protocol seeks**

Already China uses more coal than the USA, the European Union and Japan combined. And it has increased coal consumption by 14 percent in each of the past two years in the broadest industrialisation ever.

Every week to ten days, another large new coal-fired power plant opens somewhere in China. **To make matters worse, India is right behind China in stepping up its production of coal-fired power plants – and has a population expected to outstrip China by 2030.**

Aware of the country's growing reliance on coal and of the dangers from burning so much of it, China's leaders have vowed to improve the nation's energy efficiency. No one thinks that effort will be enough. To make a big improvement in emissions of global-warming gases and other pollutants, the country must install the most modern equipment – equipment that for the time being must come from other nations.

Industrialised countries could help by providing loans or grants, as the Japanese government and the World Bank have done, or by sharing

technology. But Chinese utilities have in the past preferred to buy cheap but often-antiquated equipment from well connected domestic suppliers instead of importing costlier equipment from the West.

The Chinese Government has been reluctant to approve the extra spending. Asking customers to shoulder the bill would set back the government's efforts to protect consumers from inflation and to create jobs and social stability.

But each year China defers buying advanced technology, older equipment goes into scores of new coal-fired plants with a lifespan of up to 75 years.

Source: New York Times, Sunday 11 June 2006.

## Future Oil Prices?

Rex Tillerson, who became Chairman and Chief Executive of Exxon Mobil at the beginning of 2006 believes that the present oil price of around US\$70 per barrel will not hold. He says that there is a "complete disconnection between the fundamentals of supply and demand on crude oil" and if you had a supply and demand connection the price would be somewhere between US\$30-40 per barrel.

Whereas his predecessor, Lee Raymond, challenged the evidence for global warming, Tillerson says that "climate change is a serious issue" and that "what we know is that carbon emissions are one of the factors that contribute to climate change".

So would he have signed up to the Kyoto Protocol? "No", he says, "as it excludes a large part of the consuming world, and also that part of the world which is going to generate 80 to 85 percent of the growth in carbon dioxide emissions."

Source: NZ Herald, Wednesday 30/8/06, pg C6

## NZ Natural Gas Reserves

### Contact Short of Gas

Contact Energy released its annual report on 25 August for the year ending 30 June 2006, showing a big profit increase but warning that it will be as good as it gets, **because of a profitable combination of a dry year and the last of the cheap gas from the Maui field**, a combination of factors unlikely to be repeated.

Low hydro lake levels during the year meant more gas-fired generation than normal, which coincided with the last year that low-cost gas from the Maui field would be available under long-standing contracts.

Contact used 36 percent more gas than in the previous 2004/05 year and wholesale gas prices are likely to rise about 25 percent in the year ahead.

Only 83 percent of the electricity Contact generated was needed for its retail customers and to honour hedge contracts (presumably leaving the rest to be sold on the wholesale electricity market).

Looking forward, Contact is short of gas not only for new generation (such as a plant it has consents for at Otahuhu C), but for its existing gas-fired plants (including Otahuhu B and Taranaki Combined-Cycle) beyond 2010. **However Contact states it is increasingly confident it will be able to secure additional gas.**

Contact will be buying gas from the Pohokura field from this year and is interested in the additional supplies being made available from Maui.

As a “prudent risk management strategy” Contact will continue to investigate importing liquefied natural gas (LNG), together with Genesis Energy, but any decision to proceed to construction of a LNG import terminal “will be delayed as long as possible to allow future domestic gas discoveries to come to market”.

Source: NZ Herald, Saturday 26 August 2006, pg C3

### More Gas in the Maui Field

In early April this year, it was announced that the Maui mining companies were about to market an additional 200 petajoules (PJ) of gas from the Maui field. Under its right-of-refusal arrangement, Contact Energy would be looking to acquire a 61.63 percent share of this gas.

Under a June 2003 agreement with the NZ Government, Maui Developments Ltd can offer this gas on commercial terms, as distinct from the cheap gas available under the old Maui contract.

Contact’s then CEO, David Hunt, said that while Contact welcomed this development, it was important to emphasise that 200PJ is less than two years of NZ’s gas demand.

“We are conscious Contact’s existing firm gas entitlements can largely meet the company’s core needs until 2010 based on present estimates of gas use. However Contact’s firm gas entitlements fall sharply from that date.

While the potential to acquire additional gas is positive, it will not itself address the longer term fuel challenges faced by Contact”, Mr Hunt said.

Industry sources believe other tranches of gas may become available from Maui at a later date.

Source: NZ Energy and Environment Business Week, 5/4/06.

The previous week, Steve Hounsell, managing director of the Austrian-based OMV NZ Ltd, which holds a 10 percent stake in the Maui field said that studies were under way by OMV and Shell-Todd and he said that there would be some “extended reach drilling”. He said that there was a degree of confidence any new gas finds could see the joint venture “operating for some time”.

Source: NZ Energy and Environment Business Week, 29/3/06.

In late July it was announced that major discoveries of gas have been made in the Maui field which are likely to keep the production flowing to at least 2016.

The gas has been discovered on the northern side of a geological fault called Ihi, which until now had been considered to be the northern boundary of the Maui field. The Maui field's owners confirmed on 27 July that the new wells will "contribute to extending the life of the field" but are saying nothing more.

Rumours are suggesting that at least 300PJ of gas may have been discovered via two exploration bores drilled off the Maui A production platform this year.

**(NZ's total annual consumption is at present around 130PJ to 140PJ, more than half being used by gas-fired power stations, and down from 162PJ in the year ending 31 December 2004).**

The Maui joint venture said that the project had been challenging because of the weight restrictions on the Maui A platform and because the drillers had to precisely target locations some distance from the rig. But the drillers had set a record for lateral distance drilled offshore, at 5603 metres.

Source: Taranaki Daily News, Friday 28/7/06, pg 1.

## More Gas In Maui Pockets?

Debate over how much gas remains in the Maui field has been re-ignited by further drilling by the Maui partners to tap into two different "pockets" within the field. The partners are talking of a "useful increment" in reserves but dismiss speculation that they may get 20 years of gas from the new drilling.

Shell owns 83.75 percent of Maui. Todd Energy, and the Austrian company OMV (10 percent), own the rest. Any new gas discovered in the two new wells (AD Ihi and East of Ihi) would be outside the Maui contract and can be sold at current market rates.

Former Shell NZ Managing Director, Dr Lloyd Taylor, said in 2003 that there might be another 100PJ of gas in the field but 300PJ would be the "extreme upside".

The CEO of Todd Energy, Richard Tweedie was quoted in the Dominion Post as saying that the size of the estimated reserves in the two wells

was a "smallish increment". He said that it was definitely not the case that the wells would have a life of 20 years. "I could not be specific but it's not long".

Crown Minerals Group Manager, Adam Feeley, says that there is plenty of gas to meet NZ's requirements in the short to medium term, and it is "frustrating" that companies are investigating importing liquefied natural gas. Both Contact and Genesis are involved in the LNG studies while gas distributor, Vector, is investigating importing compressed natural gas.

Source: NZ Energy and Environment Business Week, 8/7/06

## Development of the Kupe Field

The joint venture partners have agreed that the Kupe gas field, about 30km off the South Taranaki coast near Hawera, will be developed at an estimated cost of NZ \$980 million and will start delivering gas by mid-2009. The cost includes an offshore platform with up to six production wells, an onshore production station near Hawera and associated pipelines, including one to bring unprocessed gas and light oil to shore and one from the production station to another gas treatment plant.

The project is 50 percent owned by Origin Energy, 31 percent by Genesis Energy, 15 percent by NZ Oil and Gas Ltd, and 4 percent by Mitsui E & P New Zealand.

The Kupe field was discovered by NZOG in 1986 but cheap and plentiful natural gas from the Maui field made it uneconomic to develop Kupe until now. The rundown of Maui has doubled gas prices in the past three years and made Kupe economic.

Kupe is expected to produce around 20PJ of gas a year for up to 15 years. This compares with about 60PJ annually now being produced by the Maui gas field as it runs down.

(The Pohokura gas field discovered in early 2000, immediately offshore and near Motunui on the North Taranaki coast, and which is now being developed, is more than twice the size of Kupe with estimated gas reserves of about 700PJ. It could produce somewhere around 30 to 40PJ annually).



Kupe is also expected to produce around 1.7 million barrels of light oil condensate and 90,000 tonnes of LPG annually with total estimated recoverable reserves of 95PJ, and will preserve NZ's ability to meet the bottled gas market.

Genesis Energy plans to use most of the Kupe gas to run its new 385MW E3P combined-cycle power station at Huntly, due to be commissioned in April 2007, with any remaining gas likely to go to a new 240MW power station which Genesis is planning at Rodney from 2009. Genesis has gas available from other fields until Kupe starts producing in 2009.

To ensure that the E3P power station was built by Genesis, the NZ Government stepped in two years ago to underwrite it. Other players complained of interference in the market.

Genesis says that Kupe won't affect plans by Genesis and Contact Energy to investigate importing liquefied natural gas (LNG), as their projections of future gas needs have always been based on the assumption of the Kupe field coming on stream about 2009.

Kupe's development will also help reduce NZ's rising trade deficit, along with three other offshore Taranaki fields about to come into production at Maari, Tui and Pohokura. **When all these fields are commissioned, NZ's overall self-sufficiency in oil and gas will rise from the current 17 percent to around 50 percent** which would mean a \$2 billion annual turnaround in the NZ external accounts, assuming that world oil prices remain around current levels.

A new onshore plant will be built to extract LPG from the Kupe gas instead of using an existing onshore gas treatment plant at Kapuni (as previously planned). The estimates of LPG extraction from the Kupe field have doubled.

Sources: New Zealand Herald, Friday 30/6/06, pg C1.  
NZ Energy and Environment Business Week, 5/7/06.

## Genesis to Pay More for Kupe Gas

The Kupe field's estimated gas reserves are 253PJ, only two year's supply for NZ which uses about 130PJ a year, much of that in power stations.

But the gas will be extracted at a rate of about 20PJ a year, giving the field an estimated lifespan of up to 15 years.

As a 31 percent owner of the gas project, Genesis is entitled to 78PJ out of the estimated 253PJ of gas in the field. Genesis has indicated that it will seek to take all the gas in the field but is not revealing what it will pay. It is understood it will pay about \$6 to \$7 per gigajoule. The remaining 175 petajoules is expected to cost Genesis about \$1 billion over the next 15 years.

(The present gas price for power generation has been stated by the Electricity Commission to be \$3.50 per gigajoule, presumably for gas supplied under the Maui contract, plus a "throughput fee" of \$0.61 per gigajoule for all generators except the Taranaki Combined-Cycle).

Origin Energy as the other major owner of the project has acknowledged that renegotiating the gas price with Genesis to better reflect the higher capital cost had been vital for the project to proceed, in spite of a dramatically increased estimated development cost since the project was conceived three years ago. Recognising that it was essential for those costs to be recovered was a key factor in order to take the project forward.

Origin also noted that the estimated 253PJ of gas was a 15 percent increase over earlier estimates. In addition the field is estimated to produce 1.06 million tonnes of LPG and 14.7 million barrels of oil.

At present oil prices of around \$US70 per barrel the income from the oil alone would be around \$US1290 million, (NZ\$1650 million) which on its own is much more than sufficient to cover the development costs of the field.

Though it is noted that oil prices might not remain at \$US70 a barrel, Origin believed they will stay high.

Source: Dominion Post, Friday 30/6/06, pg C1.

## New Developments Extend Gas Availability

The official position on NZ's remaining natural gas reserves in Taranaki as at 31 December 2004 is as follows:

### Production fields

	Ultimate Recoverable	Remaining	2004 Production
Offshore	PJ	PJ	PJ
Maui	3730	346	106
Onshore			
Kapuni	1039	258	25
McKee	212	77	8
Tariki/Ahuroa	147	43	10
Rimu/Kauri	81	74	4
Mangahewa	90	47	8
Waihapa/Ngaere	33	<1	<1
Kaimiro/Ngatoro	23	8	1
Sub Total	5345	853	162
Near-Production Fields Offshore			
Kupe (from 2009)	309*	309*	--
Pohokura (from 2007)	700**	700**	--
	6354	1862	

Source: New Zealand Energy Data File, January 2006, Table H.1, pg 141.

\* Estimate only. Later estimate suggests 253PJ but other estimates have been around 230PJ.

\*\* Estimate only

In addition to the above, during April this year Greymouth Petroleum has discovered the onshore Turangi field near Tikorangi, north-east of New Plymouth and south of Waitara. Independent assessors have estimated reserves of 154PJ of gas and 5.1 million barrels of condensate in the field and the nearby Ohanga area. Greymouth Petroleum have been awarded a mining permit to develop the discovery and expect to operate the field over about 30 years.

**Near-production fields offshore at Maari and Tui are expected to produce only liquid fuels (but in very significant quantities).**

## Remaining Maui Gas Reserves

In February 2003 an independent expert (IE), Netherland Sewell of Texas, reported on a re-determination of the Maui gas reserves. As at 1 January 2003 the IE estimated economically recoverable gas under the Maui contract terms was 3562PJ implying that there was 367PJ of Maui contract gas remaining as at 1 January 2003.

It should be borne in mind that the re-determination by the IE was always going to be an artificially low figure, because it was an estimate of "economically recoverable gas under the Maui contract" (and by 2003 the Maui contract price was less than half market price because during the contract, that price has increased at only about half the rate of inflation).

The most recent Energy Data File (January 2006) estimates total Maui gas reserves at 3730PJ but notes that it is not on a comparable basis with the IE's estimate (Energy Data file uses a P50 basis i.e. a 50% probability of the reserve being reached).

**It would be reasonable to assume that the 200PJ of additional gas which the Maui mining companies are now marketing will bring the estimate of the recoverable reserves in the field up from 3730PJ to 3930PJ.**

In addition to this, there is a possible (say) 150PJ of reserves from the lateral drilling recently carried out into Ihi fault area, or from other Maui "pockets", which would bring recoverable reserves up to 4080PJ.

Remaining Maui gas reserves were estimated at 346PJ by Energy Data File as at 1 January 2005. Since then production from the Maui field has been approximately 60PJ annually so by 1 January 2007 the remaining gas reserves may be 226PJ plus 200PJ of additional gas from the Maui field plus (say) a further 150PJ from the recent lateral drilling programme or other Maui "pockets", giving a total of 576PJ.

## Estimated Remaining NZ Gas Reserves

Based on the above information, a table of estimated gas reserves as at 1/1/07 follows on the next page.

## Estimated remaining NZ gas reserves

Field	Est Remaining Reserves	Est. Annual Draw Off
Maui offshore	576PJ	60PJ till mid-2016
Pohokura offshore	700PJ	30PJ* from mid-2007 till end 2030
Kupe offshore	250PJ	20PJ from mid-2009 till end 2021
Kapuni onshore	208PJ	25PJ till mid-2015
Turangi onshore	154PJ	5PJ till end 2036
McKee onshore	61PJ	8PJ till mid-2014
Rimu/Kauri onshore	66PJ	4PJ till mid-2023
Tariki/Ahuroa onshore	23PJ	10PJ till mid-2009
Mangahewa onshore	31PJ	8PJ till end 2010

\* Could possibly be 40PJ annually from mid-2007 till end 2024.

Based on the above estimates, total annual gas production until 2018 would be:

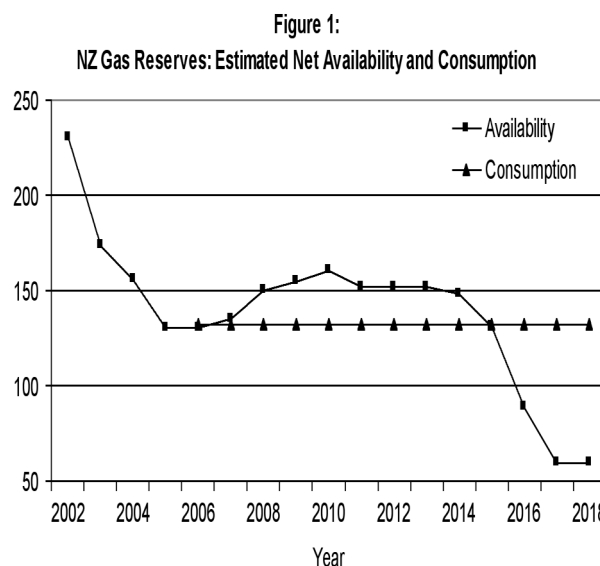
2007=	135PJ
2008=	150PJ
2009=	155PJ
2010=	160PJ
2011=	152PJ
2012=	152PJ
2013=	152PJ
2014=	148PJ
2015=	131PJ
2016=	89PJ
2017=	59PJ
2018=	59PJ

With NZ's present annual gas consumption being around 130 to 140PJ, it appears that available reserves can maintain this figure, or slightly more, until about 2015 with a rapid drop off from then on.

The above estimates of availability are plotted on Figure 1, along with the assumed future consumption of about 130PJ per year. It can be seen that for the calendar years 2008 to 2014, there may be a surplus available as the Pohokura and Kupe fields come on stream and before the Maui field starts to finally run down.

There will be a strong temptation to use up this surplus as it occurs, probably for additional electricity generation, rather than holding it in reserve for the post-2015 era when Maui gas is no more.

If this is the case, and unless significant new gas discoveries are made in the meantime, then it is likely that NZ will have to consider the possibility of importing either LNG or compressed natural gas from 2015 onwards, in comparison with other energy alternatives.



John Blakeley

## The Saga of Maui Gas

The history of the Maui gas field and its running down has been well documented in previous issues of EnergyWatch (Issues 28, 29 and 34). Presented below is a summary of some of the key points.

- The Maui offshore gas field was discovered in 1969, a very large gas field by any standard. It has been a most valuable energy resource for NZ.

- In 1973 a development contract was signed, based on the government's expectation that the gas would be used in large thermal power stations needed to supply a rapidly growing electricity demand.
- The contract included a "take or pay" clause because of the high initial investment cost in developing the field. Any unused gas within the agreed take-off allocation had to be paid for, but with the possibility of taking it later in the contract without further payment.
- There were some variations in the agreed take-off allocation but on average, the Crown agreed to take gas at a rate of about 135PJ per year for a 30 year period, intending to on-sell gas to end users.
- The Crown agreed to purchase 4060PJ of gas over a 30 year period from the opening of the field.
- It soon became apparent to the Government that the projected demand for natural gas was unrealistic, and by 1978 it could see that it was committed to buying more gas than it could use. This led directly to the "Think Big" projects of the early 1980's.
- The price of gas supplied under the Maui contract was always commercially sensitive information (although the Maui contract base price, and the formula used for adjusting it, were published in a 1973 White Paper. Insufficient allowance was made in the contract for price inflation over the life of the gas field. This gave gas users very cheap gas in the latter stages of the contract, but also acted as a disincentive for exploration and development of new gas fields until it could be clearly seen that Maui gas was coming to an end.
- Production commenced in 1979 but delays in completing the Maui A platform meant that the first gas deliveries were late and some small adjustment was made to off-take quantities.
- The contract made provision for parties to call for re-determination of gas reserves soon after completion of production well-drilling and then every two years. This would allow production quantities to be adjusted to ensure that the gas field lasted for its full scheduled operating life of 30 years.
- Re-determinations were not called for by the parties to the contract, at least publicly, and none were done until 2001, so no adjustments of allowable annual production quantities were made.
- Reserve estimates provided by the operators of the field were published regularly and remained a little above the contract quantity of **4060PJ** up to 2001, but there was little margin for error.
- The published figure of estimated recoverable reserves at 1 January 2001 was **4130PJ** of which 1324PJ remained at that date. During the following two years estimates tumbled until on 7 February 2003 the Minister of Energy stated that an independent expert had now confirmed the estimated total Maui reserves at **3562PJ** of economically recoverable gas (about 88% of the contract amount) with 367PJ still remaining as at 1 January 2003.
- This rapid decline in estimated reserves impacted very considerably on NZ's energy supply situation as Maui gas production then had to be cut back by about 60 percent. This led to a shortage of available gas to cope with the dry winter electricity shortage in 2003, and in the longer term for future electricity generation. It also led to the Methanex plant at Motunui losing most of its remaining Maui gas entitlement, which in any case was due to end in 2005.
- Under an agreement announced on 2 June 2003, the remaining gas reserves to be delivered at the contract price after 1 January 2003 were guaranteed by the Maui mining companies to be 367PJ. This agreement enabled the mining companies to develop (presumably at additional

expense) further reserves in the field to be sold at market price, which would be much higher than the Maui contract price.

- The most recent Energy Data File (January 2006) estimates total Maui gas reserves at **3730PJ** as at 1 January 2005 with 346PJ remaining in the field at that date. This is higher than the re-determination of the Independent Expert whose figure was an artificially low one based on an estimate of “economically recoverable gas under the Maui contract”, when the price of Maui gas had become less than half market price, because of the low inflation rate allowed for in the Maui contract.

- In April 2006 it was announced that the Maui mining companies were about to market an additional 200PJ of gas from the Maui field. This presumably increased the total recoverable gas from the Maui field to **3930PJ**.

- In late July 2006 it was announced that gas had been discovered on the northern side of a geological fault called Ihi which until then had been considered to be the northern boundary of the Maui field. No estimates of quantity of gas have so far been given, but speculation is that it could be in the range between 100PJ and 300PJ from this or other Maui "pockets". If the actual figure eventually turns out to be 150PJ, then the total amount of gas ultimately recovered from the Maui field would be **4080PJ**.

**Note:** No consideration has been given above to production of **condensate** from the Maui field. The Maui contract covers only the gas, and the owners of the field have always been free to sell condensate to any buyer at a market price. A gigajoule of condensate has a very much higher value than a gigajoule of gas.

EnergyDataFile indicates ultimately recoverable condensate reserves of 1132PJ compared with gas reserves of 3730PJ, **so about 23 percent of the total energy resource in the Maui field was condensate.**

## NZ Electricity Issues

### Risk of 2006 Winter Shortage “nearly” over by late April.

Heavy rainfall in the South Island breaking the drought on the Taieri Plains and bringing flooding to Oamaru had a clear upside for the rest of the country.

During the ten-day period from 16-26 April, the levels of the southern hydro storage lakes rose rapidly.

Over this period the level of storage in the hydro system nationwide rose from 71 percent of average for this time of year to 84 percent of average (59 percent of the maximum).

This meant that New Zealand was “nearly but not quite out of the woods”, in terms of experiencing a power crisis this winter.

Up until early April, hydro lake storage levels were tracking down a path similar to the 1992 drought year (when drastic measures were necessary to keep the lights on in major cities, including extensive use of standby diesel generation plant) but with the exception that unlike 1992, the North Island hydro storage lakes were in much better shape than the South Island ones.

Whereas at the beginning of April 2006 the overall NZ hydro storage position was nearly as poor as that experienced in 1992, over the following month the position improved past that of 2003 when a “winter shortage” was last experienced.

Storage levels are now close to matching those experienced at the same time in 2005 when there was no threat of a crisis.

Source: Article by Alastair Thompson in Scoop, 27/4/06

### And the Spot Price Falls Accordingly

During February and March the spot price had climbed steadily from a low point of about 8 cents per kWh in early February to reach a high

point of around 21 cents per kWh at the beginning of April before commencing to fall when the rains came to the South Island hydro lakes.

During the week Sunday 16 to Saturday 22 April 2006, the daily average electricity spot price fell by 18.8 percent from 15.7 cents to 12.8 cents per kWh.

Source: NZ Herald, Monday 24/4/06, pg. C15.

By mid-May the daily average electricity spot price had fallen to 7.2 cents per kWh, before rising with the onset of colder temperatures to 8.1 cents per kWh on Saturday 20 May.

Source: NZ Herald, Monday 22/5/06, pg C15

In mid July the daily average electricity spot price was 6.8 cents per kWh. After falling very rapidly from mid-April to early May, the price had then stabilised into a narrow range of between around 7 to 9 cents per kWh, and averaging a little below 8 cents per kWh, for the two month period from mid-May to mid-July.

Source: NZ Herald, Monday 17/7/06, pg C13.

## Transmission Security Requirements May Increase Power Prices

Power prices could rise as the Government turns up the heat on its energy and competition watchdogs. Moving to seek greater investment in the national grid could see the Commerce Commission allowing higher prices to take into account the cost of new infrastructure investment and new rules for grid operator Transpower (TP), including pricing the cost of land bought for new lines.

TP will be able to recover “reasonable” costs of acquiring land corridors in advance of approval for new pylons. At present, TP cannot recover its costs until its plans proceed.

Energy Minister, David Parker, said that the Government is emphasising to regulators the prime concern that the lights don't go out. **Security of supply is the paramount consideration.**

Auckland's power was cut for four hours on 12 June when two shackles holding up wires at the Otahuhu substation failed. TP has since agreed to a multi-million dollar upgrade and is considering whether a second supply line into Auckland is necessary.

During July TP declared a nationwide grid emergency, asking generators to crank up all available plant after a record surge of demand exceeded supply during a cold snap.

The Government also wants more investment in electricity generation but says that is unlikely to happen until investors can be sure that the national grid capacity can carry their product.

David Parker denied that he was criticising the Electricity Commission (EC) set up by the Government to help regulate the electricity industry but admitted that the EC had run into problems on plans to upgrade transmission lines from Waikato to Auckland. “I don't blame the EC for it but neither do I absolve either them or TP from responsibility for sorting it out” he said.

The Government's new Directives include telling the electricity industry that it wants the transmission grid to be adequately resilient against the effects of low-probability but high-impact events. It has asked TP to develop and submit upgrade plans for the EC for approval.

**“TP hasn't clearly articulated its long term vision for the whole of the grid from Benmore to Auckland” Parker said.**

He also said that the Government was considering whether to again allow lines companies to generate and retail electricity and would agree to this if it believed that it would add to security of supply. (Lines Companies were forced to divest their retail and generation businesses under the electricity reforms of the 1990's.)

Source: The Press, Tuesday 8/8/06, Pg A1

## Radio Discussion on National Grid Security

Below is a summary of a discussion on National Radio on this topic.

**Chris Laidlaw, Introduction:** Transpower (TP) believes that we must build more transmission lines and build them quickly to avoid future electricity shortages.

However the Electricity Commission (EC) says that TP must invest in cheaper and more profitable alternatives to the proposed 400kV transmission line from Whakamaru to Otahuhu.

He then introduced the panel of Dr Ralph Craven, Bob McQueen, Tony Baldwin and Roger Sutton.

**Tony Baldwin:** Transmission lines are the “highways” for transporting electricity directly from remote power stations to the towns and cities of NZ and, in some cases, directly to major industrial plants. NZ is a long and “skinny” country so these highways play a vital role in transporting electricity.

As the NZ population has grown, a need has arisen to upgrade and provide more capacity on these transmission lines. In 2001 TP said that it wanted to upgrade from a two lane to a four lane highway over much of the length of the country. Then in 2003 the EC was established and TP now has to take its plans for upgrading transmission capacity to the EC who put a couple of “rulers” across them.

**Ralph Craven:** The question is often asked as to why the national grid now needs to be substantially upgraded and has there been neglect in the provision of infrastructure? The answer is that the grid has been well maintained and it has done a good job since it was set up in the 1950’s, but as population grows, we are reaching the limits of capacity of the grid put in place that long ago, and sensible planning says that you now have to look at replacing that grid. There has been a lot of debate as to whether or not you need that new infrastructure in seven years time.

**Roger Sutton:** There has been a lot of debate about “why did we suddenly hit this particular wall?”, but TP in one form or another have always talked about the need for an upgrade, through various changes in their management.

In the early 1990’s TP came to Orion and said that there was a need to upgrade the transmission lines into Christchurch and Orion then embarked on a programme of reducing peaks in load to delay the need for the upgrade.

At that time under existing policy, local people would have had to pay for local upgrades. Recently that policy has changed to spread those costs across the whole country. From a regulatory point of view, the problem is that since TP is a natural monopoly, how do you ensure the people who are paying for this upgrade get the best deal?

**Ralph Craven:** There is a need to get the upgrade in capacity in place for when it is needed. There is an asymmetrical risk with very high costs of shortages and blackouts.

**Tony Baldwin:** Under the present legislation, responsibility for security of supply rests with EC, not with TP.

**Bob McQueen:** People in his organisation have been perceived around NZ in the light of the “Nimby Syndrome”. But there are alternatives available to a 400kV transmission line through the Waikato even just on the transmission side, which will give cheaper and more cost effective solutions.

**Chris Laidlaw:** There are a range of concerns of people living close to transmission lines and the concerns of Bob McQueen’s members seem to be somewhat different?

**Bob McQueen:** It is not true that we must have this 400kV transmission line by 2010 or the lights will go out and there are other alternatives.

Health issues will come up in the RMA process starting in August 2006. Land use, amenity values and health will be the key issues. TP says that a 65 metre wide corridor will be sufficient

but his organisation believes that a 300 to 600 metre wide corridor is more appropriate.

**Ralph Craven:** In making a comparison between 220kV and 400kV transmission lines, this is not comparing a 2 lane versus a 4 lane highway. Capacity relates to the square of the voltage so it is really comparing a 2 lane versus an 8 lane highway.

There is clarification needed over the responsibility of the EC in regard to security of electricity supply. The real debate which has not yet been held, is that under the current arrangements EC is responsible for **energy security** but TP has responsibility for **network security**.

There is a difficulty in open dialogue with EC which is something of a regulator. The EC do not have a planning role **and the TP role is the planning role**, to apply good electricity industry practice. Whether you require the grid upgrade capacity in 2010 or 2012, the role of TP as the national grid operator is still the same.

It was awfully difficult for his predecessors to proceed with transmission upgrades because of the need to negotiate for land acquisition but now the transmission line network is regarded as a “national good” and it is possible to get things done.

**Bob McQueen:** In the view of his organisation, TP hasn't done a good job in planning ahead and the EC has pulled them up because of this.

**Tony Baldwin:** There is some uncertainty over what the TP role is relative to that of the EC.

The problem is that in the case of the proposed 400kV transmission line from Whakamaru to Otahuhu, this is the first time that the new rules have been run for evaluating new transmission line proposals.

The test which is at the centre of the dispute right now is the grid investment test (GIT) which evaluates the costs and benefits of a transmission line proposal and compares alternatives versus the TP proposal to see which is the best one.

EC has said that the TP proposal is \$250 million more expensive than alternatives and hence it fails the test.

**Ralph Craven:** The heart of the issue is that the GIT does not coincide with good international practice for such tests. TP still does not know what is “inside the test”. An issue with this test is that it should be run by TP because they are the planning body, and the EC role is to say yes or no.

**Bob McQueen:** EC has been very willing to talk with his organisation about alternatives whereas TP was not willing to do so.

One of the alternatives which the EC has come up with is a HVDC alternative which is good for long distance electricity transmission.

His organisation no longer trusts TP to put forward a “balanced case” of what the alternatives are.

**Roger Sutton:** The EC alternatives being discussed at present are all transmission alternatives, that is making the highway wider. Both the EC and TP are putting forward new transmission ideas as a way of keeping the lights on. It is now too late to look at other (non-transmission) alternatives and we must now upgrade the transmission capacity into Auckland and Christchurch.

**Tony Baldwin:** One of the factors which the EC has looked at in evaluating alternatives is the opportunity cost of new investment put in place ahead of when it is needed, which could have been put elsewhere into the economy in the meantime.

**Ralph Craven:** In considering the alternatives to the TP proposal, HVDC operates best over long distances, separate from and in parallel with AC systems which can deliver electricity along the route.

In considering transmission alternatives into Auckland up to 2017, the transmission system operates at between 94 and 100 percent of capacity right now and the EC alternatives to 2017 require TP to operate at that level of capacity right through to 2017 and allowing for



no delays for factors such as extra time taken in resource consent processes etc. Operating at near full capacity does not enable changes to be made along the way, for example if present electricity load forecast increases are found to be low.

Also in comparing the options, the EC has allocated a huge parcel of money attributable to the benefit of delayed investment.

**Chris Laidlaw:** The EC says that it is proposing to convene a public conference in early July 2006, and the Parliamentary Commissioner for the Environment, Dr Morgan Williams, has been pleading for people to come up with a more rational debate on the issues involved.

**Bob McQueen:** The EC does front up to many public meetings to discuss the issues involved in transmission alternatives and is sometimes subjected to heated discussion at those meetings, but at its meetings, TP sends only a “well oiled PR machine”.

**Ralph Craven:** TP had received advice that as there are many such meetings being held around the country, if he was to attend any such meetings then if it was not to be seen as a snub to others, he would have to attend all such meetings.

**Chris Laidlaw: The Minister of Finance, Dr Cullen has recently said that he does not have confidence in the electricity market to deliver on energy security and also on other important factors such as the Government’s Kyoto Protocol commitments.**

**Tony Baldwin:** Transmission by its very nature tends to need central planning (although he did not want to comment on the related issue of location of new electricity generation projects in relation to sources of increased electricity demand, as this involves a number of other issues).

**However there does seem to be some ongoing uncertainty as to who (TP or EC?) has responsibility for ongoing security of electricity supply and the Government may need to address this issue.**

Source: Radio NZ “Sunday” programme. 14/5/06.

## One View of the Proposed 400kV Transmission Line

There has been quite a bit of activity over the 400kV transmission project. The Electricity Commission (EC) tentatively ruled against it, preferring as an alternative a series of incremental improvements that don’t involve major line building until about 2017. This had the clear advantages of being cheaper and of not committing NZ to feeding Auckland from the south while other possibilities develop. Transpower (TP) responded to this by commissioning a series of studies. These are now published and available on TP’s website. I have to say that I find them convincing.

The core of the EC’s proposal is to install steadily increasing quantities of reactive compensation to maintain voltages at the Auckland end of the lines. One of the studies makes clear that this is very much contrary to good utility practice, and that the extent of compensation in Auckland is already high by international standards. Further increases would put Auckland out in a domain not occupied by other cities. In an industry where conservatism is as essential as it is in transmission, this is damning enough, but they go on to explain why. As the level of reactive compensation increases, the power level that can be sent through the lines increases. The power level at which these lines would suffer voltage collapse also increases, but less rapidly, and the voltage at which the collapse occurs gets higher. The result is that the system becomes increasingly brittle. The symptoms of impending collapse become very weak, and the collapse when it comes is very fast.

The former means that system operators do not get warning that failure is close, while the latter means that normal means of averting collapse, such as emergency load shedding, cannot happen fast enough to be effective. We have yet to see whether the EC’s advisors (mainly PB Power) can come back with any defence of their proposals, but they may have their work cut out to do that.

I should make it clear that voltage collapse does not mean the sort of failure that Auckland

experienced on 12 June this year. It would mean the whole of Auckland and Northland blacked out, with the system further south also destabilised causing further areas to black out. The HVDC depends on a stable grid for its commutation. A badly upset grid with severe voltage and frequency anomalies would cause the Haywards converter station to shut down. This would likely black out the lower North Island. Isolated areas like the East Coast, supplied from Waikaremoana, could be the only places to retain supply. The South Island would probably escape unscathed, although there could be problems there if the loading on the HVDC was high at the time.

This is the sort of failure that happened in the Northwest USA and Canada a few years ago. Recovery is a slow painstaking process putting elements together one step at a time. Anybody trying to speed things up by switching something on too quickly sets the process back. The Northwest USA recovery took four days.

**The implication of this is that new line capacity is needed into Auckland by about 2013 at the very latest.** Some delay beyond 2010 can be achieved by using a couple of the EC's better suggestions, particularly the construction of a new substation at Huntly East so that the output of Huntly (including e3p) can be spread more evenly over the available lines. This is just as well, as the delay now going on probably means that 2010 is no longer achievable anyway.

A separate report dismisses HVDC as an option, but is much less convincing as it is focussed on multi-terminal HVDC, which is not essential. However I can't see HVDC as a reasonable option unless it is part of a long term development plan, which it is not as yet.

I can see only four options here:

**1. Stop almost all growth in electricity consumption in Auckland and Northland, effectively immediately.** With Auckland's population continuing to grow, this looks impracticable, and betting the stability of the grid on a programme hoping to achieve it would be irrational.

**2. Duplex a couple of the existing 220kV lines.** This means shutting the lines down for several months. We don't have the spare capacity available to enable this to be done. The EC's suggestion - build a bypass around each section while it is being worked on - ignores the constraints of the RMA. An alternative is to build a temporary power station or two. They could be single cycle gas turbines and run on gas if someone wants to buy part of the block of Maui gas now on offer by Shell. This is not a commercial proposition so the government would need to pick up the tab one way or another.

**3. Build new power stations** (at least two separate machines) totalling several hundred MWs in or north of Auckland by 2012. Wind can't do the job as Northland is a single wind province where all the machines could be on nil or minimal output at the same time. We don't have the gas for it, biomass could not be organised on that time and volume scale, so it would have to be coal or LNG. Possibilities would be Marsden B plus a Marsden C by 2012. This is not something SEF would want to advocate even if feasible, which is unlikely.

**4. Build a new transmission line as TP proposes.** A lower voltage with slightly smaller towers could be argued for, but if a new line is to be built, I can see no sense in not building it to be at least 400kV capable.

It is fairly clear that the 400kV is what we are heading to get. It is not clear that this is a bad thing, but it is certainly a shame that we are muddling into it without having done what should have been done years ago, i.e. take upgrade options while they are still feasible, and plan ahead.

*Murray Ellis, 27 June 2006*

## And Another View

Transpower's controversial 400kV "giant pylon" plan would cram still more transmission substation equipment into the overloaded Otahuhu isthmus. Perhaps the recent blackout was a warning, to signal that the idea makes very little sense.

More important is the overall strategy for providing Auckland's electricity in the long term. Should we depend on fossil fuelled power stations north of the isthmus? If we prefer to transmit wind and hydro energy to the city centre, how much capacity will be needed?

Transpower announced in 2004 its new plan for "step-change" to New Zealand's transmission backbone. Their vision has 400kV lines going right down from Auckland to Haywards, north of Wellington. The first step, the Auckland-Waikato link, is strongly supported by Meridian Energy and the other big generator/retailers and lines companies. But the mind boggles at the no-pylons campaign the rest of Transpower's "system vision" might unleash.

The companies are right in saying this strong transmission will help to get renewable energy - wind and hydro - right into the Auckland market. But they are wrong to imply that giant pylons are the only way to create strong transmission.

A different strategy could provide strong transmission all the way from the South Island to Auckland. The HVDC (High Voltage Direct Current) line, which now goes from the Benmore power station to Haywards could be extended to reach Auckland. This has several advantages.

**Environmental:** HVDC lines can be undergrounded far more cheaply than ordinary transmission lines - and especially than the proposed 400kV lines. They could be laid under harbours and buried through all the built up areas. They do not require the giant pylons used by 400kV lines.

**Security:** The converter station from DC (direct current) to AC (alternating current) could be located somewhere north of the Otahuhu bottleneck. The improvement to Auckland's security of supply is obvious - a single failure couldn't take out virtually the whole of the central city.

**Capacity and energy efficiency:** DC lines can carry far more electricity than AC lines. This means less energy losses under normal

loads, and far greater capacity to meet any load growth. If plug-in electric vehicles explode into world markets as fast as wind turbines did, then up to 10,000 GWh per year could be used in the Auckland region. Even 400kV lines might reach full capacity long before their design lifetime.

**Cost:** One half of the Haywards converter station uses old technology. It is scheduled for replacement in 2010. The converter stations are the most costly part of the DC technology. If the Haywards pole were replaced by a new converter in Auckland, the cost of the Haywards replacement would be saved. And the land lines used in DC transmission cost less than AC lines.

**Health:** DC transmission lines do not emit harmful electronic radiation - that is one reason the pylons do not have to be as high as AC pylons.

A transmission backbone of DC lines may even be cheaper, in standard economic terms, than what is planned today. The downside of DC is that it cannot be tapped into at any point. The converter stations are too expensive.

A DC backbone would therefore require more sophisticated controls, to manage power flows on the remaining network. But such changes are necessary in any case, to improve security of supply on the existing network, which is becoming old and somewhat unreliable.

Providing for New Zealand's future transmission needs won't fix today's blackouts. It is far less exciting, but critical today, to examine each part of today's system. What are the likeliest failure modes? What is needed to protect against each? This is a major exercise - rather like a medical examination. Proper diagnosis will require specialist knowledge, money, and patience.

Government can hardly be held accountable for specific incidents such as the latest Auckland blackout. However it can be strongly criticised if it does not require the Transpower Board to take remedial action, however costly and inconvenient, to prevent future blackouts.

Government also has ultimate responsibility for the choices made by the Transpower Board about how to upgrade the lines to meet growing demand. The 400kV strategy was launched by the Transpower Board soon after a new chief executive was appointed in 2003.

Now is the time to require Transpower to consider alternatives to its preferred strategy, and make a high-level assessment of costs, capacity and environmental implications of a DC transmission backbone extending to Auckland.

*Molly Melhuish, 27 June 2006*

## Power Peaks and Climate Change

### Climate Change

A study by the National Institute of Water and Atmospheric Research (NIWA) suggests a climate change pattern likely to have a major effect on rainfall in the Southern Alps and South Island hydro lakes may be happening.

The study suggests a 20 to 30 year change in the climate believed to be under way now. This could mean fewer westerly winds, less heavy alpine rain and much reduced inflow into the southern lakes, which in turn could lead to more power shortages.

A spokeswoman for the Minister of Energy, David Parker, said he had met NIWA representatives in the past month to discuss their study and has also asked MED officials to make sure this is properly factored into models for hydro storage.

A spokesman for Transpower (TP) said that TP received 6-month to 12-month climate predictions from NIWA but had not discussed implications of a 30-year cycle of change. He noted that any suggested major change of hydro storage would be of interest to TP but would not overly much cause an immediate change in plans.

### Power Peaks

Meanwhile the cold start to the 2006 winter has led to record electricity demand in many places.

The peak NZ electricity demand reached a record high of 6748MW between 5.30 and 6.00pm on Thursday 29 June. This followed earlier record peaks of 6676MW at the same time on Tuesday 27 June and 6630MW on Monday 19 June.

The 29 June peak was also a record high for the North Island of 4505MW and the South Island had a new record of 2248MW on Wednesday 28 June.

The Energy Efficiency and Conservation Authority (EECA) noted that record evening demand was stretching NZ's already fragile electricity infrastructure and issued a plea for consumers to think about power use, saying reduced peak demand would defer investment in the system and cut costs for all. EECA said that if people could use some appliances earlier or later in the evening it would reduce the amount of electricity required during the 5.30pm to 8.30pm peak.

Source: Dominion Post, Friday 30/6/06, pg A3

The total amount of electricity used has also reached record levels. Transpower has calculated that NZ's total demand of electricity on Tuesday 27 June was 132.6GWh, breaking a previous 24-hour record of 131.3GWh set on 17 August 2004. (Note that the average NZ daily electricity consumption is around 110GWh).

The North Island set a 24-hour record on Tuesday 27 June of 85.6GWh, while the South Island recorded a new 24-hour record of 48.3GWh on Thursday 22 June.

Source: NZ Energy and Environment Business Week, 5 /7/06.

### Power Boost for Aucklanders

Mighty River Power (MRP) is awaiting the arrival of a \$30 million gas-turbine generator to pump more power into Auckland at times of peak demand.

The generator which can produce 45MW of power is due to arrive from Texas, USA in mid-August and will be installed at MRP's Southdown plant in early December.

It will be used when electricity demand is at a peak - when electricity prices are high, and when hydro lake inflows are low.

The chief executive of MRP, Dr Doug Heffernan said that Auckland's electricity demand is increasing by about 45MW per year, equal to the capacity of this additional plant, but he said that upgrading the transmission line system to and around Auckland was a priority. The size of Auckland and the growth rate in that region make transmission upgrades important.

This additional plant will increase Southdown's total generating capacity from 125MW to 170MW.

Source: NZ Herald, Friday 4 July 2006, pg A2

Note: At times of peak demand, the Auckland region (and Northland) is now using about 2100MW, so an extra 45MW is just over 2 percent, or enough to meet about a year's demand growth.

## Southland's Coal Potential

The material below was held over from previous issues of EnergyWatch for space reasons but is still very relevant to the ongoing discussion on the future use of the very extensive deposits of lignite in Southland and South Otago.

### PM Says Southern Coal has Future Role

The Prime Minister Helen Clark, has indicated support for the development of a coal-fired power station in Southland, saying that the Government realised that thermal energy was going to be an essential part of the answer to the country's energy needs.

Ms Clark told the Southland Times that the region was sitting on "tonnes and tonnes" of coal that could be used to generate electricity. She noted that the Government was reviewing its energy strategy, and although it wanted to focus on renewable energy resources such as wind and water, it was clear that the weather didn't always "come to the party" and thermal will have a real role "because it is reliable".

Ms Clark said "it was important that NZ got better at planning how it used all its energy

resources and looked at alternatives to oil, such as biofuels.

Comalco NZ Managing Director, Tom Campbell, said that as more people studied the potential of coal, the more obvious it was that it was an important part of the answer to the country's energy needs.

"A coal-fired power station utilising Southland's lignites would be the best option once affordable, carbon-dioxide catching technology was available" he said.

"Comalco has already completed the basic designs for a \$1 billion coal-fired power station at the NZAS Tiwai Point plant in case it can't secure a favourable electricity price agreement with Meridian Energy beyond 2012.

Dr Don Elder, CEO of Solid Energy, said that his company was already in the middle of major studies into the viability of an integrated power station in Southland that could turn the region's lignite into electricity and other fuels.

The first draft preliminary report would be completed within a few months but planning beyond that date would have to be done very carefully in consultation with many other affected and interested parties. "It could happen by 2012" he said. "However that date was only a target that could tie in with the end of Comalco's present electricity contract with Meridian".

But Invercargill Green Party spokesperson Craig Carson, said **he doubted that the carbon dioxide-catching technology would be available at a commercially viable cost at any time soon and not within 10 to 15 years.**

Source: Southland Times, Saturday 4/3/06, pg 1.

### Energy Potential of Southland's Lignites

The future energy potential of the extensive deposits of lignite in Southland and South Otago was investigated by the then Liquid Fuels Trust Board in the late 1970's and early 1980's.

In an article in the NZ Herald, this topic has been raised by a middle-ranking Government official, Mark Aliprantis who said that coal and

lignite resources in the Southland region had the potential to play an important role in the energy sector as a primary fuel and as a means to produce electricity.

It was noted that lignite coal is “young and low grade”, making it uneconomical to transport and that “talk is now building” about setting up a \$1 billion plant to turn this low grade coal into methane, which could be used in a power station or converted into vehicle fuel, fertiliser or methanol.

The article states that technology needed to convert coal into diesel or methane is not new, but recent developments have made the process cleaner, with carbon dioxide emissions being captured and stored.

Mr Aliprantis is manager of petroleum and minerals investment in the Crown Minerals Section of the Ministry of Economic Development, and he said that NZ’s commitment to reducing greenhouse gas emissions did not mean that hydrocarbon resources would not be developed. “Our climate change policies simply mean that the costs to the environment of various energy options will need to be considered and managed” he said in a speech to a minerals conference in Auckland.

**The article noted that one deposit, the Hawkdun lignite deposit could provide as much energy as two Maui gas fields.**

“If the lignite was converted to transport fuels in the form of petrol, diesel or jet fuel.....it could provide 71 million tonnes of fuel, enough to provide NZ’s total requirements for 15 or 20 years” Mr Aliprantis said.

Alternatively if the lignite was converted to methanol it could provide annual export income of \$1.4 billion for the next 65 years or if used to produce electricity in a power station, the Hawkdun deposit could provide fuel to power all of the South Island’s electricity demand (about 30 percent of the national electricity demand) for the next 65 years.

Source: NZ Herald Friday 18/11/05, p C3

## Comments:

- Some very significant hurdles are being downplayed in this article. The synthetic gasoline plant at Motunui clearly demonstrated that although the methane to synthetic gasoline process is technically feasible, it is very much less economic than producing methanol (and for the latter part of its working life, Motunui only produced methanol for export). That process is also very wasteful of energy in the conversion from methanol to synthetic gasoline. However as implied in the article, there are other processes available for conversion from low grade coal directly to diesel fuel.
- If the Hawkdun deposit was to be used for generating enough electricity for the South Island's needs, does this mean that all the hydro-electricity from existing stations would be transmitted north with significant line losses and with a major upgrading of the HVDC link and Cook Strait cables being required to create an "electricity superhighway" at a cost of several billion dollars?
- How will the cost to the environment of exploiting these lignite deposits be "considered and managed"? Would a carbon tax be applied? Even at the present proposed tax rate in NZ of \$15 per tonne of carbon dioxide (since abandoned), this would be a very substantial annual sum, but overseas market trading figures suggest that the present rate should be higher than \$15. And would all that money then be used to purchase carbon credits overseas?
- The alternative of carbon sequestration (in which the carbon dioxide emissions are captured and stored) is unlikely to be economically viable, especially if there is no existing large underground cavity available for storage in that part of the country.
- Finally, if in the future voluntary measures for greenhouse gas emission reductions were to be agreed internationally in place of the mandatory requirements of the Kyoto Protocol (for developed countries), would this then mean that proposed new projects utilising the Hawkdun lignite deposit would be allowed to

emit large amounts of carbon dioxide into the environment with no cost penalty being applied for greenhouse gas emissions?

*John Blakeley*

### **Synthetic Fuel may be Made in Southland**

Two companies are investigating setting up billion dollar synthetic fuel plants in Southland as interest grows in the region's lignite reserves. Southland holds about 70 percent of NZ's lignite reserves.

It has been reported that Solid Energy is investigating a \$1 billion project to convert coal into diesel at a plant in Southland. A spokesperson for Solid Energy said that a number of options including synthetic fuel, electricity generation and gasification existed around Southland's lignite reserves

It has also been revealed that there is strong interest from the L&M Group and a consortium of overseas investors to develop a synthetic fuel plant in Southland. This would convert lignite into diesel and other fuels. The plant's heat by-product could be utilised to generate 500MW of electricity, and other industry could be attracted to an area where a reliable electricity supply existed.

A spokesperson for L&M Group said that production of liquid fuels was an attraction of lignite use. Electricity generated as a by-product could be sold for use in the national grid or fed to other industry attracted to the plant's electricity generation capacity. He said that a pre-feasibility study would be started early in 2006 and would take about a year to complete.

If the plant came to fruition, it would represent a US\$4 billion investment (NZ\$5.8 billion) and would produce 50,000 barrels of diesel fuel per day.

Source: The Southland Times, Monday 21/1105, pg 1.

### **Greenhouse Gas Implications**

An obvious question arising from the above news items is how much carbon dioxide is emitted in the process (mine to tailpipe) in converting coal to liquid fuel compared with using oil to produce diesel (well to tailpipe)?

A discussion took place on the SEF News electronic network on this topic with an initial estimate of twice as much carbon dioxide being produced with coal as the energy source, than is the case with oil as the energy source.

Later discussion suggested that because of the low rank of Southland Lignite, the ratio could be as high as four to one.

However when the overall emissions are looked at on the basis of the thermal efficiencies of the energy conversion process, the answer can vary widely depending on the efficiency of energy conversion.

Steve Goldthorpe noted that the old commercial coal liquefaction processes used in wartime Germany (direct liquefaction) and in embargoed South Africa (indirect liquefaction) had **poor thermal efficiencies of about 30 percent conversion of coal energy into transport fuel energy**. With this technology, the full fuel cycle greenhouse gas footprint of the coal-derived oil was about 4 times that from conventional diesel.

However, more advanced coal liquefaction processes were developed in the 1970's and 1980's in response to the oil shocks of the 1970's. These processes were "mothballed" in the late 1980's when lower oil prices became the long term trend. **The overall thermal efficiencies of such thermally integrated direct liquefaction processes were typically in the region of about 50 percent efficiency**. With this technology, the greenhouse gas footprint of the coal-derived fuels would be about 2.4 times that from conventional transport fuels.

It is possible that further innovative process improvements might result in the evolution of coal liquefaction processes with an overall coal to transport fuel conversion efficiency of up to 60 percent, and if so the ratio of greenhouse gas footprints could be as low as 2:1.

Hence even advanced coal liquefaction technology is bad news for climate change, as it is unlikely that the ratio of the greenhouse gas footprint of coal-derived fuel could be reduced to below twice that of conventional transport fuels.

Source: Various SEF News postings on 22 & 24/11/05.

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