EnergyWatch

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Why do we want an electricity market?

The issue of an electricity market has been around for many years, and anyone unwise enough to ask why we need one has been given some variation on "for economic efficiency." However, it should be obvious by now that having an economy — let alone an optimally efficient economy — is utterly dependent on human, material and energy resources: sustainability includes society and resources as well as the economy.

If the sole criterion for designing an electricity market is further increasing the efficiency of a near-optimum market, then little change is needed. The picture looks different if resources are considered: can we fuel new (or even existing) thermal power stations at reasonable cost? why are we giving tax breaks for gas exploration but not wind turbine development? what about Peak Oil? If society is a consideration the picture changes again. We are already committed to more climate change than will be good for us. If half of all species are expected to be extinct by 2050, what will happen by 2100? How close are we to the nasty non-linear surprises that are almost certainly lurking somewhere in climate change?

Considering the whole picture, wind turbines begin to look very attractive in a country with good hydro resources and lying across the roaring forties. We look in detail, on pages 3–6, at how wind can enhance our existing hydro resource.

Yet the wind resource is still widely ignored, not least by the electricity market. An important bias is that fuel costs matter little to a generator because they can always be covered by price rises: this market is designed to maximise profitability, not economic efficiency. If we introduce substantial use of the wind resource into the present market, the need to operate wind farms and hydro stations in concert will effectively restrict market competition to generators who have or can build hydro. Is this in New Zealand's interests?

It is time to ask the taboo question: is a market the right approach for electricity supply in NZ, or would we be better to return to something more like the old ECNZ model?

Any reasonable rejection of an ECNZ-like model needs clarity about how a market will provide electricity, reliably and at acceptable cost, in the face of a wide range of known or likely risks. The benefits of the current — or any new — model must be demonstrated, not assumed. For risks with particularly serious consequences, New Zealand needs to consider not only what is likely but also what is plausible: the precautionary principle comes into its own in the face of just this kind of major uncertainty, but how is the concept to be fitted into the market? The risks to be covered include: dry years; few and unequal participants; gaming; exclusion of demand-side solutions; carbon taxation rates; fossil fuel scarcity and scarcity pricing; and climate change, possibly including more frequent dry years. And possibly other problems undreamed of at this stage.

Just what was wrong with the old ECNZ? Did they over-provide for dry years with unnecessary stations such as Whirinaki? Was it excess profits perhaps? Or a lack of concern at the rate of Maui depletion *(See page 21 — EW)*? Clearly they weren't perfect, but were the admitted problems really too deep-seated to be addressed by redefining objectives?

Or was the market solution implemented without the problems ever being defined?

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What if?

Opinion

What if New Zealand unilaterally declared that it would implement the Kyoto Protocol when ratified by countries representing say 40% of developed country emissions, instead of the presently agreed 55%? We would need a rider about the rest of the 40% making the same declaration. The effect could be to allow the countries that have already ratified, less some smaller backsliders, to get on with it.

If the tactic worked there would be multiple advantages:

- Delay in implementing Kyoto minimised.
- Removal of the uncertainty around future policy, such as the date of introduction for the carbon charge (but not the charge rate).
- Pressure on the Russians to ratify, because implementation without them would leave them with much less leverage on the EU and a risk of losing out badly.
- Pressure on the Australian government (and possibly even the US) to rethink: missing the bus can be much worse than stalling it.
- Brownie points with the EU and Japan — and very possibly others — for kick-starting Kyoto.
- Boosting our 'clean green,' 'honest broker' and general 'good neighbour' images almost everywhere, remembering that there are important pro-Kyoto constituents in both the US and Australia.

What if it didn't work? We would still do well on Brownie points, and the only downside might be a slight deterioration in relations with the current US administration.

EnergyWatch has drawn attention before to Parliamentary Commissioner for the Environment Morgan Williams' point about looking at energy in terms of shock-proofing against coming instabilities. We are now seeing plenty of instability and some strong hints that we are at a major tipping point: the gathering plausibility of peak oil coming early; the frightening implications when it does come; escalating chaos in the Middle East; the recent US power failure and upcoming gas scarcity; and huge increases in gas prices.

What if?

Matching the wind and hydro resources

From a debate on SEF News

Wind and hydro are particularly complementary because the wind is more reliable than the rain on a monthly or annual basis, and hydro can back up the wind on a daily or weekly basis. Hold those facts in your mind and everything else is detail.

1 Introduction

The discussion behind this article grew out of a claim by Bryan Leyland that a large wind resource (apparently taken as a single 600 MW wind farm) would need 400 MW of thermal back-up to cover calm days. With the current gas shortage and need for new capacity, Leyland claimed that that would mean coal.

Unsurprisingly, most SEF News contributors took another viewpoint, that wind and hydro work well together. But perhaps the most important outcome was to highlight the uncertainties, which are too numerous and too large for comfort. Much more data is needed. Some areas for research are listed at the end of this article.

The counter-argument to the thermal back-up claim is that wind (and other intermittent resources) can be developed in three stages:

- In the short term, with a fairly small developed resource, the variability of supply can be treated as 'noise' on the supply side — smaller in scale and no different in principle from the present demand-side variability — and managed in the same 'package'. Wind turbines can be either on the grid or embedded in a distribution system. The installed capacity of NZ wind farms is at present about 35 MW (~160 MW by the end of this year), 0.5% (2.2%) of the maximum demand of about 7 GW, and well within the limits of this 'noise' approach.
  It was widely accepted in the group that this approach will take us up to at least 10% of total capacity from wind. If this figure is accurate and we can manage an internationally typical 30%/yr growth rate, we could be there in about 2015.
- As the wind resource grows beyond 10% or so of total supply it will need to be stabilised by 'pairing' with some kind of back-up power source, as mooted by Leyland. In New Zealand the best choice is hydro because wind and hydro can back up each other. When the wind blows the hydro stations conserve water and when it doesn't they take over supply: what Neil Cherry described as "virtual pumped storage."
  It was thought that this approach will cover using wind to meet at least a third of demand (two thirds from one commentator), so 30% growth in the wind resource might get us to this stage soon after 2020.
- Special measures may be needed if the wind resource grows to a very high proportion of supply — more than 30%. Such measures might include extra turbines in some hydro stations, for use when there was no wind; or arranging for some hydro turbines to 'run backwards' in strong winds to supply 'real' pumped storage for later use. Other storage media, such as biomass or hydrogen, might also be possible.

2 Windfarm and wind turbine characteristics

By the time we need wind/hydro partnerships (the second phase above), the wind resource will be say 700–100 MW capacity and spread over perhaps 5–10 large wind farms, plus some smaller facilities. At that stage an unexpected change in the wind strength will not affect all wind farms together, and at the wind gust level will not even affect all turbines in a single farm. The wind resource as a whole is much more stable than a single windfarm, let alone a single turbine.

New Zealand wind farms generally develop 40-45% of their rated capacity (an average of at least 40 MW from a 100 MW wind farm). This is better than many local hydro stations and most overseas wind farms.

A difficulty at this stage is that most wind data is recorded near sea level, but wind farm sites are typically on ridges 300 m or more above sea level, and the energy conversion takes place another 100 m or so higher still. We should probably be recording wind data at far more sites, as well as developing weather and topography computer models to locate and select the best sites.

If significant numbers of wind turbines are asynchronous there may be issues of grid stability. However, at least one design is synchronous and can if necessary 'follow the load.' All designs can if necessary be shut down when there insufficient load.

3 Hydro characteristics

Two helpful characteristics of many hydro stations are:

- Excess capacity (MW), well beyond the capacity of normal river flows to cover 24 hour supply. A typical load factor is 0.3–0.5, so a station working in concert with enough wind turbines could in theory provide two or three times more energy (GWh) than it could alone. Obviously there are practical limits to this: see below.
- Hydro can in principle be shut down and started up relatively easily, allowing the concerted operation needed to get the best performance from both resources. However, in practice there are some quite severe station-specific limits: see below.

A less helpful characteristic of hydro is that we have already developed much of it. Indeed, our dry-year capacity is slowly slipping backwards as the lakes silt up. An article in e.nz (March 2004) suggests another 1000–2000 MW of hydro that is "economic and with limited environmental impact," or some 20–40% of current hydro capacity.

Most hydro stations have site-specific practical limits on how they are operated:

- Resource consent limits (almost everywhere, and Roxborough in particular).
- Multiple stations handling the same flow cannot operate fully independently, and may have to operate almost as a single system if storage is limited. We understand that running water down the Waikato from Taupo to Karapiro takes about 3 days, and both the Waikato and the Waitaki have to have a near-constant discharge from the lowest dams on each system.
- All stations have a response rate limited by the inertia of water approaching and leaving the turbines, which will limit the rate of start-up or load response. This may be a few seconds up to several minutes — Manapouri, with its 11 km tailrace tunnel, is probably the worst, but some canal-fed stations might also be interesting.
- If and when additional turbines are needed to provide 'real' pumped storage, anything more than a very short canal can only run backwards at reduced capacity, and longer canals (with a head loss greater than the canal depth) cannot run backwards at all (Waitaki).

An interesting possibility is a mention by Bryan Leyland of a massive pumped-stroage scheme near Roxburgh. *(See 'New DC link proposed,' on page 26 — EW)*

4 Thermal characteristics

Ramping the turbines of thermal stations up and down not only lowers their efficiency, it lowers their life expectancy. There are similar issues with the boilers at Huntly and New Plymouth. Another issue is fuel storage. Oil is expensive; gas in the quantities needed will tend to be on a long-term take-or-pay contract; and coal deteriorates in storage.

5 Controlling the system

Wind is probably more reliable than rain on a monthly or annual basis, but more important is that wind and rain together are substantially more reliable than either. Apart from occasional extreme events (this was written in late February, after clearing fallen trees) there is little correlation between wind and rain: dry and windy days are as commonplace as wet and calm. To illustrate the gain available, assume that there is no correlation and the wind and hydro resources are equal. The chances of a 1:20 dry year and a 1:20 calm year coinciding are then 1:400. This assumes (unreasonably) that 'dry' and 'wet' are on/off quantities but it gives the general idea, and in practice even a small part of such a large risk reduction is attractive.

A common source of wet and dry years is changes in El Niño/La Niña. These contrasting conditions affect rainfall but the wind still blows, and wind farms placed to take advantage of both states will continue to perform well.

One commentator thought there is too much emphasis on the dry year concept. We are working our hydro stations harder than in ECNZ days because of growing demand, and are now at risk in dry periods lasting only 4–6 months, even in a year with adequate total rainfall.

In general, the wind resource will not fail so quickly that hydro back-up cannot be brought on as needed, so there should be little or no need for additional 'spinning reserve'. It is in any case usual to have enough spinning reserve to cope with a failure of the South Island DC link. This contention is supported by a report by the Australian Wind Energy Association (www.auswea.com.au), which concludes that even in Australia's thermal-dominated grid:

2 *Fluctuation in output from wind farms does not in itself necessitate additional back-up from fossil fuel.*

(point 3 omitted)

4 *Wind power output is intermittent, but the output from wind farms can be usefully predicted as much as 24–48 hours in advance and has a relatively small*

impact on network variability compared with the demand fluctuations which already have to be managed by the network. With increasingly effective data collection aggregated across Australian wind sites, forecasts could be further improved to significantly benefit effective network management and minimise impacts.

However, this is not to say that wind and hydro can be fully interchangeable. Limitations on windfarm development are:

- There must be sufficient 'other' generation to meet peak load on a calm winter day, or several such days. An alternative for brief daily peaks might be contracted load shedding.
- The wind farm limitations given in Section 2.
- When 'pairing' of wind and hydro is needed (Section 1), the hydro station limitations given in Section 3.

A current problem with the grid is limited capacity to follow the demand curve, for both hydro and thermal (Sections 3 & 4). Wind farms able to follow demand may actually enhance system stability, at least some of the time.

6 Governance

At present the few wind turbines are effectively ignored in setting a merit order: by default they are as far up the order as the wind allows. As exploitation of the wind resource grows this will need to change, as 'virtual pumped storage' leads to more water being spilt from the dams.

Some commentators have seen this as a problem, but is it? Certainly, spilling water in September would suggest over-investment in windfarms, but given the variability of wind and rain — to say nothing of demand — something has to give. It is not clear that using a thermal station with high running costs and probably high carbon emissions (Whirinaki or embedded diesels) is better than a spill. Avoiding either event tends to increase the risk of the other, but getting either is still better than power cuts.

There is no point in using wind turbines as 'virtual spillway pumps,' but it doesn't have to come to that. Shutting down windfarms is possible but finding an interruptible load would be more cost-effective. Perhaps the most likely loads are heating, pumping or splitting water; for domestic and commercial use, pumped storage or hydrogen respectively.

In a carbon-constrained world it seems obvious that wind should be near the top of the merit order, well above thermal, a bit above geothermal (which also has carbon emissions) and more-or-less jointly with hydro. However the market (bluntly described as a cartel by some SEF News commentators) may take another view.

In practice there are limitations on how much thermal can be displaced — from demand growth and long-term equipment damage to long-term fuel contracts — but many of them can be minimised if this objective is written into contracts. There is urgent work for the Electricity Commission here. One commentator said:

This... was originally the reason why a 'competitive' market was opposed by almost all consultants asked to recommend it, and is probably a good reason for returning to central control, with other ways of having competitiveness.

A commercial concern is that as wind turbines generate enough electricity to need 'pairing' with hydro resources, a small turbine operator would be at a market disadvantage. However, a practical counter-argument is that by the time we get to this stage the NZ market will be tight enough for viable contracts to be available. A group of hydro stations backing up a group of wind farms will be more reliable than a one-windfarm, one-hydro station system, but how will that fit with the market? If and when we get to the stage of needing extra hydro on appropriate existing stations, will generator cartel considerations make this impossible?

7 Conclusion and questions

There is a lot of uninformed opposition in NZ to wind generation, despite the fact that it is proven technology in several countries (such as Denmark, Germany, Spain, India and the US) and is a key part of the renewables strategy for development in several others (such as the UK and Australia). And if a narrow, mountainous country lying across the roaring forties cannot do at least as well as these, surely we are doing something wrong?

The conclusion is that wind and hydro can make near-ideal partners, but that conclusion is backed up by far too much analogy and assertion (such as the previous paragraph) and far too few numbers. Surely the case for wind is strong enough by now to justify much more work on quantifying the resource?

We give below some of the questions raised by the discussion group as needing research. The focus here is on wind energy but many of these research questions also apply to other intermittent and non-storage renewables on both supply and demand sides, such as solar (PV or thermal).

Technical:

- What proportion of total generation can be wind, with its variability treated as 'noise'?
- What proportion of total generation can be wind, 'paired' with hydro?
- What is the maximum proportion of total generation from wind, with additional (water) turbines on existing hydro stations?
- Is there significant capacity for pumped storage, to back up the wind resource on an hourly, weekly or even seasonal basis?
- Will further wind resources ever need to be backed up by additional 'spinning reserve' (hydro or thermal)? If so, how much spinning reserve and at what level of supply?
- Where are the best windfarm sites?
- What is the variability of the wind resource?
- What is the variability of the wind and rain resources, taken together? What is the effect of El Niño?
- How reliable are wind forecasts, and site-specific power output forecasts derived from them? What improvements are practicable?
- Will wind turbines introduce grid stability problems? If so, what types of turbine are a problem and at what proportion of generating capacity will problems appear?
- How should wind power be dispersed around the country, and maybe offshore?
- How can the hydro system be best operated to maximise the benefits from hydro-windpower integration?
- How can we ensure that the market does not marginalise the wind resource?

Governance:

- Who is responsible for grid stability?
- How can the electricity market be prevented from excluding or limiting wind?

Let us hope that the Electricity Commission, with its modelling responsibility, addresses these ongoing issues openly, to ensure that both market players and academics are well informed.

Offshore wind farm potential

Kerry Wood

A point made in the SEF discussion group recently is that New Zealand has little potential for offshore wind farms because we don't have any shallow seas. Maybe not shallow *seas*, and we have plenty of *onshore* potential (although how much depends on doing the research and limiting NIMBY-ism).

But we also have a lot of coastline. It isn't all underwater cliffs so there should be some potential for offshore wind farms out there. Any such sites will have the usual offshore problem of high cost, but the benefits of strong winds, greater scope for using large machines and much greater acceptability. Overall, installed MW costs offshore are thought to be about double onshore costs, but the offshore cost disadvantage tends to be lower for GWh generated: it is windier at sea (but it is also windier on our high ridges).

It is time for some preliminary desktop research. The shallowest depth contour on the general chart of marine NZ (No 4600) is 30 m. This is about right for a first cut: European offshore windfarms tend to be in about 12–30 m of water. Coastal potential is given in the table opposite.

Making some very coarse assumptions about the generating potential of these areas:

- Half the chosen area is unsuitable because the water is too shallow or the swell too great (access).
- A quarter of the chosen area is unsuitable geologically, or on navigation or amenity grounds.
- The remaining area (a quarter of the total) is suitable and can have say 3 MW wind turbines spaced at 500 m intervals, achieving 45% loading. That is 12 MW/km^2, 47 GWh/km^2 yr.

Overall, the total offshore wind resource has a potential installed capacity and energy delivery at least an order of magnitude greater than needed at present. Could there be a long-term opportunity here, to use the electricity to make hydrogen, then reform it into methanol for export as a transport fuel? Such large-scale process just might be worth while when Peak Oil is with us, although NZ's wind resource would have to bring very substantial cost savings over lesser resources closer to the point of final use.

Potential for wind farm sites	gross km²
North Island	
Cape Palliser – Kapiti Island Deep water close inshore	—
Manawatu Bight: Kapiti Island – Wanganui Maximum offshore extent ~ 10 km	1000
S Taranaki Bight : Wanganui – Mania (15 km W of Hawera) Maximum offshore extend ~ 28 km	2200
Mania – Urenui (30 km E of New Plymouth) Assumed impractical: offshore boulder fields	—
N Taranaki Bight: Urenui – Awakino	600
Awakino – Cape Reinga	—
Cape Reinga – East Cape	—
East Cape – Cape Kidnappers Assumed impractical: there is surprisingly little shallow water and most of it is in areas of high amenity	—
Cape Kidnappers – Cape Palliser Deep water close inshore	—
North Island total Ultimate potential ~40 GW, ~160 TWh/yr	~3500 km²
South Island	
Marlborough Sounds: Nelson – Robin Hood Bay Assumed impractical: high amenity area	—
Cloudy Bay: Robin Hood Bay – Cape Campbell Maximum offshore extent ~ 12 km	1100
Kaikoura: Cape Campbell – Gore Bay Deep water close inshore	
N Canterbury Bight: Gore Bay – Banks Peninsular The main potential is at the S end, extending out to 50 km offshore	1600
S Canterbury Bight: Banks Peninsular – Taiaroa Head (Dunedin) The main potential is north of the Waitaki River, extending up to 17 km offshore	4600
Taiaroa Head – Waipapa Point (50 km E of Invercargill) Deep water close inshore	—
Foveaux Strait: Waipapa Point – Te Waewae Bay The main potential is off Invercargill and the Waiau River, extending out to ~ 15 km offshore. (Waters off Ruapuke and Stewart Islands ignored because of conservation values and likely danger)	1600
Te Waewae Bay – Puysegur Point	—
Puysegur Point – Farewell Spit Deep water close inshore	—
Golden Bay: Farewell Spit – Abel Tasman National Park Maximum offshore extent ~ 12 km	1000
Abel Tasman National Park Ignored — high amenity values	—
Tasman Bay: Abel Tasman National Park – Nelson	800
South Island total Ultimate potential ~120 GW, ~500 TWh/yr	10 500 km²

On this probably conservative basis the potential of the five most promising areas is:

S Canterbury Bight	55 GW	4600 km² 220 TWh/yr
S Taranaki Bight	26 GW	2200 km² 100 TWh/yr
N Canterbury Bight	19 GW	1600 km² 75 TWh/yr
Foveaux Strait	19 GW	1600 km² 75 TWh/yr
Cloudy Bay	13 GW	1100 km² 50 TWh/yr
Totals	130 GW	530 TWh/yr

ExxonMobil joins the fold?

ExxonMobil has produced a paper, "A report on energy trends, greenhouse gas emissions and alternative energy." Not exactly a conversion on the road to Damascus, but there are vaguely approving nods towards energy efficiency (we're doing it) and renewables (more research needed). Even climate change is not entirely ignored:

ExxonMobil recognizes that although scientific evidence remains inconclusive, the potential impacts of greenhouse gas emissions on society and ecosystems may prove to be significant. To address these risks...

But the centrepiece is a curve of world petroleum production showing a steady rise until about now, but then production **from existing facilities** beginning to decline at 4–6%/yr. The curve suggests that by 2012 new (post-2003) production will have to meet half of all supply.

Their recipe for this challenge? More investment, in petroleum, **big** investment.

http://www.exxonmobil.com/corporate/files/corporate/Energy_Brochure.pdf

Storm in a bathtub

(Is the northern hemisphere temperature curve for the last 600 years a 'bathtub' or a 'hockey stick' and why does it matter?
More seriously, is bogus science being used to redefine the problems of climate change and resource depletion, confusing both public and decision-makers? — EW)

The challenge

On 19 February an e-mail from Bryan Leyland was indirectly posted on SEF News, challenging the whole concept of climate change:

...I think its all in the name of Kyoto etc.

If you follow this link, you will see that there is convincing evidence that Mann's fabled 'hockey stick' is probably based on sloppy — and perhaps fraudulent — research. Read it and wonder why Mann has decided to go to ground rather than defend his research.

http://www.envirotruth.org/news/climate_Annus_Horribilis.cfm

Should the economic future of the country be put at risk in the name what may turn out to be scientific fraud?

No abuse please. Just read the paper and give us objective comments on the science — or lack of it.

And in a later message:

The whole point is that the IPCC summary — NOT the IPCC report — claims that the world is warmer than it has been in the last 1000 years (now disproven) and that the rate of warming is unprecedented. Also disproven.

This is the core of the argument driving Kyoto.

That the summary does not reflect the report should give you and others serious disquiet. Why it doesn't I do not understand.

M&M have raised serious questions. Mann has refused to answer them because he can't?...

The source

The source of Leyland's challenge is a paper on climate change by Stephen McIntyre and Ross McKitrick (M&M): *Corrections to the Mann et al (1998) proxy data base and northern hemispheric average temperature series*, published in Energy & Environment, Vol 14 No 6, 2003.

The key diagram in the M&M paper shows two curves of temperature index against date (1400–1980), from both their own work and Mann et al. The two curves are much the same for the 20th century but the new results are up to about 0.15˚C warmer for the 19th century, similar again for a minimum in the late 17th century but then diverging wildly — up to 0.6˚C warmer — over the period 1400–1550.

The paper is complex and EnergyWatch is in no position to comment directly, except to say that:

- If it is correct it may lead to a new paradigm — so it needs to be good.
- Extravagant and inflammatory claims are made. This is just the abstract:
  The data set of proxies of past climate used in Mann, Bradley and Hughes... for the estimation of temperatures from 1400 to 1980 contains collation errors, unjustifiable truncation or extrapolation of source data, obsolete data, geographical location errors, incorrect calculation of principal components and other quality control defects.
- The temperature rise given by M&M for the 20th century (from both papers) is only about 0.43˚C, when it should be 0.6˚C (IPCC) or perhaps 0.7˚C on more recent data. The difference seems to come from truncating the data at about 1980 and smoothing with a 20 year running mean, so the information presented effectively ends over 30 years ago. The visual effect is to present the 20th century warming as only 70% of the true value.
- Neither McIntyre nor McKitrick claim to be climate specialists. McIntyre gives only a street address — no position or qualifications — and McKitrick is from the Department of Economics at the University of Guelph, Ontario; again, no position or qualifications.
- The M&M paper contains an unusual claim:
  No funding from any source was sought or received for this research.

The response

A Google search on McIntyre and McKitrick turned up 719 references. One of the first is enough to confirm the impression from a cursory look at the paper. The Google piece is a response by Mann et al to a spin-off article in 'USA Today' by someone called Schulz:

Mr Schulz draws on a recent article by Stephen McIntyre and Ross McKitrick that appears to contradict Mann's earlier work and the conclusion that the Northern Hemisphere is warming. Unfortunately, the data on which the McIntyre & McKitrick analysis was based, which was forwarded to them by a colleague of Mann's at the request of McIntyre & McKitrick, was

inadvertently scrambled during tabulation for transmission to them, rendering the data for earlier centuries useless. Had McIntyre and McKitrick directly downloaded the data from the publicly available website which they were encouraged to do by Mann's team, this would not have occurred.

McIntyre & McKitrick then applied a flawed methodology to the scrambled data, and reached mistaken conclusions wildly at odds with the many peer-reviewed scientific studies.

Had the researchers themselves been experts, had they sought comments in advance from experts in the field (including Dr Mann), had they submitted their paper to a reputable scientific journal, all of which are standard procedures in scientific publication, the flaws would have been discovered. Instead, the authors, who are not scientists — one is a mining executive, the other an economist — published their article in a social science magazine that does not apply widely accepted standards of review by scientific experts.

Had Mr Schulz followed the standard procedure of getting his article reviewed, it would have become apparent that there was a problem with his story. Considering how such inaccuracies are propagated, it is perhaps relevant that Mr Schulz's website, TechCentralStation.com, receives considerable funding from Exxon-Mobil...

Mann and his colleagues conclude their letter with temperature index curves that look very different from that of McIntyre and McKitrick, and also 'smell' better: more than two curves, prepared in different ways; the historic temperature record where available; a range of uncertainty given for the proxy data; and so on.

A much more technical criticism by Mann et al is also on the web, and some of it is enough to raise doubts in the least technical reader:

The reader must do a considerable amount of detective work, based on scrutiny of the Tables in [M&M] *pages 20–23 and the indicated data links, to determine just what data have been eliminated from the original* [Mann et al] *network. A preliminary attempt to do this already demonstrates that their deletion...*

[Mann et al] *employed the standard statistical tool of cross-validation to verify the skill of their reconstructions.* [M&M] *describe no such tests. Since increasingly sparse networks are used progressively farther back in time, a series of cross-validation experiments have to be performed to estimate the skill for different time intervals... The skill can be described by a 'Reduction of Error' statistic (RE), which is bounded by negative infinity and positive one, with substantially positive numbers indicative of predictive skill. The mean expected value for a random estimate is -1. For the reconstruction with the data eliminated in a manner similar to that implicit in the* [M&M] *approach, the RE score (-6.6) is far worse than even a typical random estimate...*

The above discussion should be adequate to provide readers with a sense of the depth of the flaws underlying the reconstruction achieved by [M&M] *that is so at odds with at least a dozen other recently published empirical and model-based estimates of Northern Hemisphere mean temperature changes in past centuries.*

The backers

That bit about Exxon-Mobil tends to confirm an impression given elsewhere. The web address given by Leyland leads to an organisation called Envirotruth where you will find information on a series of statements described as myths, such as:

Myth #1C: Climate change is occurring at an unprecedented rate.

One of the facts given to dispel this myth is that:

About 15 000 years ago, while the planet was still emerging from the last ice age, Greenland's temperature rose by 9°C in only 50 years.

That is generally accepted. However, the claim to be dispelled is that the rate of climate change is unprecedented in **recent** history (only 600 years in this case), not completely unprecedented. What this fact really demonstrates is that there are non-linear traps lurking in climate change. It does **not** demonstrate that rapid climate change is either commonplace or good for us.

The Envirotruth site claims to be sponsored by the National Centre for Public Policy Research in Washington DC. A link takes you to the NCPPR homepage where they describe themselves as:
A conservative free-market foundation established in 1982 and located on Capitol Hill.

Some of the headings on the homepage cover subjects suitable for EnergyWatch, but with a rather different spin:

Tinkering With Energy is Playing With Fire:
Cap and Trade Schemes are Regressive, Placing Burdens on Low-Income Communities...

Anti-SUV Activists Versus the American Family
When you get behind the wheel of your SUV or minivan, do you automatically become a member of a hate group? According to the radicals now dominating...

Smart Growth & Its Effects on Housing Markets: The New Segregation
Policies to combat sprawl penalize minorities, the

poor, urban families and the young, says an econometrics report ...

The Guardian Weekly (6 Nov 2003) describes smart growth as, "...no more than the kind of forethought before building that has been routine in Europe for half a century."

The conclusion

The paper cited by Leyland makes paradigm-changing claims, which he says disprove the core of the argument driving Kyoto. A common-sense requirement is that such a conclusion needs a high standard of proof: qualified authors; thorough peer review; consistency with other research; thoroughly checked data and methodology; and so on.

Leyland claims that Mann et al have "gone to ground" rather than defend their research, but a few minutes on the web shows that this is untrue: the original paper's authors have raised all these common-sense points, both technically and in general terms. If Mann and his colleagues have gone to ground since, that may have been because of an e-mail blizzard similar to one on the same subject that briefly forced closure of the IPENZ website.

In summary, a complex research paper is published in an un-refereed journal, by unpaid authors with no relevant qualifications. They realise that they have scrambled data and present it as such in their paper, but without checking why it is scrambled — they want to believe it is nonsense. They then criticise the original authors without checking either methodology or consistency with either other published work or other workers in the field — they skip the reality checks. Their paper is then trumpeted around the world by well-funded groups with doubtful devotion to science and an astonishing facility for jumping to pre-set conclusions. Indeed, this facility might well explain the missing checks.

Leyland asks for objective comments on the science. We are not competent to comment in detail, and nor presumably is Leyland. However, we believe we have been detailed and objective enough to show that this paper is very unlikely to be objective science. Certainly it is not being promoted objectively.

If and when:

- The paper is published in a reputable, refereed journal, either as-is or in revised form;
- The data and methodology are fully and independently assessed by experts in the field;
- Any discrepancies with the peer-reviewed literature are rationally explained and independently verified by workers recognised in the field (not necessarily Mann et al);
- The telltale signs of disreputable, politically motivated pseudo-science diminish or disappear;

EnergyWatch will be interested.

The Holcomb hallucination

Another pseudo-science item in the news recently was a presentation in Wellington by Dr Robert Holcomb. According to a breathless press release it was before an audience of NZ government, business and environmental leaders that Holcomb, "announced today for the first time a revolutionary new technology, Electron Stream Carbon Dioxide Reduction (ESCO2R) commonly called the Carbon Dioxide Converter that goes to the heart of the current environmental problem."

To fully burn coal and end up with carbon is fantasy, unless more energy has been put in than was released by burning the coal (combustion of the non-carbon components is no more than making coke or charcoal). Coal is mainly carbon, so if this process worked we could get unlimited energy by recycling the same bucket of coal. The whole thing is no more than perpetual motion, 180 years after the concept was shown to be impossible.

Energy Analyst Steve Goldthorpe comments that we already have an excellent device to convert CO_2 into a carbonaceous solid: a tree. It may be slow but it does obey the laws of physics. He likens the Holcomb claim to that of an Irish friend who used to cycle to church on a Sunday by one route and home again by another: she claimed that it was downhill both ways.

Holcomb is a specialist in Paediatric Neurology. EnergyWatch is reminded of a phrase from the era of Uri Geller and spoon bending:

We can be so open-minded that our brains fall out

No benefit-of-the-doubt needed here.

Bush 'guilty of twisting science for political ends'

The Bush administration is guilty of misrepresenting scientific knowledge and misleading the public, a group of America's most senior scientists have claimed. They said the government had manipulated information to fit its policies on everything from climate change to whether Iraq had been trying to make nuclear weapons.

The open letter from the Independent Union of Concerned Scientists said:

When scientific knowledge has been found to be in conflict with its political goals, the administration has often manipulated the process through which science enters into its decisions...

The phrases 'sound science' and 'peer reviewed' seems to indicate good science, but beware: Chris Mooney says that these phrases:

...don't necessarily mean what you might think. Instead, they're part of a lexicon used to put a pro-science veneer on policies that most of the scientific community itself tends to be up in arms about... In this Orwellian vocabulary, 'peer review' isn't simply an evaluation by learned colleagues. Instead, it appears to mean an industry-friendly plan to require such an exhaustive analysis that federal agencies could have a hard time taking prompt action to protect public health and the environment. And 'sound science' can mean, well, not-so-sound science.

Dig into the origins of the phrase 'sound science' as a slogan in policy disputes, and its double meaning becomes clearer. That use of the term goes back to a campaign waged by the tobacco industry to undermine the indisputable connection between smoking and disease...

President Bush isn't claiming that cigarettes are safe. But if you switch from examining rhetoric to analysing policy, it turns out that he is treating science in much the same way that tobacco companies did — as a means of justifying predetermined political conclusions.

Alok Jha, Guardian Weekly, 26 Feb 2004
Chris Mooney, Washington Post, reprinted in the Guardian Weekly, 11 Mar 2004

Roy Hemmingway on the Electricity Commission

From notes by Robbie Morrison and Molly Melhuish

Roy Hemmingway, chairman of the NZ Electricity Commission, spoke at a seminar in Wellington on 24 March, organised by the NZ Energy Federation. He has been full-time Chairman of the Electricity Commission for six months now. Before taking up this role he was Chair of the Oregon Public Utility Commission, USA.

Hemmingway began by explaining that the Electricity Commission was formed in the wake of the "failure of self-governance regulation" for the electricity industry, and he suggested that this failure was not surprising: only New Zealand and Germany had attempted full public deregulation and Germany was also re-establishing a dedicated public regulator.

The Commission is formally constituted under the Electricity Amendment Act 1991. This Act viewed public re-regulation as a fall-back position and is consequently "rather thin" in this area. Two new legislative initiatives are currently in train to rectify the situation, namely the Electricity and Gas Industries Bill, due for completion in July, and a new draft Government Policy Statement, which is about to be issued for public consultation.

The Commission generally does not have direct authority, but advises the Minister of Energy. The Commission does, however, have a number of specific responsibilities:

- A watching brief on the Electricity Governance Rules (EGR). The rules adopted last December are about to come into effect, but they predate the Commission. A number of issues are still to be resolved, primarily in the area of high voltage transmission.
- The power to grant EGR exemptions. This is a 'quasi-judicial' role, for which the Commission wants to establish clear grounds and internal consistency.
- Monitoring electricity markets. Hemmingway is personally interested in market operation during extreme conditions such as the recent Benmore/Haywards transmission outage when North Island spot prices reached $ 1000/MWh (09-12 January 2004, after three pylons blew over).

- The Commission has responsibility for maintaining generation reserves and overseeing the grid pricing methodology for grid operator Transpower. The Commission must also approve Transpower's operating plans. These plans, in effect, transform forecasts of need to statements of opportunity. The Commission then has a duty to test transmission reinforcement against new generation and demand response measures.
- The Commission intends to develop model retail contracts. New Zealand, unlike most other jurisdictions, has no mandatory standardisation in this area. Hemmingway also commented that whilst small consumers pay considerably more than large users, their contracts are "automatically hedged."
- The Commission will be required to promote energy efficiency, given that these provisions remain in the new Bill.

Hemmingway next discussed particular characteristics of the New Zealand electricity system. He suggested most systems around the world are "machine constrained," meaning that the generation plant dictates system capacity. New Zealand, in contrast, is "fuel constrained" (a term which includes hydro inflows) and supply is highly variable. Given annual average hydro generation of about 40 000 GWh, a wet year is plus 7000 GWh and a dry year minus 5000 GWh. This annual variation is "without any predictability." Moreover, New Zealand has long transmission routes by any standards. But thermal backstopping introduces its own set of issues. Huntly (a 1000 MW coal and gas plant) for example, would need to maintain a large coal inventory and establish fuel contracts with no guarantee of actually taking product.

Hemmingway then turned to worst case scenarios for 2005, the first year of explicit Commission responsibility. A recent report by Concept Consulting for the Ministry of Economic Development and the Commission analysed options (available from the Commission website). The overall context has changed since the last dry year crisis: a number of small stations are coming online, the fuel situation at Huntly and elsewhere is better, and Whirinaki (155 MW) has been built and commissioned as part of the reserve generation pool.

The broader question is what else to do. Transpower is proposing to rebuild the national high voltage backbone but the Commission is required to weigh this option against the alternatives of new (better sited) generation, energy efficiency, and demand-side initiatives.

Points raised during questions included:

- New Zealand has a very 'pure' wholesale market with 244 grid exit points and 30 minute time intervals.
- There is considerable system variability and poorly developed forward wholesale markets and retail competition. The Commission intends to address these two issues as a mater of priority.
- A further question focused on the need to distinguish between variability and demand growth, and recognise that ongoing growth tends to confound any solutions to variability. Hemmingway observed that there is no official electricity demand forecast, the Commission has no jurisdiction over gas, and "no direct role with respect to carbon charges."
- Hemmingway thought the current state of systems modelling was adequate for the Commission's needs. they will adapt methodologies from overseas where need be. The main problem is data. An example was the (unknown) number of hot-water cylinders under ripple control in Christchurch.
- Getting energy into Auckland will become increasingly problematic. There has been a substantial build up (of housing) under existing high-voltage corridors and there is a clear "lack of new corridors." Demand side measures could act as a "stop gap" here.
- Hemmingway indicated that the 'draw down rules' for hydro are a complex issue, for which top-down command and control is no longer appropriate. The question is now how best to uncover "commercial arrangements' that give "sufficient incentives" for appropriate management. The two reserve generation triggers are a price threshold, currently set at $ 200/MWh, and a storage 'min-zone' approach.
- It is an open question whether the Commission have enough resources to deal with major investment such as the grid upgrade plan — if not, then "participants will tell us what to do."

EnergyWatch

This edition is a little late: our apologies. EnergyWatch has been plagued by mysterious computer problems for some while, but the problem has — hopefully — been found and the June issue should not be affected. The formatting just happened to trip over a software bug, so look for a slightly revised format in June.

The hydrogen economy

Steve Goldthorpe, Energy Analyst

The promise of a hydrogen-based energy economy is clean and secure energy for all, forever.

CRL Energy et al, handout at the launch of the Coal Technology Package

On 23 February 2004 Associate Minister of Energy officially Harry Duynhoven launched the Coal Technology Package for the Hydrogen Energy Economy at CRL Energy. The project is supported by Industrial Research Limited, Solid Energy and the Coal Association of New Zealand. Earlier the same day a seminar was held in Wellington at which international speakers described progress with studies of geological sequestration of carbon dioxide (CO_2).

Put together, these two events provide essential elements of an energy scenario for New Zealand that could supply our transport fuel needs from indigenous primary fuel resources for many years, whilst minimising the consequent contribution to climate change. It is timely to review the process, the promise and the potential problems of this visionary concept.

The resource

The recoverable lignite resources in the South Island are estimated by MED to be around 110 000 PJ. Lignite is an intermediate form between peat and sub-butuminous coal, also known as brown coal. In energy terms this dwarfs the Maui gas field and is an order of magnitude larger than all other coal resources in NZ.

The process

The first stage in the CRL Energy research project is to develop a fluidised bed gasification process specifically tailored to convert lignite into a fuel gas with high hydrogen content. That process will include:

- Energy transfer from carbon monoxide to hydrogen by reaction with steam to yield a CO_2 by-product.
- Separating a pure hydrogen product from that gas stream using a membrane system.
- Separating the remaining high-CO_2 fuel gas into pure CO_2 for disposal and a residual fuel gas, which still contains some CO_2, CO and CH_4.

The energy conversion and CO_2 capture yields that can be achieved will depend on the outcomes of the CRL Energy research programme. Energy balance considerations indicate that it would be reasonable to expect the energy content of lignite to be distributed into four roughly equal portions: Hydrogen; Fuel gas; Gasification heat losses; and Process energy.

Hydrogen, like electricity, is an energy carrier. Its value is in the energy services that it can provide. However, with a bit of ingenuity it can be made portable for use in fuel cells as a transport fuel. Hence large scale lignite-based hydrogen has the potential to address the looming problem of global shortage of petroleum transport fuels. This is an application to which dispersed renewable sources of energy are less well suited.

The promise

The Hydrogen Economy claim is for a clean and secure energy source for all, forever. However, the claims beg some qualification:

- Cleanliness is a major advantage of hydrogen as a fuel. Used in fuel cells, there are no pollutants emitted at the point of use. It is primarily this feature that has led Californian Governor Schwarzenegger to promote the technology. However, in the NZ scheme processing the lignite raw material would have the potential to produce a number of pollutants. However, the mining and processing of lignite has the potential to give rise to environmental issues. Large scale lignite mining in Australia's Latrobe Valley presents a standard. Should that be matched in New Zealand or improved on?
- Geological CO_2 sequestration, ie returning to the lithosphere as injected CO_2 a portion of the carbon that has been extracted as lignite, addresses the climate change issue. However, there is a limit to the fraction of the CO_2 from mining and processing lignite that can be captured in the lignite-to-hydrogen conversion process.
- Security of supply is now probably more certain with indigenous coal than with imported oil or gas. However, the costs of the hydrogen energy supply route are ill-defined at present
- Forever is a long time, but the reality is quite impressive. A lignite resource of about 110 000 PJ, mined at 40 Mt/yr and converted to hydrogen for use in fuel cell vehicles might meet New Zealand's transport needs for 100–200 years. The Hydrogen Economy concept is envisioned ultimately to transition to renewable primary energy. Whether hydrogen is the best storage and transport medium for

renewable energy is beyond the scope of this review.

The problems

An optimist would say that there are no such things as problems, only opportunities. The Hydrogen Economy concept provides many opportunities for innovative research in the chain of technologies that would be required to deliver the Hydrogen Economy. But any chain is only as strong as its weakest link, so there is a risk of economic or technical show-stoppers:

- Lignite gasification and the subsequent gas conversion and separation processes required to produce a pure hydrogen product and a pure CO_2 by-product at high pressure are process engineering issues. The aims are to maximise yields, and to minimise parasitic energy consumption and cost. Definitive costs for hydrogen from lignite in NZ are a long way off at present.
- Transport, distribution and storage of hydrogen presents several challenges. The low volumetric energy density of hydrogen requires very high pressures, or some form of absorption. The small hydrogen molecule demands sophisticated engineering to avoid leaks. The combination of high energy, high pressure and potential leakage implies safety issues.
- The utilisation of hydrogen requires fuel cell technology to be cheap and to be integrated with vehicles and other applications. There is much development work being done, but still some significant hurdles to be overcome.
- If the Hydrogen Economy were to be established in NZ without major increases in the CO_2 emission inventory, then underground storage of CO_2 would be needed. At the geological CO_2 sequestration seminar, several papers described research into geologic storage of CO_2 in various countries. These studies indicated that deep saline aquifers present the greatest capacity, but depleted gas wells also presented possibilities for CO_2 storage. Ocean storage was not on the agenda. The options of injection into oil bearing strata or deep coal seams also present opportunities for hydrocarbon recovery, which raises the question of the extent of net carbon disposal that would be achieved.
  A common theme at the seminar was that CO_2 sequestration options are very site-specific. No detailed studies of the potential for geological CO_2 sequestration in NZ have been carried out. Without this essential element, the Hydrogen Economy based on NZ lignite would be incompatible with the NZ Government's goal of setting NZ on a permanent downward path for total gross greenhouse gas emissions.
- Even with CO_2 sequestration, the challenge of reducing greenhouse gas emission is daunting. The lignite-to-hydrogen process would produce CO_2 at a rate of about 400 kg/GJ of delivered fuel on a full fuel-cycle basis, compared with about 80 kg/GJ for conventional transport fuels. This means that least 80% of the CO_2 would have to be captured and stored, just to maintain the status quo.

The promise of hydrogen providing clean and secure energy for all forever sounds too good to be true. The Consumer's Institute warning might be heeded:

If it sounds so, it probably is.

(CRL Energy has been invited to respond to this article in the next issue of EnergyWatch — EW)

Maui deal soon?

On 20 March the Dominion Post reported that a deal to extract the last significant amount of natural gas from Maui is being hammered out by its owners and the government, and could be announced by April.

Tui oilfield — PEP38460

Preparations for drilling to follow up last year's Tui oil discovery are well advanced, and the Ocean Bounty rig is to drill up to three more wells. Ocean floor surveys have been carried out over several different locations to allow flexibility as to drilling locations after the first two firm wells have been evaluated. The rig is scheduled to be on location late March. The first well will be in the Amokura prospect, to ascertain whether Amokura contains oil which would support a development jointly with the nearby Tui find, some 4 km away. Following Amokura, the Ocean Bounty will drill Pukeko. Pukeko has three targets — the Kapuni C, D and F Sands. The C sands objective is a simple structure of a capacity to contain in the order of 12 million m^3 of oil. Each well will take around 30 days to drill.

NZ Oil & Gas, 30 Jan 2004

Getting Auckland moving?

In December the government announced a proposal that Auckland's transport be governed by a single organisation. Local Government Minister Chris Carter said that present arrangements are confused, inefficient and ineffectual.

The proposal was:

- A new Auckland Regional Transport Authority (ARTA), accountable to the Auckland Regional Council (ARC) for developing and implementing a transport plan for Auckland.
- The ARTA funded from government and local money, to contract with transport providers.
- The ARTA Board be appointed by a panel representing the ARC (with a majority) and the seven Auckland city councils. Members of Auckland councils, including the ARC, will not be eligible.

The funding package depended on Auckland councils accepting that ARTA would administer Auckland transport.

Funding

Also in December, the government announced a new funding package, from April 2005, with an annual $M 297 for new transport initiatives. Funding will come from:

- A 5c increase in the fuel excise levy, and an equivalent rise in road user charges for light diesel vehicles, raising an estimated $M 207 /yr for expenditure throughout New Zealand.
- A specific funding allocation of on average $M 90/yr over ten years for Auckland's specific needs.
- Future revenue from tolls and borrowing.

The Auckland funding package was conditional on Auckland' local bodies agreeing to the new governance structure, which has now been given.

Comment

A SEF press release (see www.sef.org.nz) applauded the commitment shown by government (and later by the Auckland local authorities), but called for a a visionary public transport system to get the people moving around Auckland *(see below — EW)*. Convenor John Blakeley said, "We need to start building sustainable transport facilities for the future. Oil is running out. The money will not be well spent if, by the end of the decade, the cost of fuel is so high that Aucklanders can not afford to use cars."

"Building more motorways will increase fuel demand, cause more congestion and pollution in cities. The 21st century solution is to provide much more user-friendly and efficient public transport, and road pricing measures to reduce congestion in business districts, such as is now being used in London and Singapore," Blakeley said.

As the Greens pointed out:

An orgy of road building based on a 1950s plan, as some Auckland local authorities want, would be an economic suicide note for Auckland. No rational business would say that a 50-year-old plan is the best way to plan investment.

The Greens have a point here, with the Dominion Post for 10 Mar 2004 highlighting eastern corridor roading proposals estimated at $bn 3.0, running from Manukau City to the Auckland Waterfront. Even with no cost escalation that would use the whole of the proposed ARTA funding package (excluding any toll revenue) for the next decade, on a single mode in a single corridor.

Visionary public transport

What does the phrase mean? Kerry Wood

Visionary public transport tends to be interpreted as big projects, which may help but too often don't. An alternative view is that the phrase is best seen as doing the little things well, to achieve a simply defined objective:

> *To maximise the city-wide speed, safety convenience, reliability and pleasantness of public transport, at reasonable cost.*

Achieving the objective is less easy. It needs a broad and consistent long-term focus, with three 'must haves':

- Political consensus, regardless of the means of finance.
- An overall urban transport strategy.
- A clear decision-making framework.

Big projects are often better avoided. Standard

diesel buses (2-axle, single-deck) will be the short- or medium-term norm for all routes in most cities and most routes in all cities. Trolley or fuel-cell buses; articulated buses; light rail or suburban rail may also have their place.

Monorails and metros are unlikely to cut the mustard in NZ. Monorails are too inflexible because of the difficulty of getting a train from one track to another. That is why they so often run on a loop — the technology dictates the layout, as in Darling Harbour or Disneyland. Metros are too expensive for all but the largest cities, with a risk of sucking funding out of other routes and limiting what can be achieved overall.

Metros and monorails rarely deliver passengers where they want to be — on the street or in a building, not up in the air or down a hole. Getting passengers to street level delays them and pushes up costs, and high stop costs encourage too-long stop spacings which increase overall journey times. Metros have their place (the jury is still out on monorails, after a century), but in New Zealand there are few, if any, corridors carrying more than 10 000 passengers an hour — well within the capacity of one light rail route or two parallel articulated bus routes.

Measures supportive of a good passenger transport system include:

- Route, street and vehicle design to minimise delays. The objective should be that public transport vehicles do not stop except to pick up or set down passengers, and rarely need to stop for more than 20 seconds.
- Safe, clean and pleasant stops and vehicles, free of vandalism and graffiti.
- City-wide, all-mode, off-vehicle ticketing to minimise boarding times, maximise convenience and ensure that passengers are on the the lowest fare for their trip, such as London's new 'Oyster' smart-card system.
- 'Clock-face' timetables (departures from each stop at the same times past each hour) for easy memorising, carefully integrated to minimise transfer times.
  Transfers (or taxis) are the only way to cover every possible journey. If they seem unimportant at present, that is because they have not been managed and journeys needing transfers are only being made by those with no alternative.
- Accurate timekeeping to make scheduled transfers work.
  'Bus due in...' indicators are second-best because they don't help with transfers: keeping to a simple printed timetable is much better.
- Vehicle monitoring systems to give drivers feedback on timekeeping and allow early intervention when problems develop.
- Carefully planned stop locations to maximise service while minimising delay.
  Specifying a maximum spacing will tend to slow overall trip timess because of lower vehicle speeds.
- Benchmarking against other systems to check on progress.

No system will ever achieve all of this, all the time, but a close approach is achievable and very effective. A key understanding is that order-of-magnitude improvements are both necessary and practicable, and that the ideal can be achieved often enough to offer a real alternative to car use. A common timnekeeping target is 95% of public transport vehicles within 5 minutes of time, but much better timekeeping is possible. Even on-street, 95% within ± 1 minute is possible and makes a huge difference to interchange reliability. Timekeeping is all the more important when services are infrequent, and especially if the headway is more than about 7–8 minutes.

Two other things must also be done well:

- Motor vehicle users both encouraged to use public transport and discouraged from unnecessary car use, by measures such as parking restrictions or charging their full costs. Even crude proxies — based on very crude estimates — are better than the present system of pretending that all costs are already internalised. London has shown that this approach works, even when implemented crudely.
- A supportive planning environment, including measures to encourage medium density, mixed use residential areas; locating large trip generators in areas best served by public transport and large freight generators in areas best served by road and rail; limiting sprawl; and restricting large out-of town shopping complexes.

When the vision is achieved, public transport will be often be faster than using a car. Another key understanding is that achieving the vision will make many or most remaining car drivers —and commercial vehicles — **better** off than at present, as has happened in central London.

(See page 26 for a suggestion on funding — EW)

Plan now for a world without oil

Michael Meacher, Financial Times (UK), 5 Jan 2004

(The writer was UK environment minister from 1997 to June 2003. The article has been edited — EW)

Four months ago, Britain's oil imports overtook its exports, underlining a decline in North Sea oil production that was already well under way. North Sea oil output peaked at about 460 000 m^3/day in 1999, and has been predicted to fall to only 250 000 m^3/day by 2007. Even the discovery of the new Buzzard field, the biggest British oil find in a decade, with a total of some 80 million m^3 recoverable, will hardly alter the overall picture...

This prospect would not be so bleak were it not that similar trends are now becoming manifest around the globe.

(World oil production prospects by region omitted)

These calculations place the coming oil crunch some time between 2010 and 2015, perhaps earlier. The reserves in the world's super-giant and giant oilfields are dwindling at an average rate of 4–6% a year. No more big frontier regions remain to be explored except the north and south poles. The production of non-conventional crude oil has already been initiated at enormous cost in Venezuela's Orinoco belt and Canada's Athabasca tar sands and ultra-deep waters. Yet no major primary energy alternative can replace oil and gas in the short-to-medium term.

The implications of this are mind-blowing, since oil provides 40% of all traded energy and no less than 90% of transport fuel. But not only are the motor vehicle and farming industries dependent on oil, so is national defence. Oil powers the vast network of planes, tanks, helicopters and ships that provide the basis of each country's armaments. It is hard to envisage the effects of a radically reduced oil supply on a modern economy or society. Yet just such a radical reduction is staring us in the face.

The world faces a stark choice. It can continue down the existing path of rising oil consumption, trying to pre-empt available remaining oil supplies, if necessary by military force, but without avoiding a steady exhaustion of global capacity. Or it could switch to renewable sources of energy, much more stringent standards of energy efficiency, and a steady reduction in oil use. The latter course would involve huge new investment in energy generation and transportation technologies.

The US response to this dilemma is very striking. The National Energy Policy report prepared by Dick Cheney, US vice-president, in May 2001 proposed the exploitation of untapped reserves in protected wilderness areas within the US, notably the Arctic National Wildlife Refuge in north-eastern Alaska. The rejection of this extremely contentious proposal forced President George Bush, unwilling to curb America's ever-growing thirst for oil, to go back on White House rhetoric and accept the need to increase oil imports from foreign suppliers.

It was a fateful decision. It means that — for the US alone — petroleum imports will have to rise by 70% by 2020. Securing that increment of imported oil — the equivalent of total current oil consumption by China and India combined — has driven an integrated US oil-military strategy ever since.

There is, however, a fundamental weakness in this policy. Most countries targeted as a source of increased oil supplies to the US are riven by deep internal conflicts, strong anti-Americanism or both. Iraq is only the first example of the cost — both in cash and in soldiers' lives — of facing down resistance or fighting resource wars in key oil-producing regions, a cost that even the US may find unsustainable.

The conclusion is clear: if we do not immediately plan to make the switch to renewable energy — faster, and backed by far greater investment than currently envisaged — then civilisation faces the sharpest and perhaps most violent dislocation in recent history.

Oil production to fall?

On 10 February OPEC announced a production cut of a million barrels a day (160 000 m^3/day) from 1 April, and also curbing another 240 000 m^3/day of 'excess production' (OPEC quota cheating). In early March it was thought likely that the production cut would happen, although the excess production was not to be curbed 'this month.' Brent crude futures sold for up to US$ 33.44 a barrel (€ 112/m^3, NZc 20.9/l) in early March.

Dominion Post, 6 Mar 2004

Why climate change matters

Pete Hodgson
Minister of Energy, Convenor of the
Ministerial Group on Climate Change

(An edited version of an address to Dairy Expo 2004, New Plymouth, 19 Feb 2004 — EW)

Let's talk about the weather. A climatologist would tell you that the storms we're going through now are not necessarily the result of climate change, but this is what climate change looks like. One of the significant consequences expected from climate change is an increase in the frequency and severity of extreme weather events.

The NZ dairy industry is founded on the superb conditions this country's climate provides for growing grass. This is why climate change matters to dairy farmers and NZ. We know climate change is already under way on a global scale, and there appear to be measurable effects emerging in NZ. A recorded halving of the planted area in kiwifruit in Northland over the six years to 2001 could be at least partly attributable to a warming climate, leading to reduced productivity.

More than one farmer has suggested to me that a little global warming might not be such a bad thing for farming. And it is true that warmer average temperatures could bring some benefits, including better pasture growth in milder winters.

Some of the predicted impacts of a moderate rate of climate change for Taranaki include changes in average temperature and rainfall patterns, and a rise in sea levels. In general, much of the west coast is likely to become warmer and wetter — perhaps up to 3˚C warmer, on average, over the next 70–100 years. That compares to a temperature increase in NZ during last century of about 0.7˚C. And the 1997/98 summer, which by NZ standards was particularly long, hot and dry, was only about 0.9˚C above the NZ average for the 1990s. Taranaki could be up to 20% wetter with more varied rainfall patterns. That means more rain for the pasture, but also flooding, perhaps up to four times as frequent by 2070.

A key thing to remember about climate change is that it is a cumulative process. If the rate and magnitude of climate change is not slowed down by a reduction in greenhouse gas emissions, any beneficial effects are expected to diminish while the costs and risks continue to increase.

The negative effects predominate in the longer term. This is why NZ can't afford to ignore climate change, and can't refuse to play our part in trying to do something about it. By thinking ahead and acting with foresight, we can also seize opportunities to maintain or secure competitive advantage in global markets.

Acting on climate change is primarily about changing energy habits, particularly fossil fuel use. Humans invented the fossil fuel economy not that long ago and one day we will look back at it as we look back at the ages of horse and sail power. It is important that NZ catch the next wave in energy technology, rather than watch it pass by. The countries who catch that wave will be those that are actively moving towards renewable and low-emission energy, and pursuing innovation and efficiency in the way they use energy and natural resources.

The Government decided its climate change policies in late 2002. They work across the economy, to spread costs and opportunities as widely as possible. First I want to mention the policies for non-agricultural sectors, because I have been made aware in a number of conversations with farmers that their breadth and even their existence is not widely understood.

The foundation policies of our response to climate change are the National Energy Efficiency and Conservation Strategy, the Waste Strategy and the Transport Strategy. Each is detailed and wide ranging, concerned with improving energy efficiency and increasing renewable energy, reducing pollution and waste, and improving the efficiency of our transport systems, including public transport. Between them, they are expected to reduce NZ's excess emissions over 1990 levels by about a third over the next decade.

(Carbon charge, Negotiated Greenhouse Agreements and Projects to Reduce Emissions omitted —EW)

Agriculture

One tonne of methane, the chief agricultural greenhouse gas, has the global warming potential of 23 t of CO_2. A cow produces about 75 kg/yr of methane, equivalent to over 1.5 t /yr of CO_2. The cow is only doing what comes naturally but people are inclined to forget that farming is an industry. We're pretty good at it, which is why atmospheric concentrations of methane increased by 150% globally over the last 250 years, while CO_2 concentrations increased by 30%.

About half NZ's total greenhouse gas emissions come from agriculture, which is unique for a developed nation. If we want to contain and reduce NZ's emissions, we can't ignore emissions from agriculture. Just a small success in cutting methane and nitrous oxide would deliver us a useful improvement at a national level. But the problem is that there are currently no readily available, practical ways for farmers to significantly reduce emissions, apart from the undesirable one of reducing stock numbers.

That is why the Government is clear that agricultural emissions will not be taxed in the way that fossil fuels will be. It does not make sense to tax emissions from a sector that has no practical options for cutting them. Instead, the Government decided to pursue a solution through research, and that the agriculture sector should fund most of it: the sector should take some responsibility for its emissions, and success is likely to benefit farmers directly.

Because methane is waste, the potential productivity gains are exciting. But there are also likely to be business opportunities in selling NZ solutions to the world. Research is also likely to have other environmental benefits. For example, reducing nitrous oxide emissions through more efficient nitrogen fertiliser application is likely to reduce nitrate leaching into groundwater, as well as lower the cost of producing more feed.

The Government and agricultural sector groups have signed a partnership agreement on research into agricultural greenhouse gas emissions. It is underpinned by an industry-led research strategy, which aims to develop safe, cost-effective greenhouse gas abatement technologies that will seek to reduce methane and nitrous oxide emissions from livestock by at least 20% by 2012.

The Government will bear the cost of the agricultural sector's non-CO_2 emissions, and maintain at least the current level of research funding. In return the sector will undertake and fund its research strategy, co-ordinated by the Pastoral Greenhouse Gas Research Consortium. The research will seek to develop practical on-farm technologies for reducing emissions.

NZ has been successfully exporting agricultural products for more than a century. We are increasingly exporting agricultural expertise. The industry's greenhouse gas research programme offers new opportunities for that, as well as addressing a fundamental threat to this country's agribusiness. I think it will pay off, because wherever you look, in whatever sector, research and development pays off.

SEF Conference 2003

Janine Baalbergen

(An independent view of our last conference — EW)

A dysfunctional New Zealand electricity market is responsible for the recent power supply crises, says John Blakeley, SEF Convenor, speaking at the 2003 conference in Auckland, Blakeley said that energy efficiency and conservation — as well as more power generation from renewable sources, spread throughout NZ — are essential to securing a long term power supply for this country. "We know that the world's oil reserves were at their highest 30 years ago. Our own local supplies of oil and decreasing significantly with the demise of the Maui gasfield."

Many consumers believe the government to be responsible. In turn the government blames the industry, since deregulation has meant that it is not responsible for and can take only limited action to prevent any disruption in the power supply. Blakeley identified our isolation, our vulnerable transmission networks and our high (and increasing) dependency on imported oil as major obstacles to a secure future.

The government's original intention was that the electricity industry be self-regulating, but has recently established an Electricity Commission to have more control over the industry. The attempt by the current Labour government to force some form of regulation back on the energy market has left experts guessing at both its purpose and its powers.

Energy Minister Pete Hodgson assured the Electricity Engineers Association in June that the new commission is, "about governance, not dry year generation." A few days later he told the Energy Federation Conference that the commission is only, "part of the big picture." And that is precisely the problem Blakeley says: the government has no overall energy policy, only strategies for certain issues. It is time it did.

Deregulation means that the various forms of power generation now compete with each other, instead of complementing each other as they did when the country had an integrated national system. That structure has been broken into pieces and market mechanism means low hydro lake levels drive up prices, which causes alarm to large commercial and industrial users. As long as no-one is in charge the looming sense of crisis in power supply will not go away.

The developing market for energy efficiency in New Zealand ECNZ (1992)

(Another recent subject on SEF News was a 1992 ECNZ report on energy efficiency. Some SEF News members have had trouble getting a copy, and another got a copy with "a comment from ECNZ basically slagging it." The report is reviewed here, but note that the review copy was the final draft and may differ slightly from the published report. — EW)

This important report was first presented 12 years ago, prompted by a recognition that energy efficiency could play a significant role in the future of the ECNZ in the proposed energy sector reforms, and particularly end-use efficiencies. Studies considered overseas experience, while recognising the pitfalls of direct comparison, and assessed the implications for NZ. The report traced the development of the energy efficiency concept and identified a growing recognition that energy efficiency must be market driven. Major gains in energy efficiency were thought possible while consumers got what they want — comfort, convenience, better products, and competitive advantage.

This new focus was described as:

...building on a long term decline in the energy intensity of economic activity in the leading industrialised nations. Since the 1920s... there has been a steady drop in the energy:GDP ratio in most industrialised countries. This was reversed in the 1950s and 1960s... but after a 'catch-up' phase in the 1970s and early 1980s, the long term trend has resumed.

New Zealand moved against the world trend in the 1980s, with increasing labour substitution by capital and the impact of major projects such as the Synfuels plant, the refinery expansion, the Glenbrook steel mill expansion, and developments at the Tiwai Point aluminium smelter. This overall shift, however, should not obscure the underlying technology improvements...

It was thought that over the next 15 years, underlying changes in energy efficiency could reduce consumer energy intensity by over 20%, or:

With the speed up of the spread of end use energy efficiency products, processes, and practices which could occur with the reform of the energy sector, this drop could be over 35%, based on assumptions about the development of the efficiency market and government actions.

In particular, the impending energy sector reforms will give an unparalleled opportunity for the development of energy efficiency services. Elsewhere such initiatives are often hampered by price control or orchestrated in complex bureaucratic and legal processes which often have a net overall cost to consumers and taxpayers.

Demand-side management (DSM)

A key problem was identified as the supply side focus of much of the industry. A proposed definition of energy efficiency, intended to overcome this problem, was:

The systematic use of technology and services to maximise consumer values from energy use.

The US was seen as placing particular emphasis on DSM. Reasons given included:

- The strong and growing environmental lobby. It is asserted that customers don't mind higher tariffs, as long as their electricity bills are not higher.
- Advances in energy efficiency equipment.
- Helping to meet air pollution requirements.
- DSM may be cheaper than building and operating generating facilities, or even cheaper than operating only (although some failed DSM programmes can be quite the reverse).
- Predicted future supply shortages due to environmental or economic constraints on future generating capacity; or lead times of new capacity that, even if it can be approved and built, it will not be available in time to avert anticipated shortages;
- The need to provide better services to customers.

The experience of states such as California suggests that is necessary but not sufficient to make DSM revenue-neutral to the Investor-owned utilities (as instigated by the Public Utilities Commission in 1980). However, the:

record of utilities in responding to efficiency by regulation has been patchy. Benefits may be lower than claimed because utilities tend to use generic programmes, rather than tailoring them to the needs of specific customers. Forcing conservation through regulation may subsidise investments that are not efficient.

Significant implications for New Zealand include:

- The proposed regime seemed to avoid many of the pitfalls of the heavily regulated, price-controlled regimes overseas.
- NZ could avoid some of the arbitrary impediments to the promotion of energy efficiency imposed by price control; and
- Many utilities overseas were still supply-side driven.

Energy efficiency in NZ

The study projected three scenarios 15 years ahead, to 2005:

- Standard: Medium-efficiency, with most capital equipment turned over within the 15 year period using best available technology
- Efficiency: High efficiency, with most capital equipment turned over within the 15 year period using state of the art technology
- Frozen: No change. This scenario was chosen to demonstrate the scale of the other two scenarios, but was thought (from the projected outcomes) to be non-feasible.

In each case five types of energy service were considered separately: High temperature heat (<150˚C); Low temperature heat; Motive power; Lights and motors; and Feedstock (including electricity for aluminium smelting). Thirty one industries were specifically considered in developing the scenarios.

Conclusions

It was thought that in NZ the Energy Sector Reform Bill would establish an environment in which energy suppliers would be encouraged to escape the commodity trap by shifting their focus from selling kWh and Joules to selling energy services. This would provide the electricity industry with an opportunity to broaden its market and to make a profit, even though the sale of kilowatt hours would become a low profit business. There should be strong commercial incentives for electricity suppliers to switch customers from inefficient fossil fuel use to electricity use where this is more efficient, with rapid development of energy service companies to take advantage of these opportunities.

(The ECNZ were also concerned that Maui reserves might be as low as 1200 PJ by 2005 — EW)

Scramble to find new energy

Ian Howarth
Australian Financial Review, 18 Mar 2004

(A lightly edited view of NZ's energy predicament, as seen from West Island — EW)

The lights are going out in New Zealand and it's not because children are being sent off to bed early now that school's back. The nation is fast running out of natural gas. With more than 20% of electricity from gas-fired, the situation is getting dire. NZ Energy Minister Pete Hodgson says that NZ, "will run into a serious gas problem in 2011, 2012 and 2013." The country's biggest gas field, Maui, has supplied almost all of NZ's natural gas for years. But Maui is expected to be depleted in as few as five or six years and NZ is racing to find a major new source of energy for electricity.

One obvious alternative is to build more coal-fired power stations, utilising NZ's large but remote coal resources. But to a country used to, and proud of, operating the world's lowest greenhouse gas impact electricity system *(What about Iceland or Norway? — EW),* increasing its dependence on coal-fired generation is about as appealing as chronic migraine. Two-thirds of New Zealand's electricity comes from its hydro-dam network. It is not only clean but it has produced cheap electricity for decades. However rising electricity demand, environmental opposition to new dams and a couple of drought years have resulted in a steady contraction in hydro's share of the market. By 2025, hydro's share is tipped to account just over half of demand. Coal- and gas-fired generation have made up the gap, with wind power and geothermal sources recently adding to the mix.

But that's not enough. The government reckons that by 2010 the country will be facing electricity shortages. Lights out. They're trying a number of fixes. The first is a search for more gas reserves, but meanwhile, coal-fired generation will have to make up most of the gap, Hodgson says. Other options he identifies are:

- A 520 MW generation hydro scheme on the Waitaki River.
- Another 35 MW of small hydro.

- Wind power will quadruple, from 40 to 200 MW.
  (That's about 17.5% annual growth, which seems lower than is possible — EW)

Serendipitously, the gas shortage might be eased if the nation's biggest gas user, methanol producer Methanex, ceases production, which has already been cut to 40%. "Methanex was a creature of Maui," Hodgson says.

Only four substantial NZ gas fields have been discovered in 45 years. The first was Kapuni, found in 1959, followed by Maui a decade later and then the smaller Kupe and Pohokura fields in 1987 and 1999. But with just 1100 PJ left and annual gas consumption of 250 PJ, Maui is a short-term option at best.

One of the problems in attracting new exploration investment is the low price. For years, NZ government policies have kept natural gas prices artificially low. Current US gas prices are around $NZ 8.00 /GJ; in Australia $NZ 3.60 /GJ; but in NZ it is well below $NZ 2.90 /GJ, not enough to encourage most new gas explorers. But Hodgson says gas prices, excluding Maui, are already being forced up. He predicts gas discoveries in next few years but, "Not finding enough gas is an entirely feasible scenario."

Two of NZ's biggest electricity producers, Contact Energy and Genesis Power, recently formed a joint venture to explore developing an LNG terminal to overcome the impending gas shortage. An LNG contract to supply New Zealand is potentially good news for Australia. Another option for NZ is wood waste generated by the country's forestry industry. Geothermal energy is also being used, but it's unlikely to ever add much.

Pike River coal mine

NZ Government, 12 Mar 2004

Conservation Minister Chris Carter has approved in principle an application for the Pike River Coal Co to access mine deposits in the Paparoa Range, Westland. The approval is subject to the company and the Department of Conservation (DoC) reaching a satisfactory agreement on the terms and conditions for the company's access to the area, including financial assurances and bonds.

Pike River is proposing an underground mine to extract 0.6–1.0 Mt/yr of coal for an estimated twenty years. The mine will require an access road over 3.6 km of public conservation land. The mine itself is located under conservation land on the eastern slopes of the Paparoa range in the Grey Valley, north east of Greymouth. The mine is mostly underground and its visual footprint above ground is only 10 ha. There are only small impacts on the neighbouring ecological area and the Paparoa National Park.

Carter noted that there were four major issues relevant to the mining proposal.

- Subsidence as the roof above the coal seam collapses. In the Pike proposal up to 3 m of surface subsidence and associated cracking is expected over an area of 200–300 ha. The medium to long term effects are likely to be minimal because of the low stature and shallow rooting of the trees and shrubs affected.
- Possible acidic mine drainage from pyritic materials exposed to air and water, oxidising and forming acids. They can also release heavy metals. The risk of acid mine drainage is 'manageable and probably low.'
- Access route impacts. The road will stretch for about 3.6 km across public conservation land but mainly follow an existing partially formed road. The impact on native species will be confined to a small area in a large habitat.
- National Park impacts. The proposal involves the drilling of four 1.5 m holes within the park boundaries to act as emergency escape passages for miners. Some subsidence is also expected along the edge of park the boundary, but only 150 mm of subsidence is expected.

EnergyWatch adds:

The press release says nothing about extraction and shipping methods. Pike River say that coal will be barged or shipped from Greymouth to Shakespeare Bay, Picton, and there transferred to large vessels for shipping to overseas markets (it is a high quality coking coal).

Forest & Bird say the coal will be sluiced down the Pike River valley in a flume, dewatered on private land (leading to some water pollution), then trucked to either a rail siding or Greymouth. Greymouth is some 40 km away, almost all on local roads.

Curiously, there is no mention of rock waste: does that come down the sluice too? The 10 ha surface footprint suggests so.

MiniWhats

Iraqi oil reserves

The Iraqis were injecting as much as 15 000 m^3/day of oil into the giant Kirkuk Field during the oil embargo. One quoted expert said that he had never encountered such a practice in his lengthy career in the industry. Why inject oil to recover oil? The answer presumably is that oil exports were embargoed but Iraqis needed the gas for domestic use. From a reservoir standpoint this is very bad news as the gas cap is normally a useful drive mechanism. It may now be possible to recover only 15% to 25% of the oil in place. The published reserve estimate of 17.9 km^3 looks increasingly unreliable, and something like 8 km^3 now looks more plausible. See: www.nytimes.com/adx/bin/adx_click.htm

The New York Times, 30 Nov 2003

Kyoto carbon credit contract for Windflow

New Zealand Windfarms Ltd, a subsidiary of Windflow Technology Ltd, has won a share of carbon credits from the Government for cutting greenhouse gas emissions and helping to make New Zealand's electricity supply more secure. The company proposes to construct a 50 MW wind farm over the next four years on the Manawatu saddle, about 10 km south-west of the Manawatu Gorge. The project is named Te Rere Hau, a Maori translation of 'Windflow'. It will produce 180 MWh/yr, fed into the national electricity grid. First generation is expected in 2005.

Windflow Technology

Earthsong energy results

The first stage of the Earthsong eco-neighbourhood in Ranui, west Auckland, is now complete. By mid 2003 they had 17 of an eventual 32 dwellings in use, generally 2 or 3 bedroom houses of standard design, with floor areas of around 80 or 110 m^2. The houses are well insulated and with good thermal mass, but without double glazing.

The best energy bill for the month of August 2003 was $ 20, for a house with three occupants. The average is around $ 39/month, including a water supply charge. These figures are achieved by bulk-buying power, energy efficiency within each dwelling, and attention to peak demand. Solar thermal water heating is used, backed up by a 3.6 kW electric booster element. Cooking is by bottled gas.

Within the neighbourhood, residents are charged 14.5c/kWh for electricity use up to 600 kWh/month, and 19.5c/kWh for higher use, with no standing charges. Each house is allocated to one of four 'time windows' for hot water booster heating, to limit the maximum total power demand. Each house has a 32 A main fuse, half the usual size.

EnergyWise News
www.cohousing.planet

The rising cost of electricity

Costs for new-entry electricity generation, from the latest MED Energy Outlook to 2025 are given below. The non-renewable figures include a carbon charge and so do not apply until 2007:

	c/kWh
Project Aqua	4.5
Geothermal	6.2–8.5
Wind	6.2–8.5
Indigenous gas (CCGT)	6.5-8.5
Other Hydro	7.0-8.5
SI Coal	7.6-8.6
Imported gas (LNG, CCGT)	9.5-11.6
NI Coal	9.8-10.9

Save up to $ 100/yr

Just by turning off all those standby electrical appliances in your home, you can save up to $ 100 a year on your power bill. That would amount to almost $M 120 /yr if all NZ households did the same.

That is just one piece of information uncovered by the Household Energy End-Use Project (HEEP) research carried out by the Building Research Association of NZ (BRANZ). Now in its seventh year, the study is collecting data from 400 homes throughout New Zealand, from Kaikohe to Invercargill. Data collection will be completed in 2005.

BRANZ principal scientist and HEEP project leader, Nigel Isaacs, says New Zealand's energy supplies may be uncertain — and the costs are rising — but understanding the reasons for our demand for energy will ensure those supplies are used most cost-effectively. "Much of the energy debate has centred on improving supply, but it is demand for energy that creates the problems," says Isaacs. "By better understanding the demand issue, we can better manage the supply side and therefore reduce the need to build hugely expensive new power stations."

Previous HEEP reports have revealed that:

- Increasing energy prices have had the most

effect on low-income households

- Nearly 30% of New Zealanders spend their winter evenings in temperatures that are low enough to compromise their health
- Houses built since thermal insulation was a requirement (1978) are warmer, but use no more energy than older houses.

Further material, including the report Executive Summary, is available on the BRANZ website:
www.branz.co.nz/main.php?page=HEEP

Building Research Association of NZ
16 Feb 2004

Toilet gushes crude

A Texas woman struck oil when she came home to find her toilet gushing with bubbling crude. [She found] *oil gushing out of everything in her house connected to the water drainage lines, including her kitchen sink and toilet. The floor... was drenched with a thick covering of oil. Officials believed the house was connected to a line used to dispose of saltwater instead off a sewage line. Saltwater lines are associated with oil production.*

Dominion Post, 7 Feb 2004

This suggests almost unbelievably slack attitudes towards the safety of both staff and the public, let alone profit maximisation:

- The workers making the connection must have had at least a 100 mm hole open in the saltwater pipe. How did they manage not to notice it was the wrong pipe?
- Why did a saltwater disposal line contain so much crude that it formed a 'thick covering'? A simple separator would have removed most of the oil and would surely have been profitable.
- Where does the crude in the saltwater usually line go? Most options are nasty from most viewpoints and the main exceptions are self-defeating: pumping back to the oil plant or the geological formation the oil came from.
- Sewers are normally and very simply arranged so that backflow can't come into the house, for obvious reasons. What went wrong?

Someone must employ a lot of monkeys. Maybe a few more would make up the mythical 'hundred monkeys' and improve the situation?

Oil production from the Canadian tarsands

An article by John Busby reviews the potential for Canadian tarsand production, noting the low extraction rate and the low net energy yield.

Reserves are huge, at 250 billion m^3 but the amount of gas needed to produce it limits extraction to about 1% of this — and even that will require 10% of the remaining natural gas in North America, or imported LNG.

The energy used to produce synthetic crude from the bitumen extracted from the tarsands is about 30% of the energy in the crude, so the greenhouse gas potential of the produced crude is 50% higher than for conventional crude.

Producing bitumen results in about 3 litres of contaminated water for each litre of oil, and the surface mining method produces a 'devastated' landscape.

http://www.peakoil.net/Newsletter/NL37/Newsletter37.html

Energy Efficiency & Conservation Strategy on target

New Zealand is on track to meet the targets set by the National Energy Efficiency and Conservation Strategy (NEECS), with a 1.9% improvement in energy efficiency in the strategy's first year. Energy Minister Pete Hodgson today released the first full year's results since the launch of the National Energy Efficiency and Conservation Strategy. The benefits include 536 000 tonne less CO_2 emitted due to the energy efficiency improvement. The figures, for the year ended March 2002, show a 1.9% improvement in energy efficiency. Efficiency gains came from the transport, commercial and industrial sectors with efficiency improvements of 3.5%, 2.1% and 1% respectively. Energy efficiency in the residential and primary production sectors declined slightly.

NZ Government, 27 Nov 2003

Watch this (lack of) space

Shanghai, China's biggest city, plans to ban bicycles from all major roads in 2004, to ease congestion brought on by a wave of private car ownership. The city has about 20 million people and 9 million bikes. In recent years, Shanghai has become a centre of China's auto industry and growing affluence has spurred private car buying. Numbers of private vehicles in Shanghai are expected to top 200 000 by the end of this year, plus some 1.2 million buses, taxis, government cars, and commercial vehicles. "Bicycles put great pressure on the city's troubled traffic situation," according to a police official.

A later report said that Shanghai bureaucrats had been labelled bike-haters in a nation of cyclists, and seemed to be back-pedalling fast. Residents

had scoffed at claims the measures could reduce congestion. Now, seemingly out of the blue, city officials have announced plans to build a network of cycle paths in the downtown area.

CAN

(In most cities banning bikes from main routes would make many bike journeys impracticable, even with road crossing permitted at all junctions. According to Dutch data a bike uses 30% of the space for a car (much less for parking), but in narrow streets the advantage for bikes may be even greater. And note the imbalance in numbers: 45 bikes to each car — EW)

Cheap and environmental heating solution

A PhD student at the University of Auckland is developing a solar panel for New Zealand's warehouses and office blocks. Avinda Weerakoon, from the School of Engineering, is developing metal panels that use the sun's radiation to create an environmentally friendly and cheap form of heating. Although similar products have been used in the US, Weerakoon says New Zealand's strong winds and unique climate means the product needs to be modified to be of use here.

The system has metal panels on the roof and sun-facing side of the building. There is a gap between the panels and the wall and a fan sucks warm air through the gap and into the building heating system. "The metal absorbs energy from the sun and creates warm fresh air," says Weerakoon. "It is more likely to be applicable for large buildings such as apartments, warehouses and apartment buildings, that have large surfaces facing the sun."

"What is great about the panels is that they are most efficient during the winter, when the sun is low and therefore shining on the sides of the building. We also think they will be most suitable for the South Island, which has colder but sunnier winters," Weerakoon says.

Weerakoon is also building a computer model that will enable architects and builders to predict the heating requirements of the building. It will predict solar radiation levels and the likely energy output of the panels on a particular building. This will help with decisions such as where to place a building and how many panels are needed. The panels can warm the air by 15˚C in winter.

University of Auckland, 16 Jan 2004

Greens ask for power-price explanation

The Green Party is calling on the Government to fully explain to the public the reasons behind recent power-price hikes of up to 15%. "The public has every right to be confused by both the justification for the price rises and the variable rates of increase being imposed by power companies around the country," Green Co-leader, Jeanette Fitzsimons said. "Some are blaming inflation, others say wholesale prices are out of kilter, others say the price hikes are necessary to pay for new generation. In fact, it is very difficult to disentangle price rises caused by scarcity of resources, like the end of cheap Maui gas, from price rises due to poor market structure or to power company price-gouging."

Fitzsimons said there was no way of avoiding price increases, whether it a new gas field, wind, coal or a combination of these.

"However, this should not be an opportunity for power companies to profiteer. The Government should be reassuring the public by investigating the extent and reasons for price rises and publishing its findings, so that the public will know what is justified and what is not. It is inevitable that the more power demand grows, the more expensive it will be to supply as more costly resources are used. The best way to keep prices down is to reduce consumption through better energy efficiency. Power companies which profit from high prices are unlikely to encourage an efficiency campaign," said Jeanette Fitzsimons. "However, that's where the new Electricity Commission can make a difference, by levying the power industry to fund serious energy efficiency measures."

Living in the greenhouse

A report by the London School of Hygiene and Tropical Medicine says that the greenhouse body count has already reached 160 000 deaths a year. The majority of these occur in Africa, Southeast Asia and Latin America, where people are highly vulnerable to malnutrition, malaria and diarrhoea as hotter temperatures settle in and floods and droughts become more common.

Tom Athanasiou

Government transport sector to be reviewed

The government is to review its agencies in the transport sector, State Services Minister Trevor Mallard and Transport Minister Paul Swain announced in December. The ministers said the review would explore opportunities to improve performance in the sector.

With the development of a comprehensive and long term transport strategy for New Zealand, it is timely to review the effectiveness of the sector as a whole. The review includes the Ministry of

Transport and the six transport crown entities: Civil Aviation Authority (includes the Aviation Security Service); Land Transport Safety Authority; Maritime Safety Authority; Transport Accident Investigation Commission;, Transfund NZ; and Transit NZ. The purpose of the review is to:

- Consider whether the government transport sector is best arranged and has the capability to implement the New Zealand Transport Strategy and to carry out its other requirements and obligations.
- Consider ways to enhance the performance of the sector.
- Propose any necessary changes.

The review team has been asked to provide the Ministers of State Services and Transport with a draft report by mid-April 2004.

NZ Government, 10 Dec 2003

Standard for pellet heaters

Standards New Zealand and Standards Australia have released or public comment a draft of:

DR04061: Domestic solid fuel burning appliances — Pellet heaters: Installation requirements

Comments close on 15 April and the draft can be downloaded from:

http://spex.standards.co.nz/drafts.jsp

Comments in electronic form are preferred and there is a form on the web site.

SNZ

But we can't afford it

One of the biggest problems in public transport is finding the money for capital works. However, Dave Wetzel, vice-Chair of Transport for London, quotes an estimate by a London property developer that the extension of the Jubilee Underground Line in South and East London has raised land values by £bn 13.0 within 1 km radius around the ten new stations on the line.

Allowing say a third for roads and public open space, that is about $NZ 1.5 billion for a square kilometre of private space, or about $ 750 000 for a 500 m^2 section. It will be some while before that kind of capital gain is available from any public transport developments in NZ, but then our project costs don't often run to $bn 10.0 either. The private gain in this case has been over three and a half times the public cost. As Wetzel says:

If this value were collected by means of a Location Benefit Levy then there would have been enough income to pay for three new lines without any resource to taxes on trade or higher fares.

Common sense costs extra — or does it?

A thread on SEF news was started by Nick Sargent, who commented that in building practice, getting anything more sustainable than the legal minimum is hard work. He had had to push his architect hard to get solar water heating; R4.0 ceiling insulation; R2.6 insulation in most walls (but R3.0 in some, with the cavity drained and ventilated); water-filled central heating (to provide a warm healthy home); wiring of all towel rails to a central timer; and double glazing (but with no thermal barrier!).

Another comment was that many people take a particular course because, "my builder (architect) said I should (must)." The long-term solution must be to educate the industry as a whole, but a suggested kick-start looked useful: that an energy-efficient design be the default option in the Building Code, and that any less efficient acceptable solutions require the client's specific approval.

However, a current BRANZ research project is suggesting that the value of non-energy benefits is more than three times the energy benefits (comfort, health, security of supply, better conscience for saving the planet and so on). And there are even wider societal benefits such as employment, environmental impact and industry savings. BRANZ energy scientist This leads to two conclusions:

- The way to sell energy technology is through the feel-good stuff.
- The economic case for good energy use is going by default because most of the benefits are left out. If the true (but uncertain) economic figure is probably more than 3 times the energy cost savings, then assuming it is at least two times will be *more accurate* than assuming it is zero.

What chance of getting this built into a standard release that the client has to sign?

New DC link proposed

A new DC link has been proposed, to replace an existing link that was a pioneer in its day. The proposed capacity is 2000 MW, running from the lower South Island to north of Auckland, at an estimated cost of $bn 2.0. It would bypass the existing system and eliminate the need for

upgrade of the 220 kV grid. The existing DC link would continue to supply Wellington and could be tapped to boost supply into Christchurch.

Options claimed as viable with the proposed link in place include a 1000–2000 MW power station using Southland coal, completing the hydro-power development of the Waitaki and Clutha rivers to give us more than 1500 MW of renewable energy, tapping South Island wind resources, and providing a market for offshore gas fields.

Another interesting idea is for a large pumped storage scheme near the Roxburgh power station. This might store so much water that it would effectively eliminate the dry year problem. That might allow much more wind power on the system.

Bryan Leyland, NZ Herald, 8 Mar 2004

Those slow cyclists again

As part of National Bike Week, Cycle Action Auckland again organised commuter races, from four urban locations to Aotea Square, each starting at 07.35. Average travel times were:

Cycle	27 minutes
Car (professional driver)	32 minutes
Bus	53 minutes

The car times were much faster than on previous races, and the suggested reason was that the race was on a Bike to Work day, when an extra 6% of commuters were thought to be cycling.

e-CAN, 27 Feb 2004

Trans-Tasman action on climate change

The Convenor of the Ministerial Group on Climate Change, Pete Hodgson, and the Australian Minister for the Environment and Heritage, David Kemp, have announced details of the first projects to be undertaken under the Australia-New Zealand Bilateral Climate Change Partnership. The Partnership aims to focus on concrete ways to address climate change, particularly at a regional level. The first Partnership projects include:

- Work to enhance climate monitoring and prediction in the South-West Pacific Region;
- Measures to facilitate local government engagement and action on greenhouse gas abatement and other climate change issues;
- The development of common energy efficiency regulatory requirements;
- Measures to develop a better understanding of Australian/NZ climate variability and predictability;
- Analysis of past climate behaviour at a regional level to help model future climate change scenarios; and
- Collaborative work to reduce emissions of synthetic greenhouse gases.

Dr Kemp said Australia and New Zealand recognised that climate change was a serious and long-term challenge requiring a strong response. "Climate change is a reality and both our countries, and our regional neighbours, are vulnerable to its effects. We have an opportunity and a responsibility to work together to find practical and effective ways to tackle climate change - today's announcement reinforces our commitment to taking action."

The Ministers also announced that Climate Change and Business: The Australia-New Zealand Conference and Trade Expo 2004, jointly sponsored by the Australian and New Zealand Governments, would be held in Auckland next November. This high-level international conference will profile business opportunities arising from responses to climate change. More information is available on the conference website:

www.climateandbusiness.com

NZ Government at 11 Dec 2003

Pictures from Patagonia

The Dominion Post for 11 February shows two photographs of a glacier in Patagonia, taken 75 years apart. The difference is enormous — from mostly glacier to mostly lake and moraine. Mountains in the distance show that the viewpoint is more or less the same and the eye has not been fooled by a very wide angle lens. The photos support a claim in the accompanying text, that the Patagonian glaciers are losing 43 km^3 of ice each year.

So how much does that melting cool the atmosphere? How much faster will the atmosphere warm when all the Patagonian glaciers have melted? A simplistic calculation suggests a huge 4.5°C a century, for the heat going into melting the Patagonian glaciers alone.

It won't happen of course: processes such as heat transfer from the atmosphere into rain and snow; the oceans; other glaciers; and radiation into space will see to that. What the calculation does illustrate is that climate change is the 'small' difference (10^{20} J/yr in this case, or 100 000 PJ/yr if you prefer) between two mind-bogglingly large numbers: heat in minus heat out. Anything we do to change the climate is affecting one of the big numbers and only 'incidentally' the small

difference between them. It is no wonder that changes take time to have any noticeable effect, but then develop an inertia of their own.

Indonesian LPG for NZ?

BP are "interested in NZ as a potential play" for LNG, according to BPNZ managing director Peter Griffiths. "We are talking about a boutique operation... but you could scale it later." Griffiths described NZ as potentially needing up to a million tonnes a year. *(That's about 55 PJ — EW)* Sales to New Zealand would potentially complement a contract already signed for supply to South Korea, where winter demand peaks at the opposite time of the year. The gas source is the Indonesian Tangguh LNG project, designed to supply 7 Mt/yr and scheduled to begin deliveries in 2007. The report named Contact Energy and Genesis as possible customers.

Dominion Post, 11 Mar 2004

Another sign of Peal Oil?

On 9 January Shell downgraded its world-wide proven oil reserves by 20%. Further (accounting) downgrades may be needed because some reserves may not be extracted before licences expire.

Global warming 'catastrophe'?

Reinsurers Swiss Re have issued their now-annual warning of the serious consequences of global warming. They now expect the economic costs to double to €bn 120 /yr within 10 years, hitting insurers with €bn 25-30 in claims, or the equivalent of one World Trade Centre attack annually. Insurance losses from environmental effects have now risen exponentially for 30 years.

Reuters, 3 Mar 2004

SEF on Project Aqua

After some agonising, the SEF Committee have made a submission opposing Project Aqua, Meridian Energy's proposal for getting additional hydro power from the Waitaki by diverting much of the flow into a 50 km canal with six power stations, running from Kurow almost to the sea. While the Forum supports all forms of renewable energy generation, and NZ will clearly need more of it, the reported economic and environmental costs seem to be disproportionate to the benefit.

SEF believes that every renewable energy project, from whatever energy source, must be judged on its own merits and must comply with all statutory requirements, including RMA procedures. In this case Meridian has not demonstrated that they have considered alternative means of influencing demand (including financially assisting, not just 'promoting,' efficiency measures).

(As EnergyWatch went to press it was reported that Project Aqua has been abandoned — EW)

Coal for Huntly

Contracts to import 1.0 Mt of coal for Huntly poser station are now in place. A final contract with Tranz Rail has been signed for hauling coal from a new 70 000 t stockpile facility at Tauranga to Huntly, using new wagons to be built by Tranz Rail. The wagons will will go into service later this year.

Dominion Post, 23 March 2004

SEF membership

Memberships are for twelve months and include four copies of EnergyWatch.

Membership rates, including GST, are:

Unwaged/student	$	22.50
Individual	$	45.00
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Mail the form below, with your payment or order, to The Sustainable Energy Forum Inc, P O Box 11 152, Wellington.

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