



In the danger zone

This edition includes five articles and an opinion piece (plus this one) with overlapping themes:

- Jeanette Fitzsimons committing the Greens to a Peak Oil platform for the coming general election (page 3).
- *The long emergency*, by Jim Kunstler (page 5), a frightening scenario for Peak Oil in the US (hopefully NZ would avoid its worst effects).
- A report on recent computer modelling of climate, *Temperatures may rise by 1.9–11.0° C* (page 10). This concludes that, "the danger zone is not something in the future. We are in it now."
- *Meeting the climate challenge*, by Michael McCarthy (page 11), reporting a high-powered report for the UK's Blair government.
- *Why the sun seems to be 'dimming'*, by David Sington, a BBC report on the effects of non-greenhouse pollutants (page 13).

And an apparently odd-man-out opinion piece:

- *Don't push Bush on Kyoto*, by Tom Burke, suggesting that Tony Blair would be better advised trying to influence China than the US (page 12).

That is a commitment supported by four strong reports and an opinion piece; all against a steady drizzle of alarmist, greenwash or flat-earthier reports (such as the 'hockey stick' on page 22 or a WWF claim that polar bears might be extinct in 20 years: if the projection is correct, what action can now save them?).

EnergyWatch supports the Greens on this: something needs to be done. Very likely because the science is persuasive, and certainly because of

the precautionary principle: the science is **likely** to be right and, if so, the consequences **will** be **much** less nasty if we take action now.

The fundamental problem is worth restating: in a finite world, growth cannot continue indefinitely. That has been known for centuries but so much ignored that some still deny the obvious, 30 years after *Limits to growth*. However, now we have good grounds for believing that a crunch is likely or very likely to be close:

- Peak Oil will come in about 2037 according to the Government (and they have not had enough praise for that recognition); or this year according to Princeton Geologist Kenneth Deffeyes. That is close agreement, given the inherent uncertainties of Peak Oil.
- A recent 'study of studies' suggests that an atmospheric carbon dioxide concentration of 400 ppm will mark a dangerous threshold, committing us to global warming of 2°C since 1750. With the concentration now 379 ppm we shall be there in about 11 years.
- A recent spate of bad news: rapid melting in both arctic and antarctic; warming suppressed by pollution (so should we keep polluting?); new modelling results looking worse than we have seen before; and so on.

But what to do? Bush is apparently immovable; Blair seems unlikely to achieve much because of Bush and, er... Blair; and the general consensus seems to be "Don't frighten the markets."

Fitzsimons worries about democracy, with good reason. Kunstler's scenario — based on drivers

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which we know are coming — would strain any democracy, and Bush's flawed and polarised version perhaps more than most. But is democracy also part of the problem? China is hardly democratic but shows the weakness described by Burke: solve today's problems today and hope to solve tomorrow's problems someday. The end of growth is not something for politicians, on our behalf, to face readily, today or tomorrow.

The end is nigh — or is it?

Gerry Coates points out (page 27) that Bjorn Lomborg's 'unaffordable' estimate of the annual cost of Kyoto is little more than a third of the US defence budget: 1.3% of US GDP. Kyoto isn't enough but Lomborg seems to have over-estimated the costs, so perhaps we could call it quits at around half the annual cost of the US defence budget: less than 2% of US GNP, or perhaps of the order of half of one percent of world GNP. Or at least an order of magnitude lower if Lomborg is wrong and Amory Lovins right.

The costs of controlling our folly seem numbingly large in isolation, but when the whole picture is seen they vanish into the uncertainties. Size is relative: Kyoto is affordable.

What we need is a climate version of the Marshall Plan of the 1940s (post-war reconstruction in Europe); the space race of the 1960s ('giant step for mankind': the project was probably worthwhile just for photographs of the 'blue planet'); the relief work following the Boxing Day tsunami; or even the competitive 'space races' of building the medieval cathedrals. Would we now be richer, in any sense, if any of these mega-projects had been cancelled as too expensive?

How would New Zealand fit into a Marshall Plan for climate? (would calling it the Blair Plan keep him happy?). With a small, adaptable, technically literate population and generous resources of land and sustainable energy (as well as a solid base of sustainable energy use) we could fit in very well. We could run pilot projects; develop and trial technologies; build up knowledge and experience to support joint ventures; learn new technologies and transfer them to others; inspire others; and win pieces of some very big action, all in sunrise industries.

We might even help to catalyse the project by making a start on our own. An article by John Blakeley (page 19) suggests some directions.

Could this be an election year to go down in history?

First political commitment to Peak Oil

(At a Green Party 'Picnic for the planet' on Waiheke Island on 17 January, Co-Leader Jeanette Fitzsimons was the first NZ politician to commit to a Peak Oil platform. Those parts of her speech relevant to Peak Oil and a possible NZ response are given here. — EW)

...When we reach that peak, demand will continue to rise, not just from Western societies that have used most of the oil so far, but also from countries, such as China and India, trying to catch up with our level of motorisation and industrialisation. There is no technology on the horizon that can replace our present consumption of oil, though there are many that can make a contribution. We cannot afford to turn to coal without causing runaway climate change. The only answer is to learn to use energy much more effectively.

The point at which demand outstrips the capacity of the wells to supply is the point at which oil prices rise inexorably and countries at the end of the supply line with little military power are likely to miss out. At first, it will cost you \$ 3.00/l instead of one to fill up your car. Later, there will be absolute shortages, no matter what you are prepared to pay. The cost of farming, fishing, manufacturing and international trade will skyrocket, and our international markets will no longer be able to afford our butter.

No-one can say for sure when this peak will be reached. The Government has picked 2037 as its best guess, based on what oil companies, the US Government and the International Energy Agency are saying. To be frank, this is daydreaming. Discoveries of oil peaked in the 1960s. For many years we have been burning four times as much as we have been finding. When you look beyond the oil companies to independent, experienced petroleum geologists, you find a consensus that we may well have less than ten years before we reach this terrible tipping point. The end of cheap oil is coming towards us with the force of a tsunami and New Zealand is not ready. Only the Greens are planning for how to cope.

History tells us that when civilisations are threatened, empires get nasty.

If there is anywhere on the planet that can do it, it is New Zealand.

If it is oil that has caused the growth of a consumer society that threatens the physical limits of the planet, it is Peak Oil that is causing an unprecedented attack on the human values that we have, until now, associated with civilisation. History tells us that when civilisations are threatened, empires get nasty. It should come as no surprise, then, that the United States — an empire dependent on oil — is doing everything in its power to secure the world's fast dwindling oil reserves, even though that means trampling on the very freedoms it purports to uphold.

NZ could be a leader

I cannot disguise the enormity of the task we face. It is no less than to transform our civilisation so it can meet the challenges of peak oil, climate change and ecological collapse. More than that, it is the challenge of meeting these threats without letting go of the values of civilisation that New Zealanders so cherish: the values of personal freedom, peace, and justice.

If there is anywhere on the planet that can do it, it is New Zealand. We have a unique set of advantages, and so a unique responsibility.

We are a country with few people but many resources; an educated population with advanced technology and knowledge. We have more renewable energy per person than any country bar Iceland. We make our living closer to the earth than many nations and we have not entirely lost our connection with it. The ocean gives us some protection from neighbours. There is no doubt that we can feed ourselves, even without oil, though our diet may change somewhat. We are spared the extremes of climate some have to deal with.

Just as importantly, we have a tradition of democracy, freedom, community action and a welfare state. We have a tradition that says no one should starve from misfortune, that everyone should have the opportunity of education and health care. We must guard these values jealously because, if we are to transform our civilisation to be less reliant on fossil fuels, then only those values will allow us to do so in a humane, inclusive, compassionate way.

However, there is only a narrow window of opportunity and we have to start now. I'm asking you to think this year about what kind of future you want to build, and who you think you can build it with. Sadly, there aren't too many options.

Actions taken

Labour has taken encouraging steps, prodded by the Greens, to reduce the impacts of climate change and oil depletion, and for that they deserve praise. They have signed Kyoto, announced a carbon tax for 2007, made several new wind farms possible through carbon credits, recovered Kiwi control of our rail system and committed \$ 200 M to start fixing it up. They have funded more public transport and we have worked with them to create a new, more sustainable transport strategy. It has been very hard work and involved tough negotiations, but we now have a legal framework that will encourage a transport system that uses less oil. Labour is also the only other party to acknowledge the fact of Peak Oil, though it cannot afford to acknowledge how close it is, for fear of scaring the markets.

Unfortunately, Labour has disappointed us in other policy areas. They have underwritten a new gas-fired power station for which there is as yet no fuel; they have given the coal industry very mixed messages; and they have given tax breaks to oil-exploration companies.

A positive Peak Oil future

In a Green future, we will comprehensively rethink our way of life to reduce and then eventually eliminate our consumption of oil. We will double the efficiency of our car fleet over the next ten years. We will send long-distance freight by rail or ship, not truck, and we'll use buses, trains and ferries to get to work in cities and towns. We'll get on with repairing and extending the rail track, and investing in new buses.

We will no longer trade low-value goods in bulk around the world. We will trade less and do more for ourselves. We will use air less and high-tech wind-assisted shipping more. We will abandon the free-trade agreements we are seeking and develop fair-trading relationships for those products we really need.

Our food production will be more local, and use less petroleum-based fertiliser and pesticide and more integrated pest management strategies. An organic farming strategy will keep production up and increase quality while reducing oil inputs. We'll have more training courses on low-energy, sustainable farming and invest in more soil science. We'll maintain New Zealand's GE-free status.

The diminishing yields of distant, high seas fishing will not pay for its fuel costs. Pressure on coastal fisheries will increase, so we better get some

marine reserves in place to sustain a marine ecosystem that will replenish the fishery. We'll place controls on fishing technology so we don't trash the other creatures in the sea.

Forestry will thrive as long as it is not dependent on long transport distances. We'll grow a much wider variety of higher-quality timbers, which can be sustainably managed and don't need treatment. Wood wastes and low-quality fast-grown logs will become an important fuel source for industry and even transport.

Used resources will be prized and recovered for further use. Products will be designed for reuse, repair and re-fabrication.

Our tourism industry will learn to attract fewer tourists but persuade them to stay longer and to spend more on higher-quality experiences.

The arts, culture and sport will thrive so long as they can also adapt to using less transport. After all, the physical limits of the planet place no limit at all on human ingenuity, imagination, creativity and love. □

Comment on the speech

When the *NZ Herald* reported Fitzsimons' speech on 18 January they obtained comment from others, including:

- Energy Minister Trevor Mallard said, "I am glad the Greens are pointing out the issues in the world. Industrialised nations will need to look closely at alternative forms of fuel but the time scale depends on whether or not we discover more oil deposits."
- Energy analyst Robin Clements, a senior economist for Swiss bank UBS, said it was Fitzsimons who was daydreaming. He did not disagree that world demand for oil would sooner or later outstrip supply at current levels, but said markets rarely let such a thing happen. Either new reserves were found, price rises suppressed demand, or technology moved on.

(We like the comment by banker Robin Clements: price rises will suppress demand [at what price?] and technology [which?] will move on — so everything's all right then. He must have had a bad day at the beach.

— EW)

The long emergency

Jim Kunstler, www.kunstler.com

(An abridged version of a talk about an upcoming book with the same title, posted on SEF News by Brent Efford — EW)

Global peak oil production will change everything. It will challenge all of our assumptions. It will compel us to do things differently. Nobody knows for sure when the peak year will occur; you can only tell in the 'rear-view mirror.' The US oil production peak in 1970 was not immediately recognised, but by 1973 it was clearly in decline.

The Yom Kippur War was in 1973. With Soviet encouragement, Syria and Egypt ganged up on Israel, and Israel won. Islam was unimpressed with US assistance to Israel, pressure was put on the leaders of the Arab oil states and we got the OPEC embargo. It was effective precisely because it was recognised that the US was no longer the 'swing producer' of oil: OPEC was. It was a tectonic shift in world economics. OPEC set the price of the oil markets and we had a rough decade. Interest rates of 20%; stagflation; unemployment; stock market crises. Then we had a second oil crisis in 1979 when the Shah of Iran was overthrown.

The last great discoveries

The crises prompted a frantic era of drilling, and the last great oil discoveries came on line in the 1980s — chiefly the North Sea and Alaskan fields. The markets were glutted, and prices fell as low as US\$ 10 /bbl. It was an illusion. These great fields are now well into depletion and the UK is again an oil importer, after 20 years.

Some of the most knowledgeable geologists in the world now believe we have reached the peak. We may never actually see any reliable figures; it may only show up in strange behaviour of the markets. It is likely to appear as a 'bumpy plateau' — all kinds of market and political signals saying that something is happening but not what it is. Markets will wobble — as they have done for the last year. International friction will increase, especially around the places where the oil is.

Now Saudi Arabia seems to have lost the ability to be the swing producer. They have kept promising to produce another million barrels a day, but

there's no evidence that they really have. No swing producer and no production surplus is a strong sign of the peak.

Princeton Geologist Kenneth Deffeyes says that peak production will occur in 2005. We're there. Others, like Colin Campbell, former chief geologist for Shell Oil, put it more conservatively as 2007.

The end of growth

Industrial societies will never again enjoy the 2–7% annual growth that has been considered healthy for over 100 years. This amounts to a permanent depression. We will see world-shaking political disturbances and economic disruptions. The end of globalise will be hastened by international competition over the richest oil-producing regions. We are already seeing the first military adventures over oil as the US attempts to assure supplies. The Iraq war is only the overture. Bear in mind that the most rapidly industrialising nation in the world, China, is geographically closer to the Caspian region and the Middle East than the US.

The US also faces an imminent natural gas crisis, as threatening as the oil crisis. Over two decades — in response to the OPEC embargoes of the 70s and the Chernobyl and Three Mile Island emergencies of the 80s — the US has shifted electric power generation to dependence on natural gas, and now no amount of drilling can keep up with demand. Canada and Mexico are hardly better off, and gas from elsewhere has to be shipped as LNG — much more expensive than a pipeline. There are very few natural gas terminals in the US and nobody wants them because they are dangerous. About half the houses in America are heated with natural gas.

There is not going to be a hydrogen economy. We may be able to run a few things on hydrogen, but not replace the entire US automobile fleet with hydrogen fuel-cell cars. Nor will electric or natural gas cars suffice. We're going to make fewer car trips. Expect political problems when car ownership and driving becomes incrementally a more elite activity. The mass motoring society worked because it was profoundly democratic. Where is the tipping point for political resentment?

Downscaling America

We will have to change the way we live: downscale and re-scale virtually everything. The scale of daily life will have to be adjusted to fit a post-globalist, post-cheap-oil age. We will have to live a lot more locally and a lot more intensively. Successful human ecologies will soon have to be supported by intensively farmed agricultural

hinterlands. Places that can't do this will fail. Say goodbye to Phoenix and Las Vegas.

I'm not optimistic about most big US cities. They are going to have to contract severely. They grew in the exuberant years of cheap oil and they will have enormous problems remaining viable. The same will be true for social organisation: large-scale enterprises, including many types of corporations and governments, will function very poorly in the post-cheap oil world.

We are entering a period of economic hardship and declining incomes. New development will be very small-scale. The suburbs will tank spectacularly, with unprecedented loss of equity value. We will see an amazing distress sale of properties, with few buyers. The action will be in renovating towns and villages, and connecting them with regions of productive agriculture.

There is no historical precedent for the downscaling that big cities will require. The process is liable to be painful and disorderly. There is a fair chance that the US will disaggregate into autonomous regions before the 21st century is over.

Agriculture

The economy of the mid 21st century may centre on agriculture. The transition will be traumatic, given the destructive land-use practices of our time, and the staggering loss of knowledge. We will be lucky if we can feed ourselves. Farming will have to be much more labour-intensive than it is now. We are going to have to reorganise everyday commerce. The whole system of big box discount and chain store shopping is headed for extinction, sooner than you might think.

Change is coming, like it or not, prepared or not. Prepare to be good neighbours. □

(In New Zealand we seem to be in a much better position. We have no 'large' cities, in world terms, a much greater proportion of electricity from hydro and a more temperate climate. We may have relatively greater reserves of oil and gas. But we have no room for complacency: in the soon-to-come hydrocarbon development climate, finding too much oil could be as disastrous as using too much. — EW)



Electricity and sustainability: making the best of what we have

From David Close and SEF News

Despite much criticism of the sustainability of the New Zealand electricity system, it is what we have, and we shall probably have to work with it for a few years yet. But there is still plenty we can do. Indeed, some things have been done for many years. Demand-side management (DSM) has more of a history than is sometimes recognised, with several decades of encouragement from peak load charges.

David Close comments: "As a new Christchurch City Councillor in 1977, I was briefed on the efforts of the MED (*Municipal Electricity Department — EW*) to manage winter peaks by arranging for the Waterworks Division to operate the standby diesel generators to pump water in extremely cold weather. Over the years I frequently defended the use of ripple control of domestic water heating as a means of keeping domestic power charges down."

DSM is also used for security. Transpower must be able to reduce demand quickly in the event of failure of a major generating plant or transmission line, to avoid a NZ-scale version of the blackout that hit the north-eastern USA in August 2003. In addition to purchasing generation reserves, Transpower also purchases reserves in the form of interruptible load. Such reserves must be available instantly to avoid voltage collapse and system failure in an emergency.

There are already conflicts here, not always recognised. Is the objective cost reduction, and is that for generator, supplier or consumer? Or is the objective energy saving; maintaining supply in a crisis; or deferring capital investment in generation and/or lines?

For example, if a lines company is using ripple control of water heating to control peak loads on its own network, this will help to manage peaks on the national grid — at least to the extent that the peaks coincide. However, the lines company cannot then offer its water heating as reserves if that load is already committed to normal peak load management.

How are all these objectives to be prioritised?

Another limitation of DSM is the length and frequency of demand reductions. A company may be perfectly willing to negotiate to turn off its space heating for one hour, but not for two or three. Similarly it may be willing — with the right incentive — to shut down its entire operation one or two hours early on a few occasions each year, but frequent or prolonged disruption of its business would be uneconomic.

Despite these limitations there is evidence that general adoption of the DSM practices of the best lines companies would bring significant savings. Work is being done for the Electricity Commission on this.

Energy efficiency

The biggest gains are probably to be made in energy efficiency. Capital investment is usually required but the cost is often recoverable in 1–3 years. The energy savings then roll on (with a little monitoring), and the cost savings escalate with rising power prices. There is usually no loss of quality or comfort and often these are enhanced. Indeed the primary benefit of energy savings in home space heating may be health gains. It is genuinely win-win, but it requires skilled assessment, skilled implementation, and accurate measurement of savings.

Not all the gains are in consumer energy. A claim made at the SEF conference was that replacing all old meters could save 10 MW, continuous, and better phase balancing could probably save much more.

Efficiency objective

Efficiency in electricity use is now an objective for the Electricity Commission: it has been made a priority in the latest Government Policy Statement and Act. The Commission is in the process of contracting with competent industry participants to implement pilot programmes with commercial, industrial and domestic elements. One of the requirements is verified savings in consumption. The programme for 2004–05 is modest — only \$ 2.5 M — but it will be increased to \$ 8 M in 2005–06 and \$ 11 M in 2006–07 if the pilots prove effective.

The Commission has recently appointed a specialist staff member to head the efficiency programme, who has recommended a broad approach. A SEF News suggestion was that a useful early action by this person would be to review the activities of the International Energy Agency's DSM group, hopefully leading to NZ joining the group under Commission leadership.

Getting there from here

Very few people in the electricity industry know anything about designing and delivering tangible-result energy-efficiency projects. They do not know either that they do not know, or that much of it is very counter-intuitive. This is a specialist field and needs real specialists who have been working in the field for 20 or so years. Finding them, keeping them, helping them to train others and providing a productive environment for them will be key objectives for many years to come.

A further complication is that we are in a new situation. DSM delivery in liberalised and unbundled energy markets is different from the former integrated utility models — not a simple issue at all.

Ready-Fire-Aim

An often-valid critique of sustainable energy programmes and projects is that they tend to be 'Ready-Fire-Aim' in practice. Some SEF News contributors thought this is effectively what the Electricity Commission has done, by jumping in with pilot programmes to reduce energy consumption. If this criticism is valid it may not matter too much in the first year or two, if there is plenty of low-hanging fruit within range, but it will need to be addressed before the programme is declared a success — or a failure. (*Metaphors getting a bit mixed here: time for a new paragon — EW*)

The effect of letting contracts for sustainable energy programmes will be to choose those who are best able to tender, while remaining unaware of the difficulties faced by those who cannot tender, or cannot tender effectively. What are the barriers? Are contractors (such as the solar thermal industry) suffering growing pains, through growing rapidly from a very low base? Are they desperately managing staff shortages and consequent inefficiencies? Are there perverse incentives, or no incentives? Who pays if things go wrong, such as a relay failing to turn a freezer on again? Are there taxation barriers? Or counter-productive incentives? Or desirable actions that are contrary to someone's ill-considered policy, or not considered, or even illegal?

Barrier busting

What is needed — early in the piece — is a robust, contestable, open, multi-stakeholder analysis of barriers and barrier-removal components, using a proper international best-practice programme and project design process. Then do it again: keep aiming as you fire. And again: no single-stage process is ever going to find everything. Keep barrier busting to bring sustainability gains.

Other barrier examples include:

- Be careful of idealism, rather than practical realities. Small projects are not necessarily good, any more than large ones are necessarily bad.
- One retailer now charges 7 c/day extra for sites with controlled loads (the retailer owns the relays...).
- End users will subscribe to load management or DSM if it suits their purposes, including financially. How do we share the benefits?
- Reliability and cost are important too.
- A problem identified by Amory Lovins is that capital costs for energy efficiency may be too *small* to meet internal capital budget rules, but too large to come out of the operating budget. Are there tax issues here?
- Competition is an illusion unless you have a minimum of 6–8 fully independent contractors with relatively equal market power.
- Which are the most fruitful technologies? Is dumping old fridges a better option than double glazing? (And who will recover the CFCs?)
- Things that clearly don't work in practice — at least in NZ — continue because policy types say they should work in theory.

Most of these issues are being considered by the International Energy Agency's DSM Implementing Agreement, but NZ is still not a member. Many countries are doing better than we are in fixing their particular and individually different messes. The difference is their focus on pragmatism.

Picking winners

Picking winners is difficult but essential. We have to assess facts, options, costs, long- and short-term advantages, and make a choice. We must try to see around our various prejudices. We can never know we have made the right choice until too late, and our grandchildren will be living with some of our choices — right or wrong.

Picking winners is even harder in a data-free environment. What data is needed? Are we sure that is all we need? Is it reliable? Is it hidden from the decision-makers by commercial confidence or other barriers? One difficulty mentioned — out of many — is that the separation of distribution and retailing is unhelpful.

But for the moment we are stuck with it.

More work needed on energy efficiency

NZ Government, 20 December 2004

In late December Minister of Energy Pete Hodgson announced the second year results for the National Energy Efficiency and Conservation Strategy (NEECS). Results to March 2003 show that energy efficiency has improved only 1.0% over 2 years but that 20% of the renewable energy target has already been met. "While there are still many issues to resolve around the quality of the energy efficiency data we have, the message is clear, we must do more," said Hodgson.

The NEECS targets are for energy efficiency to have improved by 20% by 2012 and for renewable energy to contribute an additional 30 PJ of energy. The targets cover all areas of the economy including transport, domestic and commercial energy consumption.

Since March 2003, the government has taken many significant steps that contribute to meeting the targets. In the transport sector, this includes new legislation, a restructuring of the sector and the announcement of an \$ 18.7 bn spending package. All of these measures should lead towards improving the overall efficiency of the sector.

Domestic and commercial energy efficiency measures have also been boosted. More money has been put into EECA and the Electricity Commission is looking to implement a \$ 22 M energy efficiency programme (*over 3 years: see page 7 — EW*). Large businesses are being encouraged to improve energy efficiency, at the same time as reducing emissions, through the Negotiated Greenhouse Agreements scheme.

Energy efficiency was also highlighted as an area requiring further work in the recently released Sustainable Energy discussion document.

Government is also supporting the growth of renewable energy. If all the renewable energy schemes successful in its 'Projects to Reduce Emissions' programme proceed, they could contribute around 13 PJ to the NEECS target. "Energy efficiency can help increase security of supply, reduce the pressure to build expensive new generation sooner than we otherwise might and can help protect the environment. We need to secure these gains at the same time as supporting sustainable economic growth and improving standards of living," said Hodgson.

Critics challenge White House 'Clear Skies' proposal

Roddy Scheer, emagazine.com, 25 January 2005

According to a recently released report by the US National Academy of Sciences, implementation of the Bush administration's proposed 'Clear Skies' initiative would actually weaken air quality standards for some large coal-fired utilities, putting millions of Americans at greater risk from air pollution.

While the existing 'New Source Review' regulations and the Clear Skies proposal both call for reducing emissions of mercury, nitrogen oxides and sulphur dioxide, the difference lies in implementation. The current system relies on public advocates to engage utilities in lengthy legal battles to reduce emissions. Meanwhile, Clear Skies calls for the institution of a cap-and-trade system whereby utilities could buy and sell the right to generate limited amounts of pollution. While Bush administration environmental officials say a similar cap-and-trade system successfully mitigated acid rain during the 1990s, critics point out Clear Skies would allow major utilities to actually increase emissions if they were willing to buy credits from those polluters willing to cut back. That could lead to more mercury releases in some areas.

The report was released just as Congress began debating passage of Clear Skies. If implemented, the new regulations would replace the existing New Source Review system, which first went into effect in 1977 as part of the Clean Air Act.

Wind farm for TrustPower

TrustPower has announced plans for a 120 MW windfarm next to its existing Tararua windfarm, which it says will be the most technically advanced in the southern hemisphere. There will be 40 turbines of 3 MW capacity each. The windfarm is expected to cost \$M 220 (\$ 1800/kW, or about \$ 4000/kWh for 'virtual baseload' if an average power of 45% of rated capacity can be maintained) The wind farm should be generating in time for the 2006 winter.

TrustPower, 23 December 2004

The Centameter

Kerry Wood tries a device to measure instantaneous power use

I recently bought a 'Centameter' to monitor domestic power use. They are available from www.centameter.co.nz, at about \$ 150. There are two units, both powered by dry cells: a transmitter, connected to a sensor clipped around the power (red) cable into the meter; and a remote read-out.

The sensor usually cannot be installed without taking out the power board. I did this with the power off but a professional might not have bothered — there was plenty of insulation. The clip cannot go around the main cable, which contains both power and neutral wires: these (hopefully) carry the same current in opposite directions and so would give a zero reading. Similarly, the Centameter cannot be used on individual appliances without special wiring (between a close-coupled plug and socket would be easiest).

The display unit can be wall-mounted or sit on a bench, and can be read across a small room. It can display instantaneous power cost (c/hr) or greenhouse emissions (kg/hr), although setting up the constants requires some system knowledge. But the most useful display is kilowatt hours, updated every 6 seconds and displayed to 10 W accuracy (this can be a little confusing: 70 W displays as 0.07 kW). There is also a display of room temperature and humidity, and a little smiley appears if the combination is within the comfort range.

It was easy to see that our standby load is 50–70 W (the range seems to be due to the instrument's sensitivity limit, which explains the clumsy display: 70 W displays as 0.07 kW); the main and under-bench cylinders take 1500 W each; the fridge takes 250 W but does it too often, and so on. The Centameter quickly gives a feel for where the energy goes. It is fully portable. You can even take it to bed with you, to check standby power or the electric blanket, although you will also need a torch: turning on a light to take a reading will mess up the reading...

Is it worth while? If you are energy-conscious and have done the more obvious improvements, perhaps not. If you want to know just how much your fridge is taking it won't help — it does not integrate readings over time (the meter does that). But if you are new to the idea of energy conservation, or nontechnical and wondering where to start, or considering anything radical, I recommend it.

Temperatures may rise by 1.9–11°C

(mean 3.4°C)

Nature/insnet

The greenhouse effect could be far more severe than experts have previously predicted, according to results from the world's biggest climate-modelling study. In the worst-case scenario, doubling carbon dioxide (CO₂) levels compared with pre-industrial times increases global temperatures by an average of more than 11°C.

But as well as predicting a bigger maximum rise, the project has also increased the range of possible temperature changes.

The results are the first from climateprediction.net, a project that harnesses the world's desktop computers to predict climate change. More than 90 000 people have downloaded software that uses the spare capacity of their computers to run global climate simulations.

A doubling of CO₂ levels could eventually lead to an increase in world-wide temperature of anything between 1.9 and 11.5°C, the project's researchers report. That is a far greater level of uncertainty than the 2-5°C rise predicted by the UN's Intergovernmental Panel on Climate Change (IPCC).

The uncertainty is greater because climateprediction.net looks at more possibilities than previous models, explains the project's leader, David Stainforth of the University of Oxford, UK. Previous predictions of global warming have been based on just a few dozen simulations; Stainforth's team analysed more than 2000.

The researchers cannot yet put a timescale on the temperature increases, although they suggest that extreme warming could take decades or centuries. Atmospheric CO₂ levels, currently standing at 379 parts per million (ppm), are predicted to hit double their pre-industrial level of 280 ppm midway through this century.

Policies aimed at keeping greenhouse-gas levels below a safe threshold may miss the point, says team member Myles Allen, a physicist at the University of Oxford. Uncertainty over global warming may mean that no such threshold can be determined; rather, we may need to keep cutting greenhouse gases for many years to come. "The

danger zone is not something in the future," he says. "We're in it now."

Each simulation is a different version of a programme called a general circulation model. This model divides the globe into thousands of sectors, and estimates the future temperature based on certain assumptions such as cloud coverage, the rate of heat movement and rainfall rates.

Previous studies have included only the most probable values for these factors, whereas climateprediction.net's power has allowed the researchers to investigate two or three settings for each parameter.

The project's final predictions are based on the 2017 simulations that were able to mimic the current climate. All predicted temperature rises. Most were about 3.4°C, the average value predicted by the IPCC; many were far more severe.

The researchers plan to improve their models, including a more sophisticated picture of how heat travels through the oceans, regional data and a more accurate picture of how temperatures will change during this century. "There's a huge database of which we've hardly scratched the surface," comments team member Mat Collins of Britain's Met Office in Exeter.

Meanwhile, they hope that more users will volunteer their spare computing power through climateprediction.net. "There's lots and lots more to do," says Stainforth. □

The danger zone is not something in the future. We're in it now.

It's not got much to do with energy but...

The Irish government has uncovered 58 000 new road signs, setting speed limits in kilometres an hour and ending years of confusion. Previously distances were given in kilometres but speed limits were in miles an hour.

Guardian Weekly, 28 January 2005



Meeting the climate change challenge

Michael McCarthy, *The Independent*,
25 January 2005

The global warming danger threshold for the world has been clearly marked out for the first time in a report published in late January — and the bad news is, the world has nearly reached it already. The climate can barely afford a 1°C rise in average temperatures before massive climate changes hit the planet. These could include widespread agricultural failure, major droughts, increased disease, sea-level rises, the death of forests, the melting of the Greenland ice sheet and West Antarctica and the switching-off of the North Atlantic Gulf Stream.

A task force of senior politicians, business leaders and academics spell out the warning in the report Meeting The Climate Change Challenge — and it is remarkably brief. In as little as 10 years, the report says, the point of no return on global warming may have been reached. This point will be 2°C above the average world temperature prevailing in 1750, before the industrial revolution, when human activities — mainly the production of waste gases such as CO₂ — first started to affect the climate.

But it points out that global average temperature has already risen by 0.8°C since then, with more rises already in the pipeline — so the world has little more than a single degree of temperature latitude before the crucial point is reached. More ominously still, the report says a 400 ppm concentration of CO₂ in the atmosphere will make that two-degree rise inevitable — and the level is already 379 ppm and rising at 2 ppm/yr.

“There is an ecological time bomb ticking away,” said Stephen Byers MP, the former British Transport Secretary who co-chaired the report with American Republican Senator Olympia Snowe. The report makes clear that, although global warming’s effects may seem distant, time is actually very short and it is action taken — or not taken — in the next few years which will be decisive for climate change this century and beyond.

The authors urge all countries in the G-8 group of rich nations to generate a quarter of their electricity from renewable sources by 2025, and to double their research spending on low-carbon energy by 2010. The study also calls on the G-8 to

form a climate group with leading developing nations such as China.

The report’s major impact will be in linking the twin danger thresholds of a 2°C temperature rise and the 400 ppm CO₂ concentration. Perversely, although preventing ‘dangerous’ climate change is the principal objective of the UN climate treaty signed in 1992, no-one has yet defined what dangerous actually is. In early February the UK Government were to host a major scientific conference to try to do so.

The report — based on an extensive review of the current scientific literature — will be widely noticed and its core message taken on board. “What this underscores is that it’s what we invest in now and in the next 20 years that will deliver a stable climate, not what we do in the middle of the century or later,” said Tom Burke, a leading environmental adviser to business.

The report’s influence will be enhanced further by the seniority of the authors, assembled by the Institute for Public Policy Research in Britain, the Centre for American Progress in the US, and the Australia Institute. They included leaders from the political, business, academic and environmental communities in developed and developing countries. Their chief scientific adviser was Dr Rakendra Pachauri, the chairman of the IPCC, who in effect is the world’s senior climate scientist.

The report starkly spells out the likely consequences of exceeding the global warming threshold of 2°C warmer than 250 years ago:

- The risks to human societies and ecosystems grow significantly. It is likely, for example, that average-temperature increases larger than this will entail substantial agricultural losses, greatly increased numbers of people at risk of water shortages, and widespread adverse health impacts. They could also imperil a very high proportion of the world’s coral reefs and cause irreversible damage to important terrestrial ecosystems, including the Amazon rainforest.
- The risks of abrupt, accelerated, or runaway climate change also increase. The possibilities include the loss of the West Antarctic and Greenland ice sheets (which, between them, could raise sea level more than 10 m), the shutdown of the Gulf Stream and the transformation of the planet’s forests and soils from a net sink of carbon to a net source of carbon. □



Don't push Bush on Kyoto

Opinion
Tom Burke

(Why UK PM Tony Blair should not waste his opportunities this year — as G-8 leader and EU President — in trying to bring Bush into the Kyoto Protocol, but rather should focus on China. Extracted from the Guardian Weekly, 4 February 2005 — EW)

Tony Blair has begun climbing the Everest of expectations he has built for himself on climate change. On successive days last week the prime minister breakfasted with Britain's leading environmentalists, spoke to the World Economic Forum in Davos, when he again stressed the urgency of the issue, and had a private meeting with business leaders to seek their support for faster action on the climate.

This week there is a major conference on the science of climate change in Britain. Then, in March, there will be an unusual ministerial round table of energy and environment ministers... No one should doubt Blair's personal commitment to this issue. But, on this as on so many other issues, the real question is whether his good intentions will be translated into a practical political strategy.

Blair is not starting from a high point. His decision to seek an increase in the CO₂ that Britain would be allowed to emit under EU legislation caused outrage. Why he sacrificed so much credibility for a 3% increase is difficult to imagine. It could hardly have been the difference between life or death for British industry.

...

Bringing the US closer to the rest of the world on climate change is a key goal of Blair's G-8 strategy, the west face of his Everest. This confused start will comfort the White House, confirming the impression left by his visit to Washington after the re-election of President George Bush that, personally important though this issue is to Blair, he will not spend much political capital on it.

...

[Blair] must open an assault on the more promising east face of his Everest and give everyone something else to talk about. He has so far overlooked the chance to use his G-8 initiative as a springboard to lead the EU, whose presidency he holds for the second half of the year, into developing a powerful investment-driven

relationship with China on energy security and climate change.

The Chinese government increasingly understands it is between a rock and a hard place on the climate. It must maintain its rate of economic growth to avoid social turmoil. To keep up that rate of growth, it must expand its electricity supply. To do that securely, it must burn a lot of coal. If it burns a lot of coal, the climate will change. Because the Chinese environment is particularly vulnerable to a changing climate, an unstable climate will quickly lead to social turmoil.

Faced with certain trouble today or likely trouble tomorrow, the Chinese, like any other government, will deal with today's problem first and hope something turns up for tomorrow's. This matters for the rest of the world because China is already planning to build more than 500 coal-fired power stations between now and 2030. If they are built with current technology there is no prospect that we will stabilise CO₂ concentrations at a safe level.

A strong EU-China partnership on rapidly deploying advanced coal gasification and carbon sequestration technologies; wind and other renewables; and harmonising high technical standards for vehicles and appliances, would alter the political landscape on climate change substantially.

Anything China can do, India can do too. Such a strong and potentially trade-promoting relationship between Europe and two of the most powerful growth engines of the global economy would catch the attention of the US business community. Only Americans will eventually persuade America to do more on the climate, and the prospect of lost markets will carry more weight there than even the best science.

To climb the east face of his Everest, Blair needs to do two things urgently. The first is to recognise that the G-8 is a device for generating headlines but the EU has real economic clout in the world. The second is to persuade President Jacques Chirac of France and the German chancellor, Gerhard Schröder, to join him in making an opening to the east on climate.

...

This will not be easy. But it is likely to be more productive than trying to persuade the US to do more. And, if nothing else, it will lessen the chance that the only thing anyone will remember of the Blair year of the climate, with all its high expectations, is that President Bush turned him down again. □

Why the sun seems to be 'dimming'

David Sington BBC News

(We reported this effect last September — Global cooling?, EW 34, p 23 — but now there is new information on how it is happening and why it is so important. Information covered in the earlier article has been heavily edited here — EW)

Scientists have been studying solar measurements for decades, and have reached the disturbing conclusion that the amount of solar energy reaching the Earth's surface has been gradually falling. Paradoxically, this may mean that global warming is a far greater threat to society than previously thought.

The effect ('global dimming') was first spotted by Gerry Stanhill, an English scientist, when he compared Israeli records from the 1950s with current ones, and found a large fall in solar radiation. When he looked more widely, he found that sunlight had fallen by 10% over the USA, nearly 30% in parts of the former Soviet Union, and by 16% in parts of the UK. The decline amounted to 1–2% each decade from 1950 to 2000.

Cooling effects include light bouncing off soot particles in the atmosphere and back into space, and greater reflection from clouds, which form more easily around particles of pollution. Now a key new effect is that because pollution particles seed the formation of water droplets, polluted clouds contain more droplets than clean clouds. Recent research shows that this makes them more reflective than they would otherwise be, reflecting the Sun's rays back into space.

Scientists are now worried that dimming will shield the oceans from the full power of the sun, and disrupt rainfall patterns. There are disturbing hints that this may be happening in Asia, home to half the world's population. "My main concern is global dimming is also having a detrimental impact on the Asian monsoon," says Professor Veerabhadran Ramanathan, professor of climate and atmospheric sciences at the University of California, San Diego. "We are talking about billions of people."

But perhaps the most alarming aspect of global dimming is that it may have led scientists to underestimate the true power of the greenhouse effect. They know how much extra energy is being trapped in the Earth's atmosphere by the extra CO₂

we have placed there. What has been surprising is that this extra energy has so far resulted in a temperature rise of just 0.6°C.

This has led many scientists to conclude that the present-day climate is less sensitive to the effects of CO₂ than it was, say, during the ice age, when a similar rise in CO₂ led to a 6°C temperature rise. But it now appears the warming from greenhouse gases has been offset by a strong cooling effect from dimming — in effect two of our pollutants have been cancelling each other out.

This means that the climate may in fact be more sensitive to the greenhouse effect than previously thought. If so, then this is bad news, according to Dr Peter Cox, one of the world's leading climate modellers. As things stand, CO₂ levels are projected to rise strongly over coming decades, whereas there are encouraging signs that particle pollution is at last being brought under control. "We're going to be in a situation — unless we act — where the cooling pollutant is dropping off while the warming pollutant is going up. That means we'll get reducing cooling and increased heating at the same time," says Cox.

Even the most pessimistic forecasts of global warming may now have to be drastically revised upwards. That means a temperature rise of 10°C by 2100 could be on the cards, giving the UK a climate like that of North Africa, and rendering many parts of the world uninhabitable. That is unless we act urgently to curb our emissions of greenhouse gases. □

Wind generates extra profit for TrustPower

Extra output from TrustPower's Tararua Windfarm near Palmerston North helped boost its net profit in the nine months to December 31, by 17%. The Tauranga electricity generator and retailer posted an unaudited net surplus of \$ 61.5 M for the period, compared with \$ 52.7 M for the same period in 2003.

Chief executive Keith Tempest said TrustPower's turbines had had "quite a good run from a wind perspective" since stage two of the farm was commissioned last May. "The additional power that has been generated has some dollars in it, no question. But it (the windfarm) is an investment, (and) capital costs and depreciation costs are high in the initial years." *Stuff*, 28 January 2005

Roads gone wild

Tom McNichol www.wired.com

(An edited version of an article on a new approach to traffic engineering. However, we suspect that in New Zealand this approach would be a bit hairy under current give-way rules.

— EW)

Hans Monderman is a Dutch traffic engineer who hates traffic signs. He considers most signs to be not only annoying but downright dangerous. To him, they are an admission of failure, a sign, literally, that a road designer hasn't done his job. "The trouble with traffic engineers is that when there's a problem with a road, they always try to add something," Monderman says. "To my mind, it's much better to remove things."

Monderman is one of the leaders of a new breed of traffic engineer — equal parts urban designer, social scientist, civil engineer and psychologist. The approach is radically counterintuitive: build roads that seem dangerous, and they'll be safer.

A favourite junction

His favourite junction is in Drachten, a 17th-century village that has grown into a town of more than 40 000; a busy intersection carrying 20 000 cars a day, plus thousands of bicyclists and pedestrians. Several years ago, Monderman ripped out all the traditional instruments used to influence driver behaviour — traffic lights, road markings, and some pedestrian crossings — and in their place created a roundabout. It is remarkable for what it doesn't contain: signs telling drivers how fast to go, who has the right-of-way, or how to behave. There are no lane markings or kerbs separating street and footpath, so it is unclear where the car zone ends and the pedestrian zone begins. To an approaching driver, the intersection is utterly ambiguous — and that's the point.

Somehow it all works. The drivers slow to gauge the intentions of crossing cyclists and walkers. Negotiations over right-of-way are made through fleeting eye contact. Remarkably, traffic moves smoothly around the circle with hardly a brake screeching, horn honking, or obscene gesture.

Monderman says, "Pedestrians and cyclists used to avoid this place, but now, as you see, the cars look out for the cyclists, the cyclists look out for the pedestrians, and everyone looks out for each

other. You can't expect traffic signs and street markings to encourage that sort of behaviour. You have to build it into the design of the road."

Variations of Monderman's less-is-more approach are showing up in Austria, Denmark, France, Germany, Spain, Sweden, the UK, and the US. In Denmark, the town of Christianfield stripped the traffic signs and signals from its major intersection and cut the number of serious or fatal accidents a year from three to zero. In the UK study of centreline removal conducted by the Transport Research Laboratory, found that drivers with no centre line to guide them drove more safely and had a 35% decrease in crash rates.

US rethink

In the US, traffic engineers are beginning to rethink the dictum that the car is king and pedestrians are well advised to get the hell off the road. In West Palm Beach, Florida, planners have redesigned several major streets, removing traffic signals and turn lanes, narrowing the roadbed, and bringing people and cars into much closer contact. The result: slower traffic, fewer accidents, shorter trip times. "I think the future of transportation in our cities is slowing down the roads," says Ian Lockwood, the transportation manager for West Palm Beach during the project and now a consultant. "When you try to speed things up, the system tends to fail, and then you're stuck with a design that moves traffic inefficiently and is hostile to pedestrians and human exchange."

The common thread in the new approach is a recognition that the way you build a road affects far more than the movement of vehicles. It determines how drivers behave on it, whether pedestrians feel safe to walk beside it, what kinds of businesses and housing spring up along it. "A wide road with a lot of signs is telling a story," Monderman says. "It's saying, go ahead, don't worry, go as fast as you want, there's no need to pay attention to your surroundings. And that's a very dangerous message."

In the nearby village of Oosterwolde a once conventional junction with traffic lights has been turned into something resembling a public square that mixes pedestrians, and cyclists with about 5000 cars a day, with no serious accidents since the redesign in 1999. Monderman demonstrates what he calls a crucial test of such a design. He tucks his hands behind his back and begins to walk into the square — backwards, straight into traffic, without being able to see oncoming vehicles. A stream of motorists, bicyclists, and pedestrians ease around him, instinctively yielding to a man with the courage of his convictions.

From the beginning, a central premise of US road design was that driving and walking were utterly incompatible modes of transport, and that the two should be segregated as much as possible. The suburban community of Radburn, New Jersey, founded in 1929 as 'a town for the motor age,' took the segregation principle to its logical extreme. Radburn's key design element was the strict separation of vehicles and people; cars were afforded their own generously proportioned network, while pedestrians were tucked safely away in residential 'super blocks,' which often terminated in quiet cul de sacs. Parents could let kids walk to the local school without fearing that they might be mowed down in the street. Radburn quickly became a template for other communities in the US and Britain, and many of its underlying assumptions were written directly into traffic codes.

The psychology of driver behaviour was largely unknown. Traffic engineers viewed vehicle movement the same way a hydraulics engineer approaches water moving through a pipe — to increase the flow, all you have to do is make the pipe fatter. Roads became wider and more 'forgiving' — roadside trees were cut down and other landscape elements removed in an effort to decrease fatalities. Road signs, rather than road architecture, became the chief way to enforce behaviour. Pedestrians, meanwhile, were kept out of the traffic network entirely or limited to defined crossing points.

Unintended consequences

The strict segregation of cars and people turned out to have unintended consequences for the structure of towns and cities. Wide roads sliced through residential areas, dividing neighbourhoods, discouraging pedestrian activity, and destroying the human scale of the urban environment.

The old ways of traffic engineering aren't going to disappear overnight. But one look at West Palm Beach suggests an evolution is under way. When the city of 82 000 went ahead with its plan to convert several wide thoroughfares into narrow two-way streets, traffic slowed so much that people felt it was safe to walk there. The increase in pedestrian traffic attracted new shops and apartment buildings. Property values along Clematis Street, one of the town's main drags, have more than doubled since it was reconfigured. "In West Palm, people were just fed up with the way things were, and sometimes, that's what it takes," says Lockwood. "What we really need is a complete paradigm shift in traffic engineering and city planning, to break away from the

conventional ideas that have got us in this mess. There's still this notion that we should build big roads everywhere because the car represents personal freedom. Well, that's bullshit. The truth is that most people are prisoners of their cars."

Some of the most car-oriented areas in the US are rethinking their approach, mainly because they have little choice. "The old way doesn't work anymore," says Gary Toth, director of project planning and development for the New Jersey Department of Transportation. The 2004 Urban Mobility Report, published by the respected Texas Transportation Institute, shows that traffic congestion is growing across the nation in towns and cities of all sizes. The study's conclusion: It's only going to get worse.

"The cities that continue on their conventional path with traffic and land use will harm themselves, because people with a choice will leave," says Lockwood. "They'll go to places where the quality of life is better, where there's more human exchange, where the city isn't just designed for cars. The economy is going to follow the creative class, and they want to live in areas that have a sense of place. That's why these new ideas have to catch on. The folly of traditional traffic engineering is all around us."

As the new approach to traffic begins to take hold in the US, the road ahead is unmarked and ambiguous. Hans Monderman couldn't be happier. □

Saudi Arabia 'approves' the Kyoto Protocol

On 20 December 2004 it was announced that the Saudi government had given its approval to the Kyoto Protocol. A royal decree is being prepared to formally endorse the step. As a developing country, Saudi Arabia would not be subject to emissions cuts under the protocol.

Oil Minister Ali al-Naimi, said his country expects to lose billions of dollars in oil sales as developed nations implement the pact. "By the year 2010, Saudi Arabia will lose at least US\$bn 19/yr as a result of the policies the industrialised nations will adopt to reduce their greenhouse gas emissions," Naimi told a UNCC conference.

Saudi Arabia has called for research to improve technology to recover greenhouse gases at the point of production of fossil fuels, easing the impact of environmental measures on oil exporters.

How green are trolley buses?

Opinion

Mainly from SEF News

Do Wellington's trolley buses run on sustainable hydro-electricity, polluting thermal electricity or something in between? And how do they compare with the diesels? As usual, it all depends...

- The opening argument was that Wellington's electricity usually comes from the South Island — 100% sustainable hydro.
- Even when running on 100% fossil-fuel sourced electricity, a trolley bus is probably better than a diesel for greenhouse gas emissions, and certainly better if the energy source is gas.
- A new trolley bus (not a replacement) creates a marginal demand for electricity, and this is made up — directly or indirectly — by thermal generation.
- The 'thermal at the margin' argument is weaker than it was even a year ago, with substantial wind generation now onstream. Predictions are for another 1000 MW of new wind turbine capacity in a decade (or say 450 MW of 'virtual base load').
The carbon tax, coming in 2007, will be a further push towards sustainable energy sources.
- More new buses — diesel or trolley — will mean a better public transport service and potentially less private vehicle use, leading to GHG and pollution savings.
However, cars may be **less** polluting than diesel buses (or even trolleys) at off-peak hours, when the buses are carrying only a handful of passengers.

But there are wider issues than pollution:

- A trolley bus is more expensive to buy than a diesel (although it lasts longer — less vibration). It also has high costs for the overhead wires, which become unrealistically high on lightly used routes.
- A trolley bus is quieter than a diesel, although Wellington's latest diesels are probably quieter at stops than the current trolleys (they have noisy fans — on this occasion the electrical variety).

A trolley bus is much less reliable, because of the overhead wires and because Wellington's trolleys are almost unique in having no standby power.

Light rail

Trolley buses would look much less attractive if they shut out an even more sustainable mode — light rail — and a major upgrade of Wellington's trolleys might do just that. Ignoring minor services (diesel passenger rail, ferry, cable car and maybe the James Cook lifts), Wellington currently has three public transport modes:

- Suburban rail: no major change anticipated (although new or upgraded cars will be nice).
- Trolley buses: under discussion.
- Diesel buses: no major change anticipated, although overhead maintenance costs for trolleys might encourage some take-over of lightly used trolley routes.

Light rail might run on some existing rail routes — notably the Johnsonville Line — but cannot be a wholesale replacement for suburban rail. There is not enough track capacity to carry the traffic on trains short enough for street running (trams longer than a city block are a menace at stops). There are also safety issues which would be very expensive to solve.

Light rail can share streets with trolley buses, but if the bus services continue there is no gain. And if the trolleys lose their central city spine route — where their advantage over diesels is greatest — would they be viable on other routes?

So there is a possibility that either light rail and diesel buses would squeeze out trolley buses, or that suburban rail and trolley buses would leave no space for light rail.

Given these difficulties, why consider light rail?

- Lower labour costs and much lower energy use (low rolling resistance and regenerative braking).
- More attractive to passengers (smoother, quieter, easy boarding, route and stops obvious, and better timekeeping — which makes interchanges much more attractive).
- Crucially, light rail is faster, a key passenger attractor. It is much easier than buses to keep moving in traffic-filled streets, because a few large vehicles don't delay each other. They also minimise delay to **motor** traffic, because of much lower demands on junction time.

A light rail system would be much more effective than a few extra trolley buses, in attracting passengers and improving Wellington's transport generally; both private and public. It would also be much more expensive. There are some interesting and overdue studies here. □

How like a trolley bus is an aluminium smelter?

Mainly from SEF News

Comalco are negotiating (or have they finished?) a Negotiated Greenhouse Agreement with the Climate Change Office, for their Bluff aluminium smelter. They have been allocated a 'zero' emissions factor (associated carbon emissions) on electricity from Manapouri (under their bilateral contract with Meridian) and the prevailing official emissions factor for electricity purchased from the New Zealand Electricity Market. (The emissions factor is the official answer to the opening question in the article opposite, about how much GHG emissions are associated with any particular electrical load)

Given that the smelter accounts for some 15% of New Zealand's total electricity demand, the emissions factor chosen is significant. Allocating a zero value to a bilateral contract and a larger value to market purchases needs justification.

Should the smelter close for any reason, reduced electricity demand would displace thermal production. In terms of both GHG emissions and consumer cost of electricity, closing the smelter would bring benefits (but not necessarily net benefits).

Of course the same is true, on a smaller scale, of a Wellington trolley bus, or your toaster for that matter. The difference is that the smelter is so large that it dominates the market, which is why you can't get a cheap, secret, bilateral contract for your toaster. So why is everybody trying to pretend that the smelter is somehow outside the market?

The question seems to be worth asking: would closing the smelter be of net economic benefit to New Zealand in any of these cases?

- A massive gas field is discovered off East Cape. The carbon charge after 2007 is \$ 15/tonne.
- A large gas field is discovered off East Cape but shortages develop before it can be brought to market and there are 3–5 years of severe exposure to dry-year electricity shortages. The carbon charge after 2007 is \$ 20/t.
- A small gas field is discovered off Cardiff Road and the electricity generators agree to long-term contracts to buy gas imported as LNG. The carbon charge after 2007 is \$ 25/t and after 2012 is \$ 50/t.

- No new gas is discovered and Solid Energy develop a 1000 MW power station burning wet lignite. The government amends legislation to allow development of nuclear power. The carbon charge after 2007 is \$ 25/t and after 2012 is \$ 75/t.

We can only hope that the Government is not locking itself into unwise NGAs.

Prime Minister opens Te Apiti

Prime Minister Helen Clark officially opened the Te Apiti wind farm on 9 December 2004. Her speech will be of interest to EnergyWatch readers not so much because of what she said as because she chose to be there — in an election year — and because of the subjects she chose to cover:

- Wind power is coming of age in NZ and Meridian is at the forefront of its development. Generation from wind has grown fourfold this year — from 40 to 160 MW — by the end of the year to April, and there will be more coming.
- Obviously NZ has a significant untapped wind resource. Wind is now proving to be more cost competitive in the energy marketplace, and it fits well with other generation methods like hydro. While wind currently provides less than 2% of total electricity generated, it has the potential to provide over 20% of our electricity needs.
- The Kyoto Protocol recognises the key role business can and, in my mind, must play in tackling environmental issues.
- Put simply, electricity from wind farms and other new, clean energy projects reduces the need for generation from gas or coal. This in turn reduces the greenhouse gas emissions which have contributed to climate change. The government is able to help make clean energy projects viable by passing on carbon credits to those undertaking them.
- New Zealand faces two key challenges with regard to climate change. The first, the adaptation challenge, is to prepare our infrastructure, ecosystems and productive sectors to be able to cope with its effects. The second, the mitigation challenge, is to limit both the magnitude and rate of climate change. That

means working to reduce emissions of greenhouse gases.

- Te Apiti symbolises the transformation New Zealand is currently undergoing to become a sustainable, innovative, world class economy. It shows we're capable of completing outstanding technological and engineering projects. It shows we are forward thinking enough to conceive of such projects in the first place and it shows that our commitment to the Kyoto process can help us take visionary projects forward.
- A recent nation-wide survey of attitudes towards electricity generation options found wind power to be the most popular mode of generation with 82% of respondents approving or strongly approving. Even when people were asked if they would support a wind farm being built in their local area, 60% were in support and only 18% were opposed. Such large public support for renewable energy developments is a credit to our country. It says that we care about our environment and that we want to do our bit to preserve it, while at the same time providing power for our growing economy.

And incidentally, it looks as is one of the PM's researchers had had a quiet afternoon:

Wind farming is a relatively new development in New Zealand — the first significant wind turbine was installed in Brooklyn, Wellington only in 1993. Yet the technology to do this has existed since the late nineteenth century. One of the pioneers was Danish meteorologist Poul la Cour, who built his own wind tunnel for experiments in the 1890s.

La Cour was concerned with the storage of energy, and used the electricity from his wind turbines for electrolysis in order to produce hydrogen for the gas light in his school. One basic drawback of his scheme was the fact that hydrogen exploded due to small amounts of oxygen in the hydrogen, causing him to replace the windows of the school several times. The technology has come a long way since then. □

Dairy energy information

SEF member Malcolm Souness has started an e-mail newsletter on electrical energy use on dairy farms, Dairy Energy Mail-Out (DEMO).

Information from : www.kWh.co.nz

A 'standard' solar house

Heather & Kerry Wood

Nelson architect Helen Richards has built a solar 'show home' in Nelson, and has lived in it through the first winter without using any heating. The extreme internal temperature range was 16–24°C (and Richards should know: almost every room has a digital thermometer). The show house has a concrete floor 150 mm thick to provide thermal mass, some internal concrete walls, and even concrete benches in kitchen and bathroom. Double glazing and thick insulation minimise heat losses, with large windows on the north side to maximise solar heat gain in winter.

Richards has blended energy efficiency with style, to increase the mass appeal of a solar home. She says that people are often surprised at the house's good looks. The design is patented.

Technical information can be found in *EnergyWise News* (June 2004) and on the web site:

www.poweredliving.co.nz

We visited Helen Richards in January, hopefully as a first step in building a Powered Living house. We were impressed. The look, feel and comfort all seemed right at once, although it is unfortunate that the view across Golden Bay is not part of the standard package.

Points we noted included:

- The package is neither a standard spec-house nor a conventional architectural offering: much more flexible than a spec house but cheaper than a full architectural design. We were given a rough preliminary drawing, an adaptation of the smaller design on the web site, prepared for us. Studying it in detail when we got home showed that it is already close to what we want, and easily adjustable where needed. However, it will probably need adaptation to the site, when a site is chosen.
- Claddings and finishings can be the owner's choice.
- Recommended orientation is ideally within $\pm 15^\circ$ of true north but $\pm 30^\circ$ is acceptable.
- Some form of heating is recommended. Radiant is best — warm air may do something for you as it goes past, but then just warms the thermal mass and takes hours to make any other difference.
- The windows are double glazed and huge —

almost full-width and higher than standard. They might easily feel uncomfortable if the house were overlooked from the north.

- The design has north-side eaves to keep the summer sun out. There are no verandahs but this is a strength (solar gain) not a weakness: with bi-fold doors open, the space just inside them effectively is a varandah.
- Owner's temperature control is encouragingly casual. A clerestory window was slightly open, with no way of closing it from ground level. It had been like that all winter (remember that this is a prototype), but now a control has been fitted for summer cooling.
- A main spine wall, running E–W, is made of upended and (in the show house) polished concrete slabs, and forms part of the thermal mass of the house. Concrete surfaces can be finished as the owner wishes.

Finding a solar section

Our experience is that many sections are unsuitable for a solar house. We have had to search for something large (probably at least 700 m²) to reduce the risk of being built out, which would mean losing heating as well as outlook.

This is a general problem: typical District Plan protection is inadequate for a house designed to rely on passive solar heating. District Plans typically require a house to be inside a building line rising vertically to 2.0 m at a point 0–3 m inside the boundary line, and then sloping inwards at 45° (recession plane) to some specified maximum height. This gives little protection when the noon winter sun is only 26.5° above the horizon, and no protection against growing trees.

Molly Melhuish points out that the city of Boulder, Colorado, has addressed this problem (Boulder is in latitude 36°, compared with Auckland 37°, Dunedin 46°). Their guidelines are on the web at:
http://www.ci.boulder.co.us/building_services/guides/solrshad.pdf

Broadly, Boulder offer:

- A planning requirement for new houses to be built with their long axis E–W, with subdivisions laid out accordingly. There are additional requirements for sloping ground.
- General protection of a right to sun for a minimum of four hours (11.00–14.00) in mid-winter.
- Special protection for houses designed for solar gain, by issuing a 'solar access permit'.

The sustainable energy imperatives

John Blakeley
Convenor, The Sustainable Energy Forum

(An edited version of a paper presented to the conference of the Energy Federation of New Zealand, Wellington, 25 November 2004
— EW)

From a New Zealand perspective, the twin imperatives for more sustainable energy are:

- The global warming / climate change issue and the long-term sustainability of the planet's environment and resources;
- Future availability and cost of oil (and gas) imported into New Zealand (Peak Oil).

Global warming

Recently the international reinsurance company, Munich Re, stated that inflation-adjusted annual economic losses from weather-related events have risen 14-fold over the last 40 years.

At the 19th World Energy Congress in Sydney in September 2004, there were 2300 people present from all continents. They agreed that global climate change is a serious concern, with very little dissent, and that delivering sustainability has become a clear priority of the energy sector.

Peak Oil (and gas)

'Peak Oil' is when oil production peaks and then gradually declines. There is now considerable discussion around the world as to how soon this might occur, but most agree it will be within the next few decades.

Oil prices have risen dramatically over the last 12 months due to geopolitical risks of supply and increasing demand, especially in India and China.

In NZ we are becoming increasingly dependent on imported oil. 'Self sufficiency' has decreased from nearly 50% in the early 1980s to around 20% now. This makes us extremely vulnerable to supply fluctuations and balance of payments issues if the price rises dramatically (such as in 1973–74).

The running down of the Maui field highlights a future potential shortage problem with natural gas. Do we want to increase our vulnerability by turning to LNG as a solution?

The governments' *Sustainable Energy* document

This document, released in October 2004, was discussed at the SEF conference on 19-20 November. The consensus was that it is excellent in parts. It is very good on policy analysis and assessment of the present situation, but weak on considering actions to be taken.

It also lacks a sense of urgency. Six months are allowed for comment and it may take 1–2 years to put a programme of action in place.

When comparing energy options, it is important that they be compared on the same basis. For example, in comparing a new transmission line option with a demand side option, don't compare a 50 year payback period on a new transmission line with a 2–3 year payback period on a demand side option.

Future energy options

We need to use more alternative fuels for transport: ethanol and bio-diesel, and perhaps hydrogen in the (longer term) future.

We need to use more alternatives for heating including biomass wastes for industry and co-generation, wood pellet stoves, solar water heating (residential and commercial) and more use of gas for direct heating and water heating in the commercial/industrial/residential sections. (Ban the slogan *Electricity: the only one you need*?)

We need to exploit much more the potential for energy efficiency and demand side management. A paper at the SEF Conference by Steve Goldthorpe postulated that the ultimate potential is somewhere between a half and three times present energy use. The problem is we don't know exactly where, between these wide limits.

We must exploit NZ's potential for renewable energy. We have high wind energy potential, relatively limited future potential for hydro-electricity and geothermal energy, high future potential for biomass from forestry wastes, and (further into the future) for solar electricity from photovoltaics as this becomes more economic.

Final comment

(from *I Chem E Journal*, October 2004)

Security of energy supply, especially electricity, is now an important political issue in many countries.

Environmental advocates argue still that sustainable development should, "not be allowed to be trampled on" by energy security rhetoric. That might be laudable, but

it cannot be denied that energy security is a pre-requisite for sustainable development.

Pursuing environmental excellence, reducing greenhouse gas emissions and sustaining cost-effective secure electricity supplies are indivisible goals. There is a need for a uniform national approach to all the elements that underpin the achievement of these goals. □

Party Party Party Party

The Kyoto Protocol: in force from 16 February

On 16 February 2005 it was party time: the Kyoto Protocol came into force. The press release by the Environment and Conservation Organisations of NZ (SEF is a member) said in part:

The entry today into force of the Kyoto Protocol was welcomed by ECO, the national organisation that represents over 70 organisations with a concern for the environment.

"Convenor of the Ministerial Group on Climate Change, Minister Pete Hodgson deserves the thanks of all those concerned about the environment, the economic and environmental future of New Zealand and the integrity of the systems that keep the planet functioning," ECO Spokesperson Cath Wallace said. "Hodgson has shown particular moral authority and perseverance and we are thankful for his efforts."

The tasks facing the government now will be to resist the pressure from those who want to continue pollution, pretend there is no problem or to freeload on the future and the rest of the world's efforts. Implementation is vital.

We congratulate the government and call upon new Energy Minister Trevor Mallard to switch direction away from coal and to fostering transport and other energy efficiency, demand reduction and truly renewable supply sources.

Increasing emissions

But it wasn't exactly a splash. Many of those who celebrated were only too well aware of what a small, late, start it is.

A UNCC presentation showed that New Zealand ranks high among the industrialised countries now facing greenhouse gas emissions beyond their agreed targets for 2012. Countries now required to reduce or offset emissions by more than 10% of 1990 levels include:

Country	Increase since 1990 %	Protocol commitment ± 1990 %	Required correction (1990 base) %
Monaco*	31.7	-8.0	39.7
Canada	20.1	-6.0	26.1
Spain	40.5	+15.0	25.5
Austria	8.8	-13.0	21.8
New Zealand	21.6	0.0	21.6
US*	13.1	-7.0	20.1
Japan	12.1	-6.0	18.1
Ireland	28.9	+13.0	15.9
Italy	8.8	-6.5	15.3
Australia*	22.2	+8.0	14.2
Portugal	40.5	+27.0	13.5
Belgium	2.9	-7.5	10.4

* Did not ratify

According to NZ's Climate Change Office, the nation's latest greenhouse gas inventory shows emissions are increasing, with CO₂ emissions running 28% higher than in 1990. Transport sector emissions are continuing to grow rapidly and now make up almost 40% of total CO₂ emissions.

Further comment

Other points included:

- Our members represent a diverse group that includes major fuel consumers, energy and oil companies, large agricultural businesses and waste companies. They are already involved in carbon trading initiatives and are exploring opportunities to reduce further the greenhouse gas emissions caused by their operations and services. [We support] economic incentives to stimulate change. As a practical solution, we are studying whether policy changes such as an amendment to the Fringe Benefit Tax might motivate greater use of lower emission vehicles in company fleets. We are also conducting a feasibility study of a cap and trade mechanism for greenhouse gas management in New Zealand and believe that a competitive marketplace stimulates innovation, rewards efficiency, and speeds the pace of development.

NZ Business Council for Sustainable Development

- In November 2004 the Business Council co-sponsored the first joint Australia/New Zealand

climate change conference at which Eileen Claussen, Chair of the Pew Center on Global climate change, said that attention must now turn to strengthening the international framework for the years beyond Kyoto's initial commitment period (2008–12). The overriding challenge for governments will be to forge an agreement that includes all the major emitting countries — both developed and developing. Among the core issues are the nature of future climate commitments, equity, cost, the interaction between climate efforts and international trade, and how best to integrate climate concerns with the development needs of developing countries.

NZ Business Council for Sustainable Development

- New Zealand accepted a 'Kyoto target' of returning its 'net' emissions to its 1990 level (ie subtracting the carbon captured by forests planted since 1990). This is an easier target than for most countries, which have to reduce their net emissions to below their 1990 levels. We are miles away from achieving our commitment. Even on a 'net' basis we are producing 20% more now than we were then. We have just five years to get rid of that 20%, otherwise not only will we not have the carbon credits we're expecting to sell, we may have to buy them.

Jeanette Fitzsimons, Green Party

- Business and individuals have already successfully tendered for over \$ 150 M worth of emissions units, tradable under Kyoto. Many others have looked to use energy more efficiently, at home, on the road and in business. Our economy is becoming more competitive and productive as a result. The Kyoto Protocol will drive significant technological changes in the years ahead. New Zealanders have never chosen to be left behind as the world changes. We're proud to be doing our bit alongside 140 other nations who have ratified. Our economy and our environment will be better for it.

Pete Hodgson, Convenor, Ministerial Group on Climate Change

- In the end the reasons for supporting Kyoto are:
 - 1 The compulsion of the science argument
 - 2 The practice of sustainability. The risk was too great to do nothing. In the risk area, they were guided by their members in the insurance industry.
 3. The Council supports a market approach and economic incentives to facilitate change.

John Blakeley, reporting an NZBCSD meeting □

Bathtubs & hockey sticks

Just a year ago, EnergyWatch ran an article on a supposed flaw in the science of climate change ('Storm in a Bathtub', EW 32). Bryan Leyland highlighted a paper by Stephen McIntyre and Ross McKittrick (M&M), and made a strong challenge:

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

The M&M paper was claimed to have demolished work by Michael Mann and colleagues (Mann), but EnergyWatch thought it looked suspicious. Now the subject has been on SEF News again: EnergyWatch had failed to consider the possibility of Mann also being astray. Coincidentally Dr Stephan Rahmstorf, of the Potsdam Institute of Climate Impact Research (www.ozean-klima.de), gave a talk in Wellington (25 February) on the risk of sudden climate change, and some of his material is used here.

Part of the problem is confusion between regional and global changes. The temperature rise last century is a global mean, but most proxy studies of earlier data cover only the northern hemisphere, and we cannot assume that features such as the medieval warm period were global. Rahmstorf drew attention to 17 sudden, large temperature rises in the arctic in the last 60 000 years, which were associated with cooling in the antarctic. His interpretation is that changes in the ocean thermohaline circulation were sucking heat out of the antarctic to warm the arctic. This suggests that temperature changes in the northern hemisphere do not necessarily indicate **global** warming.

A paper by Hans von Storch and colleagues (von Storch, *Science*, v 306, 22 October 2004) compares northern hemisphere multi-proxy data with a climate model, and draws the conclusion that temperature variation over the last millennium is at least twice as great as Mann has maintained. And now Anders Moberg and colleagues (Moberg, *Nature* v 433, 10 February 2005), have used the same broad approach as Mann, but with a wider range of proxy data and a new statistical technique, getting similar results to von Storch.

Another approach taken by Moberg is to use borehole data (deep temperature gradients used to infer heat flow in earlier centuries, and hence historical surface temperature). This allows surface temperature estimates as back to about 1500, with results earlier than about 1700 outside Mann's uncertainty limits.

Moberg and von Storch are in reasonable agreement with Mann about a maximum around 1100, with temperatures similar to the twentieth century before 1990. However they also show a minimum around 1600, with temperatures about 0.7°C lower than the 1961–1990 average, at or below the limits of the Mann uncertainty data. The M&M results are different again.

In an earlier note, Rahmstorf puts the Mann/M&M spat into perspective by posing the question, "What if the 'hockey stick' were wrong?"

So let's assume for argument's sake that Mann, Bradley and Hughes made some terrible mistake in their statistical analysis, so we need to discard their results altogether. This wouldn't change our picture of the last millennium (or anything else) very much: independent groups, with different analysis methods, have arrived at similar results for the last millennium. The details differ (mostly within the uncertainty bounds given by Mann et al, so the difference is not significant), but all published reconstructions share the same basic features: they show relatively warm medieval times, a cooling by a few tenths of a degree Celsius after that, and a rapid warming since the 19th Century. Even without Mann et al, we'd still be stuck with a 'hockey stick' type of curve — quite boring. (see <http://www.realclimate.org/index.php?p=114>)

More work is needed before firm conclusions can be reached, hopefully in time for the IPCC fourth assessment report in 2007. However, there is no paradigm-change in sight, however personally embarrassing the new results might be:

- The evidence for global warming does not rely on paleoclimate studies (although perhaps the most **visually** telling part of the IPCC 3rd report was based on Mann's work). Their value lies in helping to build up a detailed picture of an extremely complex subject.
- The simplest evidence for global warming is that the carbon dioxide we have emitted accounts for the rise in atmospheric concentration (plus absorption into the oceans), which in turn accounts for the temperature rise.

The hockey stick is a distraction, cleverly drawing attention away from the important 20th century temperature rise and the critical 21st century rise — much of it already inevitable — towards relatively minor fluctuations (0.6° compared with 2–4°) in the centuries before thermometers. If the hockey stick is now 'sawdust', as claimed by the flat-earthers, that should be because the focus is on the climate problem, not the flat-earthers, with their shaky distractions and shady funders. □

MiniWhats

A 'new' transport mode for London?

Transport planners in London are considering much greater use of an old transport mode to take freight traffic off the roads— canals. London's canals date back to the eighteenth and early nineteenth centuries. A 150 km system is available but is only designed for 50 t barges. It carried only about 17 000 t last year, but planners hope to expand this to 800 000 t/yr without ruining the leisure traffic which predominates today.

Officials at Transport for London are paying particular attention to the Grand Union Canal linking Paddington and Uxbridge. This 42 km stretch is thought to be ripe for expansion because it has no locks and can easily be upgraded for large loads. It is hoped that the enhanced network will serve a new state-of-the-art recycling centre, which would do away with more than 100 000 truck trips journeys a year. Several pilot projects are being planned and executed, and one, for barging aggregates, is already in operation.

The Guardian, 5 August 2004

More wind farms for the Manawatu

Palmerston North City Council is planning to build the region's fourth wind farm, on virgin bush land at Turitea Reserve. The council has received four unsolicited approaches from New Zealand power generation companies to use the Tararua block. The council says it is formally seeking a commercial partner to provide the capital and develop the wind farm project. Under the partnership arrangement the council will let an energy company use its land to develop the wind farm — at no cost to ratepayers. The project could return a minimum of \$ 250 000 /yr to ratepayers, according to a spokesman. *Stuff*, 15 January 2005

An alternative to Transmission Gully?

Transport 2000+ have come up with an interesting idea for the Pukerua Bay – Paekakariki bottleneck, in a submission on the Wellington Regional Council's Western Corridor Study. This is a bottleneck for all modes: motor vehicles on SH 1; walking and cycling, which have to take their chances on SH 1; and rail through the Paekakariki tunnels, which are single track, have to be taken very slowly and are too tight for some loads.

The proposed solution is integrated:

- A 3 km double-track rail tunnel, large enough

for all standard loads, straight enough for 100 km/h, parallel to the existing line and far enough into the hill to be stable in all but the most catastrophic earthquakes.

- A 4-lane coastal highway behind a new seawall. Fill could come from the rail tunnel, brought out on conveyor belts in side adits and placed using chutes over the existing road.
- Construction of the 4-lane Pukerua Bay Bypass, as already designed.
- Conversion of the existing single track railway to a footpath and cycle track, with provision for access by maintenance and emergency vehicles.

Transport 2000+

(Might there be a danger here of using a 3 km rail tunnel to free up space for a cycle route? That might be one expensive cycle route. If this objection proves valid, cheaper options might include a shorter tunnel and daylighting the northernmost tunnel; accommodating cyclists by extra widening at road level (if designed from the start the marginal cost would be quite small); or a benched or even bridged cycle route alongside the railway, looped outside the tunnels. — EW)

Hybrids, Carpooling and HOV lanes

A surge in the number of hybrid vehicles using carpool lanes in Virginia (suburban Washington DC) has left them nearly as congested as the regular lanes they are intended to relieve. The number of hybrids in carpool lanes on Interstate 95 more than tripled in six months last year.

"For every two cars, there's one hybrid," said Cora Seballos, who carpools daily. "Since September, usually the regular lanes have less traffic" than the carpool lanes. She has to leave home a half-hour earlier because of the increased congestion.

The hybrid exemption, allowing single-occupant hybrids to use carpool lanes, is scheduled to expire in June 2006, and officials have argued against extending it.

Hybrids use a combination of gas and electric power. Current models get as little as 3.9 l/100 km and are less polluting than conventional cars. Virginia State rules allow owners of the Ford Escape hybrid, Toyota Prius and Honda Civic and Insight to drive solo in carpool lanes.

The Washington area ranks with California as the country's leading markets for hybrids. Car dealers say it is because of the HOV (*High occupancy vehicle: more than one person in it* — EW) exemption. One said, "I'd say 95% of the people who buy a

Prius say it's to get into HOV. They talk about the tax break and the HOV, and once in a while they say they prefer it for the gas mileage as well."

The HOV lanes are critical to the region's transportation network because they allow bus services to run smoothly. If they become chronically congested, carpoolers could resume driving themselves, adding thousands of cars to the region's roads.

The Washington Post, 7 January 2005

Choice of LNG site 'months away'

Genesis Power and Contact Energy are still several months away from choosing a preferred site for a liquefied natural gas terminal. As reported in the December 2004 issue of EnergyWatch, the companies are selecting a preferred site for a LNG reception terminal, in Taranaki or near Marsden Point, near Whangarei.

The companies were still talking with various owners about potential sites for the terminal, but now say that choice could take another 3–6 months.

After that, the companies will start community consultation and build up the material required to apply for the appropriate resource consents for the terminal. Application for resource consents is likely to be next year. *Stuff*, 17 January 2005

Awhitu wind farm appeal in May

A showdown is looming between lifestylers and greenies over the proposed state-owned Awhitu wind farm in south Auckland. Several big green organisations are joining forces in support of Genesis' proposal, rejected by Franklin District Council, for a \$40 million, 19-turbine farm on the Awhitu peninsula. This is expected to be a test case about acceptable locations for wind farms as the technology gains traction and becomes economic in New Zealand.

EECA is taking a separate appeal against the council, in addition to Genesis' own appeal. Both are scheduled for May in the Environment Court. In support of both appeals are Greenpeace and the Environmental Defence Society. Auckland Regional Council is also expected to support the appeals. Ranged against them are the residents of Waiuku, a farming centre — including lifestyle blocks — about 7 km from the 200 ha wind farm site, and horse-related businesses neighbouring the site.

The Awhitu proposal was the first wind farm proposal to follow an amendment last year to the

Resource Management Act which included wind farms in a list of matters of national importance.

The residents groups are hoping to engage a scientist from Germany to talk about the effect of the wind turbines on horses. It was claimed that the horse businesses were the most directly affected by the proposal, and would go out of business if the wind farm happened.

Stuff, 13 January 2005

City design to fight obesity

You are what you eat — and possibly where you live. The message in the US has been that opportunities for physical activity tend to be much less than they could be. Many of the same trends show up in NZ. We drive our kids to school more often and don't let them bike or walk.

A North Shore City Council survey of children at 17 primary schools showed an "unhealthy addiction to cars." Almost three quarters of children surveyed live within a kilometre of school yet more than half are driven there and back.

The built environment could increase incidental activity, such as walking, as people went about their daily business. That might result, for example, from a better public transport system in Auckland. In Wellington, structures encouraged people to walk from the train station to their workplaces but the city was not bicycle friendly.

A study of nearly 11 000 people in Atlanta, US, found those living in highly residential areas tend to weigh significantly more than those in places where homes and businesses are close together. This is mainly the result of the amount of time people spend driving or walking. Each hour in a car was associated with a 6% increase in the likelihood of obesity and each 800 m walked each day reduced that chance by nearly 5%, researchers found. eCAN 113

Efficient power adapters could dramatically reduce electric bill

The US Environmental Protection Agency has issued a new standard for power adapters driving some 1.5 billion cell phones, digital cameras, answering machines, camcorders and countless other gadgets in the US. The new standard is being marketed as ENERGY STAR. It was claimed that more efficient adapters could save about 5 TWh/yr (Terawatt hour = 10^{12} Wh = billion kWh). The EPA expect the new standard to bring efficiency improvements of about 35%.

http://www.energystar.gov/index.cfm?c=ext_power_supplies.power_supplies_consumers

(These figures suggest an average power use of just over 1 W continuous for each existing adapter, which seems much too low. Presumably not all the adapters are plugged in at the same time. We wonder whether operating efficiency is being improved, or whether this is simply a measure to limit standby power? — EW)

Wind farm consent for White Hill, Southland

State-owned electricity generator and retailer Meridian Energy has gained resource consent for its proposed wind farm at White Hill in Southland, after a three-day hearing. The proposed capacity is 70 MW. Chief Executive Keith Turner said the company is delighted to have received consent.

"The White Hill site looks very promising... Our wind monitoring on the site has shown us that there is a very good resource here, and it has the potential to make a major contribution to security of electricity supply in this part of the country."

"What has been particularly pleasing about this is the overwhelming support we have received from the community for this project, with submissions running 10-1 in favour. There seems to be a growing recognition that renewable energy, and particularly wind, is the technology of today and the future and the way to keep New Zealand a clean and attractive country," Turner said.

Meridian has a long-term agreement with Danish wind turbine manufacturer Vestas which supplied the turbines for its recently-opened Te Apiti wind farm in the Manawatu. No final decision has been made on what size of machine will be used at White Hill.

Dr Turner says it is hoped that construction will begin in the first half of 2005.

Meridian Energy, 22 December 2004

(And on 1 February it was reported that there will be no appeals. — EW)

Tsunami sea level rise alert

Dr Clive Hamilton, Executive Director of The Australia Institute, says that billions of dollars worth of aid to rebuild infrastructure devastated by the Boxing Day tsunami could be wasted unless the impacts of rising sea levels due to climate change are taken into account, according to a new paper by the Australia Institute.

"The recent tsunami in the Indian Ocean has cleared much of the infrastructure from regions threatened by future sea level rise," said Hamilton. "The temptation will be to rebuild on the same sites in the hope that a warning system will prevent another disaster if a tsunami of a similar

magnitude occurs in the same region within the next few decades."

The Intergovernmental Panel on Climate Change has estimated that by the end of the century sea levels will rise by up to 0.9 m and much of the low-lying land in the north-eastern Indian Ocean will be subject to inundation. Globally, 100 million people live within about one metre of the present-day sea level, so the potential human impacts of sea level rise are enormous.

The Australia Institute, 7 January 2005
www.tai.org.au

Windflow progress

The Windflow 500 prototype is still undergoing testing at Gebbies Pass, working towards International Electrotechnical Committee (IEC) certification, the global standard for wind turbines. CEO Geoff Henderson said, "IEC certification is a rigorous testing and quality reporting programme that requires us to perform calibration work on every aspect of the turbine's performance, from the strength of the blades to wind dynamics at the site. Ongoing measurements mean the turbine will be operated in a stop/start manner for some time yet, sometimes even with the blades being turned in odd directions to test the effect on them."

In mid-December the turbine was shut down for improvements to the lubrication system for the final stage of the gearbox, after it was discovered that an automatic shutdown at the weekend had been caused by the smallest bearing in the gearbox giving way. Henderson said, "The good news of course is that we are picking up these 'learning experiences' now while we are still testing on the prototype."

Windflow believe that this particular issue was not due simply to high loads. Investigations indicate lack of lubrication to that bearing.

And in a mid-February press release it was announced that resource consent had been granted for the Te Rere Hau wind farm near Palmerston North. The proposed wind farm is adjacent to TrustPower's Tararua wind farm which has been described as the most productive in the world.

Subject to any appeals, Windfarms is confident it can have its initial batch of turbines operating at Te Rere Hau early next summer, and it has planned a staged process to have all 104 turbines in place by 2008.

Windflow Technology, 14 December 2004

Windflow Technology 15 February 2005

Research grant for Windflow

Wind turbine manufacturer Windflow Technology has received a research grant of \$ 130 000 from Technology NZ, through its Technology for Business Growth scheme. The grant will provide half of the funding for the company to prove the suitability of its turbine design for use in small, isolated networks such as islands or remote communities. The research will involve refining the torque limiting feature of the Windflow gearbox to include a dynamic control system that will respond simultaneously to both the varying demands of a small network and the available wind energy.

“Our turbine is the only one in the world to run a synchronous generator stably in variable wind conditions,” said Windflow CEO, Geoff Henderson. “Using the same torque limiting feature, our synchronous generator will maintain the frequency at 50 Hz, through the rapid demand changes that occur in isolated networks.”

The technology produced will be a wind turbine capable of operating successfully in tandem with a diesel generator, in an isolated situation. Wind-diesel combinations are likely to lead the way to water desalination and refrigeration applications that are expected to be growth markets.

The project is expected to demonstrate the Windflow design's ability to 'ride through' a fault in the electrical grid. Fault-ride-through is important not only for isolated grid applications but also for national grid-connected wind farms. The issue of wind power's fault-ride-through capability has become a major concern internationally in recent years and is increasingly seen by Windflow as a point of competitive advantage for its torque limiting gearbox technology.

Windflow Technology, 9 February 2005

PCE report for 2004

Some extracts from the 2004 annual report of the Parliamentary Commissioner for the Environment, Dr Morgan Williams.

See also: www.pce.govt.nz

- “Providing ever more [electricity] to deliver qualities of life is not a sustainable option. In energy, investment in negawatts (electricity savings) is clearly more cost effective and environmentally sustainable than generating more megawatts”
- “I end 2004 quite optimistic that seeds of change are starting to germinate. When Australia's most frontier state is talking about compulsory energy

and water design and technologies, it is evident the environmental and economic costs of an 'ever more' paradigm are being deeply questioned.”

- “Our political leaders appear, for various reasons, 'leg roped' when it comes to driving bold initiatives. With electricity we are still largely obsessed with providing more generation capacity and more and bigger lines to distribute. Despite the talk and some effort in electricity efficiency, it appears easier to find capital to invest in megawatts than negawatts.”

Dr Williams has urged the Electricity Commission to widen its grounds for deciding whether Transpower's controversial high-voltage power line from Waikato to Auckland is the best option for meeting Aucklanders' energy needs. Transpower received 21 submissions on a consultation paper about its criteria for making a decision on the \$ 500 M line. His letter can be found at:

<http://www.electricitycommission.govt.nz/develop/retail/submissions-received>

Improved passenger rail in Auckland

The Auckland Regional Transport Authority introduced more suburban passenger trains during peak hours on both the western and southern lines, from February 14. Chief executive Alan Thompson said three more trains would run on the western line between New Lynn and Britomart station in the central city in the morning. Five more trains would go from Britomart to New Lynn in the afternoon. The improvements follow the completion of a \$ 23.2 M double-tracking project between Mt Eden and Morningside stations. On the southern line, four extra trains will travel the Otahuhu-Britomart section in the morning and afternoon. Trains would no longer stop at Wiri station, used by about 40 travellers each weekday, in a bid to speed travel times. The number of people using Auckland's rail network grew by one million last year and the aim was to increase patronage by the same number this year.

The New Zealand Herald, 27 January 2005

Wind generates extra profit for TrustPower

Extra output from TrustPower's Tararua windfarm near Palmerston North helped boost its net profit in the nine months to December 31, by 17 %. The listed Tauranga electricity generator and retailer posted an unaudited net surplus of \$ 61.5 M for the period, compared with \$ 52.7 M for the same period in 2003.

Chief executive Keith Tempest said TrustPower's turbines had had "quite a good run from a wind perspective" since stage two of the farm was commissioned last May. "The additional power that has been generated has some dollars in it, no question. But it (the windfarm) is an investment, (and) capital costs and depreciation costs are high in the initial years." *Stuff*, 28 January 2005

Mallard aims to deliver secure power supplies

Political considerations do not count for much where hydro lake levels are concerned, says Energy Minister Trevor Mallard. The minister, who took over the portfolio in December, said he was trying to keep politics out of an issue which everyone agreed needed work. "The unfortunate thing is that rainfall doesn't take too much notice of elections — so really we've got to continue to develop the policy," he said. That policy is to make sure that the country can cope with a one-in-60 dry year without shortages or restrictions on use. "Clearly we are slightly above average for this time of the year now. Some of the dry years can start at this level, but over a six- to eight-week period things can drop away very quickly." Additions to the baseload generation — including new wind turbines and a new gas turbine at Huntly — had been useful. "We're not going to be caught this time by fuel stocks for gas- and coal-fired generators. Lack of preparation has been an issue in the past and I think that there is some security around that now."

Mallard said the Electricity Commission had done its job well, organising the reserve generation needed for this winter. Now the job is to look at 2006 — is the reserve generation enough to cope with the annual growth in electricity demand? "And then there's stuff which I'm still working quite hard to get my head around — what is the capacity on the demand side? I wouldn't expect demand reduction, but efficiency to the point where demand growth is not as fast as it might have been."

The New Zealand Herald, 24 January 2005

The high/low cost of Kyoto

According to Danish author Bjorn Lomborg, "We're talking about spending perhaps US\$ 150 bn/yr on Kyoto with fairly little benefit." Lomborg said that money would be better spent on combating Aids and malaria, malnutrition and promoting fair global trade.

However, as SEF member Gerry Coates points out, that is little more than a third of the US defence budget, or about 1.3% of US GNP.

According to SEF member Robbie Morrison, Lomborg largely bases his 'best action' views on the DICE (Dynamic Integrated Climate Economy) model, developed at Yale University by economist William Nordhaus. DICE is an optimal economic growth model which embeds technology change through simple formula. Model output, in this case, is interpreted using social cost-benefit analysis (CBA). In Morrison's view, key problems with the DICE model include:

- Technology change, and more specifically, induced technical change, is treated rather pessimistically. Hence, the cost to the economy of the structural change associated with decarbonisation starts high and remains high.
- The discounting of climate impacts occurring decades and even centuries into the future means that these hardly register in current dollars (that is, net present value). For instance, sea level rise is expected to take centuries to plateau. SEF News

Wind energy balance

What is the 'Energy returned on energy invested' (EROEI) of a wind turbine? Contributory factors include:

- Wind strength and turbulence.
- Energy input to manufacture, assembly and maintenance.
- The thermal efficiency of the energy used to build the turbine.
(Wouldn't it be fairest to assume that a wind turbine 'post-generated' its own construction power, and energy return was expressed in units of time? — EW)
- Turbine efficiency. The theoretical limit is 59% and the practical limit about 43%, mainly due to aerodynamic considerations like turbulence, especially at the rotor tip.
- Capacity factor: the actual average power output expressed as a percentage of rated output. This is very variable: one figure given was 27% for 43 wind farms over 4 years, with a month to month variation of 15–45%. Most onshore designs seem to achieve about 33–38% (but some 45% in the Tararuas).

It is probably safe to say that the EROEI of modern wind turbines with an assumed 20 year life is 20–25x. With one nacelle replacement this would go to 26–33x. With optimised blade design and winglets, the future expectation can be 30–40x. If improved design and maintenance can increase

expected life to 30 years, then we have a potential for 40–50x.

Interestingly, a turbine life of 20 years was claimed for current onshore machines, but more like 30 years for offshore because of smoother air.

Summarised from the Yahoo group
Energyresources

Household energy information

SEF member Nigel Isaacs reports that three new research reports on the Household Energy End-use Project (HEEP) are available free as pdf files, at: <http://www.branz.co.nz/main.php?page=Free%20Publications>



EnergyWatch Editor

This is my last edition of EnergyWatch. After retiring fifteen months ago, I have now accepted full-time work with the Ministry of Transport, in policy development. In terms of the front page piece in the December issue, I am switching from imaginative nonsense to rigorous nonsense; a change inconsistent with editing EnergyWatch. It is a bit sudden and this issue may look rushed: I shall have been doing 'real' work for nearly a month by the time it is mailed out.

Unfortunately the rush has created a problem for the SEF Committee, who now have to do succession planning at a run — they are looking for both an editor and a Secretary. My apologies to them, and to all readers if the next issue is late.

My first effort at EnergyWatch was Issue 9 of the current series, in February 1999. At twelve pages it was dauntingly large, but practice and much wider use of the internet has simplified editing since then.

Many thanks to all the contributors who have helped me out, to the SEF News correspondents whose gleanings I have used, and especially to Heather, my proof-reader, comprehensibility standard and chief critic.

I wish EnergyWatch and its new editor well.
Kerry Wood

EnergyWatch

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