



# Energy Watch

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## Politicians please read!

This is the title of an article in *Rails* (January 2001), setting out a realistic-looking option: if reforming road transport is politically too difficult, what about leveling the playing field the other way, by reforming rail?

TranzRail own all the rails, bridges and so on, but the government owns the land. Suppose the government were to buy the infrastructure back, maintain it and charge TranzRail for using it? Charging could be by the wagon-kilometre, on a sliding scale based on maximum gross weight: directly comparable with road user charges. Such a system would have major advantages:

- TranzRail would be made more competitive through reduced capitalisation; insulation from risks such as seismic damage; and exemption from capital charges on sunk costs—all directly comparable with road transport.
- Tonnage transferring to rail would gain a four- or five-fold reduction in emissions per tonne kilometre.
- Rail User Charges could be discounted by an agreed fraction of the public good savings from the road traffic avoided: crash costs; emissions; road congestion; and urban severance.
- Problems with Regional Councils wanting to buy track rights would disappear.
- System extensions agreed with TranzRail could be funded by increased system-wide payments by TranzRail—almost directly comparable with road transport. In this case payments would cover land purchase: again directly comparable.

A known problem is that the proposal would do nothing to assist reform *within* roading. There are others: for example, negotiating a buy-back price might be too difficult, and the UK's problems with Railtrack would have to be avoided. But it would be a simple way to level an intractable playing field, if the barriers to 'real' reform are too great.

It must be worth a look.

### Moving NZ towards Sustainable Energy Use

#### Sustainable Energy Forum Conference 2001

April 19th and 20th, Wellington.

The conference will open with an address by Minister of Energy Pete Hodgson, in a joint session with the Energy Federation of New Zealand, who are holding a seminar on sustainable energy earlier that day.

On the 20th the conference will cover the national energy efficiency strategy, the CoP-6 negotiations, environmental taxation; and the potential for energy conservation in NZ.

The SEF AGM will be held at 12.30 on April 20th.

See page 9 for more information on both conferences.

# CoP-6, CDM, Carbon Sinks and Cycles

(to say nothing of Supplementarity and Flexmex)

Kerry Wood

If you understand the heading you will probably want to just skim the article. If not, it may help to start with some explanations:

**Carbon cycle:** The natural circulation of carbon into and out of the atmosphere.

**Carbon sink:** Somewhere to put carbon dioxide to keep it out of the atmosphere: a forest, or perhaps pump it into a depleted oil field. A natural sink is transfer to oceans and ultimately geological storage.

**CDM:** Clean Development Mechanisms. A mechanism for developed countries to help third-world countries to reduce carbon emissions, then claim credits for the saved carbon. The justification for this is that the developing countries have no use for emissions credits because they are not required to reduce emissions.

**CoP-6:** The sixth Conference of the Parties to the Kyoto Protocol. There is also 'MoP', the Meeting of the Parties, which will be the protocol's implementation group. CoP-6 was adjourned in November 2000 in The Hague, and is expected to be reconvened in Berlin in June or July 2001: CoP-6 bis.

**Flexmex:** Short for 'flexible mechanisms': taking (through the CDM) or buying carbon credits to offset emissions elsewhere.

**Supplementarity:** Short (?) for meeting a significant proportion of a nation's targets through domestic action.

## Interests

Another key to the complexities is the self interest of the participants:

- The 'umbrella group' of the US, Japan, Canada, Australia, New Zealand, Iceland, Norway, Russia, Ukraine and Kazakstan see reducing their carbon emissions as a difficult and expensive task, and wish to use CDM to buy credits as widely and as cheaply as possible.
- The European Union (EU) is trying to ensure that CDM is only used where the benefits are

certain. This is dressed up as environmental purity—there is a strong green lobby—but the intention is also to gain economic advantage. The EU is well on the way to meeting its targets for 2008 – 2012 (the first commitment period), largely because the Thatcher government in the UK switched power generation from coal to gas—for political reasons—and reunification of Germany led to closure of some very inefficient plants. France, Germany and Sweden have significant nuclear power sectors. The EU may also wish to gain from royalties as the US and Japan adopt European technologies.

- Vested interests lobbying for—amongst other things—carbon sink trading. It is claimed that carbon traders stand to earn US\$ 48 billion a year in brokerage fees world-wide.

Another complexity is that the Kyoto Protocol does not apply to third-world countries: hence the CDM. The top 10 emitting countries are the US, China, Russia, Japan, India, Germany, the UK, Canada, Italy and South Korea, so the result is to exclude China and India. Their importance as emitting countries has led the US Senate to insist on third-world countries accepting some responsibility for cuts, but this line may now be softening. They have very low emissions per head of population, and China is modernising at such a rate that full carbon credits—for what the Chinese intend to do anyway— could halve the real carbon reductions required from the developed countries.

New Zealand is still a member of the 'umbrella group' but may now be taking a more independent line, arguing for environmental integrity.

However, NZ interests are described as centring on:

- No supplementarity, and seller liability
- Agreement on what is a sink
- A clear distinction between rules under Articles 3.3 (human induced changes to sources and sinks) and 3.4 (other sources and sinks). See 'Native forests in NZ' on the next page
- Inclusion of natural regeneration as a legitimate activity under Article 3.3
- Deferred consideration of harvested wood products to a later session.

## Carbon sinks

Around half of annual carbon dioxide emissions into the atmosphere are absorbed into vegetation or the oceans. Carbon entering the oceans is eventually used by marine animals to make skeletons and shells, and is slowly deposited as limestone or chalk (calcium carbonate, 44% carbon dioxide by weight, or 12% carbon: a mussel farm

will be a small carbon sink if the shells are disposed of in the right way). Carbon dioxide also re-enters the atmosphere during volcanic activity.

The main debate about carbon sinks is over carbon storage in plants, and the intention is to increase the carbon take-up of forests. Trees undoubtedly absorb atmospheric carbon as they grow, but the complexities grow much faster than the trees. If too permissive a regime is adopted it may become just a scam: this theory was boosted when the US claimed credits for 310 million t /yr of carbon by 2010, 23% of total emissions in 1990. Some of the complexities are:

- Global warming scenarios may assume that increased atmospheric carbon encourages faster growth and increased carbon uptake, but there is no clear indication that this is beneficial.
- If increased atmospheric carbon does encourage plant growth, it is likely to also warm the forest. This will encourage soil microbes to emit carbon dioxide, and it is possible that within 50 years the emissions will be as great as the absorption.
- Even without feedback effects, what happens when the trees have grown? They could be left as they are and the carbon content of the forest would stabilise. This is fair enough if new growth offsets decay, and some selective logging should be acceptable. But what happens to the original credit if the forest is over-logged? Or burnt out, as recently happened on a very large scale in the US? The likely outcome had CoP-6 succeeded is 'seller liability,' which might raise as many questions as it answers. Alternatively the forest could be cut and replanted: Is another credit then justified? How much of the carbon in the milled timber is released when the timber—or the derived paper—is burnt or rots down? How long will 'permanent' uses such as structural timber or furniture lock up the carbon? How long is forever?
- The protocol creates private property rights by imposing obligations on nations: another scam?
- What about existing forests? If credit is taken for a new plantation, what debit is allowed for the mature forest cut down to make room for it? There are claims that this is already happening.
- What happens to people living in registered forests, or economically dependent on them? Carbon credits may be effectively a subsidy on planting fast-growing, monocultural forests. A

statement by representatives of indigenous peoples said, "Through sinks projects, we will lose our rights to manage traditionally our lands and become slaves of the carbon trade. Carbon trade-induced social conflicts, such as violence for access to basic resources, will endanger our survival as peaceful peoples of the land." *Seller liability* suggests that this is the way things are going.

- It has been known for a long time that the atmospheric carbon dioxide concentration follows an annual cycle. For the Hawaii measuring station in the 1970s the annual range was about five times the annual increase. Recent work has identified annual carbon 'fluxes' between the Russian forests and the atmosphere roughly ten times as large as annual human emissions. Given these conditions, the current state of knowledge, and the need for verifiable estimates, can credits be calculated to any meaningful level of accuracy?

### Native forests in NZ

A special problem in NZ is that native forests are being damaged by introduced species—mainly possums and goats. These pests kill mature trees, prevent regeneration and disrupt nutrient cycles, reducing the carbon content of the surviving bush—and creating emissions. It has been claimed that these emissions can be disregarded because they are not strictly anthropogenic and therefore not covered by the Protocol. The government seems to be moving away from such a hard-line attitude, but questions remain. Some of our special interests look ominous, as reported by the Ministry of Foreign Affairs and Trade (opposite page). It is claimed that the additional \$M 5.5 a year announced last year for pest control is hardly enough to manage the problems in Taranaki, let alone the whole country. Little work has been carried out to define carbon losses, apart from some satellite surveys.

Unfortunately these losses matter. The total carbon sequestered in NZ's native forests amounts to some 2 billion tonnes. The present annual net loss of carbon from forests and soils could be anywhere between 0.5 – 2%, equivalent to between 35 and 145 Mt of CO<sub>2</sub> / year. New Zealand's anthropogenic carbon emissions in 1990 were assessed at 25.5 Mt of CO<sub>2</sub>, so annual losses from native forests are some 1.4 – 5.7 times the losses from 'truly' anthropogenic emissions. This wide range makes better data an obvious priority, but better data may be impractical, given the uncertainties and the need for verification. Probably the best that can be done is to spot check

satellite data, so as to—hopefully—tailor the calibration to NZ's forests. This particular problem is unique to NZ, but carbon release from collapsing forests is a much more general problem that cannot be ignored.

Another New Zealand problem is methane emissions (the source of most of NZ's emissions: methane is a much more powerful greenhouse gas than carbon dioxide), although at CoP-6, references to *ruminant physiology* simply provoked hilarity...

### Clean development mechanism

The CDM has always been controversial, and is sometimes called the *Cheap Development Mechanism*. Ultimately it was the open-ended CDM proposals—without supplementarity—which killed CoP-6 Chairman Jan Pronk's final compromise. Both wings of the debate felt that failure was better than giving up too much. The danger is that the CDM will allow rich countries to buy cheap emissions reduction credits from poorer states, and avoid commitments to reduce greenhouse gas emissions at home. Some other technologies that may be included are:

**Nuclear Power** Greenpeace has turned up an industry claim that nuclear power station sales to the third world are unlikely unless it is included in CDM.

**Coal** Again, inclusion in CDM would help the industry. Because coal is high in carbon, it can only be included if the investment uses coal at a higher efficiency than would otherwise have been the case. How will that be audited?

Similar arguments, although with less force, are possible for oil and gas technologies.

If the carbon sink and CDM processes are to be kept honest, perhaps the figure of US\$ 48 billion a year for carbon sink brokerage is on the low side...

### Flexmex

Flexmex would allow countries to use carbon credits towards meeting their Kyoto targets. Two difficulties were the proportion of their target that countries should be allowed to meet using flexmex credits, and the extent to which they could use sinks. The use of flexmex and sinks was the battleground fought over by two of the country groups: the EU and the umbrella group.

It has been claimed that carbon sinks and flexmex are areas where the IPCC (see article opposite) is

weak, because so many researchers also work for forestry companies. One group claimed to be independent is the IIASA, who did the work on the Russian forests; their web site is at:  
[www.iiasa.ac.at](http://www.iiasa.ac.at)

But as Energy Minister Pete Hodgson puts it, we have to do something.

### More Greenhouse gas sources

The UK government is revisiting the amount of methane gas leaking from disused mines, following claims that the problem is much worse than suspected. Two companies specialising in extracting gas from abandoned mines, have submitted evidence showing that the government has "grossly underestimated" the impact of methane emissions on the environment and local communities. They said spot checks showed at least 300 000 tonnes of methane were seeping from disused mines every year. This was in "stark contrast" to the findings of the Watt Committee on Energy report, produced at the time of the main pit closures in 1994, which said net methane flow would be "negligible" a few years after shut-down.  
Financial Times

Droughts caused by global warming could release large amounts of carbon dioxide into the air. A team led by Dr Chris Freeman of the University of Wales in Bangor, said the increase in droughts predicted by some climate models could abruptly activate a dormant enzyme in moist, peaty northern soils, triggering decomposition of their organic matter. The soils are believed to hold about 60% of the amount of carbon held in the atmosphere as carbon dioxide.  
NY Times

Soot may be a leading cause of global warming. A study in *Nature* indicates that soot may be the second biggest contributor to global warming—just behind carbon dioxide. More information on:  
[www.ens.lycos.com/ens/feb2001/2001L-02-08-06.html](http://www.ens.lycos.com/ens/feb2001/2001L-02-08-06.html)  
ENS/NZWEA

There are indications that climate change has begun to feed on itself. There is emerging evidence that in parts of the Arctic, melting permafrost is now releasing carbon as it thaws, intensifying the warming that is already happening. About 14% of the carbon stored in the world's soils is estimated to be in the Arctic.  
BBC News

# Intergovernmental Panel on Climate Change

## Third Assessment Report, January 2001

We give here the UNEP's and NZ Government's January press releases in full, followed by summarised comment. EW

### UNEP press release

Leading climate change scientists and government officials from around the world have finalised a major report confirming that the evidence for humanity's influence on the global climate is now stronger than ever before.

The new assessment by the Intergovernmental Panel on Climate Change (IPCC), which is jointly sponsored by the United Nations Environment Programme (UNEP) and the World Meteorological Organization, projects a potentially devastating global warming of 1.4 – 5.8 °C over the coming century.

"Intensive climate research and monitoring over the past few years has given scientists greater confidence in their understanding of the causes and effects of global warming," said UNEP Executive Director Klaus Töpfer.

"The scientific consensus presented in this comprehensive report about human-induced climate change should sound alarm bells in every national capital and in every local community. We must move ahead boldly with clean energy technologies, and we should start preparing ourselves now for the rising sea levels, changing rain patterns, and other impacts of global warming," he said.

The IPCC's Third Assessment Report is being written and reviewed by hundreds of climate change experts on the basis of the most up-to-date, peer-reviewed research available. In addition to today's Volume I with the title *Climate Change 2001: The Scientific Basis* the IPCC Report will include a Volume II on impacts (to be finalized in mid-February) and a Volume III on response strategies (early March).

"The scientific findings being reported today should convince governments of the need to take constructive steps towards resuming the climate change talks that stalled last November in The

Hague," said Michael Zammit Cutajar, Executive Secretary of the UN Climate Change Convention.

Some of the report's key findings are:

- There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities. Since the IPCC's 1995 Report, confidence in the ability of models to project future climate has increased. For example, there is now a longer and more closely scrutinised temperature record. Reconstructions of climate data for the past 1000 years, as well as model estimates of natural climate variations, suggest that the observed warming over the past 100 years was unusual and is unlikely to be entirely natural in origin. In addition, detection and attribution studies consistently find evidence for an anthropogenic signal in the climate record of the last 35 – 50 years. However, there are still many remaining gaps in information and understanding about climate change.
- An increasing body of observation gives a collective picture of a warming world.
- Globally it is very likely that the 1990s were the warmest decade in the instrumental record, since 1861. New analyses of data from tree rings, corals, ice cores and historical records for the Northern Hemisphere indicate that the increase in temperature in the 20th century is likely to have been the largest of any century during the past 1000 years, and it is likely that the 1990s were the warmest decade and 1998 was the warmest year.
- In the mid- and high-latitudes of the northern hemisphere, it is very likely that snow cover has decreased by about 10% since the late 1960s, and the annual duration of lake- and river-ice cover has shortened by about two weeks over the 20th century. It is likely that there has been about a 40% decline in Arctic sea-ice thickness during late summer to early autumn in recent decades.
- Since 1750, the atmospheric concentration of carbon dioxide has increased by 31%, from 280 parts per million to about 367 ppm today. The present CO<sub>2</sub> concentration has not been exceeded during the past 420 000 years and likely not during the past 20 million years.
- The globally averaged surface temperature is projected to increase by 1.4 - 5.8 °C from 1990 to 2100. This is higher than the 1995 Second Assessment Report's projection of 1.0 - 3.5 °C,

largely because future sulphur dioxide emissions (which help to cool the Earth) are now expected to be lower. This future warming is on top of a 0.6°C increase since 1861.

- Global average water vapour concentration and precipitation are projected to increase. More intense precipitation events are likely over many of the northern hemisphere's mid- to high-latitude land areas. The observed intensities and frequencies of tropical and extra-tropical cyclones and severe local storms, however, currently show no clear long-term trends, although data are often sparse and inadequate.
- Sea-levels are projected to rise by 0.09 to 0.88 m from 1990 to 2100. Despite higher temperature projections these sea level projections are slightly lower than the range projected in the Second Assessment Report (0.13 to 0.94 m), primarily due to the use of improved models, which give a smaller contribution from glaciers and ice sheets.

Over 150 delegates from about 100 governments participated in the working group meeting. The full report is over 1000 pages, has been three years in production, and was written by 123 lead authors, assisted by more than 516 contributing authors. The delegates unanimously accepted the report and approved the Summary for Policymakers.

### **NZ Government press release**

Energy Minister Pete Hodgson, the Convenor of the Ministerial Group on Climate Change, says the latest report of Intergovernmental Panel on Climate Change (IPCC) further strengthens the case for action to reduce human-induced greenhouse gas emissions.

Mr Hodgson said the IPCC report reinforced earlier scientific assessments of the role human greenhouse gas emissions play in heating up the globe. Its findings were also consistent with long-term climate changes that have been observed in New Zealand, which has warmed by about 0.7 °C since reliable measurements commenced in the early 1870s, with an estimated 40% loss of snow and ice in the Southern Alps.

"The report gives a consistent picture of the effect that greenhouse gas emissions have on the world's climate, and there remain no excuses for inaction," Mr Hodgson said. "The New Zealand government is committed to playing its part in reducing the potentially harmful effects of climate change. This

is why we are developing a series of policy measures that will allow us to reduce our own greenhouse gas emissions in agreement with Kyoto Protocol targets, while encouraging other nations to follow our lead." Mr Hodgson was referring to the Third Assessment Report of Working Group I of the IPCC. It says the world has warmed by about 0.6°C since the 1860s and human emissions of greenhouse gases are likely to be responsible for most of the temperature increase. Several hundred climate scientists from all over the world, including five from New Zealand, contributed to the report.

The report's Summary for Policy Makers states that "an increasing body of observations gives a collective picture of a warming world and other changes in the climate system... There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." The report comes to this conclusion after an in-depth analysis of the natural and human factors influencing the world's climate.

Predictions for future temperature rises range from 1.4 to 5.8°C by the year 2100, with the amount depending mainly on assumptions about future greenhouse gas emissions. The scientists also predict rising sea levels, possible changes in large-scale weather patterns, and an increase in heavy rainfall events for many regions of the globe.

### **Comments by others**

#### **Business**

The failure of climate talks has dashed business hopes for clear rules over potentially lucrative technology transfer to the developing world and the emerging market of trading greenhouse gas emissions. "Business is disappointed with the outcome," said Nick Campbell, chairman of the Climate Change Working Group at the International Chamber of Commerce. "We came here expecting a decision which would have clarified the rules and guidelines of the Kyoto Protocol. We now walk away as empty handed as everyone else and leave as confused as when we arrived about the role we might play in contributing to solutions." Reuters

Many companies say the international fight against global warming will provide big growth opportunities to build clean power stations in developing countries, especially in Asia and Latin America, where electricity demand is soaring. Such openings would be provided by the so-called clean development mechanism, a measure that allows countries to encourage companies to make clean

investments to offset national obligations to cut emissions of greenhouse gases. Reuters

The growth of emissions trading will not be derailed by the breakdown of the Hague talks on climate change last week, an adviser to the European Union on the subject told Reuters. Reuters

## CoP-6

The debate about whether climate change is caused by humans, and especially by the emissions of industrialized nations, is still open; but there is every reason to err on the side of caution and cut these emissions. Indeed, nobody in The Hague argued with this ambitious goal; but matters that were swept under the carpet when the Kyoto Protocol was agreed three years ago have emerged again. Kyoto left a lot of tricky issues unresolved, and trying to resolve them is what has proved so difficult in The Hague. One positive aspect is that delegates have refrained from making the same mistake again. They have refused to be forced into another premature accord that would store up further trouble for the future. Ultimately, the Kyoto Protocol may simply prove too ambitious to implement. This would not mean the end of efforts to counter global warming, however: The Hague has shown that interest in doing something about the problem, including interest from business, is growing all the time. Neue Zürcher Zeitung

## Developing countries

The desert advancing across West Africa, the ravaging of Latin America's forests, and the rising waters threatening coastal and island nations, are stark signs of the environmental crisis. "One third of the world's most densely populated country would be flooded even with a small rise in the sea level," said Anwarul Chowdhury, Bangladesh's ambassador to the United Nations. The immediate impact on developing nations from the conference failure is already being assessed. Financial Times

The Kyoto process is, in essence, a fraud. But could it be made serious? An effective international agreement would have to cover every significant country. But in 1997 the US emitted 20.3 tonnes of carbon dioxide per head, the EU about 8.7 tonnes, China 2.5 tonnes and India 0.9 tonnes. Asked to restrain the growth of emissions, the Chinese and Indians will rightly refuse to be locked into a position of inferiority merely because others exploited global absorptive capacity first. They are entitled to a standard of living equal to that of Europeans. This would, with current technology, imply a threefold increase in China's carbon

dioxide emissions. For India it would mean a 10-fold rise. Martin Wolf, Financial Times

The Netherlands, large parts of which are below sea level, is able to manage the risk of flooding; Bangladesh is not. Similarly, the US is able to cope with hurricanes; Nicaragua is not. Martin Wolf, Financial Times

## Insurance

Dr Andrew Dlugolecki, director of general insurance development at CGNU, one of the world's six largest insurance groups, told a briefing that climatic instability would inevitably worsen for at least another 40 years. "Property damage is rising very rapidly, at something like 10% a year," he said. "We've still not yet really begun to see the effects of climate change in the West. What we are seeing so far is largely the result of more people living in areas which are becoming more dangerous. But once this thing begins to happen, it will accelerate extremely rapidly, as the IPCC report makes clear." Dr Dlugolecki said, "there's no way we can prevent things getting worse for at least the next 40 or 50 years. But we can prevent them getting far worse." BBC News

The effects of global warming could cost the world more than US\$ 300 billion / year by 2050, according to a new actuarial study. (The average world-wide cost of natural disasters for the decade 1990 – 99 was US\$ 40 billion / year) Flood defences, abandoned land, more frequent tropical cyclones and damage to fish stocks, agriculture and water supplies will all contribute to a huge worldwide bill unless climate change can be contained, a report by the German insurance company Munich Re has found. Some small and low-lying countries could face losses linked to climate change in excess of 10% of their entire GDP. Dr Gerhard Berz, head of Munich Re's geoscience research group, said: "There is reason to fear that climatic change will lead to natural catastrophes of hitherto unknown force and frequency. Studies have indicated, disturbingly, that climatic changes could trigger world wide losses totaling many hundreds of billions of dollars per year. Most countries can expect their losses to range from a few tenths of a percentage point to a few per cent of their gross domestic product each year. And certain countries, especially small island states, could face losses far exceeding 10%." Once the calculations have been refined, "they might convince even those governments and businesses still hostile to international action to combat global warming." The Times

## Skeptics

According to the US Energy Information Agency, Kyoto would cost the US economy \$400 billion/yr in production that would have been shut down; raise electric utility bills by 80 – 85% and impose a permanent Kyoto gasoline tax of 45 – 55 c /US gal. As if the shocking economic costs were not enough of an argument against Kyoto, the mounting scientific evidence questioning the impact of human behavior on climate change has increasingly robbed global warming theorists of their veneer of scientific credibility.

John Carlisle, Chicago Sun Times

Sir John Houghton, the former UK Met Office chief who co-chaired the Shanghai meeting, said, "I think there are very few scientists who'd disagree with the IPCC. And most of those who do disagree have not published much."

BBC News

Scientists working on ice core from Antarctica have found evidence for a temperature change of around 4°C in a decade, 19 000 years ago. There is a correlation between the time of the temperature spike and an abrupt rise in sea levels at about the same time, as documented by Australian National University research. This is fuel for the argument that climate change can be rapid and that the Antarctic ice sheet can melt.

New York Times

*(A similar spike from Greenland indicates a temperature rise of some 7 °C in 50 years, some 11 500 years ago.*

EW)

## Umbrella group

Sam drives a huge SUV, Pierre drives a tiny Citroën. Both agree that for the sake of the environment they must reduce their combined fuel consumption. But who should bear the burden? You might expect Pierre to demand that Sam do most of the adjusting. All that Sam has to do is switch to a smaller but still comfortable car; Pierre's car can't get much smaller. You certainly wouldn't expect to find Sam trying to wriggle out of the bargain, insisting that he be allowed to adopt a tree instead. But that, more or less, is why efforts to curb global warming collapsed.

Paul Krugman, New York Times

The ultimate reason that the climate talks failed, that global warming will go unchecked, is the power of America's vitriolic anti-tax right.

Paul Krugman, New York Times

## A selection of web sites on climate change

The International Institute for Sustainable Development (IISD). On-line resource list  
[www.iisd.ca/climate/cop6/online.html](http://www.iisd.ca/climate/cop6/online.html)

UNFCCC and official Dutch Government Sites  
[www.cop6.unfccc.int](http://www.cop6.unfccc.int)

UNEP/GRID-Arendal - Vital Climate graphics  
[www.grida.no/climate/vital/](http://www.grida.no/climate/vital/)

Centre for Science and Environment  
(Southern perspective)  
[www.cseindia.org/html/cmp/climate/ew/index.htm](http://www.cseindia.org/html/cmp/climate/ew/index.htm)

Global Climate Coalition  
[www.globalclimate.org](http://www.globalclimate.org)

Tyndall Centre for Climate Change Research  
[www.tyndall.uea.ac.uk/press.htm](http://www.tyndall.uea.ac.uk/press.htm)

US Global Change Research Program  
[www.usgcrp.gov](http://www.usgcrp.gov)

## UK government failing to tackle problems

Daily Telegraph

The UK government has been criticised by its chief environmental adviser for failing to tackle traffic growth; allowing the railway network to collapse; and moving too slowly to promote green energy. Speaking at the launch of the Government's first annual report on the quality of life, the chairman of the Government's Sustainable Development Commission, Jonathon Porritt, warned airlines that in future they would have to pay tax on aviation fuel to pay for the growing damage air travel did to the environment and human health. The report, intended to be a barometer of social, economic and environmental well-being, showed that there was improvement in eight of 15 indicators measured during 1999, including education, investment and poverty. Two indicators—violent crime and air quality—were found to have worsened.

Porritt welcomed the report but added, "there are parts of the document where there is a sense of mismatch between what the Government is doing



and what needs to be done." He was especially critical of transport policies. He said the Government had calculated that its NZ\$ 600 billion, 10-year transport plan would not reduce road traffic, only reducing its annual growth from 2% to 1.6%.

Porritt said that it was proving very difficult to get a "real joined-up renewable energy strategy" in Britain. Only 2.8% of the country's energy needs came from renewables.

## Energy Energy Federation of New Zealand

### Seminar on Thursday 19 April 2001

EFNZ will be holding a seminar at the Quality Hotel in Upper Willis Street. SEF members will be welcome.

Details are still being finalised but the programme will include the following:

- New Zealand's Renewable Energy options
- Sustainable energy after CoP-6
- Getting distributed energy to the consumers.
- The power package and the impact on Renewables
- Renewable Energy investment in return for Greenhouse Credits?
- Government Research Investment for Sustainable Energy.

In the evening the Minister of Energy the Honourable Pete Hodgson will be addressing both SEFI and EFNZ members. A combined discussion forum will follow.

Further information will be available from the Energy Federation, contact [energy.fed@extra.co.nz](mailto:energy.fed@extra.co.nz) or 04 475 3299 to be put on the distribution list for further information.

## Moving NZ towards Sustainable Energy Use

### 8th Sustainable Energy Forum Conference 2001

**April 19th and 20th, Wellington.**

Themes will centre around the New Zealand Energy Efficiency and Conservation Strategy (to be released on 29 March); the CoP-6 negotiations (failed in November, reconvening in June – July 2001); and their implications for NZ. The Conference will open at 17.45 on Thursday evening, with an address by Minister of Energy Pete Hodgson, followed by plenary discussion. This session will be held jointly with the Energy Federation of New Zealand, who are holding a seminar on sustainable energy earlier that day (open to SEF members at EFNZ rates). On Friday there will be presentations and discussion on the national energy efficiency strategy, the CoP-6 negotiations, environmental taxation; and the potential for energy conservation in NZ.

The 2001 AGM will be held in Wellington at St John's Hall (Willis and Dixon Streets), over a 'working lunch' at 12.30 on 19 April. Two important items on the agenda will be:

- Nominations for Management Committee.
- Deletion of Clause 15.4 of the SEF Constitution: *Management Committee members shall stand down for three years after two consecutive terms.* (A term is of up to three years)

The intention of Clause 15.4 was to keep new members coming onto the committee, but we are not getting enough. At least one committee member will be retiring at the AGM, with another hoping to resign because of overseas transfer. Five or six more will be retiring in the next year or two and ineligible for re-election. Your committee will be seeking nominations as widely as possible (we can have nine or more members), but will also propose to delete Clause 15.4.

If you would like to help, please contact SEF or any committee member. Meetings are normally held by conference call and do not need attendance in Wellington.

More information from [sefi@actrix.gen.nz](mailto:sefi@actrix.gen.nz)  
P O Box 11 152, Wellington, or on the web site  
soon: [www.converge.org.nz/sefi](http://www.converge.org.nz/sefi)

# Think big? Think again! Think hydrogen

Ken Piddington, Adjunct Professor for  
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Suddenly, as we read the New Year papers, we were asked to believe that the petrol price would somehow return to “normal”—and stay there. In the wake of the failed climate change talks at The Hague, the skeptics about global warming have also been asking us to believe that there is no need to pursue action under the Kyoto Protocol (by limiting our release of greenhouse gases). Finally, the signals from Washington warned us that the new occupant at the White House would support those same skeptics, and concentrate on the business of pumping more oil...

All three issues are interrelated and need to be examined very carefully. There are great dangers ahead for New Zealand in the assumption that we can now return to ‘business as usual’. Locally, there are even greater dangers for Auckland if policies are not put in place to head off the creeping effects of the transport crisis—which has already made it the country’s least livable urban area. For the economy at large, there are also costs in avoiding the strategic management of climate change risk.

This is definitely the year in which to concentrate on some of these problems. In April, the Government will release a Draft National Strategy on Energy Efficiency and Conservation. It will pursue consultations through the following months, and the Strategy will be issued “on or before 1 October 2001”, as required under the statute. Is it too brave to hope that what emerges will look ahead to the energy revolution which will take place this century?

First, the petrol price. What happened late last year was not all due to the fall in value of the NZ dollar. Globally, oil is a diminishing resource and it is also a political lever which exporting countries will continue to apply wherever they see the opportunity. OPEC’s latest decisions show very clearly that they enjoy the cat-and-mouse game, especially as they become increasingly in control of it. Over the next 15 – 20 years, the fact is that imported oil is likely to cost a lot more. By mid-

century, three- or four-fold increases in constant dollar terms are not outside the ballpark.

So the short ‘oil shock’ of 2000 should at least have opened our eyes to the arithmetic. The annual bill for imports of crude (\$2 billion) already represents something close to the deficit on New Zealand’s current (external) account. It would be nice to get rid of it. Yet those same pundits who call for the rejection of the Kyoto Protocol (which everyone would agree is far short of perfection) want us to stay with fossil fuel on the grounds that our greenhouse gas emissions are minute in global terms.

The other costs of oil imports in NZ terms are however not minute. The (internal) economic costs imposed by higher petrol prices have been thoroughly analysed, even though the affected stakeholders did not take the sort of militant action that was seen in Europe and elsewhere when prices at the pump peaked late last year.

Add to this the environmental costs of collateral (non-carbon) pollution from transport fuels in public health terms, and we begin to see that there is no such thing as ‘cheap petrol’. In California, children’s lung size has been shown to shrink by 10% through exposure to this type of pollution—some studies put the figure as high as 17%! Evidence is mounting that particulates are at least a contributing factor in (and may sometimes be the direct cause of) increasing incidence of bronchitis, asthma and other ailments. Auckland should be concerned that it’s pollution exceeds not only the tight Californian standards, but on occasion breaks WHO ceilings for individual pollutants.

Second, turning to the Kyoto Protocol argument, we must bear in mind this link between global carbon dioxide emissions and local pollution. What we do to the overall stock of atmospheric carbon may appear incidental, but this does not exonerate New Zealand from acting as a good global citizen.

The Government is absolutely right to accept the firming scientific consensus that human actions are likely to bring about climate change (together with the acknowledged uncertainties). No country in the world has rejected this view, despite the Canute-like position taken by individual politicians. Even a very faint sense of environmental responsibility would lead one to interpret the breakdown of the talks in The Hague as a major setback. So the task ahead is to strive harder for a global contract—to build on Kyoto rather than demolish it.

There is moreover a possibility that oil prices might be pushed up more quickly if the Kyoto Protocol were simply allowed to lapse. Governments will not feel that they have to send any signals to the market penalizing the use of fossil fuels. Those same signals would have accelerated the switch to new technologies which will ultimately reduce dependence on oil, particularly as a transport fuel. Ever since the Kyoto Protocol was signed these have been pushing closer to consumer markets. The first innovation, the hybrid electric vehicle, is already off the rank and sells competitively in major markets.

Then the new generation vehicles will become available. First, the 'hypercars,' with up to fourfold increases in fuel efficiency. Then the fuel-cell vehicles, which could run on methanol already produced in New Zealand from natural gas. (Ultimately, by using biomass, we could grow our own). Both are proven technologies, with test vehicles on the road.

Not so far away are the vehicles running on pure hydrogen. Some are modifications of high-quality vehicles (six BMW experimental models are already running) and others use fuel-cells (already demonstrated on buses in North America and in Europe). This revolution will carry well beyond the transport sector. Take note, for example, that with the support of some big oil money, Iceland is already geared up to be the world's first 'hydrogen economy.'

Let it be clear. We don't need proof of climate change to invest in these new technologies. We need to do the numbers. In particular, we need to look at the burden on the NZ economy (and the serious health penalty) if in 20 – 30 years time we still have an inefficient vehicle fleet using dirty engines dating from the last century. These vehicles will use three times the amount of fuel per kilometre at up to three times today's cost per litre. For the big rigs, this will spell disaster. The figures don't look good for anyone.

What we are facing here is the classic timing dilemma in a major technological transition. Do you invest early, on the 'first up, best dressed' principle? If NZ were the first hydrogen economy in this hemisphere, our entrepreneurs and our technical experts would enjoy vast economic opportunities as the polluted cities of the Asia/Pacific region bolt into clean (and affordable) transport options. Other arguments could be added to reinforce the case for making an early strategic move.

The 'business-as-usual' case would have us leave any such moves until everyone else has made the start-up investments, mastered the technology and worked out how to exercise virtual monopolies in fringe markets. This at present seems to be the direction we are taking.

Perhaps the economic history of New Zealand over the last 25 years can offer us some guidance here. Few people can now list the drivers of the Think Big energy strategy of the Muldoon dynasty. By and large, its architects have been discredited and its critics vindicated. As the then Commissioner for the Environment, I was counted as a critic... But not once did I question the strategic goal of seeking maximum self-sufficiency in transport fuels.

We need to remember that in the early 1980s this doctrine was based on the experience of a persistent balance of payments deficit—over two decades—plus the warning signs from the first and second oil shocks. Which brings us full circle. In many ways, self-sufficiency for all our energy needs is an even more valid goal for public policy today than it was twenty-five years ago.

The big difference over the next decade is that instead of reaching for second-hand industrial plant and large foreign investments, we can use small scale, cutting-edge technology and distribute the benefits to all sectors and all regions. The social and health benefits would flow on to future generations. They might actually conclude that the course correction had been made at the right time.

## Time to hit the gas

The Times

The latest energy crisis is over but two hard truths remain: oil reserves are finite; and burning them in vast quantities has global consequences. Small wonder that car manufacturers are racing to market fuel-cell cars. No more than a few thousand vehicles are likely to appear in the first wave, in 2004, as manufacturers must reduce costs and extend the range before they can create a market. Mass production is expected to fix the price tag, but it will take some fancy technology to deliver the 800 km range we have come to expect from the family cruiser. Luckily, a solution is at hand—and you may even be carrying a miniature version of the technology in your mobile phone.

Fuel-cell cars operate by generating electricity from hydrogen, in a chemical process that produces no pollutants and no planet-warming carbon dioxide. Yet the nature of hydrogen limits the cars' range: because it is so light, it is hard to cram more than a few kilograms into a fuel tank. Ford's latest demonstration car—a four-door saloon based on the Focus—sacrifices most of its boot to a high-pressure gas tank, yet gives little more than 200 km of driving. Ford hopes to clear that boot for its 2004 model, but the range is unlikely to exceed 320 km.

Stronger tanks and higher pressures would help, or another approach is storage at low pressure and temperature. One DaimlerChrysler demonstration vehicle ran for 450 km on liquid hydrogen, chilled to -253°C, but the high cost of building fueling stations means that this is not a realistic solution.

DaimlerChrysler has taken a novel approach to its latest fuel-cell demo car, the Nekar 5. The hydrogen is trapped within methanol—CH<sub>3</sub>OH—and the hydrogen atoms are reformed for use by a fuel processor under the bonnet. This car can cruise for 500 – 600 km on a single tank of methanol, but the reforming equipment is expensive and difficult to control. Nor is the process sufficiently green: when the fuel is burnt that carbon atom gets loose as carbon dioxide.

There is another way to store hydrogen, however: the same technology used in the rechargeable nickel-metal hydride (NiMH) batteries that power millions of cell phones, video cameras and notebook computers. In fact, NiMH batteries were invented in the 1970s by researchers seeking a way to store hydrogen for powering futuristic devices such as fuel-cell cars.

When you charge a NiMH battery, water molecules inside it break down and release hydrogen. The negative electrode, an alloy of nickel and other metals, absorbs this gas. Turn on your phone, and this metallic sponge leaks hydrogen to regenerate the lost water and releases electrons to power the electronics. Metal-hydride storage tanks use the same hydrogen-shuttling principle. The metallic sponge has the added advantage of bringing hydrogen atoms close together, to create a sea of hydrogen more dense than the liquefied gas. The weight of the metals make these tanks hefty, so the choice of alloys must be optimised to pack in as much gas as possible.

Energy Conversion Devices (ECD) of Troy, Michigan—which helped GM to optimise NiMH batteries for its electric cars—has developed a tank holding an impressive 7 % hydrogen by weight,

enough for 500 km of driving. ECD teamed up with Texaco to perfect the tank. The challenge lies in moving the hydrogen in and out of it, since the alloy gives off huge amounts of heat when it absorbs the gas. "The technical challenge is in the thermodynamics of the device, because you need to both extract and supply heat. Mechanically it is easy, but to do it efficiently is the key," says Graham Batcheler, president of Texaco Energy Systems. His goal is a commercial prototype by 2002. Why is Texaco investing millions in hydrogen technology? Fuel cells, Batcheler says, will eventually replace the internal combustion engine.

## California's electricity mess

*An article based on a letter submitted to the New York Times, by Tom Feiler and Karl R Rábago, of the Rocky Mountain Institute*

California's electricity mess could be more easily addressed without reliance on prevalent myths.

### *No new power plants have been built*

Actually, California added 6 048 MW in the 1990s, equivalent to the state's entire nuclear capacity. Because those additions were mainly small, decentralised, and not built by the traditional utilities, they have been less visible to many pundits. Yet they've been keeping the lights on. Many also rely on renewable sources of energy, such as wind and sun, so they're immune to fossil fuel price volatility.

### *Soaring demand drove the crisis*

During 1989–99, California's retail electricity sales grew by only 1.3% / y, slower than the national average (2.1%) or the state's GDP (about 2.2%). From 1999 (when prices were normal) to 2000, wholesale electricity sales rose only 0.7%, and peak demand fell 1.9%—yet the wholesale price of electric energy soared 13-fold and the price of instantly available reserves by 120-fold. These increases are far greater than could be explained by higher natural gas prices. They suggest basic problems in California's approach to electric utility restructuring.

## Problems

The fundamental problem is that botched restructuring let suppliers game the system and gouge prices. Neighbouring states connected to the same regional power pool but not undertaking California-style restructuring saw at worst modest price shocks. Unlike other commodities, electricity cannot be stockpiled, and has been provided by a concentrated group of regulated-monopoly utilities for nearly 100 years. The unique character of electricity demanded more attention to market structure and rules by restructuring policymakers.

Other causes aren't hard to find. By the early 1990s, California's world-class efficiency efforts saved 10 000 mW—a fifth of today's peak demand—and pumped billions of dollars into the state's economy. Restructuring stalled the programmes in the late 1990s, and new laws reinvigorated them only last September. Had these cost-effective efforts been sustained, California's crisis would have been averted. Meanwhile, the regional power pool's other 16 states and provinces neglected efficiency, so their brisk population and economic growth cut the region's reserves, whipsawing California—the biggest importer—with volatile prices.

In 1996, California destroyed its utilities' incentive to help save electricity when it stopped rewarding distributors for cutting customers' bills—a successful way to align shareholder with customer interests—and instead resumed the bad practice of rewarding utilities for selling more electricity. Nor were utilities adequately encouraged to adopt aggressively the many new and cost-effective decentralized generating solutions.

Corrective actions must rest on true facts and on sound principles. Successful restructuring demands choosing the best buys first and using competition thoughtfully to let entrepreneurs cut costs. Protecting the public interest means not letting political goals override economic ones. Markets must be structured to reward innovation and economic efficiency, making competition as robust for saving as for making electricity. Markets should eliminate distortions that create a problematic bias in generation choices toward large units. And in the end, a restructured market should reward what we want—lower bills for better service—rather than the opposite: lower (or, for suppliers today, higher) prices for more kilowatt-hours.

## Funding renewable energy

Financial Times

Six months ago Robin Batchelor, a fund manager at Merrill Lynch, tried to entice investors to a new fund for high-technology companies promoting novel energy technologies such as wind and solar power. The timing seemed poor, given widespread disillusionment with telecommunications businesses. Yet the fund was heavily oversubscribed, closing at \$M 600. "People are realising the fantastically exciting potential of these companies," says an animated Batchelor.

Even a decade ago few investors were interested, but the mood has now swung dramatically. The Californian energy crisis has shown the pitfalls of over-reliance on traditional fuels, and environmental concerns are growing. Renewed interest from politicians and consumers has given a huge boost to companies whose main business is developing alternative energy solutions. There are government subsidies intended to increase the proportion—now less than 1%—of the world's 3 300 GW electricity generating capacity that comes from alternative energy sources.

The EU wants 20% of its power to come from renewable sources by 2010. Some analysts believe that within 50 years half the world's electricity could come from non-fossil-fuel schemes, including well established hydro-power schemes but excluding nuclear energy. A prime beneficiary of this trend has been Vestas, a Danish company that has become the world's biggest maker of wind turbines, with a share price that rose 158% in the past year, giving it a market capitalisation of US\$ 6 bn. Global investment in wind power systems will total US\$ 27 bn between 2000 and 2005, according to Dresdner Kleinwort Wasserstein. By 2020, world wind power generating capacity could total 400 GW, equivalent to 200 large power stations. Germany, which is spending US\$ 1.8 bn a year to promote wind energy, has emerged as the world leader in the technology, with wind farms sprouting up around the country and the wind-turbine business supporting an estimated 35 000 jobs.

Solar power too is becoming more economically viable. The capital cost of generating a single watt of electricity has fallen from US\$ 200 in 1980 to US\$ 3.50 today. The four biggest companies in this field are all large enterprises—Germany's Siemens, Kyocera and Sharp of Japan and the UK's BP. However, many analysts expect 'pure play' solar

companies such as Astropower, Energy Conversion Devices of the US and Atlantis of Switzerland to do most to encourage the development of solar energy. Astropower's shares have risen from US\$ 6 at its initial public offering three years ago to a current quote of US\$ 37.

Another form of energy production attracting interest is fuel cells. While General Electric, Siemens and Alstom, the world's three biggest makers of conventional power stations, are all keen on either developing or selling fuel cells, the pace in this sector is again being set by smaller companies, including Ballard of Canada and Plug Power and H-Power of the US. Frank Gibbard, chief executive of H-Power, who has signed a contract to provide 12 000 fuel-cell systems for rural co-operatives throughout the US, concedes that fuel cells' manufacturing costs still need to fall by half, from US\$ 2000 /kW, before they are considered alternatives on cost grounds to conventional power sources. "No one is quite there yet but they could be in a year to 18 months," he says. Most executives in 'new energy' companies agree that costs will fall further. The most prominent move so far from a large industrial group came last year when ABB, the Swiss-Swedish engineering company, quit conventional power generation projects in favour of 'green' programmes such as wind power and high-efficiency gas-driven micro-turbines.

Jeremy Leggett, a former Greenpeace scientist who is chief executive of Solar Century, a UK solar energy company, says government support is crucial in encouraging adoption of alternative energy sources. He argues that the government should give incentives to house builders to incorporate solar panels in new homes. As for investors, they hope the ambitions of many of the new energy companies will be matched by reality. There is plenty of room to grow; but as many internet companies now know, potential is not always enough.

## Renewables in Vanuatu

Vanuatu has announced an objective of 100% renewable energy supply by 2020, and is appealing for international support. The hope is to use geothermal energy to develop a hydrogen economy, and hopefully also export hydrogen.

Renewable Energy World

## Canadian tar-sands coming on stream

New York Times

North America's largest energy construction project is a US\$ 22 billion oil investments that is transforming a patch of Canadian wilderness some 400 km north of Calgary into what may soon be the continent's main oil producing area north of the Gulf of Mexico. Within five years, oil flowing south from Alberta's oil sands is expected to exceed a million barrels a day (160 000 m<sup>3</sup>/d: see page 19), more than the current production of Alaska's North Slope. It will then double in another 5 years, to exceed the current production of Nigeria, helping to feed a market in the United States that now consumes 20 million barrels/day.

"By 2010, 75% of oil sands production will go down to the US," predicts William Almdal, regional coordinator for Athabasca Oil Sands Developers. After many lean years, Almdal says, the strong oil prices of the last 18 months have unleashed such a torrent of investment that today's biggest development obstacle is not money or objections from environmental groups but a shortage of skilled labour.

According to Canada's National Energy Board, there are at least 300 billion barrels of recoverable oil within a 400 km radius. For years, mining Canada's oil sands was dismissed as a costly, roundabout way to produce oil. Multibillion-dollar 'energy independence' fiascoes—like the failed 1980s effort to mine Colorado's oil shale deposits—soured investors on any oil not from wells. But during the first 10 months of 2000, Canada edged out Saudi Arabia as the US's largest outside source of petroleum. Last year, the US imported foreign oil to meet 57% of its needs, up from 37% in 1975, and now more Canadian oil means more energy security.

Mining shovels in northern Alberta are digging at a faster pace into oil-soaked sand and loading it onto huge trucks. After passing through crushers, the sand is mixed with hot water and moved by slurry pipeline to a plant where the bitumen is extracted by floating it on caustic soda. In recent years technological improvements have pushed production costs down sharply. When Suncor Energy's project comes on stream, costs will be around US\$ 9/barrel, roughly a quarter of 1970s levels, according to Rick George, Suncor's chief executive. Suncor's goal is US\$ 5.50/barrel. While prices vary by quality, a barrel of crude oil sells today on average for about US\$ 30. Next door,

Synchrude Canada plans produce 465 000 barrels/day, more than double its 2000 levels. Money is being saved by using gigantic trucks in mining operations, by moving half-processed oil sand to upgrading plants in heated slurry pipes, and by using steam injection to extract oil from deposits too deep for open pit mines.

Companies have also announced investments of US\$ 1.2 billion to improve pipelines to central Alberta refineries and to United States markets. With easy market access, guaranteed delivery by pipeline and minimal exploration costs, the roster of multinationals investing in the tar sands includes Gulf Oil, Exxon Mobil, the Royal Dutch/Shell Group and Chevron.

While the oil companies are racing ahead, Alberta's oil sands have also drawn the attention of environmental groups. Greenpeace is calling for a halt to the expansion of all tar sands projects.

*Problems with tar-sand oil production include:*

- *The waste sand is difficult to dispose of, needing more space than the hole it originally came from.*
- *Waste stockpiles tend to cause pollution as water leaches more oil from the sand.*
- *Oil production and refining are a series of high-energy processes: mechanical mining; slurry pipelines; steam injection; pipeline heating; and disposal of heavy and bulky tailings. These processes effectively increase the carbon dioxide (and sulphur dioxide) emissions from the oil's final use.*
- *The investment draws funding away from more sustainable projects.*

EW

## **Power To The People!**

A lucky household in Dunedin or Central Otago is to get three years of solar electricity—free—from Dunedin Electricity. The power will come from domestic solar equipment. Power usage will be monitored to test the effectiveness of the equipment and as part of a community education project. Results will be published on-line on Dunedin Electricity's web site: ([www.electricity.co.nz](http://www.electricity.co.nz)).

Consumers can go into the draw by completing an application form. Applicants' houses will then be assessed for suitability and the winner will be selected.

Otago Museum/Newsroom

## **Which way will Bush jump?**

Kerry Wood

With President George Bush taking office in the midst of the CoP-6 and IPCC 'events,' entrails are being read ever-more widely and carefully. Most look depressing. On the positive side, the National Academy of Sciences has begun a study of more fuel-efficient vehicles. However, Congress has blocked such studies every year since 1995, so this may be just an election-year hiccup.

Bush has set Vice President Dick Cheney to head a task force to devise ways to reduce US reliance on foreign oil. Plans include drilling in the Arctic National Wildlife Refuge, and relaxing clean air standards to allow older plants to run at full capacity.

Some of measures in a draft Energy Bill are very positive, but too many show a bias towards subsidising well-established, and polluting energy sources, many of them non-renewable:

- Re-evaluate proposals to construct a permanent nuclear waste repository in Nevada for utilities; research treatment, recycling and disposal of high-level nuclear waste and nuclear fuel; offer greater depreciation and expensing of fuel storage costs for nuclear power plants; and offer tax deductions for nuclear plant decommissioning costs.
- Offer tax credits and create a research, development and demonstration program to show how clean coal technology can be used on a commercial scale. The program should achieve a significant improvement in emissions of sulfur dioxide, nitrogen oxide and mercury.
- Expand tax credits for electricity generated by renewable resources to include biomass, agricultural and animal waste, incremental hydropower, geothermal, landfill gas and cogeneration.
- Offer tax deductions for installing equipment to reduce energy used by commercial buildings.
- Offer tax credits for certain distributed power and combined heat and power systems.
- Offer tax credits for hybrid vehicles, and retail sales credits for alternative fuels.

# Micropower

*An article by Seth Dunn, of Worldwatch Institute, in the November/December issue of Renewable Energy World, reviews the developing technologies for micropower. Seth's main points are summarised here*  
EW

Micropower is starting to be a major player. Annual growth rates in solar- and wind-power are 17% and 24% respectively, and fuel cell companies Plug Power and Ballard Power Systems, and turbine company Capstone, have recently seen their share prices double or quadruple.

Micropower is generally defined as system capacities of 10 MW and below, and identifies several areas of development. The current standard is the diesel or IC gas engine generating set, with a capital cost of around US\$ 600 /kW. Efficiency, including generation losses, is around 25 – 45%, depending mainly on the unit size and the extent of any waste heat recovery.

The diesel's most immediate challenger is the microturbine. This is in effect a tiny jet engine—generally 15 – 300 kW—which is slightly more efficient than the diesel at a comparable scale, or considerably more efficient with waste heat recovery. Several hundred 28 kW Capstone turbines have been shipped, and a 75 kW version is now available. Capstone's President Ake Almgren predicts a billion dollar industry within five years, with capital costs of around US\$ 400/kW for a 30 kW unit, or US\$ 200/kW for a 100 kW unit. Operating costs should also be low, with operating lifetimes of 30 – 60 thousand hours and only two moving parts.

Fuel cells currently cost around US\$ 3000/kW and are economic only if very high reliability is wanted. However, they are very efficient, and effectively noise- and pollution-free. Fuel cells can be built in very small sizes, to power a bicycle or even a cellphone. Capital costs as low as US\$ 500/kW are expected within a few years. At present the most promising are the phosphoric acid, or proton exchange membrane designs.

World-wide installed wind turbine capacity is now growing at about 24% a year. The most popular machines are around 600 – 700 kW, at a capital cost of generally under US\$ 1000/kW, but machine size is still growing and 1 - 2 MW units are coming onto the market. Wind power on favourable sites is now directly competitive with new gas-fired

plants, according to the US Department of Energy. Claims of future capacity run as high as 10% of world electricity supply by 2020.

Photovoltaic (PV) power has now entered the grid-connected market. Domestic units are typically 2 – 5 kW, enough to provide around half of household power. Government subsidies, notably in Germany and Japan, have justified greater production capacity and driven down costs, and it is now claimed that a further three-fold increase in the rate of production—due in about 7 years at current growth rates—will bring costs down to a fully commercial level.

Micro-hydro stations are coming into use on suitable isolated sites, often in third-world countries, sometimes with capacities as low as 50 W.

Several micropower technologies are now mature enough to be used for distributed grid-connected power, but here they run into barriers supporting the centralised status-quo, such as:

- Higher initial capital costs.
- Customers not rewarded for relieving peak load.
- Impacts on local reliability ignored.
- Unfair taxation, standby charges, exit fees and transition costs.
- Discriminatory permitting, fire, building and other codes.

'Market accelerators' identified as helping to overcome the barriers include:

- Simplified and streamlined interconnection standards and permitting procedures.
- Aggressive gas, energy service and micropower vendors.
- More efficient electricity pricing schemes.
- Saturation of electric transmission and distribution systems.
- Siting difficulties for new central generation plants and transmission and distribution lines.
- Electricity customer dissatisfaction with central power.
- Demand for green power.



## Companies tracking their own emissions

A new report sponsored by the Pew Climate Center singles out 13 US companies making voluntary efforts to track their greenhouse gas emissions. The study, *An Overview of Greenhouse Gas Emissions Inventory Issues*, is the work of a team from Arthur D Little Inc. It presents a set of principles for emissions inventory and reporting; describes credible approaches by major companies; identifies key decision points in the monitoring process; and lists information resources available.

"Even for companies that may not be convinced about the link between GHG emissions and global warming, there's still often a drive to inventory emissions as a prudent way to measure GHG emissions," said Chris Loreti of ADL. Loreti said more and more company leaders believe they are better off reducing emissions voluntarily than being forced to do it by government mandate. Moreover, as the market for GHG emission credits and trading increases, companies see financial benefits in voluntarily reducing their emissions.

An accurate inventory will also put companies in a better position to count voluntary, near-term emissions reductions toward future regulations. "There is also the motivation to be part of discussions on climate change. If regulations are going to be developed, companies want to have an input," said Loreti. "A better understanding of their own emissions will allow them to be better prepared in that debate."

United Technologies Corporation took the bull by the horns in 1996, revising its environment, health and safety policies to include conservation of natural resources as a key ingredient in its worldwide operations. The corporate rethink resulted in the creation of an energy and water baseline in 1997 for 229 of the company's manufacturing and non-manufacturing sites. The company then set a goal to reduce energy and water consumption by 25% as a percentage of sales. UTC presently uses roughly 430 Wh to generate each US\$ of sales, and is aiming to reduce this figure to 340 Wh/\$ by 2007. Since the programme was implemented three years ago the company has saved nearly US\$ 30 million in energy consumption, through programmes such as lighting upgrades; more efficient motors, boilers and chillers; energy management systems and co-generation. One facility saved US\$ 230 000/yr simply by getting employees to turn off all computer monitors at night. ENN

## Mini-Whats

### Headlines

The *Guardian Weekly* for 25 January may have summed up the next decade in two front-page headlines:

—Main headline

*Global warming could be worst in 10 000 years  
Scientists predict extreme climate change as Earth  
heats up from fossil fuel burning*

—Second headline

*Bush puts abortion at centre of presidency*

### Cooling the planet

Scientists are looking at drastic solutions to global warming, including manipulating the atmosphere on a massive scale. One idea is blasting tiny particles into the atmosphere from the guns of battleships. The particles would deflect enough sunlight to trigger global cooling. Another is to launch 50 000 mirrors into orbit to reflect sunlight back into space. "The sooner, the better," says Dr Edward Teller, a promoter of the plan. Another proposal is to put a huge satellite out in space between earth and sun. Some experts, like Stanford University's Steve Schneider, have their doubts about geo-engineering: "We don't know what the precise effects would be, whether the cure would be better or worse than the disease." CBS

Scientists are trying to determine whether treating ocean water with iron sulphate is a quick fix for global warming or a Pandora's Box that could lead to further environmental problems. In a mid-1990s experiment Moss Landing Marine Laboratories spread relatively small amounts of iron sulphate across a 250 km<sup>2</sup> patch of ocean. The iron-treated ocean rapidly produced tiny ocean plants called phytoplankton that draw CO<sub>2</sub> from the atmosphere. The experiment increased plant biomass by an estimated factor of almost 40 and plant production by a factor of five or six. One experimenter was quoted as saying, "Give me a half tanker of iron, and I'll create an ice age." CNN

*(EnergyWatch suggests that such approaches might be useful if they meet two essential requirements, but can any reader offer expert comment?)*

- *They are reversible: a few huge satellites, not 50 000 mirrors and NOT more stuff in the atmosphere — and perhaps not in the sea either.*
- *They are seen as offsetting damage already done, and not as allowing business-as-usual.*

## Nats' release new portfolios

At the end of January the NZ National Party, announced new portfolios. Those in the sustainable energy area are:

Pansy Wong: Energy.  
Nick Smith: Sustainable Development, Conservation, Environment.  
Simon Power: Associate Sustainable Development, Conservation, Environment.  
Belinda Vernon: Transport.

## PM on Climate Change

*Extracts from Helen Clark's speech at the opening of Parliament in February*

The government will continue to engage the business and scientific communities and environmental NGOs in discussion about the development of climate change policy. It is our objective to see New Zealand ratify the Kyoto Protocol by mid-2002, around the tenth anniversary of the Rio Conference on Environment and Development. Reaching this objective is not made easier by the failure to date to get international agreement on implementation of the Protocol.

Our ministers will continue to be fully involved in international efforts to reach such agreements this year.

Scientific evidence is painting an increasingly bleak picture about the effects of climate change on our planet. It is important that New Zealand plays its part in an international plan of action to reduce the impact of greenhouse gases. Newsroom

## Fuel cells getting smaller

A bicycle powered by a fuel cell has been demonstrated at the European Fuel Cell Forum in Switzerland. The Hydrocycle is noiseless and pollution-free, and can run for 100 km at speeds up to 30 km/h (*which suggests an output of around 200 – 300 W – EW*). The technology has potential applications for laptop computers and portable electronics including cellular phones, PDA's, golf carts, wheel chairs, cordless power tools, electric kitchen appliances, alarm systems and remote power stations. A total of a billion electric bikes is forecast by 2020, mostly in Asia but with markets in Europe and the US. CARE

## Renewable energy jobs

More than 900 000 new jobs will be created across Europe by 2020 as a result of the increased use of renewable energy. Renewables will increase from a base of 440 TWh in 1995 to 1 066 TWh by 2020, with increases from all technologies and in all countries of Europe. The overall proportion of energy consumption from renewables is projected to climb from 4.3% to 8.2% over 25 years. Renewable technologies are more labour intensive than conventional technologies for the same energy output, but any jobs that are displaced as a result of subsidies to deploy renewable energies are 'significantly less' than corresponding job gains elsewhere in the economy. Conventional energy companies will lose less than 2% of their work force by 2020 as a result of the shift to greater use of renewable energy. Job gains are greatest in the agriculture and manufacturing sectors, with the greatest absolute increases predicted in Germany, France and Italy.

Canadian Association for Renewable Energies

## Hydrogen Now!

A new association of scientists, industry leaders and government representatives from all over the world, has been formed to promote the immediate potential of hydrogen as a primary fuel. The organization is called Hydrogen Now! and is based in Fort Collins, Colorado, under the direction of Dr. Maurice Albertson of Colorado State University. Hydrogen Now is on the web at [www.HydrogenNow.org](http://www.HydrogenNow.org).

## More offshore windfarms

Denmark is going ahead with two more offshore wind farms, in addition to the current Middelgrunden project off København. One is off Horn's Reef in the North Sea, the other off the Baltic coast at Rødsand. Each will have about 80 turbines, with a farm capacity of 150 MW. The windfarms are scheduled to open in 2002.

Renewable Energy World

## Orion eliminates fixed charges

Some 160 000 Canterbury customers will benefit from Orion's decision to eliminate its fixed charge for residential and small-to-medium business customers. Orion currently charge a fixed rate of 10 cents a day. The move will save customers about \$36 a year, or 3% on an average power account. The general manager of the company's commercial operations, Roger Sutton, said he believed Orion was the first distribution company in the country to eliminate fixed charges. Green

Party co-leader Jeanette Fitzsimons called the move a long overdue challenge to businesses and the whole energy sector. Newsroom

### 2000 was the sixth warmest year on record

Global temperatures in 2000 were 0.39°C above the average for the past 120 years, making it the sixth warmest year on record, according to the US National Oceanic and Atmospheric Administration.

[www.ncdc.noaa.gov/ol/climate/research/2000/ann/ann.html](http://www.ncdc.noaa.gov/ol/climate/research/2000/ann/ann.html)

### From a barber's shop in Melbourne

A national survey of Australian motorists has revealed that private use of cars is increasing, whilst their inclination to use public transport is on the decline. This a key finding of the survey, conducted late last year on behalf of the AAA. This is the fourth such national study of Australian motorists' priorities and attitudes since 1995. The survey found that 90% of motorists drove their cars on most days of the week (up from 83% in 1995) and fewer people either used or intended to use public transport. A total of 11% (16% in 1995) of motorists said that they caught public transport at least once a week, and only 7% (9% in 1995) said they were likely to use public transport more and drive less. In Queensland, the trend was stronger with only 3% saying they were likely to use more public transport. According to the report, the average person considered using public transport only when it did not represent a significant change in behavior. There has been a steady change, "ruling out greater use of public transport at the expense of driving."

### Car fuel-cell battles developing

General Motors, Exxon Mobile and Toyota have formed an alliance to develop fuel-cell cars, in opposition to the work by DaimlerChrysler. Both groups are calling on other automakers to join their groups, forcing the industry to take sides. The GM-Toyota alliance aims to develop a 'clean' hydrocarbon fuel with similar characteristics to gasoline, in contrast to the methanol-based fuel proposed by DaimlerChrysler. Yomiuri Shimbun

### CoP-6 update

Secret talks among top environmental negotiators from the so-called Umbrella Group of industrialised countries, originally scheduled for mid-February in New Zealand, have been postponed until some time in the latter half of March (29 January). Japan Times

Sweden has set itself a tougher goal under the Kyoto Protocol, with carbon dioxide reductions between 1990 and 2010 of 2% (originally 0%). Sweden already has one of the lowest emission levels of CO<sub>2</sub> in the EU of 6.4 tonnes per capita, compared with the European average of 9.0 tonnes (25 January). Reuters

The Secretary-designate of the Environmental Protection Agency in the new Bush administration apparently does not know the difference between global warming and the ozone hole. Time

### Renewable energy incentive

The ability to purchase electricity from renewable energy sources is one of the top three incentives to switch power suppliers in the UK, where 55% of households are willing to pay a premium for green power and 250 000 expect to purchase green power within five years. According to Datamonitor, consumers are increasingly well-informed and selective, and green options now are commonplace within the retail environment. The vast majority are willing to spend up to 2% more for a green tariff. Interest in renewable energy is not linked directly to age or earnings, with stronger support from respondents in the low earnings bracket. Higher income households would pay up to 10% more.

Canadian Association for Renewable Energies

### A Correction

In EnergyWatch 14 (June 2000) we published a Monitor article on pages 8 – 9, and Gremlins got into it. The US barrel (used for measuring crude oil) is NOT 220 litres:

US barrel = 42 US gallons = 35 Imperial gallons (the gallon we used to use in NZ) = 159 litres  
(actually 159.113 27 but you will be lucky to measure it that accurately)

There are corresponding errors in the sample calculations for unleaded gasoline:

- The volume equivalent of a Petajoule is  $28.3 \times 10^6 / 159 = 178\ 000$  barrels
- The volume equivalent of a tonne is  $1330 / 159 = 8.36$  barrels

The error is regretted.

EW

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