ENERGYWATCH

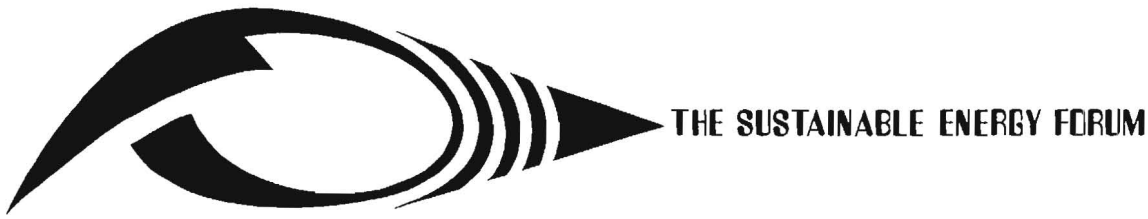
The Newsletter of the Sustainable Energy Forum

"Facilitating the use of energy for economic, environmental and social sustainability."

ISSN 1173-5449 **Issue 6, September 1996**

LOOKING BACK & LOOKING FORWARD

We are pleased to present SEFs new logo "Looking Back & Looking Forward" created by Debbie Stewart.



IN THIS ISSUE

SPONSORSHIP

ECNZ

ECNZ is pleased to be a sponsor of this edition of Energy Watch.
For more information please contact:
Greg Brown, Industrial
Programme Manager, ECNZ
Phone: 04 472 3550

THANK YOU!

A sincere Thank You to the Forest Research Institute for their in-kind contributions and support in this issue of EnergyWatch

FRI

Produced and distributed by the Sustainable Energy Forum, PO Box 11-152, Wellington, New Zealand.
Email: sefi@actrix.gen.nz
Tel:04 384 2755, Fax: 04 384 2723

NZ NEWS

ECNZ's Programme to Cut Industry Waste

Greg Brown

Waste costs New Zealand dearly in terms of the environment as well as in relation to the business cost involved in the treatment and disposal of waste.

ECNZ has developed a 'Waste Minimisation Programme' designed to help industries reduce their waste. This programme will be promoted to industries in partnership with ECNZ's power company customers.

Waste minimisation involves developing strategies for industries to reduce the amount of waste they produce.

This differs from conventional practices which concentrate on waste disposal.

ECNZ, together with allied power companies, will encourage industries to look closely at the causes of their waste and see where their processes can be improved.

Waste minimisation will help companies use their energy and materials more efficiently, comply with environmental and health legislation, meet increased 'green' market demands, and reduce costs and increase profitability.

Greg Brown, ECNZ's Waste Minimisation Programme Manager, believes, "It's a great way for us to assist power company customers to add value to their industrial customers. This will help industrial sites meet regulatory requirements in terms of environmental performance. In addition, waste minimisation can lead to monetary savings and reduce environmental impact."

"A recent New Zealand experience has proved highly favourable. Companies initially benefiting from the new programme include Richmond Ltd in partnership with Electra, Ajax Fasteners (NZ) Ltd and NZ Fish Products Ltd in partnership with Energy-Power Direct."

The Waste Minimisation Programme will be available to participating power companies from November 1996.

SEF Membership Subscriptions

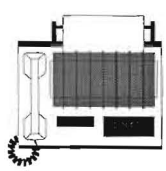
It is time again to renew membership subscriptions to SEF. Consider enrolling yourself or your company as members and take part in the expressing and exchange of ideas on sustainable energy use.

The Forum can only be as effective as its members and we need your support to continue our work. To receive EnergyWatch as a quarterly newsletter please send your name, address, phone, fax and e-mail with the appropriate fees to: The Sustainable Energy Forum, P.O. Box 11 152, Wellington. Thank you for your interest and support.

Corporate/Public Sector - $800
Small Business (less than 50 staff)/iwi authority/ community or public interest group - $200
Individual - $40
Unwaged or Student - $10

SEF's New Fax Number!

SEF is excited about their new fax machine and would like you to note their new fax number: **04-384-2723**.



Note From The Editor

Unfortunately, my time in New Zealand is drawing to a close. Though I've thoroughly enjoyed working on EnergyWatch and with the team at SEF, I must soon resume my responsibilities back in Canada. Therefore, Andrew Beer will assume the responsibilities of EnergyWatch in the SEF office.

Sincerely, Laura Tomat (Editor, EnergyWatch)

Letters to the Editor on articles that appear in EnergyWatch or on issues of sustainable energy are always welcomed and can be forwarded to the SEF office. Please ensure any correspondence is signed and clearly states a wish to be published. The Editor reserves the right to withhold or edit correspondence due to space limitations or suitability.

How the New Electricity Market Will Work

Andrew Beer

On October 1 this year, New Zealand moved to a competitive wholesale market for electricity (NZEM). The rules of the new market have been agreed and approved by a vote of the market participants. These rules are contained in a document about two inches thick. For those of you who do not have the time to read them, this is an attempt to explain briefly how the market will work.

The players in the new game are:

Generators - who own the power stations which produce electricity. In the NZEM there are two major generators, Contact and ECNZ, with some small power stations owned by local power companies.

Network Operator - who manages the grid (including the connection between the islands). In the NZEM this is a state owned monopoly, Transpower.

Purchasers - who buy, sell and use electricity. These are forty or so local power companies, energy traders and major industrial electricity users. Local power companies also operate local power networks but they have to provide access to anyone who wishes to sell electricity using their networks.

Market administrators - who operate the market. In the NZEM, the administrator will be EMCO. There will also be a Market Surveillance Committee who will act as 'umpire'. There will not, however, be an external regulator.

To confuse the issue, generators can also be purchasers and vice versa.

The Operation of the Market

The market is simply a place where the purchasers (demand side) and the sellers (supply side) get together to agree a price. In the NZEM, each purchaser will place a bid for how much electricity they wish to buy in each half hour period for the following day. The bids will specify volume required at a range of prices.

Each generator will make an offer for how much power they will generate at each station and at what price (ranging from blocks of cheap power for the South Island hydro, to more expensive fossil fuel stations).

For each half hourly period, the market administrator stacks the bids and offers in order of price to produce supply and demand curves.

The intersection of these two curves sets the price (the 'strike' price). This means that the most expensive station running at the time sets the price for all electricity. This differs from the old system, where the price was based on an average. In a market system, this price sends a signal to other generators to enter the market if they think that they can produce electricity more cheaply. This signal should also mean that new supply is built when it is needed.

Unfortunately it's not quite as simple as that, because having purchased your power, you have to pay Transpower to bring it to your region. This involves some complex calculations based on how the grid is operating (for example whether a fishing trawler has managed to catch the Cook Strait cable). In effect, these calculations produce a half hourly location charge which is added to the electricity price. Most consumers will also have to pay their local power companies for the use of their lines to bring power to their house.

The market that has just been described is the 'spot market'. Most people, of course, do not want to order their power on a half hourly basis. Not only does it take time, but it can also be risky, because prices on the spot market can fluctuate quite dramatically. For this reason, a parallel contracts market will also operate. In the contracts market a customer can 'hedge his bets' by buying a contract for a certain quantity of electricity at a fixed or controlled price. These contracts are also known as hedges and, like hedges, can come in a range of different shapes and sizes.

So the electricity market will really be two markets, a spot market where electricity is traded as it is required and a long term contracts market. Most of the time, electricity will be cheaper in the spot market, but the price could go very high very quickly in the event of a grid failure or a water shortage. Hedges protect companies against this volatility.

What does this all mean?

The purpose of changing to a competitive market is to increase efficiency and to allow market mechanisms to find ways of supplying electricity at the lowest cost. Suffice it to say that there are varying degrees of cynicism about what this will mean in practice!

However, it is clear that the role of Government is far from over. There remains a need to ensure that monopoly positions are opened to competition and to find a way to include environmental costs in the market process.

Copies of SEF submissions on the electricity market development process (or indeed any other issues) may be obtained by contacting Andrew Beer at the SEF Office..

LABOUR PARTY'S ENVIRONMENT AND ENERGY POLICIES

Rt Hon Helen Clark

Over the past two weeks Labour has released the most comprehensive set of green policies seen from any political party in this country. These policies will ensure our environment and our conservation estate are protected and enhanced.

Labour established a department dedicated to conservation, but is sorry to see the present state of DOC and its programmes. We have established the Ministry for the Environment, but are concerned to see New Zealand behind on important global issues.

Money isn't everything, but it certainly helps! That's why we are proposing a substantial lift in funding for conservation over the next five years. The increased spending will be directed, amongst other things, at pest control, saving threatened species, and ensuring public safety on the conservation estate.

Our environmental and energy policies are about working for a sustainable future for ourselves and our planet. The National Government is lagging behind, not leading, on international environmental issues and is making New Zealand an object of ridicule worldwide.

There are massive environmental pressures on our planet. Population growth, the use of cars, industries which pollute, deforestation, the use of pesticides, and the inefficient use of energy are just a few of the practices which are taking a toll on the environment.

Labour's policies address these complex problems. We will work on a population policy for New Zealand, reduce the amount of waste New Zealand produces, promote energy efficiency, reduce carbon dioxide emissions and clean up contaminated sites. Most important, our environmental and economic policies will be integrated to achieve sustainable development.

NATIONAL PARTY POLICY ON SUSTAINABLE ENERGY

The National Government's key energy policy objective is to ensure the continuing availability of energy services, at the lowest cost to the economy as a whole, consistent with sustainable development.

Greenhouse gas emissions are targeted, through voluntary agreements, to encourage business to reduce CO_2 emissions to 1990 levels by the year 2000 or a carbon charge will be introduced. New Zealand's progress will be reviewed in 1997.

The Energy Efficiency Conservation Authority has several initiatives planned or underway including:

☞ the Energy Saver Fund for tendered residential energy efficiency programmes, - amending the Building Codes energy efficiency provisions,

☞ - introduction of Minimum Energy Performance Standards for selected appliances and equipment,

☞ - the Energy-Wise Companies Campaign (membership now at 500 companies), - the Energy Wise Contractors Campaign (membership now at more than 600 electrical contractors and trade plumbers)

☞ - the Crown Loan Scheme, where Government bodies have access to interest free loans to undertake energy efficiency projects

The establishment of a wholesale electricity market sends correct pricing signals to consumers, electricity companies and businesses to use electricity efficiently. A cap has been placed on ECNZ to prevent it from building new generation capacity until its market share falls below 48%. This gives an incentive to use renewables if it wants to increase its generation capacity.

All new projects must comply with the Resource Management Act. Renewable energy sources will play a key role in New Zealand's sustainable energy future.

NEW ZEALAND FIRST - ON ENVIRONMENT AND ENERGY

Ross Gluer

New Zealand First takes a medium to long term view of the environmental/energy conservation arena. We see them as inherently interrelated and thus dependent upon each other for success or failure.

Education at all levels is believed to be a critical success factor in addressing the long term sustainable needs of New Zealand's socioeconomic environment.

New Zealand First intends to adopt a consultative approach to establishing national objectives - within the broad philosophic guidelines of our stated policies. In practical terms this includes the formation and public dissemination of a ten year plan which will incorporate national goals, compliance requirements, R&D projects and Government assistance.

With regard to energy, sustainability is the key ingredient in our policy development. R&D funding will be targeted towards alternative energy, including wind generation and solar energy. Within this approach attention will be paid to achieving sustainable population levels.

New Zealand First will institute an independent Scientific Advisory Board which will be required to report to Parliament annually on such matters as sustainable development, resources, population etc. The findings will be available in the public domain following the annual report.

In summary, we contend that historic energy management has been short sighted with too much emphasis on non-renewable energy resources. Only long term planning, wide publicity backed by multi-level educational programmes, really has a chance of success.

We intend to place our country at the forefront of this necessary and exciting discipline.

ALLIANCE ENERGY POLICY

Jeanette Fitzsimons

Alliance energy policy is designed to reduce the use of fossil fuels while maintaining access to energy services for all citizens. So while pricing is an essential tool we will not rely on raising prices alone to change behaviour. We will meet our climate change obligations by reducing gross emissions and reject the National government's net approach.

Energy efficiency measures include efficiency standards for a wide range of appliances, all vehicles, and buildings. All government buildings and vehicles will be upgraded to the maximum cost effective energy efficiency. A programme of installing solar water heaters on all government buildings where they are cost effective is designed to create a large enough market to reduce costs so that the private sector will follow this lead. The largest energy users will be required to employ an energy manager and report to their shareholders on energy efficiency gains.

A carbon tax of $10/tonne of carbon dioxide ($36/tonne carbon) will encourage both efficiency and renewables and the abolition of fixed electricity line charges and progressive pricing of electricity will reward them further.

Power companies will be required to submit integrated resource plans and have them audited before consent will be given to expand their transmission or distribution capacity.

ECNZ, Contact and TransPower will be kept in public ownership.

An additional $50million a year will be invested in public transport.We will work with the gas industry to revive the CNG industry both for its current benefits and as a bridge to renewable biogas or hydrogen in the future. We will revive NZ's research expertise in wind and biogas and support the continuation of work on wood based fuels.

Readers are welcome to phone 0800 10 10 96 tollfree and ask for a copy of our full energy policy to be sent.

THE ELECTRICITY MARKET, WHY AND HOW

Molly Melhuish

The new wholesale electricity market rules may be the most complex example of rule-making most of us will ever see. In the following article I give an impression of why and how the rules were developed.

The new market is designed to break the monopoly power of the electricity industry. At best it will create a first-ever chance for electricity users to be rewarded if they choose to reduce demand when supply is very costly. This would save not only money but environmental costs.

At worst, the market will be a field day for speculators, and an opportunity for the strongest market players to thrive at the expense of the weakest.

The rules were developed by market participants alone - buyers and sellers at the wholesale level. Yet they have a massive influence on both social and environmental effects of electricity and alternative fuels. SEF has asked EMCO on several occasions that those concerns be given a voice in the rule-making process. They answer that external regulation is the appropriate way to deal with concerns external to market participants. Pretty tough in today's deregulated electricity industry!

In its favour, the market development process has allowed full minutes of each meeting and working papers to be distributed to any who asked. But though outsiders could comment, the complexity and volume of material made informed comment virtually impossible and the market participants alone had the final say.

Voting rules were designed to achieve a balance of interests for generators and purchasers, large and small players. The vote, which was taken on July 9, accepted the rules with a very slim majority. The generators voted overwhelmingly in favour of the market rules; the purchasers were split almost 50-50.

The original concept was for the electricity market to be like an auction, with buyers and sellers keying in their bids and offers.

Wholesale buyers would look at the product and the price tag, and decide how much to buy depending on what they predict consumer demand to be at the price. But the exact supply of electricity has to be adjusted second by second to meet the actual demand, so the actual cost is uncertain until after the event. This is referred to as, "ex post" pricing, in comparison to "ex ante" or before the event).

The concept got turned around and became a complicated version of monopoly pricing: This is setting the price after the event when the retailer has no reason to influence demand, but simply prices the product high enough to ensure the wholesale costs are recovered.

The new design makes sure the generators get paid their costs and it is the wholesale purchaser who takes the risks. This risk has no "cap" on the spot price, which could rise to a dollar, or even several dollars, per kWh if a shortage looms. This design would allow generators to "discover" a shortage situation which would "regrettably" force the price to rise (the pleasant word for this sort of behaviour is "gaming").

The original market concept favoured the entry of new "distributed resources" (DRs). By this we mean energy efficiency, ripple control, modern ways to shift the time of electricity use away from high-cost periods, and alternative energy supply near consumer premises. DRs save network costs as well as generation, and are particularly valuable. However profit-seeking network companies will respond by "defensive pricing" intended to protect them from the "stranded assets" problem that is, under-utilised transmission or distribution lines.

The case for a competitive market being friendly towards distributed resources was first made by Hugh Outhred and Fred Schweppe, then at MIT, in 1979. Outhred has now adapted his original concept to suit a fully deregulated industry. SEF and EECA invited him to meet the major players in the electricity market in May, and to critique the original market design. Outhred's critique, and/or paper is available at cost.

A competitive market, despite its difficulties, is likely to yield greater benefits for sustainable management of energy resources than the monopoly pricing of the past.

The promised benefits of competition in generation of electricity are achievable. Networks are more complicated and sensitive because they are the source of most of the profits. There is little competition to duplicate networks, yet their utilisation can be fiercely contested. Management of electricity demand could either reduce or increase their utilisation.

Our conclusion is that we supported a competitive market but want the earliest possible return to the original design.

AN IDEA WHOSE TIME HAS COME

Molly Melhuish

The idea that saving electricity is cheaper than generating it is now axiomatic. Costs can be reduced by putting off consumption when electricity generation is costly to times when it is cheaper.

In April, the writer prepared a report for SEF proposing that retail electricity markets should offer "real-time pricing" to enable small consumers to share in cost saving opportunities provided by the wholesale market. Any benefits should be shared with the "less-competitive" consumers whom the market is most likely to exploit.

The technology is expected to be fully commercial within two years.

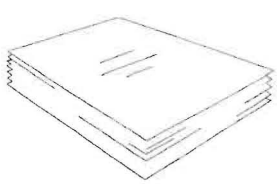
Some industry players say that market penetration thereafter can be rapid. Supply companies should offer discounts, adapting demand to real costs for small consumers (including small household consumers) as well as large ones.

Today consumers tend to be sceptical, hostile, or both when the competitive market rules are explained. Education and explicit consumer protection is needed if they are to support a competitive wholesale electricity market.

Large suppliers view demand-side management as a threat to the full utilisation of their assets. They respond with high fixed charges "to recover their revenue requirements". This reduces the financial value of demand-side investments. Thus lines charges, terms and conditions of network access are issues critical to the market's success.

The SEF project involves research, a critique of electricity market rules, and public education. The aim: find ways to help suppliers offer discounts to domestic consumers; reward behaviour which reduces electricity supply costs; and protect against power restrictions imposed by power companies.

Trans Power is now looking for a staggering 500 MW of "interruptible load" which can be switched off within 1-2 seconds, in case the Cook Strait link is interrupted, and restored within 20 minutes. Already some major industries such as NZ Steel can do this. We realised that the high value of this service could be the driving force for development of other demand-side opportunities.



SEF's project was facilitated by a report from the United States entitled, *Can We Get There From Here? - The Challenge of Restructuring the Electricity Industry so We Can All Benefit*, released by the Tellus Institute & Wisconsin Energy Conservation Corp. in April 1996. Its objective was to see if small consumers benefit from electricity restructuring, and what needs to be done to help them benefit.

The report concluded, "If regulators and governmental authorities simply declare [electricity] markets open for competition, rather than proactively create and promote effectively competitive market structures, there are likely to be few competitive benefits and small consumers will be the least likely to capture any such benefits."

The report also concluded the costs of real-time pricing meters were too high for any but the highest-use households. However their demand can be "aggregated" by the electricity supplier if they promote the interests of small consumers.

The report suggests city council-owned utilities buy electricity on the wholesale market and re-sell it to small consumers under local public policy. These utilities need not own the power lines and the authors consider that full separation of distribution, transmission, and generation assets will provide incentives for economically sound pricing.

The report works on two scenarios - traditional vertically integrated utilities, and the competitive market. Details are given on costs of real-time metering. The assumptions led to 90 combinations, each of which was the subject of a cost-benefit analysis.

The authors conclude that real-time pricing would result in net benefits only to high load factor customers, and would increase electricity costs for most low income customers. However, special tariffs could allow the demand of small consumers to be aggregated, giving lower power bills in the competitive market.

In New Zealand our electricity system has large variations in frequency, voltage, and other supply measures because of its small size relative to the size of individual supply. Our regulatory system is perhaps the "most absent" in the world.

This means that interruptible power from all consumer sectors will be valuable in rescuing the system from degradation or total breakdown.

New Zealand's extreme deregulation will put pressure on the electricity supply sector to work towards benefiting the economy as a whole.

New technologies for real-time pricing at the household level include: cellular radio and telephone communication; communication with household appliances by sending signals along the internal wiring; and interfaces with either the householder's TV set or a personal computer. The aim is to allow the consumer to set the desired level of reliability at any time, and allow appliances to be switched on and off according to the real-time cost of power.

We look forward to a future article which will describe these options in more detail.

WEL Trust Backs Innovative Energy Invention

The WEL Energy Trust is to provide a sponsorship of $90,000 to assist a Hamilton inventor to prove the viability of a unique wind powered turbine, estimated to cost $250,000.

The inventor, Owen Williamson, has put a new spin on wind powered turbines, with a unique design that features vertically mounted blades.

Mr. Williamson says the new wind turbine has more in common with an aeroplane wing than the propeller style wind generators used in Wellington and the US. Unlike conventional propeller style turbines, it doesn't need to face into prevailing winds. "The design has blade angles facing at 90 degrees into the wind, which creates a more efficient way of turning wind energy into electrical energy."

Additionally the electrical generator is located at ground level making maintenance easy.

Mr. Williamson is credited with designing the first 'unshortable' electric fence system in the early 1970's - a product which is now an agricultural industry standard.

Mr. Williamson has spent more than $500,000 making prototype designs over the past 20 years and with the support of the WEL Energy Trust, is about to build a 12 metre prototype as a part of a feasibility study.

WEL Trust spokesperson Don Bethune says the Trust is interested in supporting the development of alternative energy sources and they believe the Williamson design is a genuine breakthrough in wind power technology.

"Wind turbines are a natural non-polluting source of energy, They can service remote areas and allow electricity suppliers to supplement the national grid with peak power generation," Mr. Bethune says.

"The benefit of the Williamson design is that one unit could provide the same level of power output as a number of propeller driven turbines. It is more efficient and can be transported to different sites."

WEL Trust members see that Mr.Williamson could develop an ideal energy source which is in keeping with New Zealand's clean and green environment.

Mr. Williamson hopes to have a finished working 50 metre design supplying power to the National grid within four years.

For further information contact: Don Bethune Chairman WEL Energy Trust. Phone 07-839-4145; John Skinner Executive Officer 07-838-0093.

What Has SEF Been Doing?

SEF continues to take every opportunity to promote the sustainable use of energy, both in Government policy making and amongst industry and individuals. Much of this work is undertaken on a voluntary basis, but membership fees and donations are used in support of these activities (as well as the production of this newsletter).

Here is an outline of some of the work that SEF has been involved in over the last few months.

- Presentation to the International Energy Agency Review Team during their visit to NZ in September. (Copies available on request).
- Active involvement in the consultation and development process of the NZ Electricity Market, including submissions and participation in the 3-day Commerce Commission hearing.
- Attendance at seminars and briefings on the CO_2 Working Group report and preparation of a submission.
- Preparation of a detailed submission on the Land Transport Pricing Study and continued involvement with the MInistry of Transport in this area
- Submission on the Wellington Regional Landscape Plan highlighting concerns over potential obstacles to sustainable energy developments
- Regular meetings with the Ministry for the Environment and other NGOs
- Involvement in the Bio-energy Network New Zealand (BNNZ)

SEF will continue to try and use the limited resources at its disposal to best effect. If members would like more details of SEF's work, or have suggestions for additional activities, we would be pleased to hear from you.

WOGOCOP SUBMISSION

Andrew Beer

Submissions on The Working Group Report on CO_2 Policy (known as WOGOCOP) are due by November 1. A submission from SEF is being prepared and contributions from members would be welcomed. If you do not wish to put pen to paper, feel free to telephone the SEF office with your views.

For those of you who have not seen the Report (copies are available free from Ministry for the Environment), here is a very brief summary and an outline of the key issues.

The Report provides an excellent outline of many of the science and policy issues surrounding CO_2 emissions in New Zealand. The Terms of Reference of the study were restricted to the issue of CO_2 despite the major contribution of other greenhouse gases (methane and nitrous oxide) in New Zealand. The Group recognised the need for precautionary action on climate change. The Group also concluded that the Government should continue to base its policy on net emissions. This means that the uptake of carbon dioxide by New Zealand's growing forests is taken into account in assessing total emissions.

The Group considered the range of policy options available to reduce net CO_2 emissions in line with the Government's international commitments under the Framework Convention on Climate Change. The options considered were voluntary measures, targeted measures, the Resource Management Act and the use of economic instruments (such as taxes or permits).

The Group concluded that, in general, targeted measures lead to a 'waste of economic resources' and may have distortionary impacts on markets which offset their effect. The use of the RMA was discussed and dismissed as inappropriate. The Group therefore favoured an economic instrument as the principal policy measure. A range of economic instruments were discussed by the Group. In essence, the options considered were either a tax or a permit (certificate) system, with a range of options according to whether these would be one sided (ie emissions only) or two sided (taking account of forest absorption as well).

This analysis found that "..if a serious reduction in emissions is to be pursued then the optimal instrument would be a capped tradeable carbon certificate (TCC) scheme". The Group also suggested that this should be 'two-sided', ie, certificates should be available for both emissions and absorption. Importantly the Group concluded that the present policy, introducing a low level carbon charge in 1997 if other measures have proved unsuccessful, should remain until the TCC scheme is developed and introduced. However, the charge should not be increased beyond a low level prior to the introduction of a TCC scheme. The Group did not recommend the level at which a charge should be set, or the price at which TCCs should be sold.

Issues which will be covered in the SEF submission include:

- the inadequate coverage of transport issues and the limitations of a carbon charge in tackling transport emissions.
- the need to remove obstacles to the development of sustainable energy alternatives.
- the need for practical support for the transition to a 'low carbon' economy, including R&D and demonstration funding.
- discussion of the merits for a mixed-bag approach, which includes measures targeted at specific sectors as well as economic instruments.
- highlighting omissions in the report, including a lack of analytical support for the chosen policy, the absence of discussion of bio-energy and a neglect of an assessment of the processes which underlie technological innovation.

WHY DOESN'T ROAD BUILDING FIX TRAFFIC CONGESTION? (CONT.)

One reason why traffic generation is so important is that in cost-benefit analysis the new traffic is used to justify the new road. If even a small amount of new traffic is only there because the road has been built, it cannot reasonably be used as a justification for building the road.

Conclusions¥ The maximum capacity of a road is at about half the 'free-flow' traffic speed.

¥ Roads tend to have least capacity when it is most wanted.

¥ If there is more than one route, travel times may vary in light traffic but tend to be the same in heavy traffic, with the faster route more congested.

¥ The free-flow speeds that everyone imagines when a new road is built are unattainable at higher traffic flows.

¥ Additional capacity is very expensive and may not make very much difference to travel times.

¥ Traffic management measures such as restricting access roads are very much cheaper than additional lanes and are surprisingly effective

¥ Building new roads brings new traffic that would not have been there without the road.

Another approach is improving public transport, and this will be the subject of a later article.

OPINION

THE WORLD RENEWABLE ENERGY CONGRESS

Denver, Colorado 16 - 21 June, 1996

Keith R Dawber, University of Otago

New Zealand's contingent to the fourth World Renewable Energy Congress (WREC) was possibly the biggest per capita attendance from any country. About 750 delegates took part from about 106 countries.

There was a large display section with a number of stalls from the US Department of Energy, photo-voltaic (PV) and insulation product companies. A few wind energy stalls, mainly small wind turbine manufacturers, system developers, and publishing companies.

The opening ceremony was notable for the presence of the US secretary of Energy, the Hon, Hazel R. O'Leary. During her very dramatic address she spoke about the world problems of population growth and non-renewable energy development. It is a great pity the US Congress is not acting on her recommendations for support of renewable energy research and development. Her style is so enthusiastic and her energy enormous. For those of us who had not previously "experienced" her, it was a great privilege to do so at the Congress.

The other most charismatic speaker was Jeremy Leggett, of GreenPeace. He spoke of new evidence for human activity-induced global warming and what we should be doing about it. He discussed the proposed highly visible project of getting churches to install PV panels on their roofs and using the electricity generated for some form of symbolic lighting.

Delegates had a fascinating visit at the National Renewable Energy Laboratory (NREL) and museum. And a full day tour of the wind testing facilities at Rocky Flats was also offered.

Six gold medals were given by the Amir of Bahrain to the "most notable pioneers in renewable energy". A number of gifts and awards were given to those who had contributed to the success of the Congress.

While there are aspects of these Congresses which could be improved, in the end the world is rewarded with several large volumes of well presented papers published by an international publisher (Pergamon), giving ideas, progress and development reports on renewable energy from many countries not found from any other source.

The next WREC is to be in Florence, in 1997.

EUROPEAN UNION WIND ENERGY CONFERENCE AND EXHIBITION

Götenborg, Sweden 20 -24 May, 1996

Keith R Dawber, University of Otago

The European Union Wind Energy Conference was a week-long event attended by about 300 delegates from Europe, Asia, the Americas, and Africa.

The more involved technical papers were presented as Poster Papers which were on display all week and during two evening sessions which facilitated discussion. As a result of the large number of poster papers, most of the oral presentations were of mainly the review type and given in plenary sessions. Printed versions of the papers will be published by H S Stephens.

The conference attracted specialists and professionals working directly in the wind energy industry and was very useful for hearing about various design developments of wind turbines and local environmental considerations such as wake and noise studies, electrical component integration, etc.

From a New Zealand perspective, the most impressive aspect was the huge amount of money available for research and development through the European Union. There is no doubt that wind energy is being taken very seriously and is making great progress as one of the most accessible forms of renewable energy world wide.

I had a chance to experienced a demonstration ride in an electric car around the streets of Götenborg. The vehicle (a Renault) used Ni-Cd cells and had a range of 100km with a top speed of 90 km/h. There are several fast charge stations in the city of Götenborg for drivers who get low on "fuel". After such a charge, the next one should be an overnight charge. Fifty such vehicles have already been sold and about 200 more are available for sale in the city.

In Sweden there is already enough wind generated electricity for some large consumers to order it specifically, and they are prepared to pay 10% more for it than for fossil fuel or nuclear sourced electricity. When the Proceedings arrive in Dunedin, I will be pleased to provide details of papers presented and exhibits displayed at the Congress.

U.S. IMPRESSIONS

OPINION

Neil Mander

We arrived in Washington DC in time to see the cars finish the New York to Washington electric car race and to see the associated commercial exhibition.

Most of the mains-charged electric cars were of commercial manufacture but there was a strong student element, many with solar photo-voltaic panels to extend vehicle range. There was a considerable variety of vehicles ranging from bicycles, commuter-cars, utility vehicles, school and shuttle buses. Hybrid as well as electric vehicles, battery technology and management systems, and light-weight, high-strength materials were all featured.

Sustainability is an issue of concern. Government legislation is emphasising heavily reduced exhaust emissions from vehicles and is pushing the development of electric and hybrid cars, delivery vehicles and buses. Sacramento County has taken a strong lead with its encouragement of zero emission vehicles (ZEVs) and provision of a network of electric vehicle charging stations throughout the County.

Conventional vehicle manufacturers seem to be resisting the changes and have achieved some postponement of the new stricter emission control regulations.

Attention is being focussed on sustainability as an issue for the whole community. The President's Council on Sustainable Development has produced a report entitled, *Sustainable America, a New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future.*

For further information, brochures, reports or papers contact Neil Mander, 38 Arundel St, Mt Roskill, Auckland 4, New Zealand Ph/Fax +64 9 625-9306.

And just to show that NZ is not alone.....also from the US:

COMPETITION COMES TO YOUR ELECTRIC COMPANY

D.H. Meadows(A.Prof., Env. Studies, Dartmouth College)

The airlines were deregulated. The phone companies were allowed to compete. The health care system is privatizing. Now market competition is coming to electricity.

It's called utility reform, restructuring, retail wheeling. This last name refers to generators "wheeling" their power to any customer, anywhere. Local utilities will still maintain the delivery lines, but providers can compete to sell the stuff that flows through the lines.

The push for retail wheeling comes from big electricity users who want to negotiate for the lowest-priced power they can find.

You can't blame them. But you should keep firmly in mind that, as with every market system, the big players will be able to grab the best deals. If anything good trickles down to us little guys it will have to come from guarantees built in as the laws. Therefore, normal ratepayers should pay close attention.

If electricity providers had to compete on an open market, the cheapest ones would win. Given current pricing, that means hydro (which messes up rivers and floods land), gas (environmentally one of the best choices), and dirty coal. Normal ratepayers might have strong interests in preventing coal from dominating the market. That means strict emission requirements and stiff carbon taxes as prerequisites to retail wheeling.

Wood, solar, and wind-generated electricity would have a harder time competing. Retail wheeling could let environmentally concerned folks shop around for the greenest possible electricity. But let's face it, if that electricity is higher in price, it will capture only a small fraction of the market.

Competitive pricing should drive the final stake through the heart of nuclear power by far the most expensive of electricity sources. But it won't happen.

The owners of nuclear plants made major investments under the old system. Although it has been clear for years now that nuclear power was a terrible investment a new system that won't let them pay it off. So, the new "competitive" system will somehow shield nuclear power plants from competition. Already the most highly subsidized electricity source, nuclear power will continue to get a special deal.

The worst problem in a competitive electric system is that for major users in the short term, it will work. Competition will force downsizing, outsourcing and regulation weakening. Costs will shift to workers, the environment and the society. PriceS will drop, removing incentive to conserve electricity. Companies will swallow up companies until competition effectively disappears.

We know how to prevent this outcome. Strong anti-trust laws. Strict, unbendable environmental standards. Removal of special subsidies. "Brown taxes" to ensure that real costs to the environment and to communities are captured in price. Campaign reform, so the government that is supposed to enforce these necessary market controls can't be corrupted.

When those changes happen, competitive electricity will be a fine idea. Not before.

MONITOR

WHY DOESN'T ROAD BUILDING FIX TRAFFIC CONGESTION?

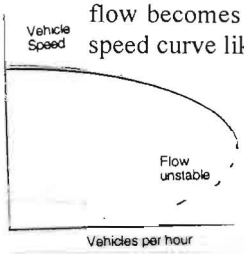
Kerry Wood

Roads and congestion go hand-in-hand, and many people are now recognising that road building is no solution. This article looks at problems caused by the way we use roads.

Vehicles and Road Capacity

Drivers in light traffic can maintain whatever speed they think is safe. Traffic runs at the 'free-flow speed', at or above the speed limit.

As the road gets busier speeds fall, because drivers have to maintain a safe gap between vehicles (the two second rule). At low speeds vehicle length makes more difference than speed. As vehicles get closer drivers are less able to see and plan ahead. Stop-start driving develops and traffic flow becomes unstable. The result of all this is a density-speed curve like this:



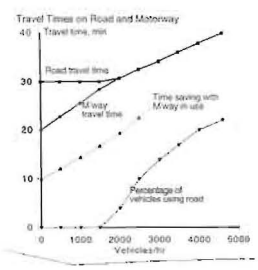
Capacity is reached when the average speed is about half the free flow speed, but any further fall may reduce capacity when it is most needed.

If an alternative route offers a time saving drivers will switch to it, so in congested conditions route times tend to be in balance. The result is obvious if two routes have the same free-flow travel time, but what if one route is faster under free-flow conditions, such as a motorway?

By-passing a Congested Road

Suppose a congested 4 lane road is by-passed by a new motorway. Road users now have a choice of 2 motorway lanes or 2 road lanes each way. At off-peak hours nearly everybody takes the motorway, but as traffic builds up speeds fall and the road becomes just as attractive.

Let's say that driving down the motorway takes 20 minutes under free-flow conditions and the road takes 30 minutes. For simplicity assume a capacity of 3000 vehicles per hour on each route. Travel times on each route then come out like this:



Notice that:

¥ The new motorway brings initial time savings of at least 10 minutes, and more in congested flow.

¥ Travel times on road and motorway are the same whenever total flow is more than 1500 vehicles per hour - only a quarter of combined capacity. On a busy route travel times may be equal for much of the day.

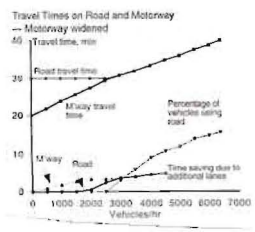
¥ When the motorway reaches capacity (40 min travel time) the road can still carry another 1500 vehicles per hour; a quarter of total capacity.

¥ Using the spare capacity on the old road will increase travel time, encouraging drivers to overload the motorway and provoking a capacity reduction as jams build up.

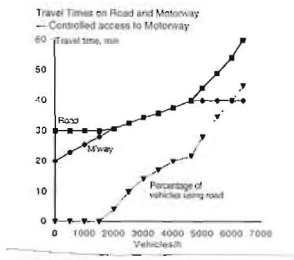
Increasing Capacity

When the motorway reaches capacity an obvious solution is to widen it. An extra lane each way increases capacity from 3000 to 4500 vehicles per hour, making the total 7500 vehicles per hour, but:

¥ There is still the same 2000 vehicles per hour of spare capacity on the road when the motorway reaches capacity.



¥ The motorway is still no quicker than the local road at higher traffic volumes. Travel times are now equal when total flow is at or above 2250 vehicles per hour; still less than the total capacity of the original road.



A less drastic and very much cheaper way of increasing capacity is to leave the motorway unchanged and put traffic signals on its access roads, forcing excess traffic to use the road, or wait. This maintains a reasonable traffic flow on both routes. The result is to use the full capacity of both routes, a total of 7500 vehicles per hour. The problem is that the road is very slow at peak times.

This solution actually has a greater capacity than widening the motorway because both routes flow freely. Travel times on the motorway are unchanged but drivers forced to use the road when traffic signals are in use will have longer travel times. This system is to be tried in Auckland.

Traffic Generation

Another problem is that roads generate traffic; build a new road and you get new traffic This effect is rarely allowed for in traffic modelling studies and some highway authorities still deny that it happens, but a report to the UK government has effectively confirmed it. As a witness to the enquiry put it, if travel to Melbourne was possible in 5 seconds, more people would go to Melbourne.

(continued on page 9).