

# EnergyWatch

The Journal of the Sustainable Energy Forum Inc.

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

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Email:- [info@sef.org.nz](mailto:info@sef.org.nz)

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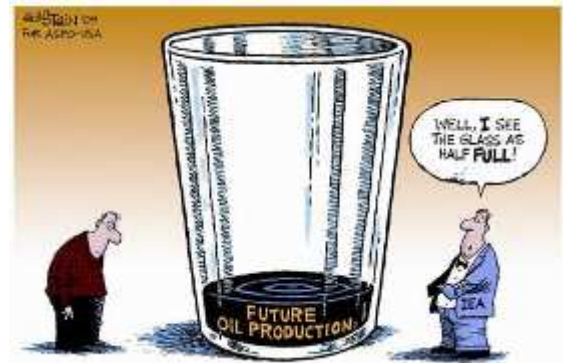
Editor: Steve Goldthorpe

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## EDITORIAL

### Learning to live within our means

The start of the second decade of the twenty first century is a good time of taking stock of where we are at as a global civilization and where we are going. There have been numerous reports published, including the IEA World Energy outlook, which was discussed in the last EnergyWatch and is caricatured in this cartoon.



It can be argued that this image is over-pessimistic if “future” is defined as all the time from now onwards. However, if the caption “Future oil production” is interpreted as the yield from currently producing oil fields in 2035, then the depicted 15% of projected global oil demand is exactly in accord with the IEA World Energy Outlook 2010, as reported in EW59.

The glass in this cartoon would have to be filled up from sources that are increasingly difficult, expensive and dangerous to access. However, if the oil were to be poured into a smaller glass then it could indeed be seen as half full. It is not the oil supply that is too small; it is the glass that is too large.

The IEA World Energy Outlook, and many other projections ask the seemingly reasonable question “How much oil will the world need and where will it come from?” This approach presupposes no alternative to global oil demand projections continuing in accordance with historical trends under a business-as-usual scenario. It inherently assumes that an increasing oil price will make extra oil available from sources that were previously uneconomic. The logical outcome of considering the problem on this basis is to drill for oil in ever more difficult places, to convert food into fuel and to convert coal or lignite into oil and accept the climate consequences. But what happens when we get to the point that more oil can’t be created at any price no matter how hard we try?

If instead the question is posed “How much oil is the world likely to have and how can that be well managed?” then we get very different set of scenarios as a sustainable planning basis. New Zealand can be considered as a micro model of the world. So we can reduce the problem to a manageable size by considering, for example, New Zealand’s liquid fuel supply. If the decreasing amounts of liquid fuels likely to be available to our little islands at the end of the world could be quantified, then we would have a sinking-lid basis for our long term strategic planning.

For personal transport needs there is scope for living within our means via lifestyle changes and the advent of lightweight electric vehicles. However, freight transport is more difficult. Potential for reducing the diesel consumption per tonne of freight moved is very limited without a mode change. Living with less diesel fuel requires a sea change in NZ freight transport; e.g. from road to rail or coastal shipping. The reverse is happening.

A case in point is rail infrastructure north of Auckland. A recent presentation by the CEO of KiwiRail to the Northland Regional Council explained that rail services up north are barely raising the revenue to meet operating costs. The service must expand or die. A business case is being investigated for expansion, but the likelihood is that after the next election a decision will be made to mothball the line, followed in five years by taking up the rails. Once gone, rail north of Auckland is unlikely ever to be reinstated.

In this context, we have a keynote guest article in this issue from Jeanette Fitzsimons reviewing the landmark Common Cause report, which discusses how human values need to replace narrow economics as the guiding principles for dealing with 21<sup>st</sup> century issues.

This issue also reports data released by Solid Energy which shows that diesel made from lignite in NZ would have a higher greenhouse footprint than imported diesel made from coal in China. These data contributes information to the current hot topic of the potential exploitation of South Island lignite. I have drawn the important distinction between low quality lignite and high quality black coal.

Dave Kelly writes a follow-up article on the sustainability of personal transport choices, which looks at the pros and cons of hybrid vehicles.

Now that the Cancun Climate Conference is behind us, John Blakeley reviews the global political situation. In contrast, James

Hansen's latest paper on the potential risks of major Sea Level Rise is highlighted.

John also contributes articles on the paradox of energy efficiency and a commentary on the uncertainty that can be seen in Neil's regular oil price chart.

Also, check out the outcomes of the Wild Energy design competition and a further point of view on Feed-in Tariffs.

*Steve Goldthorpe, Editor*

## CONTENTS

Editorial	1
Solid Energy Releases Data on Greenhouse Footprint of making Diesel from Lignite	3
Motivating People on Climate Change - Is it a question of Values?	4
Are Hybrid Cars the Answer?	8
When is coal not coal? When it is lignite	10
Cancun Climate Conference Outcomes	12
Multi-metre SLR by 2100?	13
The Paradox of Energy Efficiency	14
Wild Energy Competition Outcomes	15
Viewpoint - Feed-In Tariffs	16
Price of Electricity	17
Uncertainty over Oil prices	18
Neil's Oil Price Chart	19
Price Variability between Sources of Oil	19
Join our Sustainable Energy News & Discussion Group!	20

# SOLID ENERGY RELEASES DATA ON GREENHOUSE FOOTPRINT OF MAKING DIESEL FROM LIGNITE

There is currently an active debate in parliament, on the blogosphere, and in meetings around the country on Solid Energy’s plans to mine lignite and turn it into dried briquettes, urea and potentially into an indigenous source of diesel fuel. The incompatibility of this strategy with New Zealand’s CO<sub>2</sub> emission reduction targets is obvious and has led to a campaign to leave Southland lignite in the ground.

In response to a recent OIA request from WWF-New Zealand, Solid Energy has released some indicative data of their “Coal to liquids life cycle assessments of greenhouse gas emissions”. The Solid Energy data are presented in Figure 1.

These data might be compared with a similar analysis in EW58 and figures presented in the recent PCE report “*Lignite and Climate Change, the high cost of low grade coal*” on the consequences of lignite exploitation

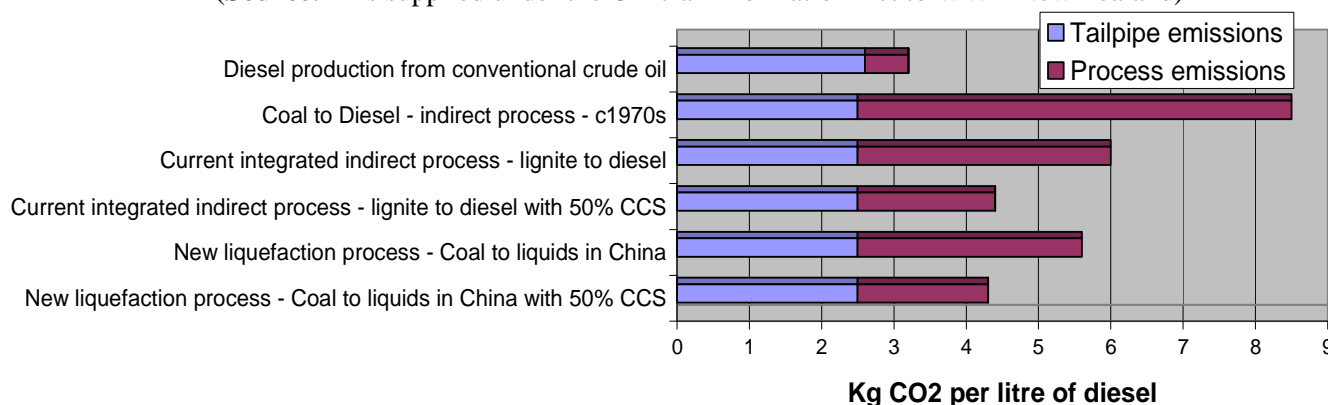
(<http://www.pce.parliament.nz/assets/Uploads/Lignite-web2.pdf>)

Although some of the assumptions differ between these assessments, the message is consistent. The process of making diesel fuel from lignite is very much more greenhouse intensive than the conventional process of making diesel from crude oil.

Even with 50% carbon capture and storage (CCS), as suggested by Solid Energy’s data, making diesel from lignite does not come close to the lower emissions from refining crude oil to make conventional diesel fuel.

The Solid Energy data show that making diesel from lignite in Southland would emit 3.5 kg CO<sub>2</sub>/litre compared with emissions of 3.1 kg CO<sub>2</sub>/litre from making diesel from coal in China and transporting it to NZ. The distinction between coal and lignite is shown in Table 1 and discussed on Page 10. *Editor*

**Figure 1. “Well to Wheels” CO<sub>2</sub> Emission Assessment by Solid Energy**  
(Source: - As supplied under the Official Information Act to WWF-New Zealand)



**Table 1 Illustrative Coal and Lignite Properties**

	Typical high quality coal	Typical B grade lignite
Net calorific value as mined	30 MJ/kg	10 MJ/kg
Moisture as mined	8%	46%
Mineral Matter as mined	8%	8%
Oxygen in organic matter	2%	25%
Hydrogen in organic matter	5%	4.5%

# Motivating people on climate change – is it a question of values?

By Jeanette Fitzsimons



Why is it that the facts of climate change are now quite widely known yet our collective response to the problem is pitifully weak?

Why do people consistently vote for governments whose policies are directly contrary to their self – interest – as when poor people vote for governments who give tax cuts only to the rich?

How can it be that after years of huge publicity on world poverty, disease, debt, and general misery in poor countries, which could be addressed for far less money than is spent on war, relatively little action is taken by governments and the people acquiesce?

For that matter, why do people still smoke?

The only statement of James Hansen's in his latest wonderful book that I profoundly disagree with is his belief that if we can just give people the facts about climate change, they will act. Experience shows that is just not true. It really matters that we understand at a deep level why.

There is a significant body of writing showing that emotion, values and culture have far more influence on our beliefs and actions than logic and facts. George Lakoff (*Moral Politics* 2002; *Don't think of an elephant* 2004 and others) has written on the topic particularly as it applies to politics and elections. Clive Hamilton's *Requiem for a Species – why we resist the truth about climate change* (2009) explores similar ideas in relation to climate change. What cannot be denied is that our current responses to huge global issues, whether poverty, war, climate change or extinction of species are wildly incommensurate with the scale of the problem.

The latest I've seen is a 100 page UK report by WWF and four other NGOs: *Common Cause – the case for working with our cultural values* Sept 2010.

[http://assets.wwf.org.uk/downloads/common\\_cause\\_report.pdf](http://assets.wwf.org.uk/downloads/common_cause_report.pdf)

It contains no original research but draws together a huge body of social science in 8 pages of references which I believe we ignore at our peril – and at the planet's peril. This article is an attempt to summarise the issues and comment on their relevance to NZ energy issues.

The global problems above are characterized as “bigger than self” problems. We are affected by them, at least indirectly, but we cannot much reduce those effects on ourselves by the personal efforts we make. Addressing them therefore requires values that go beyond personal self-interest.

In *Requiem for a Species* Clive Hamilton develops the argument that people in western countries now have made economic growth a fetish – a quasi-religious symbol with magical powers to cure all ills. People's personal identity – the deepest part of themselves – is as consumers constantly needing and wanting more stuff. Dealing with climate change challenges people's core identity as well as our national identity and so we use various strategies of denial and avoidance to say to ourselves “It can't be true. Or at least it can't be that bad”. This is made easier for us by the climate skeptics telling us the science is junk and setting out spurious arguments that reinforce what we want to hear; and by well funded lobby groups pressurizing governments to take no action. This is why the skeptics don't have to prove anything they say - they just have to sow doubt and we will gratefully grasp it and believe it. The book is worth reading despite its extreme pessimism

and there is no space here to outline some of the more interesting aspects of the argument.

*Common Cause* points out that every communication, intentionally or not, conveys values of some sort. There is no such thing as a value-free statement. In conveying those values it helps to reinforce them and to suppress the opposite value. So it is important, especially in a democracy, to recognize and publicly debate the values that underlie our behaviour and our statements.

The authors say *“Debates on the consequences of cultural values and the mechanisms by which they evolve must become as vigorous as public debate about the evidence base for government policy, business practice or civil society campaigns.”*

Values like financial success, personal status and power tend to be opposed to values like empathy, concern for the common good, universalism. The former are unhelpful in solving “bigger than self” problems and the latter are helpful.

Any campaign or public policy therefore will have two kinds of impact: material impacts (we kept the coal in the ground or stopped nuclear power or got an energy efficiency law passed) and cognitive impacts (we reinforced values of concern for the environment or for the most underprivileged). It is therefore possible for a campaign to be unsuccessful in its goal, but still contribute to strengthening underlying helpful values. Maggie Thatcher said her policies set out “to change the heart and soul of the nation.” Changing the economic system would flow easily after that. Policies that reinforce greed, individualism, and competitiveness will have far reaching effects in making further policy changes in that direction better accepted.

It is also possible to succeed in the material goal of a campaign or policy and inadvertently strengthen unhelpful values which, in the long, run will be counter-productive to our overall goals.

I invited regular SEFnews contributor Dave McArthur to add a brief comment on this topic. *Editor*

“Our most esteemed academics remain baffled, but sages have understood for millennia why humans abuse the planet that sustains them. With self-consciousness arises the ego and suffering. With self-consciousness we become aware we are a part apart from all. (Hence the original association of the “science” symbol with split/schism). We yearn to be reunited in greater meaning even as we fear the loss of the self in the process.

“This dissonance is compounded by the fact that our ego has an incredible capacity for self-deceit - incredible because it is ingenious beyond the bounds of conscious thought, which is but a trace element of our subconscious. We easily become our own worst enemy.

“Our survival as a species relies on our capacity to transcend the limitations of our ego and thought, tap into the wisdom of our greater subconscious and extract meaning so we thrive in harmony with the universe(s). All life forms use symbols to communicate meaning and thus survive and procreate. Symbols both reflect and generate and can both inform us and destroy us, which is why we need to embrace the proven principles of physics; especially the Conservation Principle of Energy.

“When we apply the Principle’s wisdom to the dominant language of our Anglo-American culture since the Industrial Revolution, it reveals our uses of our prime symbols are grossly unsustainable. This is particularly true of the global Art/Green/Environmental movement, a psychological force born of reaction to and thus being part of the excesses of the Industrial Revolution.

“Jeanette employs the potent symbols of hope, love and energy, which are profoundly intimate and vital experiences that are beyond the power of words to define. This uncertainty is why the essence of a sustainable life is the experience of compassion, for this enables the continual review of our use of these and other vital symbols so that we can most fully conserve their potential.

“I humbly recommend [www.thesustainabilityprinciple.org](http://www.thesustainabilityprinciple.org) as perhaps the most advanced prototype of such a review of our culture’s language.” *Dave McArthur*

We can motivate people to install solar power out of concern for climate change, and the rights of future generations to scarce resources. Or we can persuade them to buy solar panels as an item of green consumerism to be one up on the neighbours. (This might not even work in its material impacts, as in the story I heard some years ago when a man insisted the solar water heater be installed on the south side of his roof as otherwise the neighbours wouldn't be able to see it. But that is a side issue.)

Consumerism is part of the cause of climate change, environmental pollution and resource depletion, not the solution. "Green consumerism" tells people they can address these problems by buying stuff – it just must be the right stuff. It reinforces their identity as consumers rather than citizens. Buy a Prius, but don't think about how much you use it. Buy reusable shopping bags. Buy efficient light bulbs. But environmental problems are not solved at all by what we buy – they are solved by what we therefore do NOT buy. We often measure progress by how much renewable electricity has been installed. That is actually irrelevant. What matters is how much fossil fuel is NOT being burned. The two may not always be related. So a campaign that strengthens values of individualism and consumerism may do more harm than good in the overall long haul to sustainability.

Some examples may help. *Common Cause* cites the Stern report. Much of it strengthened common interest values by appealing to shared goals and benefits and the need for collaboration. However this was undercut by the suggestion that those who move first to address climate change will have a competitive advantage and do better economically than their neighbours, reinforcing values of individualism, competition and status. The report explores how this message could have been communicated differently to continue to reinforce values of collaboration.

It takes me back to a central argument I remember in the seventies in the campaign against nuclear power. We had focused on safety, waste disposal and concern for people in poor countries on whom it would be imposed, possible melt downs and human tragedy; the technological link with nuclear weapons; the need for future generations to manage our mess for thousands of years; etc. Then some new analysis showed that it was likely to be more expensive than the alternatives. Immediately this seemed like the king hit argument – after all, the decision makers care most about money.

Some of us argued that if we relied much on this argument all it would take for us to lose would be a real cut price deal on a reactor from a country desperate for sales. We also felt instinctively that we didn't want this to be the deciding argument, but we didn't have the tools to analyse that this would reinforce the value that economics comes first and you can put people's safety at risk if it is cheaper.

The hopeful news is that everyone holds both sets of values to some degree. Everyone is motivated by self-interest, and everyone has some common interest values that can be activated. The question is the relative strength of these, and what triggers them. A lifetime of living with public policy based on the implicit values that the market will decide, greed is good, the role of the state in the economy should be as small as possible, people who are poor usually have themselves to blame etc., etc. reinforces values of individualism and competitiveness and suppresses values of community and collaboration and empathy. But they are not gone, only weakened. This leads to the question, what influences our values?

Probably the most important is our peer group, family and role models. After that, commercial advertising is insidious and very powerful. Its purpose (and certainly its effect) is often not just to sell a particular product but to reinforce consumerism and

increase demand for all products. Research shows strong correlation between time spent watching TV and the strength of materialistic values. Other significant influences are the media, (particularly social media these days I suspect) civil society campaigns and communications, public policy norms and education. The order here is intentional.

If we analyse the ETS in this way we should be very worried. The purpose of the Act when introduced to Parliament did not even include reducing greenhouse gases. The select committee changed that. But it is widely acknowledged that this is not its main purpose and that in fact it will do little to achieve that. It is designed primarily to appeal to values of commercial gain and competitiveness. It is set up to foster speculation in the price of carbon in a “beggar-my-neighbour” kind of way that will not reduce emissions at all, but may help grow “the economy”. In the process it embeds the notion that climate change can be addressed by speculating and making money and reinforces values of greed and materialism. The recent theft of 29 million Euros in credits from the carbon exchanges of Austria and the Czech republic is consistent with this view of climate change.

In contrast, a carbon charge with the proceeds recycled to the whole community would reinforce the value of community, co-operation, “we are all in this together”. Having reinforced people’s greed and competitiveness with the ETS it will be doubly hard to introduce any climate related policy that requires a concern for the common good.

I have talked about values here but the other term used initially by Lakoff and then by the WWF report is “framing”. A frame is the way one understands the world. Lakoff gives the example of “tax relief” and “the tax burden” which subtly reinforces the message that tax is a bad thing that should be minimized, rather than the way we contribute

to paying for our collective needs in a society. The mantra “balancing the economy and the environment” is a frame. Frames are vehicles for activating and strengthening positive or negative values by the assumptions they take for granted.

How do we apply this practically to energy policy and climate change in New Zealand?

I suggest that when designing a campaign we should consciously ask:

- will the way we frame this message reinforce or undermine the values of common interest and non-materialism needed to address bigger-than-self issues?
- are the methods we are using to campaign consistent with the values we are trying to reinforce?
- Are the values we hold and the framing we use transparent and explained?
- Is our process participatory?

Common Cause makes the interesting suggestion that groups working on widely different issues might find common cause in a campaign to reinforce certain values. For example, groups working on environmental and poverty and peace issues might all form a broad coalition to campaign to reduce the power of advertising. (Why is all of it tax-deductible, for example?)

Finally, I found myself considering a very recent campaign that seems to have been successful both in material and in values terms. The coalition of many groups who worked together to stop mining in national parks and on Schedule 4 land achieved a policy change, but also motivated thousands of people to think about the love they had for special places in Aotearoa. The message was not “mining will damage our tourist industry” but “Too precious to Mine”.

*Jeanette Fitzsimons*

# ARE HYBRID CARS THE ANSWER?

by **Dave Kelly,**  
**Canterbury University**

In EnergyWatch 59 I showed that the New Zealand public do not seem to rate fuel economy very highly (lower than size, acceleration and price). To date, buyers have chosen technology that makes vehicles faster and larger, not that reduces emissions.



Here I discuss whether hybrid-car technology will allow us to reduce fuel use and reduce global warming while still depending on private cars for mobility. Specifically, I ask (1) whether hybrids save petrol, (2) whether they save money, (3) whether you can save fuel if you can't afford a hybrid.

## **1. Do hybrids save petrol (and emissions)?**

Yes, but the amount depends on your circumstances. Remember that a hybrid car has an internal combustion engine (usually petrol-fuelled) and an electric motor with a battery pack. The car can run on one or both engines. However, ALL the energy used to run the car comes ultimately from petrol. The batteries just allow the re-use of some energy that would otherwise be lost in braking.

Hence, hybrids can save substantial fuel in stop-start urban driving (perhaps 30-40% compared to similar sized non-hybrids). However, in highway driving they give little benefit, because modest savings from regenerative braking are offset by greater weight (from the battery and electric motor). Also, hybrids save more fuel for drivers who brake and accelerate heavily, whereas drivers with a smoother style will save less. Therefore, the amount of fuel a hybrid saves depends on where and how you drive.

## **2. Do hybrids save money?**

By using less fuel, hybrids do reduce running costs. But they are more complex to build, so more expensive than comparable non-hybrid cars. To work out the net financial benefits, I compare Honda hybrid and non-hybrid cars. I chose Hondas because the actual selling price is what Honda list, whereas other car makers use the "RRP" as a bargaining point, so the actual price is unknown. Secondly, we can compare hybrid and non-hybrid cars with the same petrol engine (Honda's 1330 cc unit), to see what difference the hybrid add-ons make. Although this example is based on smaller cars and hybrids, the same relative arguments apply to larger vehicles, like the Toyota Camry hybrid vs normal Toyota Corolla.

The table includes four 5-seater Hondas from 2008 and 2011. The Civic is a saloon, the others are hatchbacks. The Jazz figures are for manual gearboxes as these are cheaper and more fuel-efficient, while the hybrids have CVT automatics. The two luggage capacities listed are with rear seats up and down. Fuel ratings in L/100 km list both official ADR ratings, and the best example of each car in the EnergyWise Rallies for 2006 and 2010 respectively (which cover about 1700 km of rural roads with penalties for slow driving).

A number of key points emerge. The hybrids are heavier, longer and more expensive, but carry the same number of passengers and have less luggage space. Their official ratings list them as about 20% more efficient than the non-hybrids, but in careful rural driving the difference is only 6-12%. This is partly because, as noted above, the EnergyWise Rally is the situation where hybrids give the least benefits (open-road driving with a light right foot).



**Table 2. Comparison of characteristics of non-hybrid and Hybrid cars**

	2008 Jazz 1	2008 Civic hybrid	2011 Jazz 2	2011 Insight
<b>Weight (kg)</b>	1050	1265	1060	1205
<b>Length (m)</b>	3.86	4.54	3.90	4.40
<b>Luggage (L)</b>	380/1320	350	380/1320	408/584
<b>Fuel use ADR</b>	5.7	4.6	5.8	4.6
<b>Fuel use EWR</b>	5.0	4.7	5.3	4.6
<b>Price \$ new</b>	20,500	35,300	24,700	35,600

Also the baseline conventional car (the Jazz) is remarkable, having lots of interior space and exceptional fuel economy. The Mk 2 Jazz is fractionally less economical and less spacious than the Mk 1, but both are stiff competition for the hybrids. But that is partly because they share the same efficient petrol engine.

So do hybrids save you money? Yes and no. Using petrol at \$2.00 a litre and the ADR fuel efficiency, petrol costs 11.6 cents/km in the Jazz Mk 2, and 9.2 c/km in the Insight, a saving of 2.4 c/km. The purchase price is \$10,900 more for the Insight. With a depreciation rate of 10% (less than normal business rates, but realistic) the Insight costs \$1090 more a year in depreciation. So for a typical New Zealand mileage of 16,000 km/year, you save \$384/year in lower petrol, which offsets about a third of the higher depreciation.

That might sound like poor economics, but remember that everything else you spend extra on in a car (larger engine, larger car, 4WD, etc) costs more to buy and then costs MORE, not less, to run. So getting one-third payback – on top of the satisfaction of lower emissions – is a pretty good deal.

Also, the benefits might be larger than this. Firstly, if petrol goes up, your savings increase – and depreciation on fuel-efficient cars will decrease too. Secondly, if you require an automatic gearbox, the hybrid does

EnergyWatch 60

relatively better. The automatic Jazz Mk 2 is more expensive (\$28,500) and less fuel efficient (6.6 L/100 km) than the manual, so the Insight only costs \$710 more in depreciation and over 16,000 km saves \$640 in fuel, giving you 30% lower emissions almost for free.

So hybrids save money, but don't actually make you money. Of course, that is partly because fuel is under-priced. At the pump you don't pay for the costs of air pollution, global warming, etc. If those costs were internalized, it really would pay you to own a hybrid. There is little immediate prospect of a petrol tax to cover the costs of pollution, but is likely that peak oil will increase the petrol price substantially in the near future.

**3. Can you save petrol if you can't afford a hybrid?**

Easily, by buying a smaller car and driving it carefully. A smaller car like the Jazz is cheaper to buy and much more economical than most common "family" vehicles such as the Commodore or Subaru Legacy. There are even cheaper smaller cars that use less fuel than the Jazz (eg Suzuki Alto, Daihatsu Charade). In the last four EnergyWise Rallies (2004 – 2010), the top places have twice been taken by non-hybrids. The ten lowest-emission cars over these four rallies include 15 hybrids, 11 petrol cars, and 14 small diesel cars.

So if you are not wedded to the idea of a larger car, you can have more interior space for quite a lot less money in a sensibly chosen non-hybrid that only uses 10-20% more fuel. The key is buying carefully for fuel economy. For example, the automatic Jazz Mk 2 costs about as much to run as the Insight. Unfortunately, that's partly because the Mk 2 Jazz has a less efficient torque-converter automatic than the Jazz Mk 1's CVT gearbox, which gave 5.8 L/100 km. So if you want to save money and fuel in an automatic, buy a Mk 1 Jazz.

#### 4. Conclusions

Hybrids give their largest relative fuel savings when driven in traffic jams. To me, more rational responses to traffic jams are public

transport, active transport (walking/cycling), reducing transport demand (move closer to work), and smaller cars. However, many people do drive in traffic jams and like big cars, so hybrids meet a need. People who prioritise large car size and low cost over fuel economy, buy a typical modern car. Those who prioritise size and fuel economy over cost, buy a hybrid. Those who prioritise cost and fuel economy over size buy a small car.

So hybrids will probably become common – but some useful concepts from hybrids, such as stop-start systems that turn the motor off in traffic jams, seem certain to be added to conventional cars.

*Dave Kelly*

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## WHEN IS COAL NOT COAL?

By Steve Goldthorpe

Based on my 16 years experience in British Coal R&D, I offer this perspective on coal science.



Lignite is the generic name of a class of geologically young solid fuels, which are intermediate in the long term process of conversion of ancient biomass into coal. Lignite is sometimes called brown coal. Generic names of classes of materials in that spectrum of solid fuels in approximate order of age are firewood, peat, lignite, general purpose coal, coking coal, steam coal and anthracite. In general, the coalification process involves the gradual reduction, via the action of underground pressure and temperature, of the oxygen content of the combustible material from wood, which has about 43% oxygen, through peat to lignite, which typically has 20-25% oxygen content, to black coal with less than 10% oxygen and

## WHEN IT IS LIGNITE

to anthracite with around 1% oxygen. The energy value of any particular sample of solid fuel is highly dependent on the specific properties of the fuel.

The potential sources of B-grade lignite in South Island that are being considered for bulk exploitation are lower quality than the small amount of A-grade lignite that is currently exploited. The B-grade lignite resources comprise less than half combustible hydrocarbon material, which is already partly oxidised; the rest of the mined material is embodied moisture and mineral matter.

The L&M website<sup>1</sup> reports that feasibility studies into liquid fuel and petrochemical production have commenced for the Hawkdun and Ashers-Waituna lignite resources. One tonne of lignite from these resources has about one third of the useful energy content<sup>2</sup>

<sup>1</sup> <http://www.lmgroun.net.nz/content/Lignite/Lignite%20-%20Introduction/5316/L%26MLignite.pdf?pri=24&cid=5316>

<sup>2</sup> i.e. on a lower heating value; net CV basis

of the prized high quality black coal that is mined on the West Coast of New Zealand and exported; as is shown in Table 1 on Page 3.

The main reason for the difference in energy contents between Southland lignite and West Coast black coal resources is their moisture content. However, lignite cannot just be air dried, because it would then become pyrophoric, i.e. liable to spontaneously combust in air. Solid Energy is proposing a briquetting plant to dewater and compact lignite into a stable form that can be transported and used as a boiler fuel. These briquettes would have about half the energy content per tonne of high quality black coal.

Not that high quality black coal is normally used as a boiler fuel. The best West Coast coal is usually exported for high value overseas applications, such as steel making. High quality coal is too good to just burn it.

Although others argue that all coal use must be phased out by 2020, I suggest that it is coal **burning** that is the real global problem. Black coal could be viewed as a rich source of organic petrochemicals. **If used wisely, responsibly and sparingly**, making materials to meet our essential needs is a potentially valid role for black coal in the long term

However, just burning coal to release energy is a profligate waste of its chemical potential.

In contrast, lignite with its high oxygen content has virtually no useful potential as a chemical feedstock. Even the proposed process of converting lignite into urea does not retain intrinsic carbon-carbon bonds from the source hydrocarbon. Instead lignite would be broken down by gasification to carbon monoxide and hydrogen, from which urea would be synthesised. Effectively, the lignite would only be used for its energy potential.

### CO<sub>2</sub> emission factors

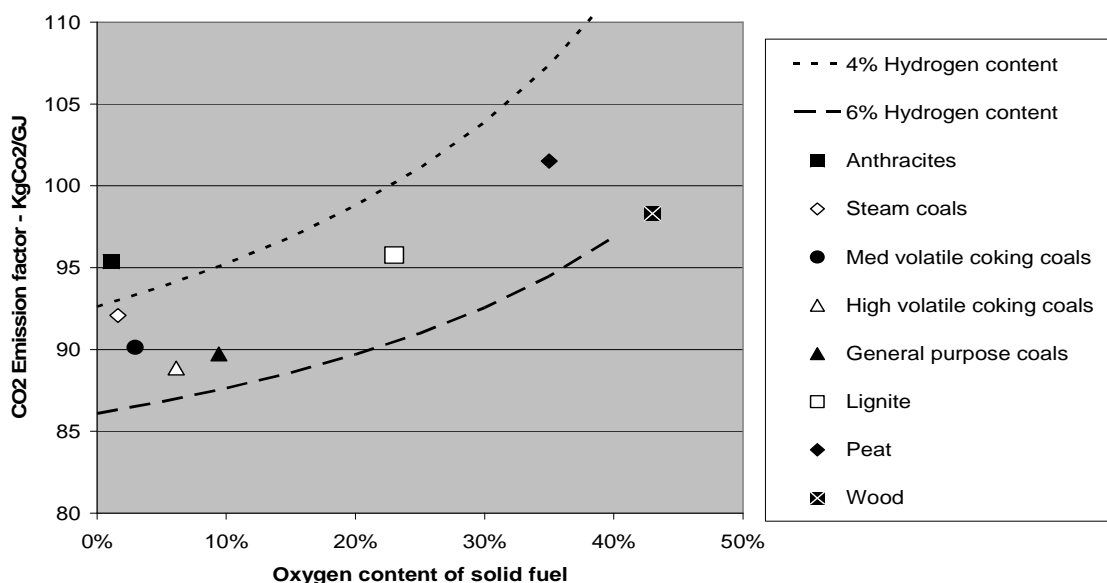
The distinction between coal and lignite can be illustrated by the CO<sub>2</sub> emission factors for solid fuels on the basis of their higher heating value energy content (when ash and moisture content have no effect). The CO<sub>2</sub> emission factors, are plotted in Figure 2, against the oxygen and hydrogen contents of the dry ash-free hydrocarbon materials.

N.B. Wood is included in this chart for illustration only. Fire wood has a CO<sub>2</sub> emission factor of zero in Greenhouse accounting because it does not involve release of geologically stored carbon to atmosphere.

*Steve Goldthorpe*

**Figure 2 CO<sub>2</sub> emission factors for combustion of solid fuels**

(Source – Technical Data on Fuels, Rose & Cooper, 1977)



# CANCUN CLIMATE CONFERENCE OUTCOMES

By John Blakeley

## Overview

In December 2010 some progress was made at Cancun on a range of issues.



1. Pledges which countries have made under the informal Copenhagen Accord over the past year, either to cut emissions or, in the case of developing countries, to restrain the growth in emissions, are now generally incorporated in the official UN process.

But we are still a long way from any treaty or legally binding agreement that would hold countries to account against those pledges.

And those pledges fall well short of what would be needed to keep global warming below the 2 degrees C increase which is thought to be the threshold for dangerous climate change.

2. A mechanism has been agreed to set up a fund, foreshadowed at Copenhagen, to channel money from rich countries to poor ones, to help them cope with the impact of climate change.

But how much money is involved? Who will pay? How it will be disbursed? The answers to these questions remain unclear.

3. There was progress on deforestation, which is a major global source of emissions. Cancun formally backed the UN's REDD scheme (reducing emissions from deforestation and dehydration).

## Kyoto Protocol

Every developed country apart from the USA is bound by commitments under the Kyoto Protocol. But the future of this treaty, after the first commitment period expires at the end of 2012, is very much in doubt.

Its three largest non-European members, countries Japan, Russia and Canada – all major emitters – have indicated that they are not interested in a second commitment period for a treaty that only covers a minority of global emissions, and in particular does not include the USA and China, which between them represent more than 40% of global greenhouse gas emissions.

New Zealand's Climate Change Minister, Dr Nick Smith, told the conference that New Zealand does support a second commitment period for the Kyoto Protocol.

Consideration of the future of Kyoto has in effect been deferred until the next annual conference in Durban, South Africa in December 2011, at which point the Kyoto agreement will have only one more year to run. This would not leave time to negotiate any successor treaty and for countries to ratify it before the present treaty expired.

Carbon offset markets worth US\$20 million depend on Kyoto emissions caps to drive developed countries to pay for cuts in greenhouse gas emissions in developing countries (where this is a cheaper alternative than cutting their own emissions). So if the Kyoto agreement is not replaced, these carbon markets could be in jeopardy.

## New Zealand Reactions

Climate Change Minister, Dr Nick Smith, and International Climate Change Negotiations Minister, Tim Groser, said that the conference outcomes represented a significant step forward toward a global, legally binding and comprehensive agreement.

Dr Smith said that at Cancun, New Zealand had agreed that a simple extension of the Kyoto Protocol, only covering 27% of global emissions, would not work.

The Green Party's climate change spokesman, Dr Kennedy Graham, said that the agreements

reached at the Cancun conference were a positive step. “But when the substance of the current pledges is analysed, we must realise that we’re in danger of cementing in national pledges that are insufficient to avoid dangerous climate change”.

### **The Elephant in the Room**

Republican takeover of the US House of Representatives early in 2011 essentially ruled out any new, legally binding pact requiring the USA to reduce its greenhouse gas emissions.

And yet at Cancun, the US political situation was hardly mentioned despite its crucial role in how the world will confront what the Cancun final document calls “one of the greatest challenges of our time”.

So a large question mark has to be applied to the US pledge to cut its greenhouse gas emissions by 14 - 17% from 2005 levels (not 1990 levels) by 2020. This is equivalent to a reduction by the USA of only around 3-4% below its 1990 emissions levels by 2020. In itself, this pledge is only a minimal response compared with that of many other developed nations, and it now seems unlikely that the USA will be able to give a legally binding commitment, even to this minimalist figure.

### **Deforestation**

Deforestation is estimated to account for around 17% of global carbon dioxide emissions. One of the most significant items of progress from the Cancun conference was a decision to back a scheme to pay poor countries to leave their forests standing.

The so-called REDD agreement outlines plans to create a framework for developed countries to provide the finance needed to protect forests in developing nations. Many questions about how the scheme will work have yet to be answered – including the detail about how it will be funded, how the rights of traditional occupants of forest lands, will be

protected, and how it will be enforced and monitored.

*John Blakeley*

### **Reference:**

1. *NZ Herald*, 16/12/10, page B2. Article by Brian Fallow entitled “Cancun talks highlight climate dilemma”.
2. *Reuters* posted 12/12/10. Article entitled “Climate talks end with modest steps, no Kyoto deal”.
3. *NZPA* posted 12/12/10. Article entitled “Government welcomes Cancun deal, Greens say it isn’t enough”.
4. *Associated Press*, 12/12/10. Article entitled “Analysis on Climate, the elephant that’s ignored”.
5. *NZ Listener*, 1/1/11. Editorial article entitled “Chop or Change”.

### **MULTI-METRE SLR BY 2100?**

Meanwhile, the science of climate change advances concerning Sea Level Rise (SLR). A recent paper, *Paleoclimate Implications for Human-Made Climate Change*, by James Hansen and Makiko Sato says.

*“Polar warmth in prior interglacials and the Pliocene does not imply that a significant cushion remains between today’s climate and dangerous warming, rather that Earth today is poised to experience strong amplifying polar feedbacks in response to moderate additional warming. Deglaciation, disintegration of ice sheets, is nonlinear, spurred by amplifying feedbacks. If warming reaches a level that forces deglaciation, the rate of sea level rise will depend on the doubling time for ice sheet mass loss. Gravity satellite data, although too brief to be conclusive, are consistent with a doubling time of 10 years or less, implying the possibility of multi-metre sea level rise this century.”*

In contrast, the current MfE guidance is to use a base value of 50 cm SLR by 2100 and to make an assessment of the potential consequences from higher SLR values of at least 80 cm with no upper limit. *Editor*

## THE PARADOX OF ENERGY EFFICIENCY

In a recent publication, Bjorn Lomborg has questioned whether individual actions to improve energy efficiency really do lead to reduction in global greenhouse gas emissions.

Lomborg notes that for years now, climate activists from Al Gore to Leonardo Di Caprio have agreed that individual actions, like driving more economical cars and using more efficient light bulbs, are a crucial element in the effort to address global warming.

The UN climate change panel and the IEA have both stated that higher energy efficiency could reduce energy consumption by up to 30%. But is this really true?

In an interesting recent article (*Energy Watch* 59, pp 3 – 5) Dave Kelly has noted that over the last 70 plus years, typical cars in New Zealand have not noticeably become more fuel-efficient than in the past. The reason is that the most popular cars have become larger and much faster than in the past, so although they now have more efficient engines, they do not use less fuel.

Lomborg notes that back in the early 1970's, the average American household expended roughly 70 million British Thermal Units per year to heat, cool and power their home. Dishwashers now use 45% less electricity and refrigerators 51% less, but on a per-capita basis, Americans are using roughly what they were 40 years ago: 70 million BTU's.

This surprising lack of change is the result of something economists call the "rebound effect". It is a phenomenon familiar to urban planners, who long ago discovered that building more roads doesn't necessarily ease traffic jams – it merely encourages more people to get into their cars and drive.

A front page photograph in the NZ Herald soon after Christmas 2010, showing holiday traffic banked up for miles as it needed to

merge to enter the Johnstone's Hill tunnel, on the new Orewa to Puhoi section of Auckland's Northern motorway, also illustrates this point.

The underlying principle is that you might think that learning to use something more efficiently will result in you using less of it, but the opposite may be true: the more efficient we get at using something, the more of it we are likely to want to use.

An article in the *Journal of Physics*, August 2010 by energy economist Harry Saunders and colleagues noted that as lighting becomes more energy efficient and thus cheaper, we use more of it.

For this reason, the proportion of resources which we use on lighting has remained virtually unchanged for the past three centuries at about 0.72% of GDP. The conclusion that Saunders and his colleagues draw from this is that rather than shrinking our electricity use, the introduction of ever more efficient lighting technologies is much more likely to lead to growth in consumption of light.

Lomborg concludes that while increasing energy efficiency is undoubtedly a good thing, it is not a remedy for global warming. Saunders puts it "energy efficiency may be a net positive in increasing economic productivity and growth, but it should not be relied upon as a way to reduce energy consumption and thus greenhouse gas emissions. The real fix to the global warming problem will come when governments focus on research and development aimed at boosting the proportion of green energy sources in overall energy consumption."

*Reference* Bjorn Lomborg, "The Paradox of Energy Efficiency", *Policy Innovations for Fairer Globalisation. A publication of the Carnegie Council.*

John Blakeley

# WILD ENERGY COMPETITION OUTCOMES

## Wind Power, Zero Energy Homes, Power Conservation and Local Production Hailed As A Great Mix in New Zealand Green Energy Challenge

Rather than choosing one answer to New Zealand's increasing demand for power, a group of energy experts on the judges panel for the green energy design challenge 'Wild Energy' have ruled that a cluster of small scale green energy design options are the best way forward.

Wild Energy, the green energy design challenge, has been running since October 2010 and was intended to showcase the myriad of power generation and conservation options available to New Zealand. It was also intended to attract energy generation or conservation ideas that could replace at least half of the proposed hydro dam at the Mokihinui River. Though the judges ruled that none of the entries entirely demonstrated how they could meet that target with credibility they did say that in combination the designs could nicely complement each other. Wild Energy has drawn to a close with not one, but four commended entries, plus one non-entry letter worthy of recognition.



The Most Highly Commended Wild Energy certificate goes to 'Wind Power':- the THINAIR 102 small scale wind turbine made by Power House Wind.

However, in the judges' opinion the potential number of installations in NZ was a limiting factor for meeting the scale criterion.

Three Highly Commended certificates go to: 'Zero Energy Town House', 'Energy Conservation: roof vent' and 'Reduce home use by installing home PV and wind generation'

The judges said that the most important contribution to getting more sustainable energy generation and innovation in New Zealand was the introduction of Feed in Tariffs, which was submitted as commentary rather than an entry to the competition. Stephan's letter is included below.



Wild Energy Judge Jeanette Fitzsimons said "The best solution in my view, by a long way, would be a combination of several of the small scale alternatives – more resilient, and able to back each other up at different times. We all felt the Feed-in-tariff was the key to getting small scale renewables actually implemented but this was not formally an entry. However, if you combined this with small scale wind and micro hydro and some good energy efficiency ideas you would have a great system."

**The Audiences Choice** went to: 'The Answers Already Exist' by Achmed Khammas with an introduction to his German book about green energy design options spanning thirty five years. Achmed will receive an Audiences Choice certificate. Although Achmed's entry won the audience choice award, it did not address all of the competition's criteria.

See <http://happyzine.co.nz/2011/02/15/>

## VIEWPOINT – FEED-IN TARIFFS

**The following abridged letter was received by the Wild Energy Organisers from Stephan Heubeck writing for REFIT-NZ**

We would like to congratulate you for coming up with the creative idea of the technology competition to get people thinking outside the box and stir debate about electricity production and consumption in NZ.

Recent debates about large scale generation schemes and this competition are steps in a line of events that shows that New Zealand has moved beyond simple black and white thinking. Concerned New Zealanders increasingly understand that use of a particular resource or a particular technology can not be entirely good or bad, that choices around electricity provision need to consider environmental, social, security and economic issues simultaneously, and that credible critique of a particular project or technology is not possible without provision of sensible alternatives – this is a very positive development.

Getting people to think more about alternatives to large scale centralized electricity generations schemes, in particular those relying heavily on fossil fuel resources and imported materials, equipment and services, is very positive in itself. We need as many options as possible on the table if we are to have a cleaner and better future electricity system.

However, does this mean that the major hurdles are of a technical nature? We don't think so.

Capacity additions to New Zealand's electricity supply have still an almost exclusive focus on large scale generation schemes. Yet the technologies to develop smaller scale generation systems have been available to us for many years.

Overseas success with diverse small scale renewable generation portfolios is living proof of this fact. Still we in NZ haven't seen

any progress in this area. Will any of the new ideas brought forward during the competition buck this trend? – That's unlikely unless the road blocks holding back the currently available technology are removed or negated.

We are of the opinion that it is a lack of a level playing field, plan-ability, security and leadership that has prevented (and will continue to prevent) smaller scale renewable generation schemes from contributing more to our energy needs. Such schemes, developed with local participation, are less controversial, have less detrimental effects and provide numerous secondary benefits.

Over the last decade many overseas countries have started to address similar imbalances on their shores, and developed tools that allow smaller scale renewable generation technologies, that are often proven for decades and do not necessarily supply electricity at higher cost, to provide more electricity to satisfy national needs and a raft of positive side effects to benefit the environment, economy and society. The most successful of these tools is without doubt the Feed-in Tariff (FIT) system, that has been adopted (in various forms) by over 60 states and territories

A true feed-in tariff system contains 3 key features:

1. Priority connection, transmission and use of electricity generated in small scale (renewable) set-ups guaranteed for extended periods of time.
2. Long term (e.g. 20 years) agreed (fixed) prices for electricity from such set-ups with different rates for different schemes according to size, type of generation, co-benefits and commissioning date in accordance with the local conditions in each respective country
3. National cost pass-on and equalisation scheme.

Using Germany as an example, the FIT system introduced in 2000 has supported the



build-up of a small scale renewable generation portfolio capable of generating 71TWh (in 2008, ~15% of national electricity needs, current total NZ electricity generation 42TWh, MED EDF 2009). This portfolio has in 2008 avoided 55 million tonnes CO<sub>2</sub>eq GHG emissions and 900 million € in fuel and electricity imports, and was responsible for direct investments totalling 13 billion € in a sector employing 134,000 people out of a total of 278,000 green collar jobs in Germany. Via the national equalisation scheme the gross premium cost of FIT electricity contributed 1.1 cents/kWh (2008) to the electricity end user price, while at the same time FIT electricity with priority access to the market suppressed the annual average electricity spot market price by 0.78 cents/kWh (2006). On balance the premium cost of the FIT system contributed ~1.1% to the end user cost of a kWh of electricity.

We think that such figures speak for themselves, and that it is time for NZ to seriously consider how to emulate these overseas success stories. Of course a 1 to 1 copy of overseas schemes won't do the trick, but FIT systems are flexible enough to be

adapted to an individual countries circumstances, needs and resource base.

No single policy or technology will be a silver bullet for New Zealand's electricity issues, but we are sure that introduction of a FIT system would be a very important step in the right direction, that may also help some of the technologies and concepts brought forward during this competition to become a reality and benefit our country in the future.

In a 2006 report, commissioned for EECA, US energy consultant Paul Gipe concluded that: - *“Renewable Tariffs offer a better prospect than any other policy mechanism available today for the rapid deployment of renewable energy in New Zealand with the cooperation and participation of its citizenry.”*

We share this view, and are looking forward to a future where progressive policies like a FIT system have helped to make (small scale) renewable energy schemes projects for local cooperation, rather than the sources of the disputes we are seeing far too often today.

*Stephan Heubeck*

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## **PRICE OF ELECTRICITY** (Letter to the NZ Herald - 22<sup>nd</sup> Feb 2011)

Some of your correspondents believe, as the Finance Minister does, that part-privatisation will make our electricity generators “compete”. They should ask themselves why, for example, Kuwait does not compete against Saudi Arabia to sell it oil for \$10 a barrel.

Crude oil is different from most products: It gets more expensive the more is being produced. This leads to shadow pricing, when the low cost producers hike up their prices to the level of oil from Alaska and deep-sea wells.

The same applies to electricity in a hydro-dominated system, where the old hydro stations are the low-cost producers. They hike up their price to the highest prevailing price at the time, reaping large windfall profits.

### **Competition will never occur when increased production makes cost rise rather than fall.**

This, precisely, is the case with electricity, and this is why our political landscape is littered with energy ministers who have tried to bring competition to the electricity generators – all without success.

*Peter Kammler*

# UNCERTAINTY OVER OIL PRICES IN 2011

**By John Blakeley**

## **Historical Background**

In considering what might happen to global oil prices during 2011, it is instructive to look at what happened the last time oil prices went above US\$100 per barrel.

As shown on Neil's Oil Price Chart below global crude oil prices first reached US\$100 per barrel in November 2007, then hovered between US\$90 – 100 until March 2008. They then rose very steeply to a maximum of about US\$147 in July 2008 before plummeting steeply down to around US\$40 between November 2008 and February 2009, before rising again more gradually towards present oil price levels.

This can be contrasted with the relatively small fluctuation in global oil demand (*see Energy Watch 56, pp 16 – 17*). After averaging just over 86 million barrels per day (mbpd) throughout 2007, demand reached a peak of 86.8 mbpd in July 2008, before dropping slightly to around 86.5 mbpd in the fourth quarter of 2008.

As the world economic recession bit more deeply in 2009, demand dropped to just over 84 million bpd during the first four months to April before averaging out at 84.6 million bpd for the full 2009 calendar year.

As the very hesitant economic recovery was taking place during 2010, the Organisation of Petroleum Exporting Countries (OPEC), forecast in March an average global demand for crude oil in 2010 of 85.24 mbpd. It will be interesting to see if this figure is confirmed by the actual annual result for the 2010 calendar year, which should soon be available. Anecdotal evidence suggests that in contrast to the financial crisis in some developed countries, during 2010 there has been a strong increase in crude oil demand in

emerging markets and notably China and India.

## **Observations**

My first observation from the above information is that global demand for crude oil has only changed by a relatively small amount compared with the large fluctuations in oil prices which have occurred since November 2007 when oil prices first reached US\$100 per barrel.

My second observation is that there seems to have been a delay of about nine months (August 2008 to April 2009) before the oil price "spike" in mid 2008 was fully reflected in reduced global oil demand.

## **Balance Between Supply and Demand**

Late in December 2010, crude oil traded above US\$90 per barrel for three straight days and commentators noted that ongoing tightness in global oil markets was pushing prices upwards towards US\$100 and that there was a fundamental demand shift emerging.

On the supply side, although OPEC countries produce less than half the world's oil supply, the world has nevertheless become increasingly dependent on OPEC, because these countries are the only ones which have present reserve capacity to produce more oil.

But since the first quarter of 2010, increasing global oil demand has been met by negligible capacity additions by OPEC countries. This means that demand has been exceeding supply by around 0.9 mbpd on average since early April 2010.

Analysts say that as demand continues to grow, they expect crude oil stocks to be drawn down at an increasing rate and that OPEC will be forced to raise production or quotas (or both) in the first half of 2011 as oil

prices again cross the US\$100 per barrel mark.

Analysts believe that allowing oil prices to continue to rise unchecked from current levels is dangerous for the world economy, as it imperils the fragile economic recovery in the

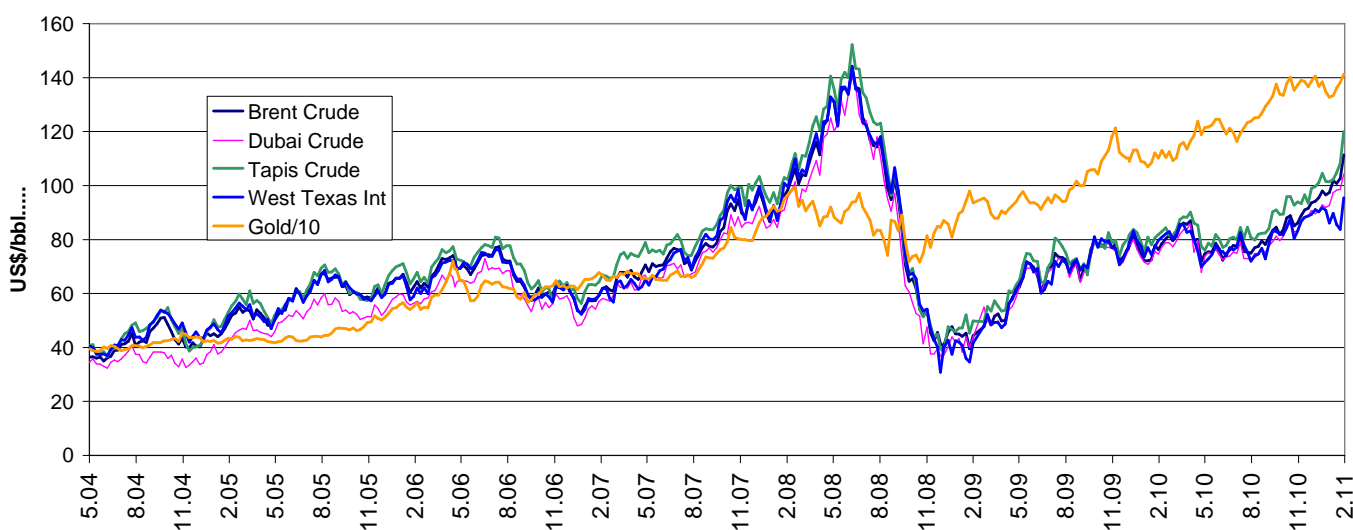
OECD countries, particularly as the OPEC cartel has the ability to bring more oil production on stream.

*John Blakeley*

*Reference: NZ Herald, 28/12/10, page B3*

## Neil's Oil Price Chart

This chart, compiled by Neil Mander, tracks a basket of oil prices in comparison with the gold price. (Source NZ Herald). Over the last three month the 3-weekly rolling average oil price has increased by 18% from US\$87/barrel to over US\$103/barrel, crossing the noteworthy \$100/bbl threshold, which was last breached almost exactly three years ago before the 2008 peak.



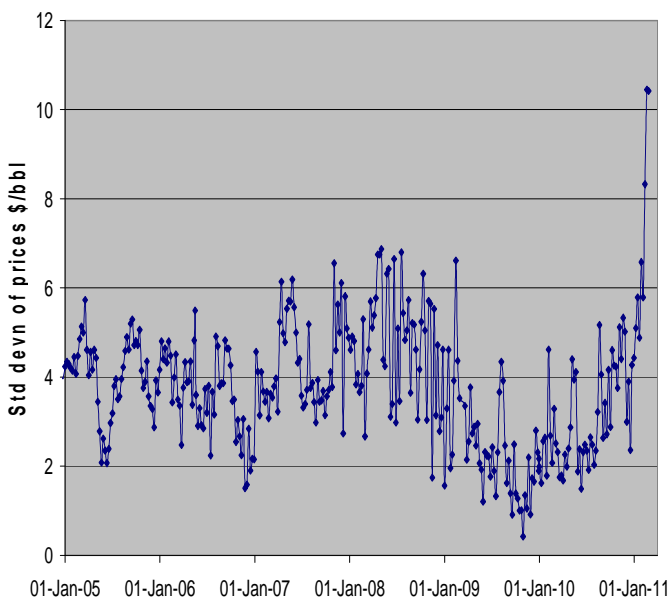
## PRICE VARIABILITY BETWEEN SOURCES OF OIL

The four oil prices shown on the above chart have generally stayed closely in-step with each other; as would be expected for an internationally traded commodity. Even at the 2008 peak the prices were broadly in-step.

However, in recent weeks there have been increased differences between the weekly published oil prices. This chart shows a plot of the standard deviation between the four oil prices over the last 6 years.

Is the increase in price variability significant?

There are various explanations of this new phenomenon in the press. Only time will tell whether this is a temporary anomaly or a harbinger of an underlying inability of the oil market to accommodate supply constraints.



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