

# EnergyWatch

*The Journal of the Sustainable Energy Forum Inc.*

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## **POST PARIS PARADIGM**

### **Editorial**

The euphoria following the historic agreement made at CoP21 in Paris in December has now subsided. In the cold light of day the practical implications of an aspirational target to limit global temperature rise to 1.5°C is viewed as “mission impossible”. Business-as-usual prevails.



The Government’s roadshow “The Paris Agreement: COP21 Decoded” was disappointing in not indicating any practical plans for reducing New Zealand’s Greenhouse Gas emissions inventory. For example, there was no mention of the Energy Minister’s programme to promote electric vehicles, nor any mention of how the Prime Minister’s aim of reducing fossil fuel subsidies, as expressed in Paris, would be implemented in New Zealand. Instead there was a simple blind faith on the ability of the Emissions Trading Scheme to constrain emissions, with a dearth of any analysis about how that would be actually be achieved in practice.

Likewise, there was a worrying reliance on the indefinite supply of high quality low cost carbon credits on the international market, despite the clear signal from Paris that all countries would need first to improve significantly on their domestic emissions reduction performance to achieve the globally desired target.

Furthermore, there was an over-optimistic reliance on the prospects of research to solve the problem of methane emissions from dairy cattle and other ruminants. Whereas, the limited research findings to date are based on very tight control of the animals’ diet in feed lots, which is not consistent with the free-grazing in open paddocks that it typically practiced in New Zealand.

In summary, the assurances given by the Government that no changes of policy are needed for New Zealand to achieve and improve upon our inadequate Intended Nationally Determined Contribution (INDC) of 11% reduction on the absolute amount of NZ emissions inventory in 1990 by 2030 are mystifying. Growth in population alone, makes that a very challenging, albeit inadequate, target requiring major departures from a business-as-usual Greenhouse Gas emissions trajectory. Logically, this means finding on the international market a new source of low-cost carbon credits to supplement indefinitely the environmentally meaningless “Ukrainian Hot Air” that is used to meet NZ’s Kyoto GHG reduction targets.

In this issue of EnergyWatch there is further consideration of real policy changes that are needed to enable planning for meeting New Zealand's obligations, before the Paris Agreement can be ratified.

John Irving considers issues surrounding electricity storage, which is a vital component of updating New Zealand's electricity system to meet the needs of the 21<sup>st</sup> century. He notes *"Change can only be possible with a serious push for regulatory reform to enable the equitable use of new technologies by consumers and suppliers alike."* Reform of the NZ electricity system is needed to phase out fossil fuels and to accommodate the essential transfer of transport energy from liquid fuels to electricity.

Molly Melhuish discusses home heating needs in relation to electricity system reform. She notes that the shared goals agreed by IEA countries include: - *"Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner.... Strong efforts by governments and all energy users are needed to realise these opportunities."*

Fonterra, as a major energy consumer in NZ, has a significant role to play in achieving a low-fossil paradigm in the long term. However, Fonterra has short term economic imperatives which put a shift to cleaner energy on the back burner, as described in a recent Waikato Times article. Jeanette Fitzsimons highlights some downsides of the strategy of growth in volume at all costs and suggests a change in direction to better serve the interests of New Zealand and the climate.

Ian Shearer has thrown out a challenge for SEF to build a Local Sustainable Energy Agenda as we approach the local government elections season. He will welcome ideas for content and also for internet-based means of making it available.

From the perspective of freight transport, Kerry Wood describes the trimming of the rail infrastructure in New Zealand and how the KiwiRail annual report shows that a leaner and fitter approach is still being pursued. The vision presented by KiwiRail does nothing to contribute

to the future low-fossil paradigm, indeed consideration of any impacts on greenhouse gas emissions from freight transport are still bedevilled by rudimentary rhetoric.

This issue ends with the oil price chart and a claim that the oil price woes are cyclical not permanent.

Now is the time of year to think about the SEF AGM in June or July. It would be good to have a face-to-face gathering with some purposeful focus. If any members have ideas for a suitable focus, probably in Wellington or Auckland, then ideas forwarded to the SEF executive committee would be welcome.

This is my 21<sup>st</sup> issue of EnergyWatch and the time has come to look to the future of EW, its purpose and its stewardship. Is there anyone out there who would like to try their hand a guest editor for EW77? Please let me, or any member of the SEF executive know.

Perhaps a single issue edition might be timely. For example, EW has repeatedly pointed to the brokenness of our electricity system. There is a wealth of commentary on SEFnews and elsewhere to that effect. Could someone pull together a proposed SEF road map to get from where NZ is now to where NZ ought to be?

*Steve Goldthorpe, Editor*

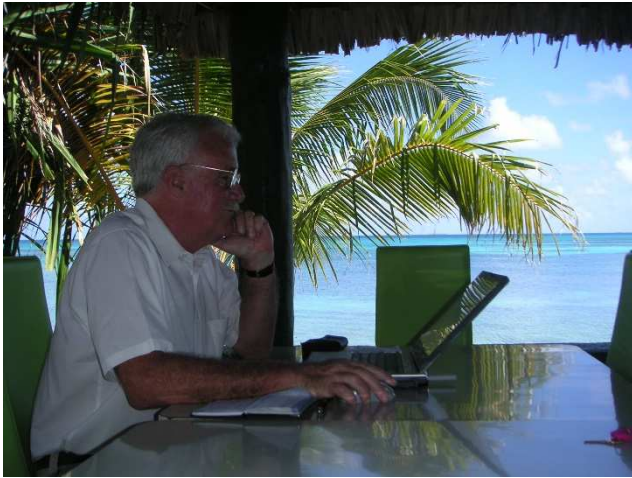
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# The Dynamics of Electricity Storage

By John Irving

Retired Staff Engineer,  
World Bank and EBRD



When talking to the man in the street, you wouldn't know it but there is a revolution crackling in the air. If you believe the experts from the NZ power industry, you might even be tempted to sceptical of an imminent regulatory reset to their traditional way of operating. You might also wonder why they are so dismissive of the prospect for change. But after being made aware of an informal survey at a recent electricity networks association conference, you might be equally surprised that the industry practitioners also denied that NZ should be worried about climate change. Instead they appeared to be more concerned about the prospect of the Huntly Coal fired station being shut down in 2018.

On the other hand, a click on an Android App such as "Flipchart", or a visit to a website like "Wikipedia", will quickly tell you all you need to know about the renewables revolution in the rest of the world. You'll then appreciate that it won't be long before the status quo between the NZ power industry and their complicit energy regulatory partner is about to end.

We are all aware that manufacturers of wind plant, and later of PV solar power systems, have dramatically brought down their prices over the last 10 years. But last year, when Tesla announced its major investment in a gigafactory to build 7-10 kWh home battery storage systems, EnergyWatch 76

the world took notice. To the surprise of power industry experts, it turned out that an electricity storage revolution had been brewing for years, and Tesla's announcement was simply the catalyst for its recognition.

Suddenly there is now a realisation that distributed electricity storage systems, in their many different forms, are threatening to force a paradigm change to the long held view that electricity generation must be centralised, transmitted over long distances and distributed radially to consumers. There is a realisation that stationary grid-linked batteries, supercapacitors, flywheels, compressed air systems, and hydrogen fuel cells, along with privately owned home batteries and electric cars, used in conjunction with internet-enabled Demand Side Management schemes, can solve many power system operational problems simultaneously.

In other countries large (5-50MW) grid connected flywheel and chemical battery systems have already been in operation for 3-5 years. They are competing with traditional gas turbine peaking plant to provide alternative sources of "spinning-reserve" capacity and off-peak load absorption capability. At the same time they can also realize significant saving by avoiding the cost of reinforcing electricity transmission and distribution networks. However regulators need to be made aware of this opportunity to save costs in the supply chain to electricity consumers, so they will enable changes in the electricity market by recognising and crediting all forms of investment in electricity storage devices.

Recent publications by independent agencies like the World Energy Council (WEC), Electric Power Research Institute (EPRI), and International Renewable Energy Agency (IRENA) will tell you about their expectations of rapidly falling prices for battery systems and the likely impact on the power industry in the next five years. Even Tesla's competitive \$300/kWh battery is being challenged by a team at MIT with the prospect of a nano-tube storage device at \$50/kWh within two

years. Moreover, a quick Google search will demonstrate that countries with proactive national and local governments are developing innovative ways of combining renewables and storage systems to also meet their climate change obligations. These include schemes such as Australia's expandable Flow Batteries often used to support renewables in remote communities, Japan's floating PV platforms that can generate power on hydro reservoirs during droughts, or Toronto Hydro's underwater balloons for compressed air storage for peak electricity generation and the US ARES advanced rail energy power storage systems both of which offer competition to typical \$200/kWh pump hydro storage systems. Likewise, the UK off-shore wind farms with HVDC connections can add MWs of base load capacity by mitigating intermittency problems.

It is sad to recall that up to the 1970s, NZ was once an innovator in the international power industry. NZ had the first significant use of HVDC, geothermal power, the humble hot water ripple relay switching peak hour systems. The reform of the power sector in the 1980s was also a daring step by NZ, to break up monopolistic power sector behaviour; although some might say that it all went downhill when the finance and banking industry took over the sector. In any event, since that time NZ industry been notoriously slow to build on its geothermal and wind capacity; and moreover industry incumbents appear to be antagonistic to attempting to replicate international success in smart meters, solar power, biomass usage and electric cars.

The Commerce Commission (CC) is currently inviting public consultations on the need for regulatory reform to promote new technologies. Initial industry responses suggest that, aside from Vector (which has an association with Tesla), most NZ power companies believe that obfuscation will enable them to continue resist change as they have done with the introduction of not-so-smart meters. Unsurprisingly the only serious comment by retailer and network companies in response to the CC is to argue their

case for monopolistic rights to control grid and consumer storage systems.

There is an expectation that the Ministry of Energy is about to announce its long awaited support for electric vehicles in NZ. This step by the NZ Government could help pioneer the concept of mobile electricity storage systems - sometimes known as V2G (Vehicle to Grid) where consumers are allowed to buy power off-peak and sell back to the grid on-peak. But, even though this would result in increased electricity sales for retailers, don't expect the industry to cooperate in promoting competition with (private sector) consumer-owned distributed generation.

Change can only be possible with a serious push for regulatory reform to enable the equitable use of new technologies by consumers and suppliers alike. Ironically, if NZ regulators continue to give in to the vested interests, they will be supporting the industry's own spurious prediction that that if frustrated [wealthier] consumers are allowed to go off-grid, electricity prices for the captive [poor] consumers will continue inexorably upwards.

*John Irving*

### **Comment**

The advent of storage at the consumer level has advantages beyond the simple \$/kWh comparison with bulk storage at the generation level. Being downstream of the transmission and distribution system, using domestic storage to transfer load from peak to off-peak not only benefits the consumer, if they have time-dependent tariffs, but it also eases the peak loading on the transmission and distribution systems.

However, if domestic level storage enables affluent urban PV users to go off-grid, then they would require much more storage than if they remained grid-connected. It would be a shame if tariffs cannot be devised to retain urban consumers with PV, so that any storage installed is used efficiently for the benefit of all.

*Editor*

# IEA review of NZ energy policies stirs controversy

**By Molly Melhuish**

Domestic Energy Users Network (DEUN)

MBIE has invited DEUN to participate in the five-yearly review of NZ's energy policies by the International Energy Agency (IEA). On April 29 in Wellington, the international team will be meeting relevant government officials and regulators, energy companies, and a selection of energy NGOs including consumers and small energy suppliers.

New Zealand's energy policies are far removed from what is now considered appropriate internationally. This IEA visit is a unique chance to hold the regulators and government departments to account.

Domestic electricity consumers have suffered badly since the last IEA review in 2010. The average residential price has risen by 13% since 2010. Electricity demand per household has fallen by 8%, but average power bills have risen by 5%. The fall in demand was partly through improved energy efficiency and partly through increasing energy poverty.

EECA's home insulation subsidies have been cut by two thirds, many older houses available for rent are still not insulated, so energy poverty is increasing. The subsidies now target only people at the highest risk of illness related to cold, damp housing. Retrofit numbers fell from 60,000 in 2013 to 22,000 in 2015. About 280,000 houses have received insulation subsidies to date; some 600,000 houses remain with poor quality insulation, or none at all.

The original Warm Up NZ Heat Smart scheme offered a clean heat subsidy of \$500 towards an efficient heater to replace plug-in heaters; 70% of the households chose approved (low-smoke) wood burners, most of the rest chose heat pumps. Now there is no clean heat subsidy; the result will be continuing high winter peak loads from householders (and renters) that cannot afford efficient heating appliances. Electricity peak loads will increase as home wood burners in some

cities and towns are being removed as a result of air quality regulation, and all-electric houses will become the norm.

Inefficient home heating puts both the environment and electricity supply security at risk. Security is a particular concern of the IEA. Transpower now predicts security will fall to that of the mid-2000s, when official electricity conservation campaigns were needed to keep the electricity system stable. They predict that four new 150 MW gas fired peaking stations will be required by 2018 to restore security levels if the Huntly thermal power station closures take place.

NZ does not regulate to require adequate electricity capacity; "the market" is expected to do this. Government provided one 150 MW peaking station in 2003 to improve security, and its \$60 million per year capital charges were paid from the Electricity Levy. Now Government does not provide security support, so new peaking stations mean power price increases. What would four gas-fired peakers cost consumers?

New ultra-clean wood heating technologies could replace new gas fired peakers, and could also integrate variable hydro into the grid, but the technologies are suppressed by New Zealand's peculiar air quality regulation.

The "shared goals" agreed by IEA countries include: *"Improved energy efficiency can promote both environmental protection and energy security in a cost-effective manner.... Strong efforts by governments and all energy users are needed to realise these opportunities."*

The New Zealand Government doesn't support such opportunities. Under present policies, power bills will increase, security will fall, and the lowest income domestic consumers will pay the highest prices and suffer the negative health impacts from more cold damp houses.

The IEA report on NZ must tell us that our priorities are wrong, and our energy efficiency and renewables performance are far outside international benchmarks.

*Molly Melhuish*

## Fonterra clean energy shift not so simple

**Based on an article by Gerald Piddock<sup>1</sup>  
in Waikato Times**

There is no quick fix to improving Fonterra's energy footprint, but the dairy co-operative says it is working hard to reduce its environmental impact amongst its processing plants.

The dairy co-operative is one of the country's largest burners of coal for thermal energy, using it to fuel 10 out of 29 of its manufacturing sites, with seven of those sites in the South Island.

Fonterra also generates thermal energy from gas, light fuel oil, or biogas fuel sources, and from on-site co-generation facilities.

Altogether, these comprise 85 per cent of its energy needs with the remaining 15 per cent supplied by electricity.

A Fonterra spokesperson said they use their coal as efficiently as possible and buy emissions units to offset the coal that is used in the plants.

The particulate matter emissions from the coal are reduced using baghouses.

Its energy policy focused around energy affordability, security and sustainability. That meant looking at every gigajoule of energy used and making sure it was used wisely including yearly boiler tune ups and inspections.

Security of supply was central to whatever energy source the co-op's plants used, particularly over the peak milking period.

*"We have to have security of supply for end to end sustainability, we need to be able to process that milk every day and we don't want to have plant downtime due to an energy supply issue,"* the spokesperson said.

Fonterra claims it has few choices for energy options in the South Island other than coal. They were constantly exploring alternatives to coal but had yet to find one that was economically viable.

*"We don't have other options in the South Island as of yet. We are doing what we can to reduce our reliance on coal but at the moment it is a reality for a third of our sites. We have looked at numerous case studies to try and get one to stack up economically for us."*

According to 2013 data from the Ministry of Business, Innovation and Employment, New Zealand's largest company used 410,000 tonnes of coal to turn liquid milk into milk powder.

Altogether the dairy industry burns 512,811 tonnes of coal. Based on one tonne of coal producing 2.86 tonnes of carbon dioxide, Fonterra's coal-powered factories pump out 1.5 million tonnes of CO<sub>2</sub>. Add to that its gas-powered plants and tanker fleet, and the company becomes one of New Zealand's top greenhouse gas emitters.

In 2013, 4.6 million tonnes of coal was produced from New Zealand mines, of which 2.1 million tonnes were exported. Of domestic users, the largest are the Glenbrook steel mill, Huntly power station and Fonterra.

A Fonterra spokesperson said that coal use was not hurting them in the marketplace because its customers took an holistic view of energy use.

Fonterra owns Glencoal, as a subsidiary. The North-Waikato coal mine has been in operation since 1922 and currently its Kopako 3 area is being mined, providing coal to its Te Awamutu site.

A Fonterra spokesman said the co-operative was still looking at its energy supply options once that mine ran out.

Overall Fonterra has reduced their energy per tonne of product made by 16.8 per cent since 2003. This was achieved through auditing their energy usage at the plants.

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<sup>1</sup><http://www.stuff.co.nz/business/farming/74099939/no-single-answer-to-lowering-fonerras-energy-footprint>

This had enabled them to improve their boiler efficiency from 87 per cent to 93 per cent using economisers at their Litchfield and Pahiatua plants.

The co-op had also invested in over 900 smaller projects across the country to improve its energy efficiency.

Looking ahead, the type of energy used at any new plant built by the co-op would be determined largely by its location. Fonterra had studied a wide range of alternative energy sources to coal including, wood, geothermal, wind and biogas.

One of the most promising alternatives was solar panels to power its storage facilities at its plants. The costs with using these panels was dropping all the time.

*"It's one of the ones we keep looking at because the technology keeps changing all of the time. It's no for now, but not no forever,"*

Fonterra had investigated accessing geothermal pockets, caused by man-made water extraction, to power its Waitoa factory, but the costs of extracting the hot water using a process similar to fracking outweighed the benefits.

Growing miscanthus plants to be harvested, baled and burned as fuel was being closely looked at in the South Island and potentially co-firing it in coal powered boilers. Fonterra has a 2 hectare trial plot of the plant near Darfield. Fonterra's boilers are 'right sized' for each plant and there was no excess capacity. Fuel was needed to be put in that had a similar energy content to coal if it were to be replaced. *"The problem is that it's so light and fluffy that it doesn't go into our boilers like that."*

The co-operative has come under criticism from the Greens and the Coal Action Network of Aotearoa (CANA) for its use of coal, but he said the logistics of using wood as an alternative to coal to fuel those plants that used coal did not stack up economically or environmentally.

*"You're spending a massive amount of money in diesel to collect and move that wood. Actually from an environmental sustainability perspective it's not economically sensible."*

## A Contrary View

By Jeanette Fitzsimons, CANA



Poor Fonterra. They would have you believe they are trying so hard to reduce their carbon footprint but in fact they are doing all they can to increase it.

They are growing their milk drying so fast that even the 2013 published energy figures are now out of date. When you add up the coal use of all their plants, as CANA has done, they are already burning more than half a million tonnes a year and if they get their way they are about to increase that to over 600,000 tonnes per year.

Even without that increase (the proposed two new huge boilers at Studholme) Fonterra is the second-largest user of coal, after the Glenbrook steel mill. It now exceeds the Huntly power station usage.

Every business and organisation has bottom lines they won't cross. For CANA, ours is that the use of all fossil fuels, but especially coal, must reduce fast from now on in order to have some chance of a liveable climate for our grandchildren. For Fonterra, it is that they must continue to increase their production, their share of the market, and their profitability.

These those two bottom lines cannot be reconciled, unless Fonterra change their strategy from volume growth to improving profitability?

Fonterra has done a great job improving energy efficiency in its plants – 16% since 2003. But at the same time its coal use has increased 38% and they want to burn more. It is total emissions that matter in the atmosphere, not efficiency – that just gives us a better lifestyle.

Fonterra is well aware that there are large quantities of wood waste available and that in a new purpose-designed boiler, combustion would be very clean and efficient. A new boiler, (such as proposed at Studholme, if it is built at all) is the place to start. They say repeatedly that they have done numerous studies on alternative fuels but they refuse absolutely to release them. Clearly the only fuel they will consider is one that is no more

expensive than coal. However, we are not allowed to judge the economics as they won't release the studies. How much more per GJ are they prepared to pay to stop contributing to the greatest disaster facing humanity? Anything?

With coal markets crashing around the world, prices plummeting, and no requirement to pay for environmental damage, of course coal is cheap. We, and our grandchildren, pay the real cost. That is why we desperately need a proper price on carbon, not our current, hopeless ETS make-believe.

One could sympathise a little with Fonterra if they were pursuing a smart strategy on behalf of their farmers and their shareholders. They are not.

Increasing drying capacity now is crazy economics. Farmers are culling cows and reducing milk flow because the price is so low. Intensive stocking is a loss-making activity. Economic analysis shows that dairy farming is unprofitable at the margin because the high costs of bought-in feed, irrigation and extra vet bills are not covered by increased production. Feeding cows better just on grass in a less intensive system is already more profitable. Excellent work on this had been done by Peter Fraser, Alison Dewes <http://www.grazingsystems.co.nz/wp-content/uploads/NZARES-Fraser-The-intensification-of-the-NZ-Dairy-Industry-FINAL.pdf> and Barrie Ridler. The milk price is unlikely to rise enough to change this in the foreseeable future.

Nor is milk powder the highest value product that could be made from the milk supplied. Fonterra's strategy of "more volume" is shooting itself and its farmers in the foot. More highly processed products and ingredients would require less coal and less milk per dollar earned and earn more dollars.

If Fonterra wants a quick fix to its greenhouse emissions, the first step is not to build the Studholme plant which will be a stranded asset any way you look at it. Part of this step is to stop telling farmers to produce more. They are starting to see through it. The second is to invest some of that saved capital into more value-added processing, and perhaps into reverse osmosis

plants, as they have just built at Edendale, which could concentrate the milk to about half its volume before burning coal to dry it.

The third is to develop a plan for the eventual replacement for the old plants built in the seventies, which must be close to their use-by date. They are mostly much smaller than modern plants and a great place to install dedicated wood fired boilers to use some of the various kinds of biomass that are just going to waste. This would allow them to develop relationships along the value chain and get accurate numbers of waste wood availability through calling for tenders to supply.

So there is a potential happy win-win ending, but Fonterra's growth strategy prevents it happening.

Fewer cows, with less bought-in feed, less irrigation water dragged from our rivers and aquifers, less nitrate pollution in rivers, less soil compaction, less greenhouse gas from methane and nitrous oxide, less coal to dry milk, higher value products, more stable markets, happier and more profitable farmers, and a big tick for Fonterra's social licence to operate, which is increasingly being questioned. Are those positives enough to adjust the direction of the Fonterra juggernaut? *Jeanette Fitzsimons*

## **Building a local sustainable energy agenda?**

With the CoP21 agreement signed (but not yet sealed), and with little evidence yet that our central government is going to do anything different, it would appear appropriate to start a campaign to try and embed global climate change decisions into local communities. One way would be to develop and promote an interactive 'sustainable energy manifesto' for the 2016 local government elections.

Such a 'manifesto' could provide a consistent basis for asking candidates a range of questions. How might such a document be created and used?

Your feedback to [office@sef.org.nz](mailto:office@sef.org.nz) would be appreciated. *Ian Shearer for SEFexec*



# Rail in New Zealand – an opportunity being missed

By Kerry Wood

Mutterings about KiwiRail appeared last year. Then in February, Winston Peters proclaimed the end of railways North of Auckland and called upon the usual suspects to resign.



Meanwhile, KiwiRail had released its Annual Report for 2014/15 in December, making it all a bit clearer.

## Annual Report

There had been a Commercial Review, looking at four ‘high-level options’: -

- ‘Trimmed network’: shedding a few branch lines, which may explain Winston’s gripe;
- ‘Golden Triangle (Auckland-Hamilton-Tauranga) only’ (plus suburban rail in Auckland and Wellington): core routes only;
- ‘Separate Island networks’: presumably scrapping the rail ferries, which might mean hanging the South Island out to dry;
- ‘Exit’: Ouch!

The Annual Report continues:

### Key Findings

*The Review found that financial self-sufficiency of the network is not achievable. It is difficult for KiwiRail to increase revenue from commodity based sectors, and there is insufficient freight density in New Zealand to fully fund the network. There are also limited revenue diversification opportunities for rail in a growing New Zealand freight market. Given the capital-intensive nature of rail, owning and operating the network has a very high fixed cost component, but a competitive marginal cost when compared to road.*

*The Review underlined the challenges that KiwiRail faces in reducing the cost of the network. Historic underinvestment in the network only makes those challenges larger. The Review also identified a number of opportunities for KiwiRail. There were a number of uneconomic rail corridors identified that could be closed with little*

*ripple effect to the rest of the network; there are implications for our future funding requirements should we retain the national network in its entirety. Additionally, opportunities were identified to reduce costs and improve productivity to reduce the amount of taxpayer funding required.*

### Next Steps

*After considering the range of options in the Review, the Government signalled a long-term commitment to a national rail network and committed \$400m in funding over the next two years. However, the Government also indicated that KiwiRail must continue to drive significant efficiency and productivity improvements to reduce the level of ongoing taxpayer support required.*

*In line with the findings of the Review, a number of cost-reduction and productivity initiatives have been put in place, and we are already seeing the benefits of those initiatives. KiwiRail is committed to fully engaging with our staff as we continue to improve our productivity and efficiency, and to providing an increasingly high level of service to our passengers and freight customers.*

Winston’s gripe was that KiwiRail would not be renewing a contract for shipping wood chips from a plant near Kawakawa. That implies no rail traffic much beyond Whangarei, but there is still no clear commitment to closure.

Another cut-back might be withdrawing electric locomotives from the central North Island—Hamilton to Palmerston North—and substituting diesels. A recent Official Information Act request drew a “still under investigation”. Three locomotive options were given, but with nothing said about the overhead power supply: -

- Replacement with new, more reliable electric locomotives;
- Refurbishment of the existing locomotives; or
- Replacement with a diesel fleet.

The good news from the Annual Report is that KiwiRail is improving, with more to come.

*While the current outlook for key commodities is challenging, the prospect of bigger ships, more freight hubs and inland ports that connect rail and road, alongside a strong domestic market, all position KiwiRail well for growth.*

- The last timber bridge on the Auckland—Tauranga route has been replaced.
- KiwiRail's 1000<sup>th</sup> new container wagon arrived in 2015. These wagons have a 56 tonne capacity, 30% greater than the wagons they replace.
- New freight hubs ('inland ports'), were opened in Rolleston by Port of Timaru; in Longburn (near Palmerston North) as a joint venture between Ports of Auckland, Napier Port and Icepak, and in Whanganui by Wellington-based CentrePort. More freight hubs are expected in 2016.
- The Interislander carried more than 80% of the Cook Strait freight load (some of this was probably sublet to BlueBridge).
- On the other hand, only 20 kilometres of rail were replaced, on a 4000 kilometre system.

### **Energy efficiency**

The Annual Report includes a dubious-looking energy efficiency claim: -

*Rail accounts for less than 2% of the energy used by the transport sector while completing 16% of the freight task.*

That might not be comparing like-with-like, but it is a lot more credible than the Road Transport Forum's website, which says -

*The latest heavy vehicles have reduced CO<sub>2</sub> emissions by 90%, particulate emissions by 94% and NO<sub>x</sub> by 86% compared to 1990. Overall, a modern truck produces a tenth of the emissions of a truck built in the 1980s.* [See box. Ed]

<http://www.rtfnz.co.nz/transport-facts/environment>

A 2005 study for the Wellington Regional Council found that a train produces 31% more CO<sub>2</sub> than a truck hauling a tonne of freight from Masterton to Wellington and nearly 40% more

between Marton and Wellington and Wanganui and the capital.

Perhaps Greater Wellington should have tried running their train model with a payload of more than one tonne. The Ministry of Transport does not have energy efficiency comparisons between road and rail, but a 2012 MBIE presentation, gives a threefold emissions advantage using rail, or a 66% emissions reduction for freight transferred from road to rail. <http://www.lpga.co.nz/pdfs/12-Energy-in-NewZealand-What-the-Future-May-Hold-Bryan-Field2012.pdf>

KiwiRail's annual report claims a 9% reduction in carbon intensity for freight services since 2010 (improved gross/tare ratio, more efficient locomotives), so the MBIE figure might reasonably be upped to 3.3: a 60% emissions saving. Add to that the benefits of electric locomotives over diesel and the emission-savings of transferring freight from road to rail could be close to 90%.

### **Truck emission reductions**

CO<sub>2</sub> emissions are directly proportional to diesel fuel consumption. Modern diesel engines are more fuel efficient than older engines. So a claim that modern trucks produce 90% of CO<sub>2</sub> of older trucks would be credible. However, a reduction of fuel consumption to 10% of what it was exceeds the bounds of thermodynamic feasibility.

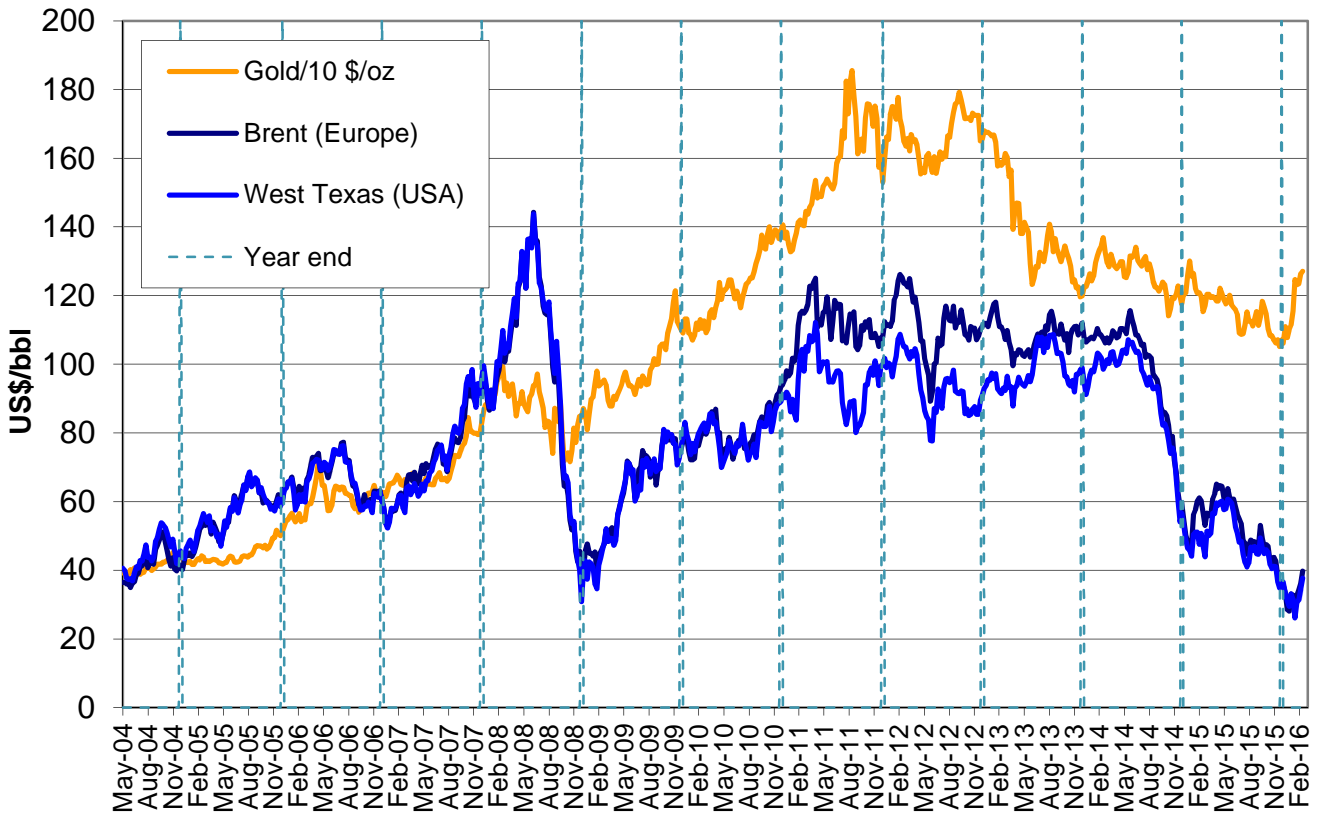
SO<sub>2</sub> emissions from the use of diesel in trucks have also reduced dramatically over recent decades. As far as the truck is concerned sulphur in equals sulphur out. The SO<sub>2</sub> reductions are due to refining improvements in response to tightening transport fuel specification regulations.

Particulate emissions relate to unburned fuel. As engines age unburned fuel increases due to wear. So a 1980's truck will have worse emissions than a new truck, if both are measured today.

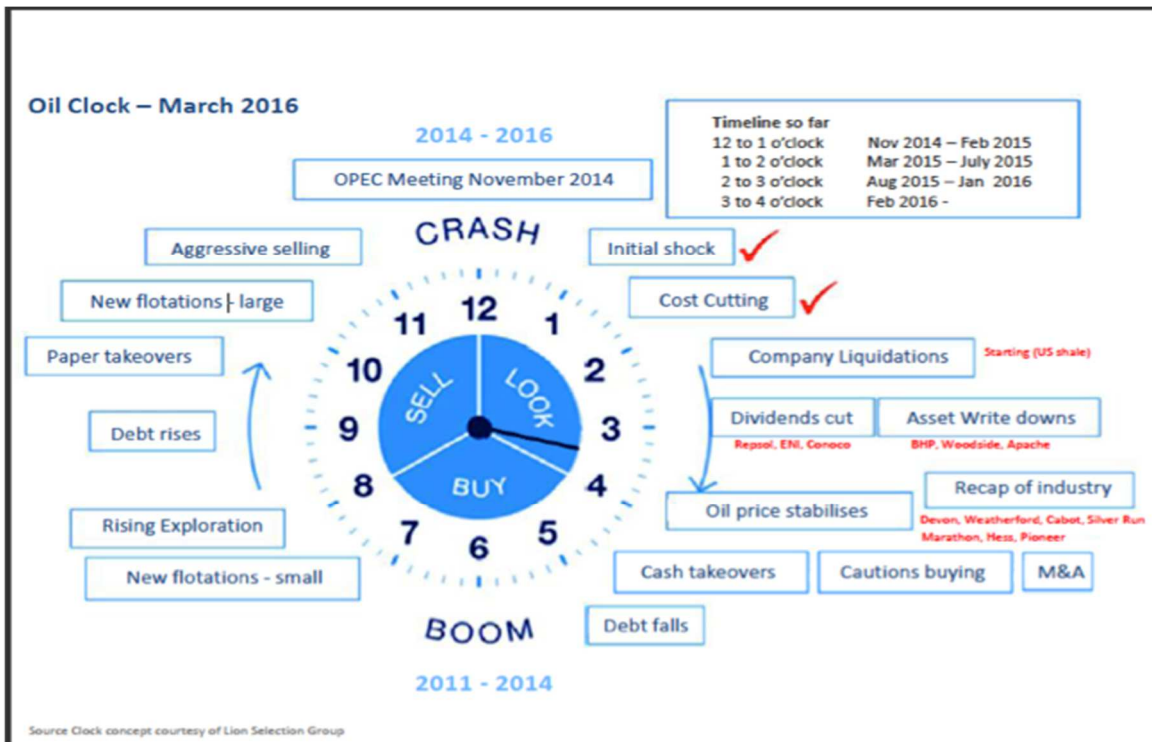
NO<sub>x</sub> emissions relate to the temperature profile of the air (N<sub>2</sub>+O<sub>2</sub>) going through the engine. The peak engine temperature could have been reduced, but fair comparison is tricky. *Editor*

# Neil's Oil Price Chart

Historical oil price variation vs gold price



The recent rally in oil prices matches a recent rally in the gold price, indicating that the reason is financial. The diagram below was circulated on Tag Oil eNews (March 2016) to reassure investors that the current oil price woes are just a part of the cyclical nature the oil business. In contrast, investment advisor Keith Shaeffer in his Oil and Gas Investment Bulletin blog is now suggesting that investors wanting to make a fortune in energy look away from the oil game and explore alternative energy schemes, notably solar PV.



## Join our sustainable energy news & discussion group

SEF Membership provides a copy of our quarterly EnergyWatch magazine. In addition, many members find the SEFnews email news and discussion facility an easy way to keep up to date with news as it happens and views of members. The discussion by the group of sustainable energy “experts” who have joined the SEFnews service offers an interesting perspective.

Non-members are invited to join the SEFnews email news service for a trial. To do this send a blank email to: <SEFnews-subscribe@yahoogroups.com>. To help us stop spammers, non-members need to supply a name and contact details, and a brief statement of their interest and/or involvement in sustainable energy issues, before their trial is approved.

As with all Yahoo groups, SEFnews emails can be received “individually” (as they are sent) or as a “daily digest” (grouped into one email per day). If you have a Yahoo ID you can also switch emails on and off, or read the news on the web – a handy option for travelling Kiwis. YahooGroups saves all of our text emails for later reference, and there is a search function so that you can review the thousands already stored over the last 6 years.

Some busy people using a work address prefer to use the Rules function in their email software to automatically save SEFnews emails to a separate folder for later reading. If you do not want a Yahoo ID, the administrator <office@sef.org.nz> can select the ‘daily-digest’ option for you.

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### Contributions Welcomed

Readers are invited to submit material for consideration for publication.

Contributions can be either in the form of Letters to the Editor or short articles addressing any energy-related matter (and especially on any topics which have recently been covered in EnergyWatch or SEFnews).

Material can be sent to the SEF Office, PO Box 11-152, Wellington 6142, or by email to [editor@sef.org.nz](mailto:editor@sef.org.nz), or by directly contacting the editor, Steve Goldthorpe, at PO Box 96, Waipu 0545.

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