EnergyWatch

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EDITORIAL

The opportunity for a change in energy policy direction?

The people of New Zealand are faced with a stark choice at the forthcoming election. Voters can choose business-as-usual led by a Government that thinks it knows what is best for New Zealand by setting targets as low as possible. Or they could set the scene for a battle-royal between an inexperienced new composite Government and an entrenched self-interested energy sector. Either way, the loser is likely to be the climate.

In this issue of EnergyWatch we revisit several energy policy issues in the hope that, at least during the current election season, the future Government of New Zealand will be more open for input than has been the case in recent years.

Energy policy, and its relationship with climate change policy, is a complex issue for election campaigns, which work in sound bites. The National party would continue with business-as-usual. The announced Labour Party policies are currently vague on the details of energy policy. NZ First aim to renationalise the electricity industry and control the oil industry. The Green Party has a similar policy, and has published a detailed policy statement, which is included here. Other parties' energy policies are variants of these.

This issue starts with further development of ten key sustainable energy issues for New Zealand

- Need to focus on real electric trolleys and trains instead of EV distractions
- Serious fuel economy focus & multiple RUC Rates under 3.5 tonnes
- Ending crony-capitalist 'Electricity Market' and unfit for purpose regulators
- Ending NZ Greenhouse Gas 'Targets' that involve no actual mitigation
- After 21 Years, it is well past time to fully revisit EE levels in the Building Code
- Time to ban coal use for commercial and industrial use
- Still ignored wood burner potentials
- Need real support for solar hot water
- Let's stop looking for more unburnable oil
- Still all the urban sprawl and motorways the millennials don't want

One high-profile Government campaign is attempting to sell the idea of electric vehicles to the NZ public. Conversion to 100% battery electric vehicles (BEVs) would help switch the transport sector from fossil fuel to renewable electricity. However, BEVs compare poorly with conventional cars for range, and re-fuelling convenience, and their current promotion by the motor trade and availability on the market is invisible. In contrast, plug-in hybrid electric vehicles (PHEVs) solve the range and availability issues, but compromise the transition from fossil fuels to renewable electricity. In the USA, car manufacturers are including just enough plug-in battery capacity into their hybrids to qualify for EV concessions. For both BEVs and PHEVs the cost savings for buyers of retail electricity are grossly exaggerated and there will be taxation problems in the NZ regimes.

Electrification of other transport in NZ is taking a backward step with the decision by KiwiRail to abandon the electric locomotives in use on part of the NIMT. Also, the planned removal of the trolley buses from Wellington will result in the demise of infrastructure for electric transport which will work against NZ's long-term CO_2 emission aspirations. The KiwiRail decision is the result of comprehensive economic analysis. The trolley bus decision is not.

In this issue Molly addresses the on-going electricity pricing controversies of transmission pricing, solar tax and low-fixed charges. These issues most starkly reflect the difference in political policy direction between the National Party and all the opposing political parties. After three terms of business-led government in New Zealand the crony capitalism philosophy has become entrenched in the electricity industry. Serving the needs of the people and responding to changes in the real-world economics of renewable energy technologies are subjugated to the market place mentality that the value of a commodity or service can be determined solely by market principles. The theory that market competition will achieve lowest prices fails when applied to a universal essential service like electricity supply.

The Government put out a Replacement Energy Efficiency and Conservation Strategy for consultation earlier this year, to which SEF responded. The so-called strategy is little more than a statement of business-as-usual with efficiency improvements only being those which evolve naturally as technologies develop. If reductions in CO_2 emission intensity only match growth in population and activity then actual emissions won't change. Hence NZ's aspirational long-term climate change response won't happen.

As usual, this issue Energy Watch finishes with a look at the global oil scene.

I look forward to meeting as many of you as possible at the **SEF AGM and forum in Wellington on July 27th at 5.00.p.m.**

. *Steve Goldthorpe*

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TEN KEY SUSTAINABLE ENERGY ISSUES FOR NEW ZEALAND

By Frank Pool

Frank is not afraid to call a spade a spade in this review of key sustainability issues for NZ in 2017. Forget the Business-As-Usual do-nothing new National Energy Efficiency and Conservation Strategy (NEECS) just released by MBIE, real action is needed, as follows:

1. Need to Focus on Real Electric Trolleys and Trains Instead of EV Distractions

- Real, existing electric transport options of Wellington trolley buses, and North Island Main Trunk (NIMT) electric trains are being replaced with diesel buses and trains. As usual, the lowest initial capital cost trumps sustainability, with no joined-up thinking on reducing NZ's Greenhouse Gas (GHG) emissions.
- The all-new first-in-the world Wrightspeed hybrid diesel electric buses that are to replace the Wellington trolley buses are already one year late, no one has yet driven one on a real route in hilly Wellington, and no one knows what their real maintenance costs will be over a 30-year lifetime. The Wrightspeed uses a diesel burning micro-turbine. Micro-turbines intrinsically guzzle diesel compared to diesel internal combustion engines for mechanical-electrical drives, that is why the Capstone micro turbines promoted with such fanfare in the 1990s are no longer promoted for building and vehicle power-only applications. The use of Wrightspeed for Wellington buses is a disaster-in-waiting.
- Once the trolley bus overhead wires in Wellington are removed and the NIMT electrification infrastructure is allowed to rust from disuse, they will be too expensive to reinstate in the future.
- EECA and the electricity industry keeps lying (Trump-style 'alternative facts') that EV's cost the equivalent of petrol at 30 cents per litre. It is actually about $1.05 per litre of petrol equivalent for the average NZ domestic electricity customer. (See page 8)
- With RUCs, EVS will only attract people who want to look Green and burn off expensive Porsches and Mercedes from the traffic lights.
- EVs cost much more to buy than an equivalent petrol car, have less range, and are slower to recharge/refuel.
- EVs will cost more to buy than petrol cars for at least the next 5-10 years.
- EVs swap a 10-year life battery for a 30-year life petrol/diesel internal combustion engine (ICE) drivetrain (engine and transmission). Modern ICE drivetrains now last longer than vehicle are used in NZ.
- ICE drivetrain annual maintenance costs are similar to EV annualised 10-year battery replacement costs. All other vehicle parts (electric heater/AC, power steering, brakes, window wipers, tyres, bodywork, glass and mirrors, etc) are the same between EV and ICE vehicles. So, ICE and EVs have similar overall maintenance costs.
- World oil demand is flattening, we cannot just assume that oil prices will increase again into the future to make EVs more economic.
- There is no need for NZ to give any special support to EVs. They will naturally find market niches when their cost and convenience is similar to an efficient ICE vehicle and once RUCs are reformed to make EVs and diesel cars pay a fair share of their use-of-road costs.
- EV costs will drop over time due to rising overall world demand, not from a few extra thousand EVs sold in NZ. So, any, even modest, public money spent supporting EVs for the rich in NZ is money that should be spent instead on real electric transport options like new Wellington trolley buses, new electric locos for NIMT freight, and extensions of NIMT electrification to Whangarei and Tauranga ports and into Wellington from the current NIMT end in Palmerston North.

2. Need Serious Vehicle Fuel Economy Focus & Multiple RUC Rates under 3.5 tonnes

- Car importers are not bringing in their most fuel-efficient vehicle options, as there is a lack of

recognition and demand for such fuel-efficient vehicles in NZ.

- Fuel efficient small diesels with their 25% fuel efficient gains over petrol vehicles are being killed off in NZ by a single RUC rate for all vehicles under 3.5 tonnes.
- Lighter weight (1000 – 1500kg) diesels now pay more than their fair share of road costs, so they are uneconomic. NZ then misses out on light diesel's 25% lower GHG emissions than equivalent petrol-engine cars.
- If EVs have to pay road user charges of 6.2 cents/km they will cost more to run with actual retail NZ electricity than fuel efficient petrol cars. Pure-EV sales would then plunge.
- NZ needs a reformed RUC regime to let EVs and lighter weight diesels pay a fair share of their road maintenance costs and compete on a level playing field with petrol vehicles.

3. End Crony-Capitalist 'Electricity Market' and Unfit for Purpose 'Regulators'

- It is clearly not a 'competitive market', nor managed by credible public interest focussed regulators in NZ, when residential prices keep going up while demand goes down.
- Current market regulators are clearly not fit for purpose when they allow lines companies to put up fixed charges for Green or cost-conscious customers who dare to fit PV on their own premises. What householders do on their own property with PVs, SWHs, insulation, wood-burners, using gas, EE appliances, etc. is clearly none of the lines companies' damn business.
- The electricity industry agitation for higher fixed charges will incentivise customers to abandon the grid altogether, thus weakening the security of supply of an essential service to most New Zealanders who stay on the grid.
- PV and battery storage costs are clearly going to continue to decrease, so customer grid abandonment will then lead to a death spiral for lines companies. Fixed charges would have to be set to nearly zero to avoid this. So, lines company asset valuations will have to take a drastic haircut. It's just a question of when and how many customers abandon the grid first, never to return.
- The massive 13% grid electricity supply glut when the 47-years old Tiwai Point smelter inevitably closes will only make the failure of the 'electricity market' and its crony capitalist 'regulation' even more apparent.
- 30 years of ongoing ideological **unquestioning 'electricity market' groupthink** by National and Labour will not be fixed overnight. Key National and Labour politicians are an intrinsic part of the problem. The Greens are so desperate to appear non-threatening to middle-NZ that their relevant policies are tinkering around the edges. They do not dare say that the 'electricity market' failures are hard-wired into its fundamental philosophy.
- The whole idea of a competitive "electricity market" needs a complete rethink, along with the NZ "electricity market" regulatory architecture. It is clearly "not fit for purpose" to protect customers from a rapacious electricity industry and a government with mixed motives to protect its income from Transpower and the its ownership in 3 out of NZ's 4½ generator/retailers.

4. Ending NZ Greenhouse Gas 'Targets' that Involve no Actual NZ Mitigation

- NZ's international GHG targets to 2020 basically involve the massive use of environmentally useless 'Ukrainian Hot Air' units at a few cents per unit. These were surrendered in the NZ ETS by 2015, while firms banked their NZ Units, which are more real, as they have no expiry date. That is a rort.
- The NZ GHG '2020 reduction target' is therefore meaningless. It does involve any real GHG reductions anywhere in the world.
- NZ's current GHG target does not involve NZ actually doing anything real over business-as-usual (BAU) and relies on some, yet to be defined, future overseas carbon credits. That is deja vu 'Ukrainian Hot Air' all over again.
- After 30 years of GHG targets with no specific policies, budgets or real implementation, it is time NZ actually did some real things with a real GHG impact to reduce its NZ GHG emissions and to create a pathway for on-going actual NZ CO_2 emission reductions.

5. After 21 Years, Its Well Past Time to Fully Revisit EE Levels in the Building Code

- The current energy efficiency (Clause H1) technical provisions in the NZ Building Code were finalised in 1996, with only minor changes made since then.
- It is still acceptable under the Building Code to use NZ 1970's technology of basic double-glazed windows in uninsulated aluminium frames with a derisory overall R-value of 0.26.
- Conventional low-e, argon filled uPVC or wooden framed windows now cost only about 10% more and have an R-value of about 0.45.
- Windows are already available in NZ with an R-value of 0.8, that meet the European Minimum Window Insulation Requirement.
- Ceiling, wall and floor insulation is now available that comfortably exceeds NZ Building Code Clause H1 EE requirements.
- All concrete slab floors should be required to have perimeter insulation to stop heat loss from their edges.
- So, it is now quite easy to halve the heat loss of new or retrofit housing in NZ over the current 21-year-old Clause H1 provisions – at a low cost to house buyers and renters.
- This would reduce purchased house energy use by about 25%, improve indoor temperatures for huge gains in occupant health, and dramatically reduce fuel poverty.
- It is therefore well overdue seriously to review the 1993-1996 technical work that is still behind the NZ Building Code Clause H1 EE levels used in NZ.

6. Time to Ban Coal Use for Commercial and industrial Use

- There is plenty of minimal GHG impact wood waste available throughout NZ. There is no need to burn the highest GHG emitting fuel (coal) to heat hospitals or dry liquid milk.
- Banning coal will cost a modest amount, hospitals will not close and Fonterra will not go bankrupt if they burn wood instead of coal.

7. Still Ignored Wood Burner Potentials

- NZ has a massive unused firewood potential, which is unappreciated because it is not properly counted in 'commercial energy' statistics, and because the Bioenergy Association (BA) focuses on its membership's key commercial and industrial sector bioenergy use, not on firewood for domestic heating uses supplied by dispersed and often informal suppliers, not BA members.
- Firewood is traditionally delivered not fully dry. In open fires and old crude wood-burner designs this causes high local pollution and hence a strong reaction against wood burning. Enclosed fuel hopper can address that issue.
- Wood burners using the downdraft principle with an enclosed fuel hopper can give low pollution levels, but are not yet certified for use or widely known to potential buyers (see page 17).
- Ultra-Low emission (wood/pellet) Burners" (ULEB) are now commercially available in NZ and certified for use (with some limitations on numbers in particular air sheds) in Nelson[1] and anywhere in Canterbury with no age restriction[2]. There are seven different wood fuelled ULEB models from six different suppliers authorised for use, including one model with a wetback for heating hot water. There are nine authorised pellet fuelled ULEB models for Canterbury and many more pellet ULEB models authorised for use in Nelson.
- Wood-burners also have value in reducing electricity system peaks on the coldest days.
- Wood burners also give dry year electricity supply support and natural disaster resilience.

8. Need Real Support for Solar Hot Water

- Solar Water Heaters (SWHs) are a very mature technology. 67 million m^2 was installed worldwide in 2014; i.e. 47 GW_{th}. There are 101 million systems worldwide and the SWH industry employs 730,000 people worldwide.
- Austria, with a colder climate than NZ, has the highest use of SWHs per capita worldwide, with 3,616 MW_{th} installed for a population twice that of NZ. NZ has only 112 MW_{th} of SWHs installed.

[1] http://nelson.govt.nz/environment/air-quality/approved-burners/ultra-low-emission-burners-ulebs

[2] https://www.ecan.govt.nz/data/authorised-burners/

- There is no good technical reason why NZ could not have 10-15 times the SWHs installed than it has now using cheaper good quality Chinese SWHs compared to the expensive European SWHs used in Austria.
- So, properly designed and implemented SWH policies like in Austria matter and work.
- SWH are widely applicable to NZ houses and apartments.
- SWHs produce as much usable renewable energy worldwide as PV and geothermal combined.
- China produces around 90% of global SWHs[3].
- Good quality affordable SWH units are already being imported into NZ from China.
- China has a similar range of climates to NZ, so appropriate Chinese SWHs are directly applicable in NZ.
- Traditional flat plate thermosyphon tank-on-roof systems work fine, but are expensive. Evacuated tube thermosyphon systems cost less, but for both types the weight of the hot water tank on the roof can lead to structural issues on kiwi homes.
- Evacuated tube systems account for 71% of new SWH worldwide and are the main systems produced in China[1].
- The minimal extra weight on a roof with pumped heat pipe evacuated tube systems, means that they can enjoy simplified building consents.
- The details of plumbing of SWH are beyond most NZ plumbers, because it involves an understanding of complex hot water control dynamics in addition to avoiding leaks and excessive hot water temperatures.
- High wholesale and retail margins, plumbers who don't understand SWH intricacies, anti-SWH 'alternative facts" by PCE, EECA and Consumer, and the need for resource consents, are major SWH constraints in NZ.
- Need to identify and focus on 'killer applications' e.g. mass new house builds to lower costs through economies of scale and building plumber capacity starting with standard mass market applications.
- We now need to address real SWH market, plumbing and regulatory barriers. A new version of the previous incompetent EECA SWH policy is not needed. We need to do any SWH support right or leave the existing SWH market in NZ well alone.

9. Let's Stop Looking for More Unburnable Oil

- The National party's energy policy is similar to the US Trump Administration's dinosaur energy policy, i.e. "let's ignore climate change and look for and develop more unburnable fossil fuel that was created in the dinosaur era".
- Draconian anti-protest legislation has been rammed through the NZ parliament to protect offshore oil exploration and drilling.
- No technology is available to cap any deep water well blowouts.
- The world already has discovered more oil than can be safely burned, so there is just no point in NZ trying to find more expensive unusable oil fields.

10. Still All the Urban Sprawl and Motorways Millennials Don't Want

- Like the US and Australia, NZ already has a huge stock of 'suburbs of nowhere' sprawling housing, which are places where Millennials do not want to live.
- Low-density suburban sprawl is costly and inefficient to serve by public transport.
- Millennials want walkable neighbourhoods and good public transport, not sprawl and complete car dependency, even if it's an EV or an Uber car.
- National/Labour policies boosting new house construction still focus on more housing sprawl served by ever more motorways.
- Once sprawl is built, NZ is stuck with it for the next 100 years, (apart from that which is built on flat coastal plains where it will be washed away by rising sea levels), and with the high cost and isolation via the motor vehicle that it inevitably requires.

Frank Pool

[3] https://www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2013.pdf

When is an EV not an EV? When it is a PHEV.

By Steve Goldthorpe

Plug-in hybrid electric vehicles (PHEVs) are a new departure in motor vehicle technology. They are dual-fuel vehicles. That is problematic for vehicle taxation and it weakens the CO_2 emission benefits of electrification of the small vehicle sector of land transport.

Motor vehicle taxation, to pay for the roads that the vehicles use, is structured around vehicles having a single energy source. For vehicles using petrol, taxation is via excise duty. All other vehicles are taxed via the Road User Charge (RUC), which is related to the distance travelled and the weight of the vehicle. It is intended to add EVs into the RUC mechanism from 2021 or when their market penetration exceeds 2%.

The definition of EVs in the Government's EV Programme includes PHEVs. PHEVs with petrol engines could then be double-taxed with both a distance related RUC and a fuel-related excise duty on their use of petrol. This taxation problem with dual-fuel PHEVs might be resolved by

a) Abandoning excise duty on petrol and applying the RUC methodology to all road vehicles. However, that major change in vehicle taxation, would require a restructuring of the low end of the RUC vehicle weight range, in which cars are taxed as small trucks at the "less than 3.5 tonne" RUC rate; or
b) There could be a system of rebating excise duty paid on petrol bought for a PHEV on which the RUC has been paid. That regime could be administratively complex.

It will be difficult to devise a simple taxation system for PHEVs that also incentivises maximising their use of electricity.

An analysis of the cost of operating an EV, based on buying electricity at retail rates (see box – The 30c/litre myth) indicates that the cost of charging an EV can be 3.5 times greater than claimed by EECA. This analysis concludes that when an RUC is introduced on BEVs there could be no running cost savings to offset the higher purchase price and inconvenience (limited range and long recharging periods) of a BEV. Accordingly, the contribution of BEVs to the planned annual doubling of EVS (BEVs plus PHEVs) in the NZ transport fleet is likely to be small.

In contrast, dual-fuel PHEV's, which are favoured by users, and by the motor trade, can provide all the convenience and flexibility of a conventional car, whilst also giving the owner the opportunity to avoid excise duty by using electricity as the fuel source for the first 30-80 km of driving each day. The PHEV owner can feel virtuous by using some renewable energy in their car and can take advantage of traffic management and taxation concessions for EVs. Accordingly, contribution of PHEVs to the desired annual doubling of EVs in the NZ transport fleet is likely to dominate.

The ratio of electricity to petrol used in a PHEV depends on the use and on the user. If the car is only used for short journeys each day, and is religiously recharged every night, then 100% electricity use is possible. However, a long-distance road trip using the full range of a PHEV would use electricity for less than 10% of the trip.

In a real-world situation, a PHEV owner may achieve 50% electric vehicle mode. If the car is driven 20,000 km per year, then the annual running cost saving could be about $500 prior to the introduction of the RUC. If a PHEV costs $5,000 more than a comparable petrol hybrid car then the simple pay-back period on the additional investment would be 10 years without RUC, and longer than the vehicle life with RUC.

One objective of the Government's EV programme is to reduce fossil fuel use in the transport sector and thereby contribute to meeting New Zealand's Greenhouse Gas emission reduction obligations. If the EV fleet is dominated by PHEV's and does not transition to BEV's, over time that objective will be compromised and the uptake of EVs may fade when the RUC is applied. The incentive for PHEV owners to maximise their use of electricity is weak and dependent on the taxation regime.

The 30c per litre myth

EECA's Energywise website claims that the cost of charging an EV is *"equivalent to 30c per litre"*. That claim is repeated on the Mercury Energy EV webpage. How is that figure calculated? Perhaps on generation costs rather than retail prices? The following analysis indicates that charging an EV with retail electricity could cost the equivalent of $1.05 per litre of petrol rather than the claimed 30 cents.

The average marginal cost of a kWh of retail electricity in NZ is 29c/kWh (MBIE Nov 2016; incl. GST and discounts). The marginal cost of a kWh of electricity for a Northland consumer is 32c/kWh from Mercury with a low daily charge or 25c/kWh from Contact or Meridian with a high daily charge. So 30c buys about 1 kWh of retail electricity in NZ. On that basis, the Energywise claim is effectively saying that one kWh (3.6 MJ) of electricity used in an EV does the same job as one litre of petrol (32 MJ net) used in a conventional car. That is not so. The overall energy efficiency of an electric vehicle is only about 2.5 times that of a vehicle powered by an internal combustion engine.

The USEPA publishes[4] comparative fuel consumption data for thousands of cars. For mass-produced (>10,000 sold) battery electric vehicles (BEVs) the rated performance (combined city and highway) ranges from 72 (Chinese BYD e6) to 124 (European BMW 3i) miles per US-gallon-equivalent. Weighted by sales, that converts to 5.3 km per kWh of electricity. At 30c per kWh, the average BEV cost would be 5.7 c/km. Compared with a Prius using 5.4 litres per 100km, the BEV fuel cost would be equivalent to $1.05/litre.

The USEPA data for plug-in hybrid electric vehicles (PHEVs) provides direct comparisons of the consumption of electricity and petrol in the same vehicle. For mass-produced PHEVs, the rated performances range from 28/76 (petrol/electricity for a BMW i8) to 42/106 (Chevrolet Volt) miles per US-gallon-equivalent. The weighted average for the mass-produced PHEVs in the USEPA database converts to 4.9 km per kWh of electricity and 17.1 km per litre of petrol. Therefore, real-world PHEV data indicates that 1 litre of petrol does the same job as 3.5 kWh of electricity. At 30 c/kWh for electricity, charging a PHEV is again equivalent to $1.05 per litre of petrol; i.e. 6.2 c/km.

If petrol costs $1.90/litre, then running a typical PHEV on petrol would cost 11.1 c/km. However, 40% of petrol cost is excise duty intended to pay for the roads. If PHEV's were to be levied with the Road User Charge and refunded the petrol excise duty, then the net fuel cost of 6.6c/km on petrol would only leave a small incentive to compensate for the inconvenience using a PHEV in electric mode.

At present, there is no time-of day pricing available on the mainstream electricity retail market. If such pricing mechanisms evolve in the future then charging an EV at night on lower cost electricity (say 20c/kWh) would provide an economic incentive for EV ownership. However, that regime would further limit the utility of an EV by denying the user the flexibility to recharge the car batterie after getting home from work before going out in the evening.

Notwithstanding the foregoing analysis, the integration of a BEV, or a PHEV, with a domestic rooftop PV system makes good economic sense from the operating cost perspective, particularly if the car is usually parked at home during daylight hours for direct charging. However, the overall economic merits of integrating domestic PV with EVs would then depend on capital investment considerations.

Improved flexibility and direct car battery charging for at least part of the energy needs might be achieved by mounting PV panels on the roof of the car. (See article "Too good to be true? See Page 9).

[4] http://www.fueleconomy.gov/feg/pdfs/guides/FEG2017.pdf

TOO GOOD TO BE TRUE?

By Steve Goldthorpe

The saying goes: "If something sounds too good to be true then it probably is". However, my usual scepticism about radical technology advances has been challenged by claims of a photovoltaic (PV) medium with greatly improved performance. The promoter of this energy investment opportunity is the writer of Oilprice.com, who says *"Owners of energy stocks should pay attention to this breaking news story as the entire energy sector is about to change forever"*. Those guys are pretty astute and usually don't make wild unsubstantiated claims.

The story concerns the discovery of a crystal structure that acts as a PV energy capture medium with a claimed 50% solar energy capture rate instead of the current 20% solar to electricity conversion rate from conventional silicon PV cells. The best available achieve 26% compared to their theoretical limit of 29%. In addition, the claimed manufacture is based on wet chemistry, which should be much cheaper than silicon processing and the PV is not limited to flat plates. It sounds too good to be true. It is certainly a bold claim, as the best NREL proven [5] organic chemistry PV conversion efficiencies are around 10% and this has not increased in the last 20 years. The "What?" and "Where?" of the claimed PV breakthrough are, of course, closely guarded secrets, if they really exist at all.

Suspending incredulity for the specific claimed breakthrough for a minute, consider the following self-charging PV vehicle order-of-magnitude scenario. The highest conversion efficiency PV research cells available today are 46%. An EV with 2.5 m^2 of PV on its roof, which captures 46% of incident solar energy at an annual average (24-7) insolation rate of 350 W/m^2, could directly charge the EV battery with 3,500 kWh/yr. If the EV performance is 6 km/kWh, then the solar energy input alone would provide sufficient energy for about 20,000 km per year of vehicle use; i.e. sufficient mileage for typical personal car use. It could always be supplemented by purchased electricity if necessary.

Coming back to the real world, one could use real world commercially available 25% conversion efficiency solar cells and 5 m^2 of cells covering the whole vehicle. So, PV + Battery self-charging vehicles, completely independent of any external commercial energy supply systems, are ultimately possible. There is good reason for owners of energy stocks and retailers of energy to be concerned. *Steve Goldthorpe*

This is no-longer fantasy. The Stella Vie, touted as the world's first solar-powered family car, has just been unveiled in the Netherlands. The award-winning fully solar vehicle is the brainchild of Lightyear, Eindhoven University of Technology's "solar team.", who have plans for commercialisation of this concept car.[6]

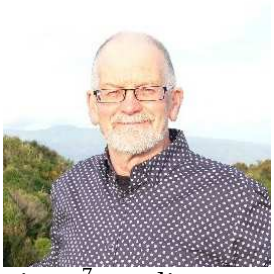
Frank Pool comments: "*This is yet another reason to doubt the long-term dream of the electricity grid incumbency that the ultimate uptake of mass market plug-in EVs will lead to a continuing nice high government income from the government's Transpower "asset value", and an on-going excessive income from local grid ODV fantasy "asset values" that bear no relation to their actual depreciated asset costs.*

[5] https://www.nrel.gov/pv/assets/images/efficiency-chart.png

[6] https://www.stuff.co.nz/motoring/news/94496635/solarpowered-family-car-revealed

Retention of our zero-emission trolley buses is a political issue

By Paul Bruce
Former Greater Wellington Regional Councillor



The apparent lack of any rigorous analysis/business case for trolley is a scandal. The European Trolley Project [7] outlines a straightforward and rigorous way of analysing the cost/benefit of trolley vs diesel, and concludes that, even without existing infrastructure, trolley is cheaper than diesel if a route has buses more than every 5 minutes, which the Golden Mile in Wellington certainly does.

GWRC's publicly stated goal is an all-electric bus fleet. It follows that the council make an objective assessment of the trolley buses contribution to city transport needs and environmental impact.

The Sustainable Transport Committee on 21st March heard our request that a Business Case[8] be carried out for Wellington's trolley bus network, as the Council had at no time during the process, done this. The petition was supported by the Civic Trust, Sustainable Energy Forum, Living Streets Aotearoa, FIT, Save the Basin, OraTaiao and Dr Susan Krumdieck.

Despite discussion and some Councillor support, the response through the Chief Executive was to reaffirm the decision to not renew the trolley contracts on 30 June, apart from short term extensions to aid transition to a new fleet.

We are deeply saddened by Regional Council's unwillingness to assess objectively the value of Trolley Buses, and also the lack of transparency by the Chair maintaining progress towards a low emission fleet.

Congestion Free Wellington (CFW) held its first public meeting on 25th May, with strong support for the extension of our 100% clean and zero emission trolley buses on the east/west route at least until 2025, or when light rail should be commissioned.

The newly elected Wellington City Council transport portfolio chair Chris Calvi-Freeman, also put the arguments for concentrating the trolleys on the new e/w routes Karori to Miramar to the Regional Transport Committee. NZ Bus owns the trolley buses and, as the incumbent, is to be awarded the e/w route, where the overhead wiring will remain largely intact. The other trolley routes would be fragmented by the new routes that come into place with contracts in June 2018.

Cr Calvi-Freeman failed to shift the entrenched view of GW transport chair and GWRC managers. Consequently, Mayor Justin Lester of WCC has continued his support for the mixed option of new roads to the airport and a vague commitment to put planning of light rail on the agenda. Light rail takes 10 years to plan. Retaining the trolleys on the e/w route could be a cost effective interim solution.

On 11th July, it was[9] reported that the trolleys were in fact going to be replaced by "old polluting diesels" for eight months or more, while NZ Bus continues to pursue the conversion of the trolley low floor chassis to a hybrid vehicle using Wrightspeed technology, despite major delays.

[7] http://www.trolley-project.eu/fileadmin/user_upload/download/TROLLEY_WP4_Transport_Mode_Efficiency_Analysis_Bus_vs_Trolleybus.pdf

[8] http://paulbruce.co.nz/business-case-for-retention-of-wellingtons-trolley-bus-network/

[9] https://www.stuff.co.nz/national/94500787/auckland-diesel-buses-set-to-replace-wellingtons-electric-trolleys

The Wrightspeed hybrid has been widely promoted as an electric vehicle, but it uses a diesel-fired micro-turbine to charge the battery. Diesel use is modelled by Wrightspeed at 65.75% that of the equivalent new Euro-6 bus. The micro-turbine would provide 89% of the energy needs, the remainder being from overnight charging.

However, this fuel consumption must remain uncertain until tested in service, as it depends on multiple factors such as air conditioning, driver performance and routes. Regional councillors have now been informed that the first bus won't be received by NZ Bus from Wrightspeed until after acceptance testing in November 2017. NZ Bus chief executive Zane Fulljames is reported in the Dominion Post as indicating the company would decide after that whether it would order the buses from Wrightspeed. The intention is to then convert the remaining 57 trolley buses to Wrightspeed technology in time for the new bus contracts which start on 1 July 2018. "There was no telling when, or if, the new buses would be ready to go", Fulljames said.

Wellington City Council (WCC) tender proposal for the removal of the trolley bus wires over the year from November 2017 must surely be put on hold and the business case for trolley buses properly assessed. WCC has ownership of the Trolley Bus overhead electrical network through the Cable Car company.

A letter to the DomPost picked up on the point that Wellington may come to be remembered as the only city to close a trolley bus system after the Paris Agreement on Climate Change.

More than 300 cities around world are operating and expanding trolley bus networks. They are more popular because they are clean, quiet and quick. Lyon, France has new trolley buses, San Francisco and Seattle have large trolley systems and Beijing and Shanghai Beijing are reconverting failed battery buses to trolleys. Other cities such as Zurich and Istanbul, are building trolley buses with new technical developments to improve trolley bus performance.

Scoop looked at what the new tender documents might mean.

"When you look at last week's announcements about new bus contracts, the Tranzit plan[10] is described as building 228 new buses, all of them diesel though with Euro 6 certification…"[11]

Recent revelations relating to filters installed on vehicles, indicated that in the real world, performance was quite different to "in factory". Euro 5 and especially euro 6 filters are expensive to maintain on diesel buses, and the temptation will be to not renew, so that their effectiveness will diminish over time. Euro 6 standards are still unable to remove the very small 2.5-micron particles which are responsible for cancers and respiratory disease leading to the WMO classifying diesel as a class one toxic carcinogenic equal to asbestos. GWRC rejected our proposal for spot air quality tests in bus contracts. Thus, there will be a jump in both greenhouse emissions and in particulates with more diesels on the golden mile.

Trolley buses are quiet, have higher passenger capacity and the existing low floor chassis are well liked by mothers with buggies, the elderly and disabled. Most importantly, they are zero emission vehicles.

Given that Piatra Neat in Romania reversed their closure decision in April this year after political troubles and protests and other cities of similar size such as Cagliari are introducing modern Solaris T12 trolley buses with much fanfare, Greater Wellington Regional Council should take heed, and have a proper look at the Business Case for expanding and modernising the present trolley fleet.

The removal of the overhead trolley bus power supply must be put on hold while the business case for a modern trolley bus is considered.

Paul Bruce

[10] http://wellington.scoop.co.nz/?p=99261

[11] http://wellington.scoop.co.nz/?p=99368#more-99368

CFW position

1: Injunction to maintain overhead and power supply infrastructure on east/west route for two years

2: Judicial review of decision to remove trolley bus network

3: Extend life of trolley buses on east/west route

4: Investigate business case for trolley buses as connectors to light rail hubs, if and when light rail is introduced

5: Remove road tax on all electric public transport

Wrightspeed technology

By Steve Goldthorpe

The Wrightspeed technology [12] has been developed for the urban large vehicle market where frequent stops and starts are required; such as refuse collection duties. It is aimed at replacing conventional diesel-powered vehicles primarily in that application.

Ian Wright, CEO of Wrightspeed Inc., at the Alameda, California factory

The Wrightspeed drive-train technology is based on an all-electric battery-powered drive train with almost all its energy source coming from an on-board constant-speed micro-turbine battery charger running on gas-oil (diesel).

The micro-turbine's mechanical energy output will be converted to electrical energy in a generator, then converted to stored chemical energy in the battery; then back to electrical energy and then back to mechanical energy via the drive motors. There will be compounding thermodynamic energy losses at each energy conversion step. Therefore, the micro-turbine would need to substantially more thermally efficient than a direct drive diesel engine, if there is to be a diesel fuel saving compared with a conventional hybrid Euro-6 diesel bus.

However, a comparable micro-turbine developed by Capstone in the 1990's had a thermal efficiency of about 30% at constant speed, which compares poorly with a modern diesel engine.

The claim of one third less fuel consumption than an equivalent Euro-6 bus must be due to the benefits of hybrid technology with regenerative braking in the battery-enabled bus, compared with a non-hybrid Euro-6 diesel bus. A better comparison would be with a hybrid diesel bus. Wellington's taxi drivers will affirm the benefits of hybrid energy recovery systems in hilly terrain.

Another question is how the micro-turbine's hot exhaust compares with a Euro-6 Diesel as far as air discharge emissions are concerned.

Steve Goldthorpe

Low-end torque in practice

When I was in Lausanne, Switzerland last year, I travelled on the urban electric light rail system. The station, where I boarded the train for my daily commute, was built on an 11.5% slope because that was the inclination of the rail line. In the rush hour, we were packed into the train like sardines with most people standing. When the train started off it was essential to hold a grab rail to avoid falling into fellow passengers as the train accelerated fiercely from a standing start uphill with that massive load. The low-end torque of that electric drive system was phenomenal; far greater than anything that could be achieved with a diesel internal combustion engine.

Editor

[12] http://www.wrightspeed.com/

DE-ELECTRIFICATION OF THE KIWIRAIL NIMT

The following letter was sent from Hon Simon Bridges to John Irving on 3rd July. An identical letter was sent to Kerry Wood on 4th July.

Dear John,

Thank you for your email of 17 May 2017 regarding KiwiRail's decision to replace electric locomotives with diesel locomotives on part of the North Island Main Trunk Line (NIMT).

As a State-Owned Enterprise, which owns and operates New Zealand's rail network, it is KiwiRail's responsibility to make decisions on operational matters regarding its infrastructure and locomotives. The government will not be undertaking an independent review of the decision made by the KiwiRail board.

The electric fleet the currently operates on part of the NMIT is ageing and replacements are required to make freight services more reliable and efficient. KiwiRail considered replacing the electric locomotives with a now or refurbished electric fleet, but these options could not be justified because of the associated risks and costs.

KiwiRail considers that the replacement of the electric locomotive fleet was critical for improving reliability to encourage more transportation of freight by rail. The latest diesel locomotives are more powerful and reliable than earlier models and have been found to outperform their electric counterparts.

KiwiRail advised me it made the decision to replace the locomotives after nearly two years of internal and external reviews over this time, which played an important role in ensuring that KiwiRail made the right decision.

I understand that the documents KiwiRail recently released were written a year before the final decision was made, and were based on information available at the time. As consultation and information progressed over the two years, the final costings and conclusions were very different to those in the initial reviews.

The Better Business Case the informed the final decision was completed in December 2016 and can be found on KiwiRail's website [13]

It concluded that the diesel option was 30 percent more cost effective over the lifetime of the locomotives.

KiwiRail made this decision because it believes the shift to a single fleet is the best way to improve reliability and efficiency for its customers and to boost the benefits of rail for New Zealand. It estimates that every tonne of freight moved by rail delivers a 66 percent reduction in carbon emissions from road, even when the locomotives doing the hauling are diesel.

KiwiRail will not be removing the infrastructure required for electric trains on the NIMT. Retaining this infrastructure leaves the way open for future use if required.

The Government wants to see New Zealand's rail network on a longer-term sustainable footing. We believe the best way to achieve this is through smart investment to ensure New Zealand's rail infrastructure is both resilient and reliable.

On 25 May 2017, the Government announced that it will invest $548 million in new capital funding to maintain and upgrade New Zealand's rail network. This funding recognises the key role that rail plays in supporting New Zealand's economic growth and we will continue to make significant investment in the New Zealand rail system because of the clear economic, social and environmental benefits.

The Government has invested over $4.2 billion in rail since taking office in 2008 and this further large investment in New Zealand's rail network

[13] www.kiwirail.co.nz/uploads/Publications/Better%20Busines%20Case%20NIMT%20Performance%20Improvement.pfd

Editor's note - This link does not seem to work. There does not seem to be public access to this pdf file on the KiwiRail website.

will support and strengthen this integral part of New Zealand's transport system.

Yours sincerely

Hon Simon Bridges

Minister of Transport.

Electrification of long-distance rail in New Zealand, where the frequency of trains is less than in some other countries, has long been a contentious issue.

In 2008, an in-depth report on the pros and cons of diesel vs electric locomotives for the NZ rail system was carried out by Murray King for ONTRACK called "Extension of Electrification – Benefits and Costs. Some conclusions from that report are reproduced here.

Conclusions of 2008 report to ONTRACK

Electrification would support government policy in both energy and transport, and bring useful environmental, greenhouse gas, and fuel savings, and independence from fossil fuels. Even if some electricity is generated, government policy to encourage renewable generation means thermal generation is likely to be only 15% in an average year in the lifetime of an electrification project. Carbon savings are valuable in policy terms, but not in dollar terms (at $15/tonne of CO_2), and even less so if filtered through electricity pricing. Electrification may also enhance capacity and save time in a useful way.

But electrification entails significant capital costs, of the order of $2.5m per kilometre for single track and $4m for double, along with extra costs for clearances. Capital costs total $860m in the North Island. The benefits are not enough to outweigh the capital costs, at least on the North Island routes. The Otira tunnel route may be justified, but it will require further detailed analysis to demonstrate that.

and

At present, therefore, extension of electrification, apart possibly from the Otira Tunnel, does not look attractive. Parts of the network are heavily used, and capacity extensions are likely to be required. More powerful locomotives (and heavier trains) are one way to achieve a capacity increase. Modern diesels have a heavier axle load than currently permitted, but electric locomotives do not. Public policy aside, whether or not electrification is extended is likely to depend on availability of high powered diesel locomotives for 1067mm gauge, and if so, then on the relative capital costs of increasing axle loads and of electrification, and on whether there are substantial benefits beyond locomotives from increased axle loads.

Extracted from "Extension of Electrification – Benefits and Costs" by Murray King for ONTRACK. April 2008

Comment on NIMT in the Engineers for Sustainable Responsibility (ESR) newsletter

Unbelievably, KiwiRail is replacing its electric locomotives with diesel locomotives on the main rail freight line in New Zealand! The justification is based around cost savings of course.

The NZ Government justifies some very large expenditures on road construction by calling the projects Roads of National Significance. Some projects have very low benefit-cost ratios, meaning that economically they should be of low priority, assuming they should be built at all. But that is not important as they are regarded as being (politically) strategically significant.

Why not apply the same logic to the NIMT? Call the completion of electrification of the NIMT between Auckland and Wellington a Railway of National Significance. Ensure that freight trains between Wellington, Hamilton and Auckland are hauled using electricity supplied from an overhead catenary to reduce our greenhouse gas emissions and the dependency of our freight network on diesel. But no, we must build roads.

Ross Rutherford, ESR

Green Party Energy Policy[14]

We are lucky to live in a country rich in renewable energy sources, and we want to make the most of our natural assets.

By living and doing business in smarter ways, we can use less energy.

What electricity we do use can be from almost 100% renewable sources.

Our Energy Policy is about minimising the impact of climate change, and enabling all Kiwis to enjoy a high-quality life in a clean green Aotearoa New Zealand.

VISION

The Green Party envisions a New Zealand in which all reasonable energy needs are reliably and affordably met from renewable energy, and there is much smarter use of energy.

SPECIFIC POLICY POINTS

Climate Change and Peak Oil

In order to reduce greenhouse emissions and move away from reliance on dwindling oil supplies, the Green Party supports:

- Investigating the role of renewable energy for public transport, other essential transport services, air and marine transport, and our main industries.
- Developing fuel efficiency standards for motor vehicles entering New Zealand.
- Introducing a carbon charge on fossil fuels, and using the revenue to reduce income tax on the bottom band, for everyone.

Improving Energy System Planning and Co-ordination

The Green Party will:

- Redesign the Electricity Commission as a Sustainable Energy Commission with regulatory responsibility for all fuels.
- Require an urgent independent review of Transpower's planned grid upgrade with a view to developing alternatives that have less impact on the environment and better facilitate a sustainable energy system.
- Ensure that all major capital projects are tested against sustainable alternatives such as energy efficiency, fuel switching, renewable generation, load shifting and distributed generation.
- Investigate introducing 'progressive pricing', whereby the more energy you use, the more you pay, above a certain base level.

Energy Efficiency

The Green Party will encourage energy efficiency and conservation in a number of ways including:

- Teaching it in schools.
- Providing funding to accelerate domestic retrofits.
- Encouraging passive solar design in new houses.

The Transition to Renewables

The Green Party will:

- Require energy retailers to buy or generate a proportion of their sales from renewable resources.
- Help district and regional councils plan for wind farm sites.
- Support a programme to install solar water heating panels on government and private buildings.
- Investigate the potential of woody biomass, biofuels, and energy from waves, tides and currents.

Editor's note. It has also been a long-standing policy of the Green Party and NZ First that the New Zealand rail network should include full electrification of the main trunk lines.

[14] Read the full policy here https://www.greens.org.nz/sites/default/files/energy_20140926_0.pdf

ELECTRICITY PRICING CONTROVERSIES
TRANSMISSION PRICING, SOLAR TAX, AND LOW FIXED CHARGES

By Molly Melhuish

Transmission pricing

The Electricity Authority's review of transmission pricing methodology (TPM), which has been under consultation since 2009 has been stopped in its tracks by an industry-funded critique of its cost-benefit analysis.

The proposed TPM would charge residential consumers from Auckland to Kaitaia $70-85 more per year, mainly to pay for the giant-pylons from the Waikato River to Auckland. West Coast and Hawkes Bay consumers would pay around $50 per year more, paying for other transmission upgrades.

The biggest winners of the proposed TPM were to be the smelter, with $21 million per year lower charges, and South Island generators, winning by $82m/year.

The critique, by consulting firm Covec, was not based on economic principles, but was an analysis of 60 expert commentaries submitted to the Authority on its 2016 TPM issues paper.

Covec identified 19 different propositions put forward by the Authority. They compared the Authority's views on each against views taken from the expert submissions, identifying 161 comparisons in all. They found that 147 of the expert views disagreed with the Authority, while only 14 views agreed.

Importantly, they observed that the EA had made no effort to rebut the criticisms. In contrast, the Commerce Commission discusses submissions in detail, and responds to each major criticism.

The Authority has now put its transmission pricing proposal on hold pending a new cost-benefit analysis.

Transmission pricing is only one of several pricing controversies today. Three others are: -

- the "solar tax" imposed by Unison on solar rooftops;
- the wish of both lines companies and retailers to get rid of the Low Fixed Charges pricing regulations passed by Parliament in 2004, and, less publicised;
- the question of what small generating companies should be paid for generating at peak times, thus reducing the load on transmission lines (avoided cost of transmission, or ACOT).

The Authority has an opinion only on ACOT – it wants any such payments to be negotiated, not given automatically on the assumption that reducing peak loads is a good thing. Small generators don't like that, as they find it extremely difficult to negotiate with big companies.

On the other two pricing issues, the Authority has kicked for touch, asking industry to take the lead. And they have indeed – commissioning Concept Consulting to analyse the impacts of new technologies – rooftop solar, battery storage and electric vehicles. There are three separate reports – on greenhouse gas emissions, economic efficiency, and residential power prices.

In this brief article, I shall not try to give the conclusions of the three Concept reports – all of which support the electricity industry's desire to suppress rooftop solar. Suffice it here to note that their scenarios assume 50% uptake of solar energy in 15-20 years. They calculate the impact of this level of solar uptake on household power bills for residential consumers assuming today's pricing structures. But they also assume a highly simplified model of pricing options, missing out on the potential of energy efficiency and/or wood burning to reduce costs of supply.

The common theme of all these analyses of power pricing is that the industry is pushing against competition from small-scale technologies that

they cannot control. By "the industry", I mean lines companies, generator-retailers, and their various support services – metering companies, data warehouse managers etc.

Industry wants to charge much-increased fixed charges, and reduce the unit charge enough for solar rooftops to become uneconomic. The industry has overbuilt its assets - both network assets and power stations. There's now a massive excess of capacity.

Industry's regulators, namely the Electricity Authority and the Commerce Commission, are supposed to promote competition, but only within the scope of their "purpose statements". Neither give any credit for sustainable energy, though the Commerce Commission is required to give some consideration to energy efficiency. However, both regulators define "the market" to be for electricity only, excluding services such as home insulation, solar hot water and wood burning, which compete with electricity.

In conclusion, power pricing today is designed to meet electricity industry goals –guaranteed return on assets – at the expense of residential consumers and sustainable energy. Industry lobbyists are trying to soften decision makers (Parliament) to repeal the Low Fixed Charge regime, with the Concept Consulting reports as their main weapon.

Those reports could be analysed much as Covec critiqued the Transmission Methodology exercise. But to date, no consultant has offered an independent view from the perspective of residential consumers, much less sustainable-energy providers.

Molly Melhuish

FUTURE WOOD BURNERS

Molly Melhuish has long advocated the benefits of the use of wood for direct home heating and makes the following points to supplement those made by Frank Pool on page 5.

- An advanced downdraft double chamber wood-burners has been demonstrated in NZ and is being manufactured on a small scale. However, most regional councils refuse to allow it to be installed because it cannot be tested according to the official wood burner standards.
- Downdraft wood burners can give extremely low pollution levels. They are convenient because you can start the fire from the leftover charcoal bed, with some meths as a starter. You can then load a whole day's firewood into the fuel bin, the driest on the bottom. Near the top you can even load some green wood, as the wood loses moisture as it falls down the fuel bin. The smoke and moisture react with the burning charcoal to produce a very clean burning fuel gas. Controls are still being developed for fully automatic control.
- Today, they keep homes warm and (if there is a cooktop) enable cooking and water heating. In future, thermoelectric generators can enable devices to be charged, and larger thermoelectric generators with batteries can even power appliances in the house.

Notice of AGM and Forum

Thursday 27th July – Wellington

The annual general meeting of the Sustainable Energy Forum Inc. will be held on Thursday July 27th at the Sustainability Trust, 2 Forresters Lane, Te Aro, Wellington at 5.00.p.m.

This meeting will be followed by broader public discussions on transport issues in and around the capital with participation by the Congestion Free Wellington Group.

Energy and Transport Forum

This forum will be chaired by Steve Goldthorpe focussing and expanding on issues raised in this issue of EnergyWatch.

We plan to have Skype access available for members. Contact Neilman@clear.net.nz to arrange remote access to the meetings.

SEF SUBMISSION ON THE REPLACEMENT ENERGY EFFICIENCY AND CONSERVATION STRATEGY

INTRODUCTION

The Sustainable Energy Forum Inc. (SEF) is a New Zealand membership-based organisation with the aim of facilitating the use of energy for economic, environmental, and social sustainability.

SEF agrees with the analysis of the state of energy efficiency in NZ, as summarised in the introduction to the proposed new draft strategy "Unlocking our Energy productivity and renewable potential". Energy Productivity, Energy Efficiency, and CO_2 emissions from fossil fuels do matter.

NZ is falling woefully behind other countries in efforts to raise energy efficiency and energy productivity. NZ is very slow in taking actions to reduce greenhouse gases (GHG). NZ is not aggressively working to implement or adapt to the use of new technologies.

These factors are impacting negatively on NZ's potential economic growth, whilst they also reveal planning to fail to meet NZ's climate change obligations.

SEF believes New Zealand must do better. To achieve better results the actions and targets included in the strategy must change. The strategy is not adequate to offer a significant New Zealand contribution to the Paris Agreement. NZ will be severely impacted by: -

- Sea level rise – from Antarctic land-based ice sheets collapsing and other factors. NZ's coastal cities will be flooded to some extent. New Zealander's coastal lifestyle and tourism potential is under threat. The only uncertainty is how soon will significant change in global sea level eventuate.
- Acidification of the oceans, and the demise of many fish species, from coral to many species of fish that many people eat and rely on to survive.
- More frequent and stronger storms, destroying houses and other buildings, farm land and crops etc.
- More droughts and floods – more extreme weather, affecting lives, and food production.

Whilst these impacts are outside of NZ's control, New Zealand is obligated to effective participation in global action to minimise these impacts, as set out in the Paris Agreement.

RESPONSES TO SPECIFIC CONSULTATION QUESTIONS

1. *Does the proposed goal capture what you see as the desirable future state from the promotion of energy efficiency, energy productivity, and renewable energy in New Zealand?*

The Goal of this strategy is stated as: "*Support New Zealand to be an energy efficient, productive, and low emissions economy."*

SEF supports this as a framework statement, but it is not a measurable and achievable goal. The goal must, as a minimum, include:

- A statement that New Zealand will achieve compliance with its declared GHG emission reduction obligation of 30% below 2005 levels by 2030;
- Energy efficiency, energy productivity, and renewable energy targets that will be adequate to achieve that framework statement;
- A target to decrease industrial emission intensity much more rapidly than 1% p.a., which would have zero impact on NZ's GHG inventory, if accompanied by a 1% per annum growth in industrial activity;
- A target to improve energy efficiency in the domestic sector more rapidly than the increase in population;
- A target to exceed 90% renewable electricity, so that growth in electricity demand, particularly from the transport sector, has a beneficial effect on NZ's GHG inventory.

- A means to enable people to invest in both efficiency and renewable energy technologies with modest debt burdens in line with their ability to repay;
- A mechanism to ensure that pricing policies reflect the GHG burden of using fossil fuels, including winter peak electricity supply;
- Electricity pricing policies that reflect external benefits of demand-side management;
- Electricity regulation goals that reinforce controls on monopolistic network company charges, to provide delineation of accountability for assertions made by network companies to justify increasing line charges;
- Electricity regulation goals that bring under control the rampant electricity retailing industry, which adds an unnecessarily large administrative overhead to electricity prices.

2. *Where do the challenges and opportunities lie for energy efficiency and renewable energy in New Zealand over the next five years?*

The challenges for energy efficiency and renewable energy lie in achieving year on year rates of improvements that substantially outstrip growth in population, GDP, and industrial activity. The opportunities to achieve such a turnaround in energy use lie in a new paradigm for energy systems including:

- Engagement with householders as responsible citizens, not just consumer units;
- Engagement with businesses as agents of change;
- Engagement with Local Government responsibilities for infrastructure and community services design.

Engagement with the domestic sector must facilitate the development of an energy use culture where: -

- Energy use minimisation is a virtue and not a vice;
- Communication technology is used in preference to travel;
- Good stewardship of communal resources is encouraged;
- Residential energy use becomes a priority area.

The strategy Warm Up NZ - Clean Heat was a successful initiative that improved the productivity of working and school-age people. The influence of healthy housing on GDP sits alongside medical cost reduction, because a significant portion of the benefits came from increased worker productivity due to less sick days. Any necessary subsidy should not come from the health sector budget, but should be funded from general taxation. o There is a steady increase in embedded energy efficiency gains from the housing stock. The 2006 building energy efficiency law changes have now become operational regulations. A follow-up is needed on the next generation of improvements to produce building standards for net-zero energy housing.

Engagement with industry must enable: -

- Adding product value, rather than just increased production;
- Adding value to primary resources, rather than just exporting them for overseas processing;
- Encouragement of deliberate use of renewable energy in place of fossil energy, especially via efficiency-retrofits and innovative use of forest residues.

SEF supports the NZ Bioenergy Association's target of zero fossil CO_2 emissions by 2050.

3. *Do the proposed objectives and priority areas capture the key contributions that are needed to achieve the goal?*

No. They are woefully inadequate.

The proposed objectives and priority areas are founded on principles that assume NZ will continue doing what it is already doing and that improved efficiency or use of renewable energy sources or adoption of innovative technology will only occur when it meets short term economic benefit criteria. That is Business-As-Usual, which will not achieve the goal.

Innovative and efficient energy use will mainly be influenced by pricing methodologies. All sectors need meaningful pricing that rewards GHG

reductions. The other big influence is the ability to invest with confidence. Capital constrained households and businesses find it difficult to rationalise investment in technologies that reduce energy consumption and emissions. New businesses that innovate are vulnerable to being suppressed, or even taken over, by bigger financially strong competitors (especially electricity generator/retailers).

4. *Does the focus on what each group can contribute resonate with you? Do you think anyone is missing?*

The focus on group contributions is disappointing and does not resonate with SEF.

By focussing on "individuals" the strategy does not optimise the benefits that could be gained from the residential sector. Residential electricity usage is one third of the overall demand, and residential power bills provide half the electricity industry's revenue. The lack of coordinated focus on the "residential sector" results in many lost opportunities.

- Householders should be encouraged (and not discouraged) from utilising firewood in suitable appliances for most locations to achieve comfortable home heating, whilst also reducing demand for electricity in wintertime peaks.
- Residential energy efficiency requires ongoing research. The HEEP study should be repeated now. Statistics related to the present state of NZ's building stock (houses and apartments) need to be improved, and implementation trials are needed to confirm cost-effective ways of reducing energy waste.
- The Energy Cultures research on demand-side management should continue to be funded, and include investment options for smart and innovative technologies, especially wood burning, to reduce the need for investment in fossil fuel peak electricity generation.
- There need to be specific projects which explore pricing options that reduce power bills and GHG emissions, and increase security of electricity supply.
- Smart grid trials need to be documented as applicable for each group.

5. *Taken together, do you think the proposed goal, objectives and priority areas will set a clear direction for action to unlock our energy productivity and renewables potential?*

No. An energy strategy to prepare NZ for an on-going sustainable energy future in the 21st century will not result from just continuing with 20th century energy philosophies. A change in thinking is required, as noted here, and described many times by others.

6. *What specific actions could help us to achieve the goal of the Strategy? What, if any, additional costs would you face if those actions were implemented? Please quantify if possible.*

Residential contributions to the Energy Levy should go mainly to fund residential energy efficiency projects, focusing on insulation, efficient heating, and efficient lighting and appliances. This component of the levy must not fund commercial and industrial energy efficiency.

Since the electricity sector was restructured, residential power bills have risen to fund not only direct costs of fuel, O&M, and administrative overhead, but to fund the asset-building ambitions of the new corporate entities, the inflated management and marketing costs, and above all the ever-inflating financialization of the whole sector, including debt servicing, asset "value" inflation.

The Energy Levy contribution from residential consumers should be apportioned between the Electricity Authority (EA) and EECA to fund residential energy efficiency improvement projects.

The EA's portion should fund monitoring of the residential electricity market (This information is currently considered to be the commercial property of retailers). That market should be considered to embrace not only electricity, but all services which can substitute for electricity, including energy efficiency, household wood burning, natural and liquid gases, rooftop solar

heat and photovoltaics (these are listed in probable order of importance).

The monitoring component of the levy should give rise to proposals to encourage, or if necessary require, residential power tariffs to reward demand response to actual wholesale prices by time of day. That would challenge the present ability of generators to create scarcity and thereby jack up wholesale prices. Wood burning and household-scale batteries (e.g. 10 kWh) are the main techniques for this.

The EA's portion of the Levy should also fund representation of residential consumers on its advisory structures, and the governance board should reflect this. However, The EA's Interpretation of its Statutory Objective precludes that.

The contribution of the Levy that goes to EECA should go to fund investigation of residential energy efficiency, with a focus on those consumers whose debt overheads preclude their self-investment in the most cost-effective retrofits. Typically, these include insulation and efficient wood burners, and natural gas heating, where that's available.

A rolling fund, like the Crown Building Loan Fund, would seem the most appropriate means, and the governance of this should be ensured by a significant residential-consumer presence on EECA's governance board.

7. *Do you agree that the preferred targets will be measurable and meaningful targets, and support the objectives and actions?*

No. SEF concludes that the two targets in the draft strategy are weak and will be ineffective in achieving the change in thinking needed to achieve the goal.

The target of annual doubling of the size of the NZ electric vehicle fleet to 2% in 5 years is unrealistic because supply will constrain it. For example, the most numerous EV in NZ is the Nissan Leaf, but Nissan have decided not to supply their newer Leaf models in New Zealand. Other manufacturers are focussing on large Plug-in Hybrid (PHEV) cars and hydrogen technology vehicles. NZ will be just dependent on second hand Japanese imports for the 100% EV fleet.

Inclusion of PHEVs in the definition of EV's seriously weakens the EV strategy. For example, the 640-mile range of the Toyota Prime PHEV would be achieved with 25 miles on electricity and 615 miles on petrol.

Growth in EV's will be inhibited by the plan to introduce a road user charge, when the EV uptake reaches 2%. To capture multi-fuel PHEVs and hydrogen technologies, the road user charge would need to be applied to all vehicles with removal of the anachronistic excise duty on petrol.

The target of 1% annual reduction in industrial CO_2 emissions intensity will be offset by growth and will be increasingly difficult to achieve without a radical change in the approach to energy use in businesses.

8. *How can we ensure that energy data and research generates knowledge and understanding that can help to unlock our energy productivity and renewables potential?*

By integrating holistic greenhouse gas emissions assessment into energy scheme assessments and infrastructure planning. New Zealand's energy infrastructure needs to be future-proofed to ensure it can fully incorporate both 2030 obligations and 2050 aspirational targets.

Solar Photovoltaics (PV) with electricity storage technologies will inevitably impact electricity industry as equipment prices continue to drop, and these technologies become attractive at small scale over the next 5 years. The electricity industry needs to embrace that reality rather than fight against it.

NZ has some high sunshine sites, especially in Marlborough, Nelson, the eastern Bay of Plenty and Tauranga, with sunshine hours averaging above 2,500 hours per year. Such locations will provide commercially attractive PV opportunities

for electricity customers, energy companies and network companies.

Solar PV produces more in summer than winter, so for the benefit of NZ an integrated approach in needed to seasonal storage using the electricity grid to link hydro, geothermal and wind resources.

Innovative technologies, such as wave and tidal energy systems, are beyond the scope of this short-term strategy.

All of this indicates that NZ should be electrifying a significant proportion of transportation, particularly public transport. Rail systems (heavy and light rail) and passenger buses need to move to all electric systems.

Retrogressive negative trends like stopping the use of electric railway engines on the North Island Main Trunk railway, and the removal of trolley buses from Wellington must be prevented.

The NZ Transport Agency needs to be restructured to change its focus from just investing in expensive and fuel-inefficient motorways, to investing in walking, cycling and electric public transport modes. This transition has started in Auckland, with construction of the city rail loop. This change needs to be rapidly replicated to increase fossil-fuel-free, resilience and energy productivity.

CONCLUDING REMARKS

New Zealand's wide range of renewable energy resources, its technical expertise, the high education levels of its population, and its capacity to implement change quickly, could all combine to create a rapid transition to an energy-efficient low carbon economy. However, its legal and regulatory systems put shareholder value as the highest priority, and puts social and environmental (including climate change) externalities as low priority, or even exclude them completely, as is the case in the EA's interpretation of its Statutory Objective and the exclusion Climate Change considerations from the RMA.

Any NZEECS strategy will tend, under the present system, to be overridden by shareholder "requirements" to maximise profits and shareholder value – including large-scale investment in further expanding electricity assets. Electricity pricing rules guarantee a generous return on those assets – and encourage expansion of the centralised electricity asset base.

In contrast, small-scale investment in end-use energy efficiency, and in distributed renewable energy including efficient wood burning and solar energy, are limited by the discretionary spending capability of householders. Most domestic consumers are already saddled with debt. This was the rationale underpinning of the Warm Up NZ - Clean Heat subsidies, which enabled some 300,000 houses to be insulated.

There is growing international recognition that the energy industry under the neoliberal economic philosophy has been hijacked by multi-millionaire elites, not only in New Zealand but throughout the western world.

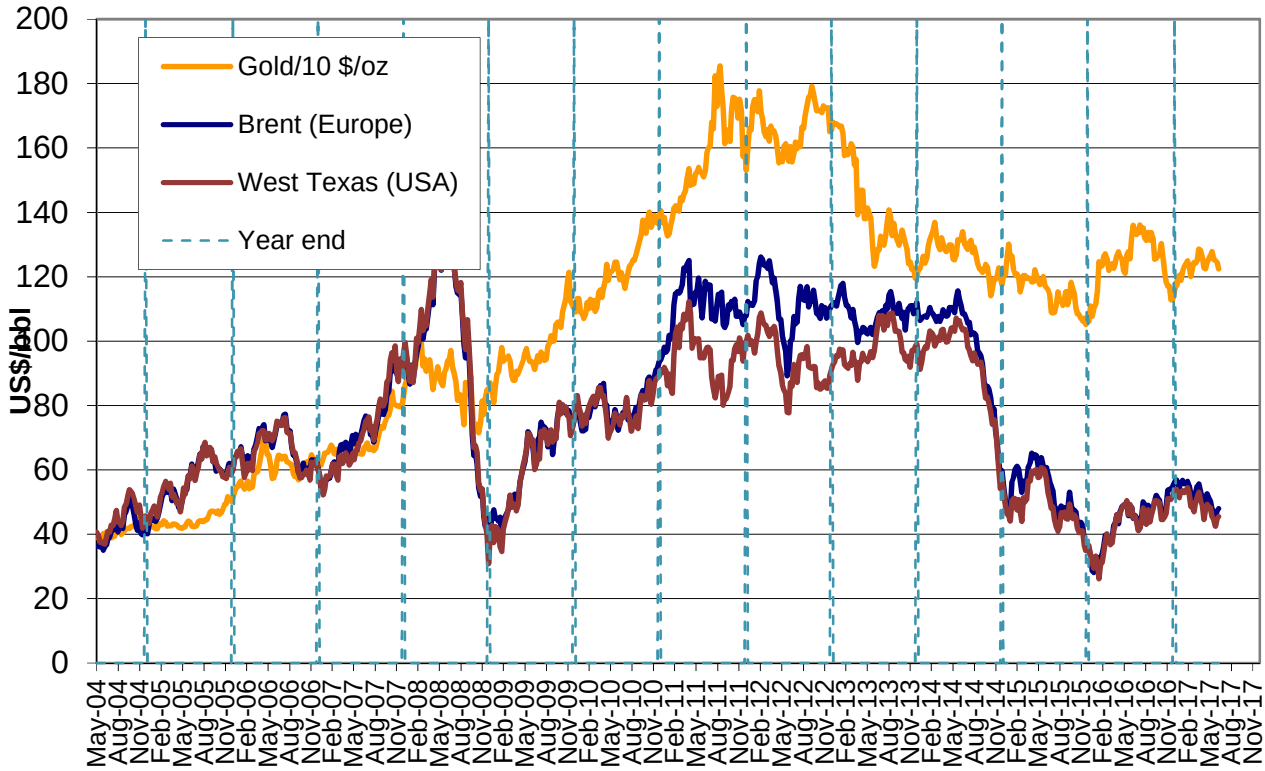
A sustainable energy-efficient future will require a change in governance. The energy strategy needs to be broadened from simple economic efficiency. It needs to be re-defined once again to include consideration of environmental/climate issues and social/cultural impacts. In particular, re-defining energy supply and demand systems, must include reconciling them with the quantified GHG emission targets.

A road map for progressing from the path that NZ is currently following, to the path NZ needs to be on a decade from now, is ill defined. However, the first step towards mending a broken system is to accept that it is broken and needs mending.

Submitted to MBIE on 7th February 2017
by S.H Goldthorpe, Convenor
On behalf of the Sustainable Energy Forum Inc

The finalised EECA five-year strategy was realised recently. It can be viewed at http://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-strategies

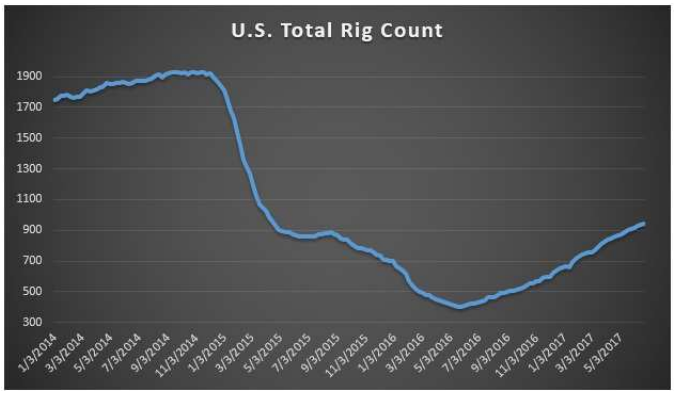
Neil's Oil Price Chart

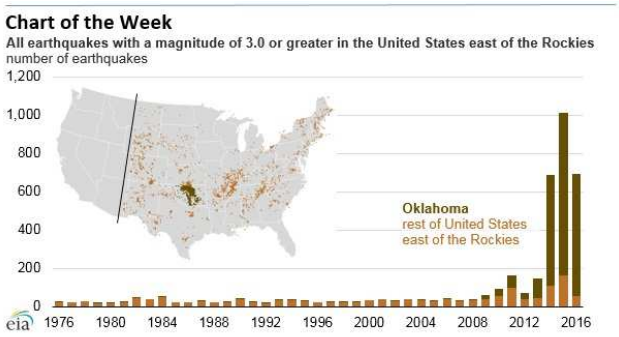


The relatively steady decline in traded oil prices over the last 6 months is signalling that sub-$50/bbl oil is becoming the new normal. The on-line oil investment bulletins, which I receive, are trying to keep positive, by highlighting production control agreements aimed at bolstering the oil price and hence revenues for oil companies. But in other less-bullish postings the energy investment community is scouting around for alternative opportunities for making a fast (or slow) buck out of the energy scene. An example is the promotion of novel PV potential, as detailed in the "Too Good to be true? article on Page 10. These energy investors are people motivated only by making money, without a care either for their captive customers in the transport market or for the planet that they inhabit.

In that investment climate, exploration for brand new oil fields makes little sense and the bulk of drilling activity is focussed on consolidation of production capacity within established oil fields locations. Hence, whilst environmentalists will celebrate when deep sea exploration activities are abandoned, a powerful element in deciding to cease such activities is simple economics. If the oil price goes up they will be back.

In this context, these two charts from the OilPrice.com intelligence report show other metrics that illustrate historical trends relating to in the symptomatic US oil and gas industry.





Oklahoma has seen a surge of seismic activity over the past several years, and the USGS points the finger at underground injection of wastewater, which takes place during oil and gas drilling.

Editor

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