

14 July 2020

Background Note:

Persistent impacts of COVID-19 on NZ's energy skills and research needs

Introduction

This note is to support a discussion on the extent to which COVID-19 will have a significant persistent impact on the demand for skills in the NZ energy sector and the priorities for energy research.

It does this by looking at the projected 2025/30 energy use in NZ to see if any of the direct effects of COVID remain in our main energy production, distribution, and use supply chains. It also has an initial look at any impact on moves to lower GHG emissions.

Method

Treasury has released several economic scenarios for how the economy might develop on assumptions about the extent of domestic controls over COVID and the impact on the global economy on NZ¹. These have been updated and extended by various forecasting agencies and the Infometrics recent report for NZTA² has been used as the basis for expected changes to GDP and employment over 2025/30.

MBIE's *Energy Balance Tables*³ have been used to give an indication of which fuels supply chains are likely to be significantly impacted, and from that an indication of any persistent shifts in skill needs and research priorities in the energy supply chains.

A recent IEA report⁴ has been used to give an indication of global impacts of COVID on energy, and a recent MfE report⁵ to identify sectors where the relatively small changes from COVID might allow reductions in GHG in NZ.

¹ *Treasury Report T2020/973: Economic scenarios* 13 April 2020. Treasury

² *COVID-19's effect on industry and regional economic outcomes*. May 2020. Infometrics.

³ <https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/energy-balances/>

⁴ *World Energy Investment 2020*. May 2020. IEA

⁵ *Marginal abatement cost curves analysis for New Zealand*. 2020. Ministry for the Environment.

The focus is on material impacts, generally >10 PJ p.a.⁶

Assumptions

The Treasury scenarios cover a range of assumptions at the various COVID Alert Levels, the length of border controls, and the magnitude of the downturn in the global economy during 2020 and 2021. Infometrics discusses these in the light of subsequent events. It reaches the general view that Treasury's Scenario 5 is the most robust through to 2024/5, but with several caveats.

Scenario 5 involves borders being closed for 12 months and world GDP growth of -5.9% in 2020 and -0.7% in 2021. To this Infometrics have added an assumption that structural changes persist through to 2030⁷.

For the purposes of this note this Infometrics' augmented Scenario 5 is used.

Economic Impacts on fuel demand

Coal

NZ produces uses net 53PJ⁸. The dominant uses are electricity (co)generation (17PJ, ~33%), steel manufacture, largely non-energy use (11PJ, ~20%), and food/dairy processing (17PJ, ~33%).

Electricity

Globally COVID is reducing electricity demand, reducing returns from generation, lowering prices, leading to a significant drop in investment throughout the supply chain. This applies to coal as a significant fuel for electricity generation.

In NZ Infometrics project a reduction in mining GDP (8%) with the implication of this being a response to lower coal prices. They also project a 20% reduction in electricity and gas supply GDP that persists until FY31, and prices are depressed.

Coal is used at Huntly to provide base load support and help manage dry years. With low prices for coal, reduced electricity demand and a shortage of capital, any acceleration in switching away from coal for electricity generation on the face of it seems unlikely.

However lower electricity demand could reduce the perceptions of dry year risk and thus accelerate the decommissioning of Huntly (with a move to NG).

Food processing

The lowest cost alternative for drying in food processing is biomass, but the lower coal prices with no large significant change in wood processing costs will make changing less attractive. Based on MfE this could put this substitution well into the 2030s.

⁶ NZs usage is ~600PJ.

⁷ For the other Scenarios they assume a reversion to the structural make-up of the economy had COVID not occurred.

⁸ Stock changes account for the minor differences.

Steel

Steel production in NZ is unlikely to retrench under BAU, and with lower coal prices and higher growth projected in construction this is reinforced post COVID. However, NZ Steel has announced the impact of CO₂-e pricing could make its continued operation in NZ marginal⁹.

Oil

NZ produces 52PJ of crude, imports 250PJ, exports 49PJ, net 251PJ. We refine the great bulk of this but also import refined fuels. This gives consumer fuels as follow:

| PJ pa | Crude | Petrol | Diesel | Fuel Oil | Aviation |
|---------------------------------------|--------------|---------------|---------------|-----------------|-----------------|
| Net Crude | 251 | | | | |
| Refined | -248 | 67 | 80 | 27 | 62 |
| Imported | | 50 | 62 | | 12 |
| International Transport ¹⁰ | | | | 12 | 57 |
| Consumer fuels ¹¹ | - | 116 | 139 | 15 | 17 |

The dominant use (~83%) of these fuels is in the transport industry (239PJ). Agriculture uses 10PJ with all other sectors using <10PJ p.a.. Petrol is by-and-large used in cars for less intensive transport, and diesel in longer-haul, with smaller quantities in rail and marine. Fuel oil is predominantly marine.

IEA estimates global end-use oil spending will fall by 40% in 2020 and investment in oil and gas by 32%. This has been caused by a combination of OPEC removing production caps (now restored), and COVID on reduced mobility.

Transport demand

The persistent impacts in FY31 lie in the sectors exposed to reduced international transport and the flow on into the domestic economy. The big absolute reductions in FY31 GDP from Infometrics are accommodation and food services (-\$308M, -3.6%), and transport related (-\$342M, -1.8%). An element in these reductions may also be a systemic change in domestic travel behaviour and working from home.

Internationally exposed services also show significant reductions, although Education and Training GDP (-\$87M, -0.7%) is less impacted than others (Finance, Telecoms). Infometrics explain this is due to increased unemployment leading to increased education and training, despite the sector having lost at least one cohort of international students.

While international tourism and education are being curtailed by the difficulty in international mobility, one suggested response has been to promote NZ's COVID free status. In education an upswing in applications is already being seen. This could work to reduce the impacts of COVID.

⁹ <https://www.stuff.co.nz/business/114961557/very-real-risk-nz-steel-could-be-forced-to-pull-out-of-auckland>

¹⁰ This ignores the fuels used by inward bound ships and planes.

¹¹ Figures do not add because small quantities have been ignored.

Transport fuel supply

COVID along with a range of other factors has led Refining NZ (RNZ) to undertake a strategic review of its operations¹² due to report in June. As the IEA notes the “crisis underlines the strategic rationale for oil and gas companies to diversify investments, but also cuts their means to do so”.

A significant shift in their business model seems inevitable and this will have a lasting impact on the NZ energy sector.

If RNZ moves to simply becoming a terminal for imported fuels then there will be a loss in both chemical processing capability and skills that could be valuable for biofuels¹³. On the other hand, the review is also considering options in solar energy, green hydrogen production and biofuels for aviation and heavy trucking.

This review is occurring at a time when global investment in the processing sector is being reduced, and margins squeezed even more than the history that drove this review. The aviation fuel throughput will be decimated by COVID and the refinery cannot currently meet desulphurisation requirements for marine fuels MARPOL 2020. Adjusting the slate of products from a barrel of crude to compensate adds costs.

These developments are increasing the need for research into the available options and to increase NZ’s skill base in them.

Beyond direct energy research into biofuels, hydrogen, better EVs, mode shifting and improved efficiency this also raises the need for better understanding of the persistent COVID changes to the demand side – logistics, international tourism, international business and travel etc – alongside the impact of other changes. The intersection between ICT, energy and transport is critical to a number of these key developments: intelligent transport systems, improved logistics and telepresence.

NERI’s proposal for a transport energy roadmap would help address these issues.

Natural Gas (NG)

NZ produces 172PJ of NG, used in electricity (co)generation (49PJ, 28%), food processing (18PJ, 10%), chemicals (27, 16%) and commercial and residential (15PJ, 9%).

NG supply on BAU is already declining with the announced shutdown on oil and gas exploration. Currently NZ is not directly exposed to international NG supply pricing and investment, but IEA estimates COVID has so far been muted in its impact. But it warns this may increase as electricity prices and demand falls¹⁴.

Infometrics suggests NZ gas prices could fall with electricity demand. This means that any shift away from NG as a fuel will be slowed.

¹² <https://www.refiningnz.com/wp-content/uploads/2020/04/Strategic-Review-investor-presentation-FINAL.pdf>

¹³ MBIE has discussed this with both NERI and Scion.

¹⁴ More recently it suggests the decline could be 4% this year and last until 2025. Gas 2020 IEA.

Renewables

NZ produces 355PJ from renewables, the bulk being used for electricity generation (283PJ, ~80%) but with significant conversion losses. The rest is biomass used for heat in the wood processing industry (52PJ, ~15%) and commercial and residential (12PJ, 3%).

We will discuss electricity in more detail in the next section.

Any change in direct use of biomass in the wood processing industry or commercial and residential sectors is unlikely given no persistent changes to them post-COVID. However if there is a decision to close Huntly this could make the use of biomass in the commercial and residential sectors for winter heating more attractive.

Finally on biomass, the relatively lower fossil fuel prices post COVID will make it more difficult for liquid biofuels. The IEA notes cash strapped companies will be very selective about their spending and this could favour clean technologies with established business models. This can be seen in Refining NZ's interest in solar PV.

Electricity

We generate 144PJ of electricity and the main users of electricity are agriculture, food processing, and wood processing (each 8-9 PJ), basic metals (23 PJ, ~16%), the commercial sector (34 PJ, ~24%) and the residential sector (45 PJ, ~31%).

IEA estimates electricity demand will drop 8% globally in 2020, with a 19% decline in renewable power investment, 15% in fossil fuel power, and 9% in the networks.

As noted earlier, Infometrics projects a persistent decline in electricity prices and margins in the NZ. Consequently, there is unlikely to be retirements of old plant in the face of this, unless Huntly is closed.

The most vulnerable aspect of electricity demand is the Tiwai Smelter. Prior to the COVID outbreak Rio Tinto had announced a review¹⁵, and has now announced their plan to exit NZ.

The Government is now planning for a short-term surplus of electricity with a crowding out of other renewable electricity investments once the link to the North Island has been completed. The Treasury had stated a decision would lead to lower wholesale prices, old assets like Huntly being closed, and 1GW of generation investment being deferred.

This could produce opportunities for a shift to electricity in the energy sector, with some implications for skills and research needs.

But because the reduced energy pricing will apply to all fuels, and business and household balance sheets will be weak, significant investments in new cleaner or more efficient electricity technologies seem unlikely e.g. EVs and heat pumps.

Summary

It appears that there could well be persistent changes to the energy sector that last beyond 2030. These in the main will reduce demand, reduce energy pricing and hence the incentives to change. Further the economic impacts will reduce the capacity of both households and businesses to invest in changes. Investment in new risky technologies will be reduced.

¹⁵ <https://www.riotinto.com/en/news/releases/NZAS-future-to-be-reviewed>

Change may occur, however, where fragile operations are closed in the face of lower margins and ongoing losses. Also prospective investments could be cancelled because lower fuels costs make change less compelling. While these will often be negative for GHG some provide opportunities.

The significant examples appear to be:

- Early Huntly closure because lower electricity demand makes dry year risks easier to manage, and reduced NG prices makes the cost more attractive. This cuts coal use.
- Delaying moving to biomass from fossil fuels for drying in food processing. The relative lower cost of the fossil fuels because of COVID means a higher CO₂-e price is required to make the change economic. This defers GHG reductions.
- Marsden Point becomes a terminal importing finished product or servicing only a profitable subset of the market (e.g. Auckland), because of the COVID induced low international oil prices and oversupply of refined products. The availability of infrastructure could be a potential opportunity for alternative fuels.
- Energy use by international transport and the flow on through the domestic economy is being disrupted by COVID restrictions. This will be coupled with changes in behaviour through COVID and with developments in ICT and energy technologies. Major adjustments and change will be required, but significant opportunities will come with this.
- Closure of the Tiwai Smelter, again with the decision precipitated by the impact of COVID on the global Aluminium industry. The opportunity is the alternative uses for the electricity.