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Market Development Advisory Group members

By email: james.tipping@ea.govt.nz Fernando.martin@ea.govt.nz

Dear members

Re: MDAG project investigating price discovery under a 100% renewable electricity supply

Thanks for the opportunity to discuss this topic with MDAG. Instead of a powerpoint presentation we have decided to present our views for discussion in this 'white paper'.

Flick supports decarbonisation of the New Zealand economy. Any changes to market design must be consistent with achieving a balance across the three legs of the energy trilemma. The sustainability leg has been solved by the government's goal for 100% renewable electricity and the industry is now challenged with working to solve achievement of the legs of affordable and secure supply of electricity.

Our comments are grouped into three key principles that any changes should attempt to deliver in order to achieve affordable and secure electricity. The changes should:

1. aim to maximise the use of existing energy storage assets
2. meet increasing demand for more sophisticated risk management products to manage volatile spot prices
3. increase the focus on decentralised (rather than centralised) energy, including demand response.

1. Aim to maximise the use of existing energy storage assets

It is in everyone's interests to maximise the use of existing energy storage assets. We already have ~4,400GWh of hydro storage (at nominal full). Renewable biogas is storable and could fuel existing thermal generating plant.

It is critical to solve for the storage of renewable energy – shifting energy from when it is abundant to when it is short (and in our view preferably by not overbuilding wind and solar capacity which negatively impacts affordability).

Storage has to be solved across a spectrum of time periods – to meet daily peak demand, days when there is no wind or sun, weeks / months / seasons when there are low hydro inflows – individually and cumulatively.

- Suggest investigating increasing the operating range of all existing hydro storage lakes (low cost no regrets way to increase generation and storage capacity).
- Suggest investigating 2-3 North Island hydro storage options for pumped hydro using existing storage lakes.
- Is it principally the North Island that has a storage / energy problem?
Existing South Island capacity is sufficient to meet demand growth.

Over time the owners/operators of this storage should be incentivised to provide firming of intermittent renewable fuel. It is economically efficient to continue to rely on commercial entities to make commercially rational decisions. But:

- What are the consequences of commercial incentives when the opportunity cost / scarcity value of hydro inflows / storage is setting the marginal spot price more often and they are valuing potentially the only stored fuel?
- Will trading conduct be appropriate with the current concentration of hydro storage?

Hydro plants might not run for weeks on end but need to receive an income over this period.

- Does this require introduction of availability payments; constrained on/off payments?

There was no new utility scale generation investment commissioned between 2014 and 2020. As discussed by MEUG, gentailers are incentivised to keep the market tight as they benefit from higher prices. This has contributed to our current experiences of shortages of energy. This could partially reflect the ongoing uncertainty about whether Tiwai was exiting or staying (since 2011). And this uncertainty about 5,000GWh of energy remains. Plus now there is the uncertainty about whether the government will invest in Lake Onslow (another 5,000GWh).

- Can changes to wholesale market design for 100% renewables be successfully identified and implemented at this time with this uncertainty?
- What incentives can be introduced to wholesale market design to ensure sufficient and timely investment in new generation capacity (with or without this uncertainty)?
- Note that the issues on the evening of 9 August would not have been solved by having Lake Onslow operating and increased capacity on the HVDC.

The Climate Change Commission forecasts electricity demand with Tiwai exiting and it takes to 2030 for total electricity demand to increase by the ~5,000GWh used by Tiwai.¹

- Suggest the Tiwai smelter should be encouraged to close and release 13% of NZs renewable generation output (via a government direction to 52% owned Meridian).

Batteries will be important for short term energy supply and ancillary services (but not seasonal dry periods).

- Should there be some form of encouragement for locating grid scale batteries over a wide geographic spread?

Note the project approach is technology agnostic.

- Does that include assuming at least some of the existing thermal power stations can run on biogas (which can be stored)?

2. More sophisticated risk management products are required

We query the role of 'price discovery' in the wholesale market – is it to recover the cost of sunk assets or to incentivise investment in new generation capacity.

Gentailers are ~90% internally hedged and the price they are selling electricity to their retail businesses at reflects recovery of sunk costs and the cost of their own new generation². In our view, the spot market / price is transacting the remaining 10% of their generation at a spot price that reflects the gentailers' marginal cost of risk. That is, all except the gentailers are paying for this risk. The spot price is not discovering the price of the last marginal drop of energy that each generator has available. This point is proven by Genesis' actions on 9 August to generate only sufficient volume to cover their own load.

- Does this outcome change with 100% renewables? We think not.
- Can any change to wholesale market design achieve the right 'price discovery' with the current vertically integrated structure?

There are currently three types of generation

1. uncontrollable intermittent renewable generation (wind, solar) and baseload flat profile must run geothermal
2. hydro which is bid at a price determined by the owners' view of future water scarcity
3. peakers where there is a real known cost of inputs (cost of gas, carbon)

¹ Using Climate Change Commission electricity modelling in Final Advice to government <https://ccc-production-media.s3.ap-southeast-2.amazonaws.com/public/Inaia-tonu-nei-a-low-emissions-future-for-Aotearoa/Modelling-files/Electricity-market-modelling-datasets-2021-final-advice.xlsx>

² Note Meridian has been explicit that output from Harapaki will be used by their load book.

Under 100% renewables, thermal peakers with a true cost disappear. Volumes on 'must-run-dispatch-auction' are forecast to increase from 27% of generation output in 2022 to 46% in 2035 (ie output from home solar + utility solar + geothermal + wind). Wind output is forecast to increase ~2.8x over the same period. And hydro output is forecast to decrease from 58% to 48% of total generation output.³

- Should price discovery be 100% reliant on gentailers' views on the risk of future water scarcity?
- Should hydro (or some existing hydro) be managed/operated as an electricity generator/supplier of last resort to ensure sufficient storage?
- Is the current determination of spot price – based on the price bid by the marginal generator – appropriate under 100% renewables? Should it be the average of the prices bid or be paid as bid or the average cost of the generation dispatched?
- Wind cannot be constrained on but maybe it will have to be constrained off (especially if there is overbuilt wind capacity)?
- Should there be a link / prioritisation between wind generation and hydro to encourage / facilitate water storage (forcing hydro generation off as wind increases and vice versa; a form of block dispatch)?

We know spot prices will be more volatile – ranging from zero to negative prices when there is a lot of wind and the sun is shining to very high prices when this intermittent fuel is not available (for an hour, day, week or longer).

The current straightforward blunt hedge products are not adequate now or in the expected future. Baseload hedges cover a portion of demand; peak products are linked to peak demand time periods. High spot prices currently occur outside peak demand periods and are likely to increasingly not be correlated with specific peak demand time periods as wind becomes a high proportion of total electricity supply.

- Suggest significant hedge market development is required to bring on more sophisticated products.

This will assist both the generation and retail sides to manage price volatility risks. Longer-term products could be expected to be priced close to LRMC of new generation and underpin new capacity investment.

- Suggest new products should include a cap product and a capacity market and/or peaking market. Suggest that there should be market making provisions for these new products.

Design of risk management products and the spot market must ensure the incentives are right on all players to drive affordable and secure electricity supply.

³ Ibid

3. Increase the focus on decentralised rather than centralised energy resources to solve for secure and affordable energy

An increasing focus on distributed energy will enable NZ to pivot and adjust as electrification of the economy progresses. This is a 'learn as you go' no regrets approach which involves incremental (as opposed to step change) increases in electricity supply to match growth in demand.

This focus includes consumers managing their level of electricity demand as well as spending their own money on their own energy resources.

We acknowledge that decentralised energy is less likely to solve for the problem of seasonal / extended periods of low levels of stored energy. However, this energy is used first and may enable more water to be stored in hydro lakes for later use.

Demand response has an increasingly important role and assists both security and affordability. This has to go beyond mechanisms for industrials to reduce load and ripple control for residential consumers. Also needs to be more sophisticated than an on/off switch (ala recent blackouts).

- Can both households and businesses be incentivised to be responsive to system-wide objectives / engaged in achieving affordable electricity with 100% renewables?

Flick is experienced at providing price signals to residential consumers – we had 25,000 customers electing to pay wholesale spot prices. These consumers believed in the market and supply / demand and were prepared to engage in reacting to prices.

Flick is now offering Time-of-Use plans nationwide. A third of customers are electing this product.

Flick also passes on price signals from distribution companies.

- Should retailers be required to pass through distributors' price signals instead of offering residential consumers largely only flat prices.

Closing the price difference between day and night by shifting demand will contribute to maximising the use of existing transmission and distribution assets.

More energy generated on the local loop gives consumers some control over their energy needs and storage.

- Imagine if the government spent \$1bn on a \$3,000 subsidy for household installations of solar+battery (one of a portfolio of options instead of Onslow). This would equate to 1 in 4 of total households with solar-battery or could be targeted in particular regions. Managing these batteries to provide energy during 5 hours of peak demand is estimated to be equivalent to having 867MW of electricity available every day. Brings the additional

benefits of reducing the need for expansion of distribution networks as electricity demand increases, batteries managing network quality issues etc.

International experience is that purchase of household solar pv and electric vehicles has some correlation.

- Government is providing financial incentives to purchase EVs – should that be combined with an incentive to install solar pv+battery?

Look forward to discussing this with you.

Steve