

You've asked us

For our thoughts on price discovery under a 100% renewable electricity supply. Specifically:

1. Understanding of the problem – how the market will operate and prices be discovered under 100% renewable electricity supply in the New Zealand wholesale electricity market;
2. Understanding of the challenges for New Zealand in dealing with this issue, and the problems that may prevent the market operating efficiently in the short run and delivering security of supply over the long run;
3. Early thoughts on solutions to any problems that may arise (or exist already); and
4. Views on demand flexibility and the ability for demand to interact fully in the price discovery process

Our key thoughts

- The market isn't fundamentally broken – but it does need improvements and alterations
- The industry needs to prioritise better use of existing resources before it defaults to building more. A change from 'old system thinking' to 'new system thinking'
- Demand side flexibility potential is significant and can help solve the intermittent generation problem
- The speed of change on intermittent generation may surprise
- Do other system stability measures need addressing (NZ equivalent of Finkel report?)

Traditional market supply focus

1. Efficient dispatch - ensure the lowest cost generation and reserves are used to meet the demand curve
2. Adequate capacity margin - make sure demand is always met
3. Optimal investment – ensure lowest cost resource is the next build

We consider this approach to have worked very well over the last 20+ years. There have been ‘blips’ but these must be considered as minor when looked at objectively.

The problem ahead



New areas of focus are needed

1. *Efficient dispatch - ensure the lowest cost generation and reserves are used to meet demand*
2. *Adequate capacity margin - making sure demand is always met*
3. *Optimal investment – ensure lowest cost resource is the next build*
4. Need to ensure market price signals are strong enough to encourage investment in new generation *(the MDAG issue)*

Two key questions to ask on ensuring new renewable generation investment

1. Is there a need to seismically shift from an energy market approach to:
 - capacity market (where DR is also considered equally)
 - regulated asset based approach
 - other, or hybrid approach?
2. Is now the right time to make a major change?

We believe the market isn't fundamentally broken and that there is time to see if improvements at the edges work – but EA needs to move reasonably fast to address it

Encouraging investment in generation

The key issue is that potential investors in generation have confidence that the long-term price received will be sufficiently high that their cost of capital will be met.

Risk needs to be reduced - not completely removed. The potential for upside gain above cost of capital will still be there for investors, so there is no need to eliminate the risk of earning less than the cost of capital.

Long-term price certainty, transparency and availability is critical to investment efficiency. **Could “improvement at the edge” mechanisms such as floor prices, or contracts/auctions for new generation, help fix this? If contracts/auctions, how is demand flexibility built into the model?**

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5. Need to technically enable intermittent generation and encourage investment in reserves to ensure resilience

Solving the technical challenges of intermittent renewables

- The technical challenges in NZ will be lower than those experienced overseas. NZ's hydro and geothermal offers significant advantages to enable integration with more wind/solar which aren't going to be as dominant proportionately as overseas. So the industry can do it!
- **Customers requirement for resilience will mean new grid balancing services are essential and we will need to optimise the HVDC**
- Demand flexibility covers customer load reduction, battery (V2G) discharge, and voltage support devices. **Demand flexibility will help to ensure that technically more intermittent renewables can be incorporated**

Solving the technical challenges of intermittent renewables

- We expect utility and commercial solar to be much bigger than residential solar (so NZ solar situation is very different to Australia)
- We have 20MW of residential solar after 7+ years of steady growth.
We have 140MW of utility scale connection applications in play, and we could have 350MW of utility solar in the next 5 years
- If day time intermittent generation exceeds demand then there may be benefit to encouraging load during day (national or local exceedance will matter)

Issues that need addressing by EA:

1. What happens when solar/wind injection at a GXP occurs? How do networks pass on the costs of that? National EA guidance here would be useful so consistent treatment occurs
2. When will large fast discharge batteries be required to be installed alongside utility intermittent generation? Currently this is up to networks to determine but overseas they're moving to national requirements. Is first mover advantage fair?
3. Do we need an NZ equivalent of the Finkel report which looks independently at where improvements in our system security could be made?

Encouraging investment in reserves

New generation (wind/solar) cannot provide spinning reserve and we have lost large North Island Interruptible Load (IL) through closure of pulp & paper mills. The HVDC is also often now constrained at periods of high demand. A renewable market with climate extremes will require high and unconstrained HVDC flows both north and south.

New IL in both islands is now needed.

We need new IL investment via energy storage from thermal and electrical batteries, and to achieve this pricing signals need to be firm.

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6. Need to ensure intermittent generation (wind/solar) is optimally utilised

Ensuring renewables are optimally used

- Not all zero-marginal costs renewables are equal. Hydro offers technical ability to balance out more intermittent renewables (wind/solar) and has some storage capability
- Can requirements or incentives be put in place to ensure all wind and solar generation that is capable of generating at any point in time is used, and part of our hydro resource transitions from base load to flexible/peaking load. This would not only benefit the environment but it also provides confidence to renewable investors
- This will require a fully flexible HVDC with high reserves in both islands

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6. Need to ensure intermittent generation (wind/solar) is optimally utilised
7. Need to treat demand flexibility like generation

Can demand impact price discovery in the wholesale market?

- The demand side of the market doesn't have a significant impact on the main issue MDAG is investigating of how the low marginal cost of renewables will affect long-run generation investment
- **Demand management does have an important part to play in:**
 - solving the technical challenges of intermittent renewables,
 - the amount of new generation and reserves that needs to be built, and
 - reducing high priced generation periods, as demand management can be called on at a lower cost during such periods

How can we capture the value of demand management?

- 95% of the value that DER could receive from any value stack in NZ is from “simple” reduction of peak demand (Sapere 2021)

however...

- The market doesn't price in effectively the potential for demand side flexibility and interruptible load
- Trials of new technology, and trials on customer reception to new ways of doing things, are essential but there is very limited funding available for this causing a significant deterrent to experimentation and innovation. Very poor by international standards.

Our approach to peak demand reduction

- Our demand flexibility objectives:
 1. Shift flexible load to low over-night demand periods (and day). i.e. reduce peaks and enable 95% of the value of DER to be captured
 2. **Keep diversity** (If a significant portion of EVs start charging at 9pm, or 12pm, then the end result is worse than all EVs being charged at peak)
- We will achieve this by:
 - a) Continuing to manage our current flexible resources – HW cylinders and major customer loads
 - b) Making best use of ‘new’ flexible DER resources – EVs/V2G, new standalone batteries, and new ‘thermal’ load in industry.

Possibly some other devices too but these are likely to provide much lower contribution at peak.

Big picture plan to reduce peak demand

- 20+ years of the most successful network demand management programme in Australasia have taught some key issues
- Peak demand flexibility is very dependent on pricing. What we have witnessed to work very well, in the real world of customers, is peak pricing/billing for commercials and TOU pricing/billing for residentials
- Retailers and households, particularly vulnerable households, don't like real time pricing/billing (works in the lab but not for the majority of customers)
- Real time incentives/payments however are a tool (subject to regulation allowing) as will be real time carbon signalling
- Management of when load comes back on is as important, but harder to manage, than when load gets turned off

Big picture plan to reduce peak demand

- We need to utilise the demand flexibility that both commercial and household customers offer, and also use our own embedded batteries
- Potential to manage commercial customers new batteries and 'decarbonisation technologies' e.g. heat pump hot water, boilers etc
- For residential customers, it's about H/W, EV's and standalone batteries. EV management should at a minimum be smoothed charging, but hopefully the huge potential of V2H/V2G will arrive. This would be a 'game changing' technology for peak demand management
- New technologies and partnerships to enable communication to devices will be essential alongside ripple