

# Market Performance Quarterly Review

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January-March 2021  
Information paper

27 April 2021



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# 1 Purpose of this report

- 1.1 This document covers a broad range of topics in the electricity market. It is published quarterly to provide visibility of the regular monitoring undertaken by the Electricity Authority (Authority).
- 1.2 This report also includes analysis of:
  - (a) The interaction between generation types and how this has changed over time
  - (b) The effect of marginal generating technology on price.

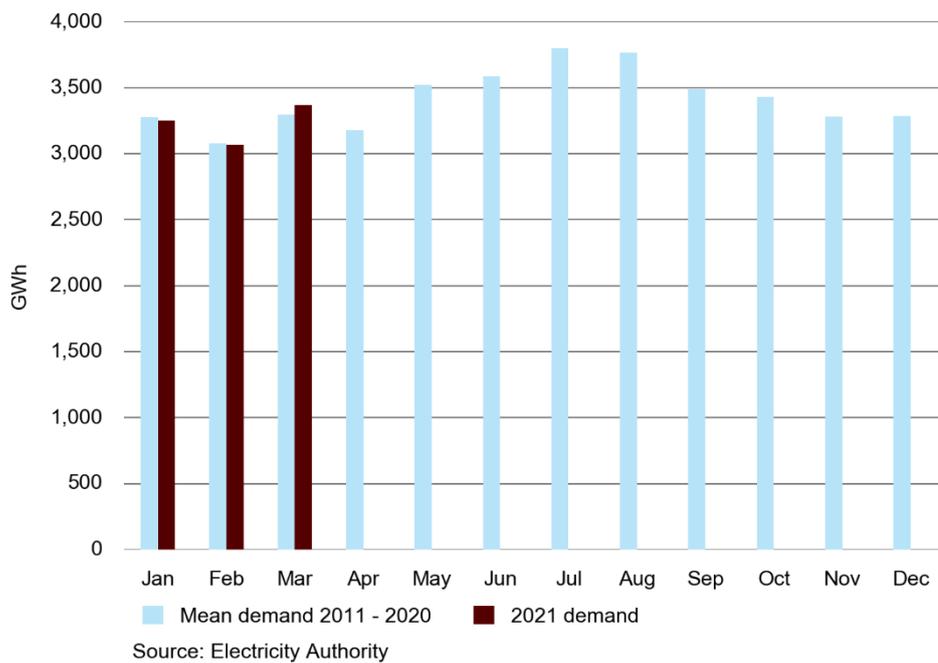
# 2 Highlights for last quarter

- 2.1 Small retailers continue to grow and switching has recovered from very low levels seen during 2020.
- 2.2 Prices were high in the first quarter of 2021 on the back of low inflows and limited supply of gas for generation. The very highest prices coincided with low wind conditions in late February and late March.
- 2.3 Prices are high partly because thermal generation is less able to firm hydro due to the lack of gas. This means that when wind generation is low, fuelled thermal is fully dispatched. The marginal generation in these circumstances is hydro offer tranches that are aimed at conserving water and are therefore highly priced.
- 2.4 First quarter wind and hydro generation were the lowest for the last seven years.
- 2.5 Purchasers took advantage of low forward prices in 2020 to hedge long dated risk. However, forward prices—including long dated futures—are very high.

# 3 Demand

- 3.1 Figure 1 shows monthly reconciled demand (including Tiwai) for 2020 compared to the average (since 2011). Demand in the first two months of 2021 was close to the average for 2011-2020 while demand for March was 2.2% higher.

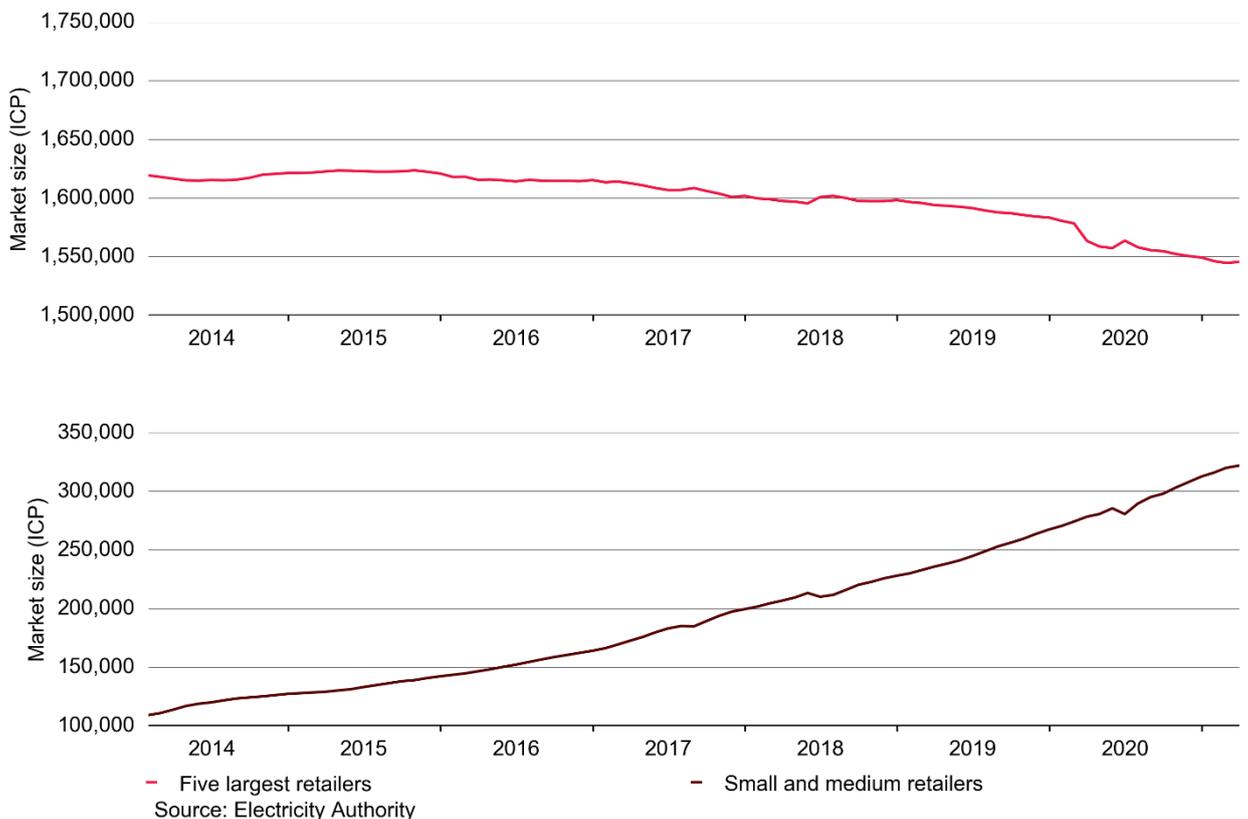
**Figure 1: Monthly reconciled demand in 2021 compared to 2011-2020**



## 4 Retail

4.1 The retail market is currently made up of five large retailers and over thirty small to medium sized retailers. Overall, we continue to see high growth for small to medium retailers and the large 5 retailers losing market share, shown in Figure 2.

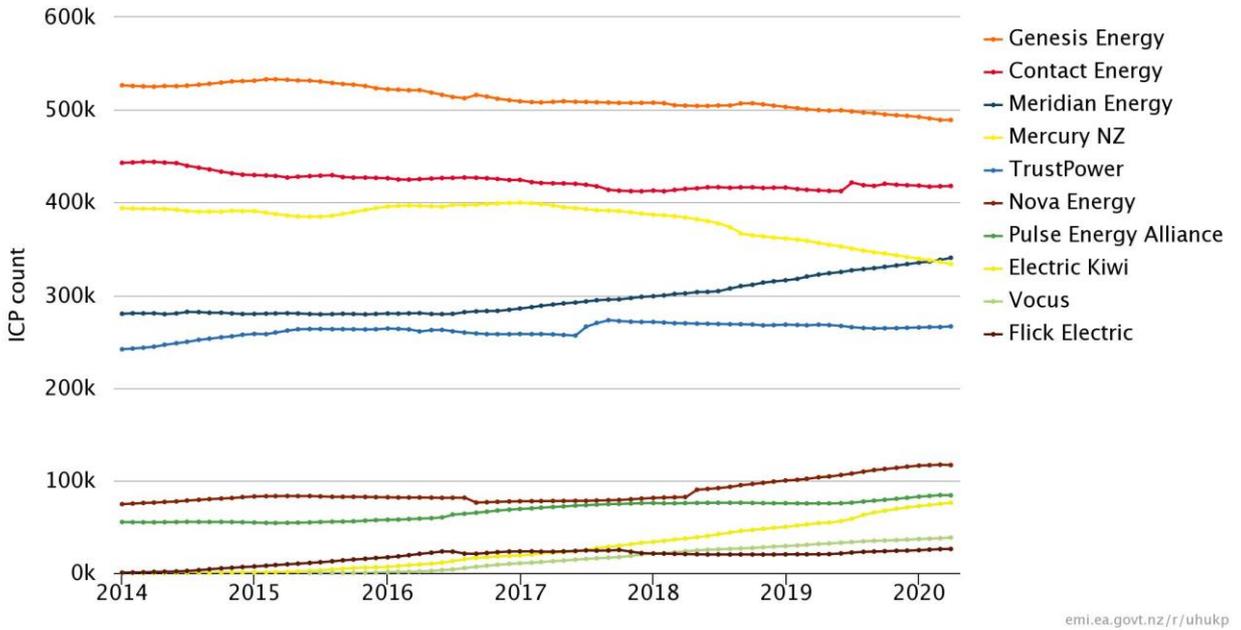
**Figure 2: Market share of retailers**



4.2 Figure 3 shows the market share for selected retailers. Despite losing ~3,000 ICPs during 2020 Genesis remains the biggest retailer. Meridian grew by ~5,000 ICPs to ~340,000 ICPs at the end of the quarter overtaking Mercury which lost almost 6,000 ICPs and are now at ~334,000 ICPs. Trustpower grew by about 1,000 ICPs while Contact had a modest drop of around 400 ICPs.

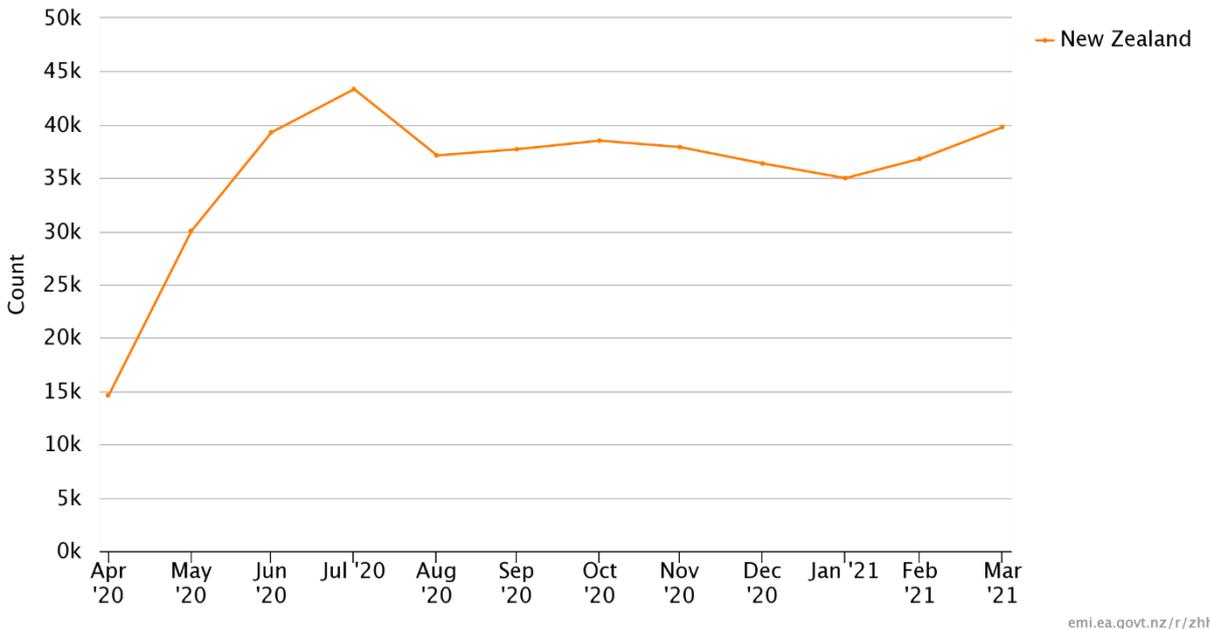
4.3 Of the medium sized retailers (10,000-100,000 ICPs) Electric Kiwi had the highest growth gaining ~3,600 ICPs. The other medium retailers grew by between ~500 ICPs (Nova Energy) and ~1,600 ICPs (Vocus).

**Figure 3: Market share for large and medium retailers**



4.4 Figure 4 shows all switches from April 2020. Switching recovered from the lows of lockdown with very high levels in July 2020 and since then has been steady.

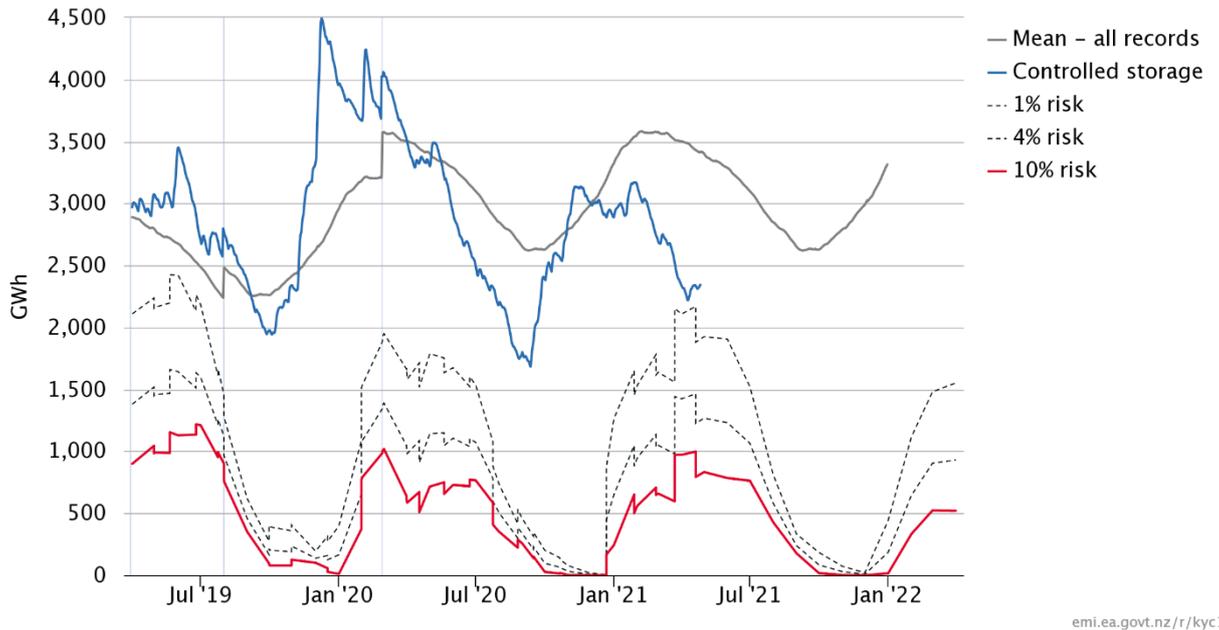
**Figure 4: Switching**



## 5 Wholesale

5.1 Hydro storage nearly hit the one percent risk curve in early April as lake levels fell as shown in Figure 5. However small inflows and an adjustment to the risk curves by Transpower moved storage away from the risk curve by the end of April.

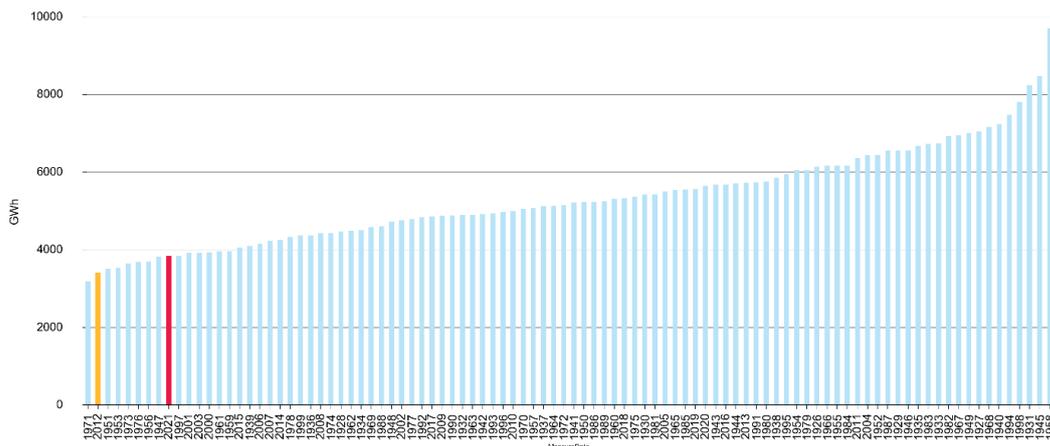
**Figure 5: Hydro storage**



emi.ea.govt.nz/r/kyc1b

5.2 Figure 6 shows inflows in the South Island from January to March for all years on record with 2012 and 2021 in yellow and red respectively. 2021 inflows have been very low so far this year, combined with below average storage at the start of the year this has led to low hydro storage levels over 2021.

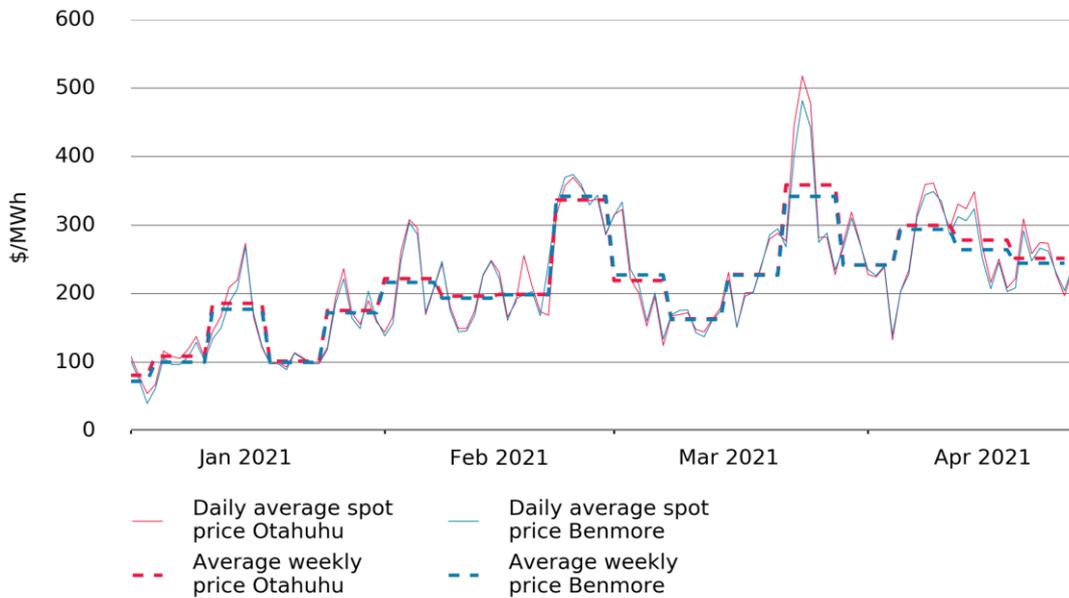
**Figure 6: South Island inflows**



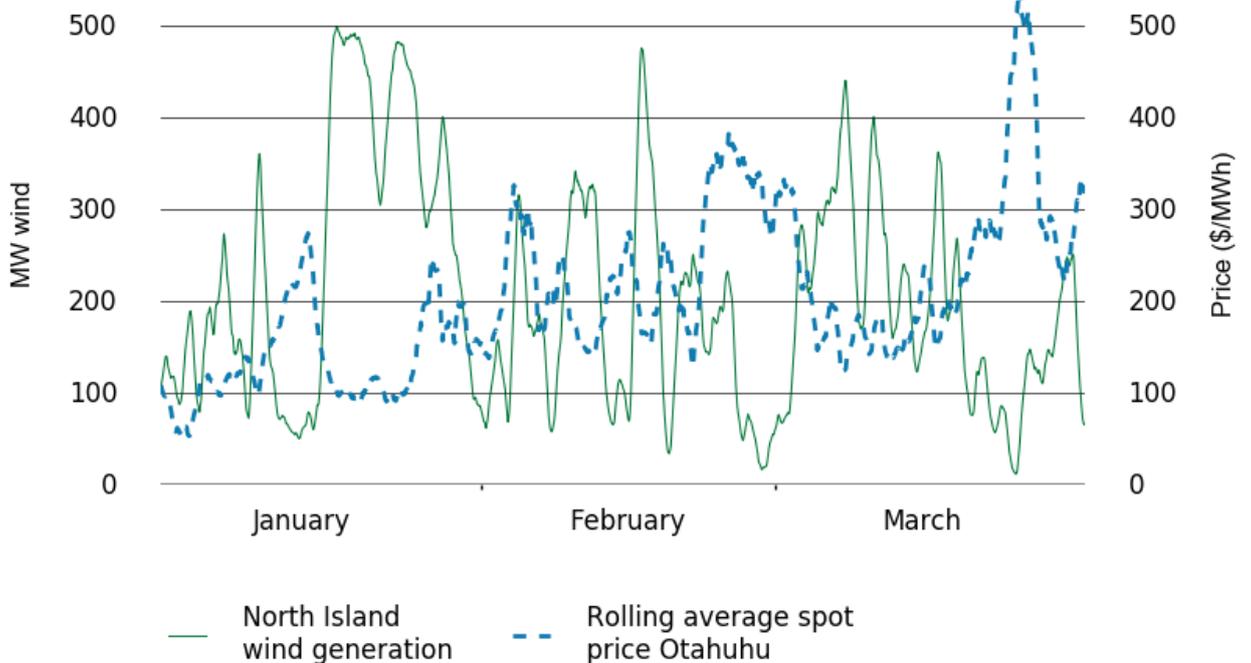
5.3 Figure 7 shows the daily and weekly average spot prices at Benmore and Otahuhu for the current year. Spot prices have increased as hydro storage has decreased. Additionally, there have been two weeks with very high prices (above \$350/MWh) in late February and late March. Figure 8 shows that this was partly due to very low wind

generation at those times, forcing other generation to run. Section 8 below discusses the marginal generating technology and its relationship to spot price.

**Figure 7: Spot price at Benmore and Otahuhu**



**Figure 8: Wind and price**



5.4 As South Island storage has fallen, more North Island generation has been dispatched and the HVDC has run southwards often over the last quarter as shown in Figure 9.

**Figure 9: HVDC transfer**

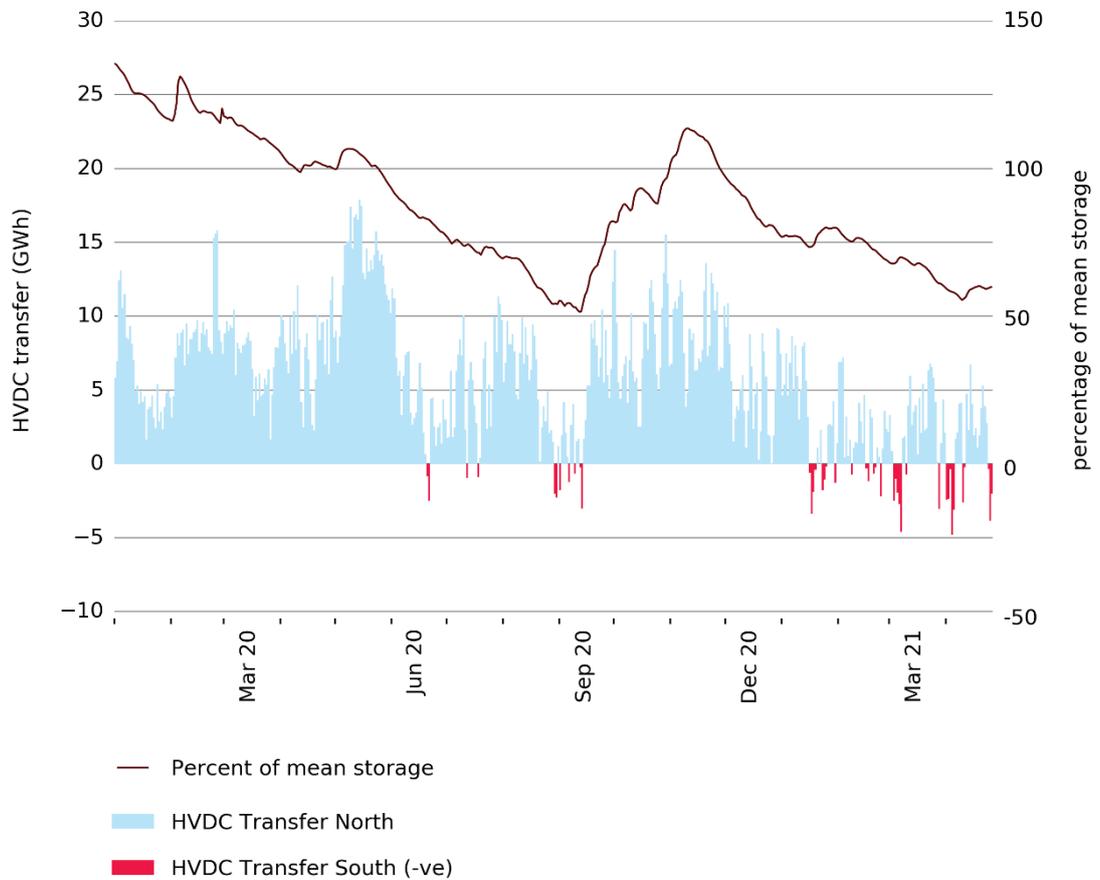
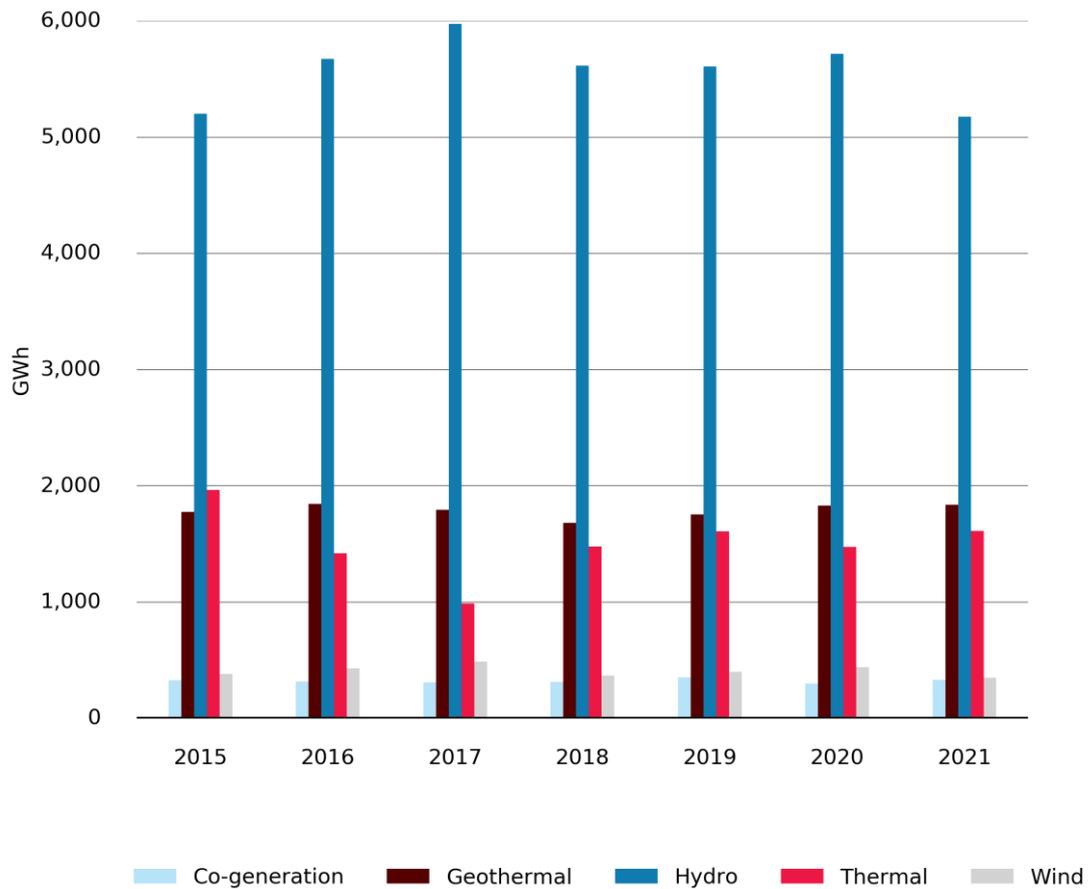


Figure 10 shows generation by technology for the first three months of the year from 2015. Of these years, hydro generation and wind were the lowest in 2021, and thermal was the second highest. Section 7 discusses how these different generating technologies interact.

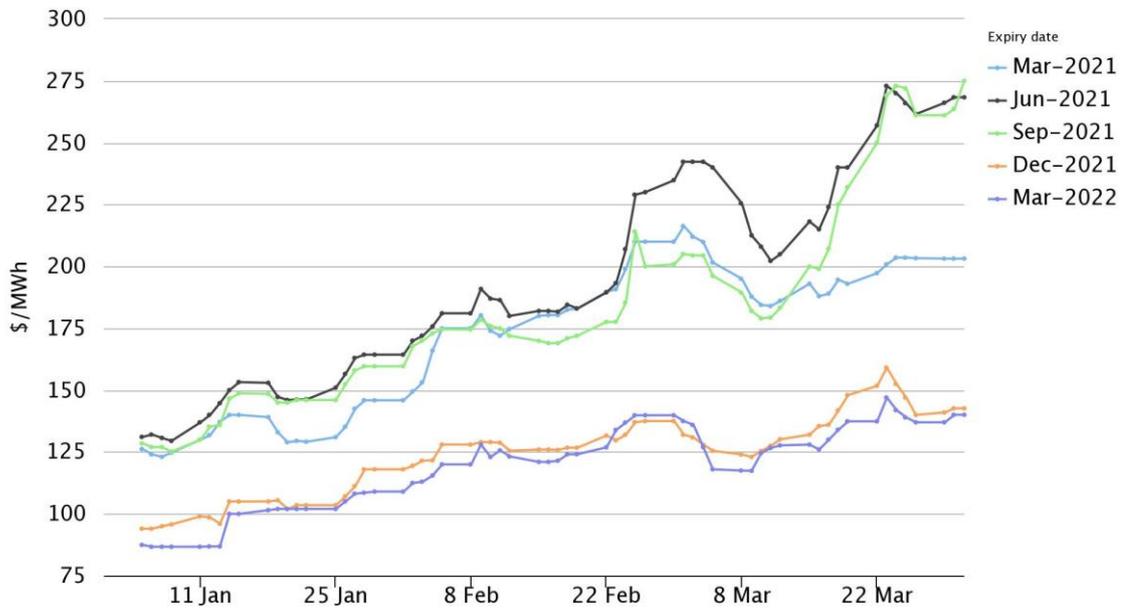
**Figure 10: Generation by technology January to March**



## 6 Forward market

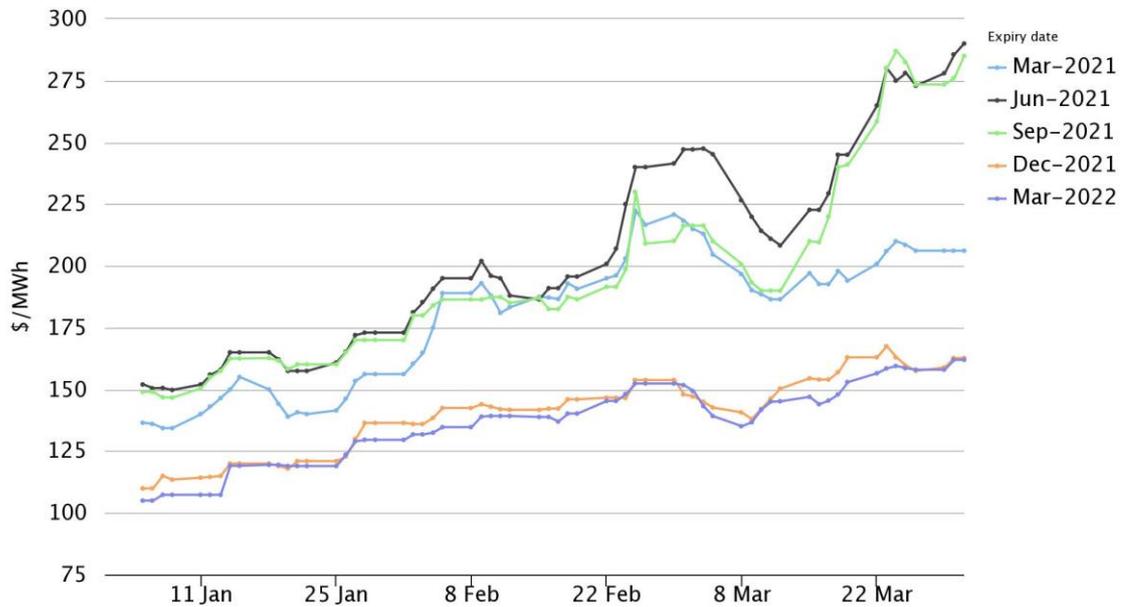
- 6.1 Figure 11 to Figure 14 show forward prices for short and long dated ASX futures at Benmore and Otahuhu. Figure 11 and Figure 12 show that the market is expecting high prices for the two winter quarters this year. Prices for forward contracts have increased sharply since the beginning of the year.
- 6.2 Figure 13 and Figure 14 show long dated ASX future prices for June quarters at Benmore and Otahuhu.
- 6.3 Figure 15 shows long dated open interest on the ASX for the last 24 months. It shows purchasers taking advantage of low priced futures in 2020 as speculation about Tiwai's exit meant expectations of future spot prices fell. This level of open interest in long dated futures is around 5 times what it was two years ago. This highlights the benefits of a liquid futures market that has enabled risk managers to access far higher volumes of futures to manage their risk long term.

**Figure 11: Quarterly forward prices (short dated) at Benmore by trading date Jan-Mar 2021**



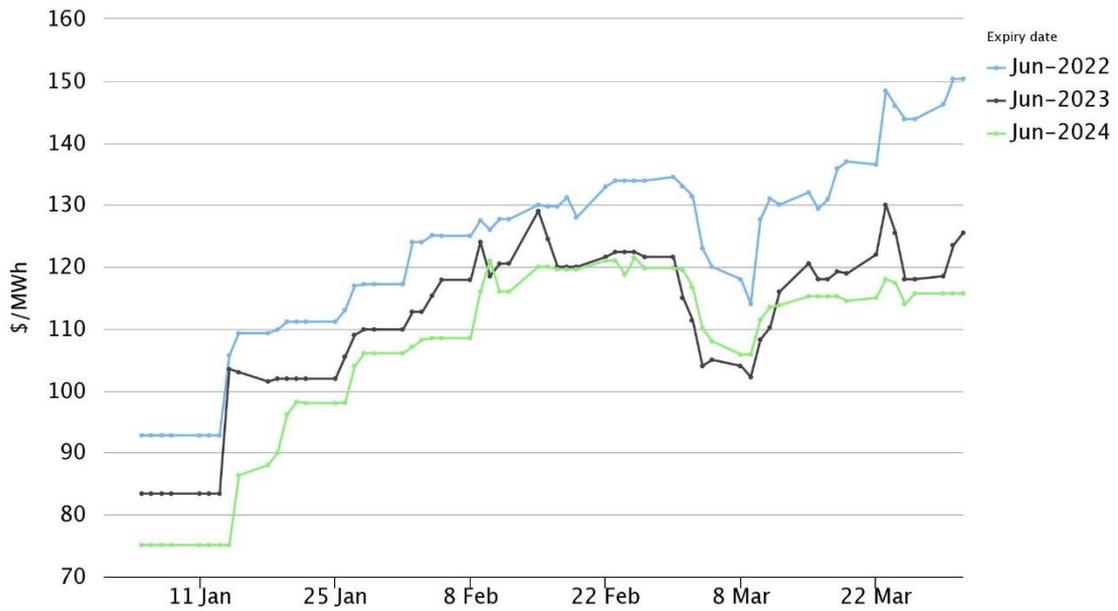
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**Figure 12: Quarterly forward prices (short dated) at Otahuhu by trading date Jan-Mar 2021**



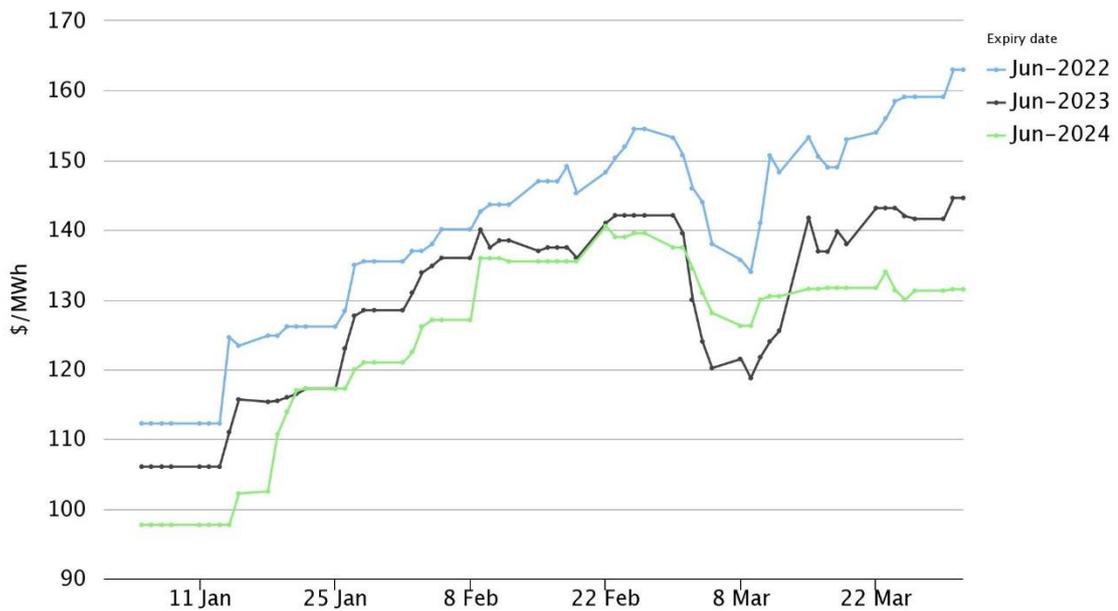
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**Figure 13: Quarterly forward prices (June, long dated) at Benmore by trading date Jan-Mar 2021**



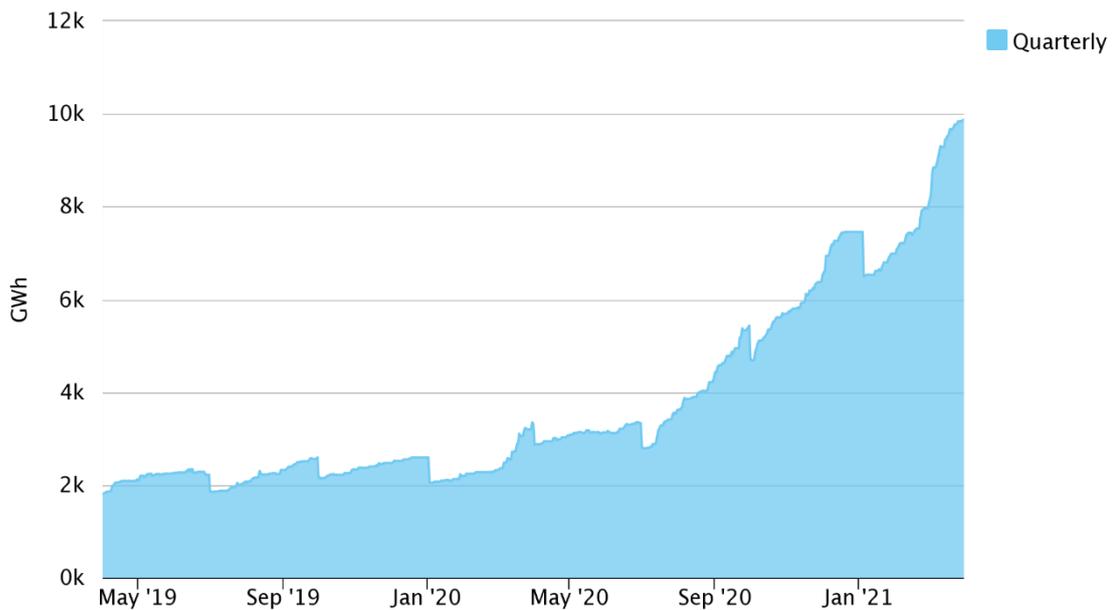
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**Figure 14: Quarterly forward prices (June, long dated) at Otahuhu by trading date Jan-Mar 2021**



emi.ea.govt.nz/r/tioy1

**Figure 15: Open interest for long dated futures**



emi.ea.govt.nz/r/rely23

## 7 Deep dive: Firming generation

- 7.1 Intermittent renewable generation requires firming, which is when another generation technology starts generating when renewable resources are scarce. This applies to wind and hydro in the New Zealand power system. Wind requires firming over timeframes of about a day, hydro requires firming over monthly timeframes.
- 7.2 Table 1 shows correlations between daily output from different generation technologies and with the spot price from 2011 to 2018. It shows a negative correlation between hydro generation and thermal generation suggesting that thermal stations generate more when hydro fuel is scarce. Table 1 also suggests that both thermal and hydro generation firm wind, indicated by the negative correlations between wind and hydro and wind and thermal. Note that wind generation capacity grew rapidly over this period.
- 7.3 Table 1 also shows a positive relationship between the spot price and thermal generation. This is indicative of thermal generation requiring higher prices to run to cover fuel and carbon costs. There is also a weak relationship between price and hydro generation, suggesting little relationship between price and hydro generation.

**Table 1: Correlations 2011-18**

	NI spot price	SI spot price	Geo	Hydro	Thrml	Wind
NI spot price	1	0.41	-0.02	-0.02	0.18	-0.15
SI spot price		1	-0.02	-0.1	0.28	-0.15
Geo			1	0.25	-0.38	-0.08
Hydro				1	-0.38	-0.17
Thrml					1	-0.17
Wind						1

- 7.4 Table 2 and Table 3 show the same data for 2020 and 2021 YTD respectively. These tables suggest a different set of relationships in the spot market:

- (a) Thermal and hydro generation are no longer negatively correlated meaning thermal is not firming hydro the way it was.
- (b) Hydro now is firming wind far more than thermal is.
- (c) The spot price is positively correlated with hydro generation, suggesting that more hydro generation lead to higher prices in 2020/21. This is consistent with the relatively low storage during this period. In Table 1 there is almost no relationship between hydro generation and spot price.
- (d) The strong negative relationship between wind and spot price in 2021 is further evidence that the high prices coincide with low wind generation.

**Table 2: Correlations 2020**

	NI spot price	SI spot price	Geo	Hydro	Thrml	Wind
NI spot price	1	0.52	-0.1	0.34	0.44	-0.14
SI spot price		1	-0.11	0.3	0.47	-0.09
Geo			1	-0.25	-0.07	-0.15
Hydro				1	0.23	-0.35
Thrml					1	-0.08
Wind						1

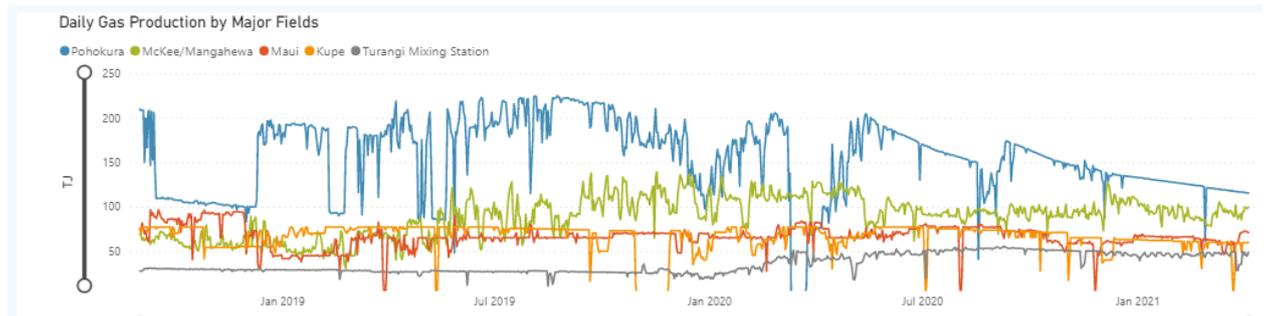
**Table 3: Correlations 2021 YTD**

	NI spot price	SI spot price	Geo	Hydro	Thrml	Wind
NI spot price	1	0.63	0	0.35	0.44	-0.41
SI spot price		1	0	0.3	0.49	-0.39
Geo			1	-0.14	-0.33	-0.12
Hydro				1	0.11	-0.33
Thrml					1	-0.15
Wind						1

## **Scarce gas means thermal generation has less flexibility to firm renewable generation**

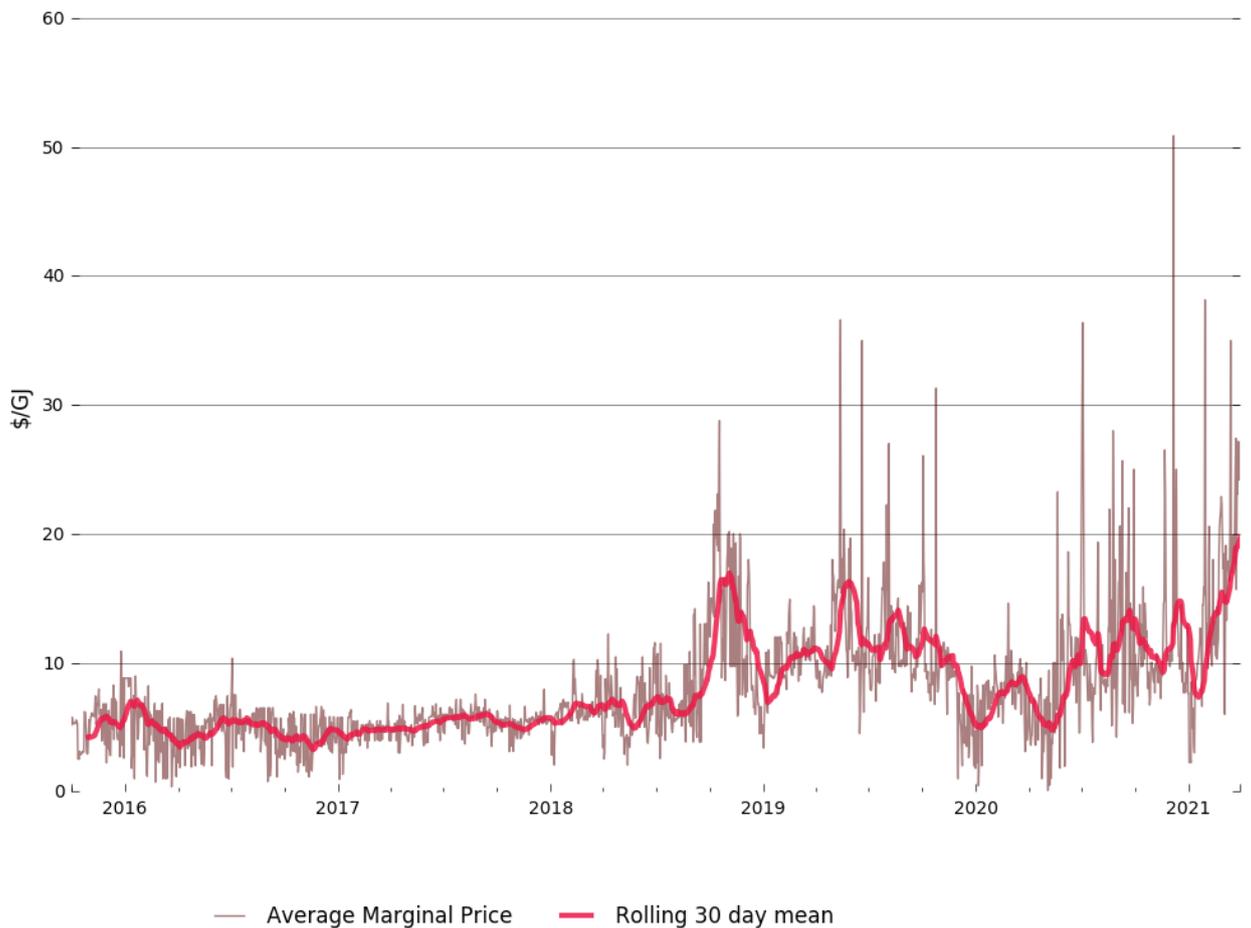
- 7.5 Reductions in output from the Pohokura gas field mean that thermal generation has reduced flexibility to firm renewable generation.
- 7.6 Since late 2018, the Pohokura gas field has had several issues affecting how much gas is available to generators. Figure 16 shows production from New Zealand’s main gas fields over the last two years—the blue line shows Pohokura. The Pohokura outage in late 2018 is shown on the left as a sharp fall in production for about three months. Since then production has been volatile and punctuated by different outages. Starting about 12 months ago, production started to fall at a steady rate to the point where production is now comparable to production during the 2018 outage.

**Figure 16: Gas production<sup>1</sup>**



7.7 Figure 17 shows the spot price for gas. Note most gas is not traded on the spot market, but the spot price is indicative of scarcity. Figure 17 shows an increase in both the level and volatility of the spot price since late 2018 coinciding with Pohokura’s production issues.

**Figure 17: Gas spot price**



7.8 The fall in available gas has led to a fall in the production of methanol, with Methanex’s Waitara Valley plant recently shut. For the electricity industry it has reduced the flexibility of thermal generation to firm renewable generation.

<sup>1</sup> <https://www.gasindustry.co.nz/about-the-industry/gas-industry-information-portal/gas-production-and-major-consumption-charts/>

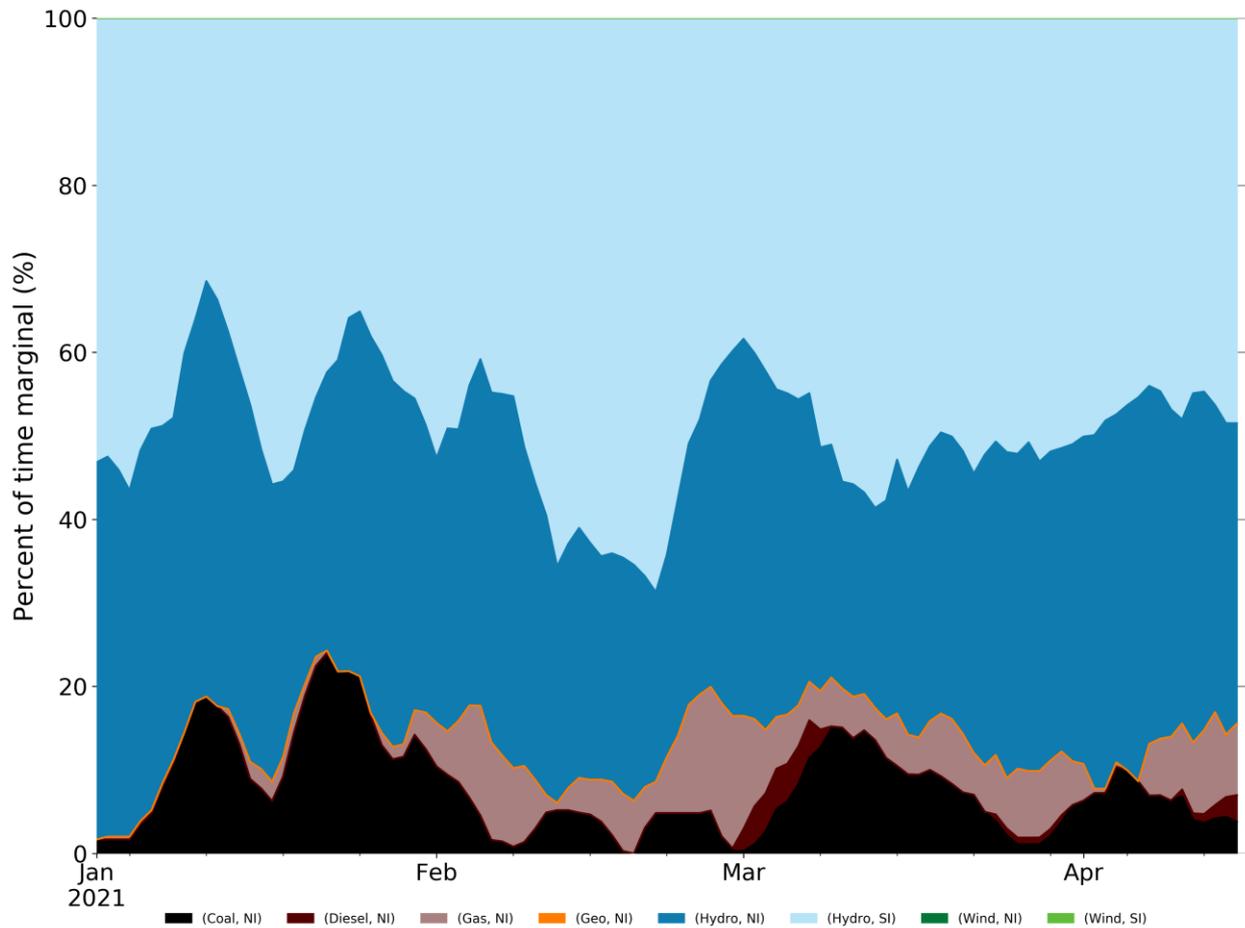
## **Firming has changed**

- 7.9 Issues with Pohokura explain the changes in the correlations shown in the tables above. Previously gas had more flexibility to respond to low storage, and this flexibility is not available due to the reduction in Pohokura's output.
- 7.10 In 2021 this has meant that when storage and wind are low, instead of thermal generation stepping in, offer tranches from hydro generators, which are priced to conserve water, are dispatched. This is explored more fully in section 8.

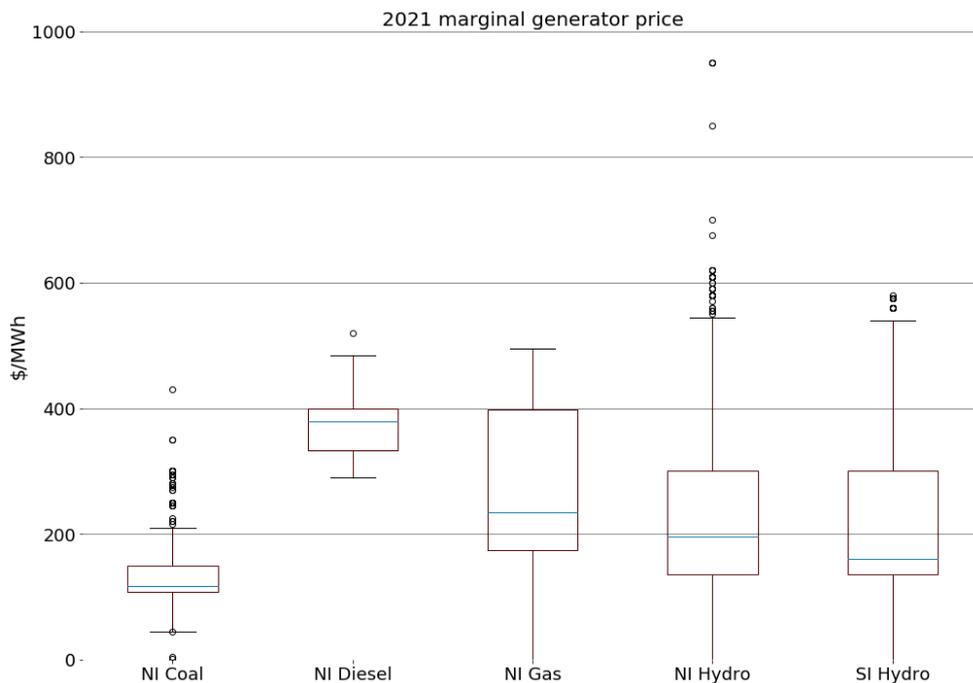
## **8 Deep dive: Marginal generator**

- 8.1 The marginal generator sets the price in the spot market. Figure 18 shows the marginal generation technology for 2021. It shows hydro generation is the marginal technology around 85 percent of the time. The rest of the time is split between coal, diesel and gas.
- 8.2 Figure 19 shows the distribution of spot price by marginal technology for 2021. In this plot:
- (a) The blue line is the median spot price for that technology
  - (b) The box is the range from the 25<sup>th</sup> to 75<sup>th</sup> percentile
  - (c) The ends of the whiskers are the highest and lowest data points within 1.5 times the length of the box; or 1.5 times the length of the box measured from either end of the box
  - (d) The circles are outliers
- 8.3 It shows median spot prices are lowest when coal is marginal, and highest when diesel is marginal followed by gas. The highest price spikes (outliers) occur when North Island hydro is marginal followed by South Island hydro.

**Figure 18: Marginal generation technology in 2021**



**Figure 19: Half hourly spot price and the marginal generating technology in 2021**



- 8.4 While the third Rankine at Huntly was the last unit to be brought into the market, this technology is not driving the highest prices because coal is not scarce at the moment.
- 8.5 In contrast hydro storage and gas are both scarce and are being priced to conserve the resource. For hydro this means generators need to make the choice between generating or storing water for future use, all within the context of uncertain future inflows. For the first three months of this year this has meant hydro generators, faced with low inflows and the impending winter, have been pricing at least some of their generation at very high prices. On occasions when this generation is needed to meet demand, this has led to very high spot prices. This has generally coincided with low wind generation as set out above.