

Trading Conduct Report

Market Monitoring Weekly Report

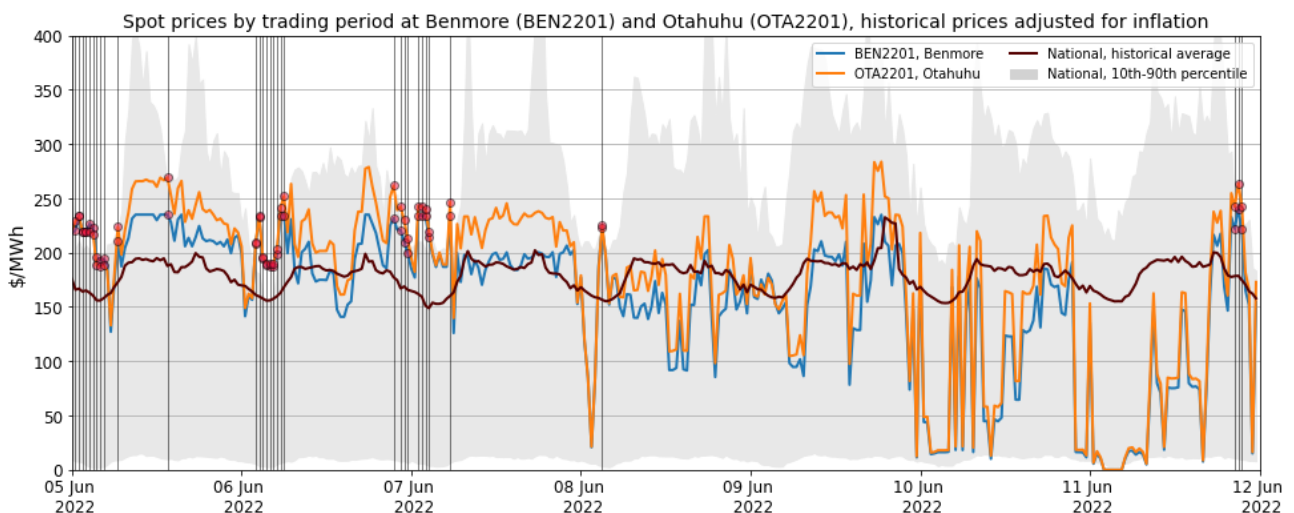
1. Overview for the week of 5 to 11 June

- 1.1. The majority of wholesale spot prices this week appear to be consistent with supply and demand conditions.

2. Spot Prices

- 2.1. This report monitors underlying wholesale price drivers to assess whether there are trading periods that require further analysis for the purpose of considering potential non-compliance with the trading conduct rule. To do this, we assess whether spot prices are behaving in line with market conditions. In addition to general monitoring, we also single out unusually high-priced individual trading periods for further analysis by identifying when wholesale electricity spot prices at Benmore and/or Otahuhu nodes exceed their historical 90th percentiles. These historically high-priced trading periods are marked out by vertical lines in the majority of figures in this report.
- 2.2. Wholesale electricity spot prices across all nodes between 5 and 11 June dropped by ~\$20/MWh from the previous week's average to \$164.86 /MWh. 95 per cent of prices fell between \$7.94/MWh and \$254.36/MWh.
- 2.3. Figure 1 shows spot prices from the past week at Benmore and Otahuhu alongside their historic mean and historic 10th-90th percentiles adjusted for inflation.
- 2.4. Spot prices fell over the week, becoming more volatile as prices reduced. Off peak prices at the beginning of the week were higher than we would historically expect.

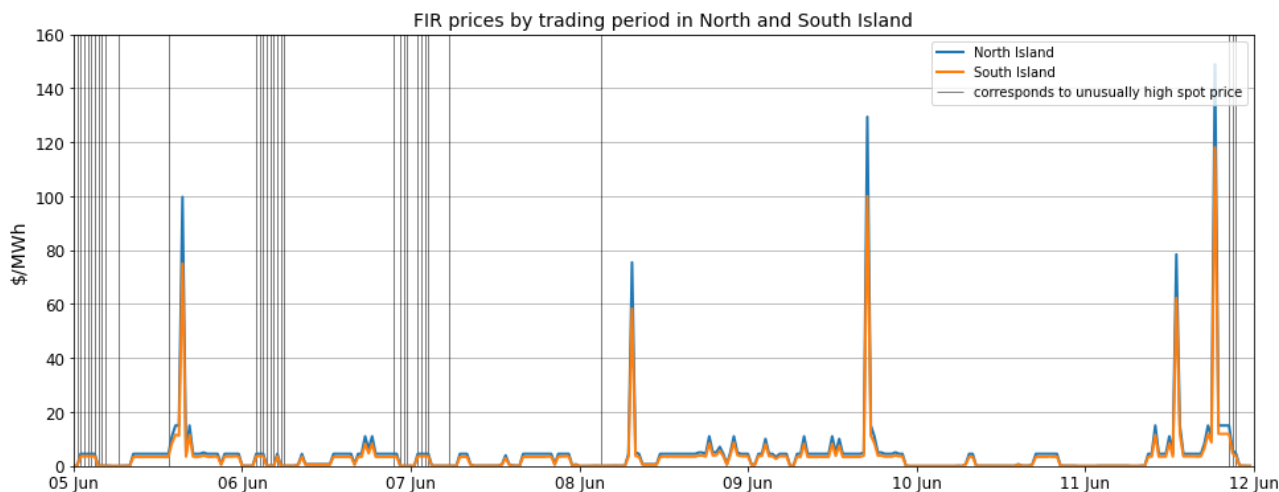
Figure 1: Wholesale Spot Prices



3. Reserve Prices

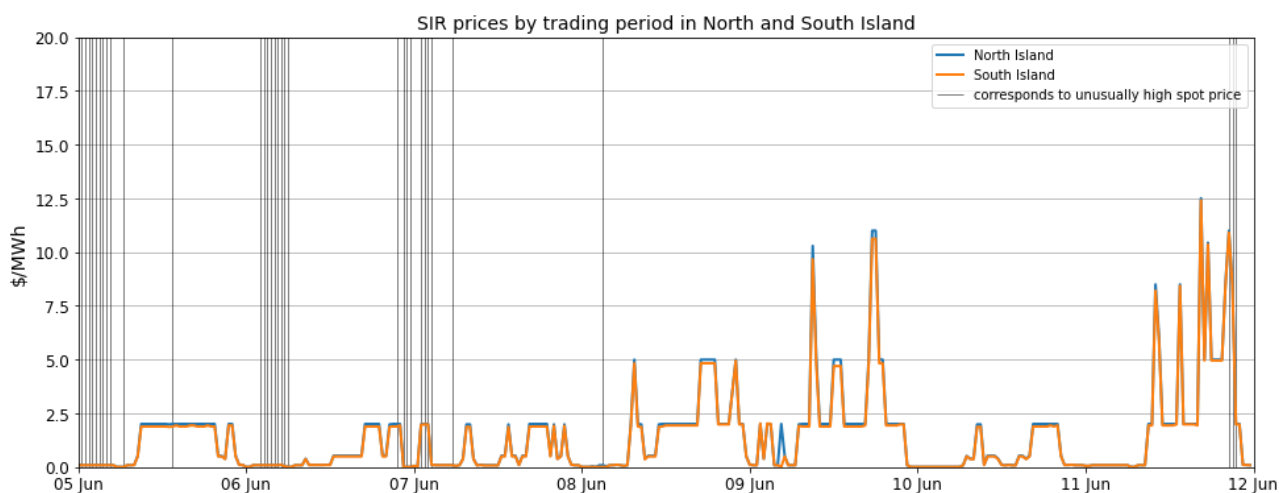
3.1. Fast instantaneous reserves (FIR) prices for the North and South Island are shown below in Figure 2. FIR prices this week saw spikes up to \$140/MWh. Similarly to last week it looks as though these spikes may be due to a mixture of factors including fewer reserve offers due to stations such as Huntly not running and possible co-optimisation by the system operator. Overall these price spikes do not appear to be a result of any deliberate changes in offers and so do not show signs of trading misconduct.

Figure 2: FIR prices by trading period and Island



3.2. Sustained instantaneous reserves (SIR) prices for the North and South Island are shown below in Figure 3. SIR reserve prices this week also showed some price spikes, though the spikes were within a reasonable range of around ~\$12/MWh. SIR prices otherwise remained within normal bounds at below \$5/MWh.

Figure 3: SIR prices by trading period and Island



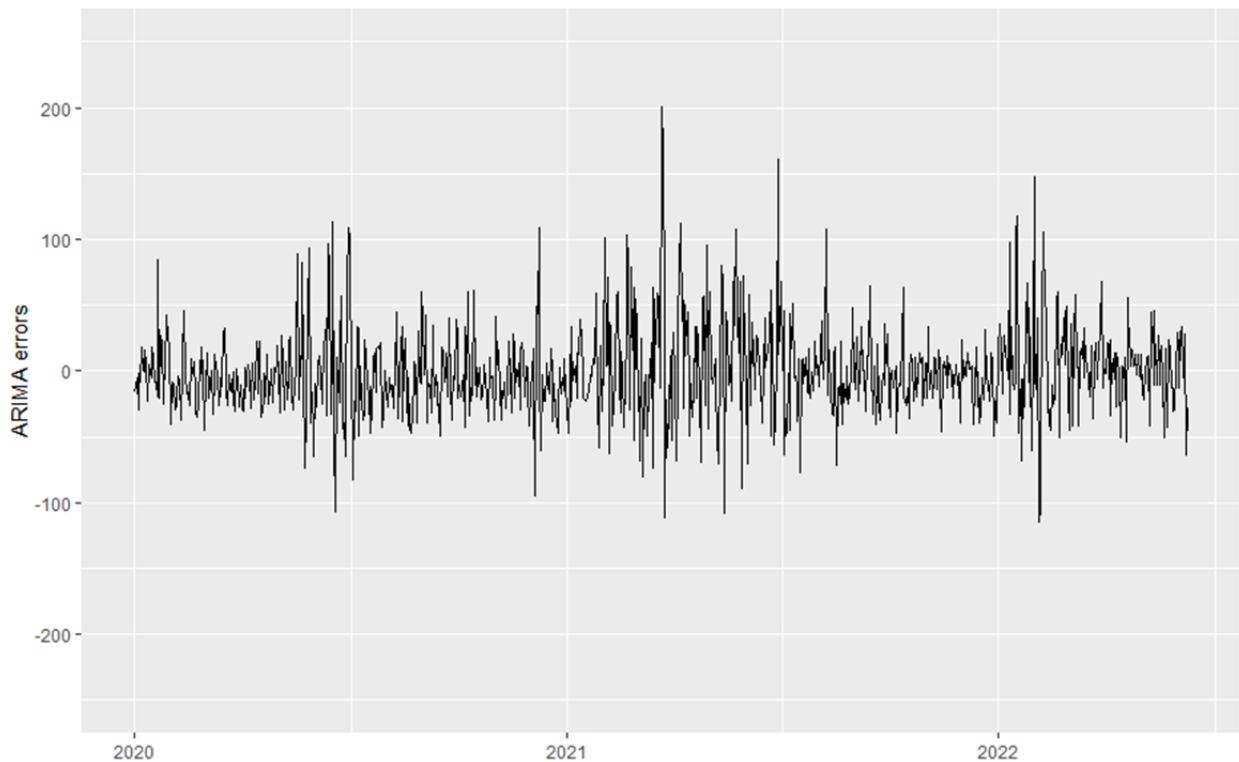
4. Regression Residuals

4.1. The Authority’s monitoring team has developed two regression models of the spot price. The residuals show how close the predicted prices were to actual prices. Large residuals may indicate that prices do not reflect underlying supply and demand conditions. Details on the regression model and residuals can be found in Appendix A¹ on the trading conduct webpage.

¹ <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-A-Regression-Analysis.pdf>

4.2. Figure 4 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Negative daily residuals this week indicated a downward trend in spot prices. Prices appear to be largely aligned with market conditions.

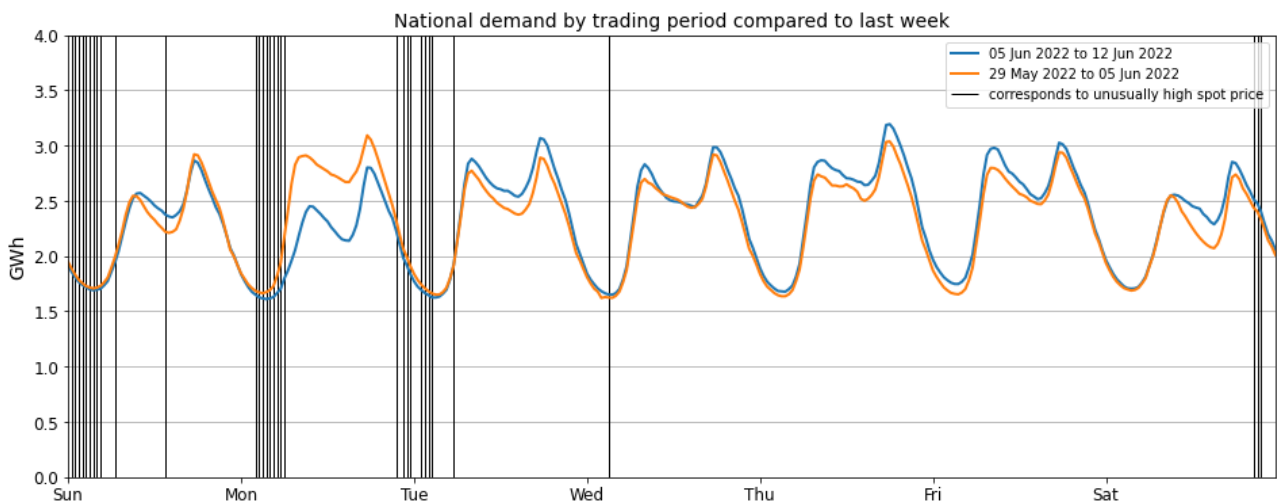
Figure 4: Residual plot of estimated daily average spot price YTD



5. Demand

5.1. Figure 5 shows this week's national grid demand against national grid demand from the previous week. With the exception of Monday daily grid demand this week has increased compared to the previous week. This was likely a result of lower temperatures as seen in Figure 6.

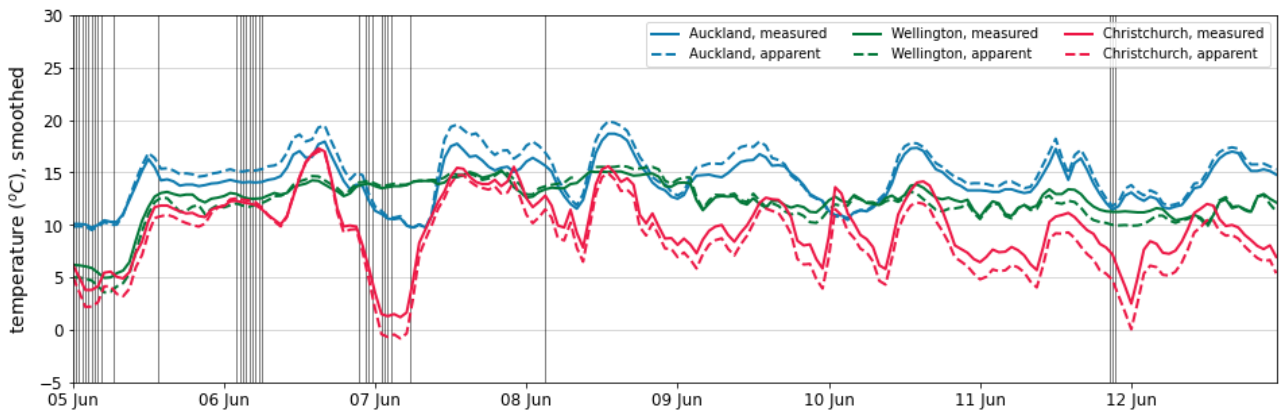
Figure 5: National demand by trading period compared to the previous week



5.2. Figure 6 shows hourly temperature at main population centres. The measured temperature is the recorded temperature, while the apparent temperature adjusts for factors like wind speed and humidity to estimate how cold it feels.

5.3. Temperatures at main population centres averaged between 5° and 15° degrees this week, a few degrees lower than the previous week. The decrease in temperatures was likely the reason for increased demand this week with some above average spot prices correlating with when temperatures were at their lowest points for the week.

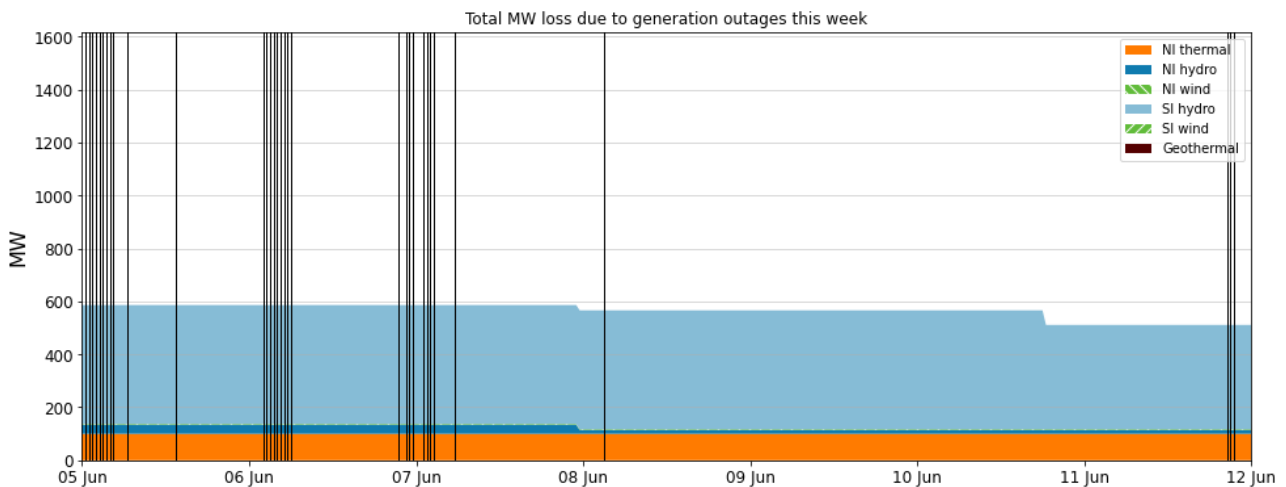
Figure 6: Temperatures across main centres



6. Outages

6.1. Figure 7 shows generation capacity lost due to outages. Outages continue to be significantly lower than previous weeks with total capacity lost due to outages at less than 600 MW. The reduction in capacity lost would have helped keep spot prices within historical bounds this week.

Figure 7: Total MW loss due to generation outages

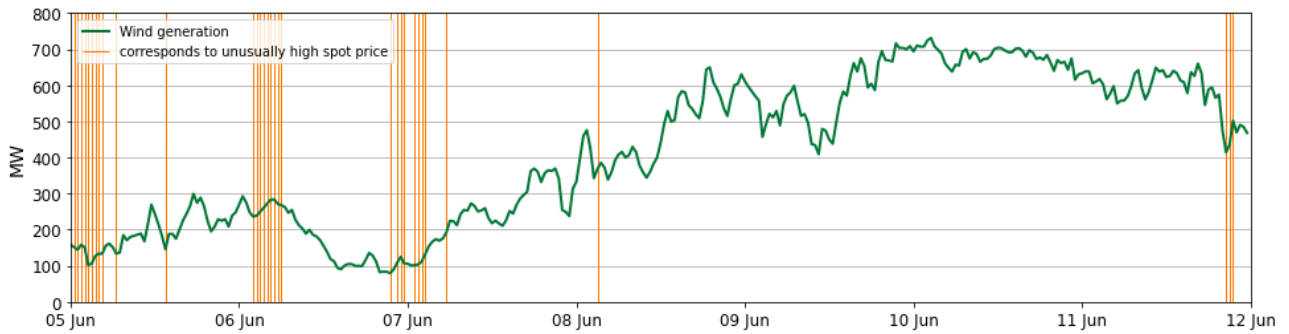


7. Generation

7.1. Figure 8 shows wind generation this week. A strong upwards trend in wind generation this week helped to keep prices depressed in the latter half of the week. Wind generation rose to above 500 MW from 8 June, reaching around 700 MW on 10 June before falling back to 500 MW on 11 June. The high amount of wind generation is likely the main cause of falling spot prices from 8 June onwards.

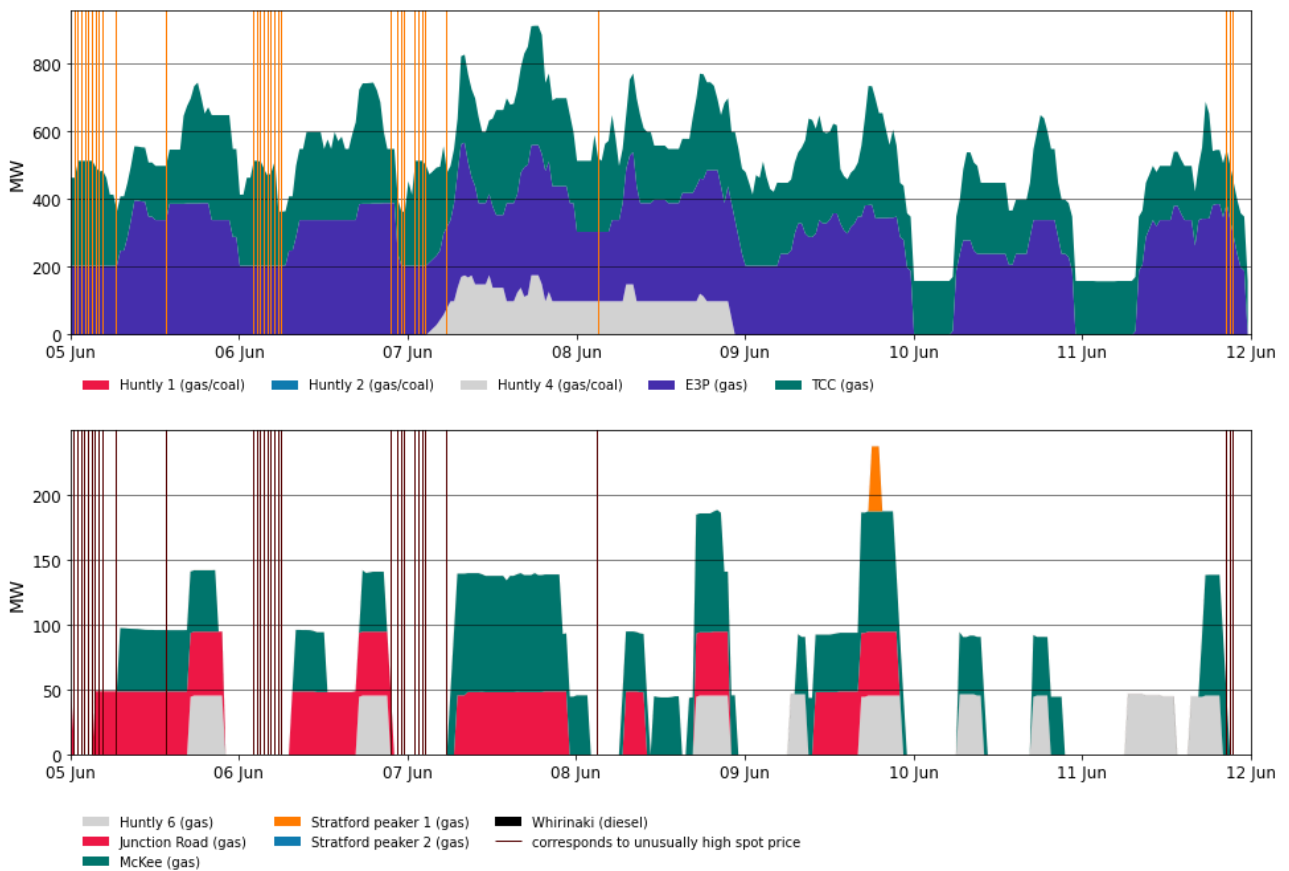
7.2. Prices that exceeded their historical 90th percentiles coincided with when wind generation was at its lowest or when wind generation unexpectedly dropped indicating a lower amount of renewable generation likely contributed to the higher than expected prices.

Figure 8: Wind Generation



- 7.3. Figure 9 shows generation at thermal and thermal peaker plants. The rise in wind generation corresponded to a decrease in thermal generation from 8 June onwards. Thermal generation fell from between 400 and 800 MW to between 200 and 600 MW. Thermal peaker generation also ran less frequently, only running for peak periods rather than for the whole day. The decrease in thermal generation likely contributed to the fall in average spot prices as thermal generation is more highly priced than wind generation.
- 7.4. In addition to overall lower thermal generation, TCC continuing to run above its minimum load of around 160 MW during off peak periods even when other thermal plants shut down, (as it was likely more efficient to keep running than to turn off and on again despite running at a loss) helped to decrease off peak spot prices near the end of the week. The combination of TCC running along with high wind generation was likely the cause for the high amount of price volatility seen between 10 and 11 June.

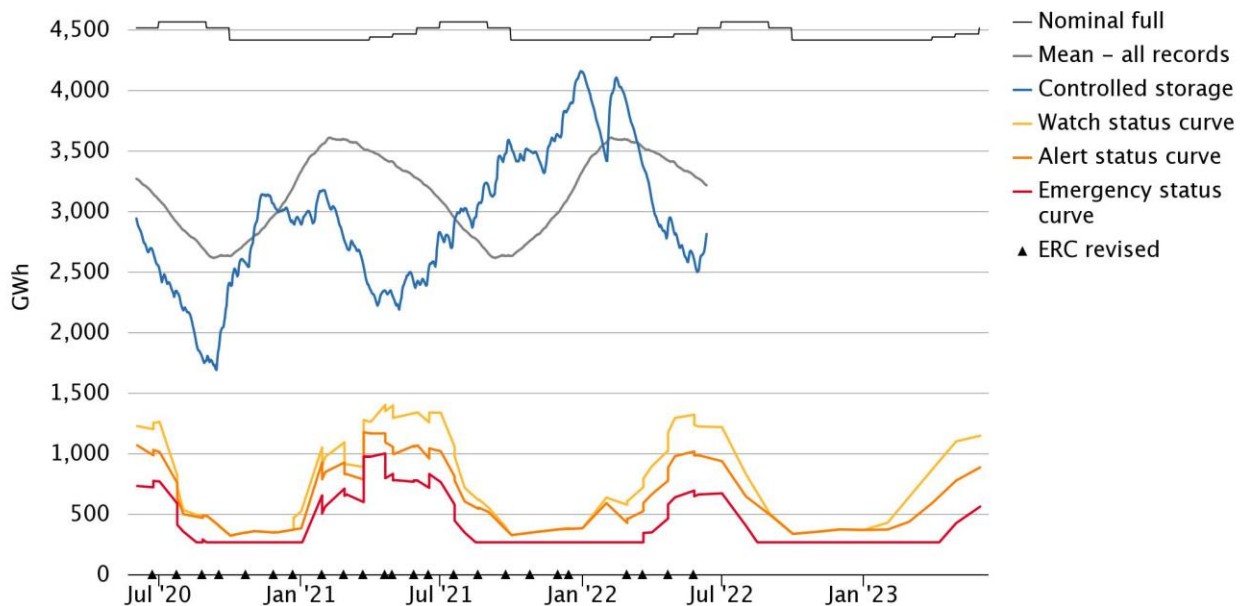
Figure 9: Thermal Generation



8. Storage/Fuel Supply

- 8.1. Figure 10 shows total controlled national hydro storage. Recent rainfall around major catchment areas has increased total hydro storage. Lake Taupo saw the most significant improvement as a result, currently sitting at above its historical mean for this time of year. Lakes Manapouri and Te Anau storage levels also rose to around their historic means. Remaining South Island lakes' storage levels however continue to hover around their 10th percentiles.

Figure 10: Hydro Storage



emi.ea.govt.nz/r/bfsggp

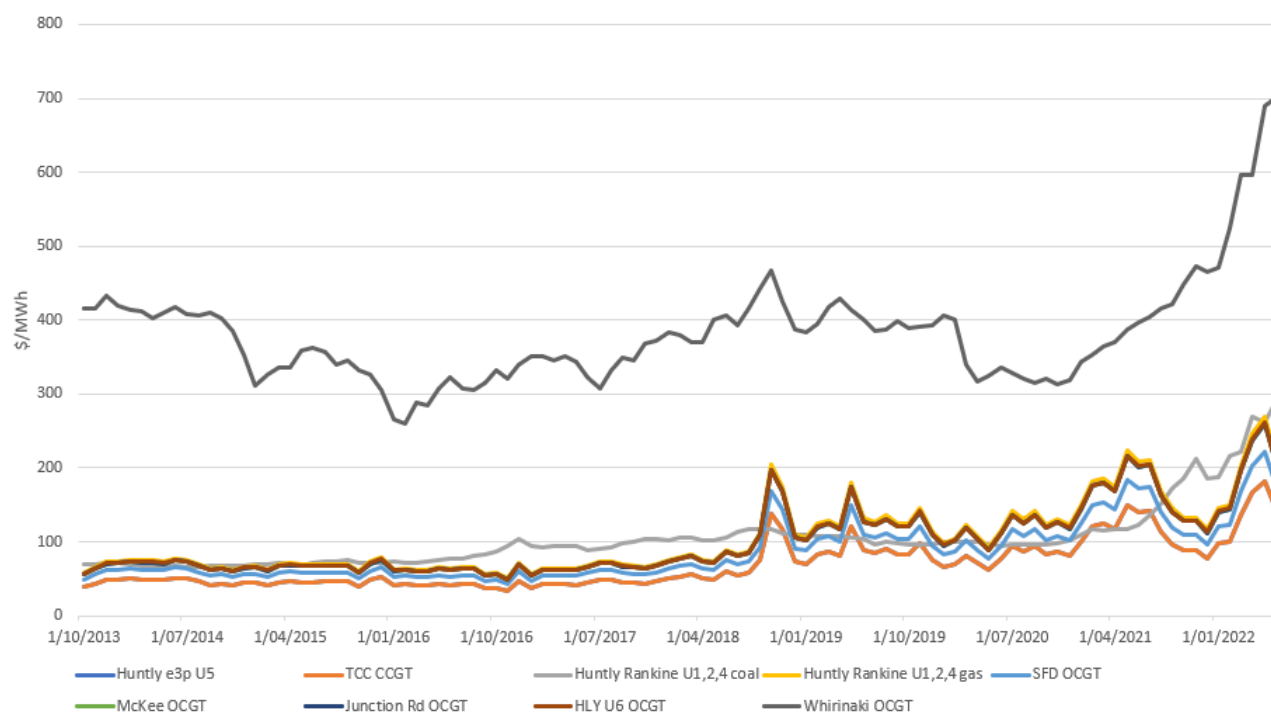
- 8.2. The increase in hydro storage does not look to have affected spot prices as significantly as high wind generation and low thermal generation has this week as South Island storage still remains quite low. The forecasts of upcoming heavy rain and snow warnings across most of New Zealand indicate hydro storage is likely to increase in the short term future and we would expect spot prices to lower as a result.

9. Price versus estimated costs

- 9.1. In a competitive market, prices should be close to (but not necessarily at) the short run marginal cost (SRMC) of the marginal generator (where SRMC includes opportunity cost).
- 9.2. The SRMC (excluding opportunity cost of storage) for thermal fuels can be estimated using gas and coal prices, and the average heat rates for each thermal unit. Note that the SRMC calculations include the carbon price, an estimate of operational and maintenance costs, and transport for coal. Figure 11 shows an estimate of thermal SRMCs as a monthly average up to 1 June 2022. The SRMC of all plants has increased sharply since the beginning of 2022.
- 9.3. The SRMC of coal and diesel have both increased due to global supply and demand conditions. As well as supply disruptions caused by Covid, the Russian-Ukraine conflict has increased the premium on all international coal due to sanctions placed on Russia. The conflict has increased recent coal prices to around \$475/tonne. The increase in diesel and coal prices has put the latest SRMC of Whirinaki and coal rich Huntly generation at around ~\$700/MWh and ~\$300/MWh respectively.
- 9.4. SRMCs of gas run thermal plants have decreased in the last month however which may be related to the recent downturn of Maui gas field and idling of Methanex's Motunui plant.

9.5. More information on how the SRMC of thermal plants is calculated can be found in Appendix C² on the trading conduct webpage.

Figure 11: Estimated monthly SRMC for thermal fuels



10. JADE Water values

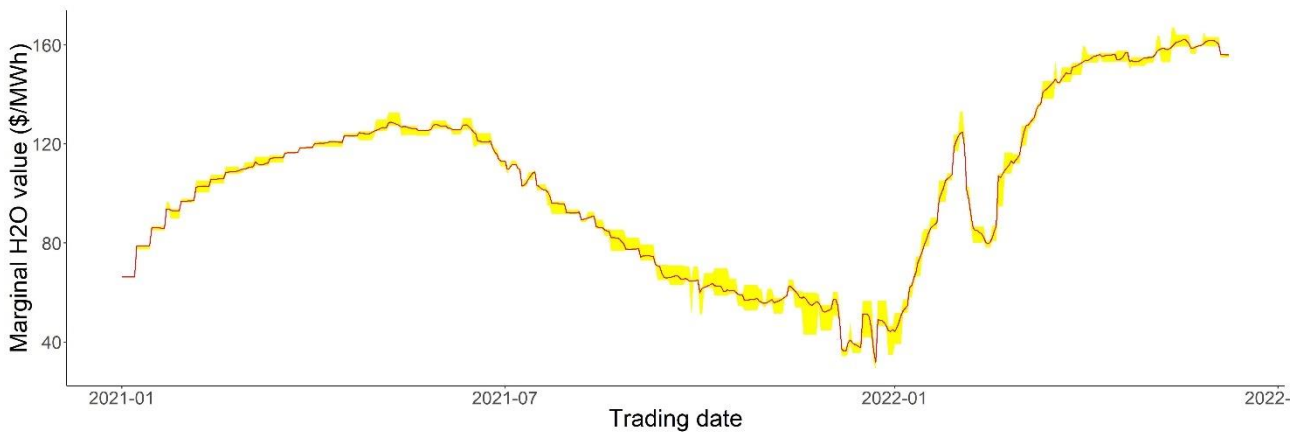
- 10.1. The JADE³ model gives a consistent measure of the opportunity cost of water, by seeking to minimise the expected fuel cost of thermal generation and the value of lost load and provides an estimate of water values at a range of storage levels. Figure 12 shows the national water values to 8 June 2022 using values obtained from JADE. The outputs from JADE closest to actual storage levels are shown as the yellow water value range. These values are used to estimate marginal water value at the actual storage level. More details on how water values are calculated can be found in Appendix B⁴ on the trading conduct webpage.
- 10.2. In general, marginal water values have increased when total national hydro storage has decreased. For the last two months water values have been gradually increasing as hydro storage has declined and despite the recent bump in hydro storage water values continue to hover around ~\$150/MWh.

² <https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf>

³ JADE (Just Another DOASA Environment) is an implementation of the Stochastic Dual Dynamic Programming (SDDP) algorithm of Pereira and Pinto. JADE was developed by researchers at the Electric Power Optimisation Centre (EPOC) for the New Zealand electricity market.

⁴ <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-B-JADE-water-value-model.pdf>

Figure 12: Water Values

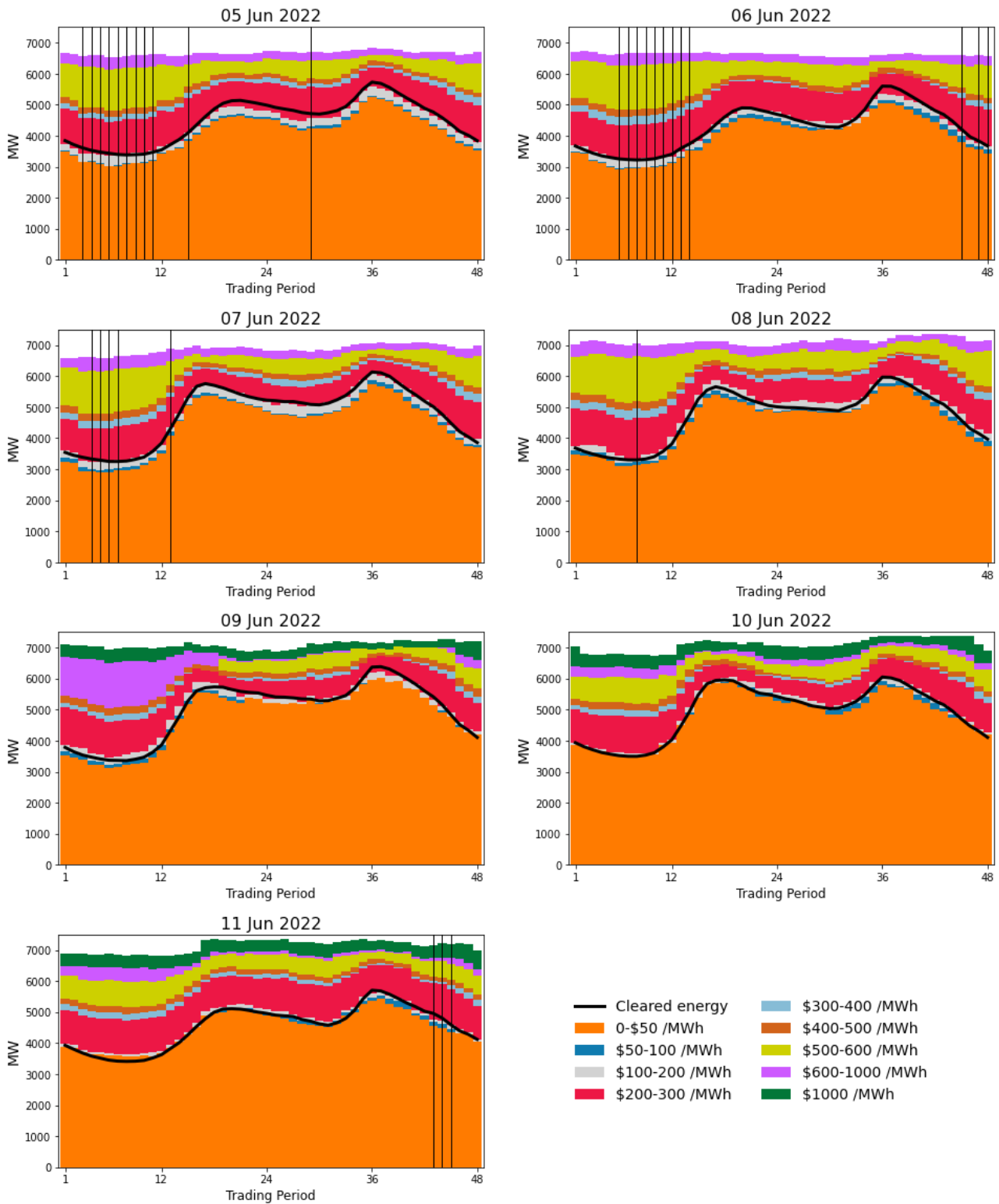


11. Offer Behaviour

- 11.1. Figure 13 shows this week's daily offer stacks, adjusted to take into account wind generation, transmission constraints, reserves and frequency keeping.⁵ The black line shows cleared energy, indicating the range of the average final price.
- 11.2. High thermal and hydro generation opportunity costs as detailed above continue to drive a steep offer curve.
- 11.3. Overall offer curves remain similar to previous weeks though a slight increase in the price of some offers shifted a large amount of morning offers into the next band up from \$500-600/MWh to \$600-1000/MWh for 9 June.
- 11.4. Prices between 5 and 7 June mostly cleared within the \$200-300/MWh range. The relatively high amount of thermal generation running during off-peak periods and relatively high amount of demand pushing prices up a steep offer curve resulted in higher than historically expected prices during morning off peak periods.
- 11.5. Despite higher grid demand than the previous week high wind generation resulted in most prices clearing within the \$100-200/MWh range from 8 to 11 June.
- 11.6. The pre-dispatch offers in the short term lead up to high prices showed no changes that would suggest generators were trying to take advantage of market conditions.

⁵ The offer stacks show all offers bid into the market (where wind offers are truncated at their actual generation and excluding generation capacity cleared for reserves) in price bands and plots the cleared quantity against these.

Figure 13: Daily offer stack



12. Ongoing Work in Trading Conduct

- 12.1. This week prices appeared to be consistent with supply and demand conditions.
- 12.2. Further analysis is being done on the trading periods in Table 1 as indicated.

Table 1: Trading periods identified for further analysis

Date	TP	Status	Notes
19/02-24/02		Compliance enquiries in progress	After reviewing information received from Genesis regarding offers from Tekapo B while Lake Tekapo was spilling, this case has been passed to compliance to assess if the offers were compliant with trading conduct rules.
19/02-21/02	Several	Further Analysis	High reserve prices were due to the HVDC outage, which increased reserve requirement in South Island, combined with less reserves available in the South Island due to low lake levels at Manapouri.