

# Trading Conduct Report

## Market Monitoring Weekly Report

### 1. Overview for the week of 10 to 16 July

1.1. Wholesale spot prices this week appear to be consistent with supply and demand conditions.

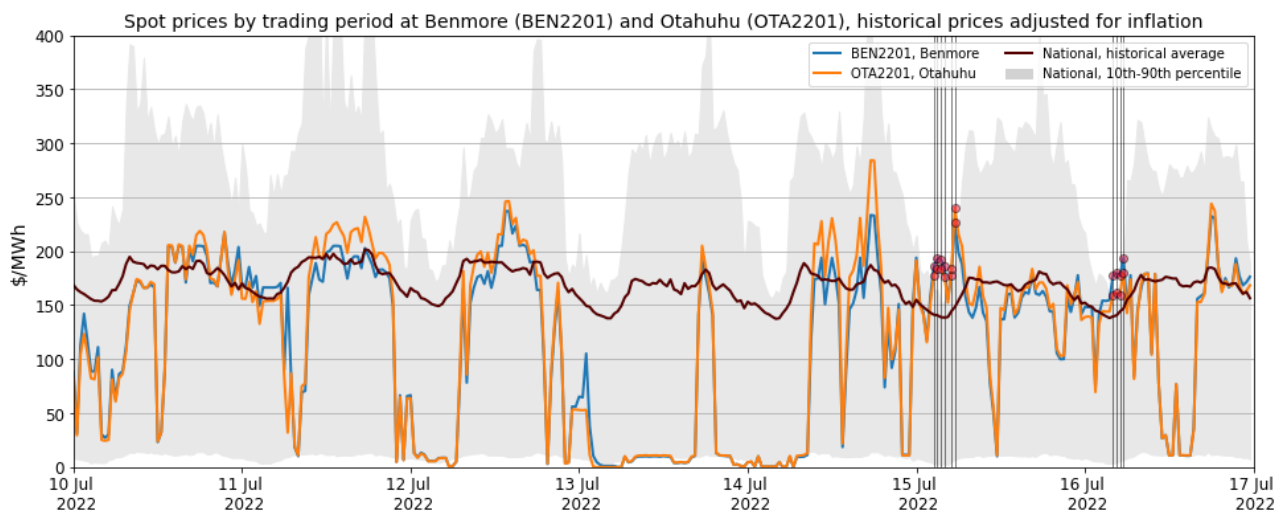
### 2. Spot Prices

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. 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 10 and 16 July averaged \$115.55/MWh with 95 per cent of prices falling between \$0.13/MWh and \$229.66/MWh.

2.3. Figure 1 shows spot prices from the past week at Benmore and Otahuhu alongside their historic mean and historic 10<sup>th</sup>-90<sup>th</sup> percentiles adjusted for inflation. Spot prices fluctuated between their historic 10<sup>th</sup> percentile and historic mean for the majority of the week with prices only rising above their historical 90<sup>th</sup> percentiles during morning off peak periods on 15 and 16 July.

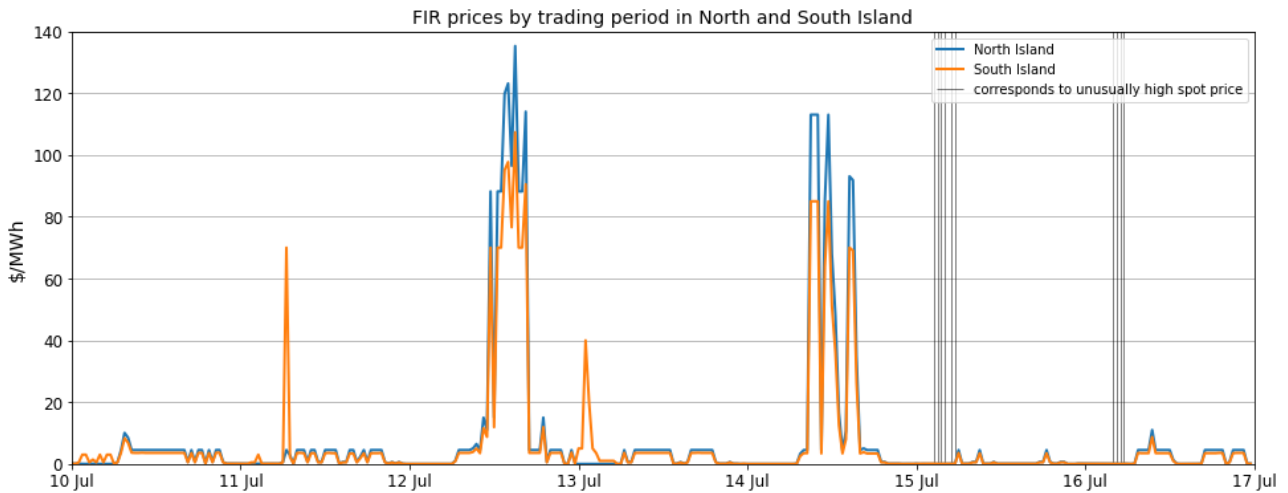
Figure 1: Wholesale Spot Prices



### 3. Reserve Prices

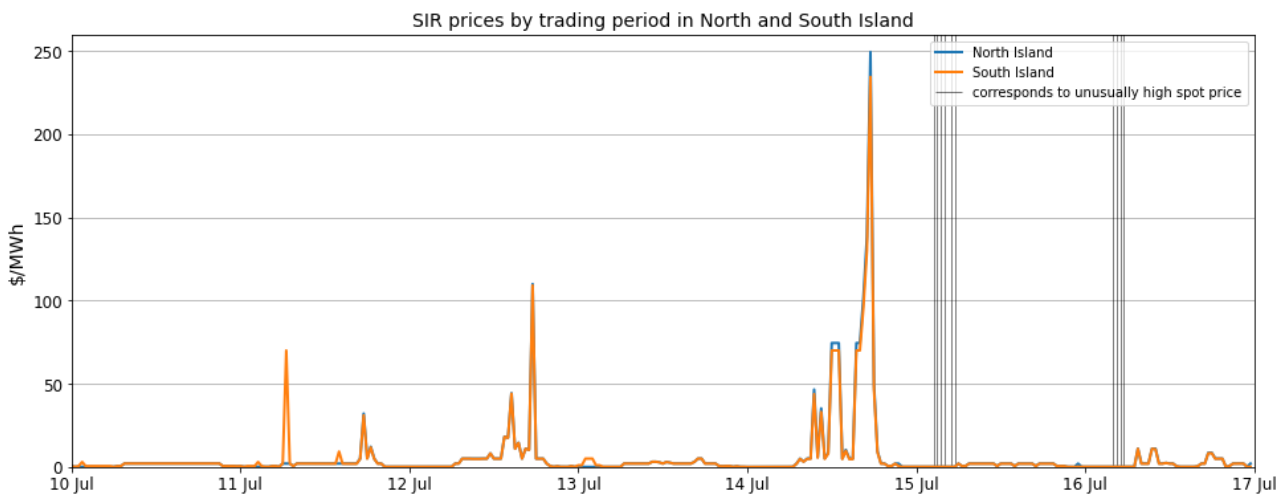
3.1. Fast instantaneous reserves (FIR) prices for the North and South Island are shown below in Figure 2. FIR prices fell mainly within historical bounds this week with the exception of some price spikes which reached just below \$140/MWh.

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 prices also fell mainly within historical bounds this week with the exception of some price spikes which reached \$250/MWh.

3.3. Figure 3: SIR prices by trading period and Island

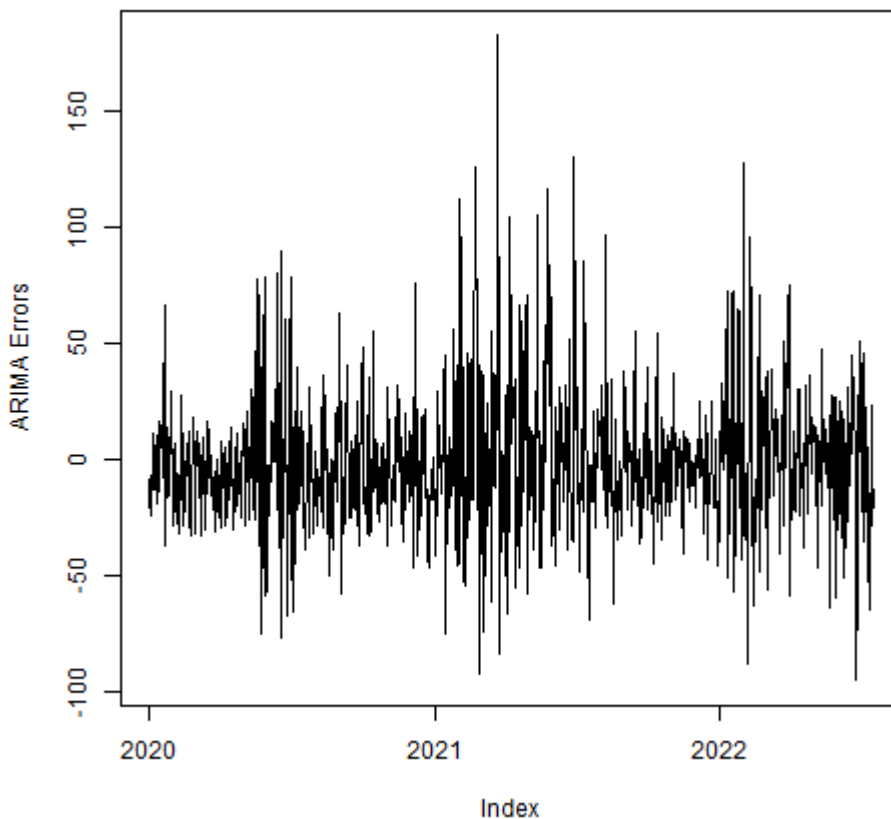


3.4. The price spikes were likely due to reserves being dispatched instead of higher priced energy offers to reduce the overall spot price.

## 4. Regression Residuals

- 4.1. The Authority's monitoring team uses a regression model to model 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 A<sup>1</sup> on the trading conduct webpage.
- 4.2. Figure 4 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Daily residuals this week suggest that prices appear to be largely aligned with market conditions. The largest residuals for the week were associated with the lowest spot prices.

Figure 4: Residual plot of estimated daily average spot price



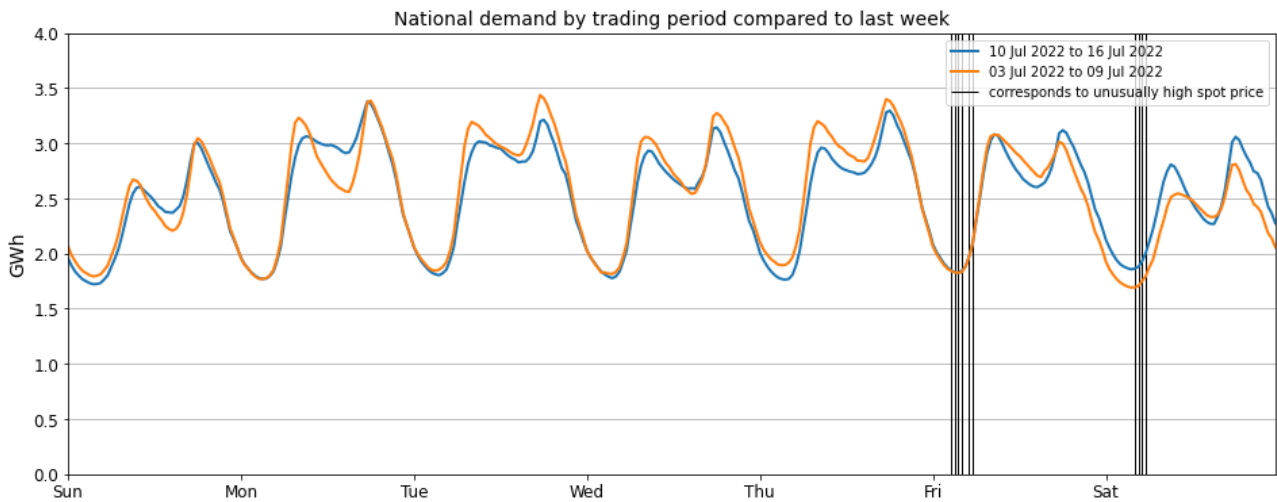
## 5. Demand

- 5.1. Figure 5 shows this week's national grid demand against national grid demand from the previous week.
- 5.2. Average weekday demand between 10 and 16 July was slightly lower than average weekday demand between 3 and 9 July, likely due to the mid-year school holiday period commencing. Grid demand during school holiday periods is historically lower than regular weekday grid demand due to changes in residential consumer demand patterns. Lower than usual demand therefore was a likely contributor towards low spot prices this week.

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

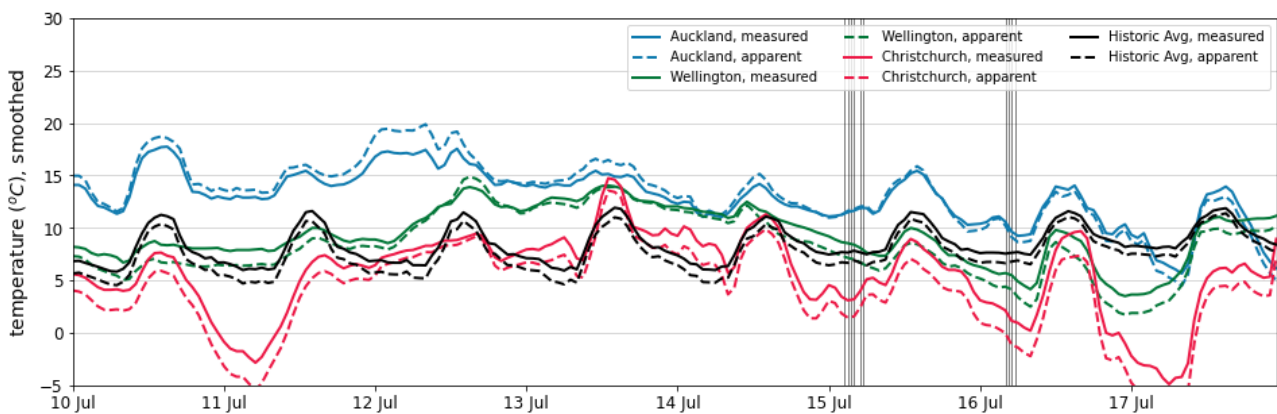
Figure 5: National demand by trading period compared to the previous week



5.3. 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. Also included for reference is the mean historical temperature of similar weeks from previous years averaged across the three main population centres.

5.4. Grid demand continues to follow seasonal trends, increasing when temperatures decrease.

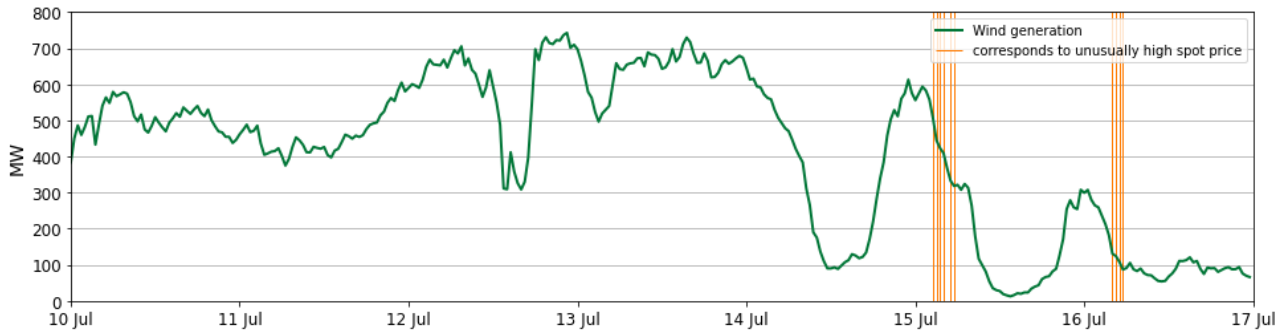
Figure 6: Temperatures across main centres



## 6. Generation

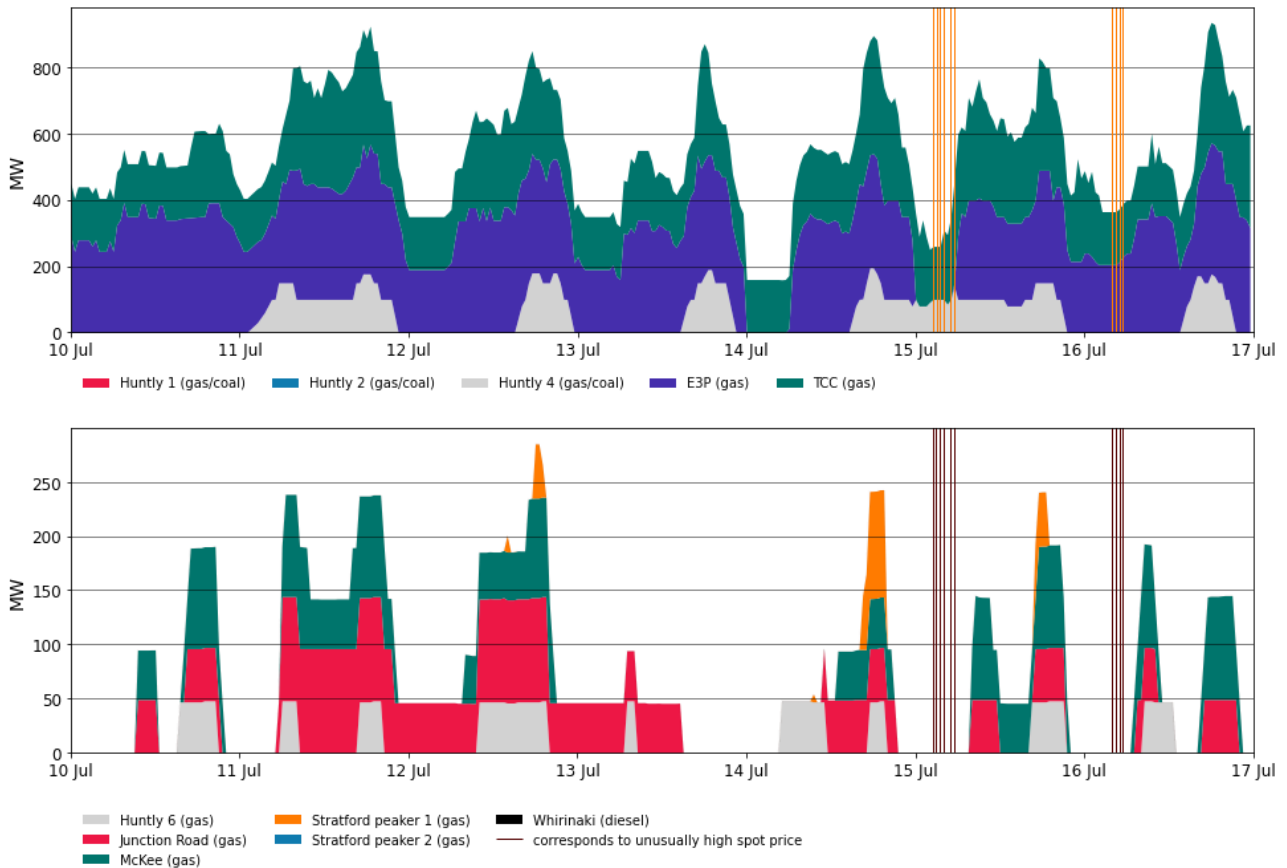
6.1. Figure 7 shows wind generation from the past week. Wind generation was high between 10 and 13 July at around ~500-700 MW. Periods of high wind generation coincided with when spot prices were at their lowest for the week at below \$10/MWh. Wind generation dropped on 14 July to below 100 MW, coinciding with a spike in spot prices to over \$200/MWh. Wind generation therefore likely had a significant influence on spot prices this week with high wind generation contributing to low spot prices and low wind generation contributing to high spot prices.

Figure 7: Wind Generation



6.2. Figure 8 shows generation at thermal and thermal peaker plants from the past week. Thermal generation continues to follow the trend of increasing when wind generation decreases with above average thermal generation associated with high spot prices.

Figure 8: Thermal Generation



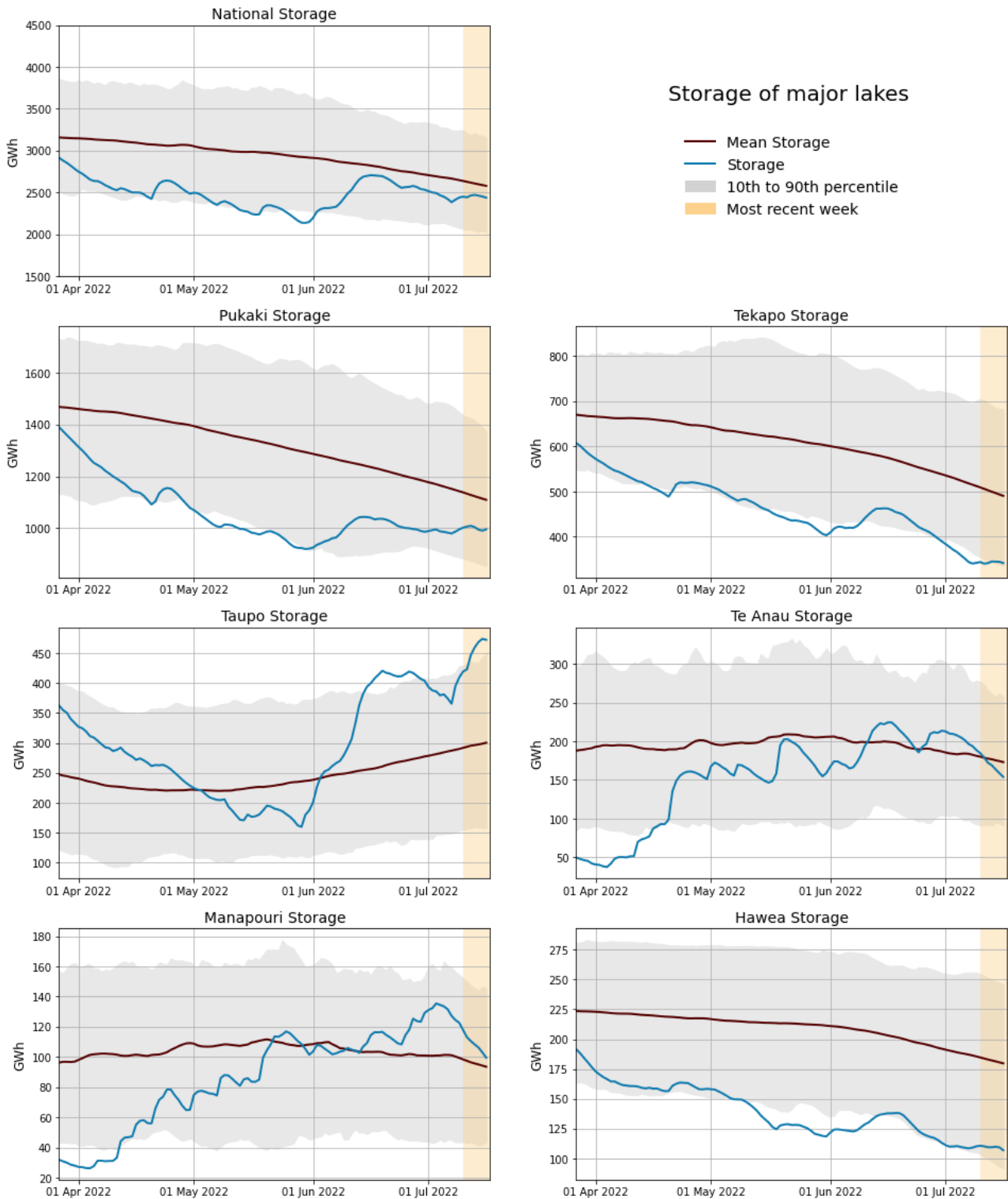
## 7. Storage/Fuel Supply

7.1. Figure 9 shows total controlled national hydro storage as well as the storage of major catchment lakes including their historical mean and 10<sup>th</sup> to 90<sup>th</sup> percentiles.

7.2. Controlled hydro storage across major catchments remains steady. Of the major lakes Lake Taupo storage is around its historical 90<sup>th</sup> percentile, Lakes Manapouri and Te Anau are around their historical mean and remaining South Island lakes are around their historical 10<sup>th</sup> percentiles.

7.3. While increased hydro storage has increased the amount of offered hydro generation the imbalance in storage between islands means the ratio of offers in different price tranches for hydro generation is still relatively similar to when hydro storage was lower, preserving the steepness of current offer curves. This means the effect of increased hydro storage becomes somewhat dampened when reflected in spot prices.

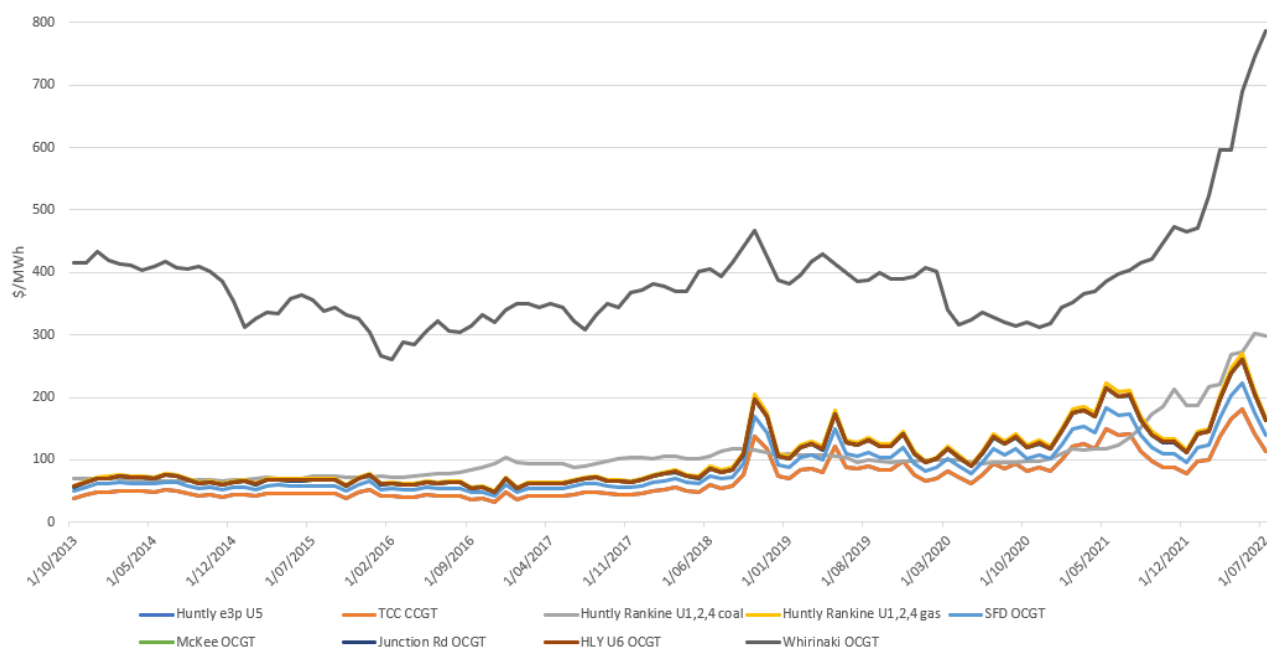
Figure 9: Hydro Storage



## 8. Price versus estimated costs

- 8.1. 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).
- 8.2. 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 10 shows an estimate of thermal SRMCs as a monthly average up to 1 July 2022. The SRMC of gas fuelled plants has fallen from its peak in May 2022 while the SRMC of diesel and coal fuelled plants continues to increase.
- 8.3. 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 most recent price for Indonesian coal was around \$515/tonne. The increase in diesel and coal prices has put the latest SRMC of Whirinaki and coal fuelled Huntly generation to \$786/MWh and \$299/MWh respectively.
- 8.4. SRMCs of gas run thermal plants have decreased to between \$100/MWh and \$200/MWh with the outlook for gas supply in the second half of 2022 looking increasingly positive.
- 8.5. More information on how the SRMC of thermal plants is calculated can be found in Appendix C<sup>2</sup> on the trading conduct webpage.

Figure 10: Estimated monthly SRMC for thermal fuels



## 9. JADE Water values

- 9.1. The JADE<sup>3</sup> 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 11 shows the

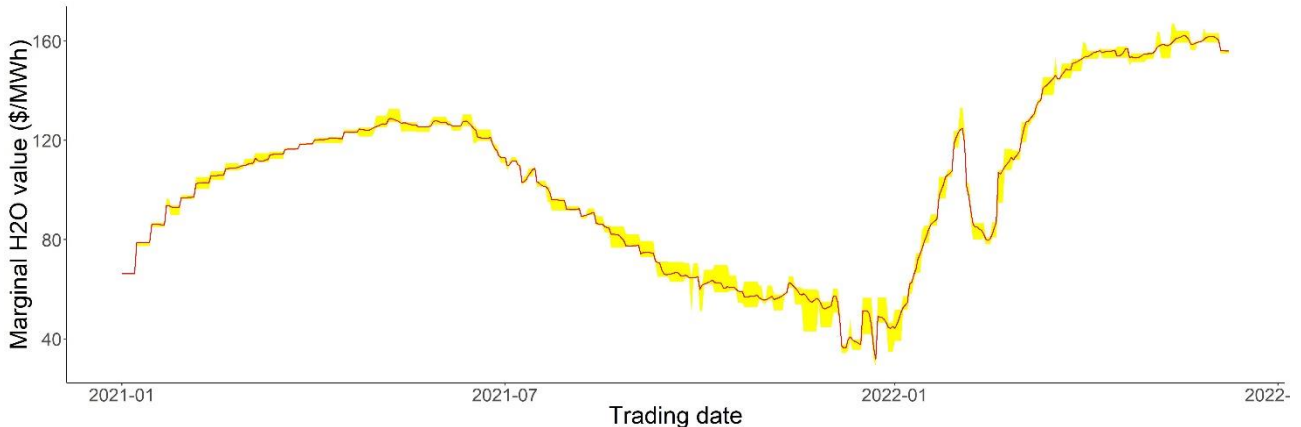
<sup>2</sup> <https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf>

<sup>3</sup> 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.

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 B<sup>4</sup> on the trading conduct webpage.

- 9.2. 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.

Figure 11: Water Values



## 10. Offer Behaviour

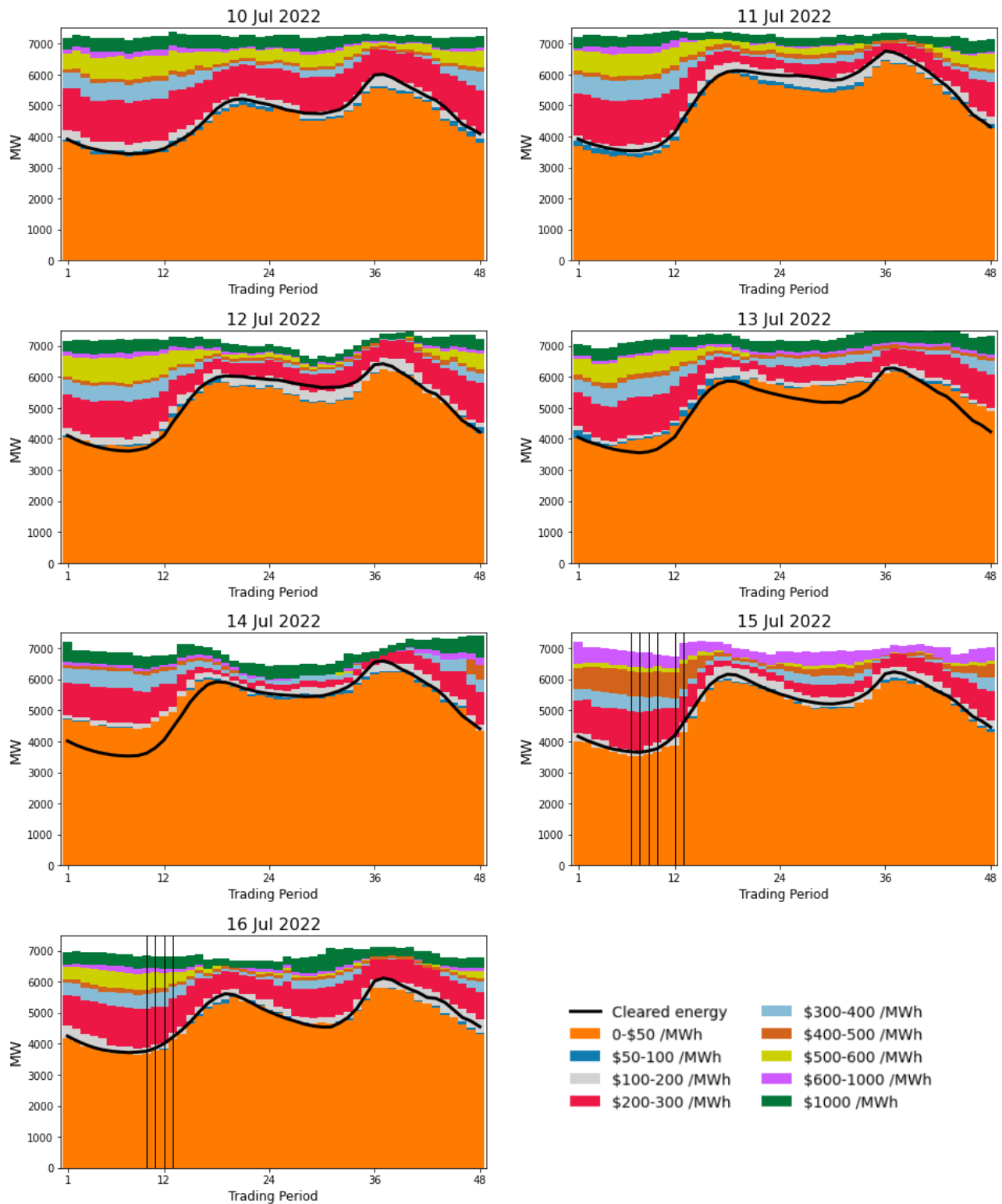
- 10.1. Figure 12 shows this week's daily offer stacks, adjusted to take into account wind generation, transmission constraints, reserves and frequency keeping.<sup>5</sup> The black line shows cleared energy, indicating the range of the average final price.
- 10.2. High thermal and hydro generation opportunity costs as detailed above continue to drive a steep offer curve.
- 10.3. Cleared energy during the week remained primarily within or below the \$100-200/MWh range as a result of high wind generation increasing the amount of \$0-50/MWh offers.
- 10.4. In addition to an increase in wind offers the recent increases in hydro and gas availability has meant the offer curve during peak periods has become less steep.
- 10.5. 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.

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

<sup>5</sup> 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 12: Daily offer stack



## 11. Ongoing Work in Trading Conduct

11.1. This week prices appeared to be consistent with supply and demand conditions. High wind generation and lower than usual weekday demand led to below average spot prices.

Historically high priced periods still remained within reasonable bounds and were likely a result of either E3P not running or low wind generation.

11.2. Further analysis is being done on the trading periods in Table 1 as indicated.

Table 1: Trading periods identified for further analysis

<b>Date</b>	<b>TP</b>	<b>Status</b>	<b>Notes</b>
19/02/22-24/02/22	Several	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.
29/06/2022	26-48	Further analysis	The Authority is making enquires with Genesis regarding offers at both Huntly 1 and Huntly 4 - the addition of only high priced offers at Huntly 1 lead to \$700/MWh+ pricing on trading period 36.