31 August 2022

# Trading Conduct Report

## Market Monitoring Weekly Report

## 1. Overview for the week of 21 to 27 August

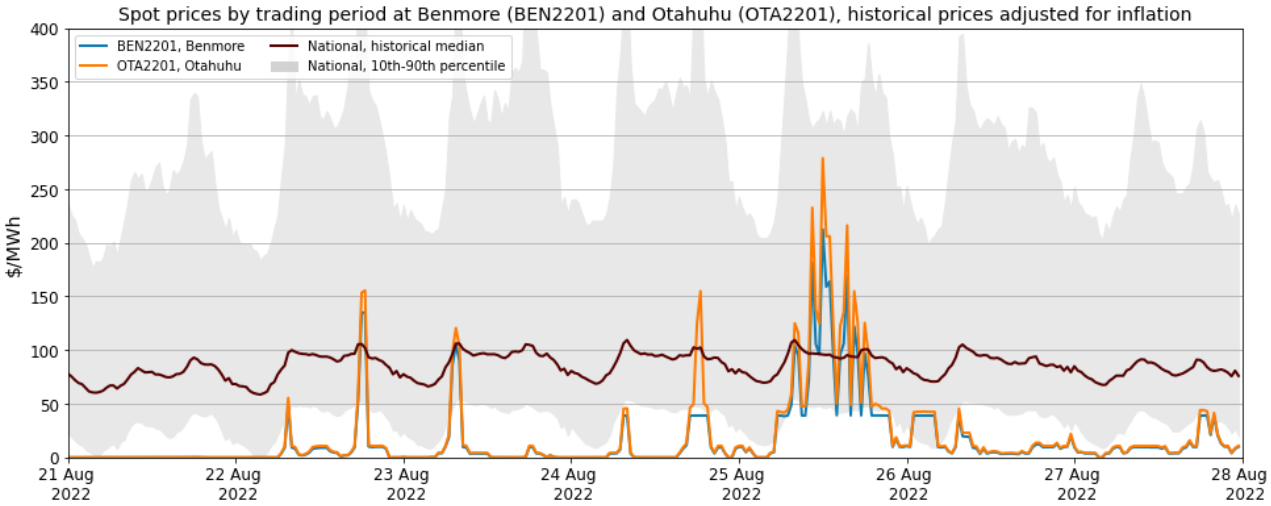
1.1. Wholesale spot prices appear to be consistent with market conditions this week.

## 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. Figure 1 shows spot prices between 21 and 27 August at Benmore and Otahuhu alongside their historic median and historic 10$^{th}$-90$^{th}$ percentiles adjusted for inflation. Between 21 and 27 August wholesale spot prices across all nodes averaged $17.60/MWh with 95 per cent of prices falling between $0.01/MWh and $134.12/MWh. Aside from a series of price spikes on 25 August prices remained largely below historical median at close to $0/MWh for the majority of the week. Price separation between the islands at 6:30pm on 24 August was likely caused by binding risks and a branch constraint at the HVDC link.

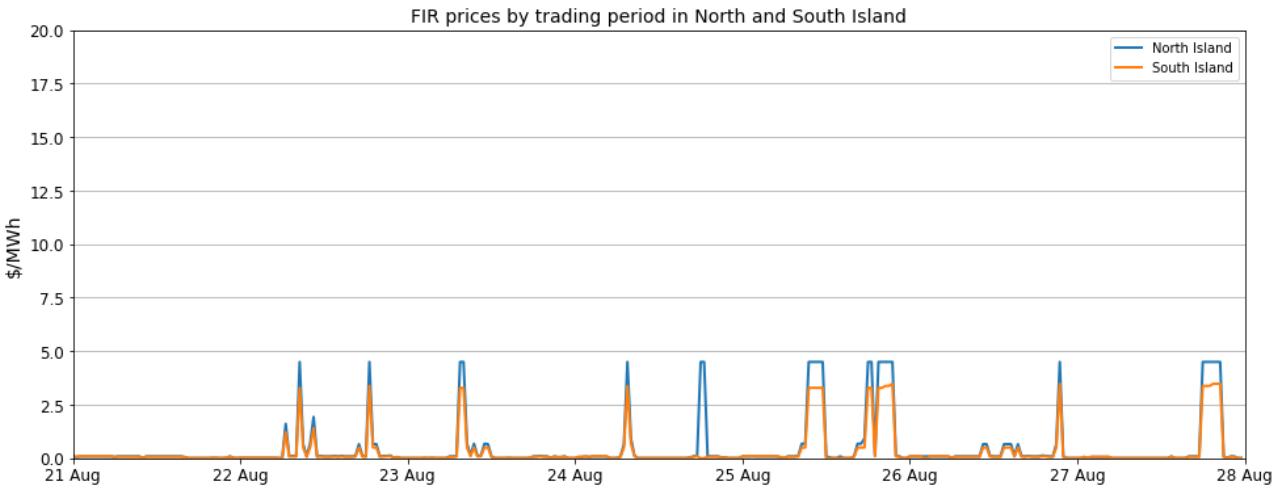
*Figure 1: Wholesale Spot Prices*



# 3. Reserve Prices

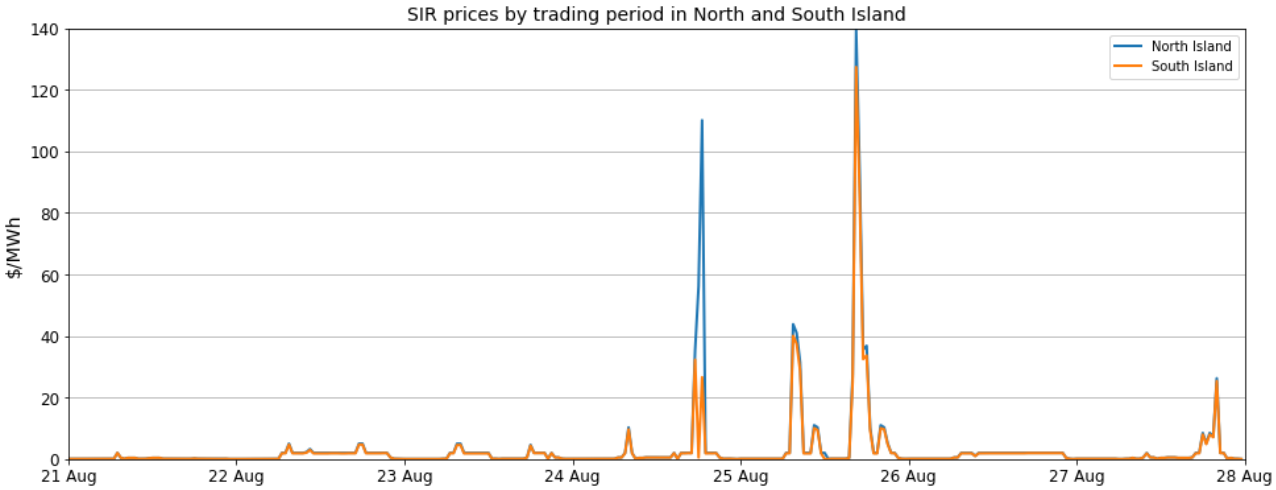
3.1. Fast instantaneous reserves (FIR) prices for the North and South Island are shown below in Figure 2. FIR prices fell within historical bounds this week with all prices below $5/MWh.

*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 fell mainly within historical bounds this week with the majority of prices falling below $20/MWh. There were a few exceptions, the two most noticeable of which were spikes on 24 and 25 August up to ~$110/MWh and ~$140/MWh respectively. The spike in price on 24 August was likely due to a branch constraint at the HVDC link. The spikes in prices on 25 August were likely due to reserves being dispatched instead of higher priced energy offers in an effort to reduce the overall spot price.

*Figure 3: SIR prices by trading period and Island*

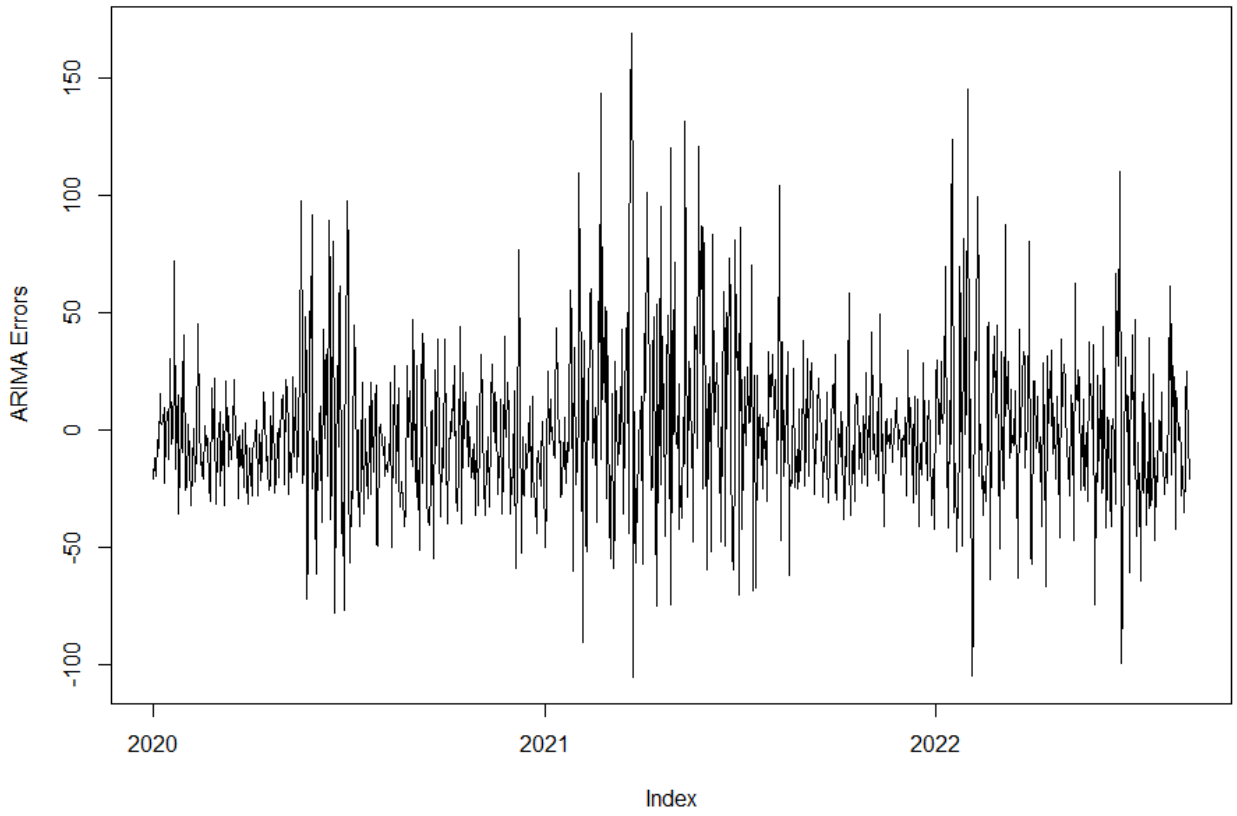


# 4. Regression Residuals

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[1] 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.

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



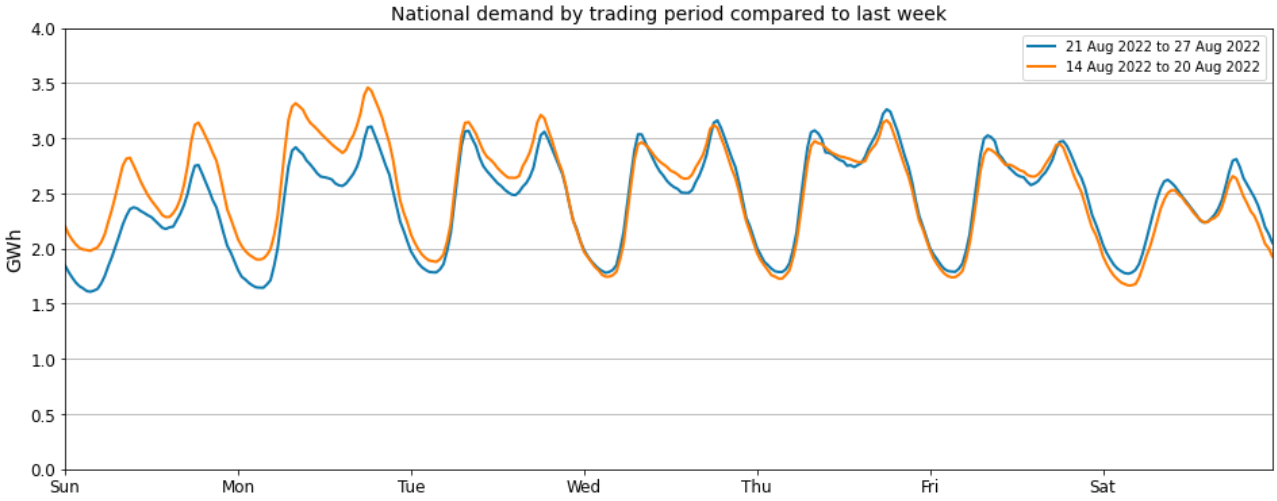

# 5. Demand

5.1. Figure 5 shows this week's national grid demand against national grid demand from the previous week.

5.2. Daily demand this week (21 to 27 August) compared to the previous week (14 to 20 August) was lower on Sunday and Monday but was otherwise similar. Above average demand during and between morning and evening peak periods on Thursday coincided with the spikes in spot prices this week with the high demand likely contributing to the increase in prices.

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

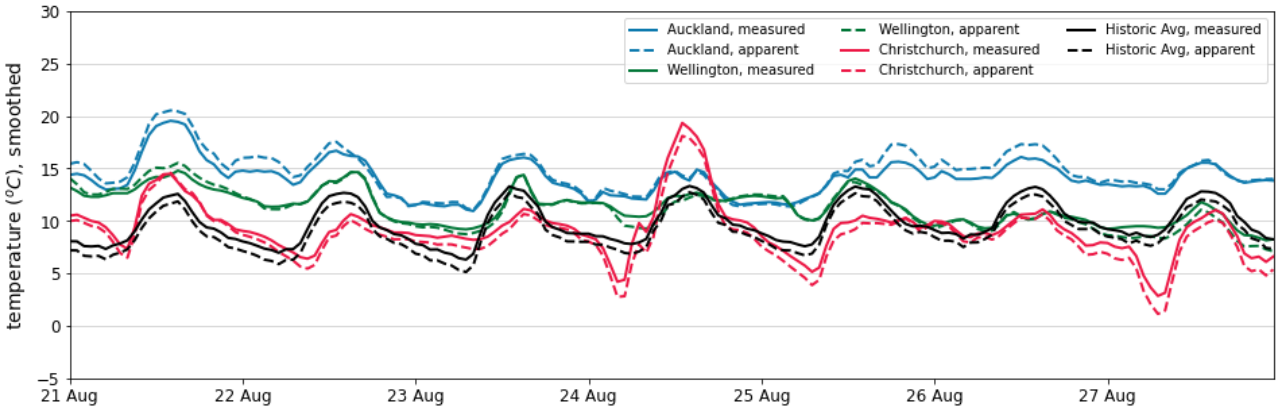
*Figure 5: National demand by trading period compared to the previous week*




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. Relatively mild temperatures for this time of year were likely the cause of moderate demand this week which contributed to the relatively low spot prices outside of 25 August.

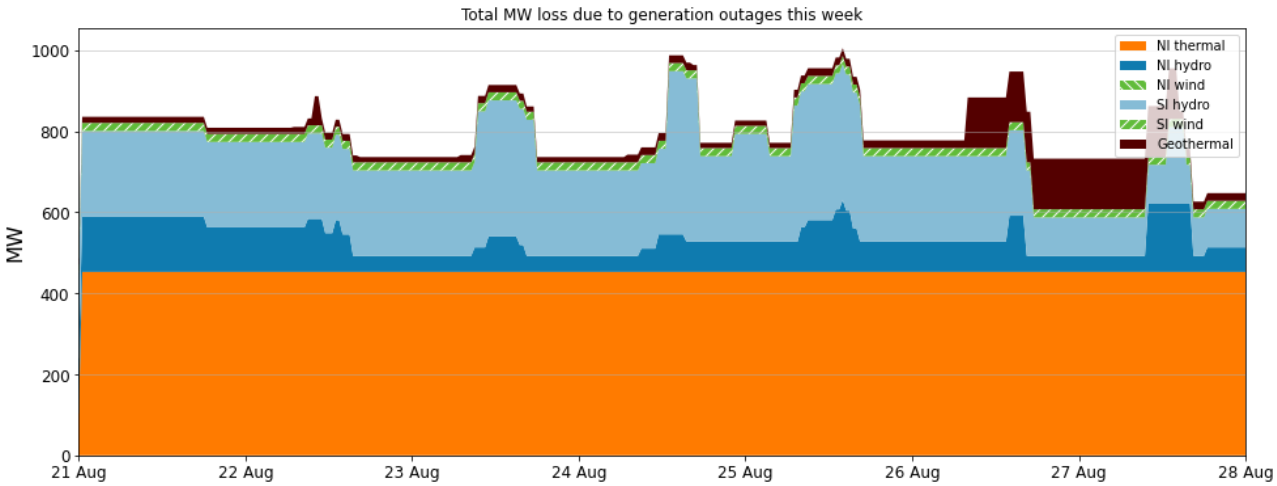
*Figure 6: Temperatures across main centres*




# 6. Outages

6.1. Figure 7 shows generation capacity lost due to outages between 21 and 27 August. Total capacity lost due to outages was around ~800 MW over the week, an average amount for this time of year.

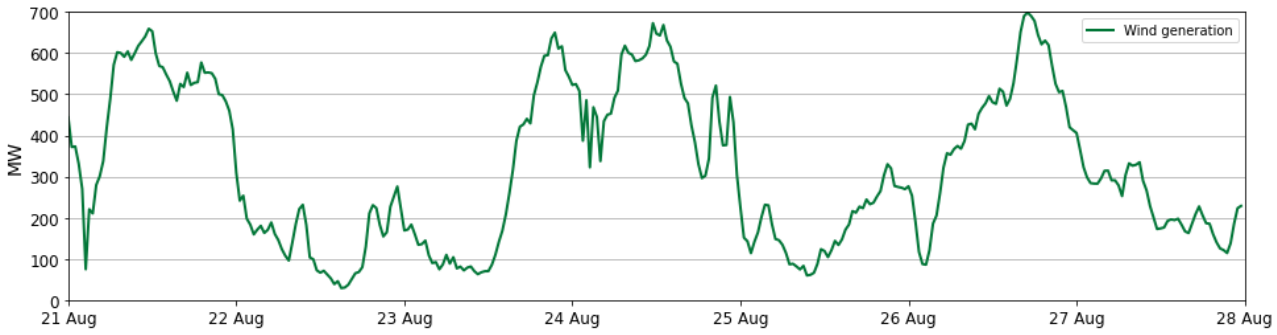
*Figure 7: Total MW loss due to generation outages*




# 7. Generation

7.1. Wind generation as seen in Figure 8 was highly variable this week, fluctuating between around ~50MW and ~700MW. When wind generation was high spot prices were low, averaging around $0.01/MWh. When wind generation was low, spot prices spiked, reaching anywhere between ~$100/MWh and ~$250/MWh. The effects of low wind generation (less than 200MW) were most apparent on Thursday 25 August when demand was at its highest, which resulted in spot prices regularly exceeding $200/MWh.

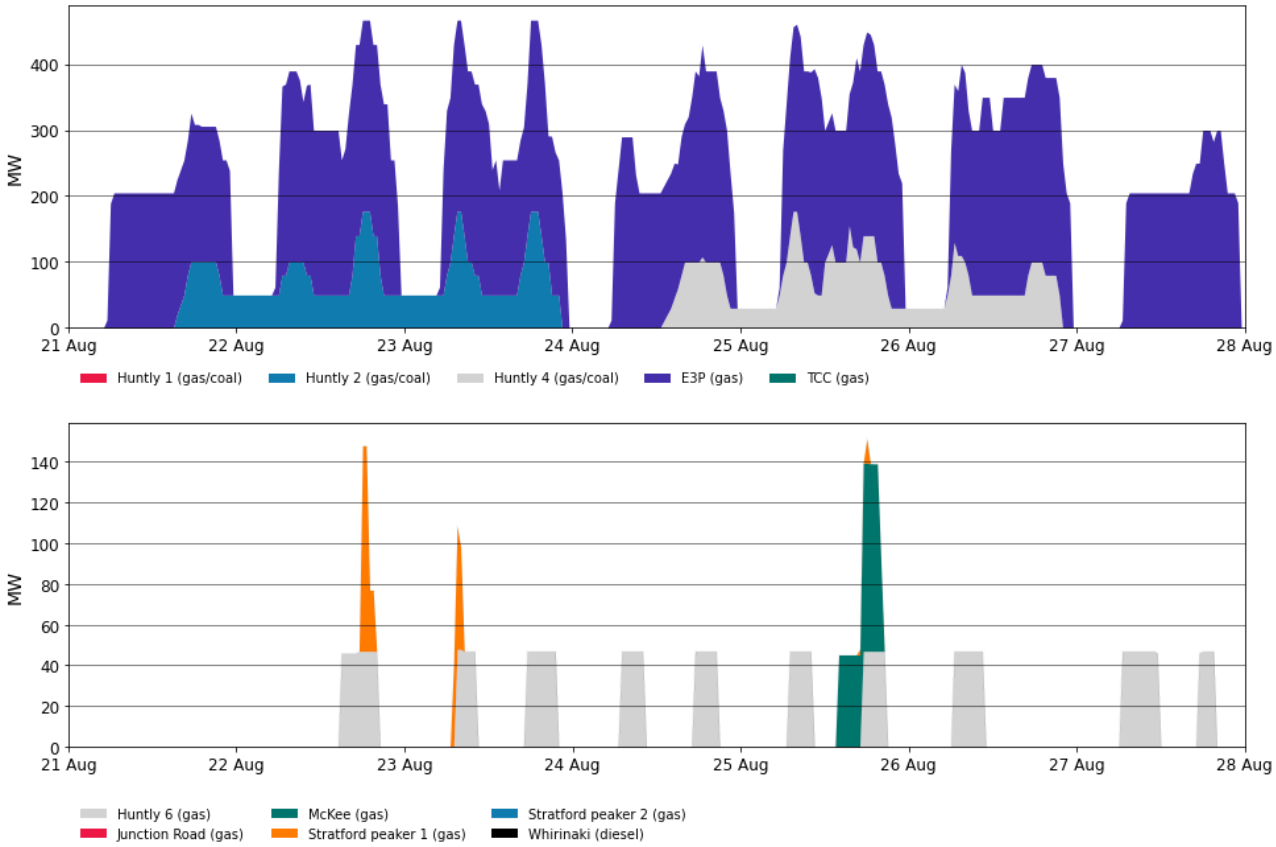
*Figure 8: Wind Generation*




7.2. Figure 9 shows generation at thermal and thermal peaker plants from the past week. Thermal generation was markedly low this week with peak thermal generation remaining below 500MW and peak thermal peaker generation remaining below 150MW. The low thermal generation would have contributed to the low average spot price seen this week.

7.3. Low overall thermal generation was likely due to the high amount of available renewable generation in the market with high hydro storage levels as well as strong wind.

*Figure 9: Thermal Generation*

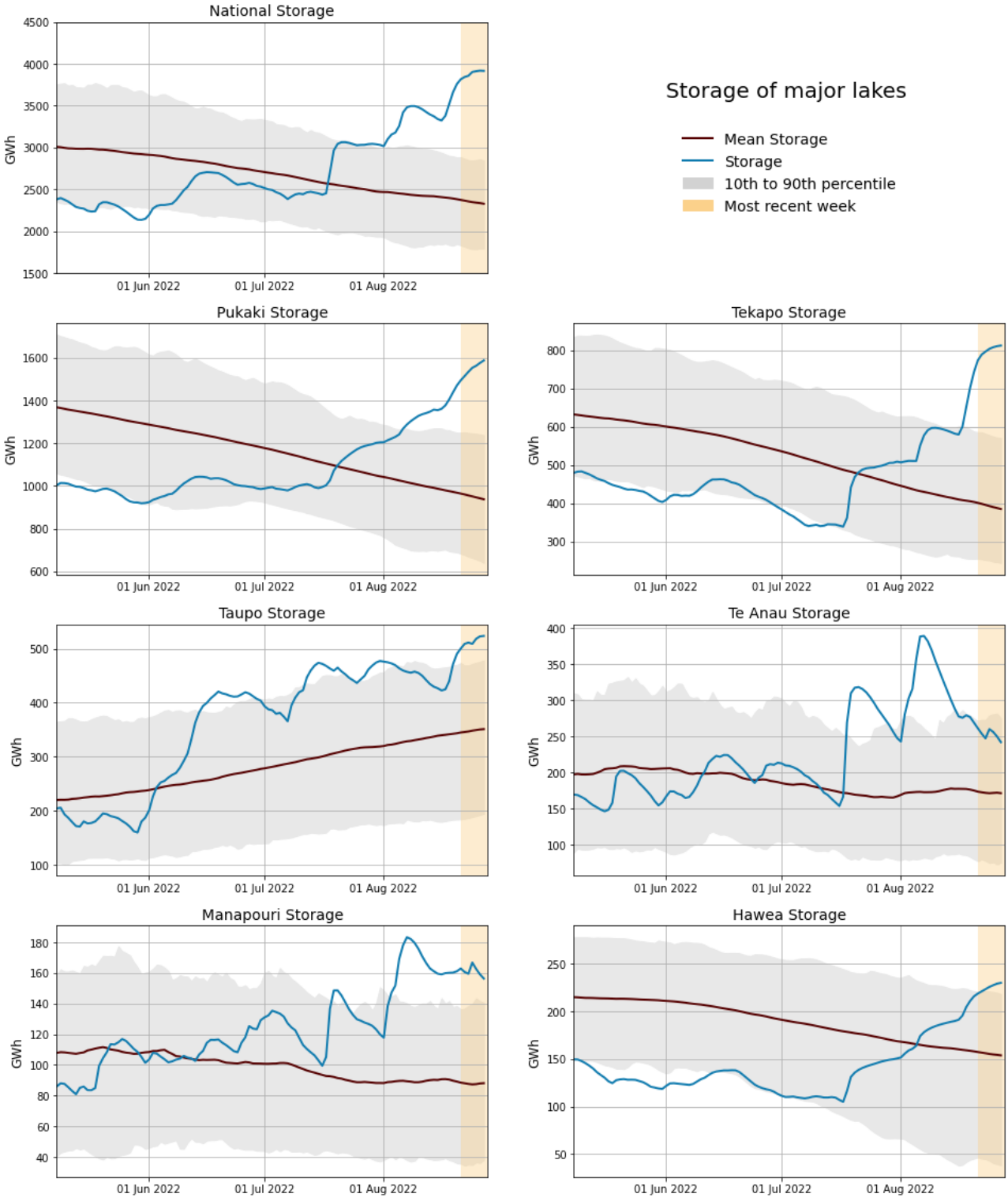



# 8. Storage/Fuel Supply

8.1. Figure 10 shows total controlled national hydro storage as well as the storage of major catchment lakes including their historical mean and 10$^{th}$ to 90$^{th}$ percentiles.

8.2. Hydro storage levels continue to remain unusually high with all major lakes above their historic 90$^{th}$ storage percentiles. Usually we would not expect to see hydro storage levels this high until the end of the year. The high storage levels have been reflected in increased low priced hydro generation offers which have contirbuted to the below historic median spot price seen this week.

*Figure 10: Hydro Storage*




# 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.

9.3. Figure 11 shows an estimate of thermal SRMCs as a monthly average up to 1 August 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 remain high.

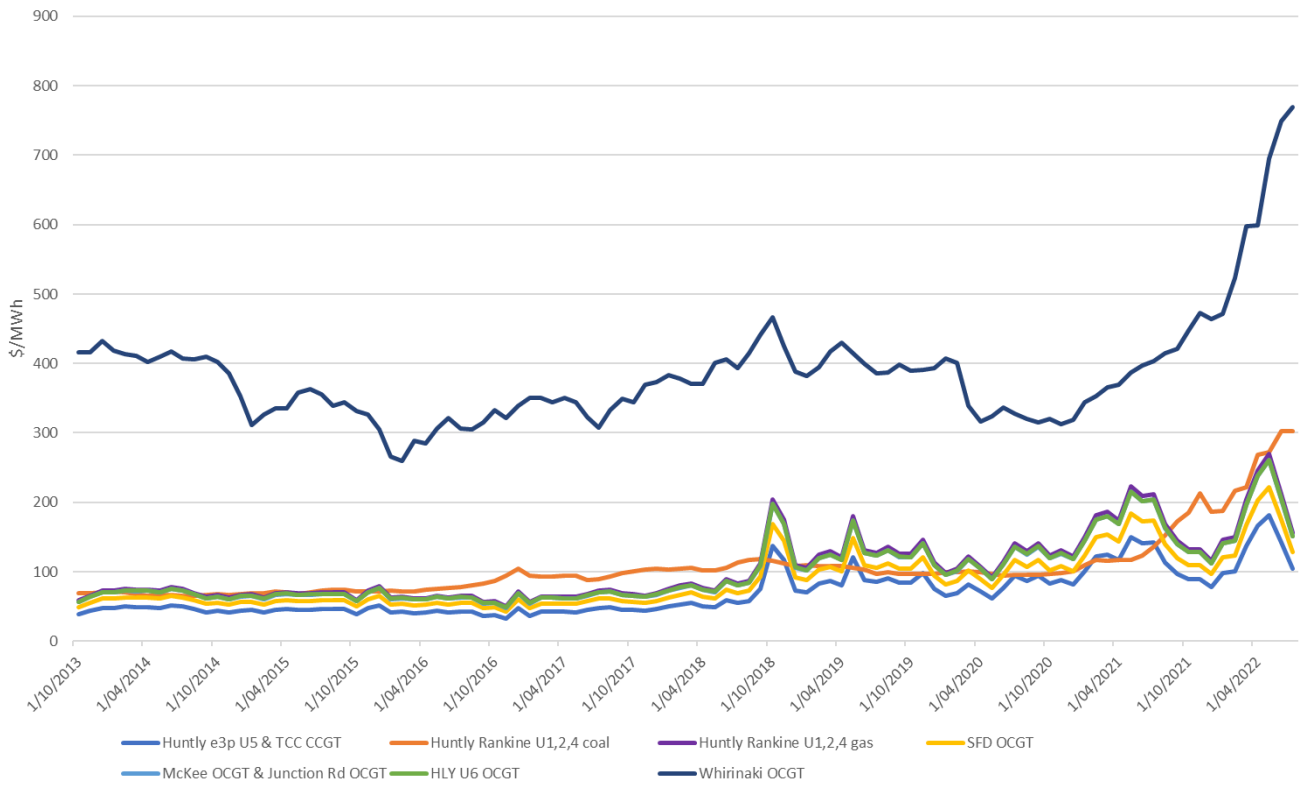
9.4. The SRMC of coal and diesel have remained largely unchanged due to global supply and demand conditions. As well as supply disruptions caused by Covid, the Russian-Ukraine conflict has increased the premium on all international coal due to sanctions placed on Russia.

9.5. The most recent price for Indonesian coal was around ~$523/tonne. The increase in diesel and coal prices has put the latest SRMC of Whirinaki and coal fuelled Huntly generation to $770/MWh and $302/MWh respectively.

9.6. SRMCs of gas run thermal plants have decreased to between $100/MWh and $200/MWh with the recent downturn at Methanex freeing up gas supply and successful well tie-ins at Pohokura gas field also increasing supply.

9.7. More information on how the SRMC of thermal plants is calculated can be found in Appendix C[2] on the trading conduct webpage.

*Figure 11: Estimated monthly SRMC for thermal fuels*




## 10. JADE Water values

10.1. The JADE[3] 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

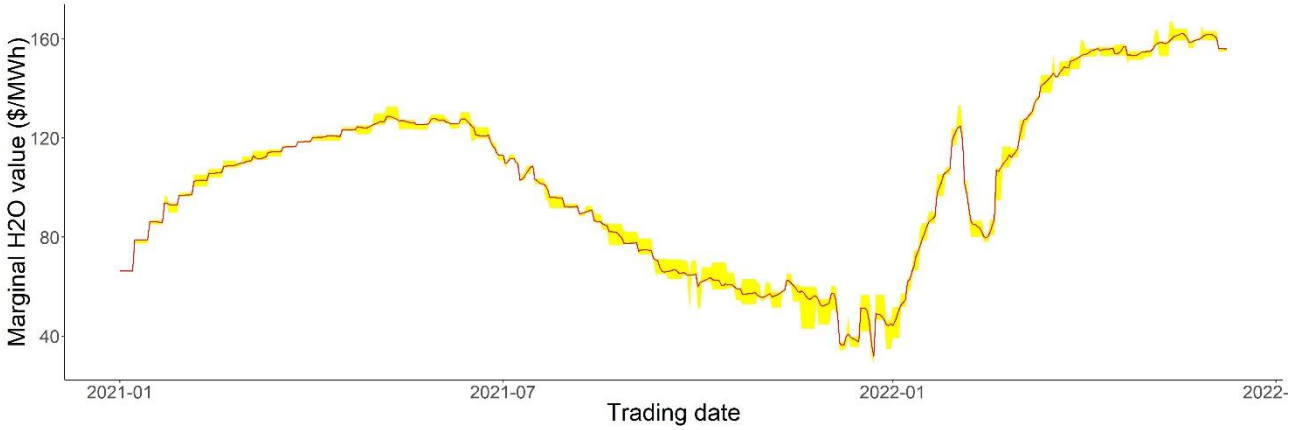
[2] https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf

[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.

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 B[4] on the trading conduct webpage.

10.2. In general, marginal water values have increased when total national hydro storage has decreased and decreased when total national hydro storage has increased.

*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. The majority of cleared energy fell below $100/MWh this week, with moderate demand, high renewable generation and low thermal generation keeping average spot prices down. Increased demand and low wind generation contributed to the higher prices seen on 25 August.

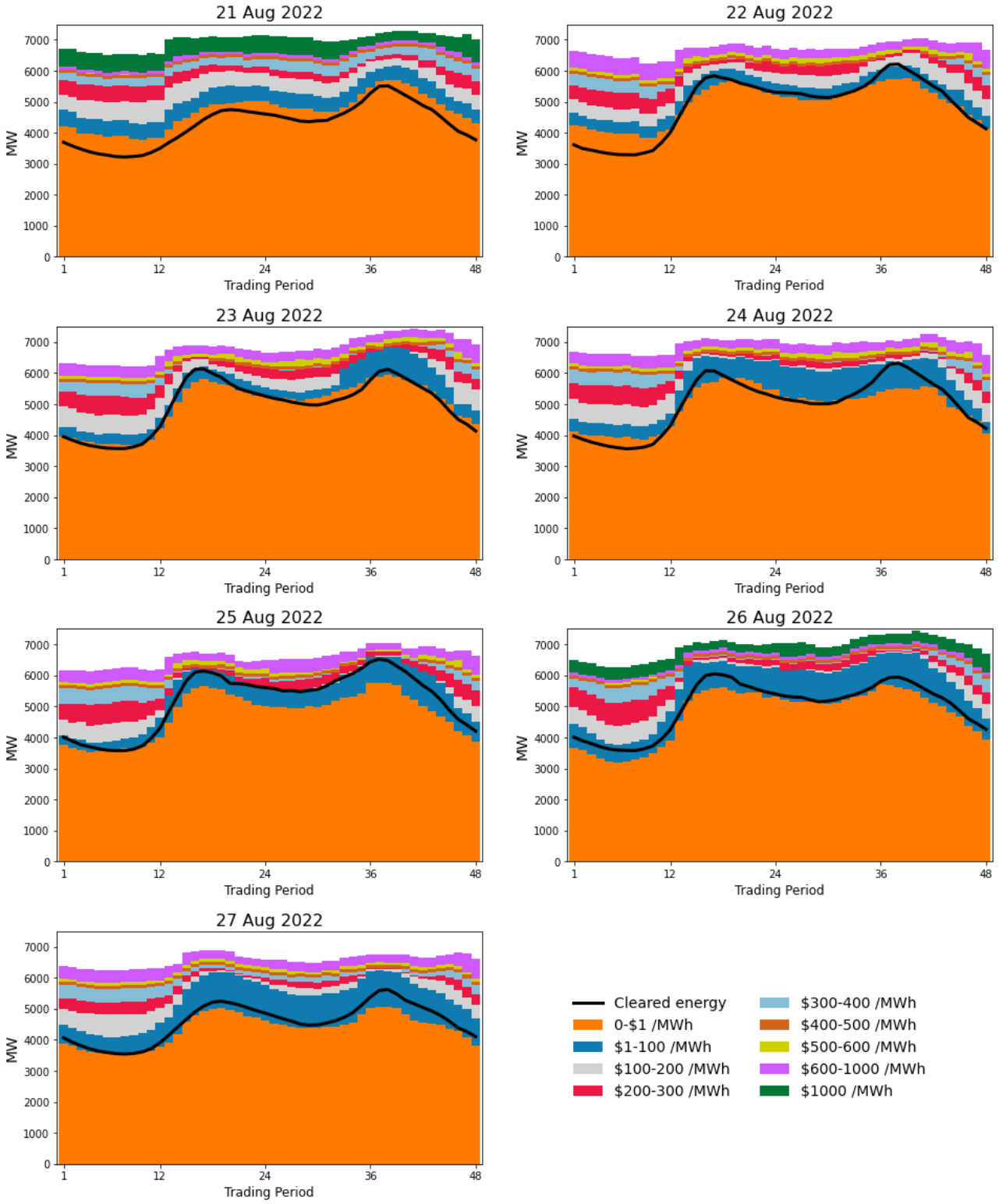
11.3. The upper end of the offer curve remains steep meaning above average peak demand can still easily result in spikes in spot prices.

11.4. 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.

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

[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 |
|---|---|---|---|
| 19/02/22-24/02/22 | 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. |