

30 October 2023



Trading conduct report

Market monitoring weekly report

Trading conduct report

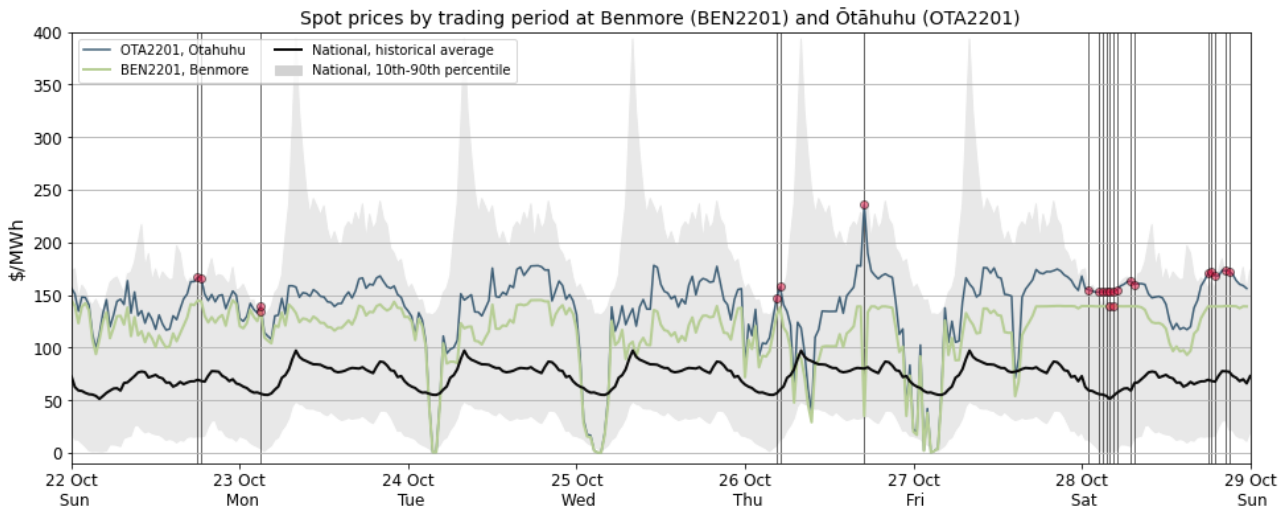
1. Overview for week of 22-28 October

- 1.1. Prices this week were mostly above historic average and in the \$114-\$147/MWh range, with a lot of overnight prices remaining within the 90th percentile bounds for most of the week except for some slightly higher overnight prices during the weekend. Wind volatility was evident again with midweek seeing some daily average wind generation above 750MW, but a steep drop off by Saturday. Only one Rankine ran as baseload generation, with lower wind days seeing the available thermal peakers running to support peak demand. Hydro storage had a small increase and sits close to 110% of historical mean for this time of year.

2. Spot prices

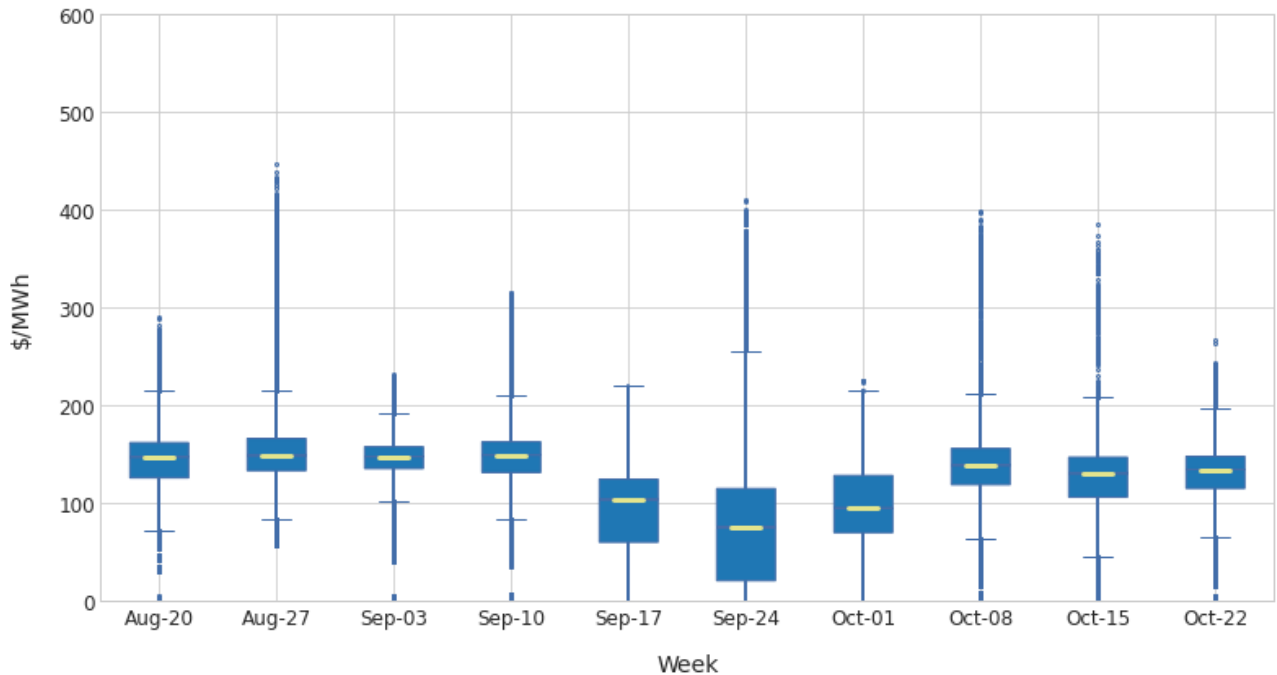
- 2.1. This report monitors underlying wholesale price drivers to assess whether trading periods require further analysis to identify potential non-compliance with the trading conduct rule. In addition to general monitoring, we also single out unusually high-priced individual trading periods for further analysis by identifying when wholesale electricity spot prices at any node exceed their historical 90th percentiles.
- 2.2. Figure 1 shows the wholesale spot prices at Benmore and Ōtāhuhu alongside their historic average and historic 10th-90th percentiles adjusted for inflation. Prices above the historic 90th percentile are highlighted with a vertical black line. Other notable prices that did not exceed the 90th percentile, are marked with black dashed lines.
- 2.3. Between 22-28 October:
 - (a) The average wholesale spot price across all nodes was \$125/MWh.
 - (b) 95 percent of prices fell between \$4/MWh and \$170/MWh.
- 2.4. The majority of spot prices continued to sit above the historic average this week, with the average spot price increasing by around \$9/MWh compared to the previous week. Overnight prices remained within the 90th percentile bounds for most of the week except for some slightly higher overnight prices during the weekend.
- 2.5. On Thursday evening at 5.00pm there was a price separation where the Ōtāhuhu price was \$236/MWh and the price at Benmore was \$35/MWh. This was due to the system operator reducing the pole 2 voltage until 6pm and hence reducing its capacity because of a line fault that occurred due to the high winds. An excursion notice and CAN were both issued to advise of this event.

Figure 1: Wholesale spot prices between 22 October (Sunday) and 28 October (Saturday)



- 2.6. Figure 2 shows a box plot with the distribution of spot prices during this week and the previous nine weeks. The yellow line shows each week’s median price, while the box part shows the lower and upper quartiles (where 50 percent of prices fell). The “whiskers” extend to points that lie within 1.5 times the inter-quartile range (IQR) of the lower and upper quartile, and then observations that fall outside this range are displayed independently.
- 2.7. The distribution of prices was similar to the previous couple of weeks, although slightly more condensed and with less outlier prices. Most prices were within \$114-\$147/MWh, with the median price this week of \$134/MWh.

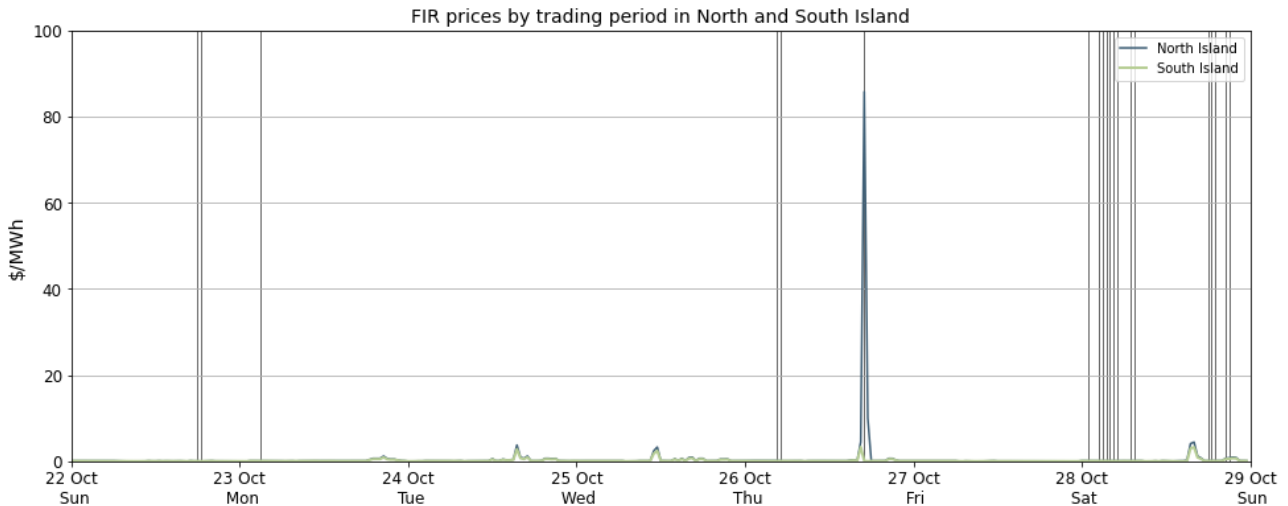
Figure 2: Boxplots showing the distribution of spot prices this week and the previous nine weeks



3. Reserve prices

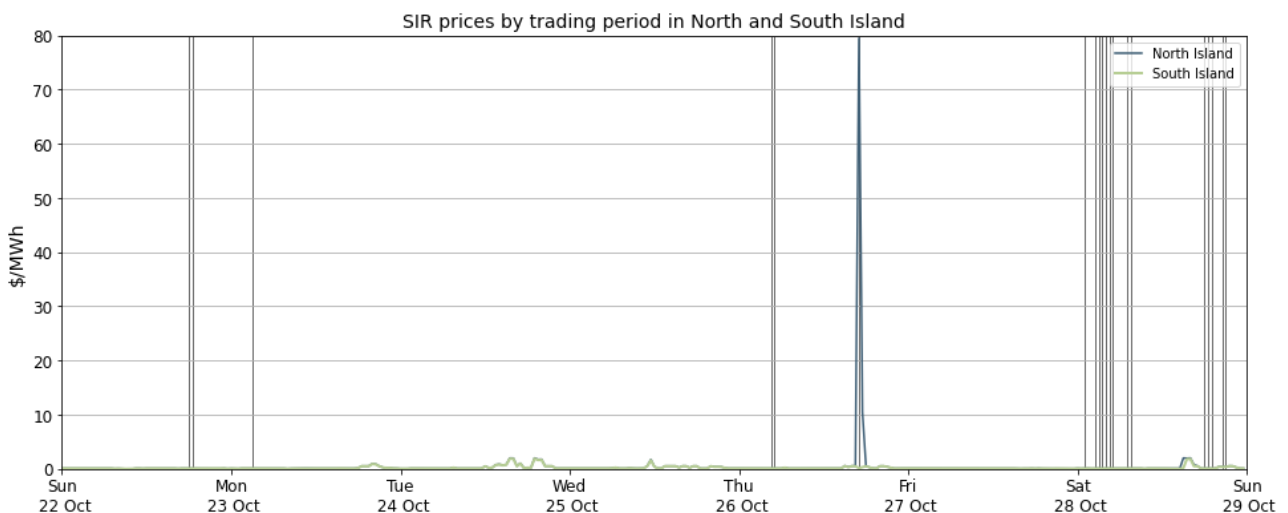
3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week FIR prices were mainly below \$5/MWh except for the spike at 5.00pm on Thursday evening to North Island FIR (\$86/MWh). This spike was because of HVDC capacity being reduced as mentioned in paragraph 2.5.

Figure 3: Fast Instantaneous Reserve (FIR) prices by trading period and island



3.2. Sustained Instantaneous Reserve (SIR) prices for the North and South Islands are shown in Figure 4. SIR prices were mostly below \$5/MWh this week. There was also a spike in SIR at 5.00pm on Thursday where North Island prices reached \$79/MWh.

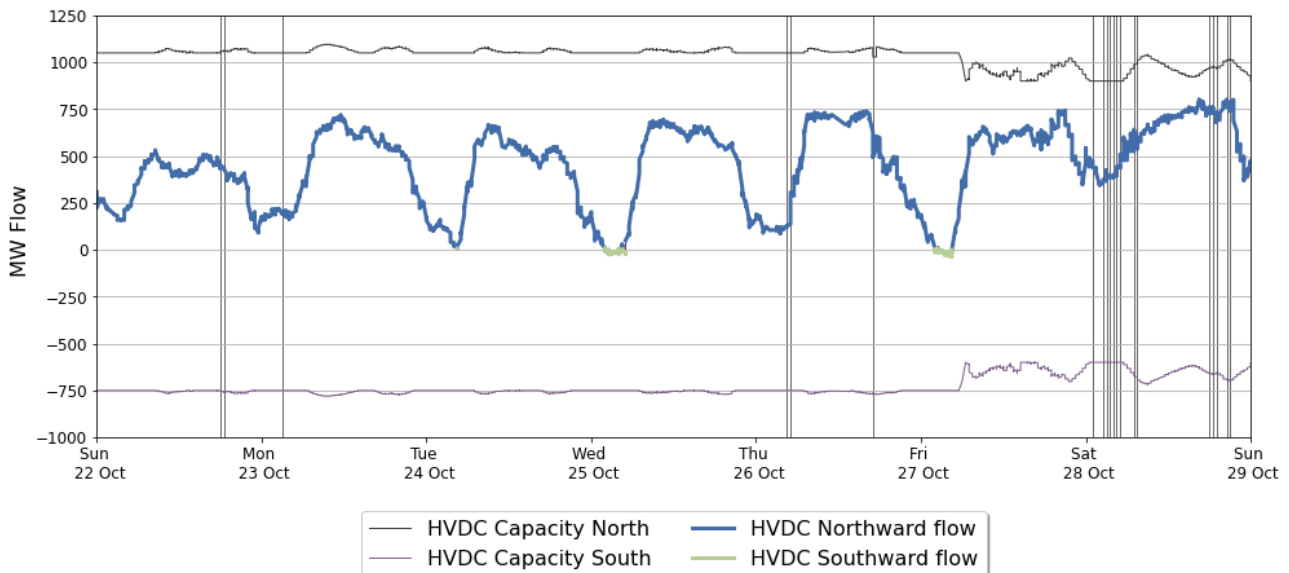
Figure 4: Sustained Instantaneous Reserve (SIR) prices by trading period and island



4. HVDC

- 4.1. Figure 5 shows HVDC flow between 22-28 October. HVDC flows were mainly northwards and below 750MW. Capacity was reduced for a short period on Thursday evening when the system operator advised of a fault¹ meaning the voltage² had to be reduced on pole 2.

Figure 5: HVDC flow and capacity



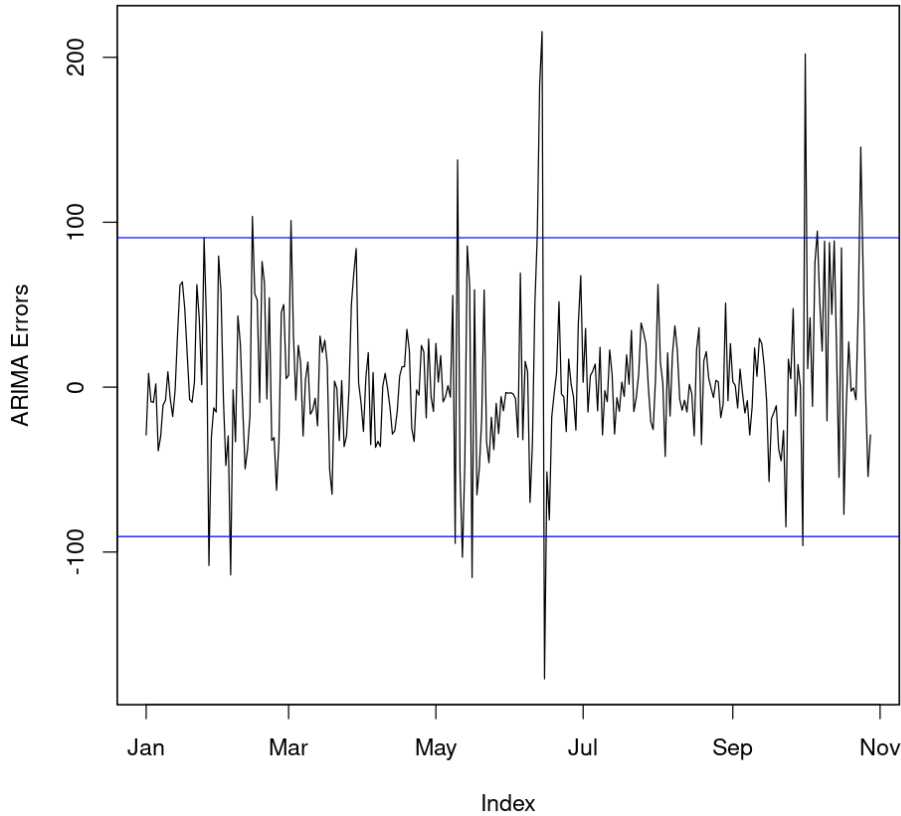
5. Regression residuals

- 5.1. 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](#) on the trading conduct webpage.
- 5.2. Figure 6 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Positive residuals indicate that the modelled daily price is lower than actual average daily price and vice versa. When residuals are small this indicates that average daily prices are likely largely aligned with market conditions. These small deviations reflect market variations that may not be controlled for in the regression analysis.
- 5.3. This week there was one residual above 2 standard deviations of the data. This occurred on Wednesday indicating prices were higher than the model expected. This is likely due to the high wind generation which the model correlates with lower prices. Prices on Wednesday were consistent with the other weekdays and reflective of underlying costs.

¹ [EXN Voltage National Benmore Haywards 2 \(HVDC Pole 5026953381.pdf \(transpower.co.nz\)\)](#)

² [CAN HVDC Pole 2 Reduced Capability 5026953334.pdf \(transpower.co.nz\)](#)

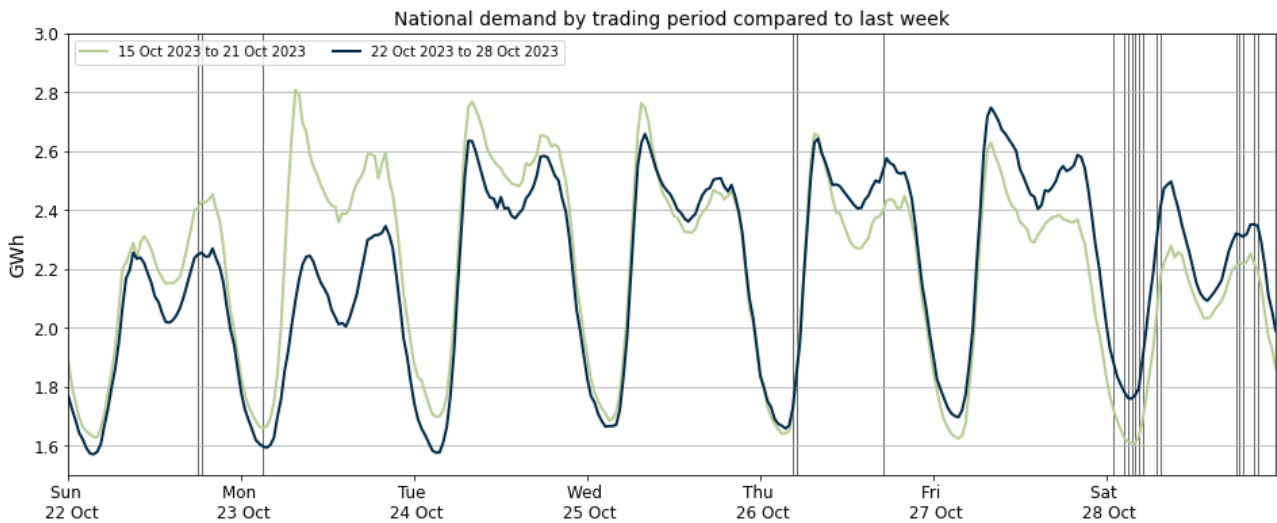
Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 - 28 October 2023



6. Demand

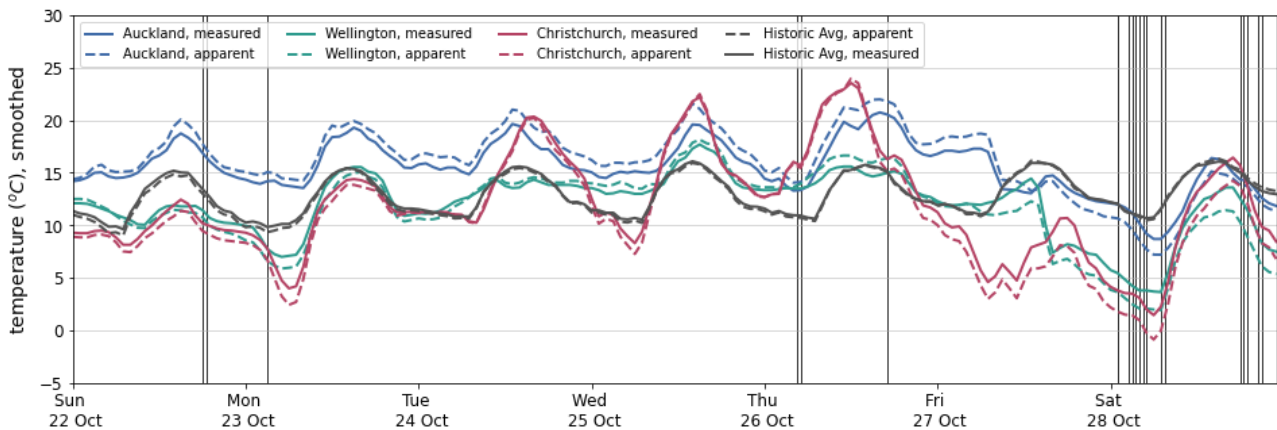
6.1. Figure 7 shows national demand between 22-28 October, compared to the previous week. Demand at the beginning of the week was generally lower than the previous week, particularly on Monday due to the labour day holiday. Some colder weather towards the end of the week saw some higher peak demand.

Figure 7: National demand by trading period compared to the previous week



- 6.2. Figure 8 shows the hourly temperature at main population centres from 22-28 October. 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.
- 6.3. Temperatures were mild for most of the week, with Auckland sitting mostly on or above average for the week. Wellington temperatures hovered above average in the middle of the week with some cooler temperatures from Friday through to Saturday morning. Midweek Christchurch apparent temperatures reached around 23°C. However, Saturday morning apparent temperatures dipped close to -1°C.

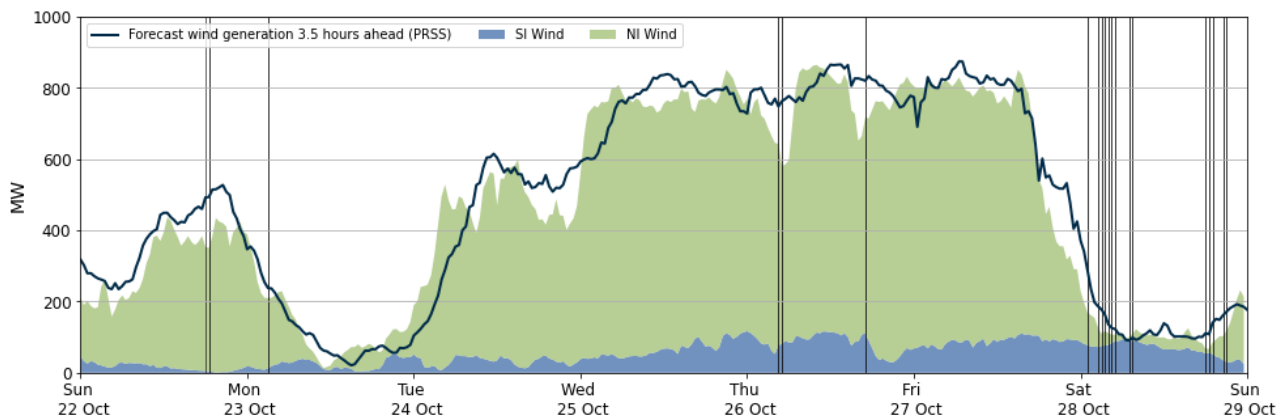
Figure 8: Temperatures across main centres



7. Generation

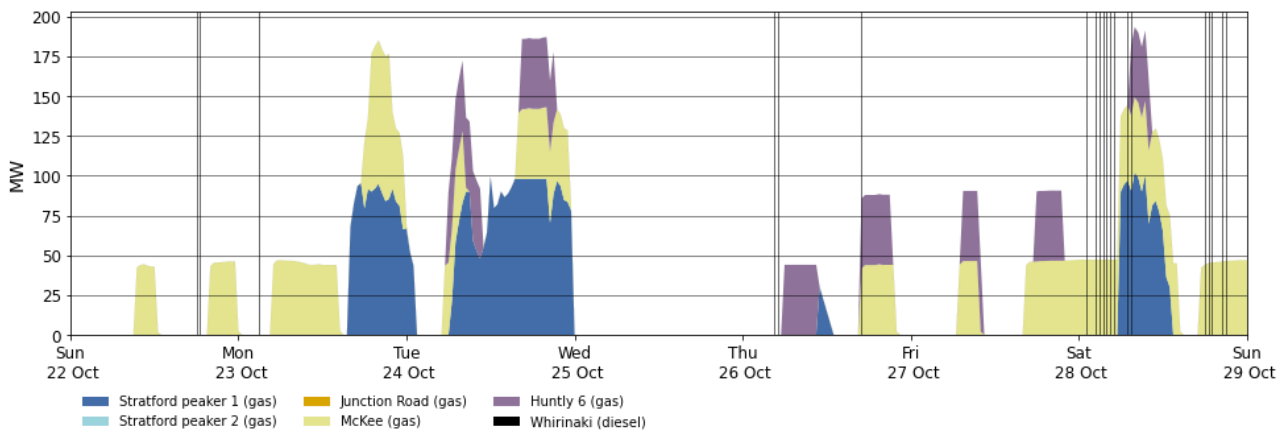
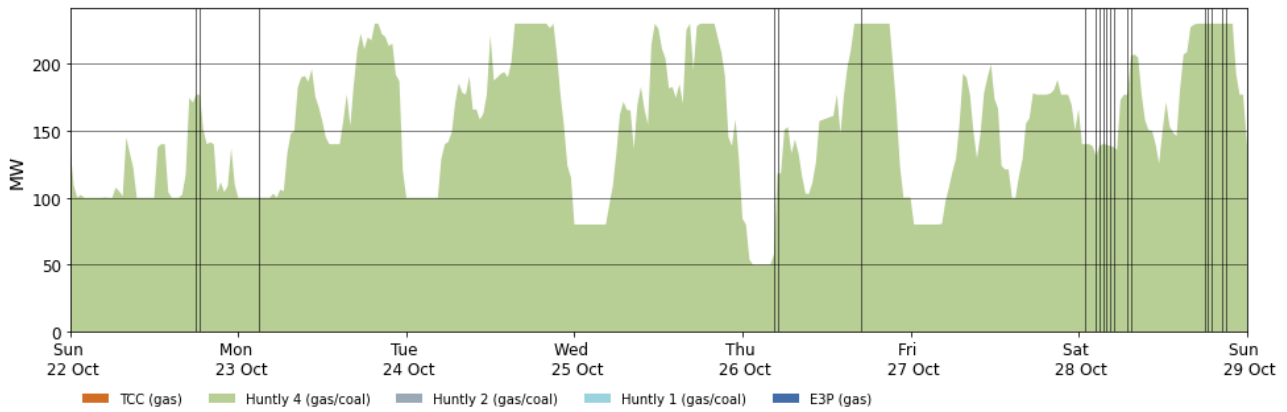
- 7.1. Figure 9 shows wind generation, from 22-28 October. Wind varied again across the week, ranging from 13MW to ~865MW. Wednesday and Thursday were two of the windiest days last week with daily averages of 763MW and 756MW respectively.

Figure 9: Wind generation and forecast between 22-28 October



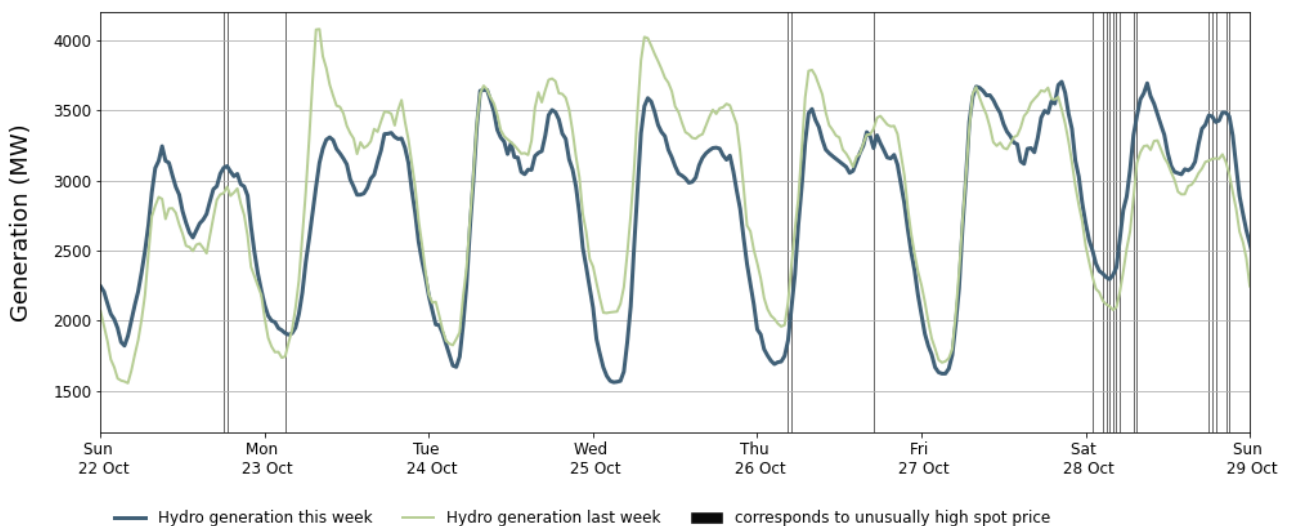
- 7.2. Figure 10 shows the generation of thermal baseload and thermal peaker plants between 22-28 October. Huntly 4 was the only slow start thermal running as baseload this week.
- 7.3. With lower demand and high wind generation days there was less requirement for peakers to run. Mainly McKee and Huntly 6 covered the peak demand times, with Stratford 1 running Monday evening, Tuesday over the peak and shoulder and Saturday morning.

Figure 10: Thermal generation between 22-28 October



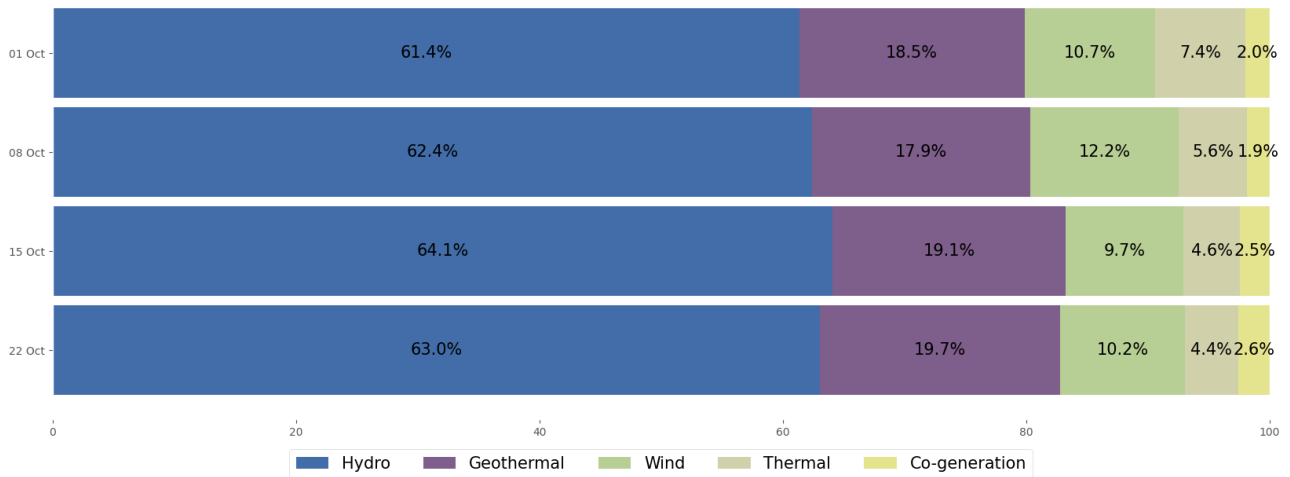
7.4. Figure 11 shows hydro generation between 22-28 October. Hydro generation was a bit lower than the previous week apart from over the weekend days. Saturday's hydro generation increase was likely down to the very low wind generation that day.

Figure 11: Hydro generation between 22-28 October compared to the previous week



7.5. As a percentage of total generation, between 22-28 October, total weekly hydro generation was 63%, geothermal 19.7%, wind 10.2%, thermal 4.4%, and co-generation 2.6%.

Figure 12: Total generation by type as a percentage each week between 1 October and 28 October



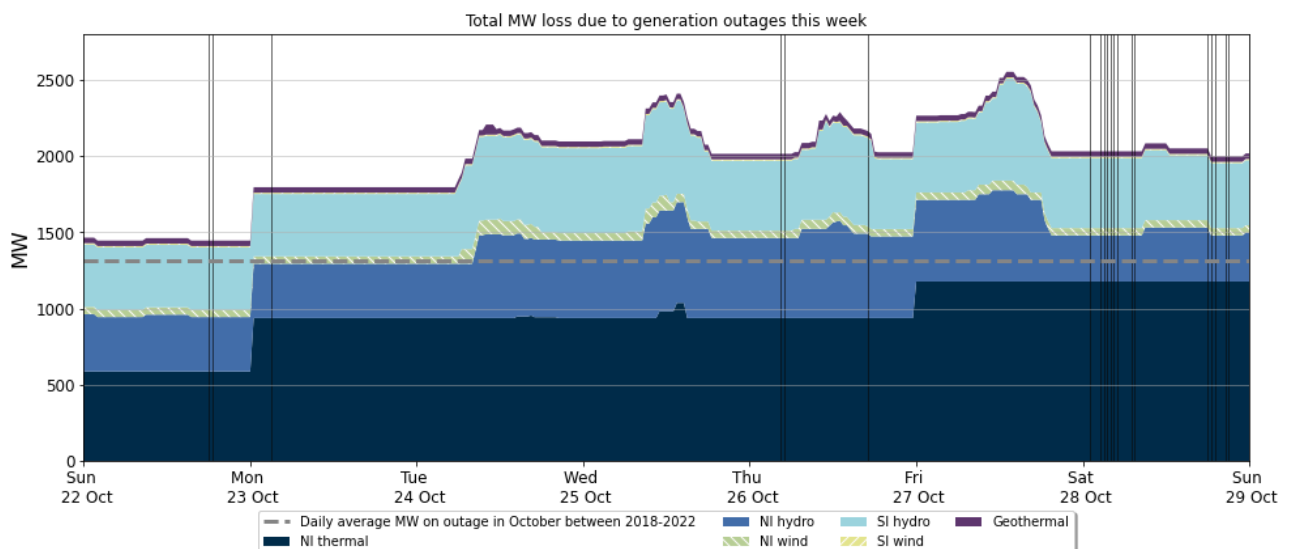
8. Outages

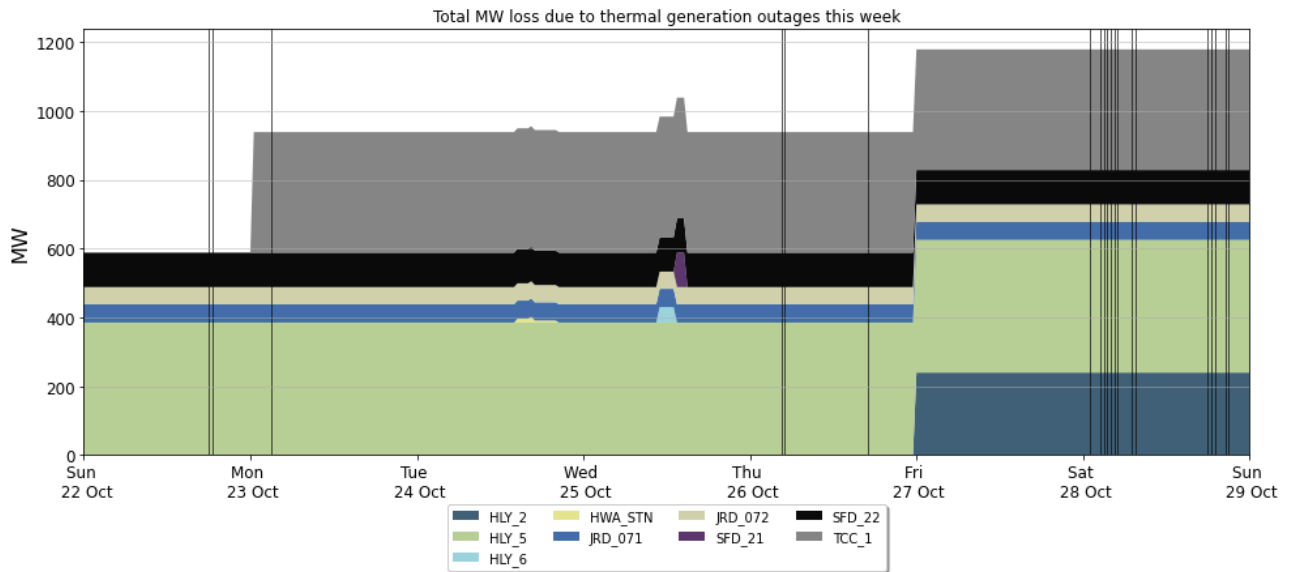
8.1. Figure 13 shows generation capacity on outage. Total capacity on outage between 22-28 October ranged from ~1450MW to ~2550MW.

8.2. Notable outages include:

- (a) Huntly 5 is on outage until 31 January 2024
- (b) TCC is on outage 23 October – 22 December 2023
- (c) Huntly 2 is on outage from 27 October – 13 November 2023
- (d) In addition to the long term Stratford 2 outage, Stratford 1 had an outage on 25 October.
- (e) Junction Road units have been on outage; one until 29 October and one until 12 November.
- (f) Various North and South Island hydro units have outages.

Figure 13: Total MW loss due to generation outages

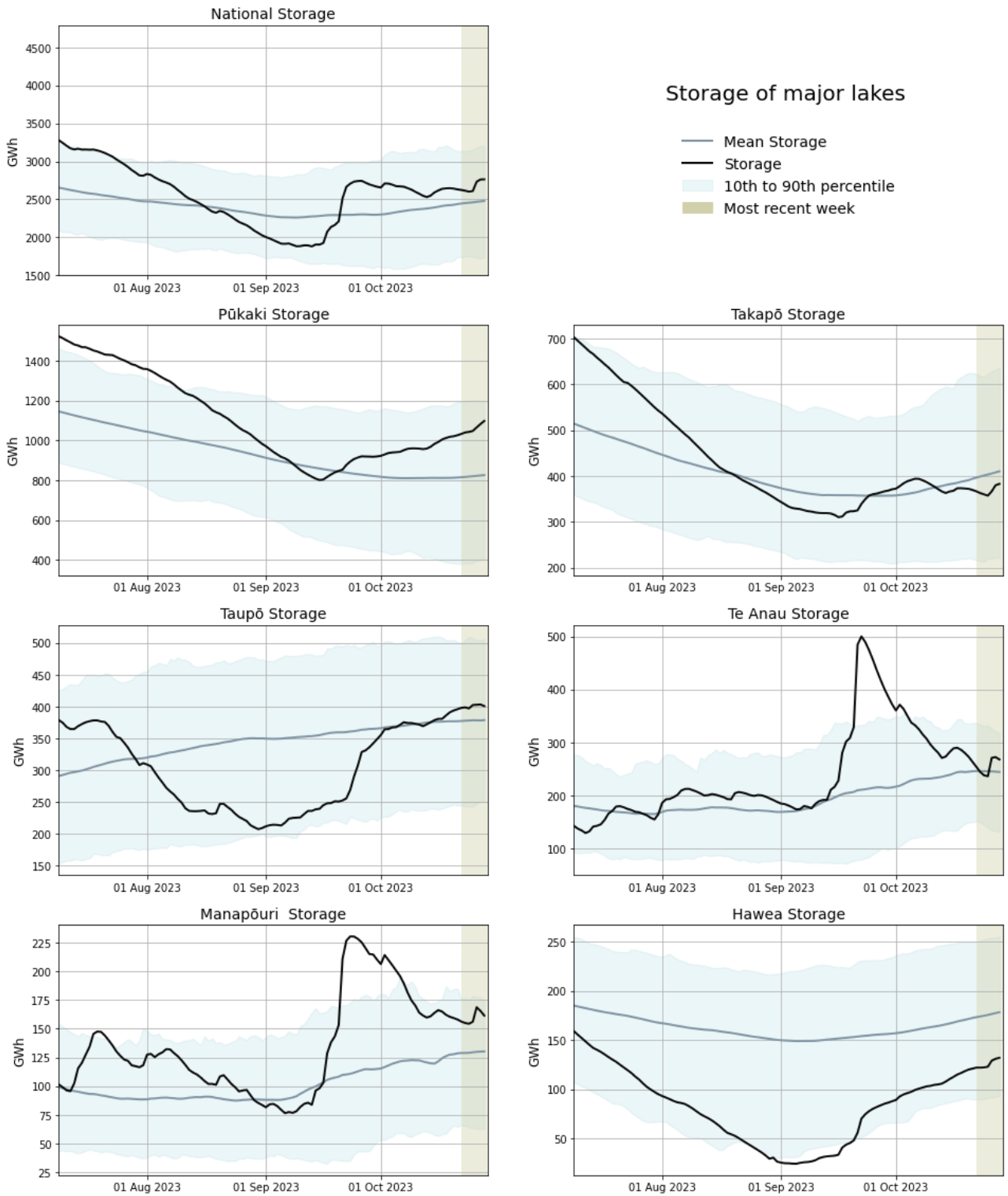




9. Storage/fuel supply

- 9.1. Figure 14 shows the total controlled national hydro storage as well as the storage of major catchment lakes including their historical mean and 10th to 90th percentiles.
- 9.2. National hydro storage levels increased over the week, with controlled storage at 69.2% nominally full and close to 110% of historic mean as of 28 October.
- 9.3. Taupō storage remained steady and above its historic mean. Pūkaki storage continued to steadily increase and is approaching its historic 90th percentile range. Takapō also saw an uptick to storage, approaching its historic mean for this time of year. Manapōuri remains close to its 90th percentile range and after dropping just below its historical mean, Te Anau saw an increase to storage going back above its mean midweek. Hawea storage remains below its historic mean but has continued to steadily increase over the week.

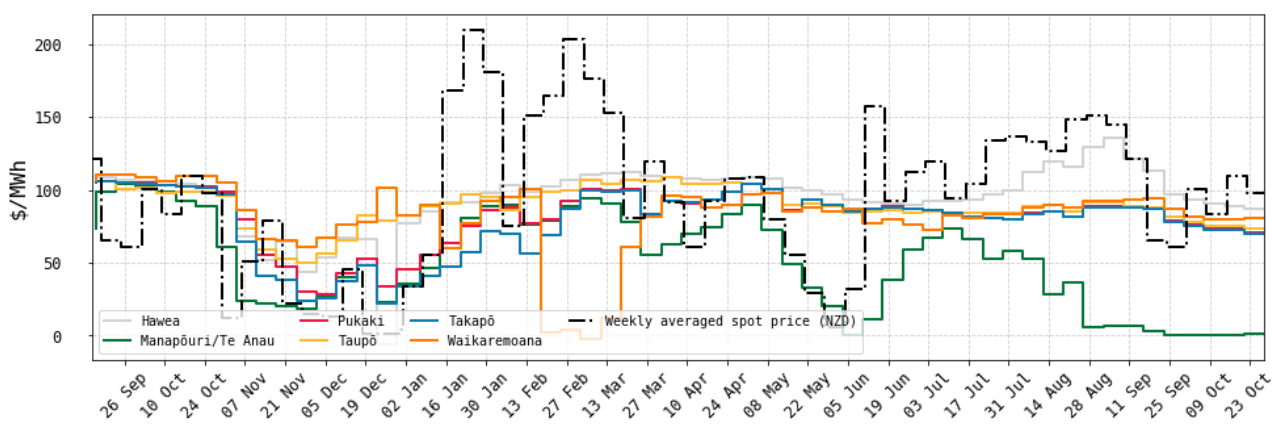
Figure 14: Hydro storage



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 15 shows the national water values between 15 September 2022 and 28 October 2023 obtained from JADE calculated as at the start of the week. These values are used to estimate the marginal water value at the actual storage level. More details on how water values are calculated can be found in [Appendix B](#).
- 10.2. There was minimal change in water values across all lakes this week with any increases or decreases within \$2/MWh.

Figure 15: Jade water values across various reservoirs between 15 September 2022 and 28 October 2023



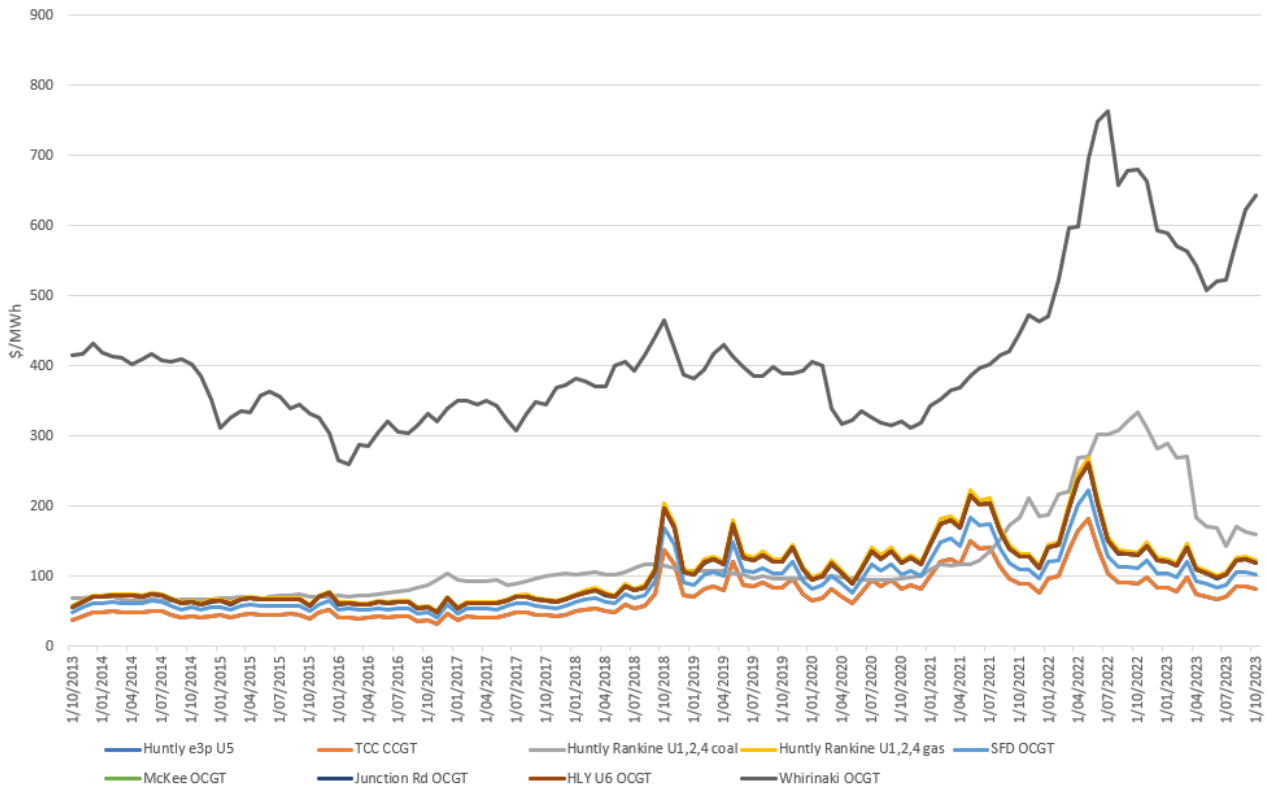
11. Prices versus estimated costs

- 11.1. 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).
- 11.2. The SRMC (excluding opportunity cost of storage) for thermal fuels is 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.
- 11.3. Figure 16 shows an estimate of thermal SRMCs as a monthly average up to 1 October 2023. The SRMC of diesel plants has been increasing since May, and the SRMC of coal-fuelled plants has started to increase again, with gas-fuelled plants continuing to decrease slightly. An increase in carbon prices has contributed to the increase in the diesel and coal fired plant SRMCs, while a reduction in gas prices has curtailed this increase in gas plant SRMCs.
- 11.4. The latest SRMC of coal-fuelled Huntly generation is ~\$168/MWh.
- 11.5. The SRMC of Whirinaki has increased to ~\$583/MWh.
- 11.6. The SRMC of gas fuelled thermal plants is currently between \$78/MWh and \$116/MWh.

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.

11.7. More information on how the SRMC of thermal plants is calculated can be found in [Appendix C](#) on the trading conduct webpage. This appendix was recently updated to reflect the changes made to coal price indices by the Indonesian government. These changes have had the effect of decreasing the coal SRMC from April 2023.

Figure 16: Estimated monthly SRMC for thermal fuels

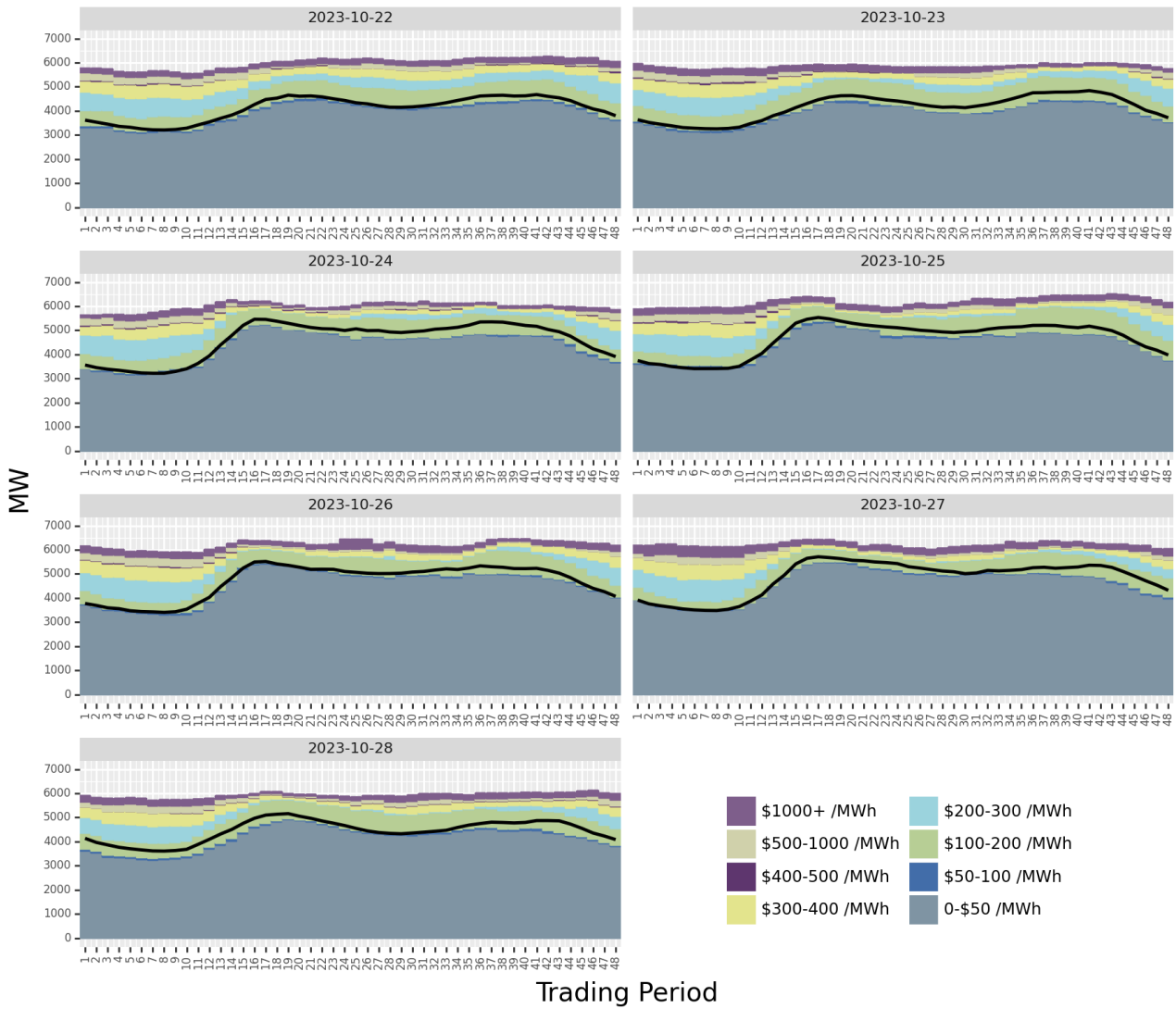


12. Offer behaviour

12.1. Figure 17 shows this week’s national daily offer stacks. The black line shows cleared energy, indicating the range of the average final price.

12.2. The majority of offers cleared in the \$100-\$200/MWh range. This is very similar to the last few weeks.

Figure 17: Daily offer stacks



13. Ongoing work in trading conduct

13.1. This week, prices generally appeared to be consistent with supply and demand conditions.

13.2. 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	Participant	Location	Enquiry topic
07/10/2022	15-16	Further analysis	Genesis	Huntly 5	Prices change for final energy tranche.
14/06/2023	15-17	Passed to Compliance	Genesis	Multiple	High energy prices associated with high energy offers.
15/06/2023	15-19	Passed to Compliance	Genesis and Contact	Multiple	High energy prices associated with high energy offers.
22/09/2023-30/09/2023	Several	Further analysis	Contact	Multiple	High hydro offers.
11/10/2023	21	Further Analysis	Genesis	Tokaanu	High prices during off-peak time.