

Date: 14 August 2023



# TRADING CONDUCT REPORT

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Market Monitoring Weekly Report

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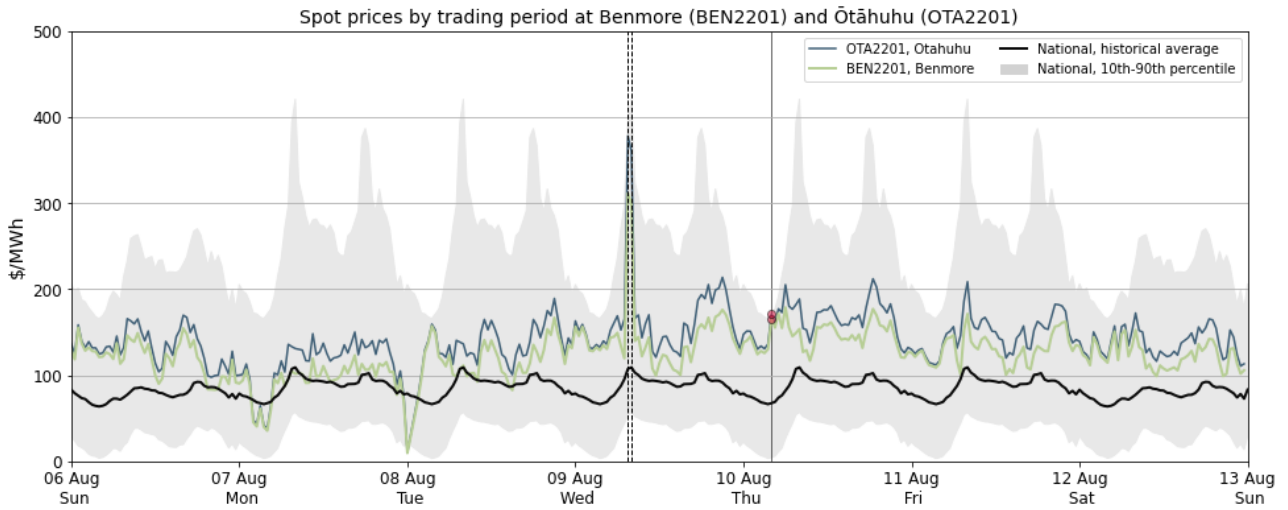
## 1. Overview for week of 6 - 12 August 2023

- 1.1. Throughout the week, prices remained higher than the historical average. A notable price spike below the 90<sup>th</sup> percentile occurred on Wednesday morning, driven by high demand and low wind generation during the morning peak. In response, some relatively high tranche offers were dispatched to meet the increased energy requirements. This week also saw an uptick in demand, especially during peak periods, which was attributed to the colder temperatures being felt across the country. Wind generation remained low, resulting in increased thermal generation to meet the demand. Meanwhile, hydro generation remained consistent with the previous week, and the national hydro storage continued to decline.

## 2. Spot Prices

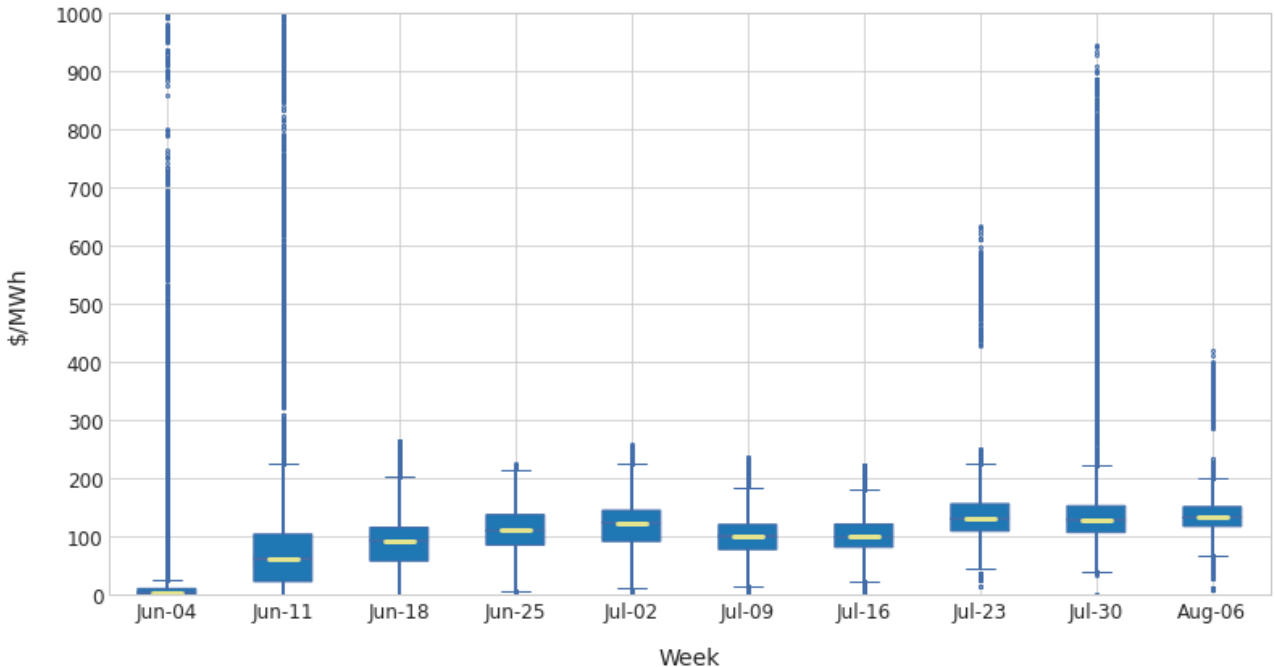
- 2.1. This report monitors underlying wholesale price drivers to assess whether trading periods require further analysis to identify potential non-compliance with the trading conduct rule. In addition to general monitoring, we also single out unusually high-priced individual trading periods for further analysis by identifying when wholesale electricity spot prices at any node exceed their historical 90<sup>th</sup> percentiles.
- 2.2. Between 6 – 12 August:
  - a) The average wholesale spot price across all nodes was \$134/MWh.
  - b) 95 percent of prices fell between \$64/MWh and \$188/MWh.
- 2.3. Figure 1 shows wholesale spot prices at Benmore and Ōtāhuhu alongside their historic average and historic 10<sup>th</sup> - 90<sup>th</sup> percentiles adjusted for inflation. Prices above the historic 90<sup>th</sup> percentile are highlighted with a black line. Other notable prices, but which did not exceed the 90<sup>th</sup> percentile, are marked with black dashed lines.
- 2.4. Prices during this week remain close to or slightly above the historic average. In the latter half of the week, prices experienced a slight increase, mainly driven by high demand, decreased wind generation, and comparatively higher thermal generation. Most spot prices remained within the range of \$100/MWh to \$200/MWh.
- 2.5. This week the highest price spike below the historic 90<sup>th</sup> percentile occurred on Wednesday, 9 August between 7:30 – 8:00 am, resulting in prices of \$378/MWh at Ōtāhuhu and \$311/MWh at Benmore, with below \$2/MWh reserve prices. The high peak demand led to the dispatch of high tranche offers. Additionally, the wind was low with relatively high HVDC flow. We are performing further analysis on these trading periods.
- 2.6. The only price slightly above the 90<sup>th</sup> percentile, occurred on Thursday, 10 August, at 4:00 am. However, prices were around \$171/MWh at Ōtāhuhu and \$166/MWh at Benmore, similar to the average price this week. The wind generation was low with a small HVDC flow northward. Note that historic percentiles for this quarter are relatively low compared to the previous quarter.
- 2.7. Transpower's System Operator issued the Customer Advice Notice (CAN) for the low residual for Friday, 11 August between 7:30 – 9:00 a.m. But the actual residual was more than 200 MW. Also, no high prices were observed during that time.

Figure 1: Wholesale Spot Prices between 6 August (Sunday) – 12 August (Saturday) 2023.



- 2.8. Figure 2 shows a box plot with the distribution of spot prices during this week and the previous nine weeks. The green 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.
- 2.9. During this week, the median was similar to the previous week with relatively less volatility. There were a few instances in the latter half of the week when 5-minute prices were above \$200/MWh.

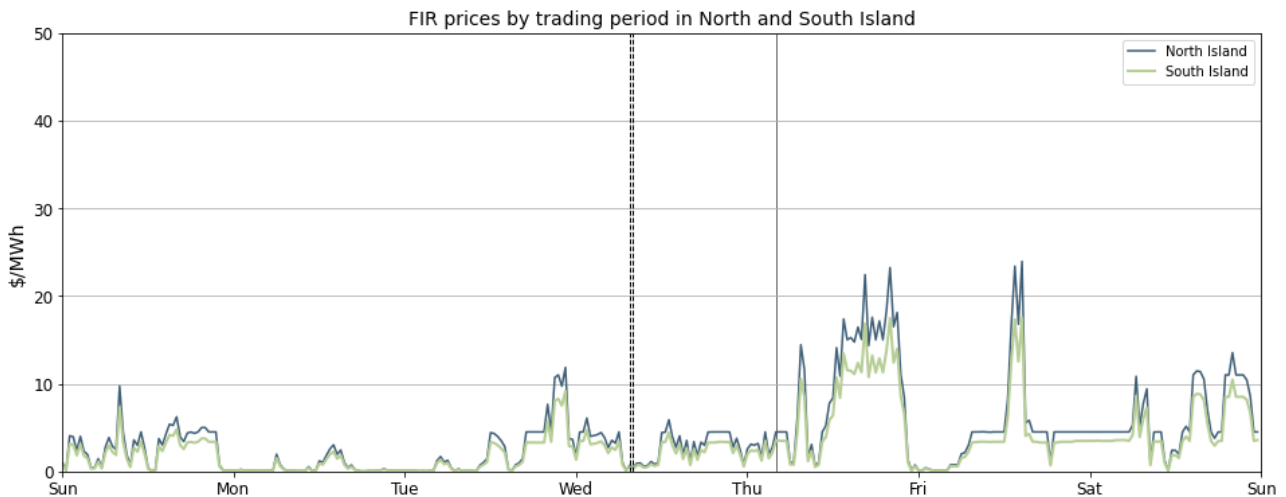
Figure 2: Boxplots showing the distribution of spot prices this week and the previous nine weeks.



### 3. Reserve Prices

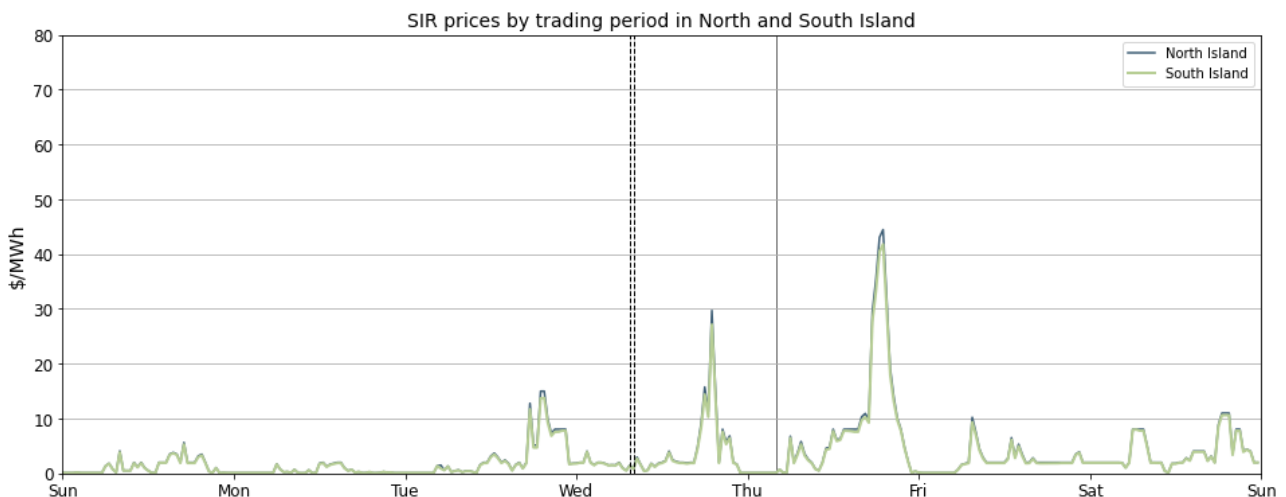
- 3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week the FIR prices were below \$25/MWh for both islands. FIR prices remained predominantly below \$10/MWh until Wednesday, after that a slight increase in FIR prices was observed due to increase in demand.

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 \$20/MWh this week, with a few price spikes but all below \$50/MWh. The highest peak occurred on Thursday, 10 August. This spike was primarily due to a relatively high demand coupled with limited wind generation. During this period, prices in the North Island reached \$44/MWh, with the South Island prices of \$42/MWh.

Figure 4: Sustained instantaneous reserve (SIR) prices by trading period and Island.

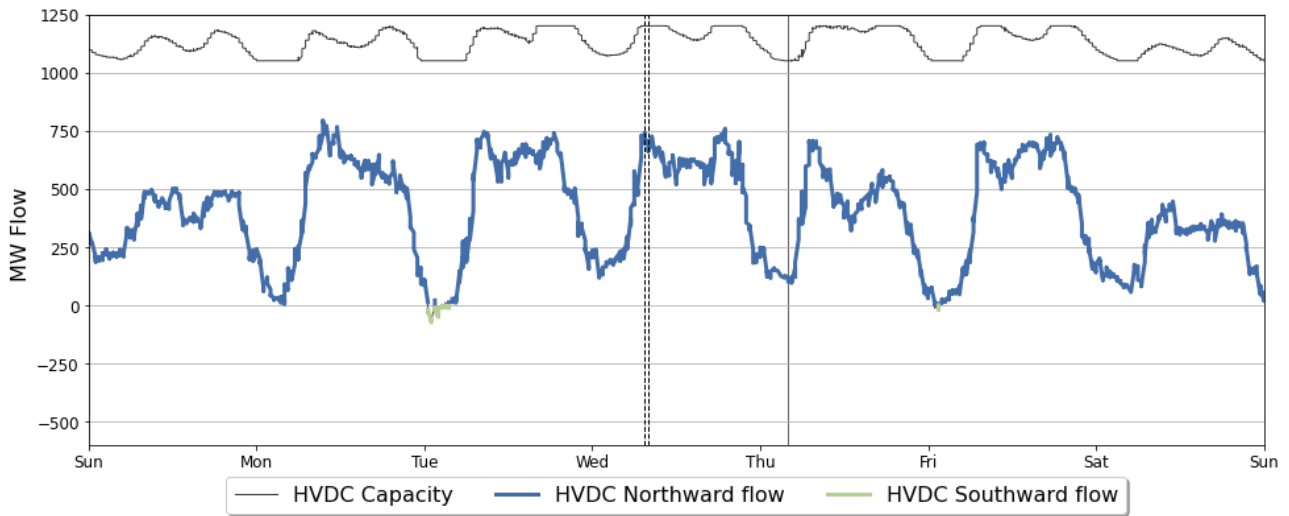


### 4. HVDC

- 4.1. Figure 5 shows HVDC flow between 6 – 12 August. HVDC flows were northward during both daytime and nighttime, reaching nearly 750 MW during the daytime. There was some

small HVDC flow southward overnight on Tuesday due to high wind generation in the North Island. HVDC flow was well below the maximum limits.

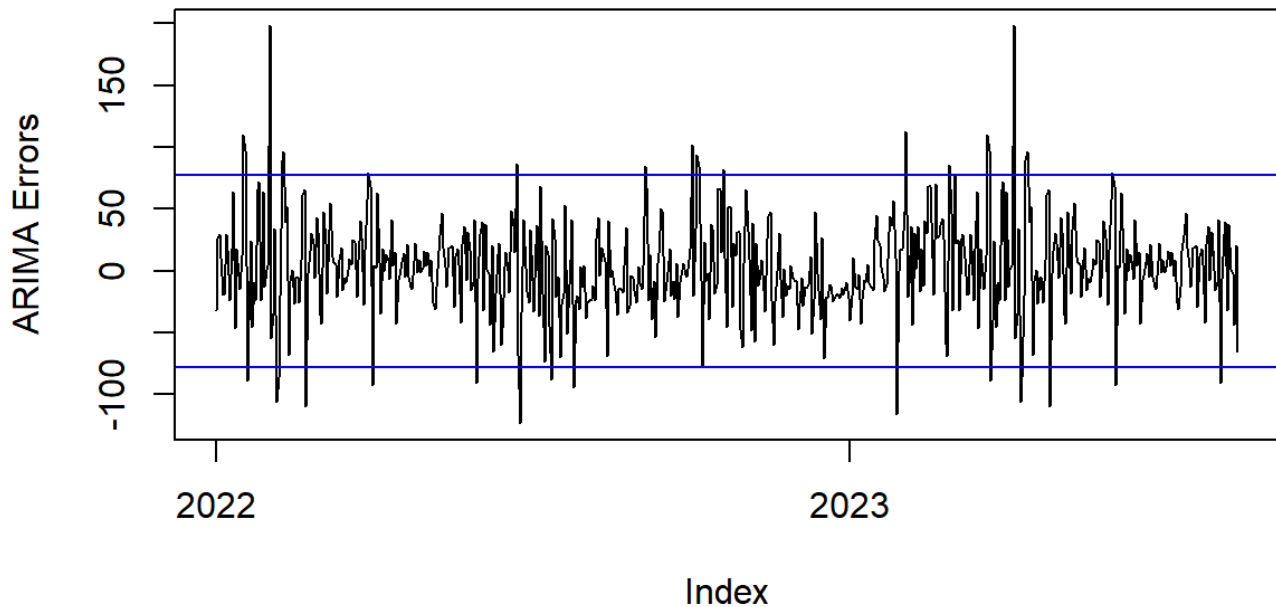
Figure 5: HVDC northward flow and capacity.



## 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. This week, there was no residual above or below the two standard deviations of the data.

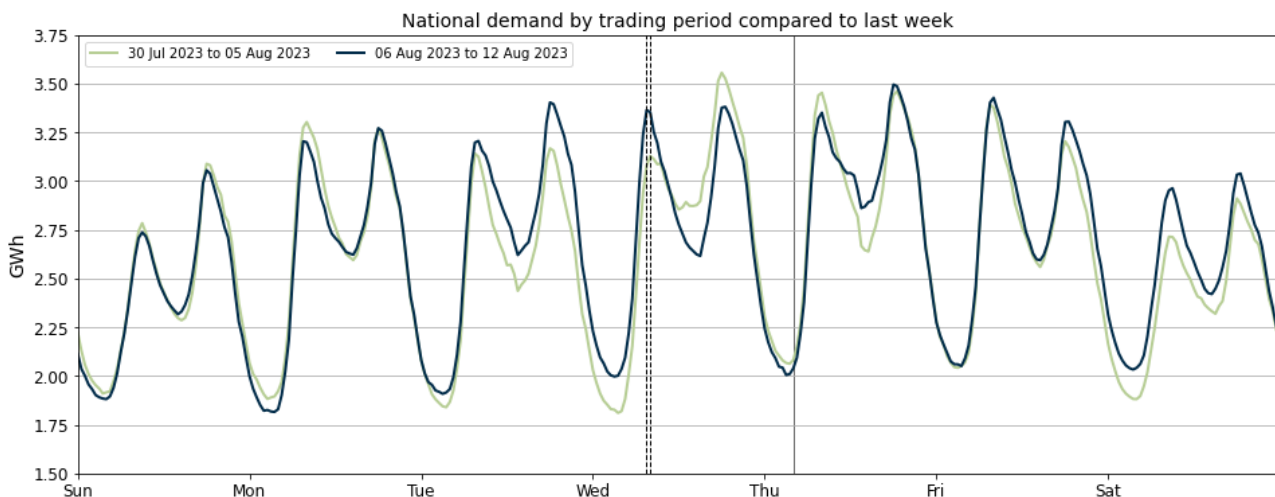
Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 – 12 August 2023. The blue lines show two standard deviations of the ARMA errors.



## 6. Demand

6.1. Figure 7 shows national grid demand between 6 – 12 August, compared to the previous week. Demand on Sunday and Monday was similar compared to the previous week. However, evening peak demand on Tuesday, and morning peak demand on Wednesday was higher compared to the previous week due to relatively colder temperatures. On Thursday, the evening peak was the highest of the week. The Thursday peak is the third highest demand peak recorded, behind only 9 August 2021 and 2 August 2023 (previous week on Wednesday – shown in below Figure). On Saturday, the overall demand was higher due to lower temperatures across the country.

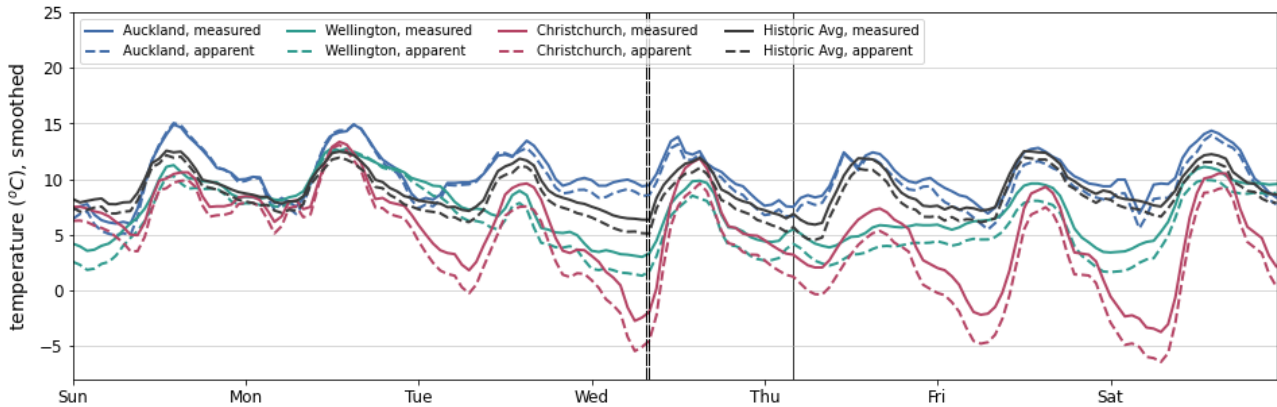
Figure 7: National demand by trading period compared to the previous week.



6.2. Figure 8 shows hourly temperatures at the three main population centres between 6 – 12 August. 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 cooler across all regions. Auckland temperatures were mostly around the historic average, ranging between 5 degrees and 15 degrees. Wellington temperatures were around the historic average at the start of the week, but the temperature went below the historic average from Tuesday. Christchurch temperatures fell mainly below average, with mornings having negative apparent temperatures from Tuesday.

Figure 8: Temperatures across main centres.



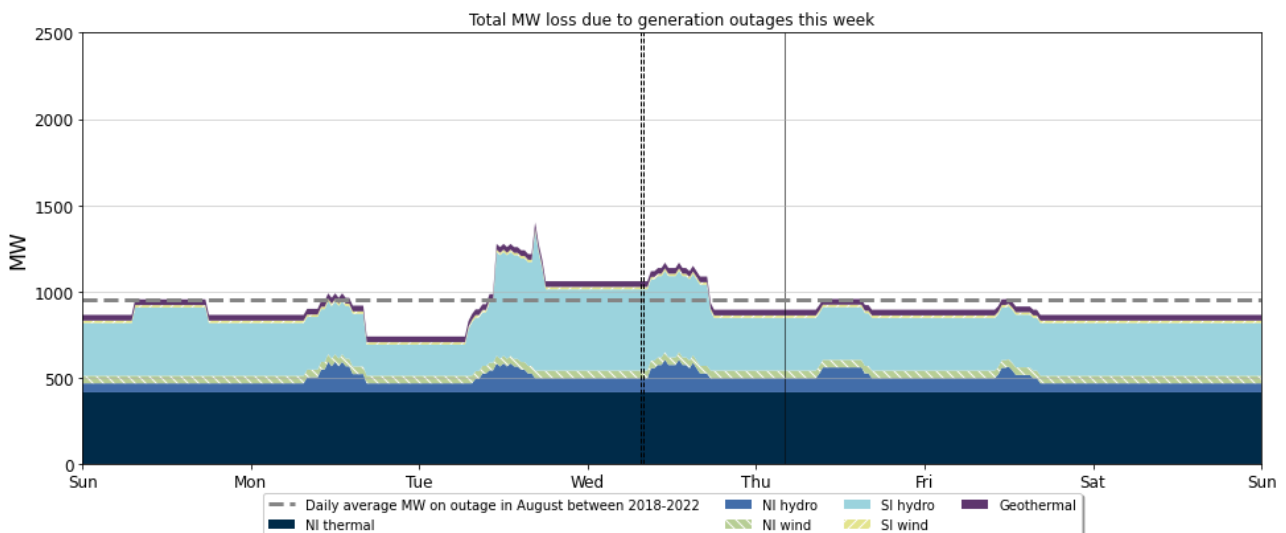
## 7. Outages

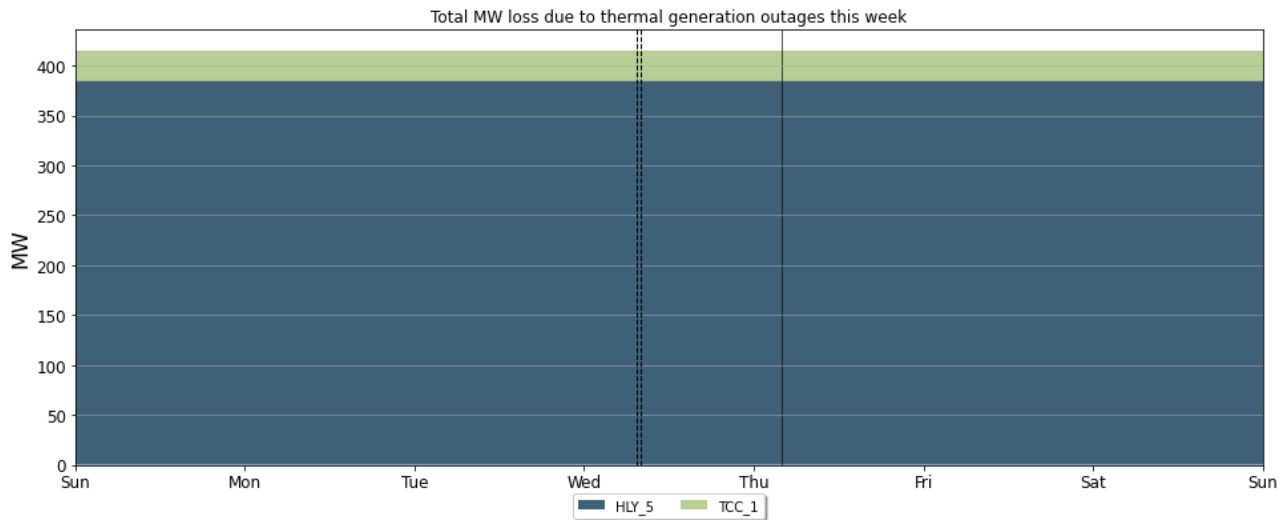
7.1. Figure 9 shows generation capacity on outage. Total capacity on outage between 6 – 12 August ranged between ~900 MW and 1300 MW.

7.2. Notable outages include:

- (a) Huntly 5 extended outage to 20 May 2024.
- (b) Various North and South Island hydro units remain on outage.
- (c) West Wind is partly on outage until 24 November.

Figure 9: Total MW loss due to generation outages.

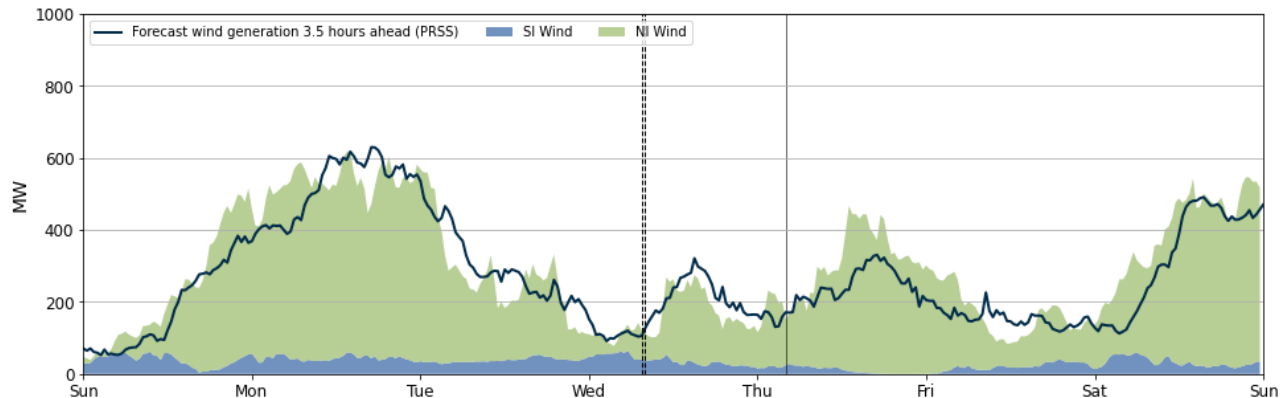




## 8. Generation

- 8.1. Figure 10 shows wind generation, from 6 – 12 August, ranged from 40 - 620 MW across the week. At the start of the week, wind started low mostly below 100 MW, and reached a peak of 600 MW on Monday. Wind generation gradually decreased to around 100 MW on Wednesday when the price spike occurred. On Thursday, wind generation rebounded, reaching up to 430 MW but dropped to around 100 MW till Friday afternoon. On Saturday, wind gradually increased but remained below 600 MW.

Figure 10: Wind Generation and forecast.

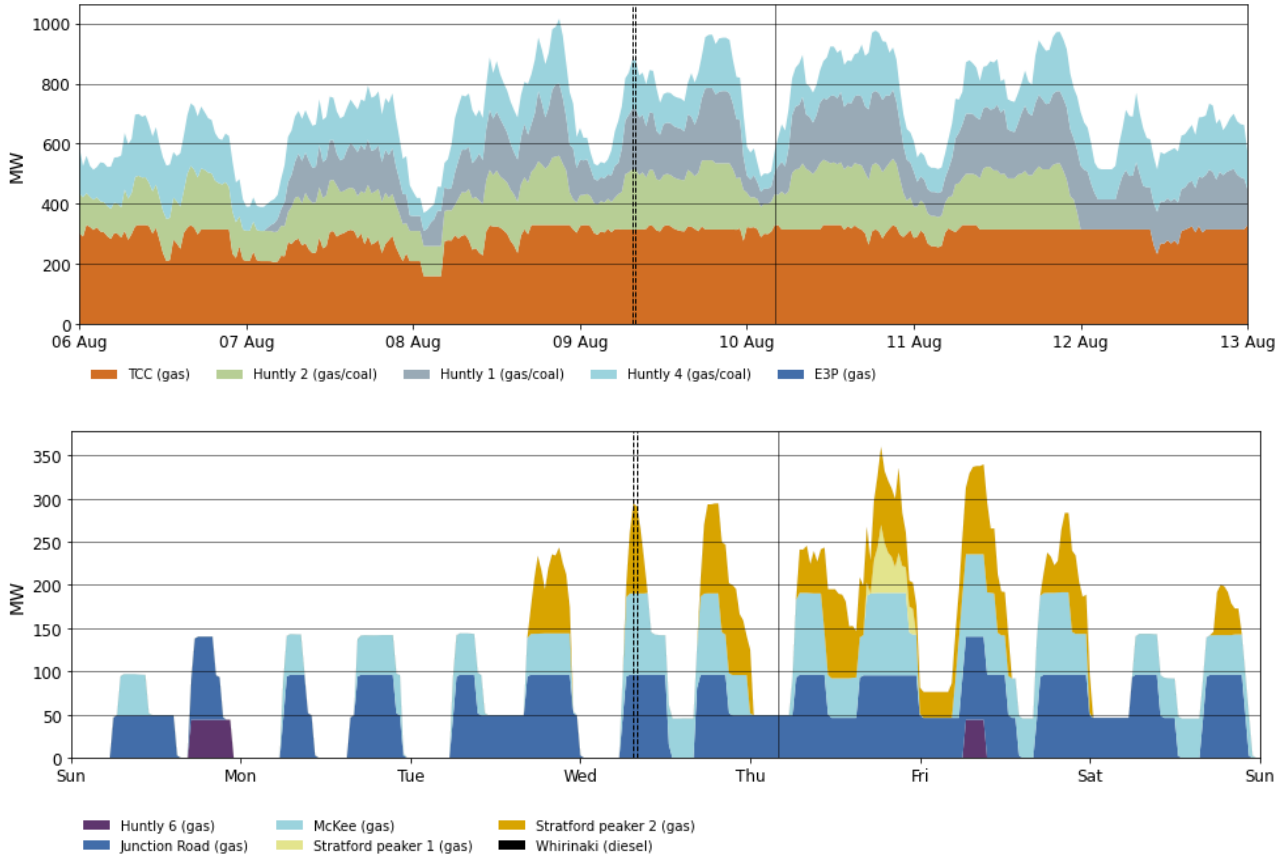


- 8.2. Figure 11 shows the generation of thermal baseload and thermal peaker plants between 6 – 12 August. E3P (Huntly 5) remains on outage, resulting in the remaining three Rankine units cycling on and off to support baseload requirements. TCC and Huntly 4 ran continuously as baseload throughout the week. Huntly 2 ran as baseload until Friday and Huntly 1 ran from Monday until the end of the week. From Monday until Friday all three Rankine units were running due to high demand.
- 8.3. Due to relatively low wind generation and high demand, the load was supported by the thermal peakers. Junction Road and McKee ran daily, with Junction Road also running continuously from Wednesday to Friday. McKee mainly ran during the peak periods although at the later half of the week also ran across some shoulder periods as well.



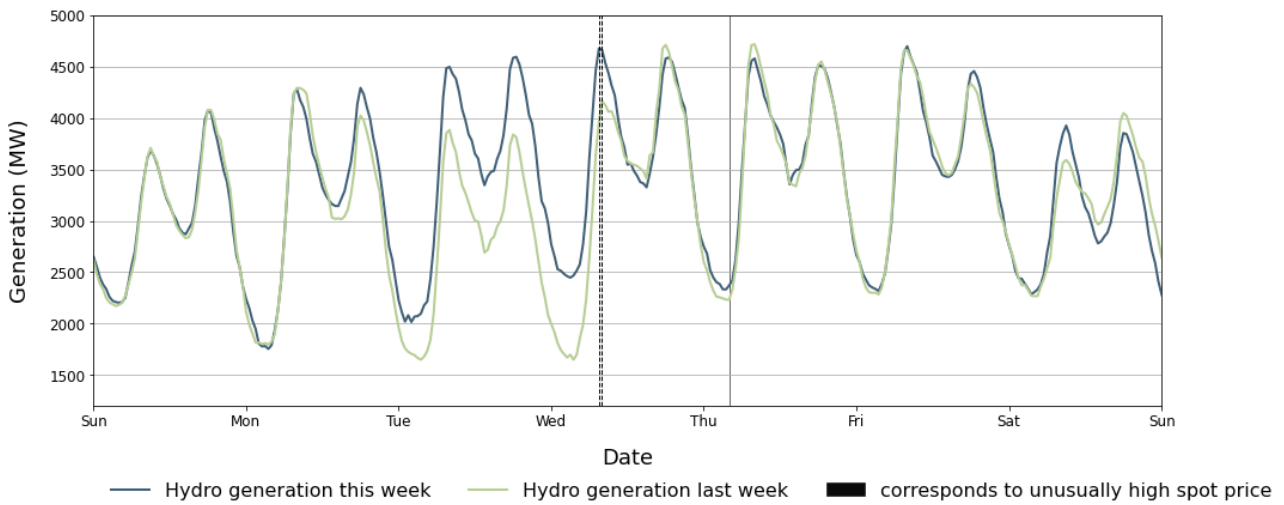
Stratford 2 ran daily from Tuesday evening during peak demand periods, while Stratford 1 ran only during Thursday evening peak. Huntly 6 ran on Sunday and Friday.

Figure 11: Thermal Generation.



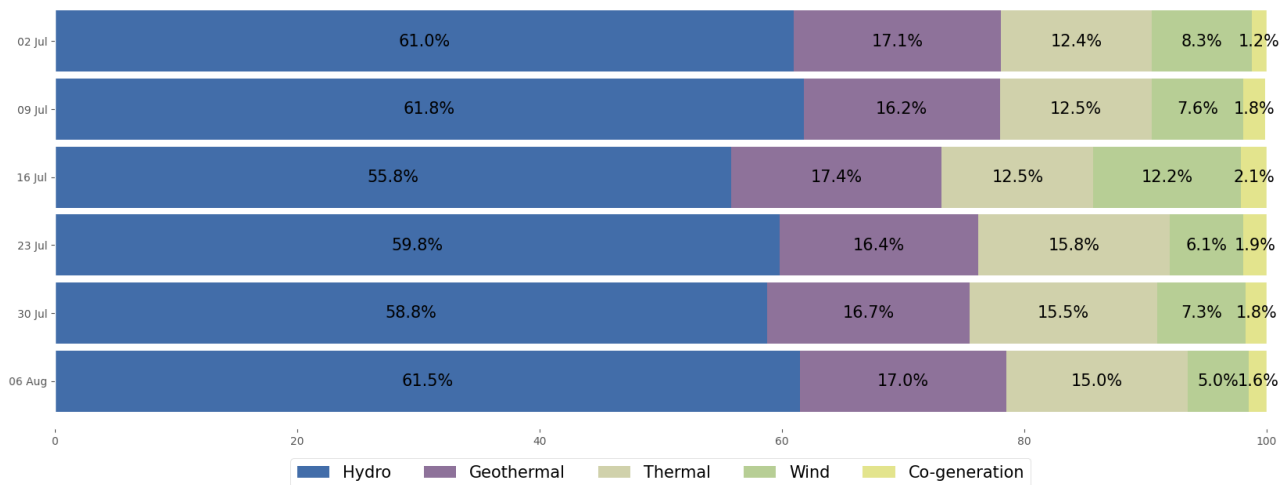
8.4. Figure 12 shows hydro generation between 6 – 12 August. Overall, there was a slight increase in hydro generation compared to the previous week. The hydro generation was higher on Tuesday due to high demand. The hydro generation was also higher during the Wednesday price spike. Also, on Saturday, there was a notable increase in morning peak generation.

Figure 12: Hydro generation between 6 – 12 August compared to the previous week.



8.5. As a percentage of total generation, between 6 – 12 August, total weekly hydro generation was 61.5 percent, geothermal 17 percent, thermal 15 percent, wind 5 percent, and co-generation 1.6 percent. This week due to high demand and low wind generation, the load was covered by the increased thermal and hydro generation.

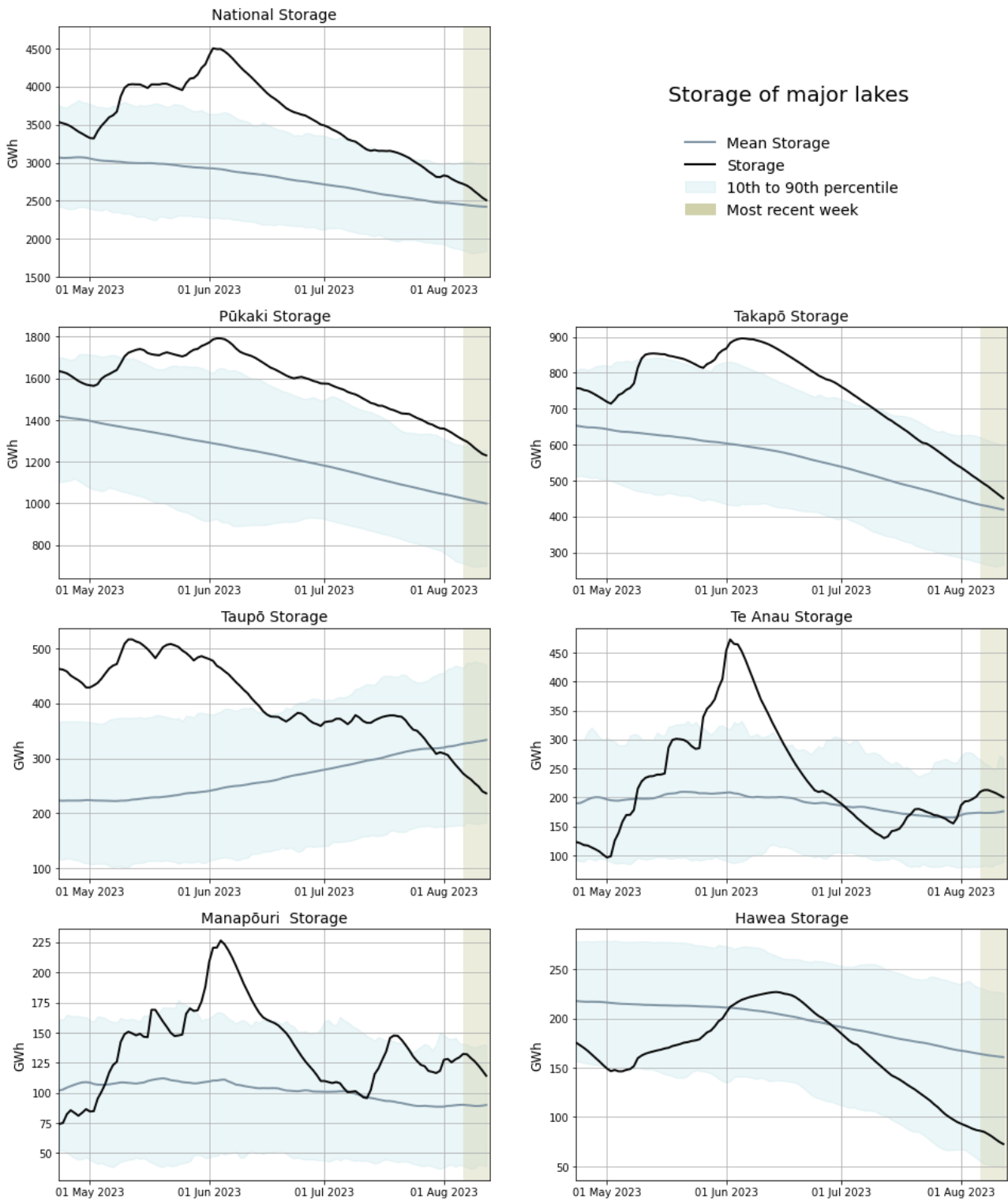
Figure 13: Total generation as a percentage each week between 2 July and 12 August 2023.



## 9. Storage/Fuel Supply

- 9.1. Figure 14 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.
- 9.2. National hydro storage levels have decreased this week to 64 percent of nominal full as of 12 August. However national controlled storage is still high at 105 percent of the historic mean for this time of year.
- 9.3. During this week, all lake levels experienced a decline. Lake Pūkaki is slightly below its historic 90<sup>th</sup> percentile and Takapō is under its historic 90<sup>th</sup> percentile but above its historic average. Storage at lakes Te Anau and Manapōuri is slightly above their respective historical average. The storage level at Taupō is below its historic mean but above its 10<sup>th</sup> percentile. Hawea storage also decreased and is currently below its historic mean for this time of year.

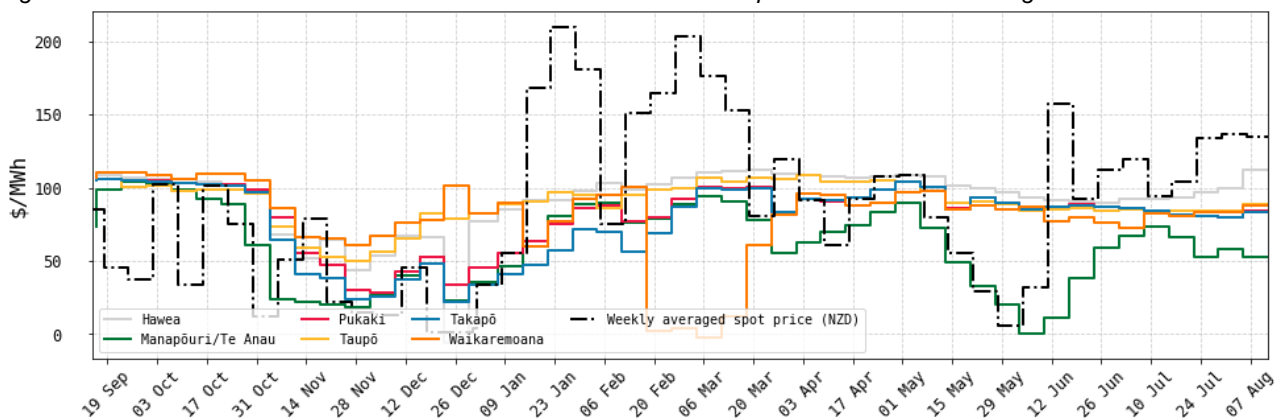
Figure 14: Hydro Storage.



## 10. JADE Water Values

- 10.1. The JADE<sup>1</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 15 shows the national water values between 15 September 2022 and 12 August 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. Recently the water values in most of the lakes remained relatively steady, except for Hawea. Water values at Te Anau and Manapōuri have been increasing since June as storage decreased, with a small decrease in the water value over the last few weeks. Water values at Hawea increased as the hydro storage decreased significantly.

Figure 15: JADE water values across various reservoirs between 15 September 2022 and 12 August 2023.



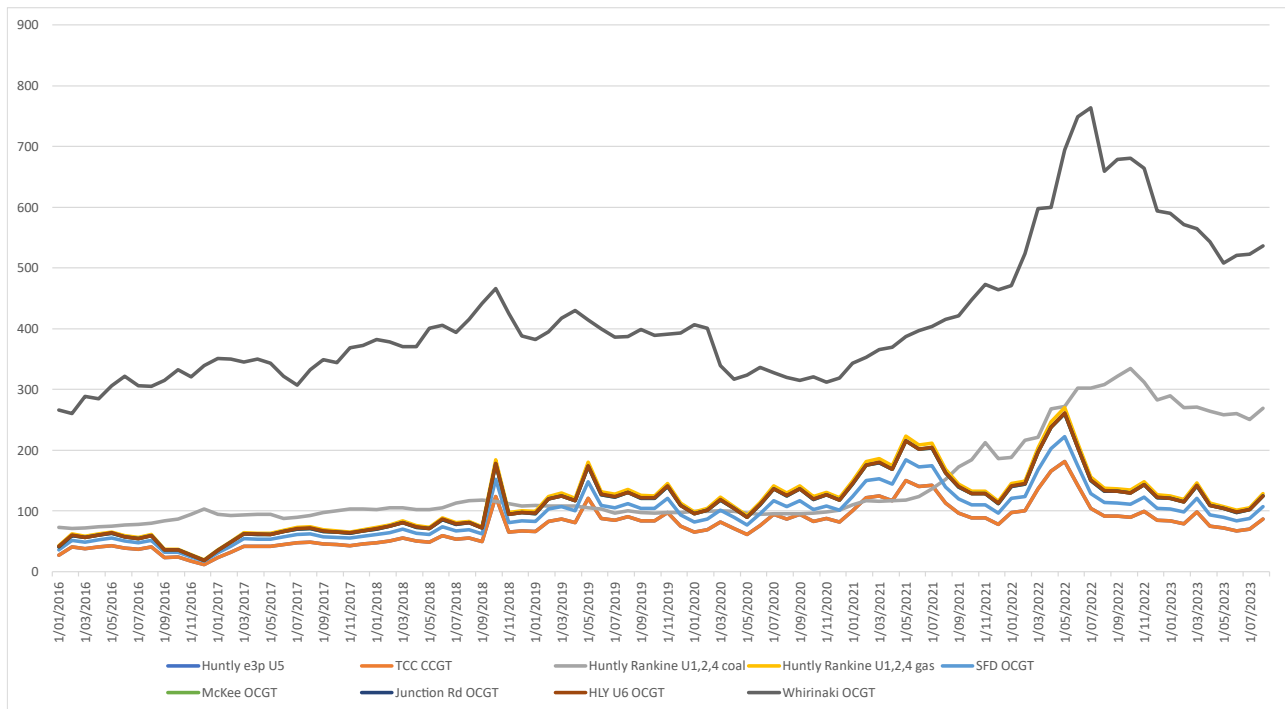
## 11. Prices versus estimated costs

- 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 August 2023. The SRMC of diesel plants has significantly decreased from March, and the SRMC of gas-fuelled and coal plants has also slightly decreased. A reduction in carbon prices has contributed to the decline in SRMCs.
- 11.4. In early July, Indonesian coal was at around ~\$315/tonne (NZD) putting the latest SRMC of coal-fuelled Huntly generation at ~\$270/MWh.
- 11.5. The SRMC of Whirinaki has decreased to ~\$536/MWh.
- 11.6. The SRMC of gas fuelled thermal plants increased again and is currently between \$86/MWh and \$129/MWh, likely due to increased demand for gas.

<sup>1</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.

11.7. More information on how the SRMC of thermal plants is calculated can be found in [Appendix C](#) on the trading conduct webpage.

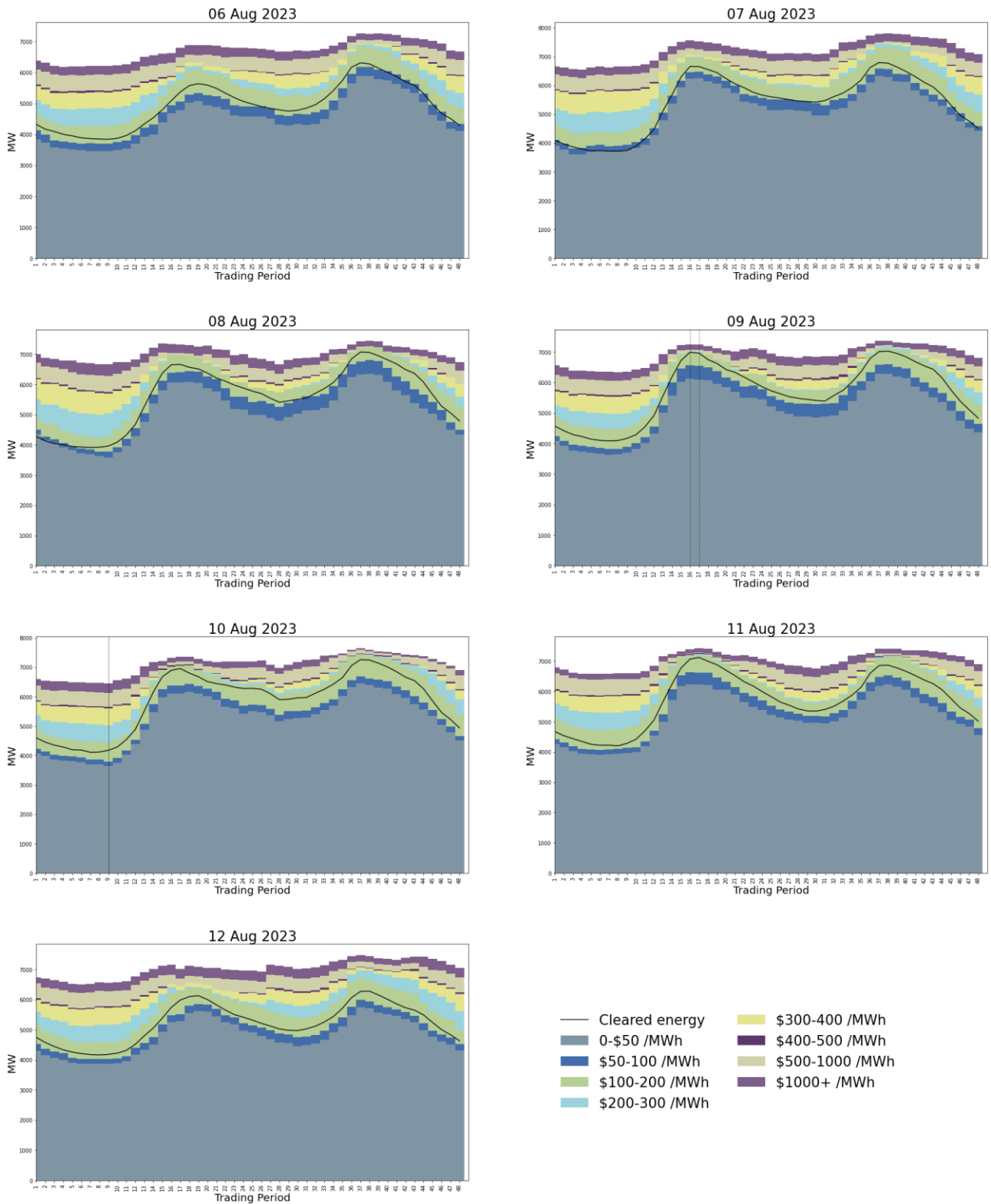
Figure 16: Estimated monthly SRMC for thermal fuels.



## 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. Throughout the week, most generation cleared in the \$100-\$200/MWh price range with some clearing below \$100/MWh. This week relatively low wind contributed to the increased thermal generation. Hydro generation remained consistent compared to previous week as well.
- 12.3. On Wednesday and Thursday, during the peak demand periods, the majority of offers were below \$200/MWh, with a relatively thin stack above this price. Total generation offered on Wednesday was slightly lower, likely due to lower wind generation. This contributed to the price spike on Wednesday morning.

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.
15/1/2023 4/2/2023	Several	Further analysis	N.A.	Multiple	High energy prices associated with high hydro offers.
18/05/2023	Several	Further Analysis	Contact	Multiple	Market conditions which led to higher off-peak prices.
13/06/2023	14-16	Further Analysis	Genesis	Takapō	Offer changes.
14/06/2023	15-17	Further Analysis	Genesis	Multiple	High energy prices associated with high energy offers.
15/06/2023	15-19	Further Analysis	Genesis and Contact	Multiple	High energy prices associated with high energy offers.
09/08/2023	16-17	Further Analysis	N.A.	Multiple	High energy prices associated with high energy offers.