

Date: 28 August 2023



TRADING CONDUCT REPORT

Market Monitoring Weekly Report

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1. Overview for week of 20 - 26 August 2023

1.1. Throughout the week, prices remained higher than the historical average. A price spike below the 90th percentile occurred on Wednesday, driven by high demand and low wind generation during the morning peak. In response, some relatively high priced tranche offers were dispatched to meet the increased energy requirements. Demand was again high due to the colder temperatures across the country. Wind generation was low from Tuesday evening, resulting in increased thermal generation to meet demand. 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 90th percentiles.

2.2. Between 20 – 26 August:

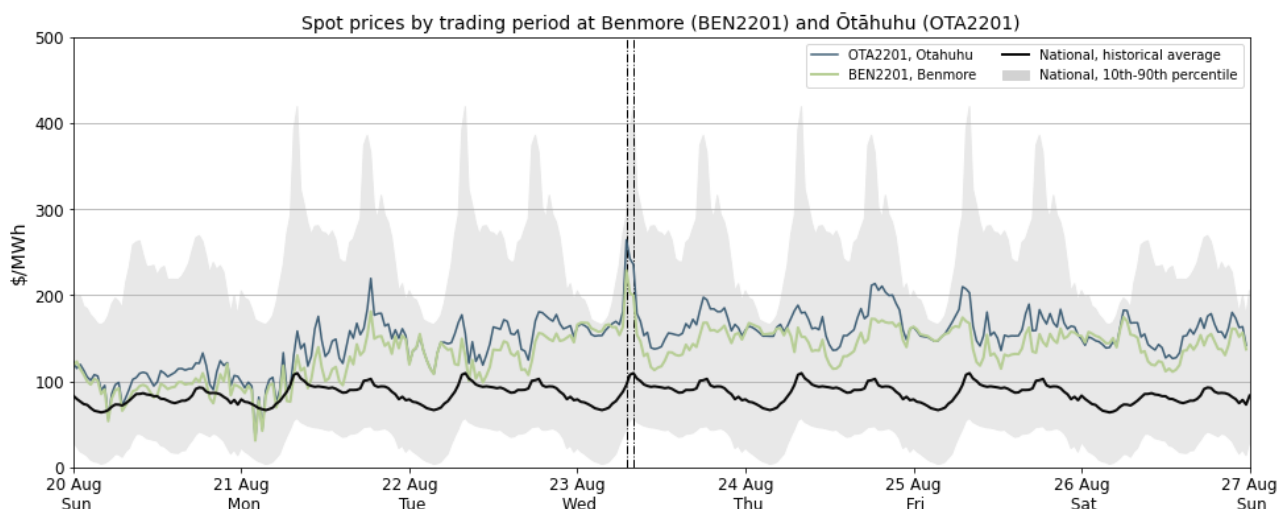
- a) The average wholesale spot price across all nodes was \$142/MWh.
- b) 95 percent of prices fell between \$81/MWh and \$193/MWh.

2.3. Figure 1 shows 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 black line. Other notable prices not exceeding the 90th percentile are marked with black dashed lines.

2.4. Prices during this week remain above the historic average but mostly below \$200/MWh. Prices increased from Monday, mainly driven by high demand, decreased wind generation, and comparatively higher thermal generation.

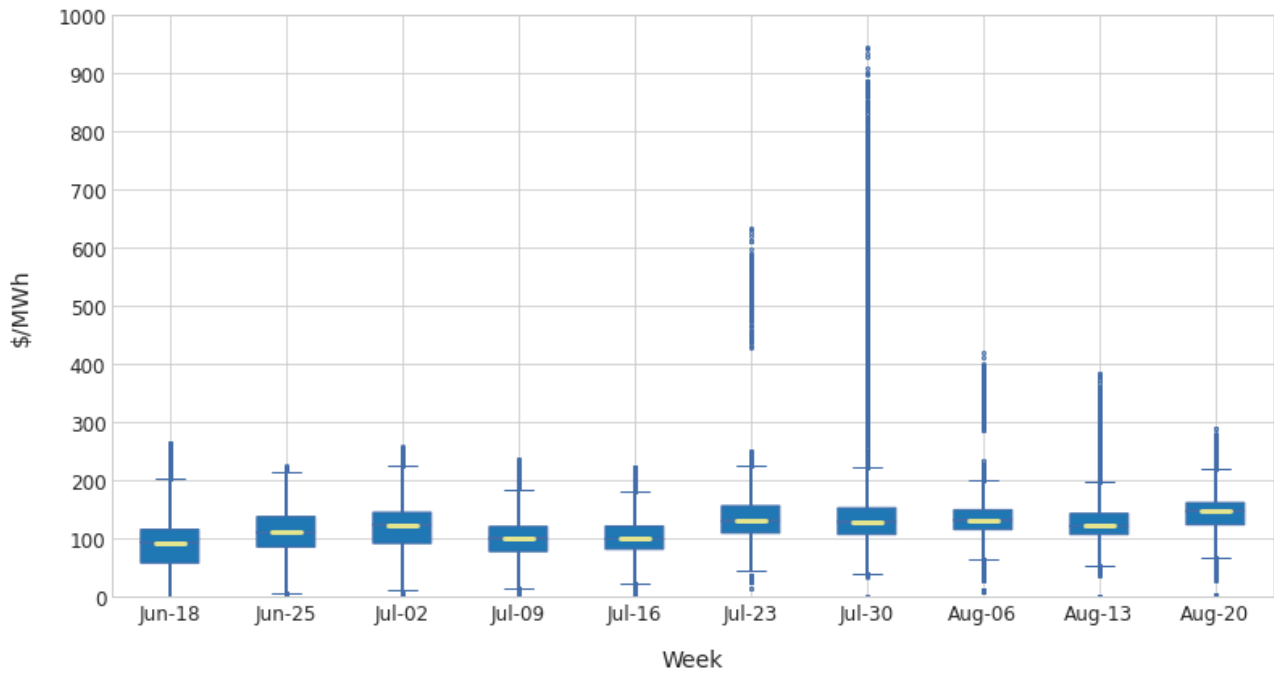
2.5. This week the highest price spike (below the historic 90th percentile) occurred on Wednesday, 23 August between 7:00 – 8:00 am, resulting in prices of \$264/MWh at Ōtāhuhu and \$229/MWh at Benmore. At that time, demand was high due to low temperatures, and wind was significantly low.

Figure 1: Wholesale Spot Prices between 20 August (Sunday) – 26 August (Saturday) 2023.



- 2.6. 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.
- 2.7. During this week, the median price was higher compared to the previous week with relatively less volatility. This week all 5-minute prices were under \$300/MWh.

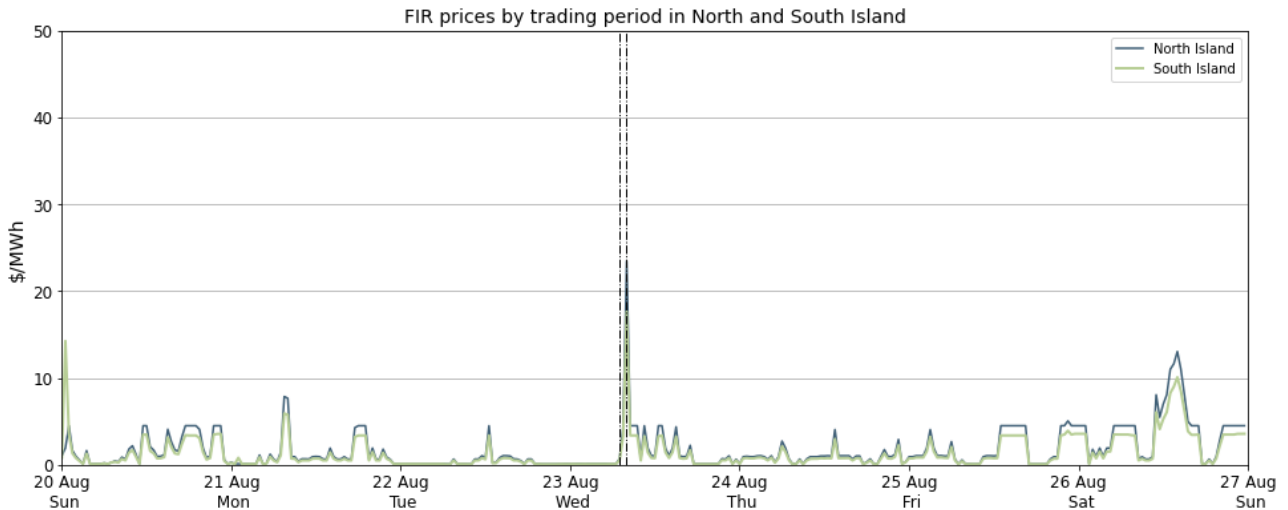
Figure 2: Boxplots showing the distribution of spot prices this week and the previous nine weeks.



3. Reserve Prices

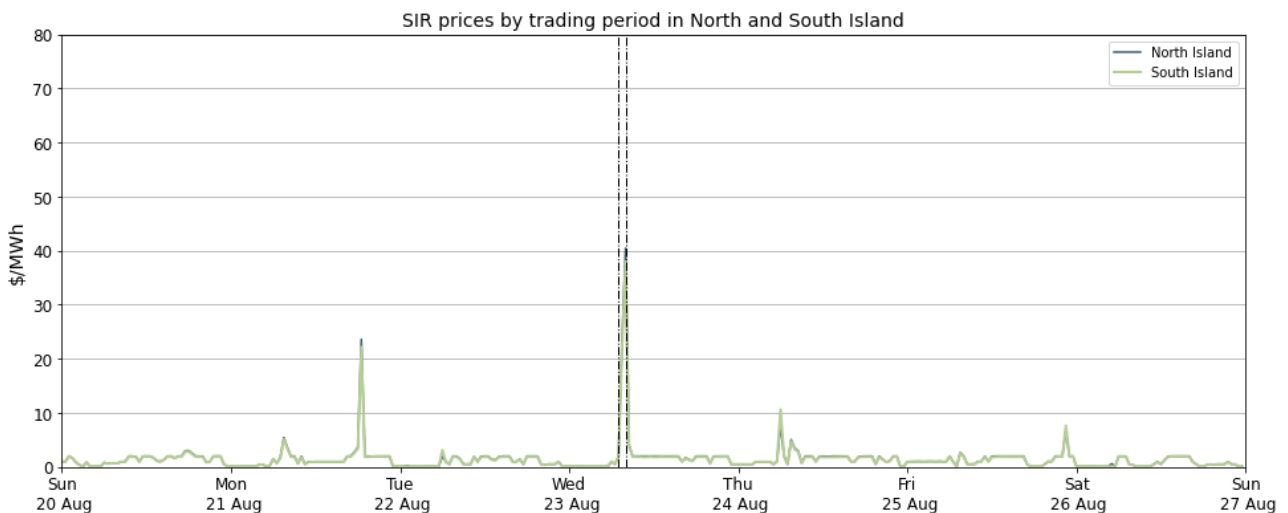
3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week the FIR prices were mostly below \$10/MWh for both islands. The highest FIR price spike was at 8:00 am on Wednesday, 23 August in line with the high peak demand. The North Island price reached \$23/MWh and the South Island price was \$18/MWh.

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 \$10/MWh this week. The highest peak occurred on Wednesday, 23 August at 8:00 am, coinciding with high peak demand. During this period, prices in the North Island reached \$40/MWh, with the South Island prices of \$38/MWh.

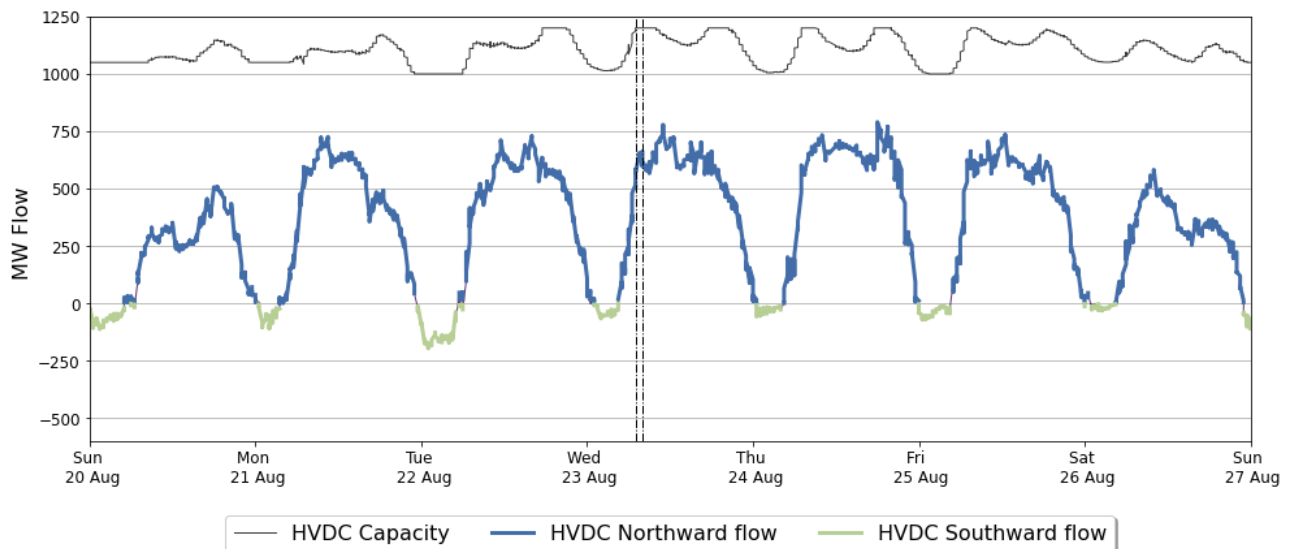
Figure 4: Sustained instantaneous reserve (SIR) prices by trading period and Island.



4. HVDC

- 4.1. Figure 5 shows HVDC flow between 20 – 26 August. HVDC flows were northwards during the day with some southward flow overnight. Northward flow was mostly below 750 MW and well below capacity limits, with the maximum southward flow of around 240 MW.

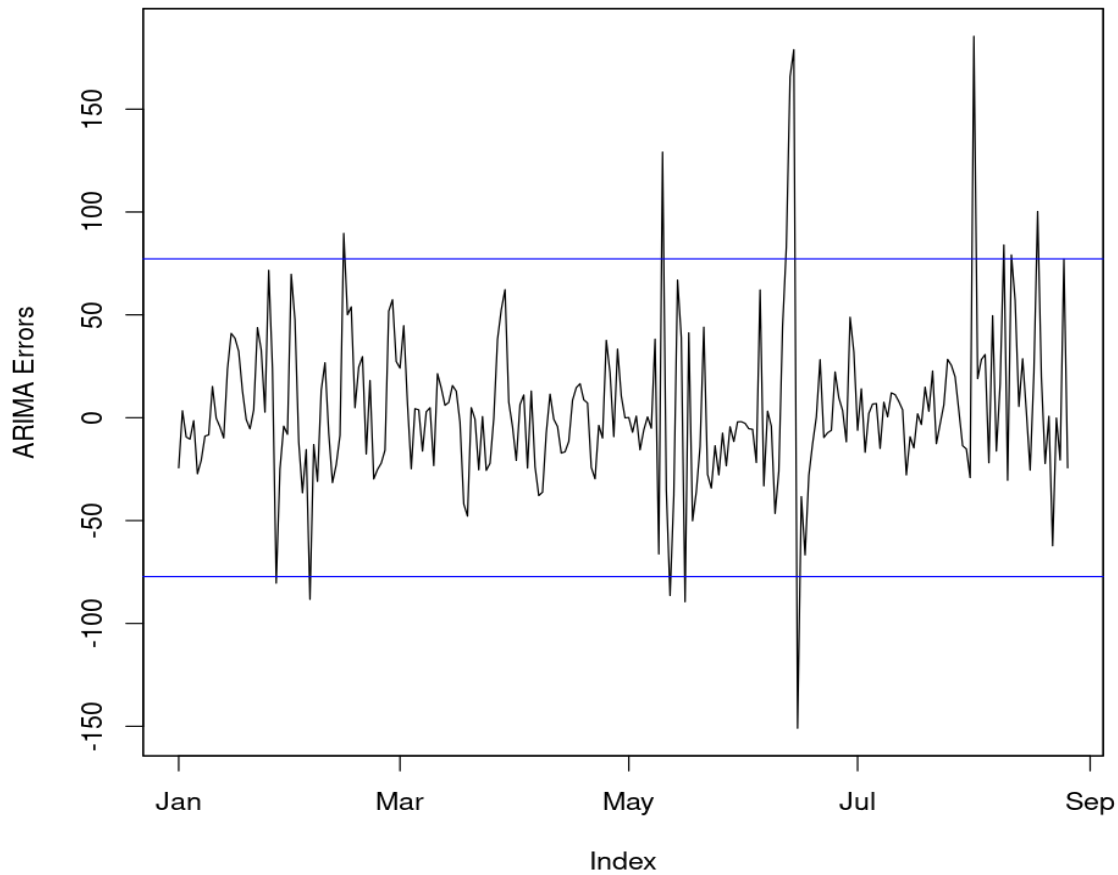
Figure 5: HVDC northward flow and capacity.



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.

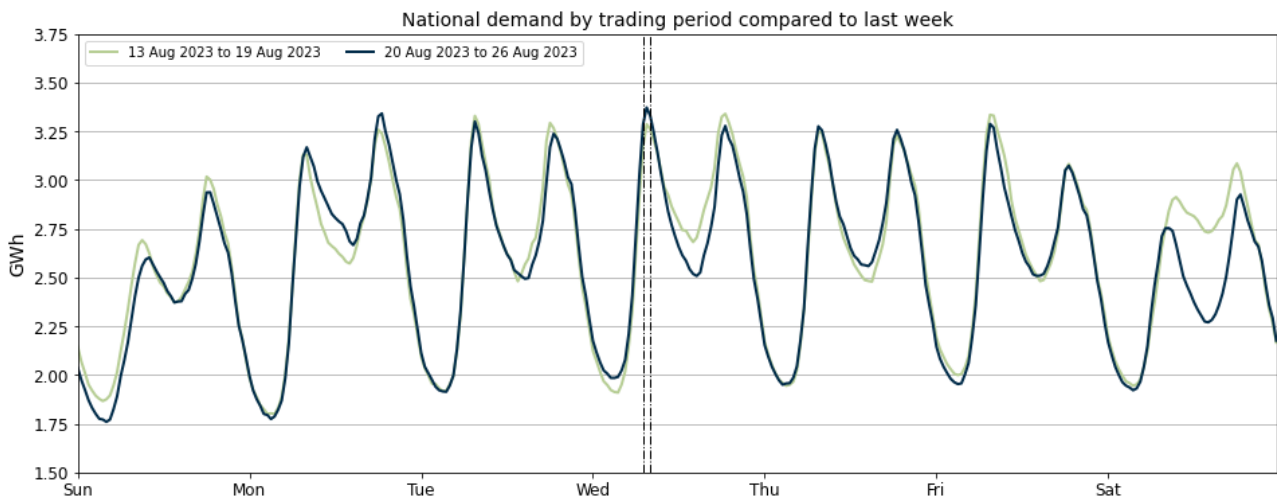
Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 – 26 August 2023. The blue lines show two standard deviations of the ARMA errors.



6. Demand

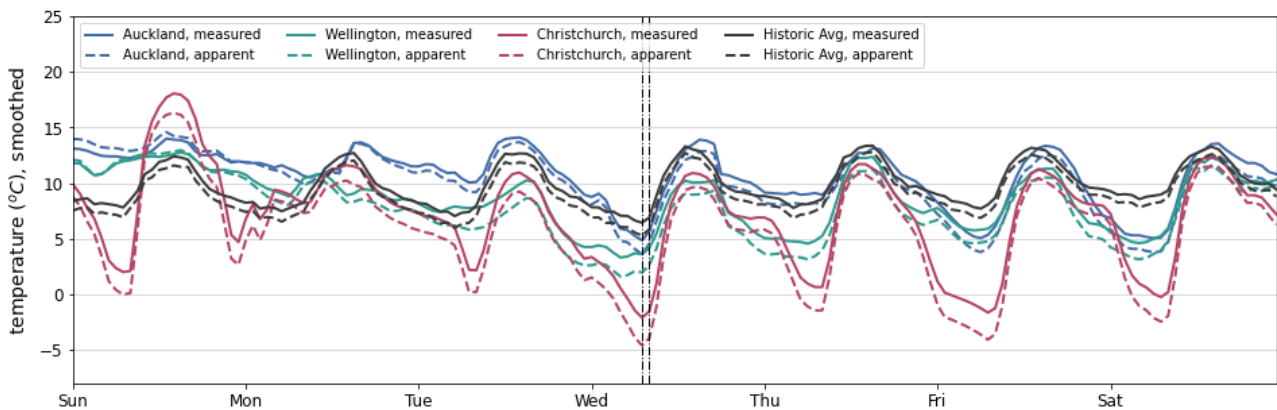
- 6.1. Figure 7 shows national grid demand between 20 – 26 August, compared to the previous week. Overall, demand was close to last week and peak demand was marginally higher than the previous week at 3.37GWh on Wednesday morning.
- 6.2. Demand on Saturday eased compared to last week. This was due to milder daytime temperatures on the South Island, which helped soften demand.

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



- 6.3. Figure 8 shows hourly temperatures at the three main population centres between 20 – 26 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.
- 6.4. Auckland and Wellington temperatures were mostly above average at the start of the week, but were close to or below the historic average from Tuesday. Auckland temperatures ranging between 5 degrees and 15 degrees, and Wellington temperatures were between 2 and 12 degrees. Christchurch temperatures fell mainly below average, with morning temperatures falling to or below 0 degrees from Wednesday.

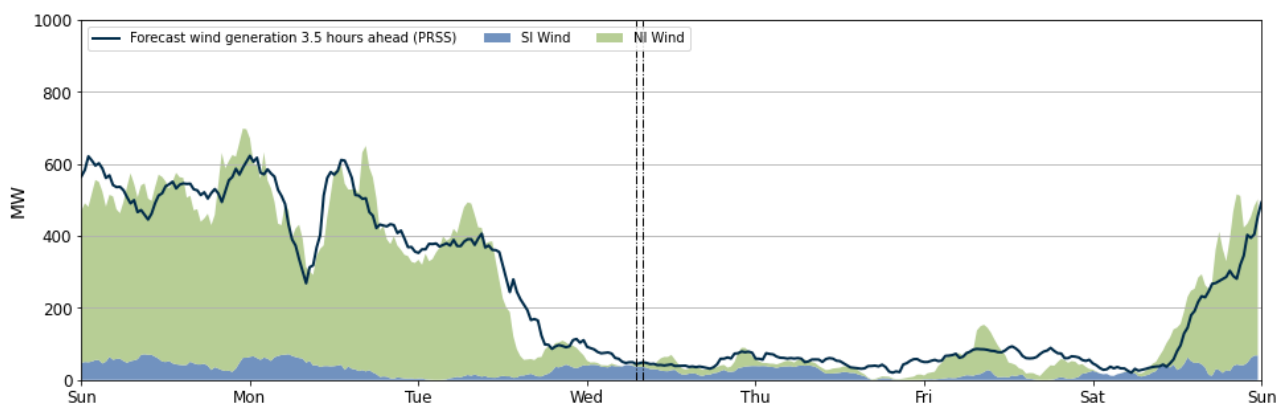
Figure 8: Temperatures across main centres.



7. Generation

- 7.1. Figure 9 shows wind generation, from 20 – 26 August, ranged from 2MW to 698M across the week. At the start of the week, wind started high mostly around 550 MW, with a dip of around 220 MW on Monday afternoon. Wind generation gradually decreased from Tuesday evening to less than 50 MW. From Wednesday to Friday wind was significantly low. On Saturday, wind gradually increased but remained below 500 MW.

Figure 9: Wind Generation and forecast.

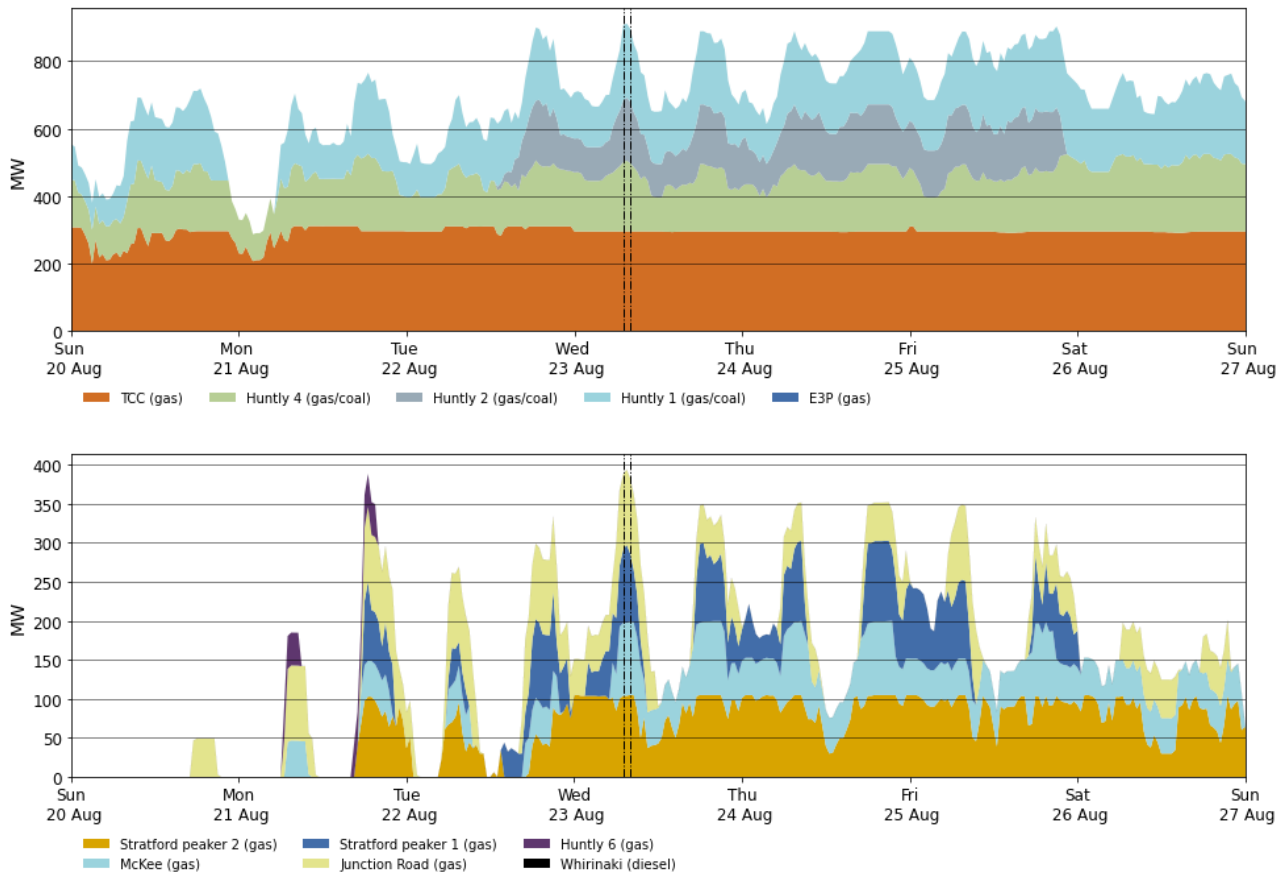


- 7.2. Figure 10 shows the generation of thermal baseload and thermal peaker plants between 20 – 26 August. E3P (Huntly 5) remains on outage, resulting in the remaining three Rankine units cycling on and off to support baseload requirements. TCC and Huntly 4 ran continuously as baseload throughout the week. Huntly 1 also ran continuously except on

Monday night. From Tuesday evening to Friday all three Rankine units were running due to low wind generation.

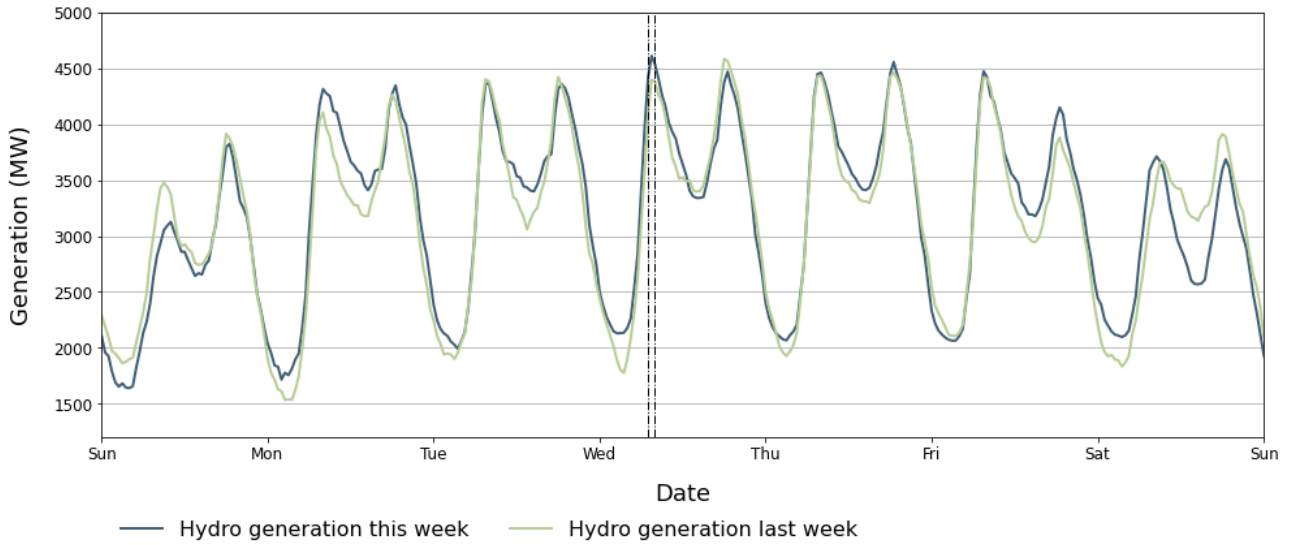
- 7.3. Due to relatively low wind generation, generation from thermal peakers was high, especially from Wednesday. Junction Road ran daily mostly during the peak demand periods. McKee ran during the peak periods, and continuously from Wednesday evening. Stratford 2 also ran continuously from Wednesday, while Stratford 1 ran during peaks and for some shoulder periods between Wednesday and Friday. Huntly 6 ran on Monday during morning and evening peaks.

Figure 10: Thermal Generation.



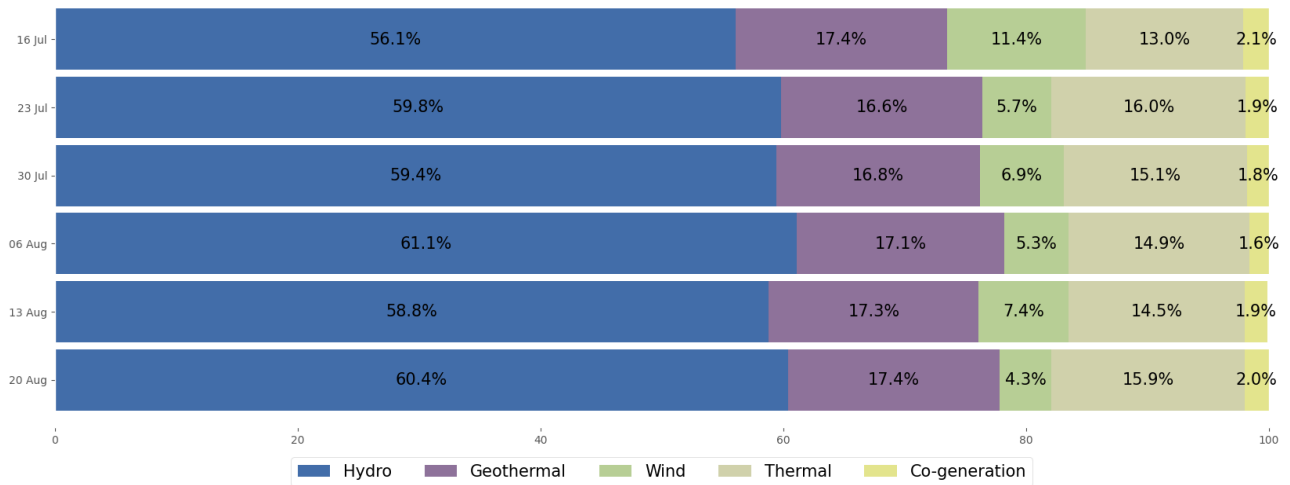
- 7.4. Figure 11 shows hydro generation between 20 – 26 August. Overall, there was a slight increase in hydro generation compared to the previous week. The hydro generation was higher on Monday due to high demand. The hydro generation was also higher during the Wednesday price spike. On Saturday, hydro generation decreased during off-peak period due to lower demand.

Figure 11: Hydro generation between 20 – 26 August compared to the previous week.



7.5. As a percentage of total generation, between 20 – 26 August, total weekly hydro generation was 60.4 percent, geothermal 17.4 percent, thermal 15.9 percent, wind 4.3 percent, and co-generation 2 percent. The decline in wind generation from last week was compensated by a mix of thermal and hydro generation.

Figure 12: Total generation as a percentage each week between 16 July and 26 August 2023.



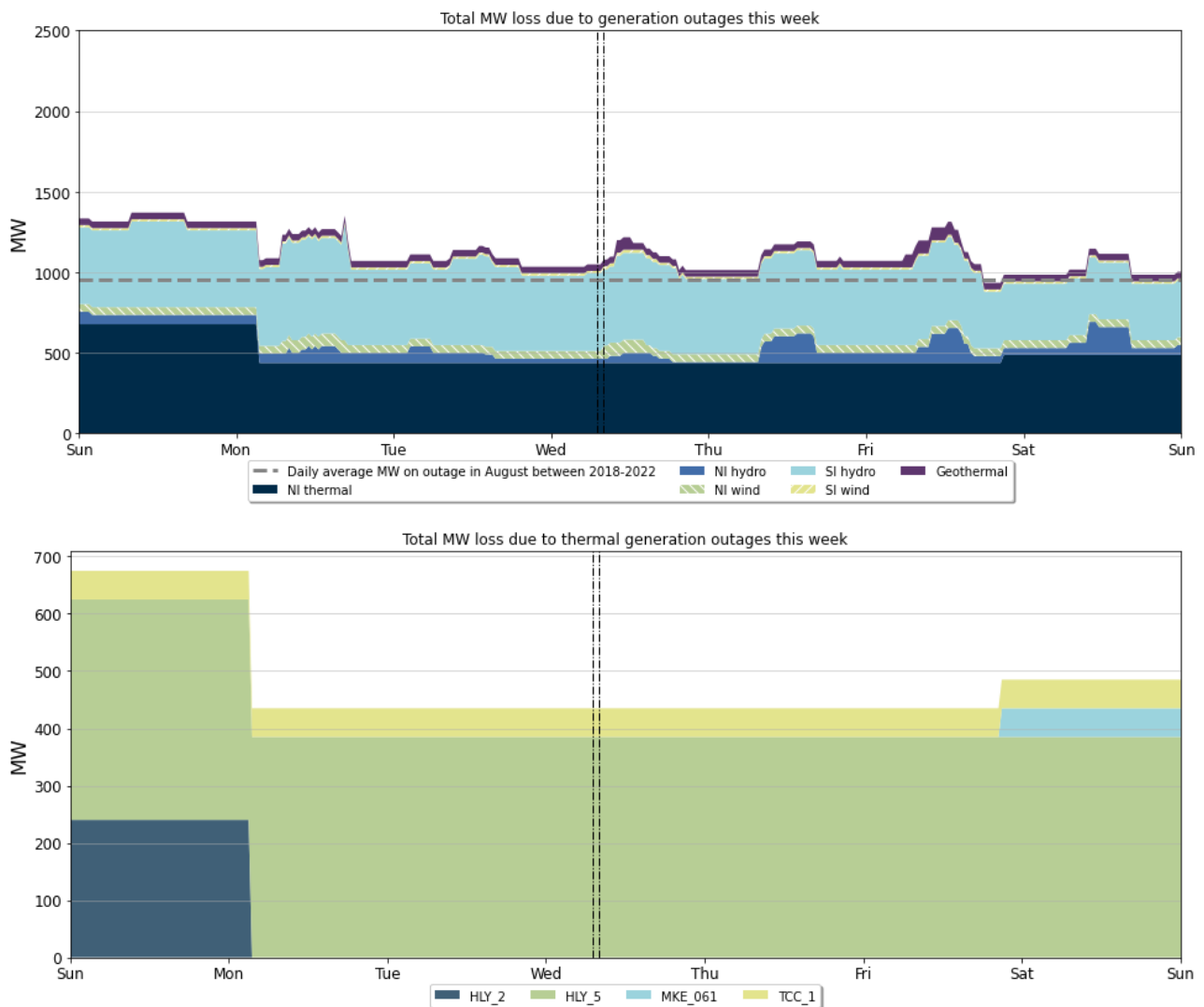
8. Outages

8.1. Figure 13 shows generation capacity on outage. Total capacity on outage between 20 – 26 August ranged between ~900 MW and 1300 MW.

8.2. Notable outages include:

- (a) Huntly 5 extended outage to 20 May 2024.
- (b) Huntly 2 was on outage from 18 – 21 August.
- (c) McKee was on partial outage from 25 – 29 August.
- (d) Various North and South Island hydro units remain on outage.
- (e) West Wind is partly on outage until 24 November.

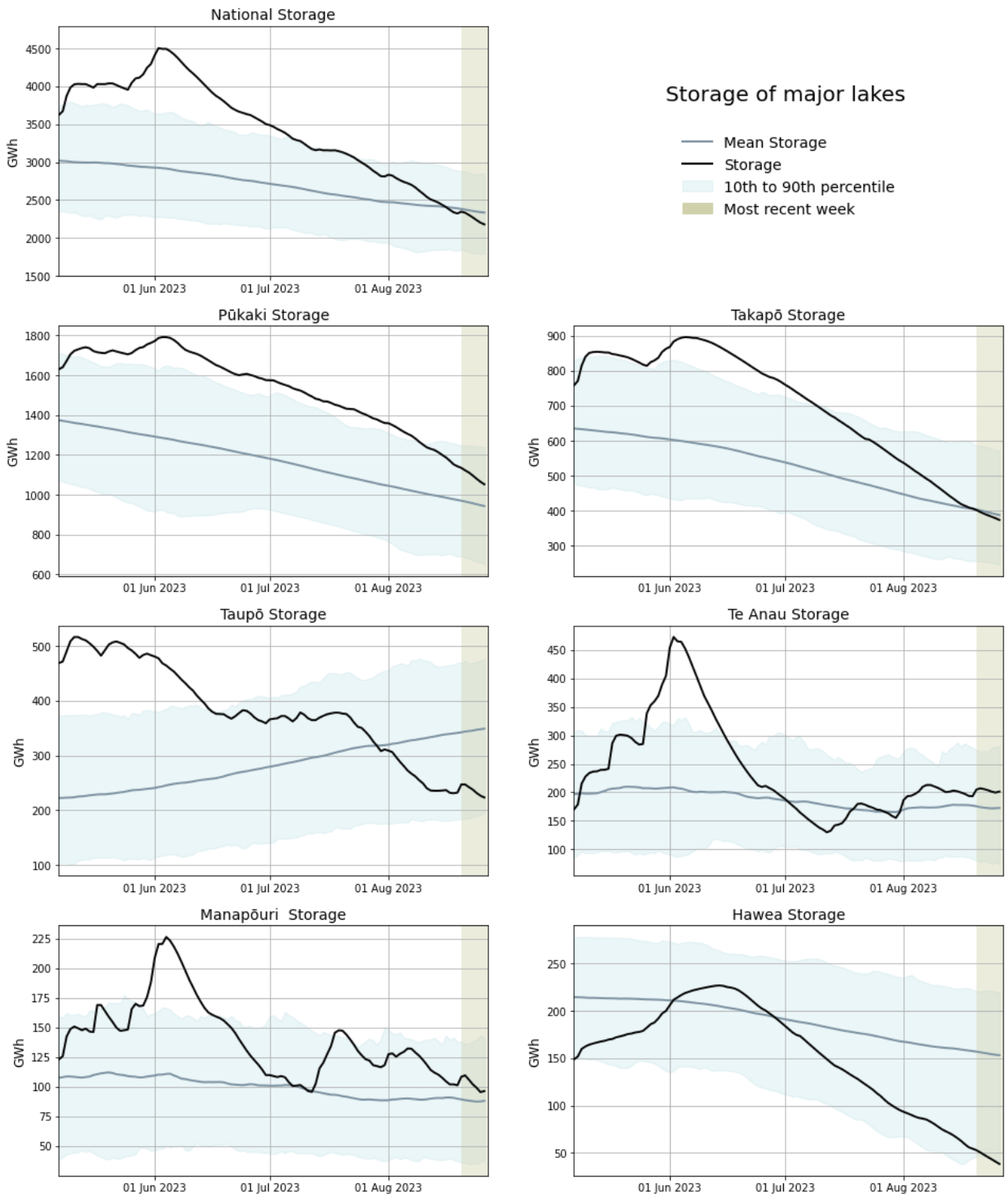
Figure 13: Total MW loss due to generation outages.



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 10th to 90th percentiles.
- 9.2. National hydro storage levels have decreased this week to 57 percent of nominal full as of 26 August. Furthermore, national controlled storage is 96 percent of the historic mean for this time of year.
- 9.3. During this week, all lake levels experienced a decline. Lake Pūkaki storage continues to drop below its historic 90th percentile but remains above its mean. Storage at Takapō has continued to decline and now slightly below its historic mean. After a steep decline over the last couple of weeks, Taupō storage remains well below its historic mean and close to its 10th percentile. Manapōuri storage decreased but remains above its historical mean and Te Anau storage only decreased slightly, with storage remaining steadily above its mean. Hawea storage continued to decline with its storage approaching its historic 10th percentile.

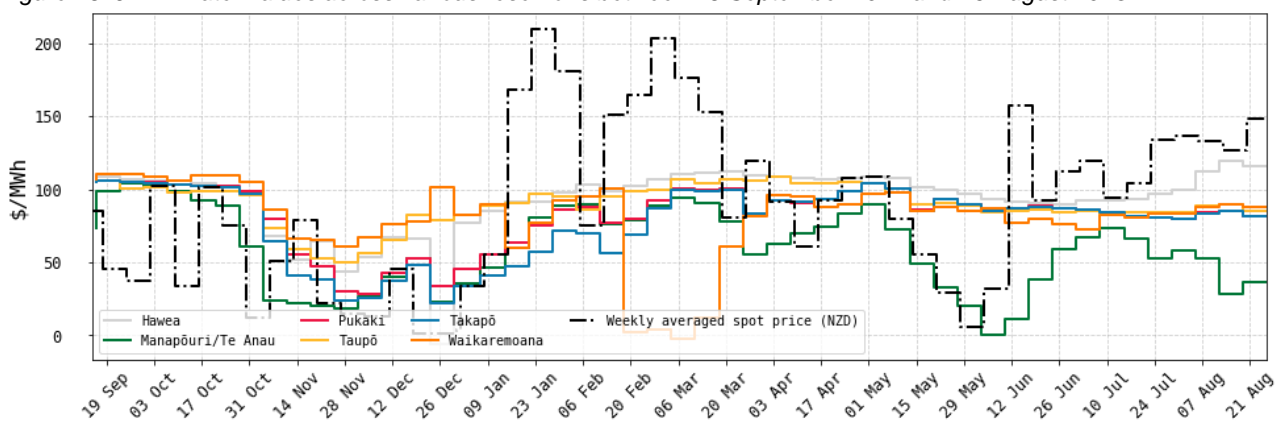
Figure 14: Hydro Storage.



10. JADE Water Values

- 10.1. The JADE¹ 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 26 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. Water values in most lakes remained relatively steady, except for Hawea and, Manapōuri and Te Anau. Water values at Te Anau and Manapōuri have been decreasing since July when storage increased, with a small increase in the water value over the last week. Water values at Hawea increased as the hydro storage decreased significantly since July.

Figure 15: JADE water values across various reservoirs between 15 September 2022 and 26 August 2023.



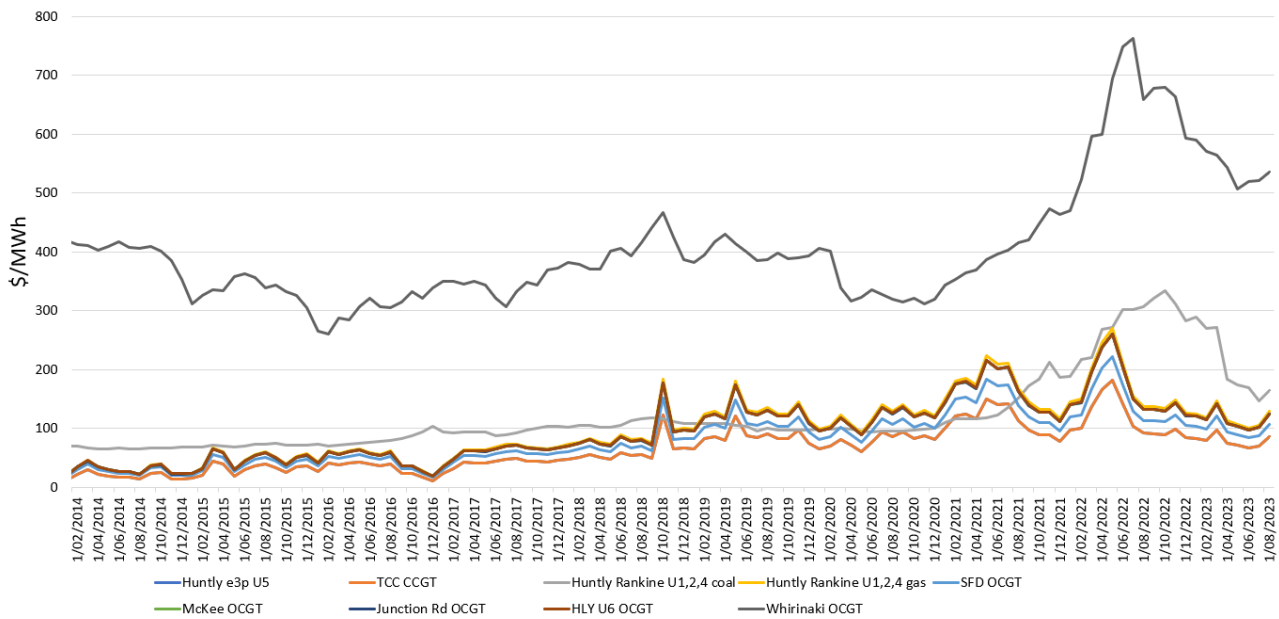
11. Prices versus estimated costs

- 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. Due to a dramatic drop in coal prices from April 2023, the latest SRMC of coal-fuelled Huntly generation is ~\$165/MWh.
- 11.5. The SRMC of Whirinaki has increased 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.

¹ 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.

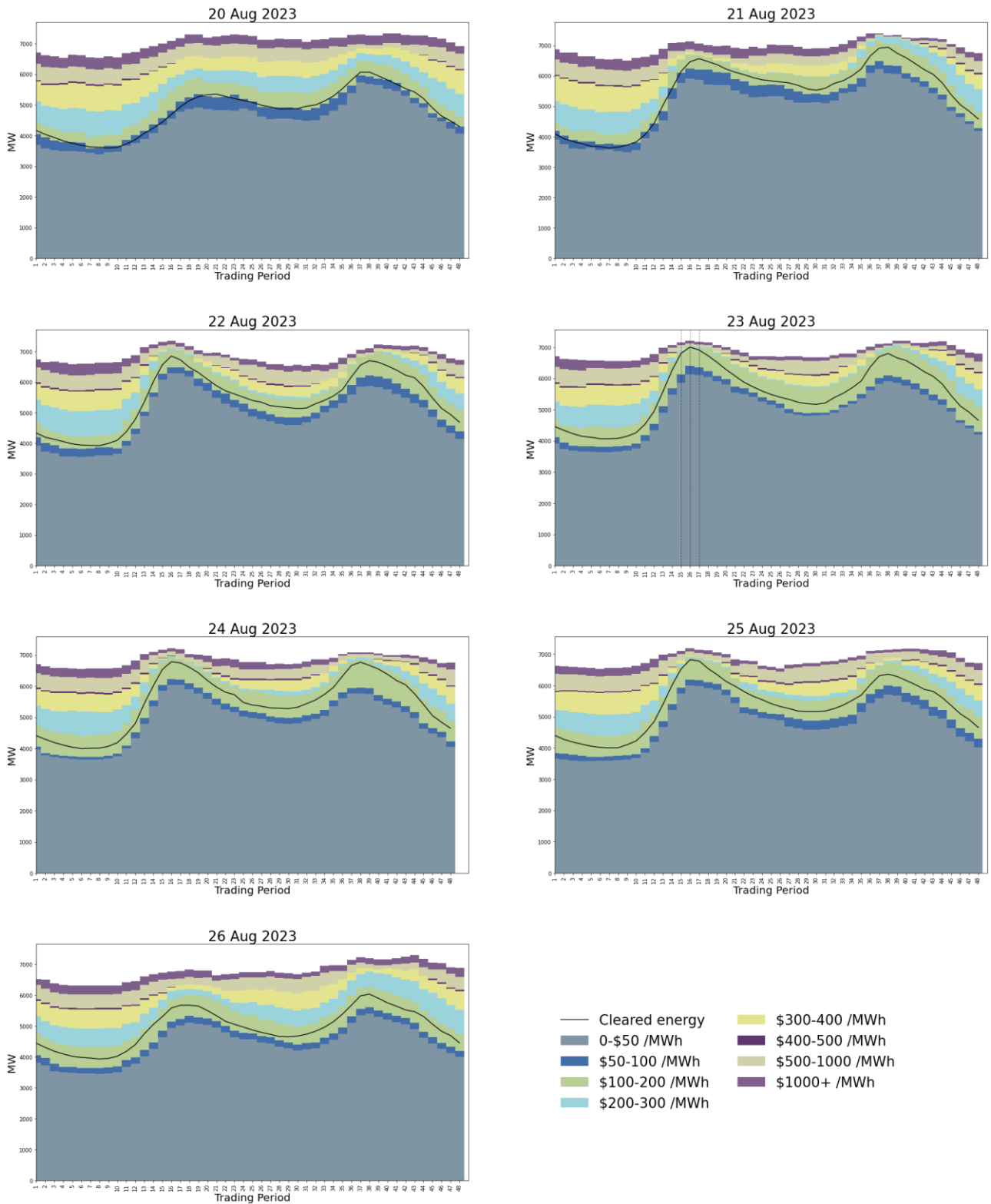
Figure 16: Estimated monthly SRMC for thermal fuels.



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. This week relatively low wind contributed to an increase in thermal generation offered between \$100-\$200/MWh and less offered above \$200/MWh. Hydro generation remained consistent compared to previous week.
- 12.3. On Sunday, due to lower demand, generation cleared in lower bands. During the Wednesday price spikes generation was clearing within the \$200 - \$300 price range, mainly due to high demand along with low wind generation. The offer stack was quite thin above \$200/MWh which can contribute to large price spikes.

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	Resolved	Contact	Multiple	No trading conduct issues identified. Read more
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.