

Date: 11 September 2023



TRADING CONDUCT REPORT

Market Monitoring Weekly Report

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1. Overview for week of 3 - 9 September 2023

1.1. This week saw no spot prices above the 90th percentile of historic prices. Prices were generally between \$100-\$200/MWh and mostly above the historic average price. Mild to warm temperatures this week saw demand, especially peak demand, significantly reduce, when compared to the previous week. This saw hydro generation ramp back. National hydro storage continues to fall and is now at 88% of the historic mean. All three Rankines ran to support baseload this week. Contact announced that its Stratford 2 peaker is likely to be offline until 2025. There are no new further analysis cases this week.

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.

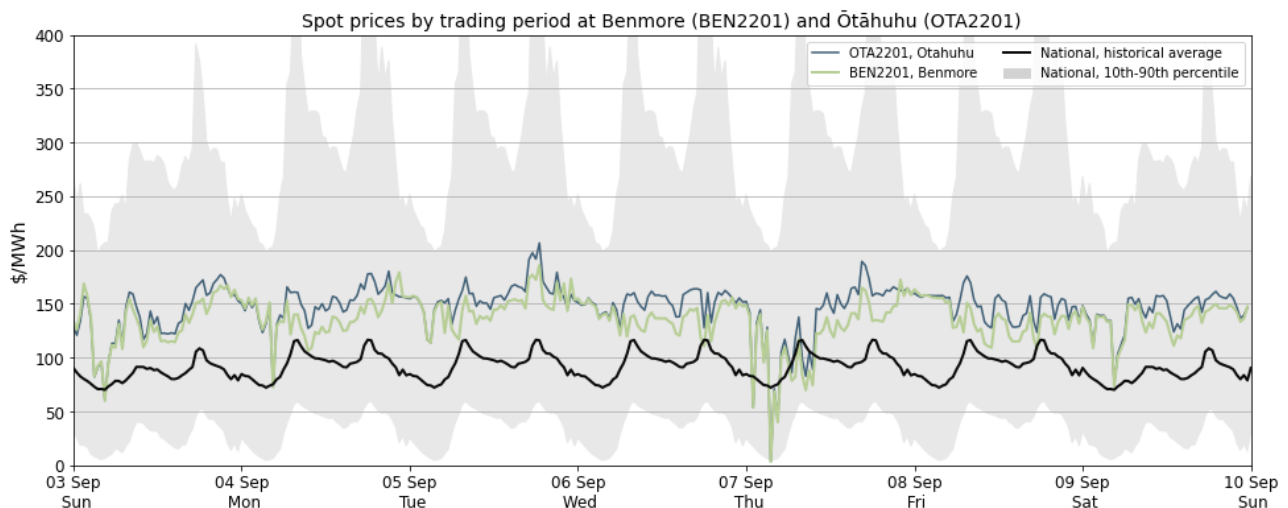
2.3. Between 3 – 9 September:

- a) The average wholesale spot price across all nodes was \$146/MWh.
- b) 95% of prices fell between \$80/MWh and \$178/MWh.

2.4. The majority of spot prices sat above the historic average for the week, with an average difference to the historical mean of \$50/MWh. However, spot prices have decreased by \$9/MWh when compared to the previous week.

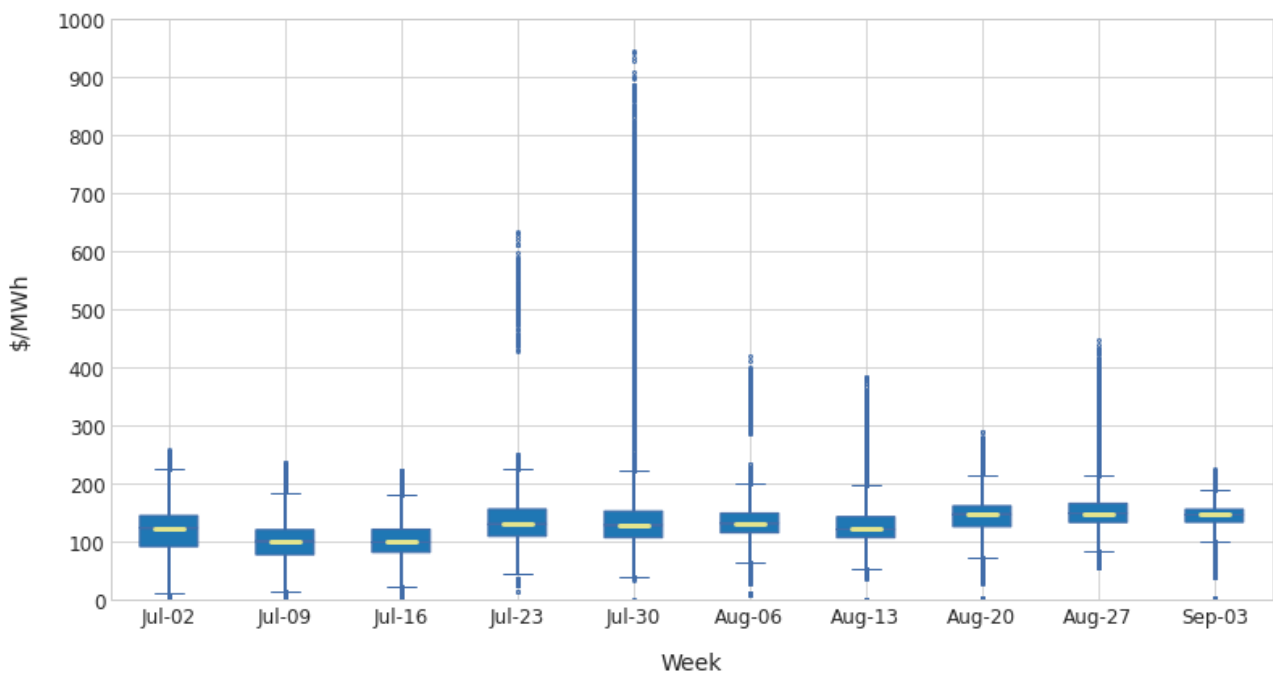
2.5. Spot prices dipped close to zero early on Thursday morning as high wind generation coincided with low demand. Off-peak prices were highest on Thursday afternoon during a time of low wind generation.

Figure 1: Wholesale Spot Prices between 3 September (Sunday) and 10 September (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% 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 spot prices remains small with the middle 50% of prices in the range of \$133/MWh to \$156/MWh. There were no outliers this week above \$250, unlike previous weeks, and a continued small IQR. Overall, the distribution is showing a slight decrease in prices compared to recent weeks, which has likely resulted from a decrease in demand, especially peak demand.

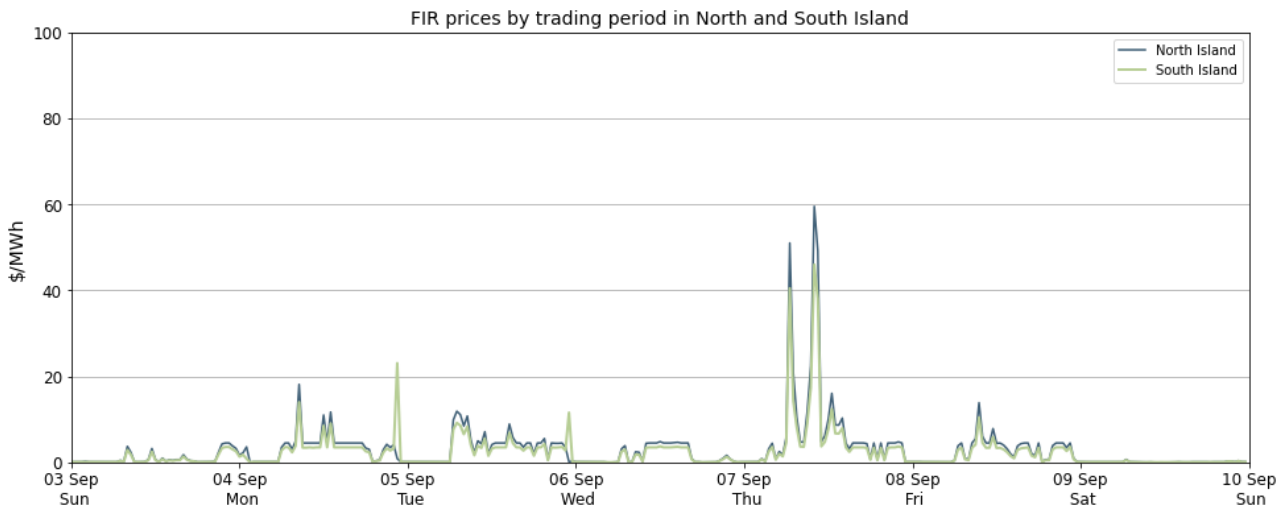
Figure 2: Boxplots showing the distribution of spot prices this week and the previous nine weeks



3. Reserve Prices

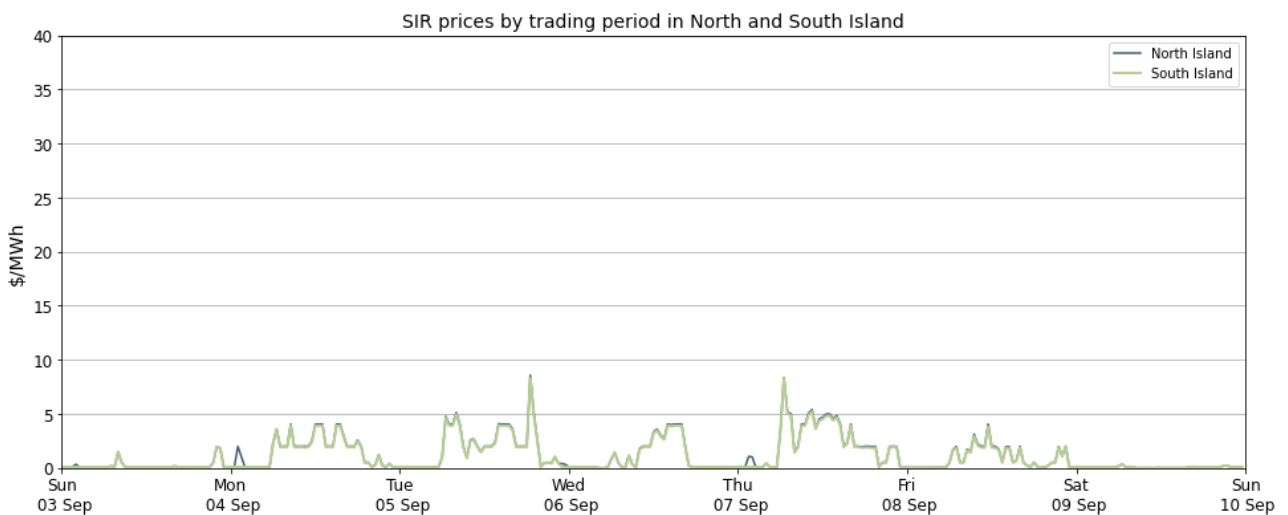
- 3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week FIR prices were mostly below \$10/MWh for both islands. There were two spikes in FIR prices in both islands at 6:30 am and 10:00 am on 7 September, where the North Island price reached \$59/MWh and the South Island price reached \$45/MWh. The first spike coincided with a large increase in northward HVDC transfer from 381MW at 6:30am to 554MW at 7:30am, which would have increased reserve requirements in both islands. The second spike was related to Huntly 2 increasing its total quantity of energy offers to full capacity in this trading period, and not offering any reserves, hence requiring more expensive reserves to be cleared. Note this also occurred in trading period 14 (6:30am).

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 all below \$10/MWh this week.

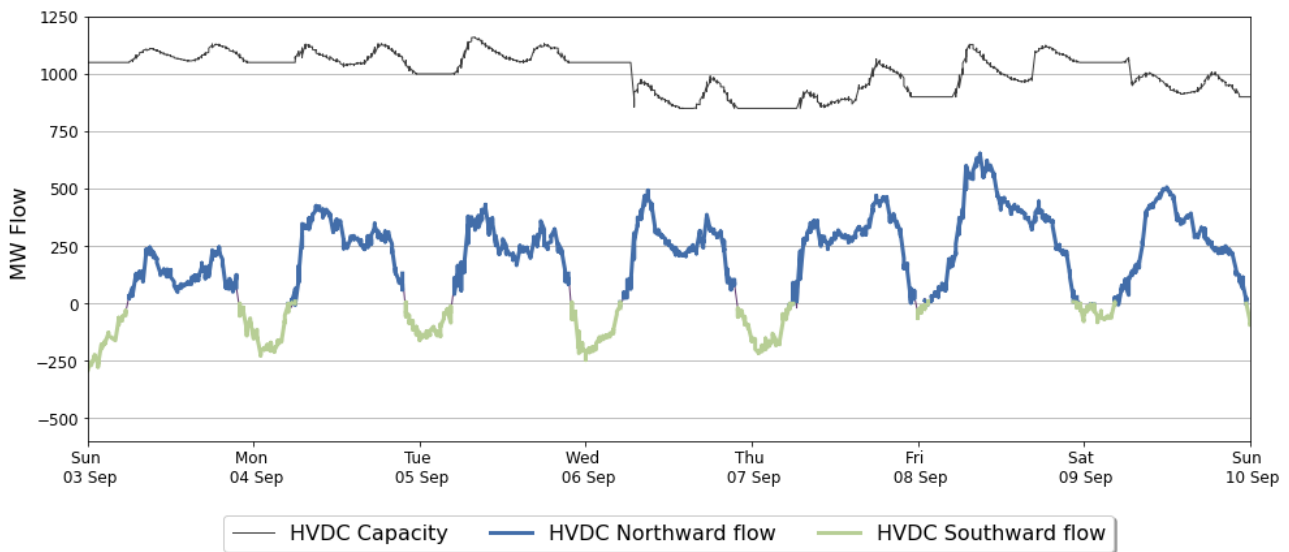
Figure 4: Sustained instantaneous reserve (SIR) prices by trading period and Island



4. HVDC

4.1. Figure 5 shows HVDC flows between 3-9 September. HVDC flows were mainly northwards with some overnight southward flow. Northward flow was mainly below 500MW except for on Friday morning where it reached around 650MW during the 9.00am trading period. Southward overnight flow was reaching ~250MW between Sunday and Thursday but decreased from Friday onwards.

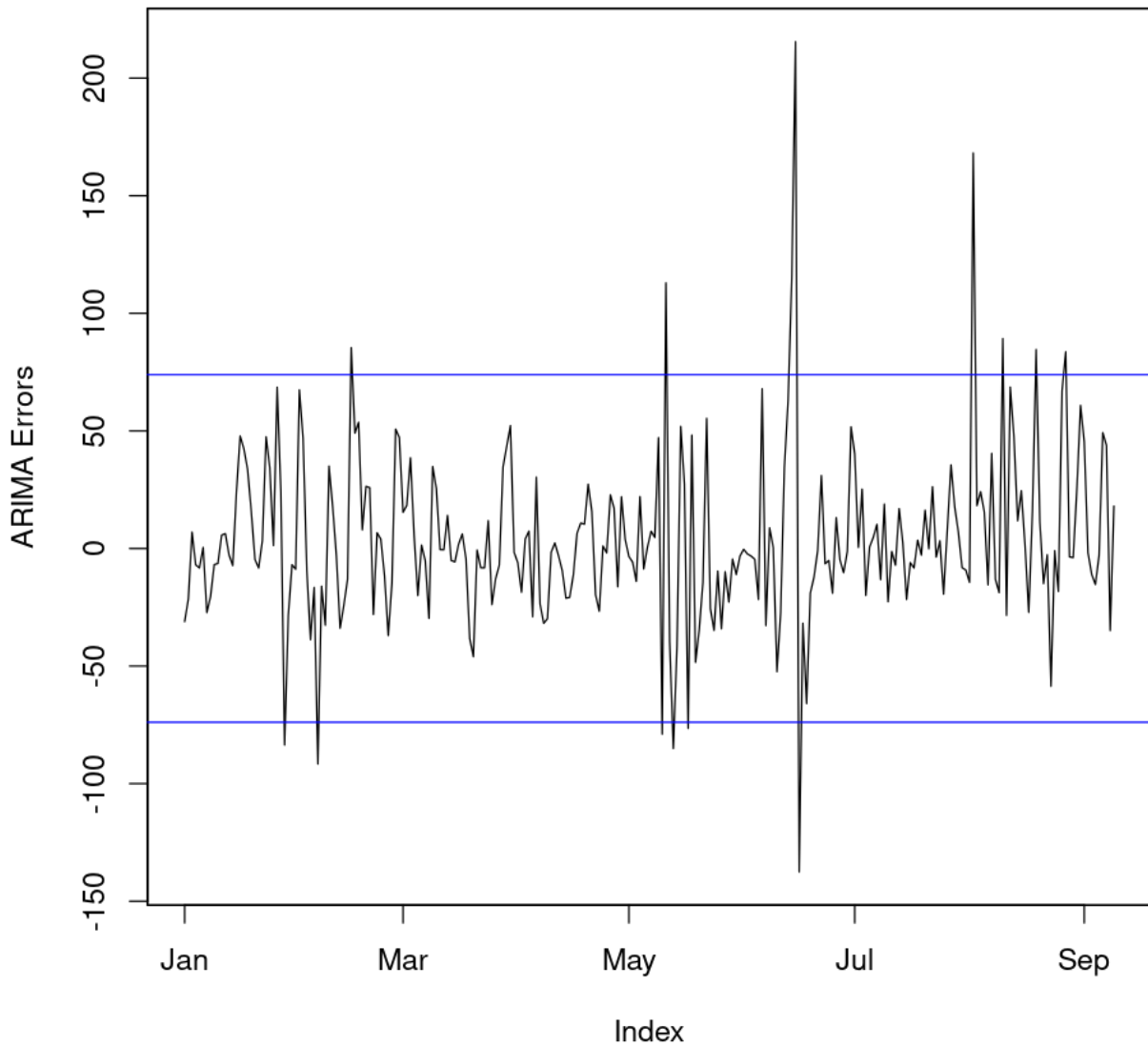
Figure 5: HVDC northward flow and capacity



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 were no residuals above two standard deviations, which suggests prices this week were largely consistent with market conditions.

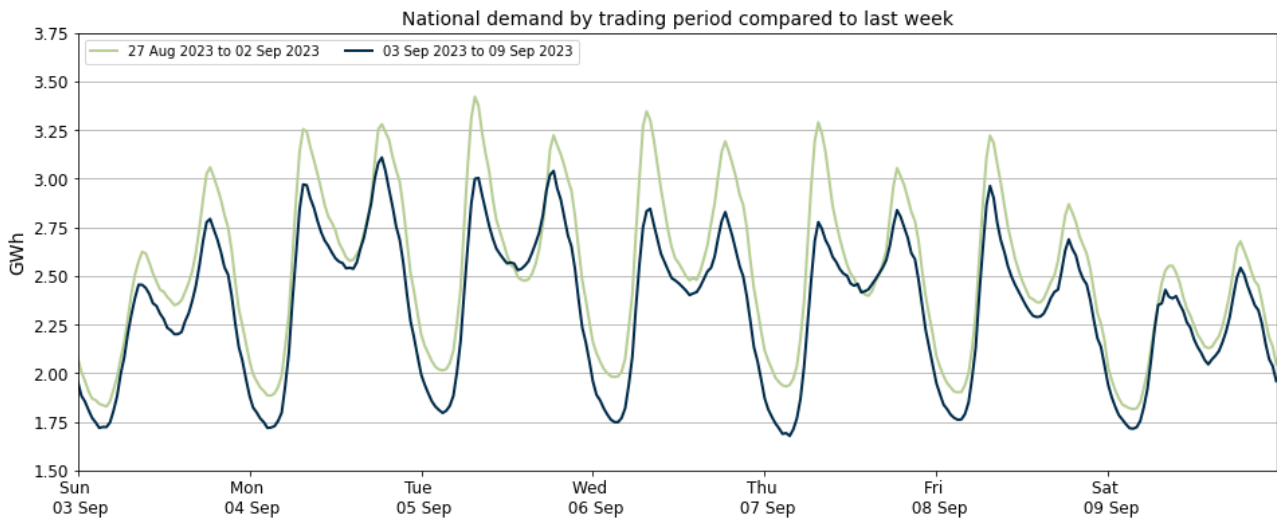
Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 - 9 September 2023. The blue lines show 2 standard deviations of the ARMA errors.



6. Demand

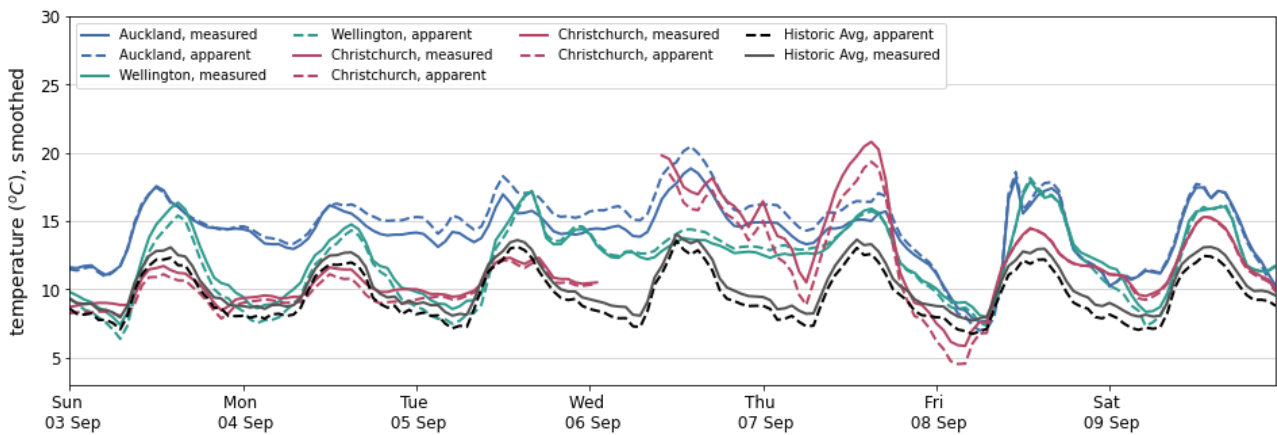
- 6.1. Figure 7 shows national demand between 3-9 September, and demand from the previous week. Overall, demand decreased when compared to the previous week, with large differences during the peaks. This week, morning and evening peak demand were relatively more similar in magnitude, except on Sunday and Friday.

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 3 - 9 September. 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 higher than average all week. In general, Auckland temperatures were all above average. Wellington saw temperatures mostly at or above average. Christchurch saw a big range in temperatures across the week, from around 6 degrees to 21 degrees. Note there is missing data for Christchurch on Wednesday.

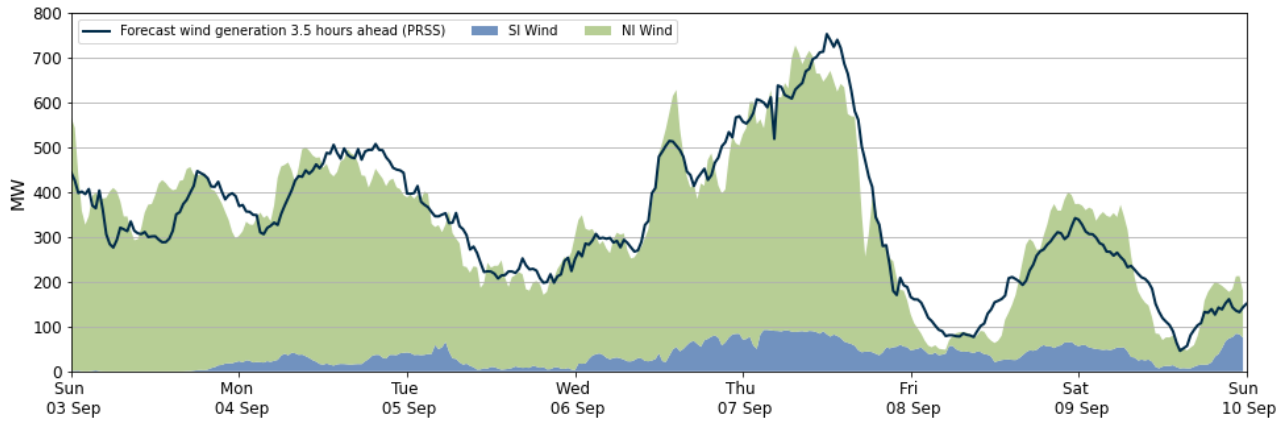
Figure 8: Temperatures across main centres



7. Generation

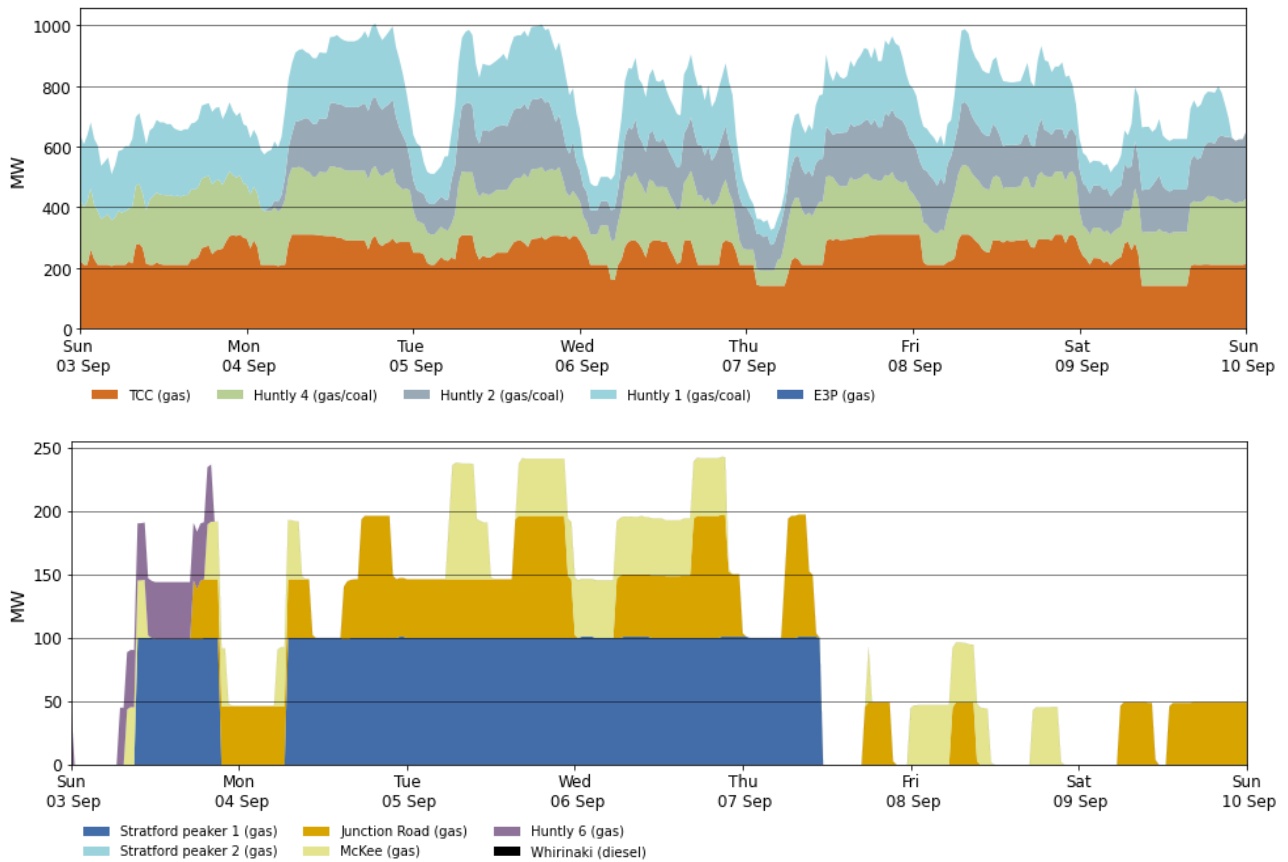
- 7.1. Figure 9 shows wind generation, from 3 - 9 September. Wind generation varied across the week ranging between 46MW and 727MW. Wind generation sat mostly between 200-400 MW between Sunday and Tuesday, rising to a peak of 727MW on Thursday. Wind generation quickly then fell to a low of 46MW on Friday morning, and remained low until the afternoon where it picked up again and reached 400MW on Saturday morning.

Figure 9: Wind generation and forecast between



- 7.2. Figure 10 shows the generation of thermal baseload and thermal peaker plants between 3-10 September. TCC continues to run as continuous baseload with all three Huntly Rankines in support from Monday onwards. Huntly 1 turned off late Saturday.
- 7.3. Multiple peaker units ran for continuous periods this week, with less running towards the end of the week. Huntly 6 ran on Sunday only. Stratford 1 ran on Sunday, and then from Monday – Thursday, before going on outage. McKee and Junction Road ran for longer stints between Sunday and Thursday, and shorter ones from Thursday evening onwards.

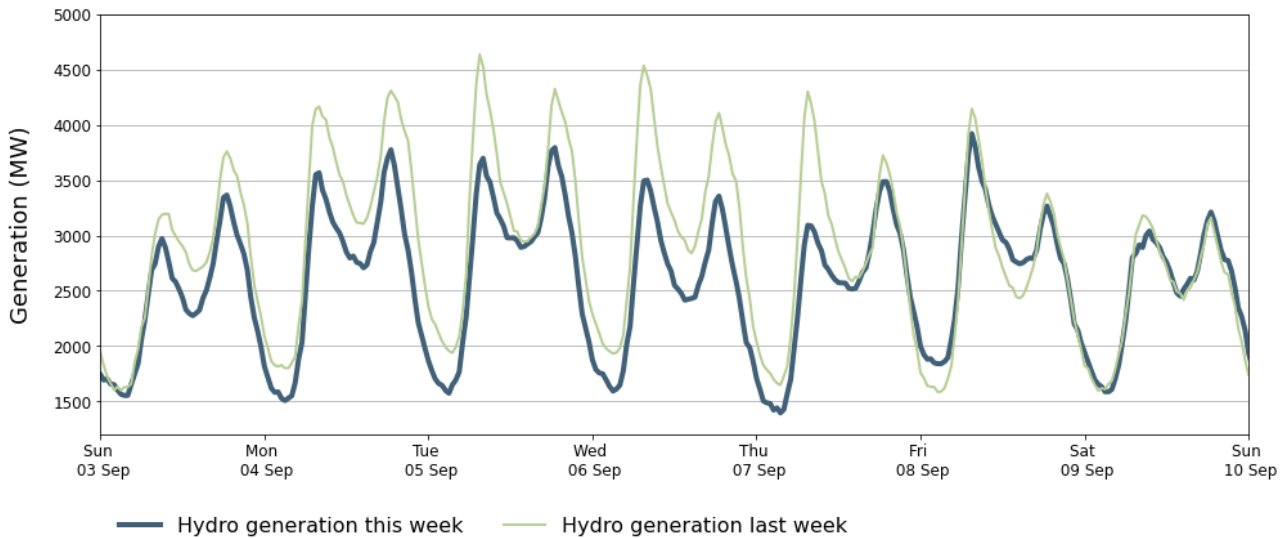
Figure 10: Thermal generation



- 7.4. Figure 11 shows hydro generation between 3 - 9 September. Generation from hydro has been decreasing coinciding with the decline in storage. This week saw reduced overall generation to the previous week, with a noticeable decrease during the peak periods. This overall drop in hydro generation reflects the decrease in demand this week and the

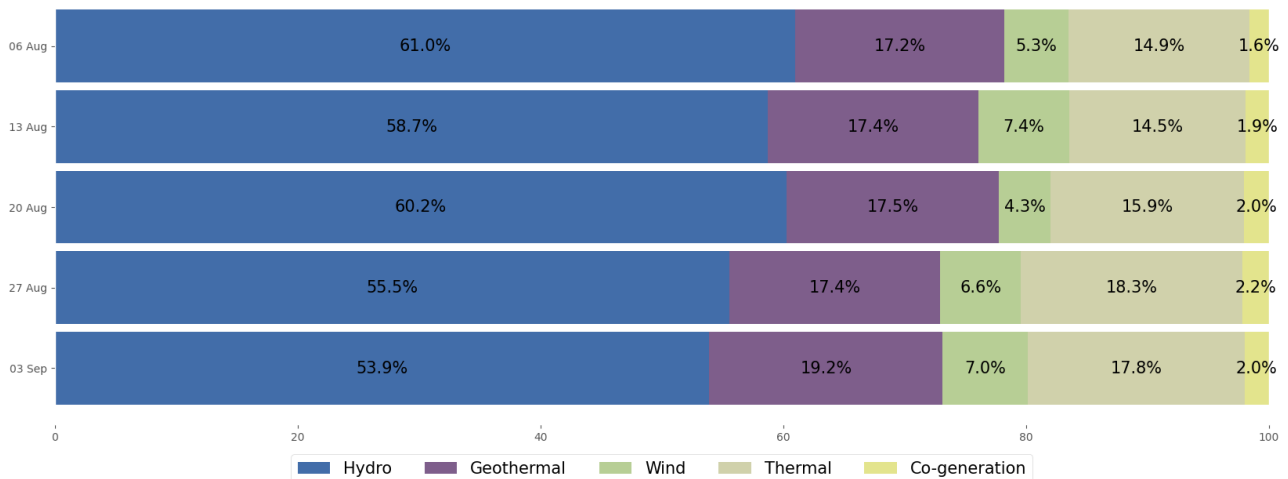
increasing need to reduce outflow from storage lakes as many continue to decline. Some regions are also anticipating a dry start to spring (see latest NIWA Outlook¹).

Figure 11: Hydro generation between 3-9 September compared to the previous week



- 7.5. As a percentage of total generation, between 3 - 9 September, total weekly hydro generation was 53.9%, geothermal 19.2%, wind 7.0%, thermal 17.8%, and co-generation 2.0%.
- 7.6. Total demand this week was lower than last week with all forms of generation except geothermal delivering less GWh. Given the lower total GWh, the share of geothermal increased above normal values.

Figure 12: Total generation as a percentage each week between 6 August and 9 September 2023.



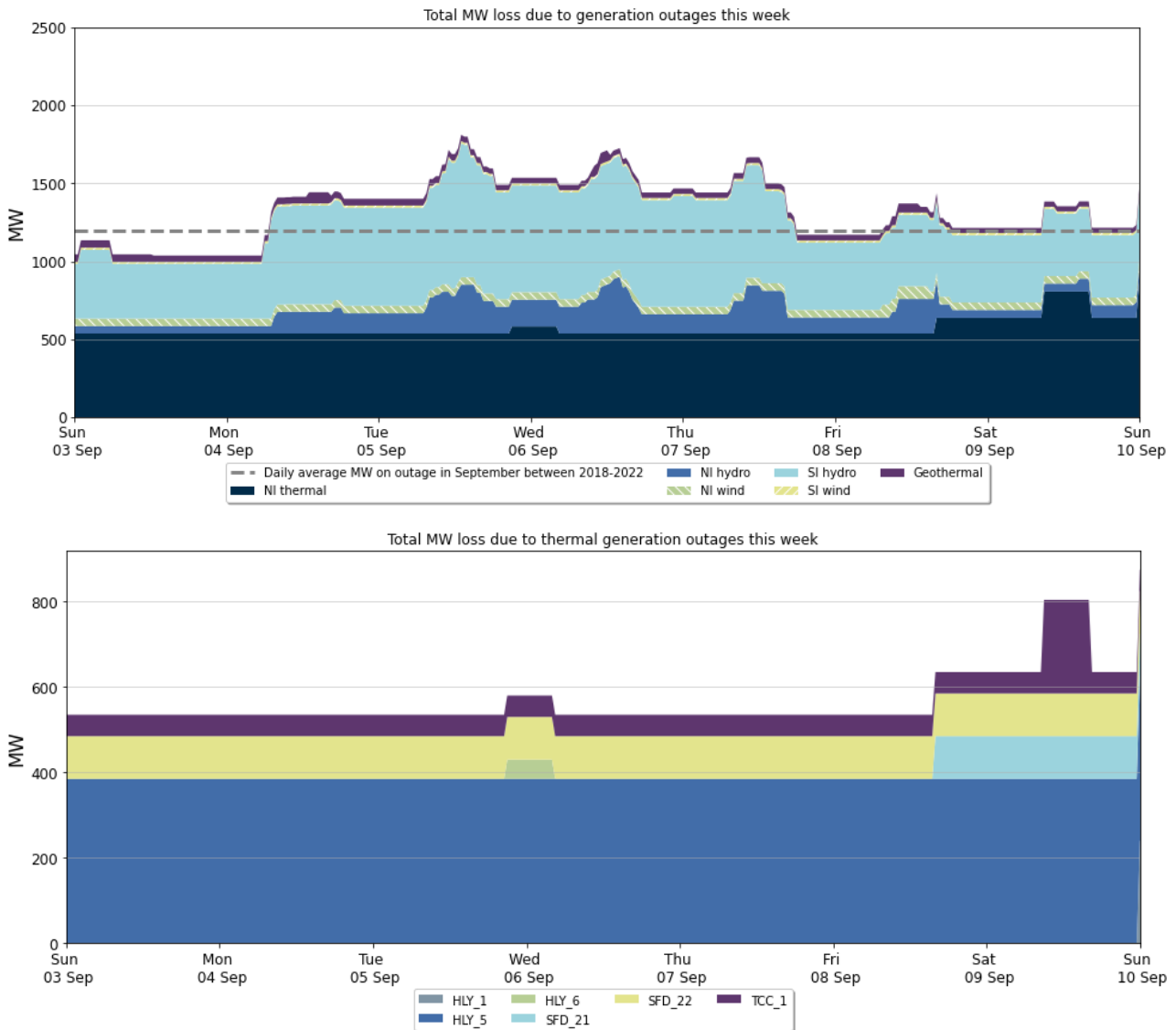
8. Outages

- 8.1. Figure 13 shows generation capacity on outage. Total capacity on outage between 3 - 9 September ranged from ~1000MW to 1800MW.
- 8.2. Notable outages include:
 - a) Huntly 5 remains on outage until 20 May 2024.

¹ Seasonal climate outlook September-November 2023 | NIWA

- b) Stratford 1 is on outage between 8 September and 1 October 2023.
- c) Stratford 2 is on outage until 28 February 2025.
- d) Manapōuri units 1 and 6 are on outage until 22 March 2024.
- e) Takapō B is on outage between 4 -15 September.
- f) West Wind Station is on outage until 24 November (44MW).
- g) Various smaller North and South Island Hydro remain on outage.

Figure 13: Total MW loss due to generation outages.

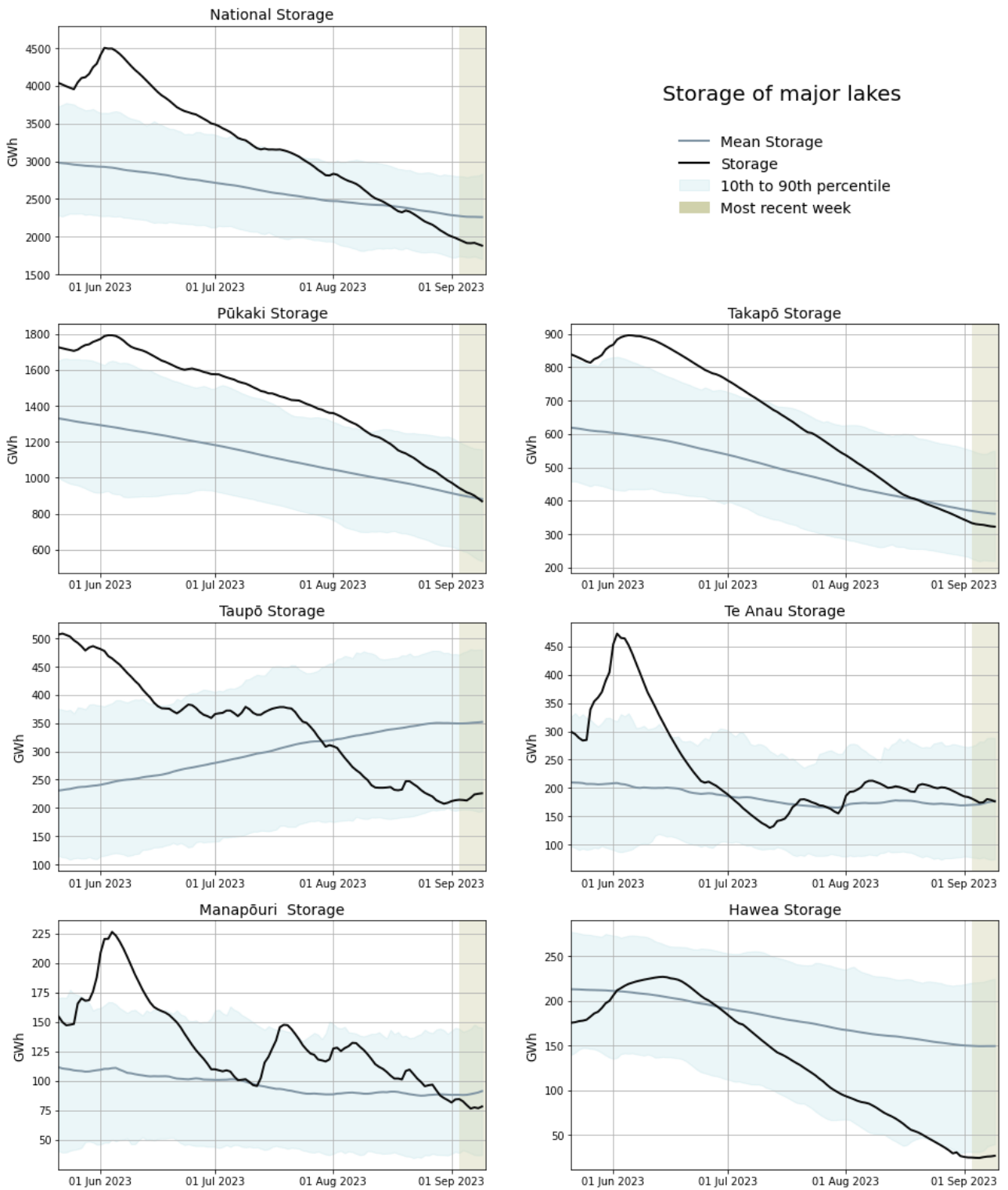


9. Storage/Fuel Supply

- 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 continue to decline with controlled storage now 51.4% of nominally full and around 87.6% of the historic mean.
 - Pūkaki continues to steadily decline, and is now below its mean.

- Takapō is currently below its historic mean, but is showing less of a steep decline compared to previous weeks.
- Taupō storage is currently close to its historic 10th percentile, but had a slight increase this week.
- Hawea storage has continued to decrease and is now below the historic 10th percentile.
- Manapōuri storage decreased and storage is below the historic mean. Te Anau storage has been generally steady with only a small decrease this week and remains roughly at its historic mean.

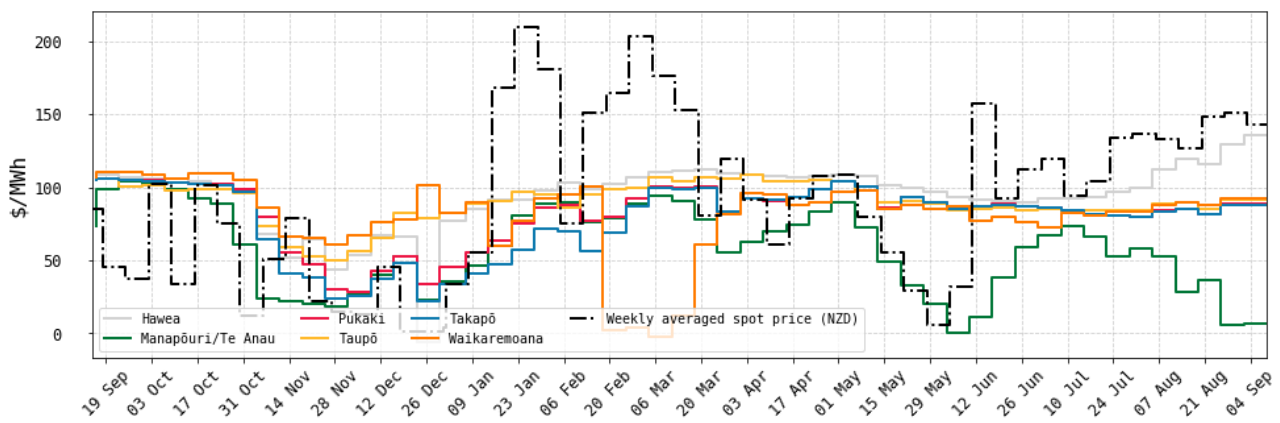
Figure 14: Hydro storage



10. JADE Water Values

- 10.1. The JADE² 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 9 September 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 for most lakes stayed about the same this week, with only Hawea and, Manapōuri and Te Anau slightly increasing. Hawea water values increased around \$6/MWh compared to the previous week as its lake levels continue to remain below its historic 10th percentile.

Figure 15: JADE water values across various reservoirs between 15 September 2022 and 9 September 2023



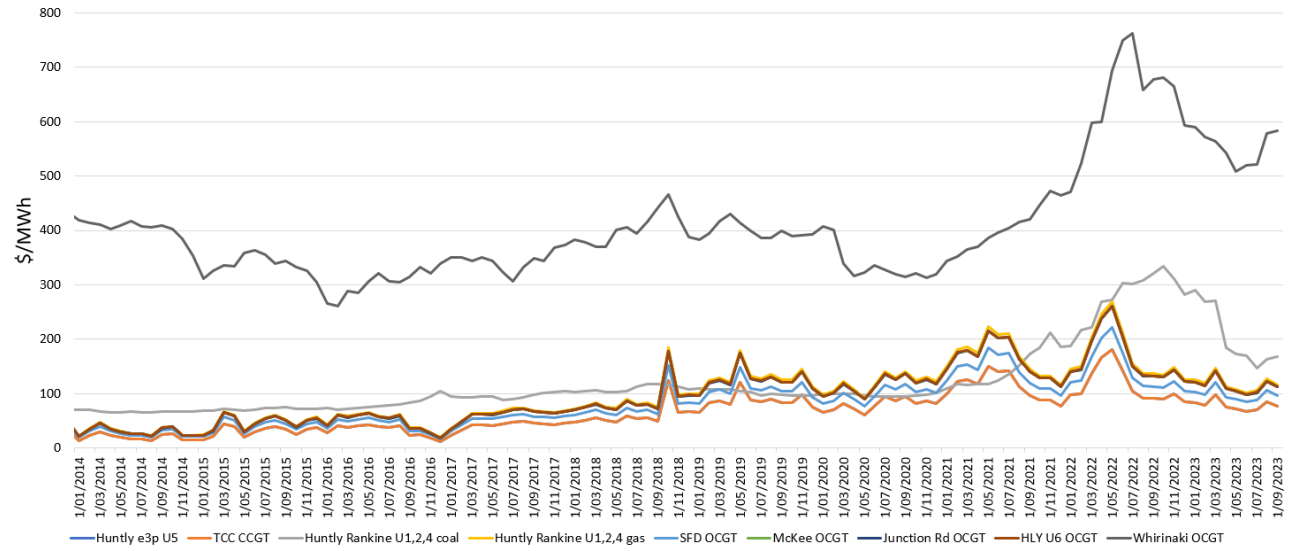
11. Prices versus estimated costs

- 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 September 2023. The SRMC of diesel plants has been increasing since May, and the SRMC of coal-fuelled plants has started to increase again, while gas-fuelled plants SRMCs decreased 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. With two or three Rankines often running simultaneously this winter Genesis has been using more coal recently.
- 11.5. The SRMC of Whirinaki has increased to ~\$583/MWh.

² 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.

- 11.6. The SRMC of gas fuelled thermal plants is currently between \$78/MWh and \$116/MWh.
- 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.

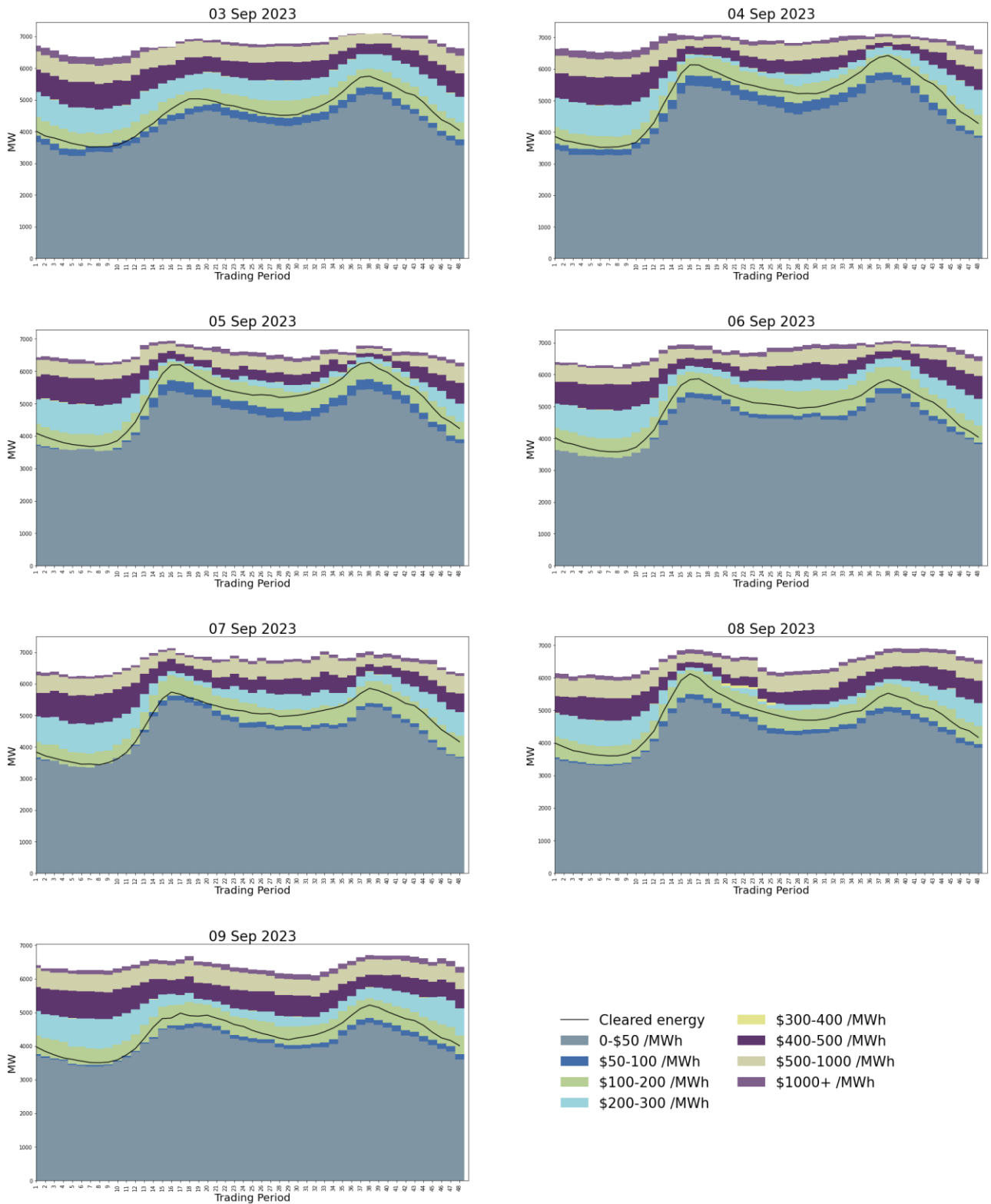
Figure 16: Estimated monthly SRMC for thermal fuels



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. Throughout the week most generation cleared in the \$100-\$200/MWh price range.

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.
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.