

11 December 2023



Trading conduct report

Market monitoring weekly report

Trading conduct report

1. Overview for week of 3-9 December

- 1.1. Spot prices this week were mostly between \$144-\$170/MWh with a few price spikes which occurred when wind generation was low or over forecast and high priced hydro was dispatched. Two Huntly Rankines continued to run as baseload with Stratford 1 also running continuously. Hydro storage is now at ~90% of historic mean as of 9 December.

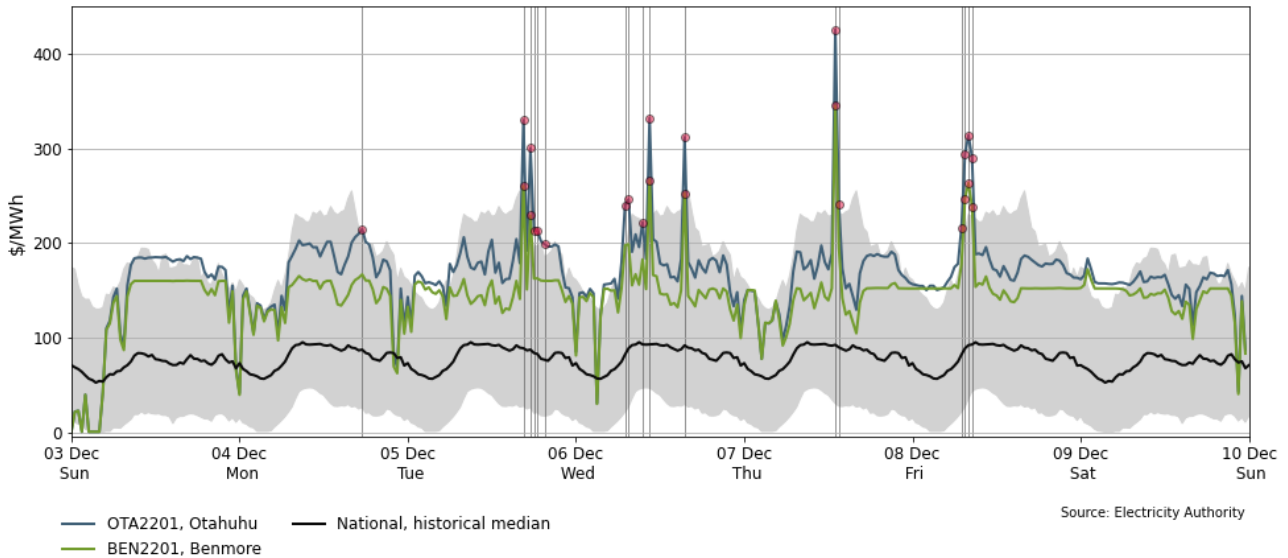
2. Spot prices

- 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 are outliers compared to historic prices for the same time of year.
- 2.2. Figure 1 shows the wholesale spot prices at Benmore and Ōtāhuhu alongside the national historic median and historic 10th-90th percentiles adjusted for inflation. Prices greater than quartile 3 (75th percentile) plus 1.5 times the inter-quartile range¹ of historic prices, are highlighted with a vertical black line. Other notable prices are marked with black dashed lines.
- 2.3. Between 3-9 December:
 - (a) The average wholesale spot price across all nodes was \$153/MWh.
 - (b) 95 percent of prices fell between \$22/MWh and \$234/MWh.
- 2.4. Overall, the majority of spot prices are still sitting below \$200/MWh and above historic average for this time of year. However, there were also a number of price spikes across the week that saw prices above \$300/MWh. Most of these spikes were due to higher priced hydro being dispatched to cover wind or demand forecast discrepancies.
- 2.5. The first price that went above \$300/MWh was on Tuesday afternoon at 4.30pm and then again at 5.30pm. The prices at Ōtāhuhu were \$330/MWh and \$300/MWh and at Benmore were \$260/MWh and \$229/MWh. Wind was around 65MW less than forecast and there was also some under forecast demand during these trading periods.
- 2.6. On Wednesday and Thursday, the price spikes occurred during the shoulder period. The Wednesday shoulder period saw some low wind generation with hydro ramping up, particularly during the 3.30pm spike. Although on Thursday wind generation was higher, it was around 80MW lower than was forecast as well as demand being higher than forecast. Some 5-min prices reached over \$400/MWh on both these days as high priced hydro tranches were dispatched.

¹ We are identifying any significantly high prices by using the historic distribution of prices depending on whether it is a weekday or weekend day, and looking for prices that lie 1.5 times the interquartile range above the 75th percentile of the distribution. This is using the outlier calculation $Q_3 + 1.5 \times IQR$, where Q_3 is the 75th percentile (or third quartile value) and IQR is your inter-quartile range.

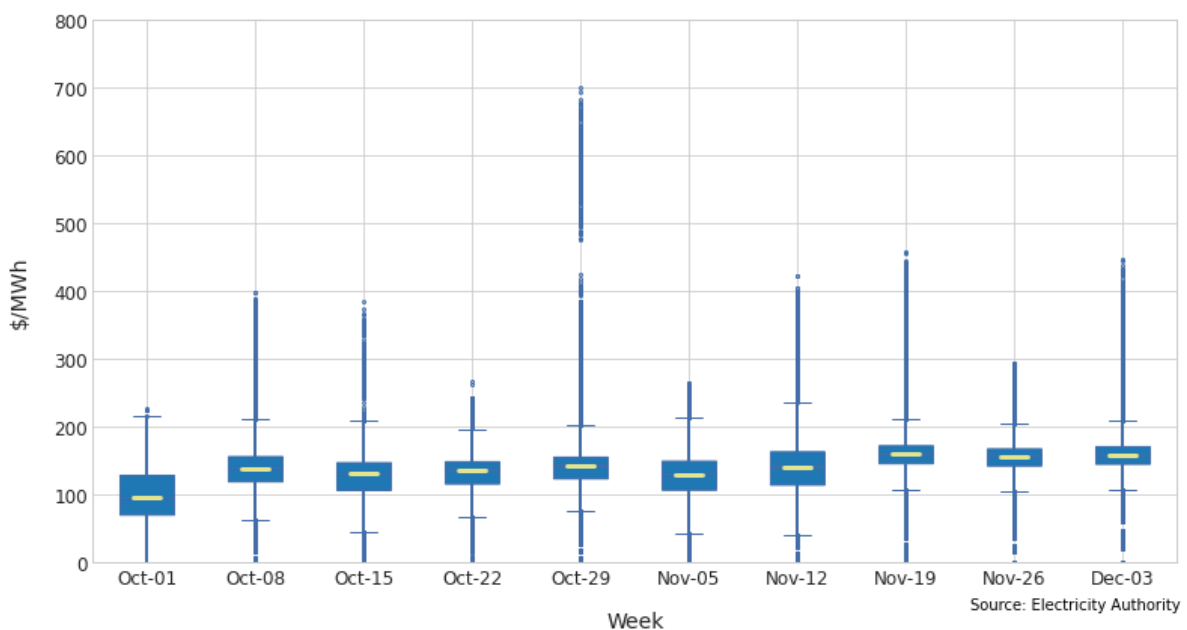
2.7. Friday morning peak saw prices between 7.30am and 8.30am of \$290-\$314/MWh at Ōtāhuhu and \$238-\$264/MWh at Benmore. Hydro generation was ramped up during this peak, with both low and over forecast wind that morning.

Figure 1: Wholesale spot price at Benmore and Ōtāhuhu between 3-9 December



- 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. Distribution of prices was similar to the previous week with the middle 50% of prices lying between \$144/MWh and \$170/MWh and median price \$157/MWh. However, this week saw more outlier prices above \$300/MWh and some over \$400/MWh.

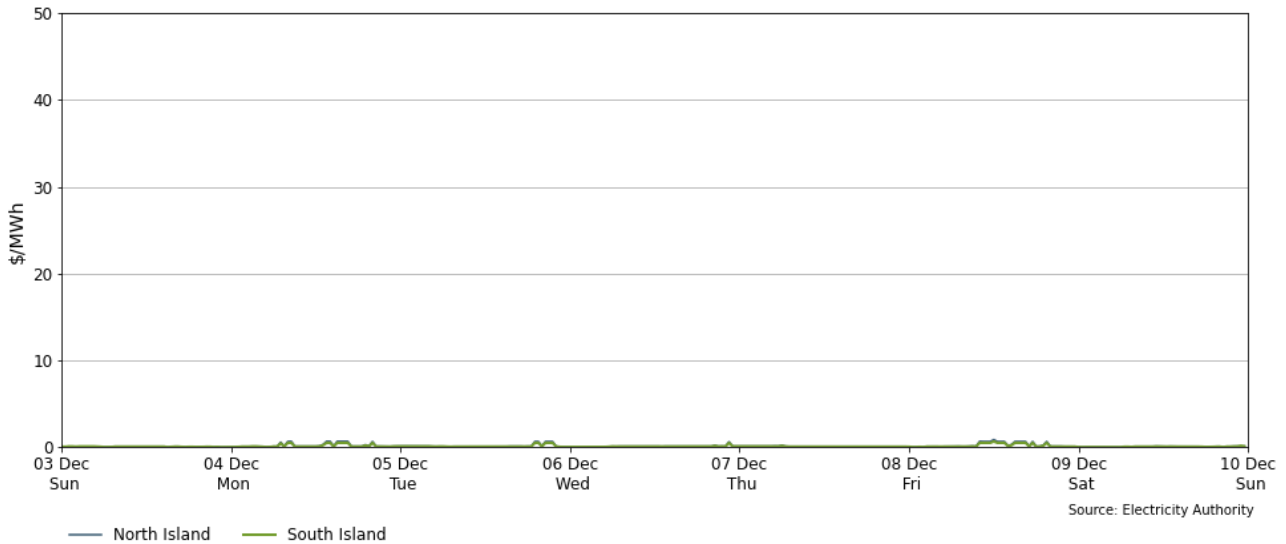
Figure 2: Boxplots showing the distribution of the spot prices this week and the previous nine weeks



3. Reserve prices

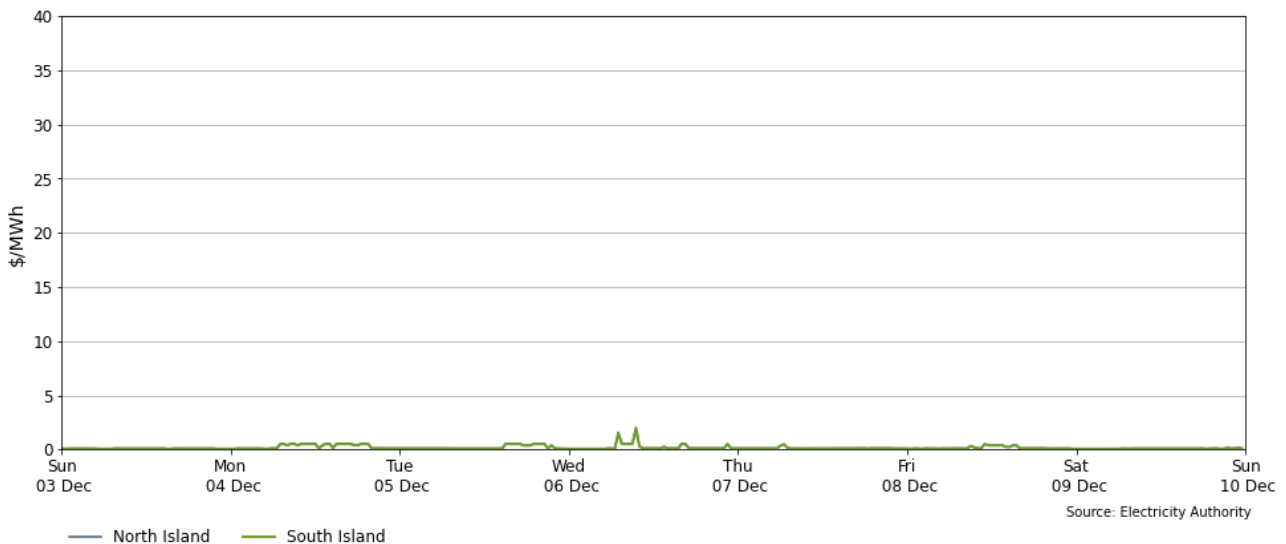
3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week FIR prices were all below \$5/MWh this week.

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 \$5/MWh this week.

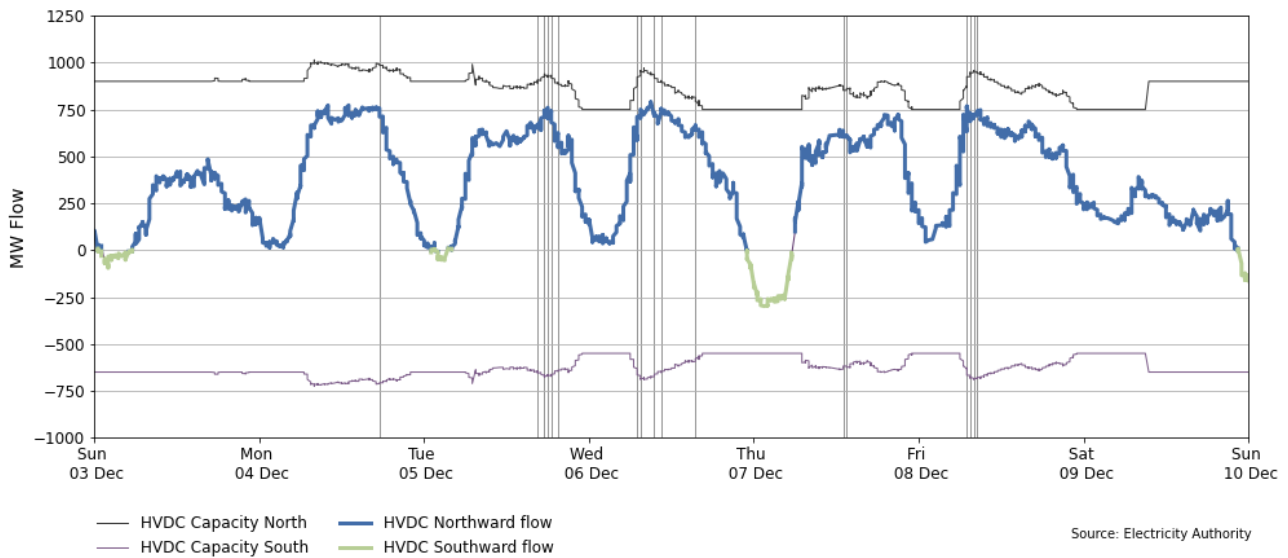
Figure 4: Sustained Instantaneous Reserve (SIR) prices by trading period and island



4. HVDC

4.1. Figure 5 shows HVDC flow between 3-9 December. HVDC flows were mainly northwards with highest flows around 750MW. There were a few instances of southwards flow this week, particularly overnight on Thursday during a period of high wind generation when southward flow was close to 300MW.

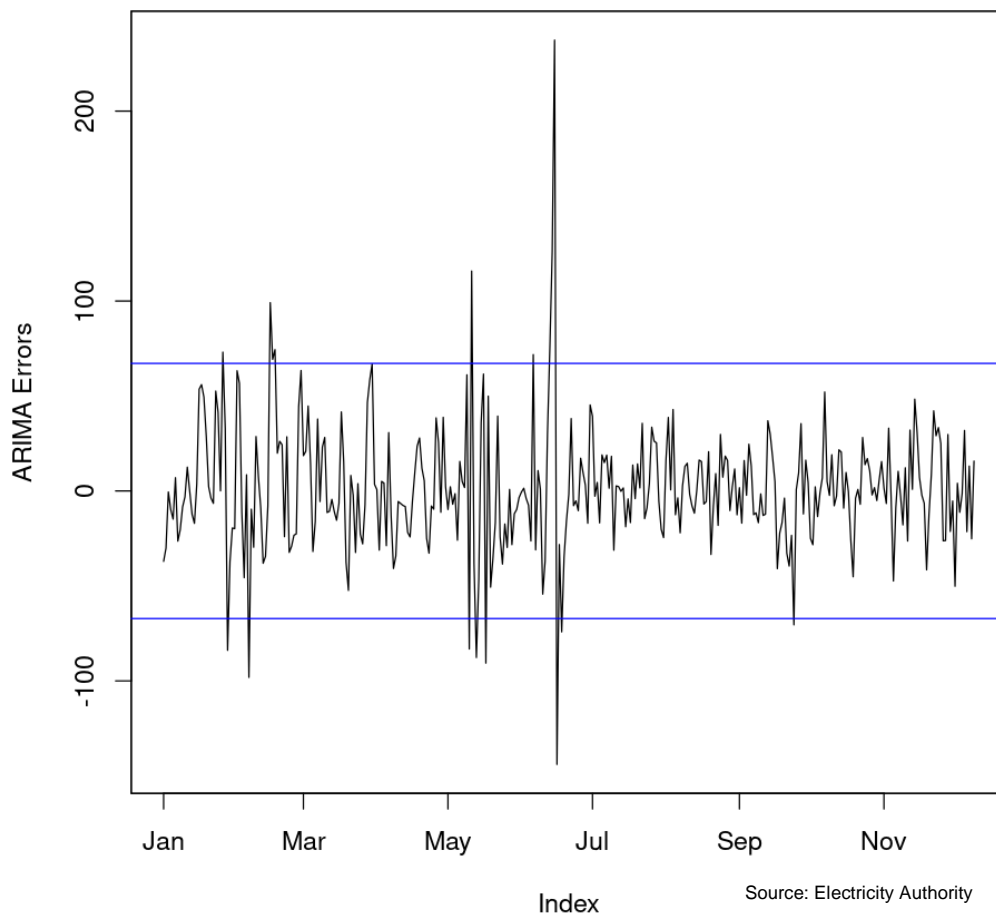
Figure 5: HVDC flow and capacity



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 the 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 no residuals were above or below 2 standard deviations, indicating actual and modelled prices were similar.

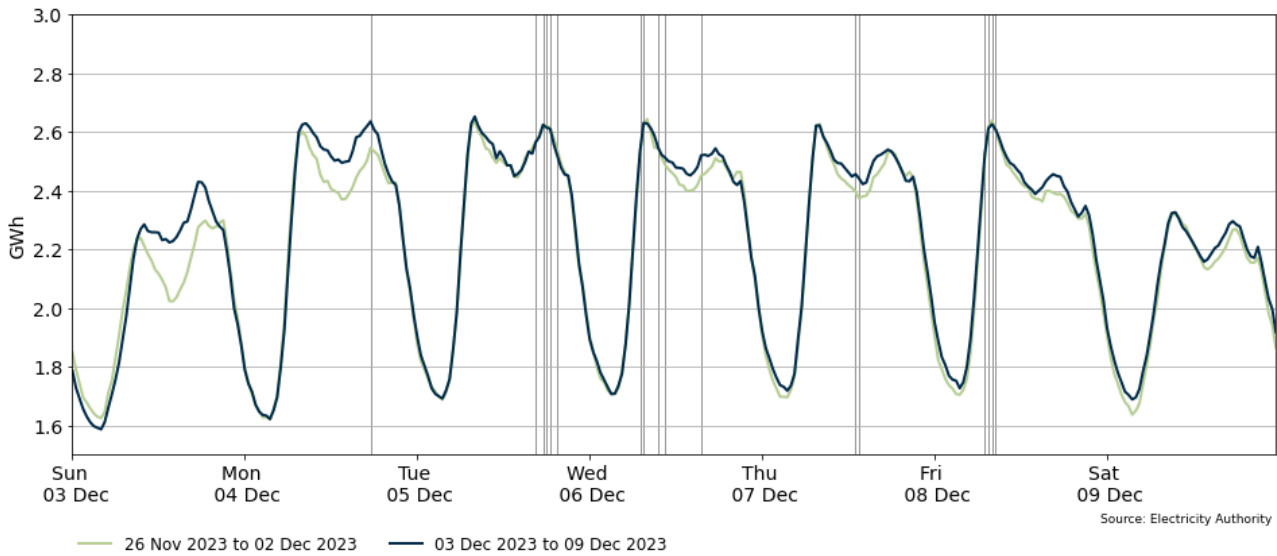
Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 - 9 December 2023



6. Demand

- 6.1. Figure 7 shows national demand between 3-9 December, compared to the previous week. Demand was higher than the previous week over Sunday and Monday. The remainder of the week demand was similar to the week before apart from slightly higher demand during Wednesday and Thursday shoulder periods.

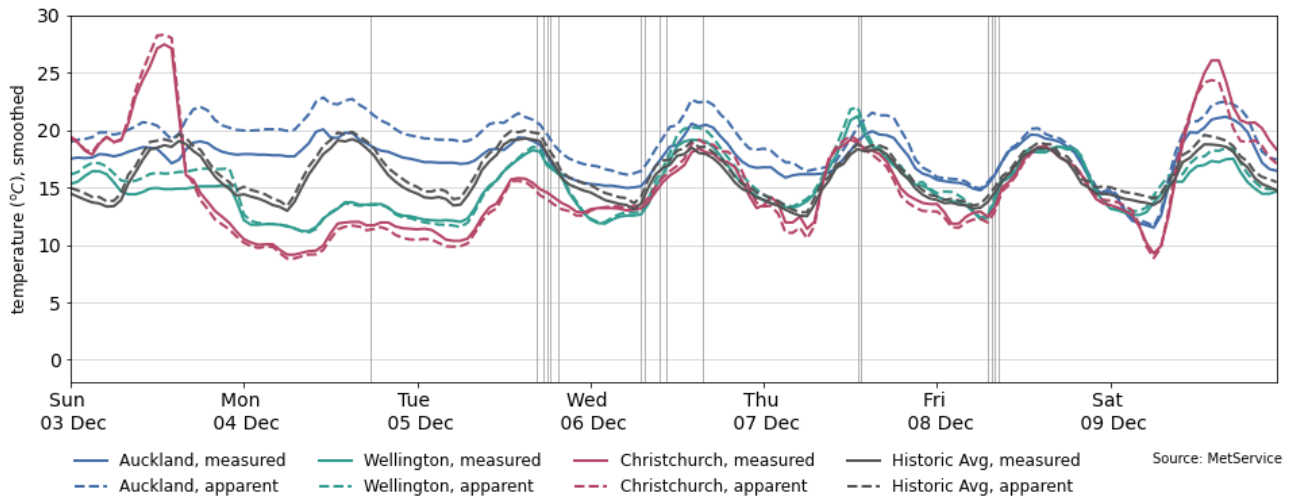
Figure 7: National demand by trading period compared to the previous week



6.2. Figure 8 shows the hourly temperature at main population centres from 3-9 December. 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 mostly above 10°C, with temperatures across all main centres close to historic average from Wednesday onwards.

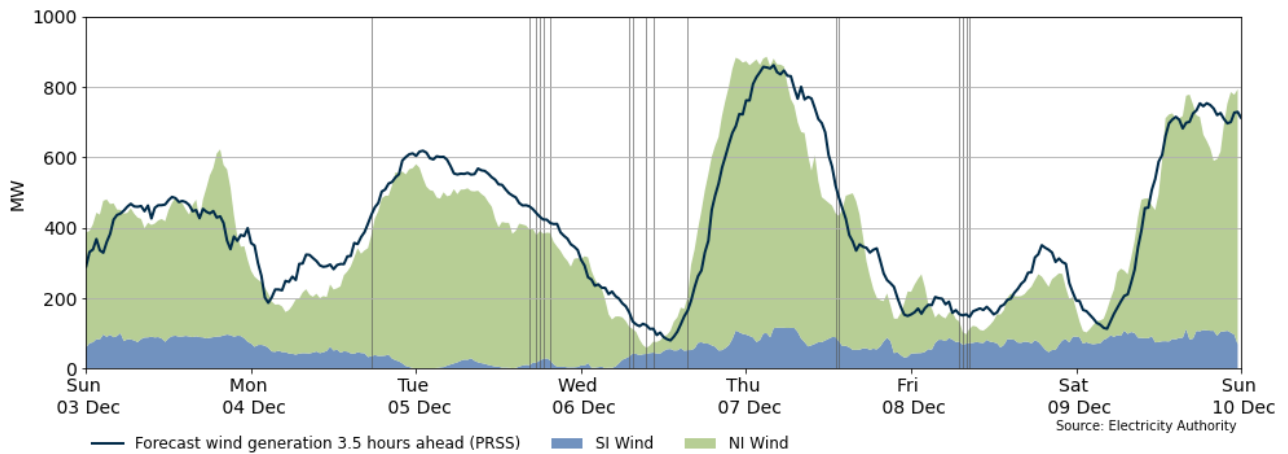
Figure 8: Temperatures across main centres



7. Generation

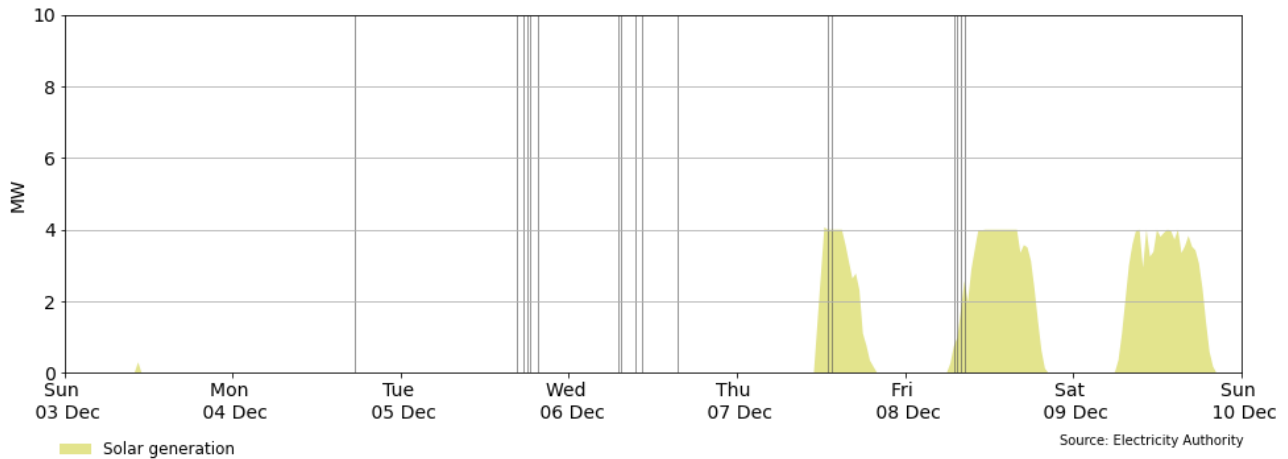
7.1. Figure 9 shows wind generation, from 3 -9 December. Wind was variable across the week ranging from ~60MW to 885MW. This week again saw both low wind generation and over forecast wind, which had an effect on spot prices.

Figure 9: Wind generation and forecast between 3-9 December



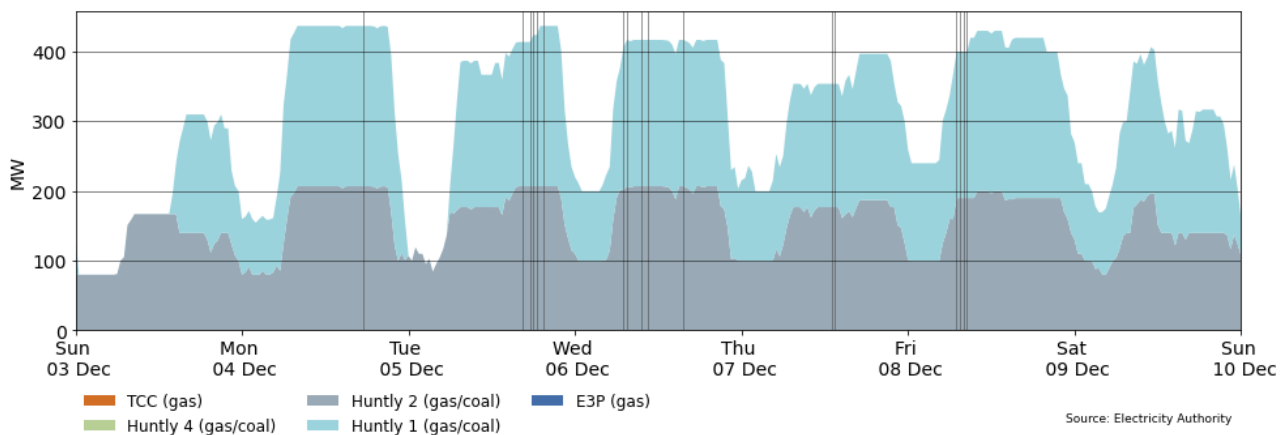
7.2. Solar generation occurred from Thursday to Saturday this week as the commissioning process continues at Kaitia Solar Farm.

Figure 10: Solar generation between 3-9 December



7.3. Figure 11 shows the generation of thermal baseload and thermal peaker plants between 3-9 December. Both Huntly 1 and 2 ran continuously as baseload this week.

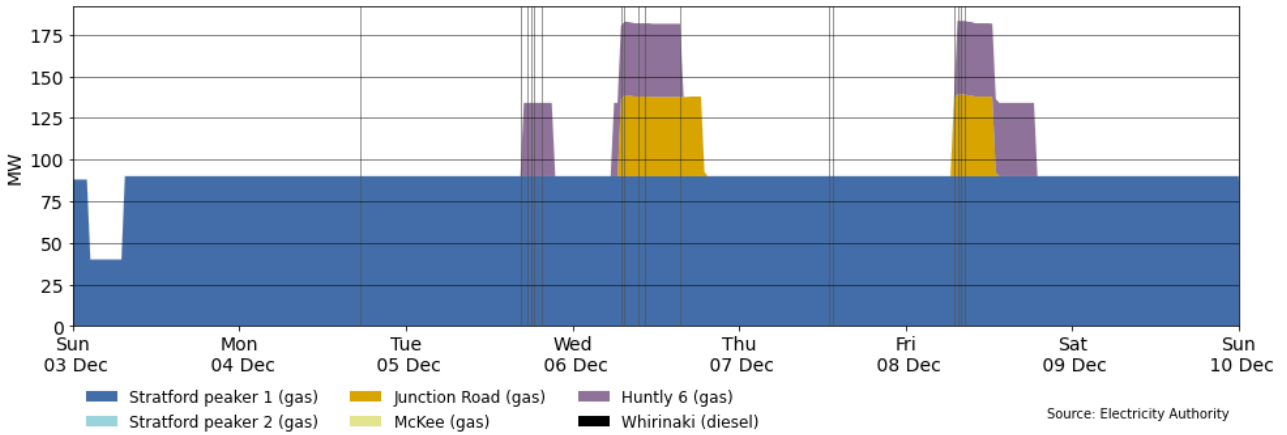
Figure 11: Thermal baseload generation between 3-9 December



7.4. Stratford 1 ran continuously at 90MW for the week apart from a short period of on Sunday morning where it ran at around 40MW as seen in Figure 12. Huntly 6 ran Tuesday evening,

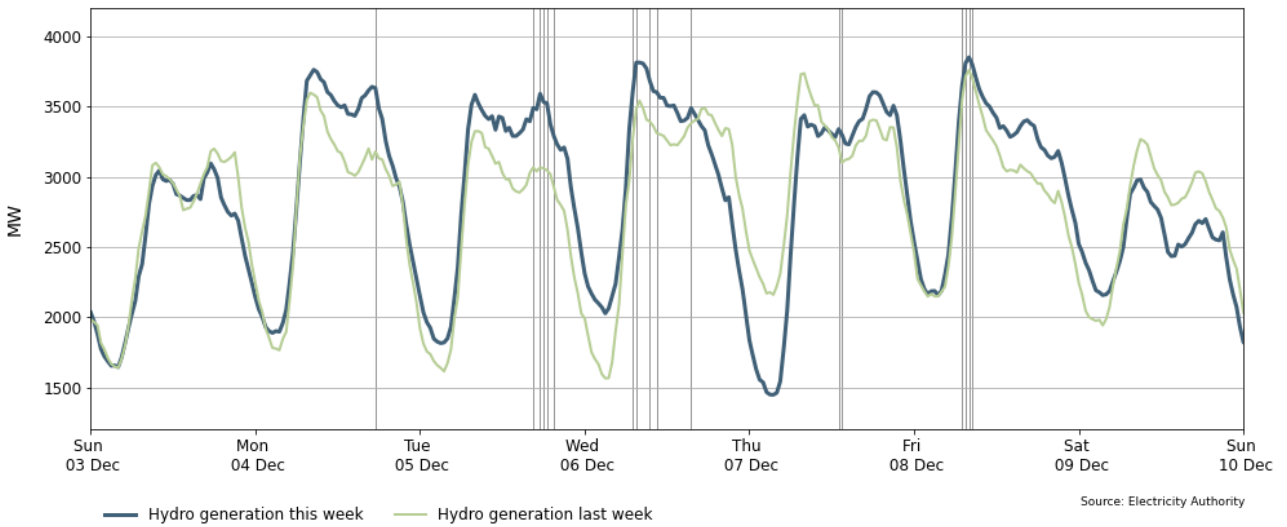
Wednesday morning through to midafternoon and then again on Friday during the day. Junction Road was the only other peaker to run during Wednesday and Friday.

Figure 12: Thermal peaker generation between 3-9 December



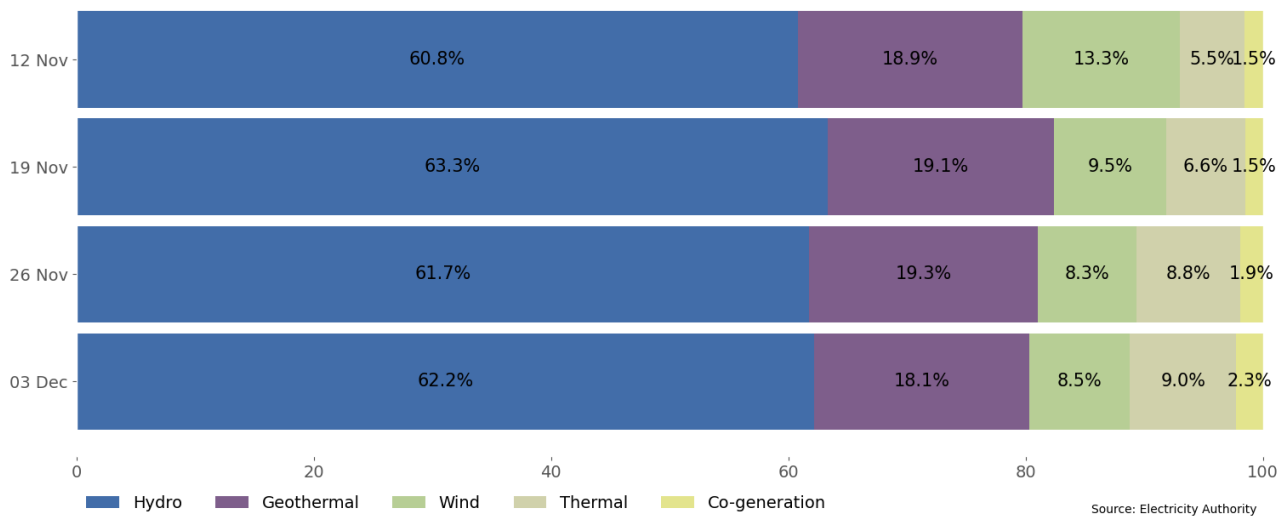
7.5. Figure 13 shows hydro generation between 3-9 December. Most days saw an increase in hydro generation compared to the previous week, ramping up during Tuesday evening and Friday morning peak periods to meet demand requirements.

Figure 13: Hydro generation between 3-9 December compared to the previous week



7.6. As a percentage of total generation, between 3-9 December, total weekly hydro generation was 62.2%, geothermal 18.1%, wind 8.5%, thermal 9%, and co-generation 2.3%.

Figure 14: Total generation by type as a percentage each week between 12 November and 9 December



8. Outages

8.1. Figure 14 shows generation capacity on outage. Total capacity on outage between 3-9 December ranged from 2100MW to 2850MW and was particularly high from Tuesday to Thursday.

8.2. Notable outages include:

- (a) Huntly 5 on outage until 20 January 2024
- (b) Huntly 4 on outage until 17 December
- (c) Stratford 2 outage until 28 February 2025
- (d) TCC on outage until 22 December
- (e) Various North and South Island hydro units on outage
- (f) Ngā Tamariki geothermal had units on outage across the week

Figure 15: Total MW loss due to generation outages

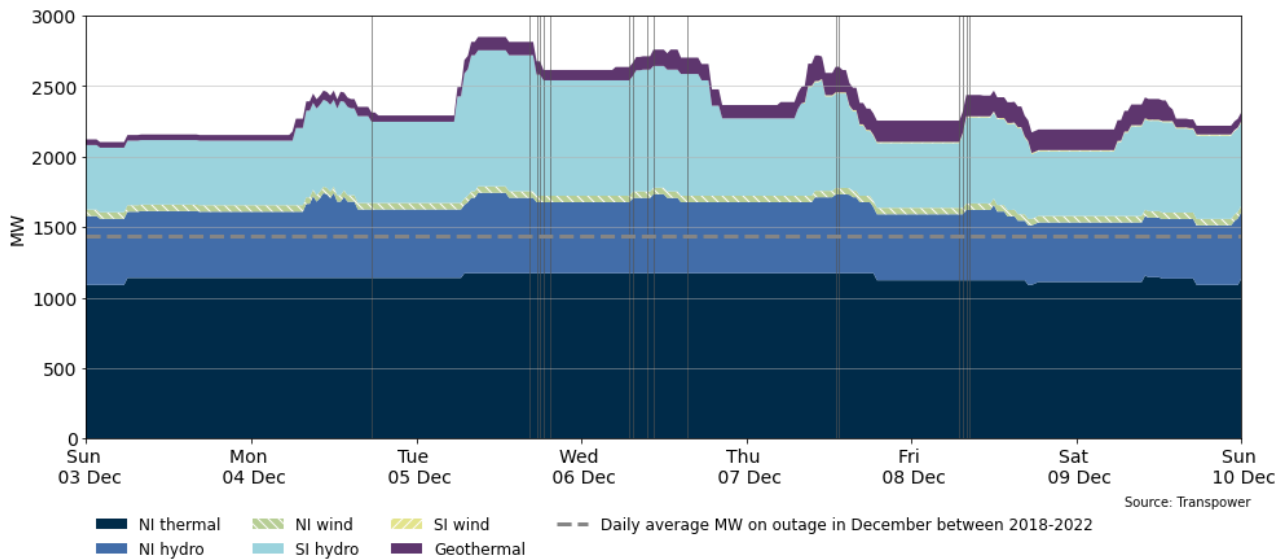
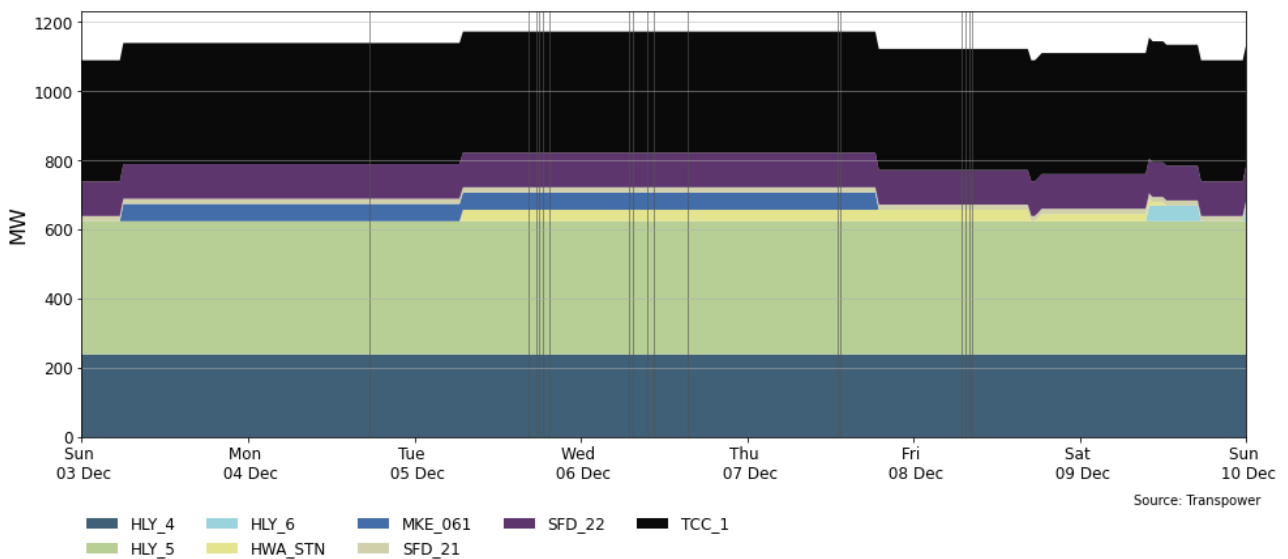


Figure 16: MW loss from thermal outages

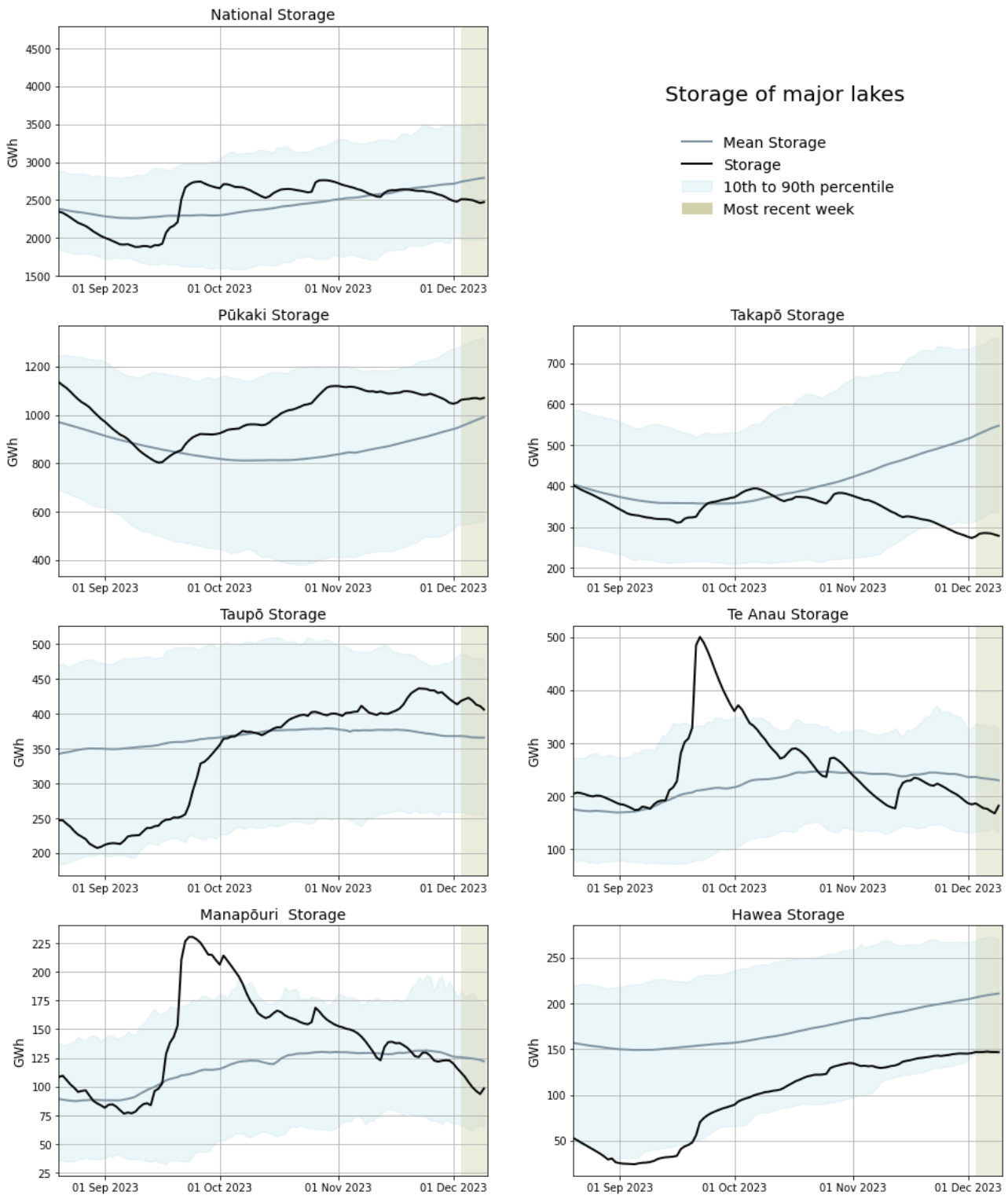


9. Storage/fuel supply

- 9.1. Figure 17 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 decrease with controlled storage as of 9 December at 90.3% of historic mean and 62.9% nominally full.
- 9.3. Pūkaki storage was steady this week and remains above its historic mean, while Takapō storage has continued to decline and is still below its historic 10th percentile. Taupō saw some inflows at the start of the week before storage began to dip again, although remains above its historic mean storage. Manapōuri and Te Anau storage decreased over most of the week before a small uptick in both lakes on Saturday as rain arrived in the southwest region of the South Island. Both lakes remain below historic mean for this time of year but

above their 10th percentile ranges. Hawea storage remains steady and around its 10th percentile range.

Figure 17: Hydro storage

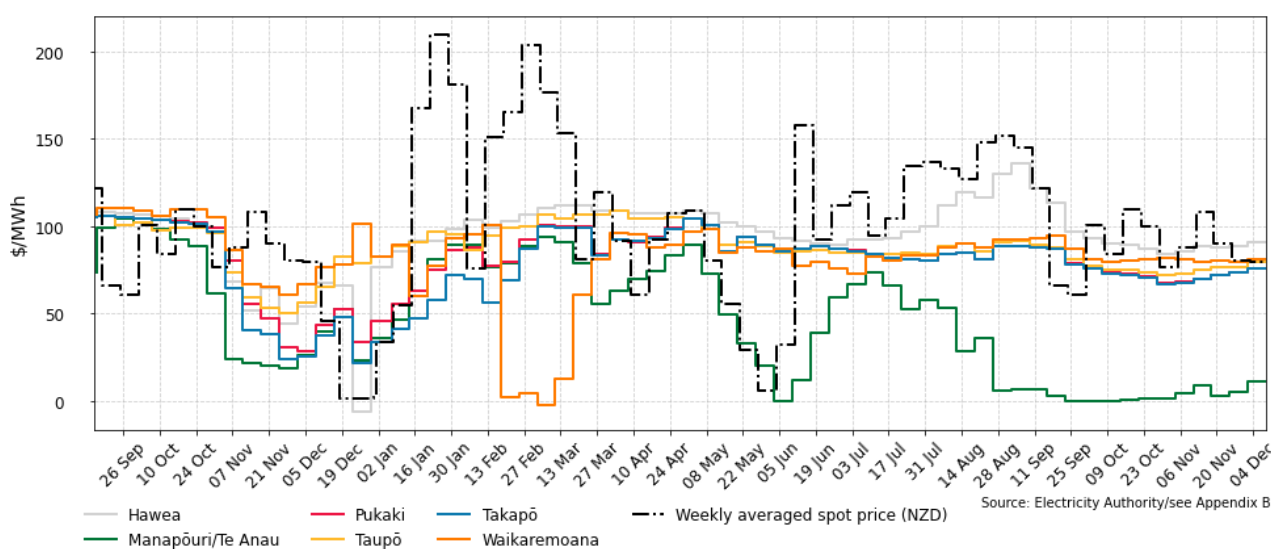


Source: Electricity Authority

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 18 shows the national water values between 15 September 2022 and 9 December 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. Most lakes saw an increase to their water values of between \$1-\$2/MWh, apart from Manapōuri/Te Anau whose water value increased to ~\$11/MWh.

Figure 18: JADE water values across various reservoirs between 15 September 2022 and 9 December 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 19 shows an estimate of thermal SRMCs as a monthly average up to 1 December 2023. After increasing since May, the SRMC for diesel has now started to decrease. Coal SRMC has increased slightly on the previous month, with gas SRMC rising due to outages which reduced supply, the most significant being a full outage at Kupe.
- 11.4. The latest SRMC of coal-fuelled Rankine generation is ~\$162/MWh. This is now lower than the cost of running the Rankines on gas at ~\$176/MWh. It appears that the Rankines were

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.

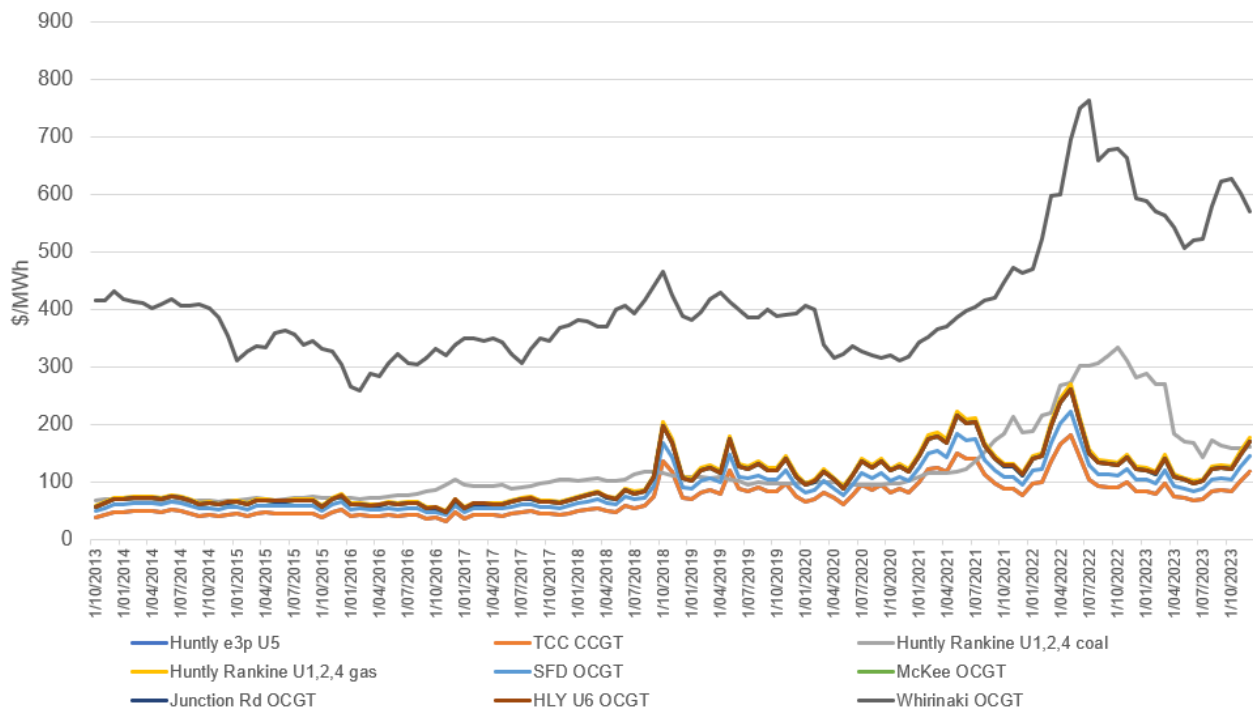
predominantly fuelled by coal during the Kupe outage, and Enerlytica estimated that the fuel mix was 30% gas when the outage started.

11.5. The SRMC of gas fuelled thermal plants is currently between \$118/MWh and \$176/MWh.

11.6. The SRMC of Whirinaki has decreased to ~\$570/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.

Figure 19: Estimated monthly SRMC for thermal fuels



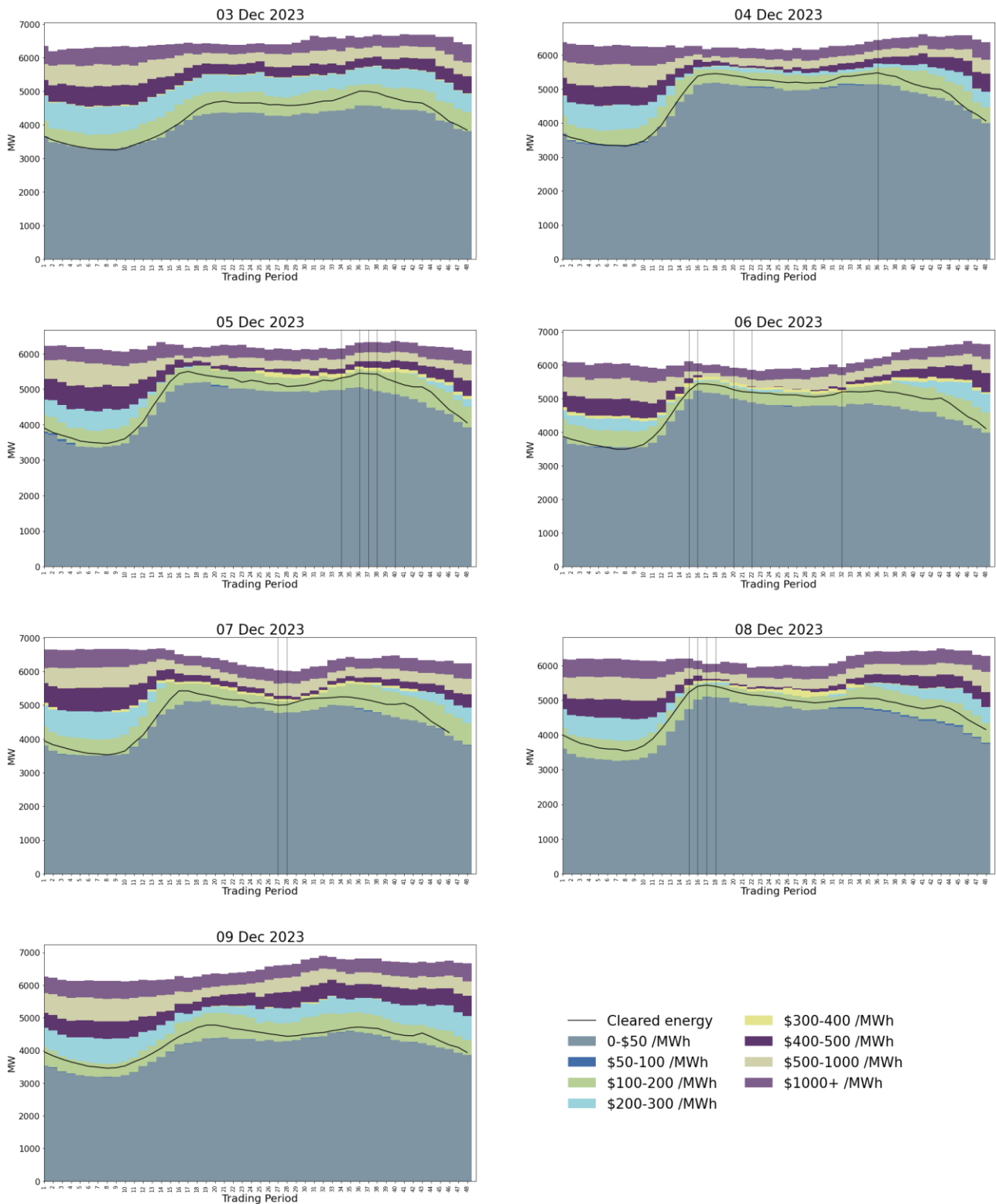
Source: Electricity Authority/see Appendix C

12. Offer behaviour

12.1. Figure 20 shows this week’s national daily offer stacks. The black line shows cleared energy, indicating the range of the average final price.

12.2. Most offers cleared in the \$100-\$200/MWh price band this week. There continues to be a thin offer stack between \$200-\$400/MWh and total generation offered remains low due to generation outages. As a result, small changes in conditions can result in large price spikes, especially when demand is high.

Figure 20: Daily offer stacks³



Source: Electricity Authority

³ Offer stacks created using PRSS data 30 minutes before gate closure due to unavailable RTD data

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
14/06/2023- 15/06/2023	15-17/ 15-19	Passed to Compliance	Genesis	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.