

4 December 2023



# Trading conduct report

Market monitoring weekly report

# Trading conduct report

## 1. Overview for week of 26 November-2 December

1.1. In general, average spot prices continue to be mostly between ~\$140-\$170/MWh including overnight prices. Periods of high wind generation and/or wind generation greater than forecast saw some overnight prices drop below the historic median. Two Rankines and Stratford 1 contributed the majority of thermal generation this week which saw a small proportional increase in the overall generation from thermal. This increase in thermal generation was down to the wind volatility and a slight reduction in the early part of the week to hydro generation. Hydro storage has declined this week and sits at 93% of historic mean as of 2 December.

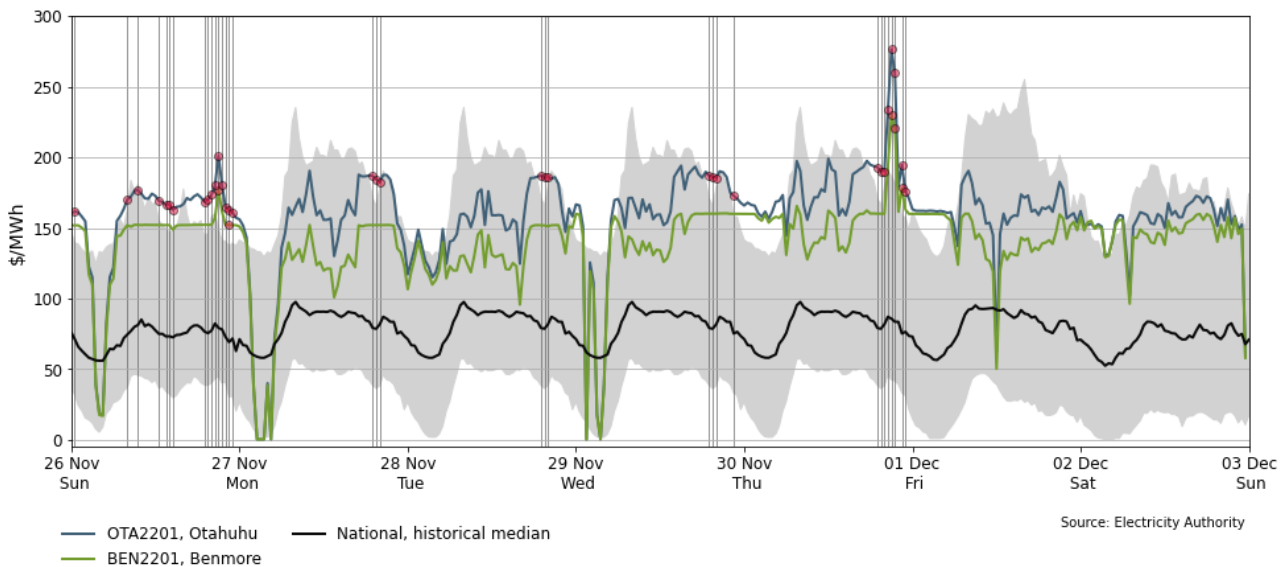
## 2. Spot prices

- 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 range<sup>1</sup> of historic prices, are highlighted with a vertical black line. Other notable prices are marked with black dashed lines.
- 2.3. Between 26 November-2 December:
- (a) The average wholesale spot price across all nodes was \$149/MWh.
  - (b) 95 percent of prices fell between \$18/MWh and \$191/MWh.
- 2.4. The weekly average spot price was around \$9/MWh lower than the previous week, with the majority of prices again sitting above the historic median and close to the \$150/MWh region. Overnight prices remain high with only a few instances of them dropping below the historic average when wind generation was high or wind generation was more than forecast.
- 2.5. During the 9.00pm and 9.30pm trading period on Thursday there was small spike in prices above \$200/MWh. Ōtāhuhu prices were \$276/MWh and \$260/MWh, with Benmore prices \$230/MWh and \$220/MWh. Low and over forecast wind as well as some under forecast demand in the South Island saw some higher priced hydro tranches dispatched.

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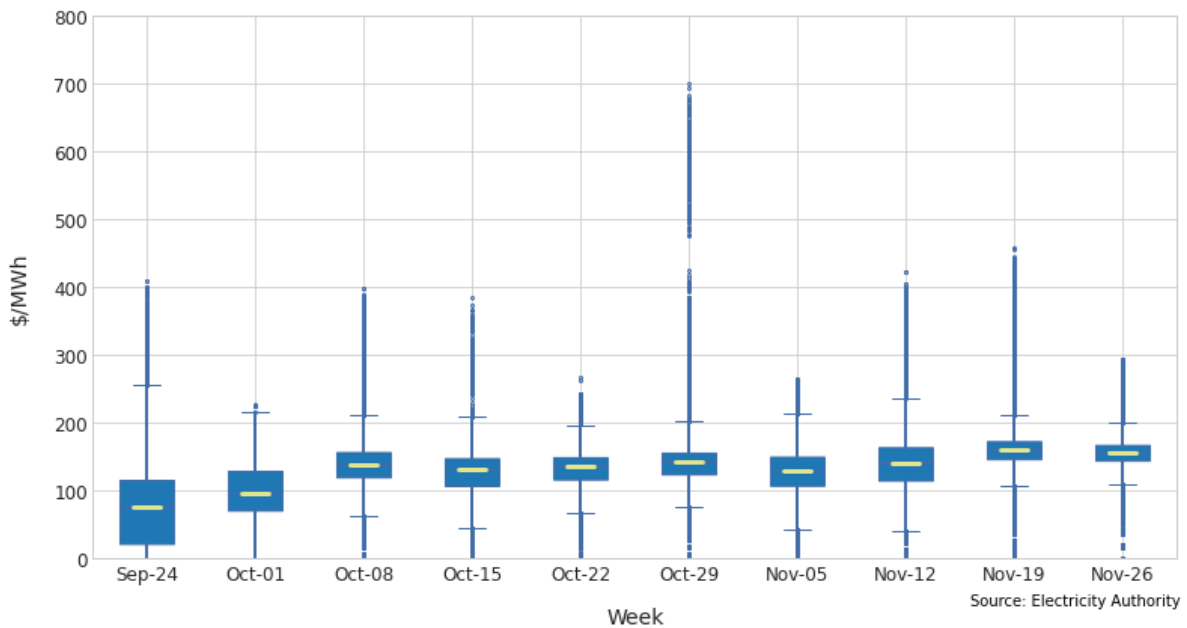
<sup>1</sup> We are identifying any significantly high prices by using the historic distribution of prices depending on whether it is a weekday or weekend day, and looking for prices that lie 1.5 times the interquartile range above the 75<sup>th</sup> percentile of the distribution. This is using the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

**Figure 1: Wholesale spot price at Benmore and Ōtāhuhu between 26 November and 2 December**



- 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. The overall distribution of prices this week is slightly lower than the previous week with less outliers. The middle 50% of prices are more condensed with most prices within \$143/MWh and \$166/MWh and a reasonably symmetrical distribution seeing a median of \$156/MWh.

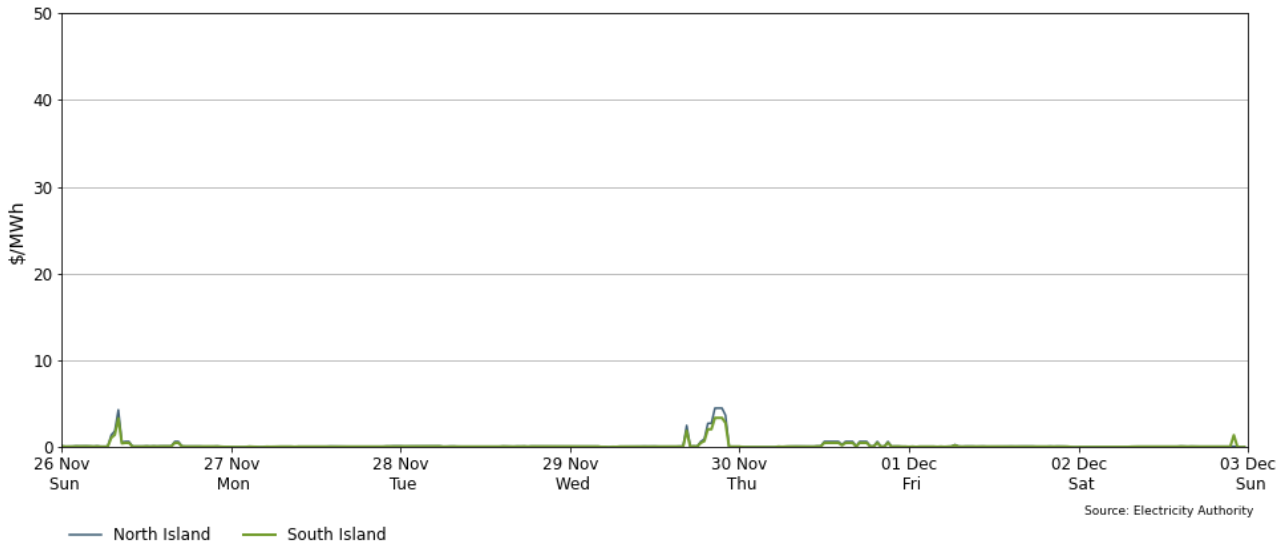
**Figure 2: Boxplots showing the distribution of the spot prices this week and the previous nine weeks**



### 3. Reserve prices

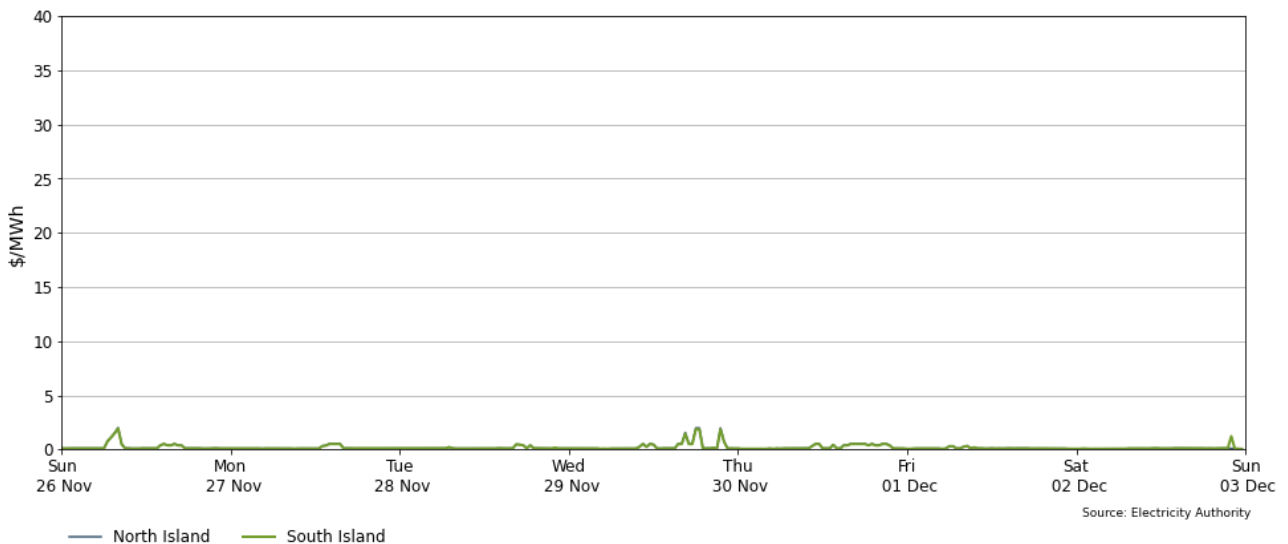
3.1. Fast Instantaneous Reserve (FIR) prices for the North and South Islands are shown below in Figure 3. This week FIR prices were all below \$5/MWh this week.

**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.

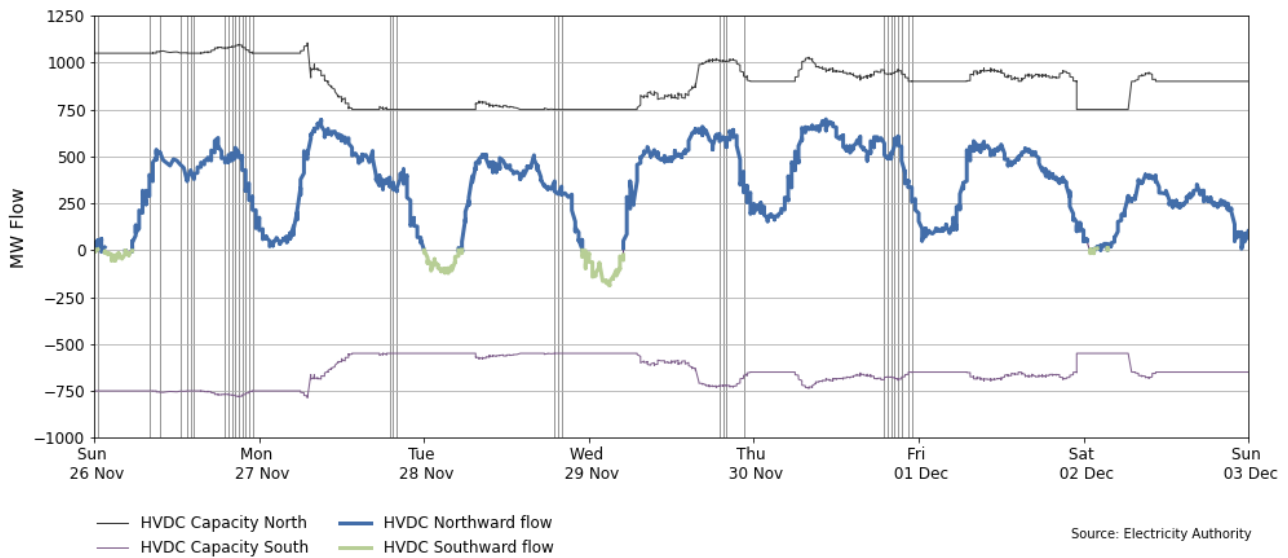
**Figure 4: Sustained Instantaneous Reserve (SIR) prices by trading period and island**



### 4. HVDC

4.1. Figure 5 shows HVDC flow between 26 November-2 December. HVDC flows were mainly northwards and below 750MW this week. Overnight southwards flow on Tuesday and Wednesday was under 200MW.

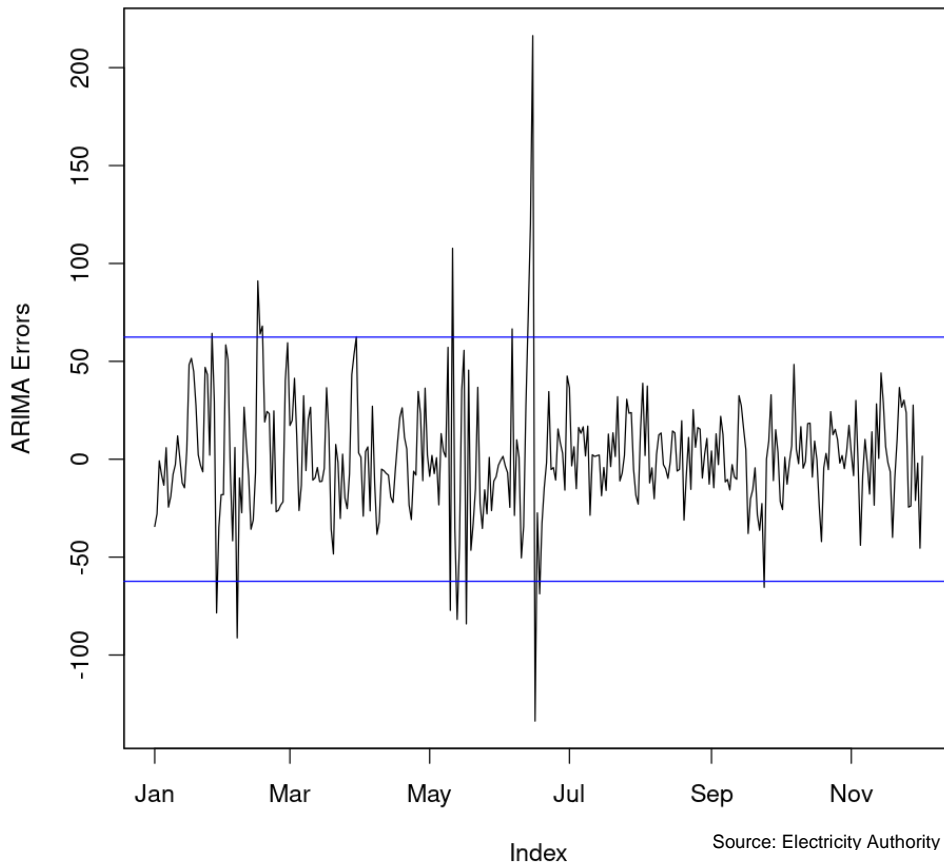
**Figure 5: HVDC flow and capacity**



## 5. Regression residuals

- 5.1. The Authority’s monitoring team uses a regression model to model spot prices. 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 no residuals were above or below 2 standard deviations, indicating actual and modelled prices were similar.

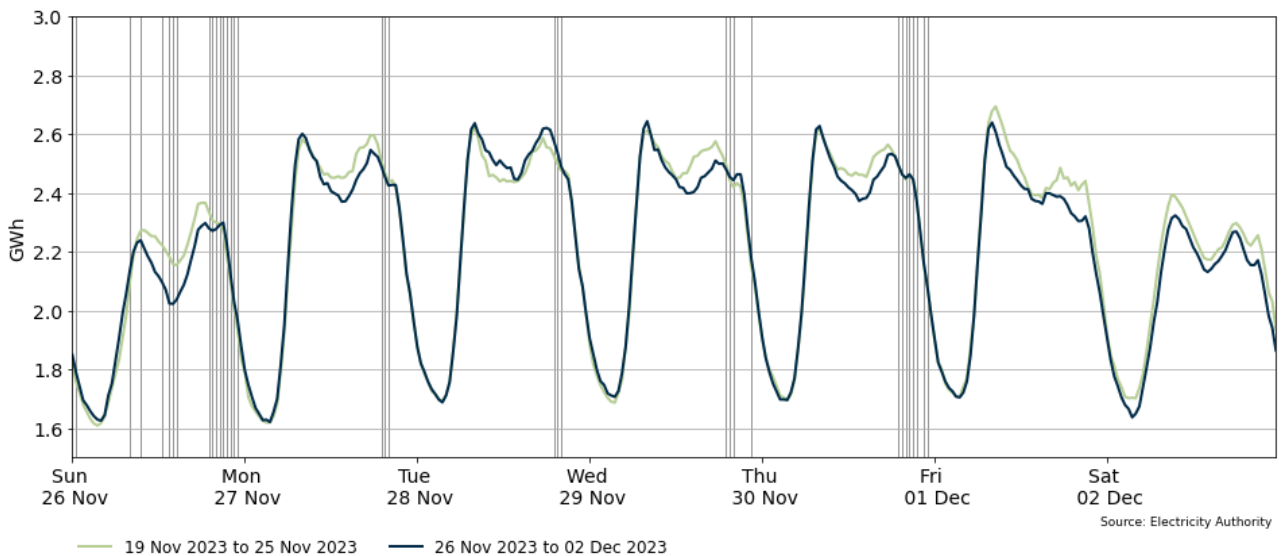
**Figure 6: Residual plot of estimated daily average spot prices from 1 January 2023 - 2 December 2023**



## 6. Demand

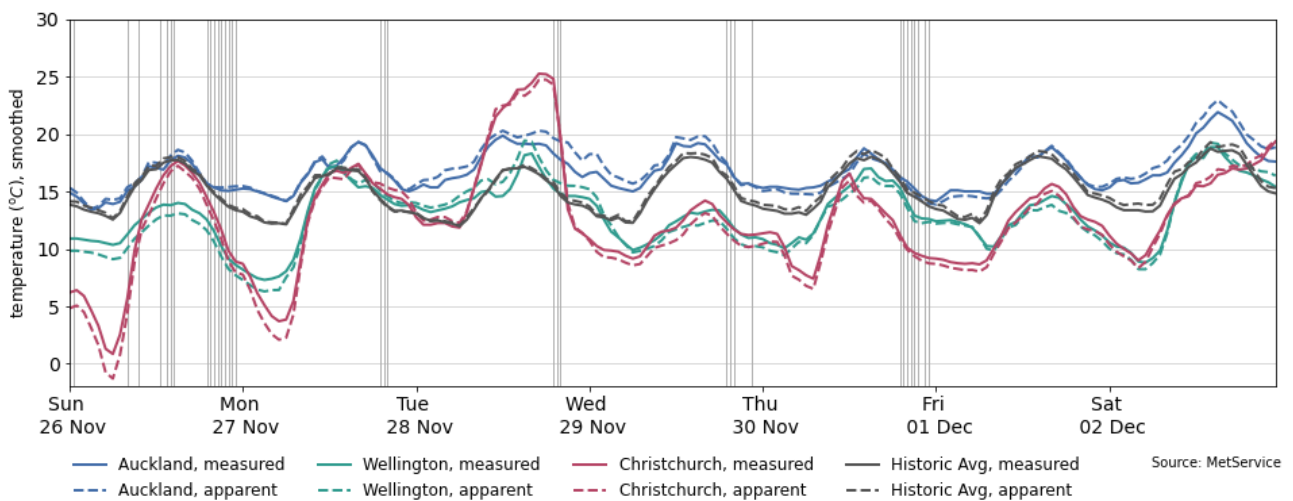
6.1. Figure 7 shows national demand between 26 November-2 December, compared to the previous week. Overall, morning peak demand was similar, with some lower demand over the shoulder period compared to the previous week.

**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 26 November-2 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. Auckland temperatures were on or above average across the week with Wellington and Christchurch both seeing some below average temperatures at times. Apparent temperatures in Christchurch were around -1°C on Sunday morning, with Tuesday afternoon seeing a maximum of around 25°C.

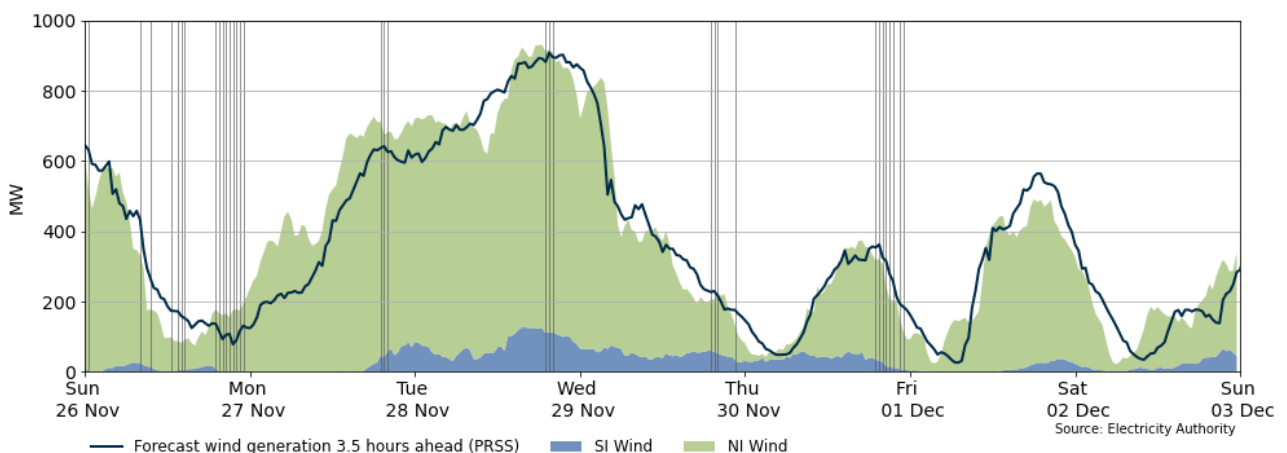
**Figure 8: Temperatures across main centres**



## 7. Generation

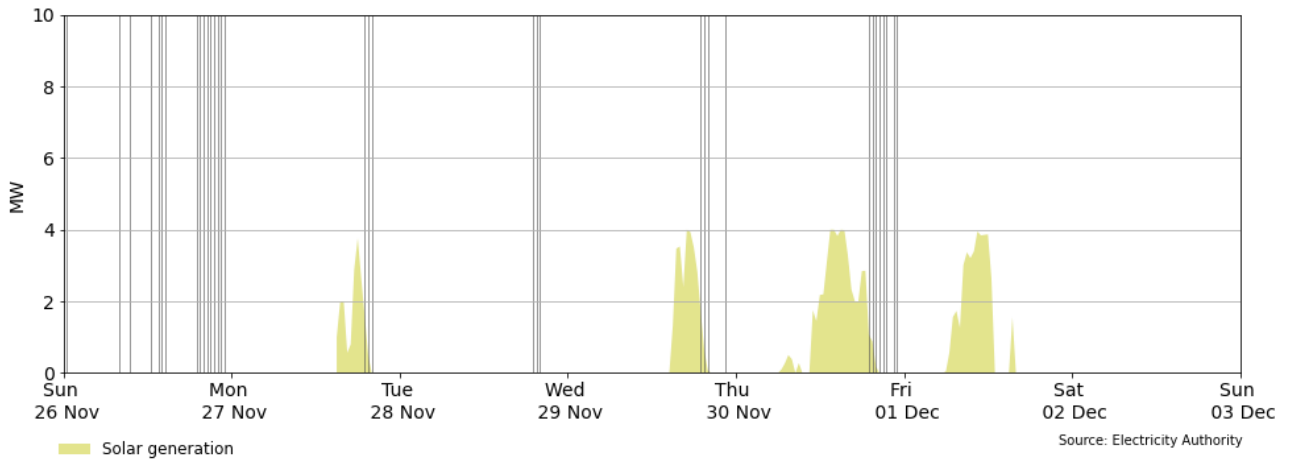
- 7.1. Figure 9 shows wind generation, from 26 November-2 December. Wind generation varied between 22MW and 930MW across the week. Although some highlighted prices occur where there are discrepancies in forecast, this had less influence on prices compared to the previous week. A number of the highlighted prices occurred at times of low wind generation. Overnight periods with high wind and wind generation more than forecast saw prices drop below the historic average.

**Figure 9: Wind generation and forecast between 26 November - 2 December**



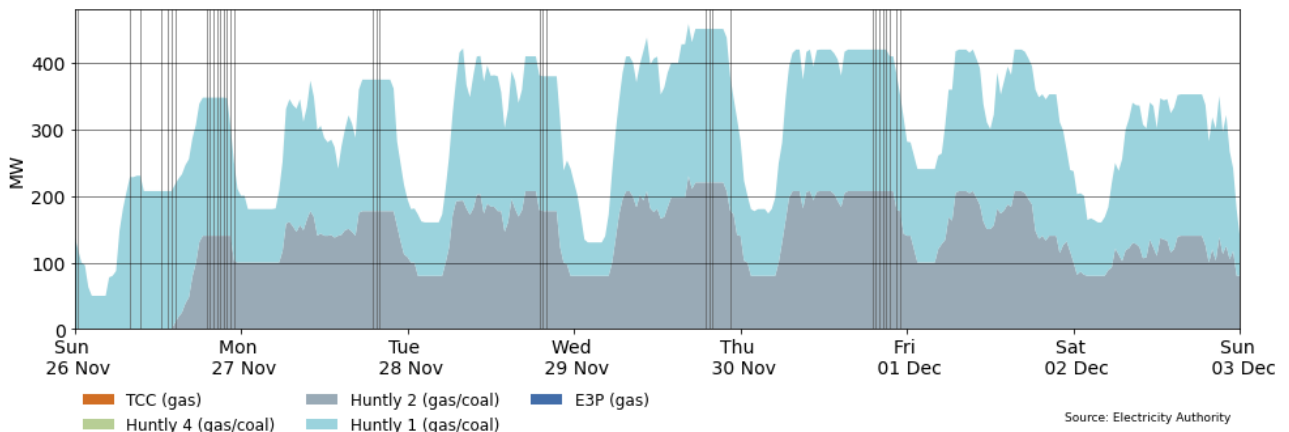
7.2. Figure 10 shows solar generation this week with maximum trading period output of 4MW. As per last week's report, Kaitaia Solar Farm is currently in the commissioning stages. Loadstone expects to be generating up to 12MW by 18 December, with their full generation capacity of ~24MW expected to be generating by end of January.

**Figure 10: Solar generation between 26 November - 2 December**



7.3. Figure 11 shows the generation of thermal baseload plants between 26 November-2 December. Both Huntly 1 and Huntly 2 ran as baseload generation this week.

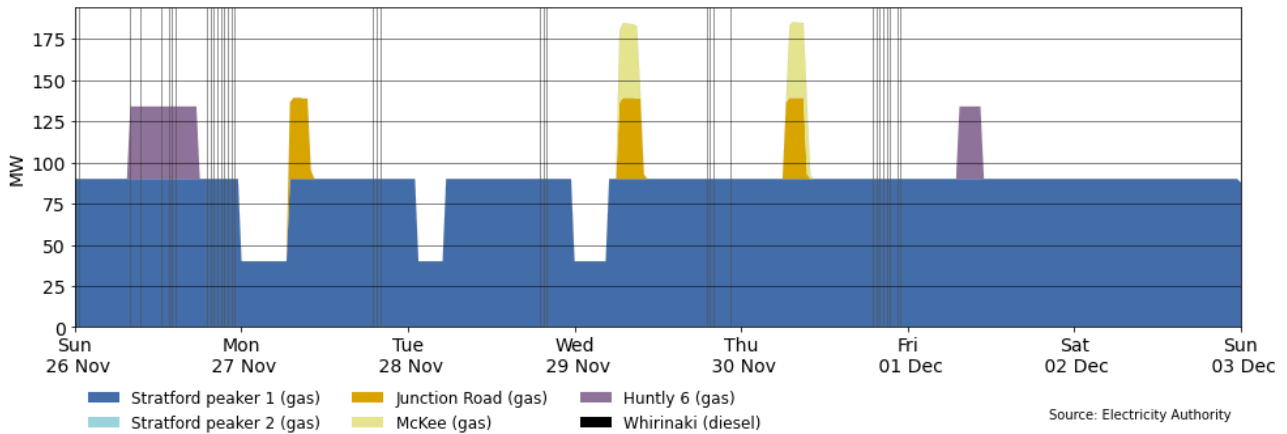
**Figure 11: Thermal baseload generation between 26 November - 2 December**



7.4. Figure 12 shows generation from thermal peaker plants between 26 November-2 December. Stratford 1 ran continuously and mostly at 90MW reduced capacity. Huntly 6 ran during Sunday's shoulder period prior to the second Rankine starting up and also a short time on Friday morning. Junction Road and/or McKee ran during the Monday, Wednesday, and Thursday morning peaks.

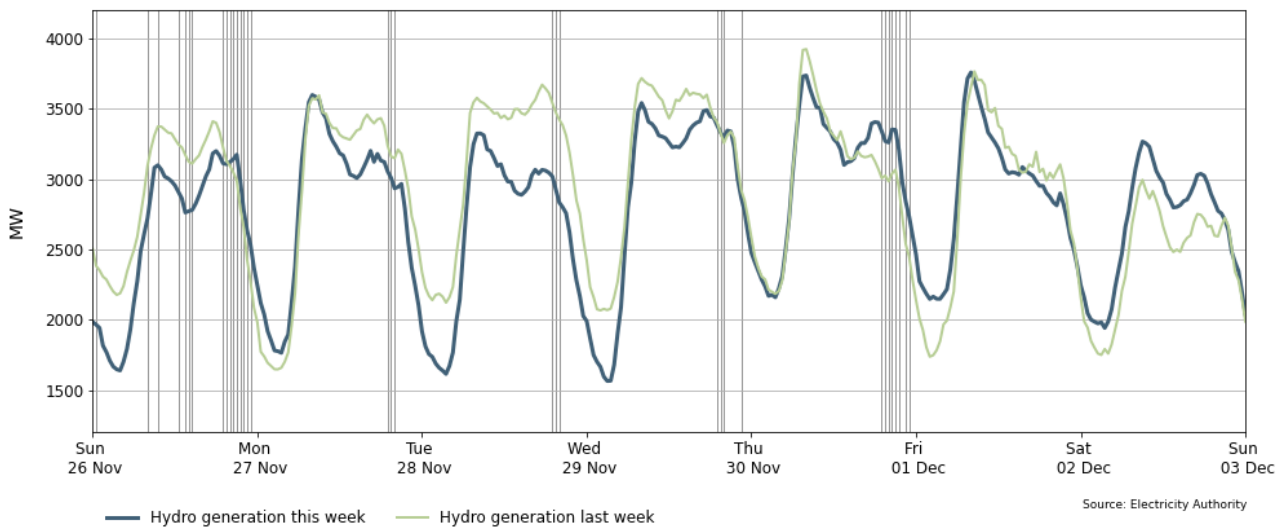


**Figure 12: Thermal peaker generation between 26 November - 2 December**



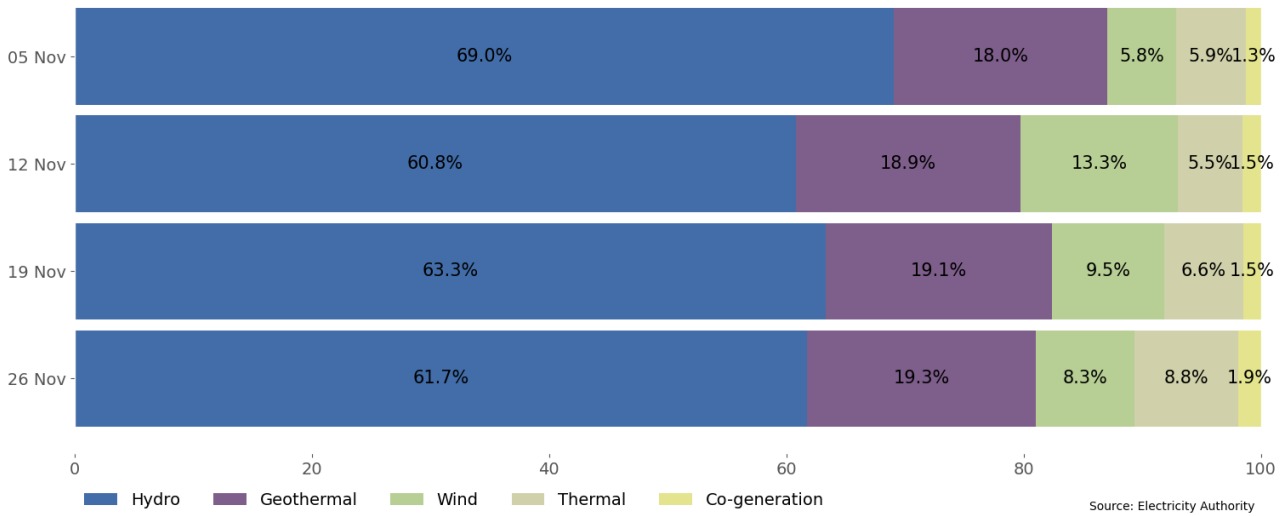
7.5. Figure 13 shows hydro generation between 26 November-2 December. Hydro generation was generally lower than the previous week at the start of the week with generation increasing from Thursday.

**Figure 13: Hydro generation between 26 November - 2 December compared to the previous week**



7.6. As a percentage of total generation, between 26 November-2 December, total weekly hydro generation was 61.7%, geothermal 19.3%, wind 8.3%, thermal 8.8%, and co-generation 1.9%. As small decrease in the proportion of wind generation and hydro generation saw an increase to the proportion of thermal generation.

**Figure 14: Total generation by type as a percentage each week between 5 November and 2 December**



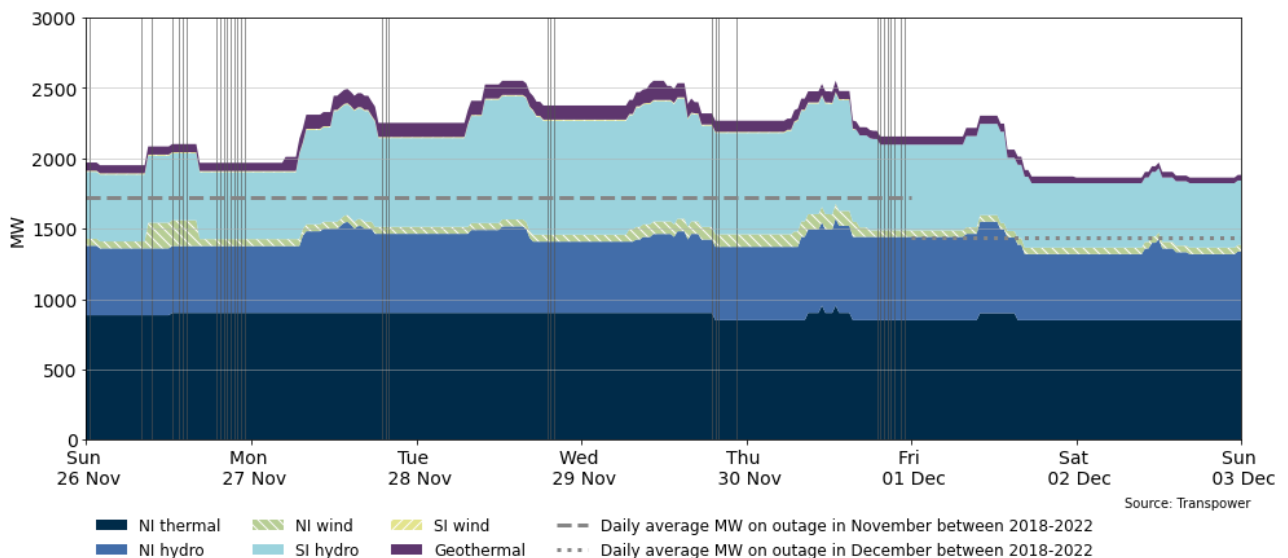
## 8. Outages

8.1. Figure 15 shows generation capacity on outage. Total capacity on outage between 26 November-2 December ranged from 1800MW to ~2500MW.

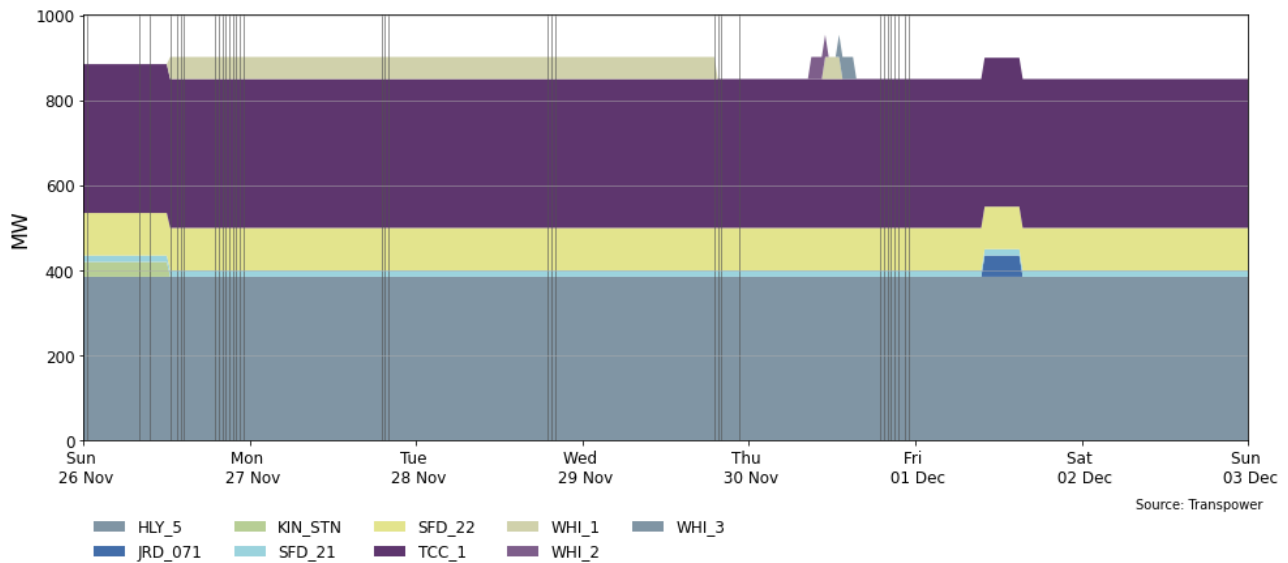
8.2. Notable outages include:

- (a) Huntly 5 outage until 22 January 2024
- (b) Stratford 2 outage until 28 February 2025
- (c) TCC outage until 22 December
- (d) Huntly 4 is on outage from 24 November – 10 December
- (e) Waipipi station had an outage during the day on 26 November
- (f) Various North and South Island hydro units on outage

**Figure 15: Total MW loss due to generation outages**



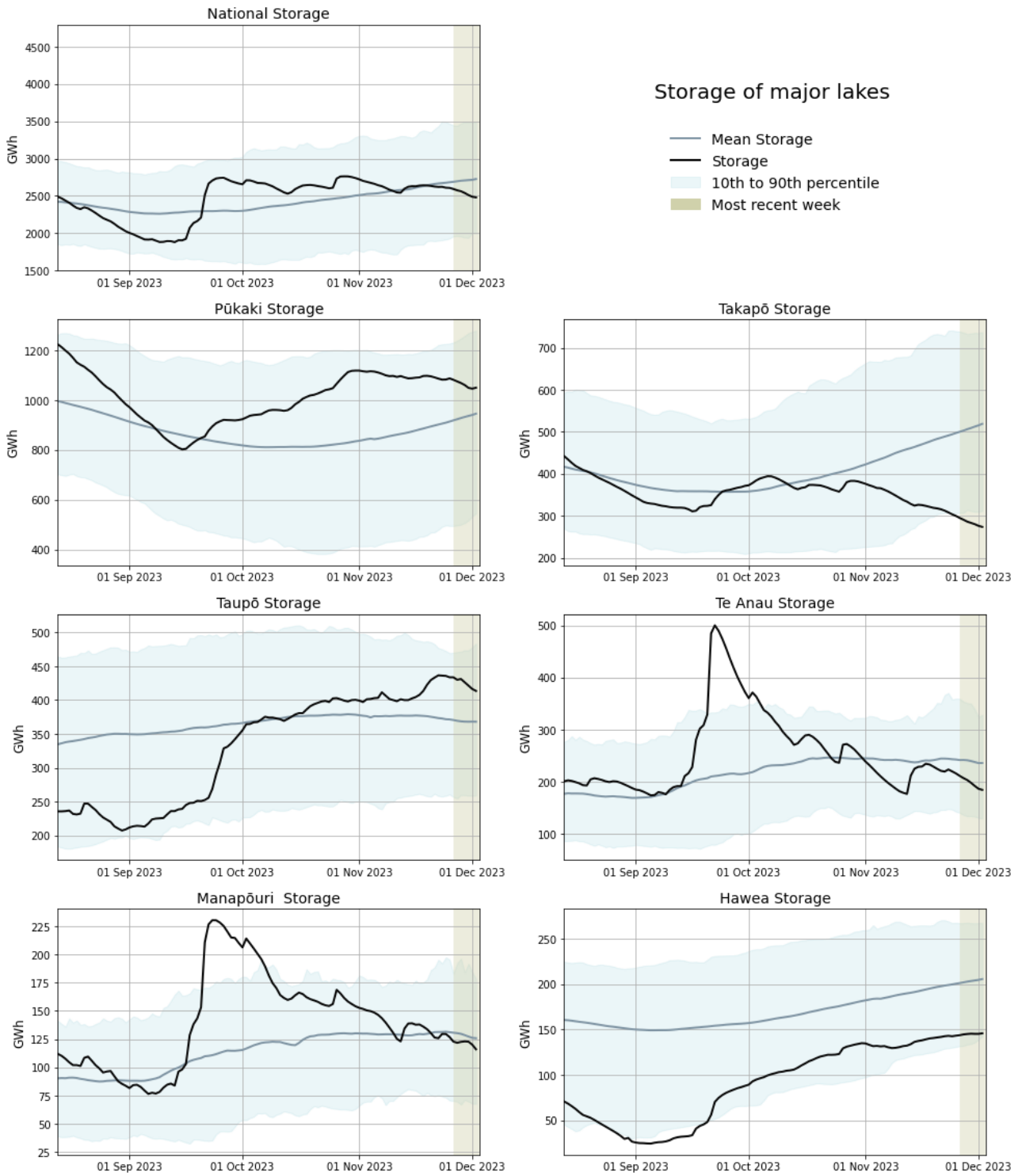
**Figure 16: MW loss from thermal outages**



## 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 decreased this week with storage as of 2 December at 93% of historical mean and 63.4% nominally full.
- 9.3. Most lakes saw a decline in storage across the week with only Pūkaki and Taupō remaining above their historic mean storage levels. Takapō storage dropped to below its historic 10<sup>th</sup> percentile. Manapōuri and Te Anau lake levels both remain below their historic mean. Hawea levels remained steady over the week but still close to its historic 10<sup>th</sup> percentile region.

**Figure 17: Hydro storage**

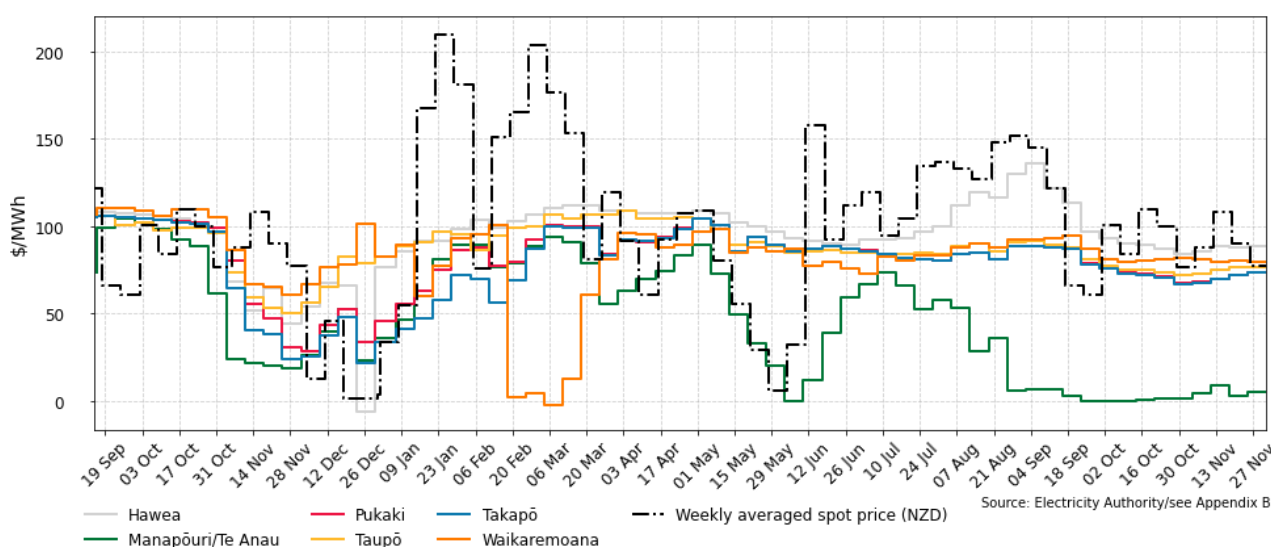


Source: Electricity Authority

## 10. JADE water values

- 10.1. The JADE<sup>2</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 18 shows the national water values between 15 September 2022 and 2 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. There was little change in water values this week with most lake values remaining within \$1-\$2/MWh of the previous week's price.

**Figure 18: JADE water values across various reservoirs between 15 September 2022 and 2 December 2023**



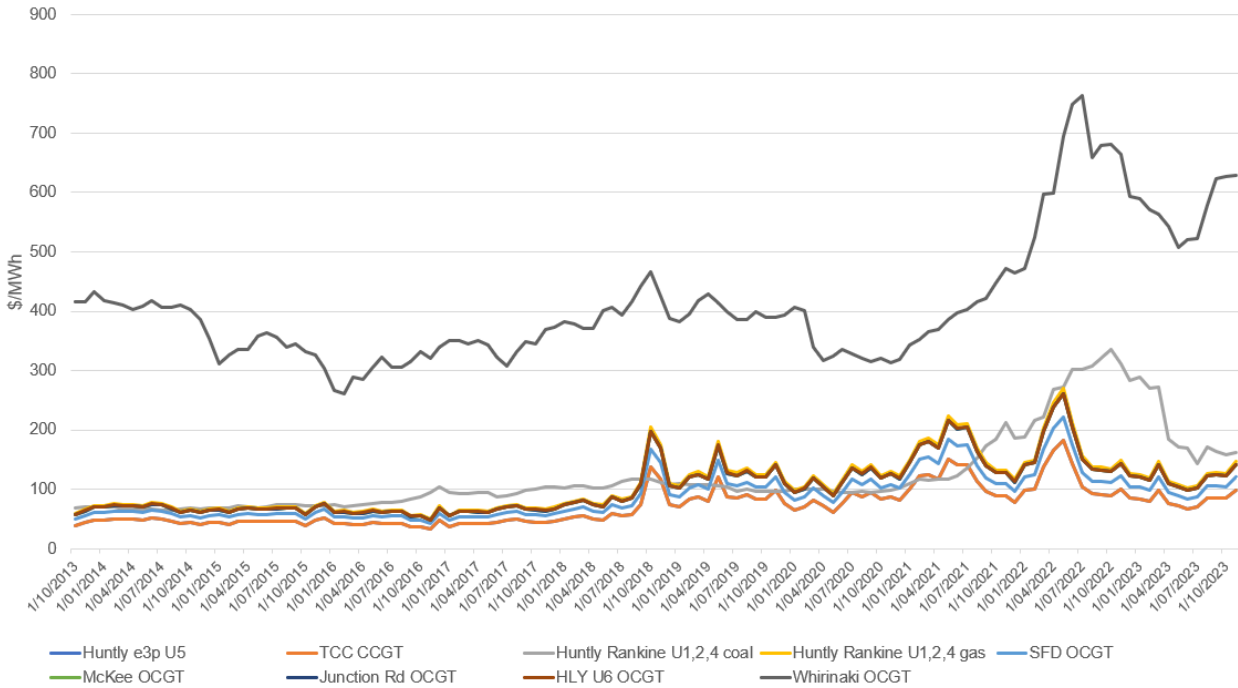
## 11. Prices versus estimated costs

- 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 November 2023. The SRMC of diesel plants has been increasing since May, and the SRMC of coal-fuelled and gas-fuelled plants has started to increase again. The recent increase in the SRMC of gas likely reflects increased production at Methanex, as well as gas production outages.

<sup>2</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.

- 11.4. The latest SRMC of coal-fuelled Rankine generation is ~\$161/MWh. This is now only slightly higher than the cost of running the Rankines on gas at \$141/MWh, with Genesis continuing to run the Rankines on a combination of both fuels.
- 11.5. The SRMC of gas fuelled thermal plants is currently between \$98/MWh and \$141/MWh. The SRMC of Whirinaki has increased to ~\$629/MWh.
- 11.6. 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 of thermal fuels**

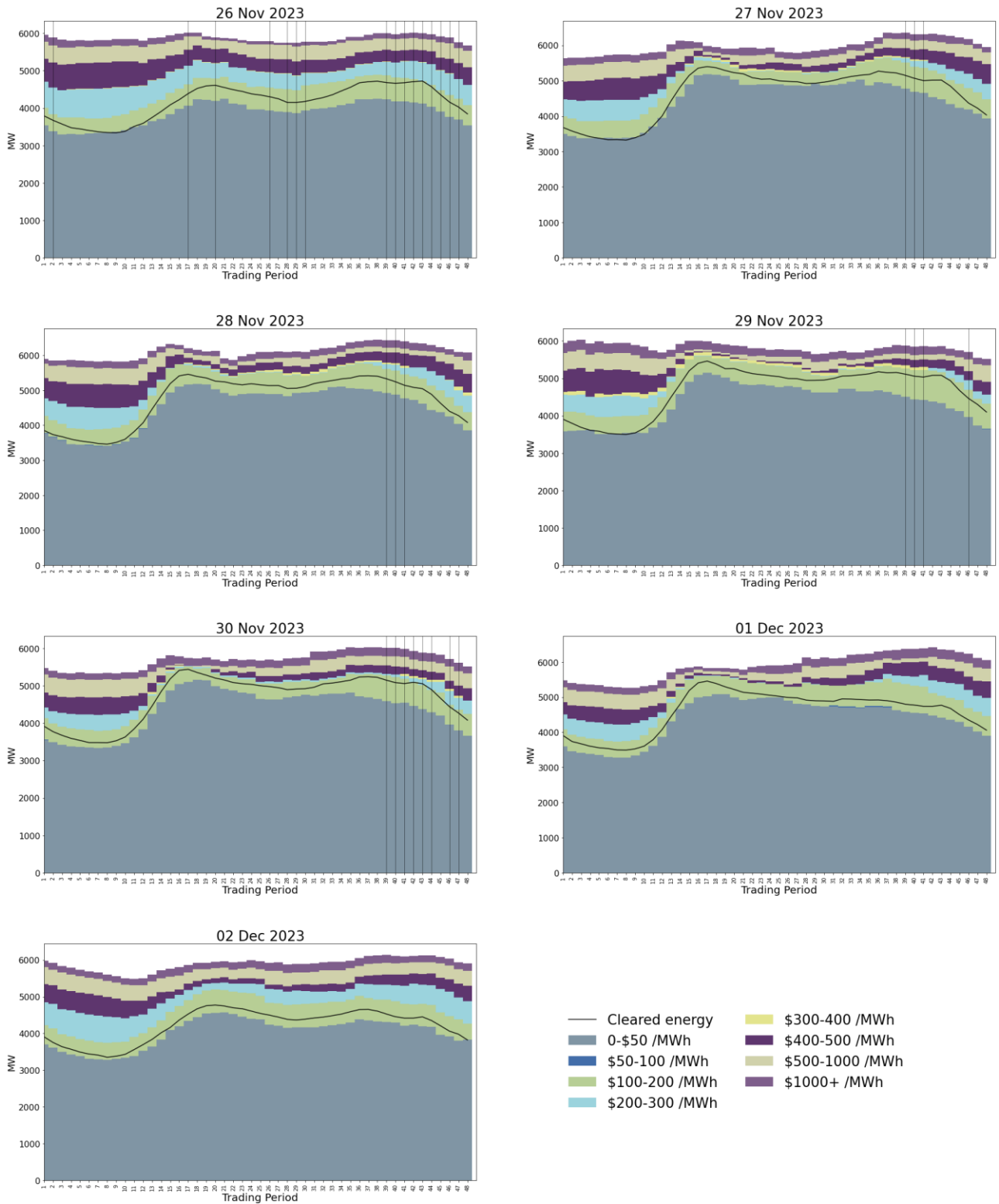


Source: Electricity Authority/see Appendix C

## 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. The majority of offers cleared in the \$100-\$200/MWh band, with a few offers clearing in the \$200-\$300/MWh region on Thursday evening where there was a spike in prices.

**Figure 20: Daily offer stacks**



Source: Electricity Authority

## 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**

<b>Date</b>	<b>TP</b>	<b>Status</b>	<b>Participant</b>	<b>Location</b>	<b>Enquiry topic</b>
<b>14/06/2023- 15/06/2023</b>	15-17/ 15-19	Passed to Compliance	Genesis	Multiple	High energy prices associated with high energy offers.
<b>15/06/2023</b>	15-19	Resolved	Contact	Multiple	No trading conduct issues were identified.
<b>22/09/2023- 30/09/2023</b>	Several	Further analysis	Contact	Multiple	High hydro offers.
<b>11/10/2023</b>	21	Further Analysis	Genesis	Tokaanu	High prices during off- peak time.