21 October 2024

Trading conduct report 13-19 October 2024

Market monitoring weekly report

Trading conduct report 13-19 October 2024

1. Overview

1.1. Prices increased this week in line with lower wind generation. Higher demand due to colder temperatures at the start of the week alongside lower wind generation saw hydro ramp up, particularly over the morning peak periods. There was also an increase to the proportion of generation from thermal, although this remains below 10% of the weekly generation. Hydro storage began to decrease with controlled storage ~109% of historic mean as of 19 October.

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, it also singles 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. Between 13-19 October 2024:

(a) the average wholesale spot price across all nodes was $106/MWh

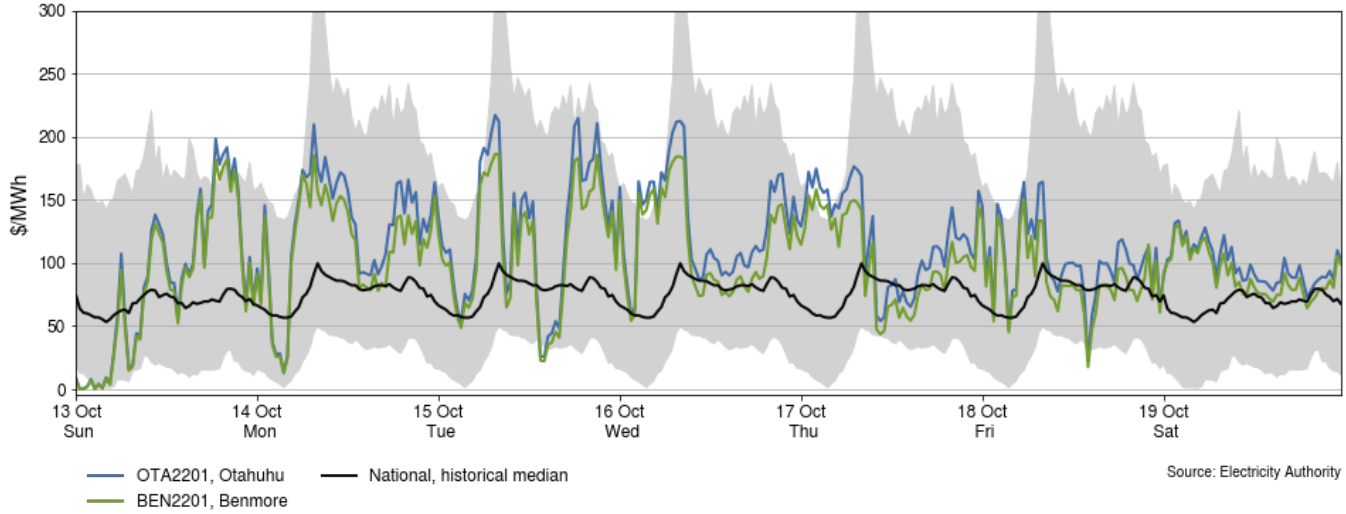
(b) 95% of prices fell between $8/MWh and $192/MWh.

2.3. Most spot prices this week were above the historic median but below the 90th percentile region. The weekly average price increase by around $80/MWh compared to the previous week.

2.4. Prices within $150-$200/MWh region generally occurred during peak periods. The increase in prices this week was likely due to the lower overall wind generation. There were also inaccuracies both in wind and demand forecasting. Demand was under forecast during several trading periods early in the week when prices were above $150/MWh.

2.5. Figure 1 shows the wholesale spot prices at Benmore and Ōtāhuhu alongside the national historic median and historic 10-90th percentiles adjusted for inflation. Prices greater than quartile 3 (75th percentile) plus 1.5 times the inter-quartile range of historic prices, plus the difference between this week's median and the historic median, are highlighted with a vertical black line. Other notable prices are marked with black dashed lines.

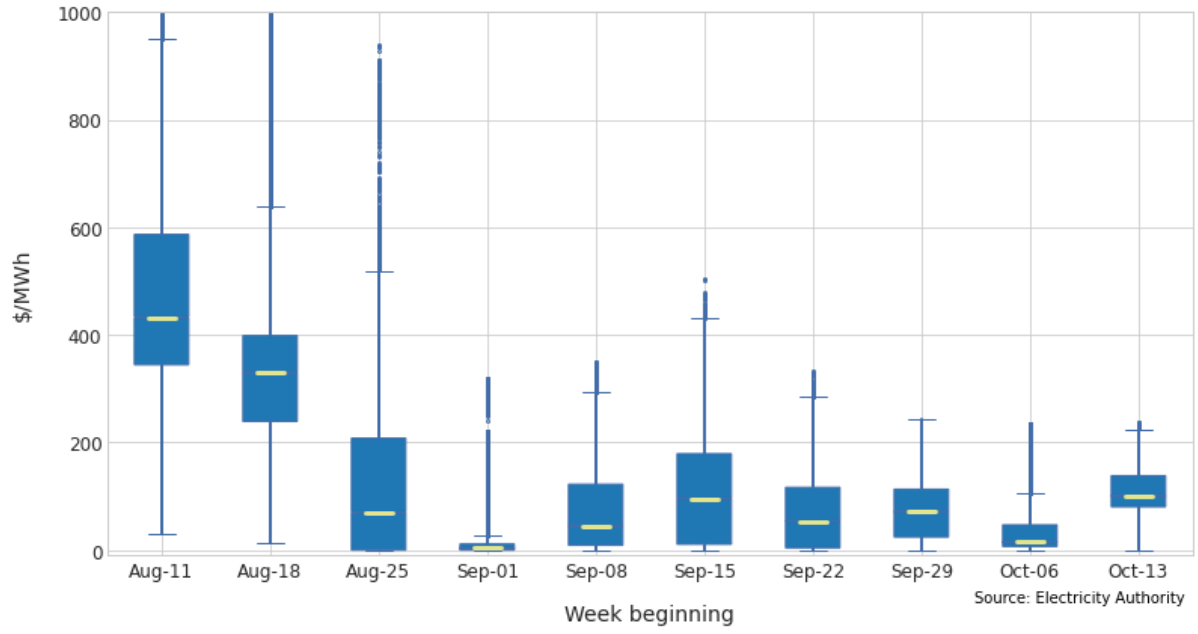
Figure 1: Wholesale spot prices at Benmore and Ōtāhuhu, 13-19 October 2024



2.6. Figure 2 shows a box plot with the distribution of spot prices during this week and the previous nine weeks. The yellow line shows each week's median price, while the blue box shows the lower and upper quartiles (where 50% of prices fell). The 'whiskers' extend to points that lie within 1.5 times of the interquartile range (IQR) of the lower and upper quartile. Observations that fall outside this range are displayed independently.

2.7. This week the distribution of prices was small, although there was a shift in prices with the middle 50% within $80-$138/MWh. The median price was ~$100/MWh which puts this week's median price higher than the median of the last seven weeks.

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

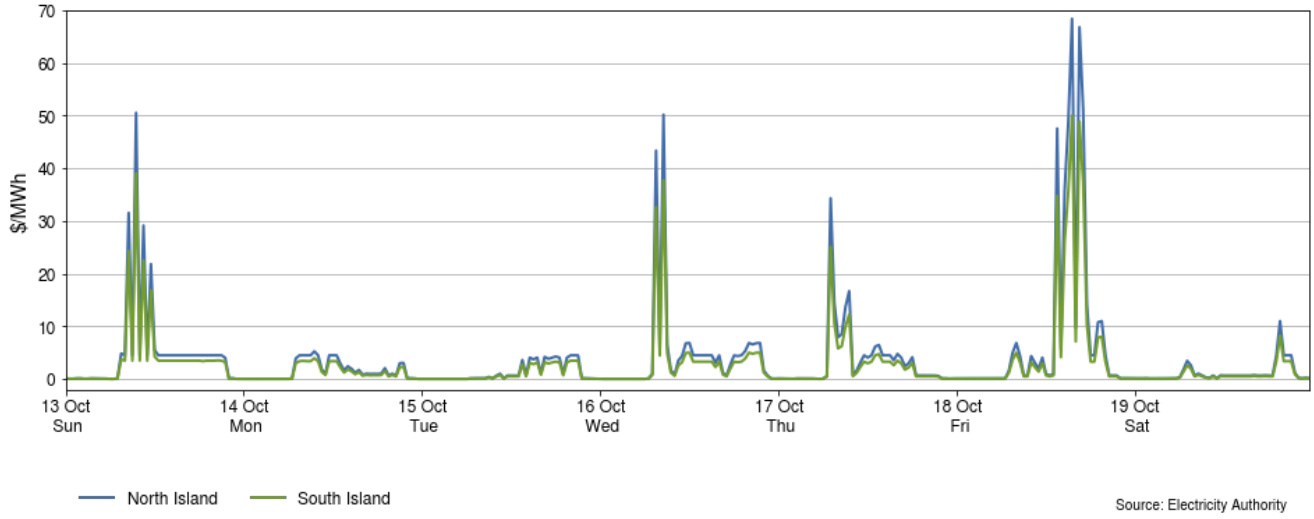


3. Reserve prices

3.1. Fast instantaneous reserve (FIR) prices for the North and South Islands are shown below in Figure 3. FIR prices were mostly below $10/MWh. There were some FIR spikes between $20-$68/MWh across the week. This mostly occurred when the risk needing to be covered

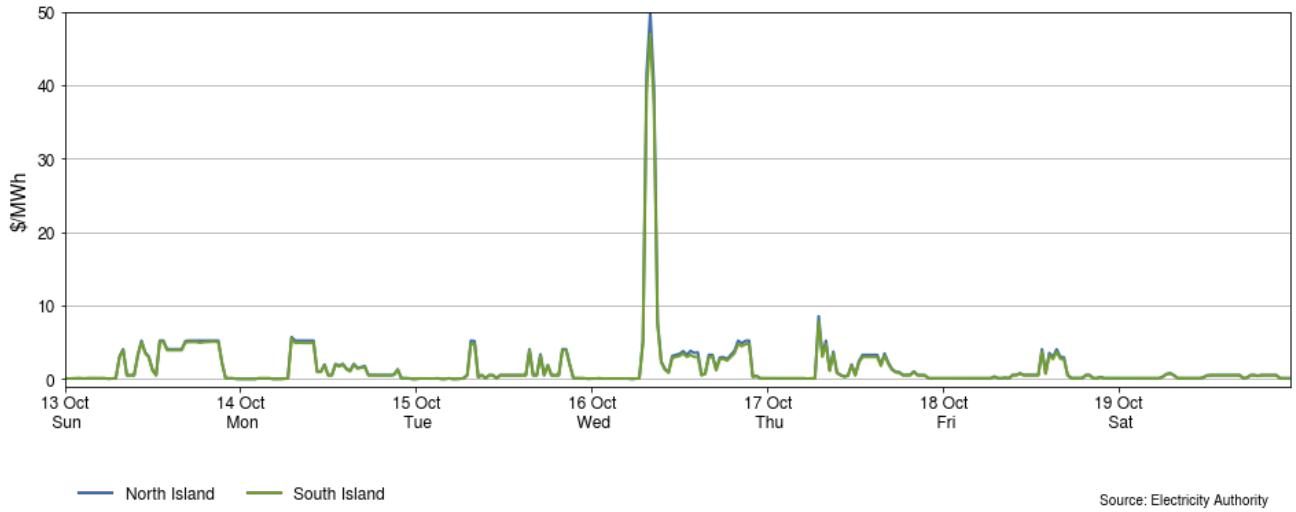
on Huntly 5 was high, and there were no additional thermal units running, which reduced the amount of reserve available in the market.

Figure 3: Fast instantaneous reserve price by trading period and island, 13-19 October 2024



3.2. Sustained instantaneous reserve (SIR) prices for the North and South Islands are shown in Figure 4. SIR prices were mostly less than $10/MWh apart from Wednesday, between 7.30am and 8.30am where SIR prices were between $37-$50/MWh.

Figure 4: Sustained instantaneous reserve by trading period and island, 13-19 October 2024



4. Regression residuals

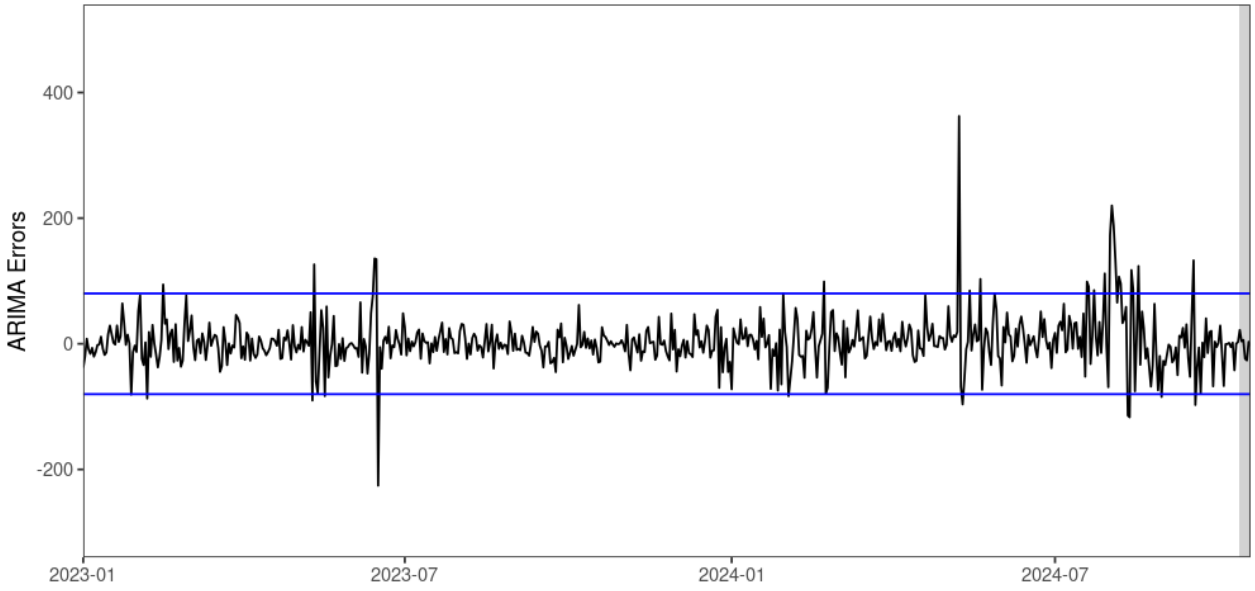
4.1. The Authority's monitoring team uses a regression model to model electricity spot prices. The residuals show how close predicted spot prices were to actual prices. Large residuals may indicate that prices do not reflect underlying supply and demand conditions. Details on the regression model and residuals can be found in Appendix A.

4.2. Figure 5 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 in the regression analysis.

4.3. This week all values were within two standard deviations of the data meaning prices were in line with what the model expected.

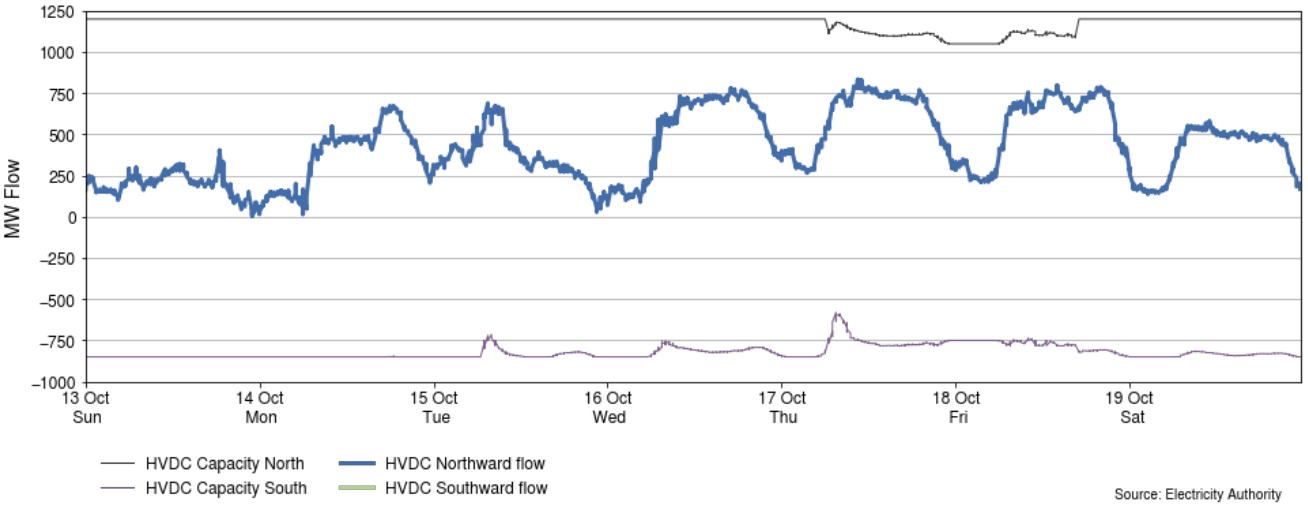
Figure 5: Residual plot of estimated daily average spot prices, 1 January 2023 - 19 October 2024



5. HVDC

5.1. Figure 6 shows the HVDC flow between 13-19 October 2024. HVDC flows were northwards the whole week. Flows northwards increased during times of low and/or over forecast wind generation.

Figure 6: HVDC flow and capacity, 13-19 October 2024

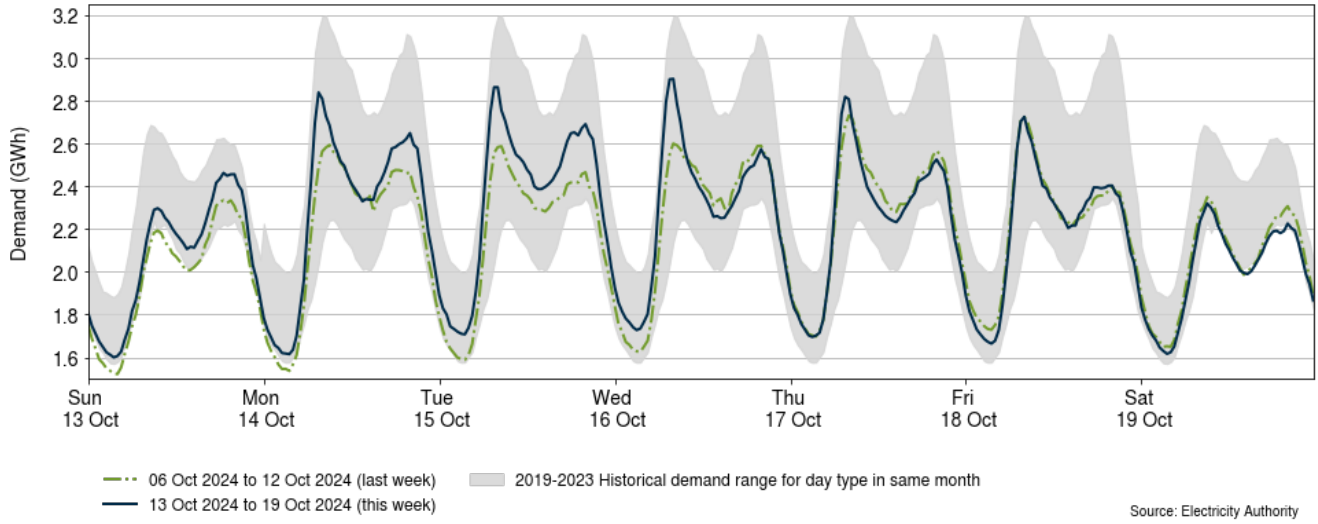


6. Demand

6.1. Figure 7 shows national demand between 13-19 October 2024, compared to the historic range and the demand of the previous week. Demand was within the historic range this

week. However, there was higher demand compared to recent weeks due to some colder weather across the country. Most weekday morning peaks were above 2.8GWh.

Figure 7: National demand, 13-19 October 2024 compared to the previous week

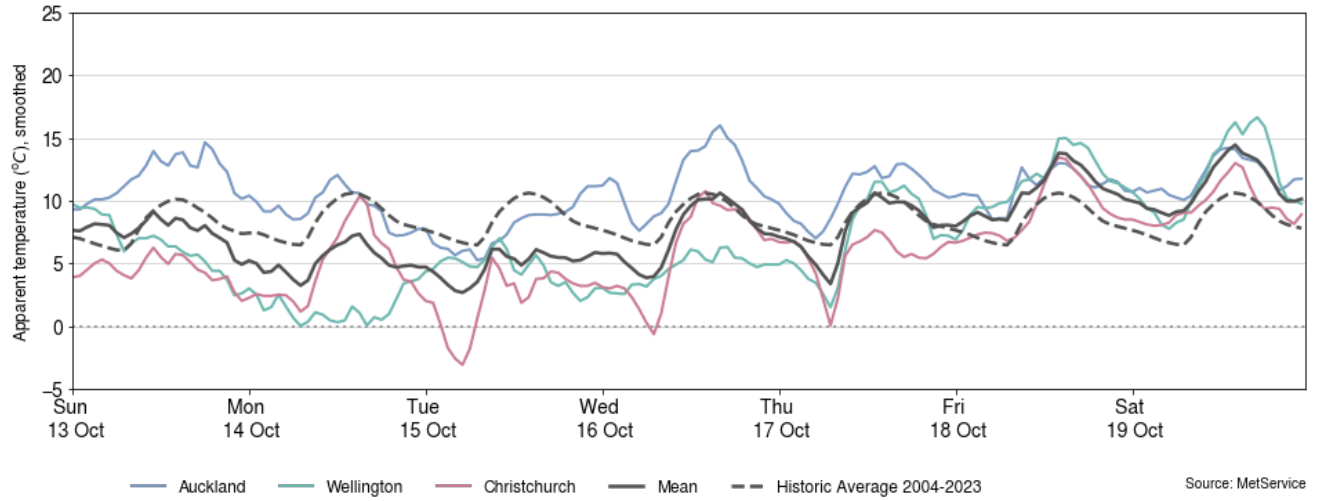


6.2. All main centres saw temperatures drop to single digits during this week. Particularly in Wellington, where temperatures were under 5°C most of Monday and Christchurch where mid-week morning temperatures were at or below 0°C. From Friday temperatures increased with temperatures back to double digits across all centres from Friday afternoon.

6.3. Figure 8 shows the hourly apparent temperature at main population centres from 13-19 October 2024. The apparent temperature is an adjustment of the recorded temperature that accounts for factors like wind speed and humidity to estimate how cold it feels. Also included for reference is the mean temperature of the main population centres, and the mean historical apparent temperature of similar weeks, from previous years, averaged across the three main population centres.

6.4. All main centres saw temperatures drop to single digits during this week. Particularly in Wellington, where temperatures were under 5°C most of Monday and Christchurch where mid-week morning temperatures were at or below 0°C. From Friday temperatures increased with temperatures back to double digits across all centres from Friday afternoon.

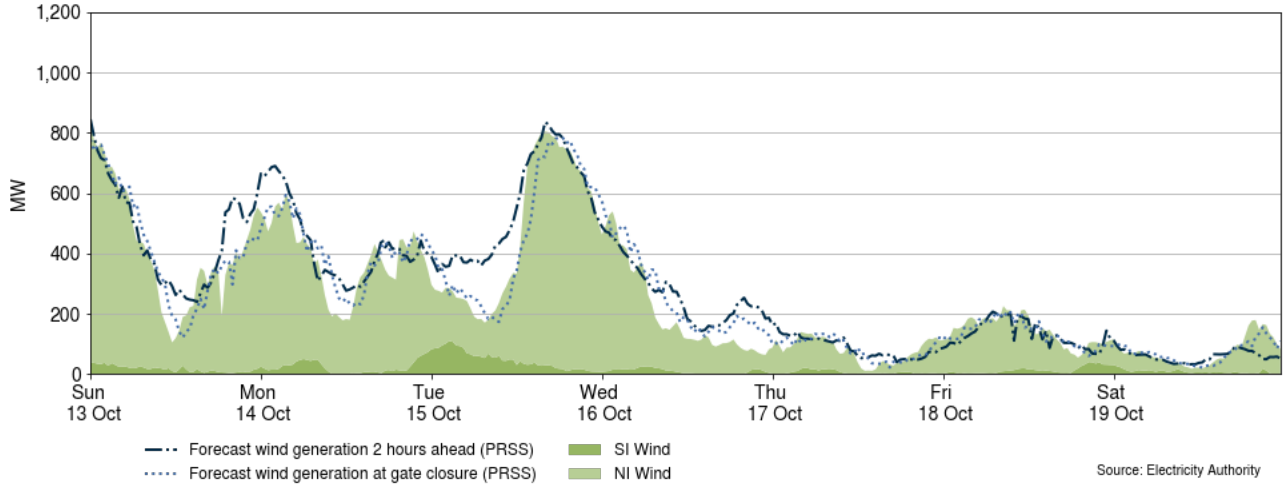
Figure 8: Temperatures across main centres, 13-19 October 2024



7. Generation

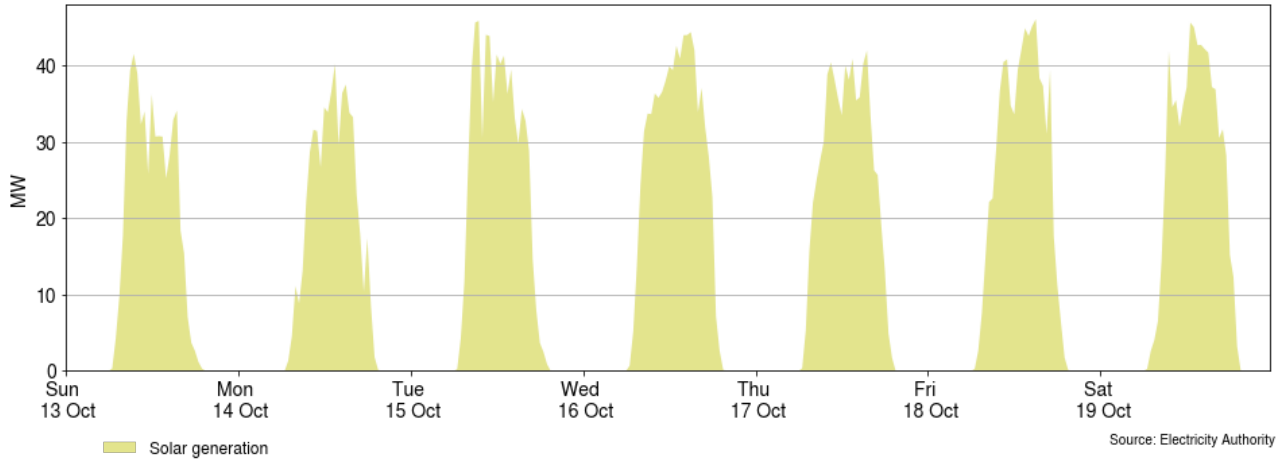
7.1. Figure 9 shows wind generation and forecast from 13-19 October 2024. This week wind generation was low, ranging between 11MW and 835MW across the week. From Thursday to Saturday daily average wind generation was below 150MW.

Figure 9: Wind generation and forecast, 13-19 October 2024



7.2. Figure 10 shows solar generation from 13-19 October 2024. Solar generation was mostly above 30MW across the week with each day seeing a maximum trading period average of over 40MW.

Figure 10: Solar generation, 13-19 October 2024



7.3. Figure 11 shows the difference between the national real-time dispatch (RTD) marginal price and a simulated marginal price where the real-time wind and demand matched the 1-hour ahead forecast (PRSS[1]) projections. The figure highlights when forecasting

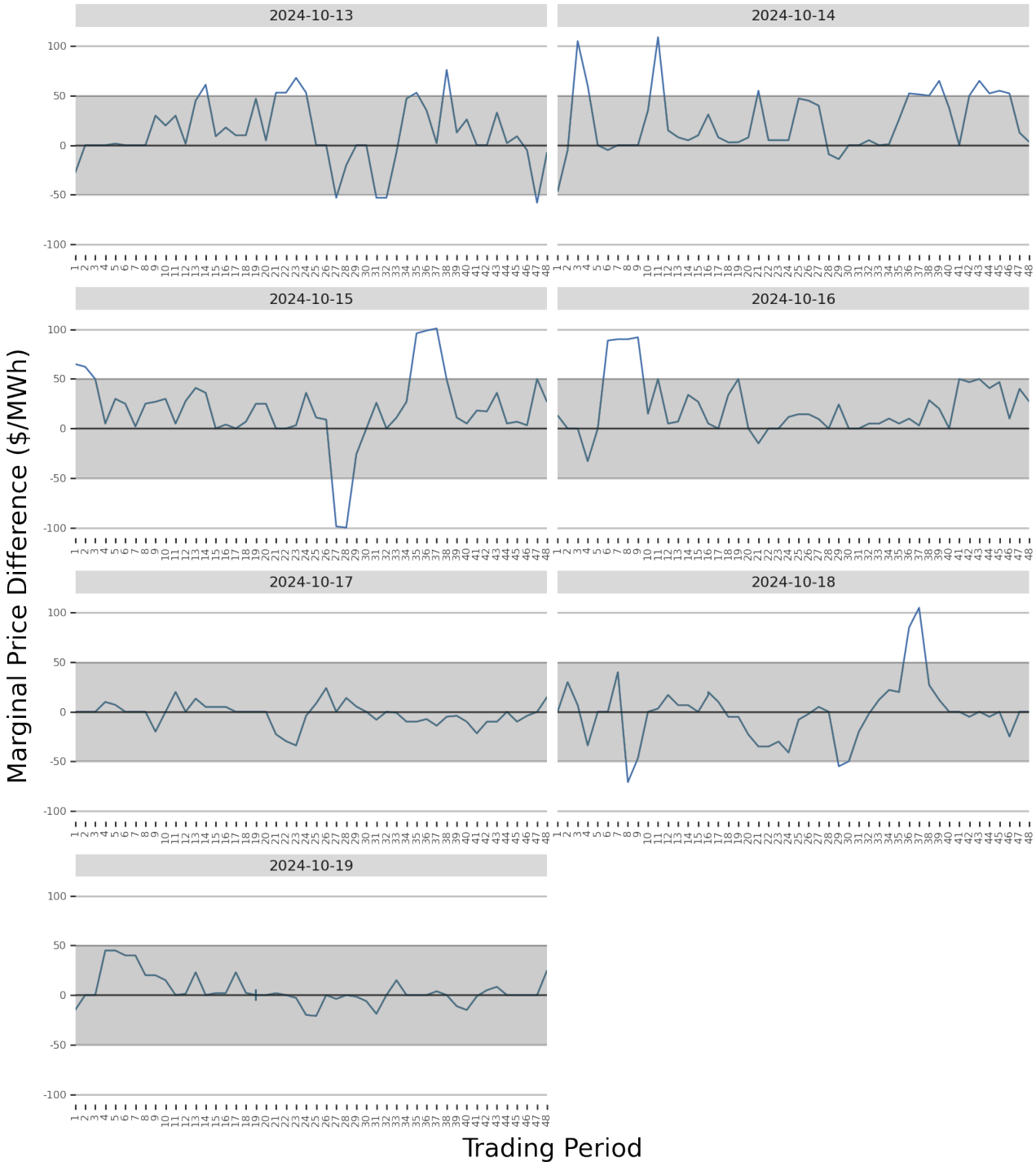
[1] Price responsive schedule short – short schedules are produced every 30 minutes and produce forecasts for the next 4 hours.

inaccuracies are causing large differences to final prices. When the difference is positive this means that the 1-hour ahead forecasting inaccuracies resulted in the spot price being higher than anticipated - usually here demand is under forecast and/or wind is over forecast. When the difference is negative, the opposite is true. Because of the nature of demand and wind forecasting, the 1-hour ahead and the RTD wind and demand forecasts will rarely be the same. Trading periods where this difference is exceptionally large can signal that forecasting inaccuracies had a large impact on the final price for that trading period.

7.4. There were only a few instances where differences were above $100/MWh this week. On Monday this was when demand was ~85MW under forecast and/or wind was over forecast between ~80-115MW at gate closure.

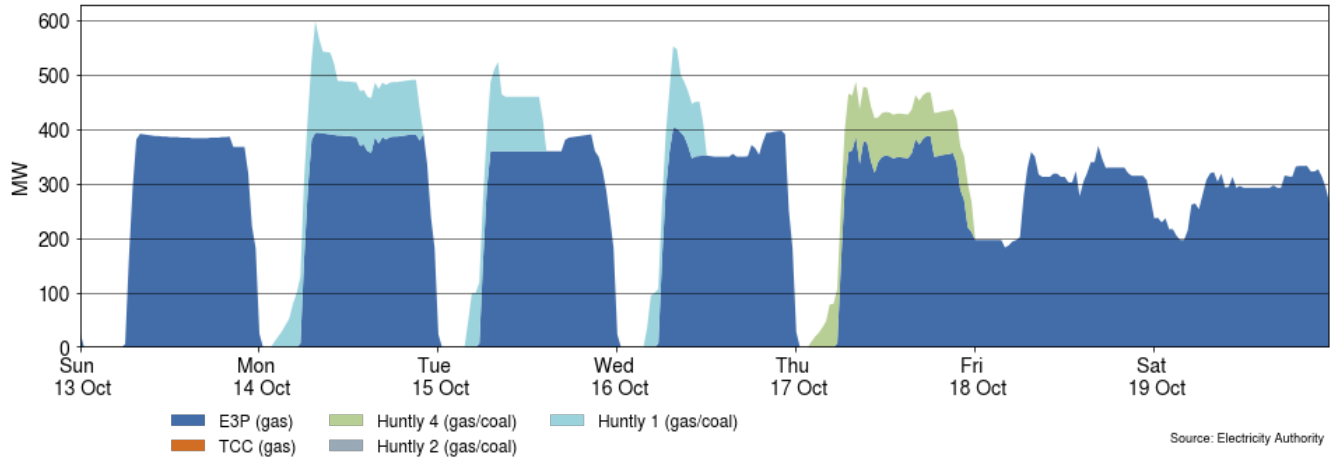
7.5. For the differences above $100/MWh on Tuesday and Friday, wind was over forecast by between ~30-35W and there was a large discrepancy in demand forecast, ~240MW on Tuesday and ~80MW on Friday.

Figure 11: Difference between national marginal RTD price and simulated RTD price, with the difference due to one-hour ahead wind and demand forecast inaccuracies, 13-19 October 2024



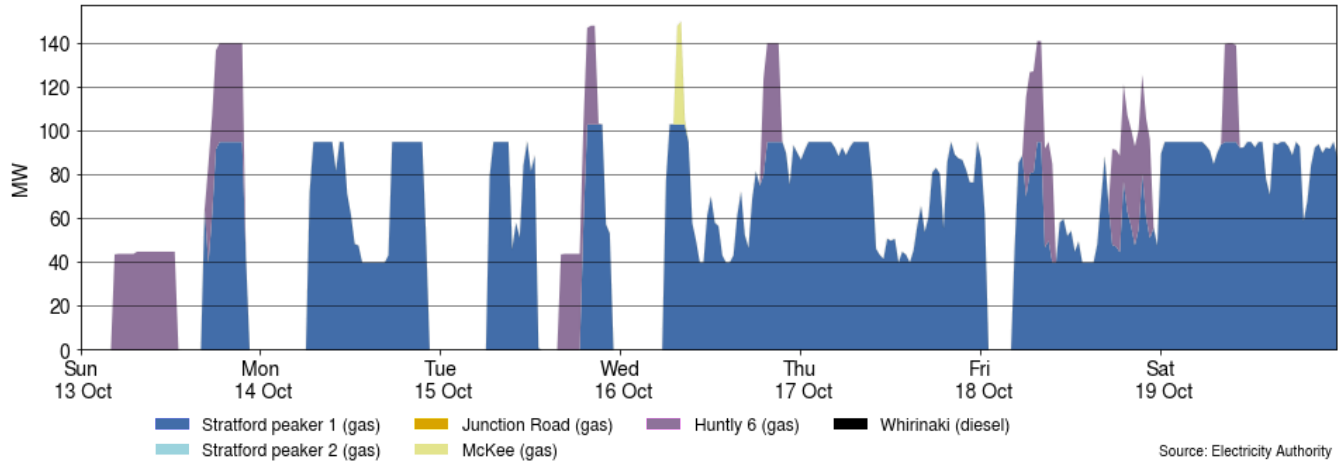
7.6. Figure 12 shows the generation of thermal baseload between 13-19 October 2024. Huntly 5 ran daily as baseload generation turning off overnight during the first part of the week before running continuously from Thursday morning. Huntly 1 or Huntly 4 supported baseload on weekdays, particularly during those high demand morning peak periods.

Figure 12: Thermal baseload generation, 13-19 October 2024



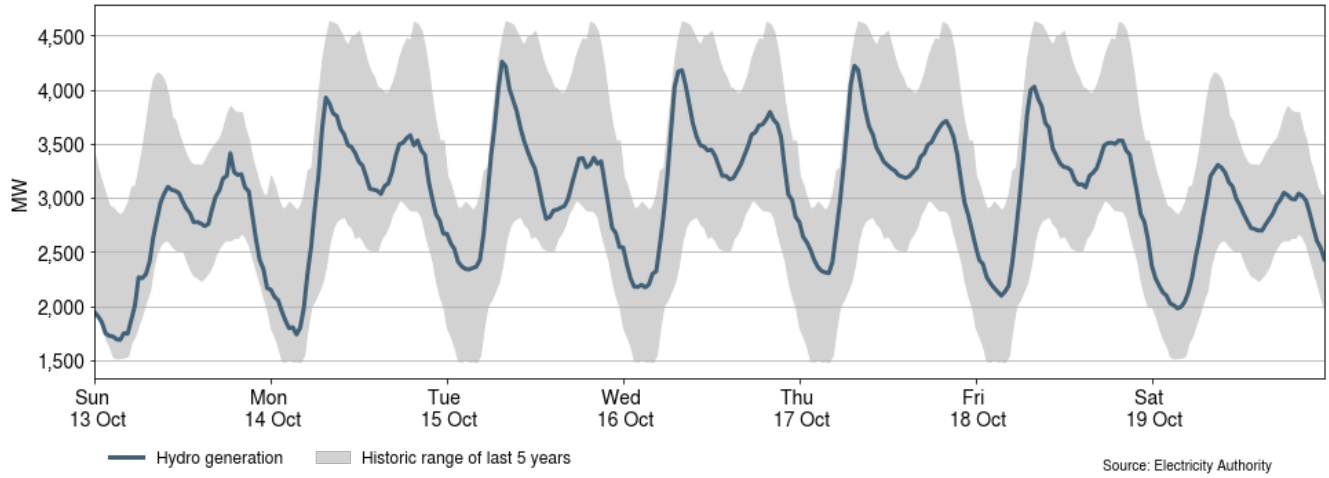
7.7. Figure 13 shows the generation of thermal peaker plants between 13-19 October 2024. Peaker generation came mostly from Stratford 1 with Huntly 6 and McKee generating for some peak periods across the week. Stratford 1 ran over the shoulder period on Monday as well as generating near continuously from Wednesday morning to Saturday, only turning off for a short period in the early hours on Friday.

Figure 13: Thermal peaker generation, 13-19 October 2024



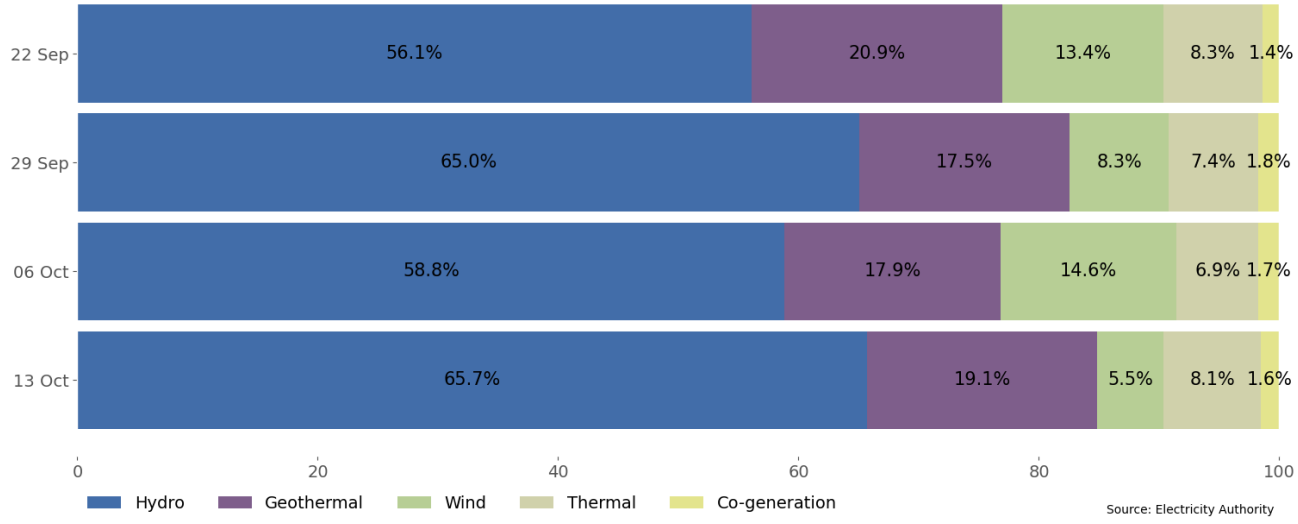
7.8. Figure 14 shows hydro generation between 13-19 October 2024. Overall, hydro generation was around the middle of the historic range this week. However, it got close to the higher end of the historic distribution mid-week, due to increased hydro generation during the weekday morning peaks.

Figure 14: Hydro generation, 13-19 October 2024



7.9. As a percentage of total generation, between 13-19 October 2024, total weekly hydro generation was 65.7%, geothermal 19.1%, wind 5.5%, thermal 8.1%, and co-generation 1.6%, as shown in Figure 15. Both hydro and thermal generation proportions increased this week due to less wind generation.

Figure 15: Total generation by type as a percentage each week, 22 September and 19 October



8. Outages

8.1. Figure 16 shows generation capacity on outage. Total capacity on outage between 13-19 October 2024 ranged between ~1342MW and ~1935MW. Figure 17 shows the thermal generation capacity outages.

8.2. Notable outages include:

(a) Huntly 2 is on outage 3 October – 6 December.

(b) Huntly 4 was on outage 3-13 October.

(c) Stratford 2 is on outage until 30 October.

(d) Whirinaki Station was on a short outage 14 and 18 October; Whirinaki unit 2 was on outage between 14-18 October.

(e) West Wind station had multiple short outages over 18-19 October (due to bringing the new transformer online to bring the wind farm back to full capacity).

(f) Two Te Mihi geothermal units are on outage until 21 and 24 October respectively.

(g) Several hydro units are on outage including larger South Island units at Ohau station, Takapō, Manapōuri and Clyde.

Figure 16: Total MW loss from generation outages, 13-19 October 2024

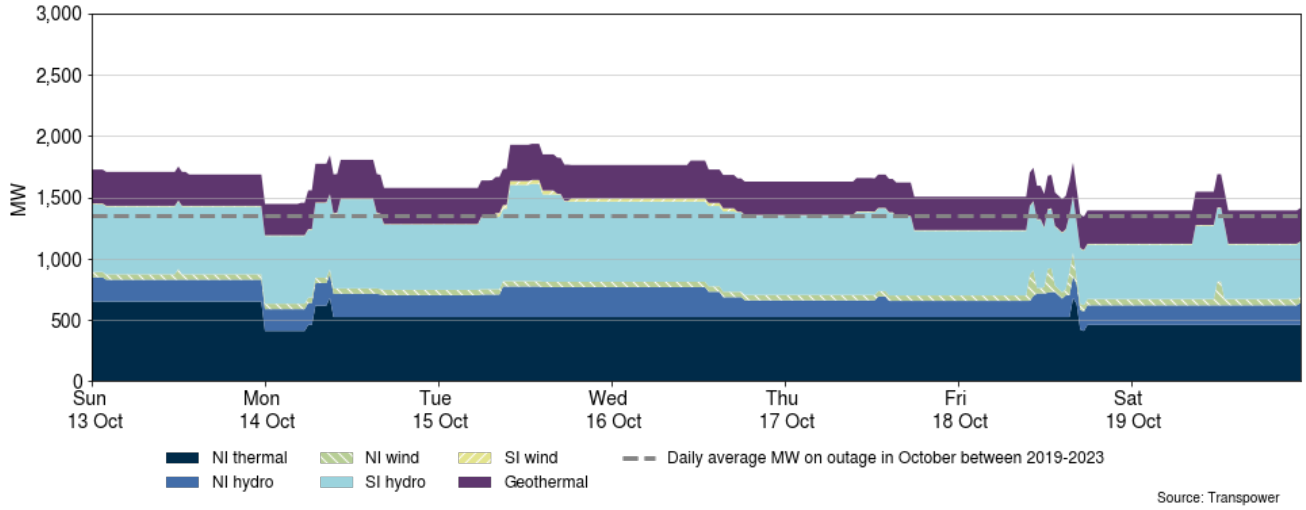
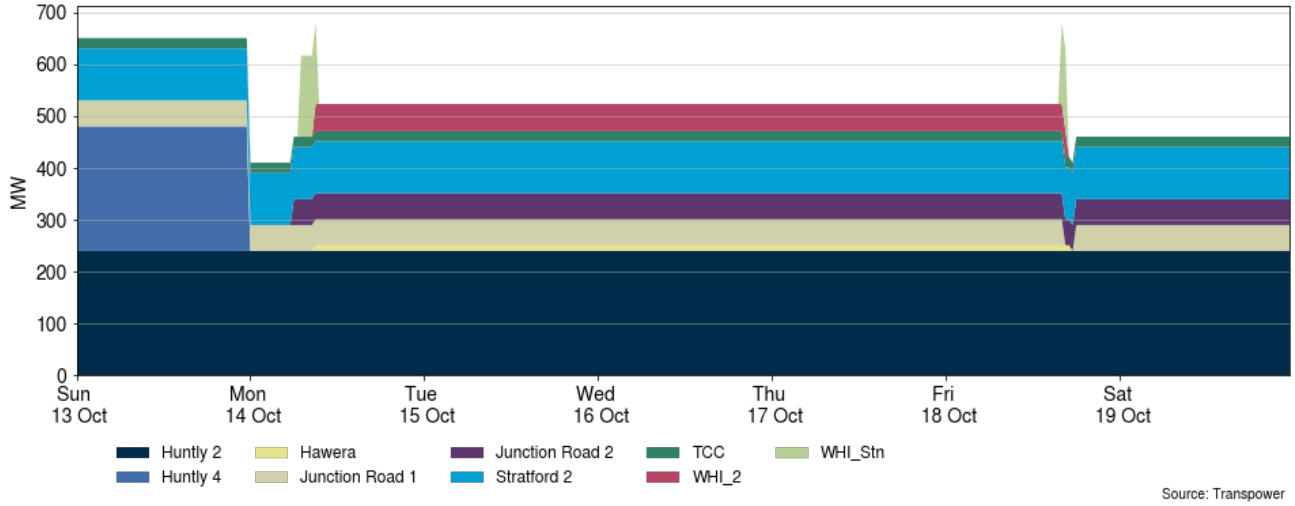


Figure 17: Total MW loss from thermal outages, 13-19 October 2024

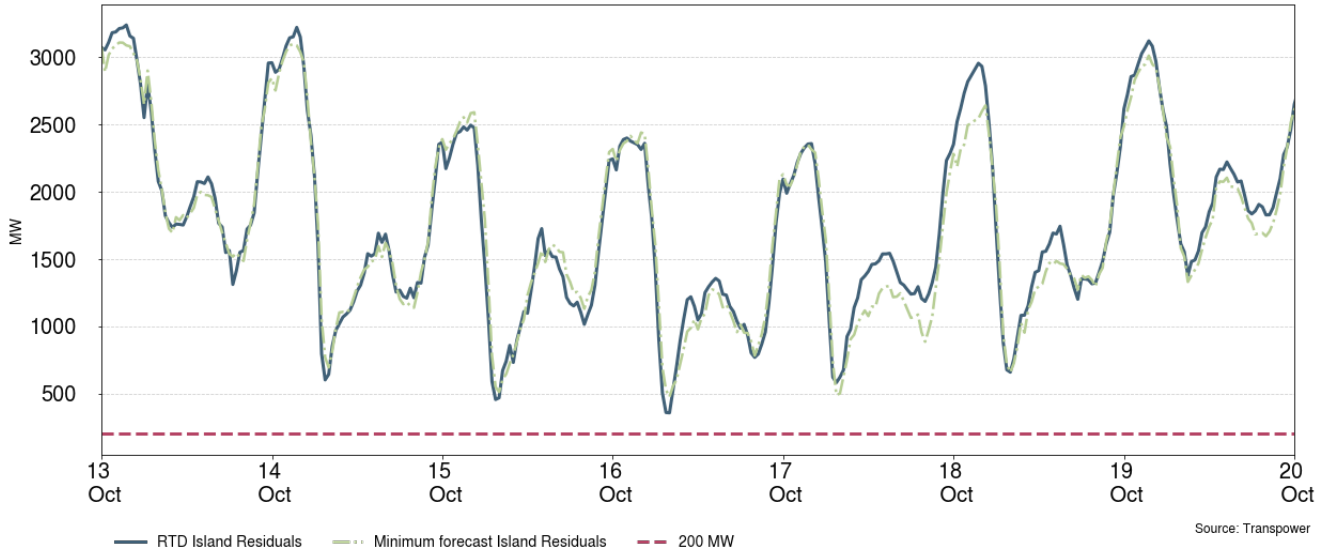


9. Generation balance residuals

9.1. Figure 18 shows the national generation balance residuals between 13-19 October 2024. A residual is the difference between total energy supply and total energy demand for each trading period. The red dashed line represents the 200MW residual mark which is the threshold at which Transpower issues a customer advice notice (CAN) for a low residual situation. The green dashed line represents the forecast residuals, and the blue line represents the real-time dispatch (RTD) residuals.

9.2. Generation balance residuals were healthy this week, with minimum residual generation of ~357MW during the morning peak on Wednesday. At this same time North Island residuals were ~189MW.

Figure 18: National generation balance residuals, 13-19 October 2024



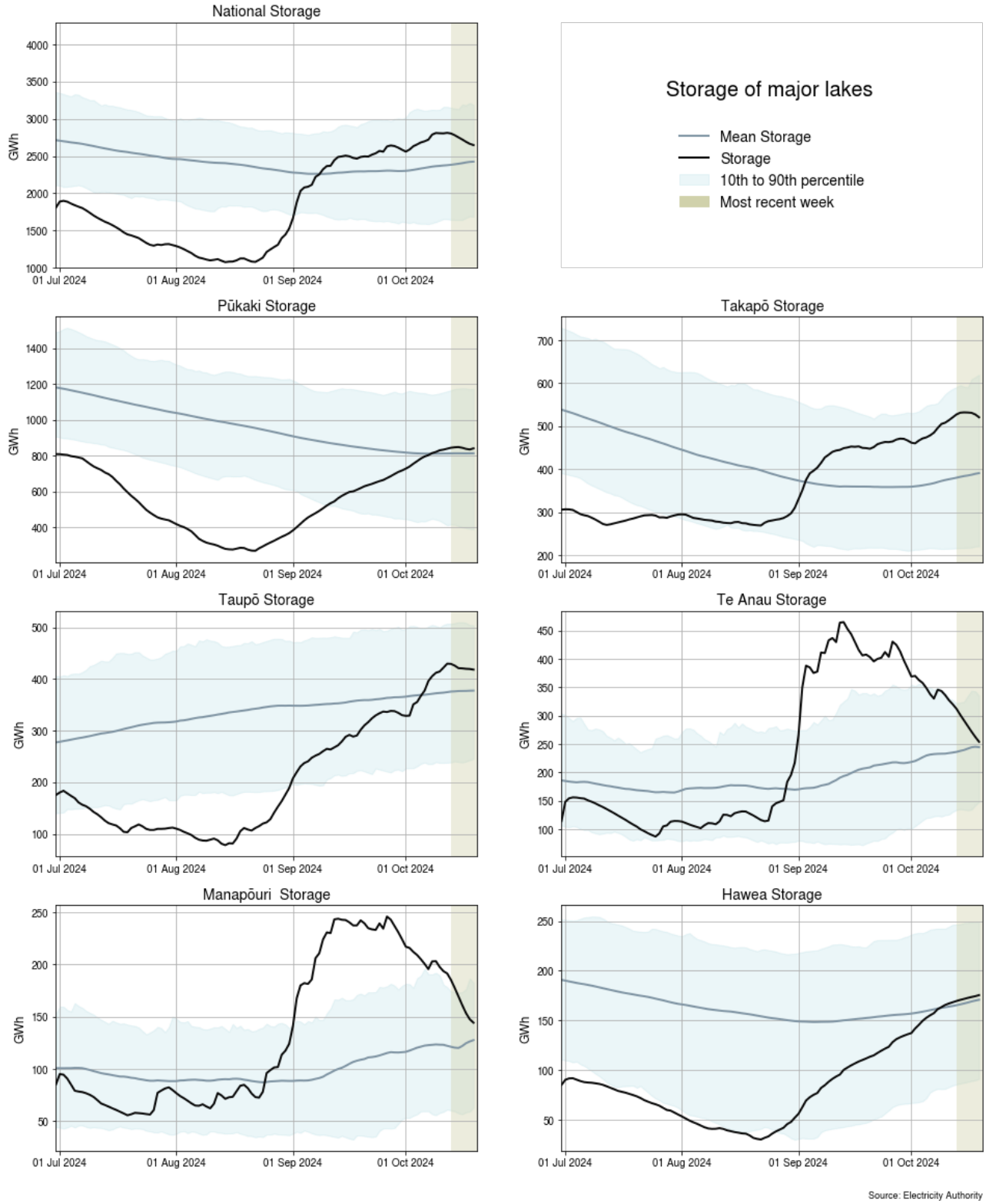
10. Storage/fuel supply

10.1. Figure 19 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.

10.2. National controlled storage decreased over the week and as of 19 October controlled storage was ~67% nominally full and ~109% of the historical average for this time of the year.

10.3. Taupō storage was relatively steady and remains above historic mean. Pūkaki and Hawea remain just above their respective historic means. Takapō began to decrease this week but remains well above its mean value. Manapōuri and Te Anau have both decreased and are now below their respective 90th percentile regions and approaching their mean.

Figure 19: Hydro storage



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. shows an estimate of thermal SRMCs as a monthly average up to 1 October 2024. The SRMC for gas has increased slightly from the previous month, while the coal SRMC and diesel SRMC have remained stable.

11.4. The latest SRMC of coal-fuelled Rankine generation is ~$167/MWh. The cost of running the Rankines on gas remains less expensive at ~$117/MWh.

11.5. The SRMC of gas fuelled thermal plants is currently between ~$78/MWh and ~$117/MWh.

11.6. The SRMC of Whirinaki is ~$511/MWh.

11.7. More information on how the SRMC of thermal plants is calculated can be found in Appendix C.

11.8. Figure 20 shows an estimate of thermal SRMCs as a monthly average up to 1 October 2024. The SRMC for gas has increased slightly from the previous month, while the coal SRMC and diesel SRMC have remained stable.

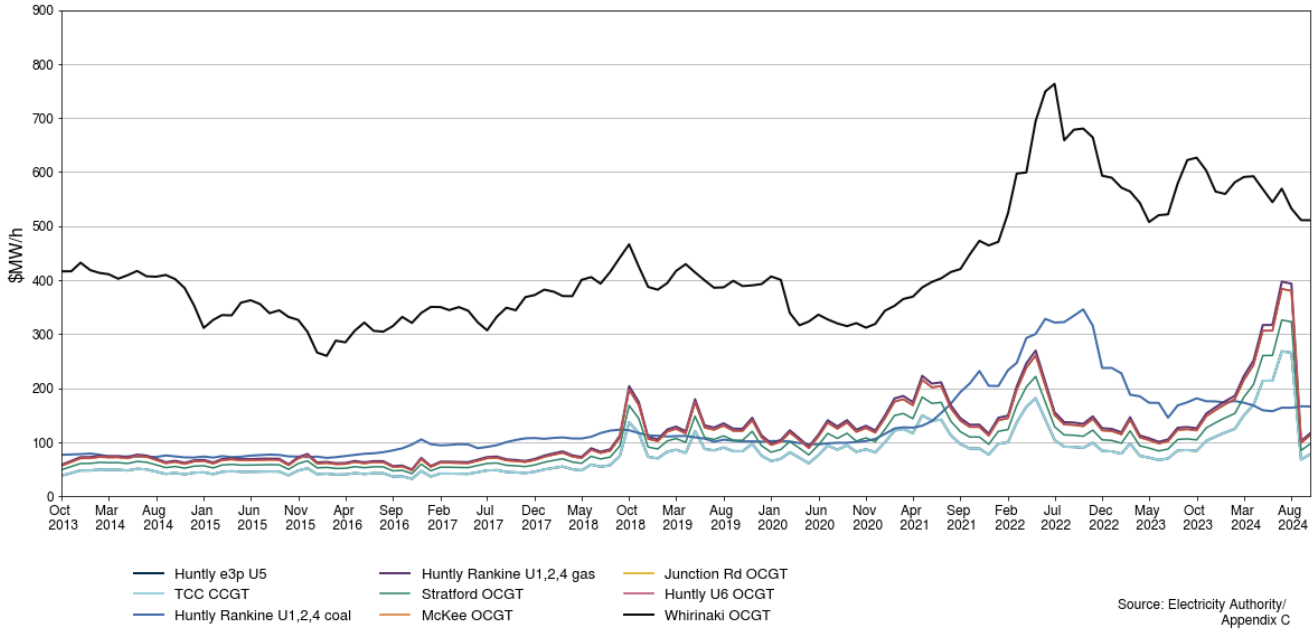
11.9. The latest SRMC of coal-fuelled Rankine generation is ~$167/MWh. The cost of running the Rankines on gas remains less expensive at ~$117/MWh.

11.10. The SRMC of gas fuelled thermal plants is currently between ~$78/MWh and ~$117/MWh.

11.11. The SRMC of Whirinaki is ~$511/MWh.

11.12. More information on how the SRMC of thermal plants is calculated can be found in Appendix C.

Figure 20: Estimated monthly SRMC for thermal fuels

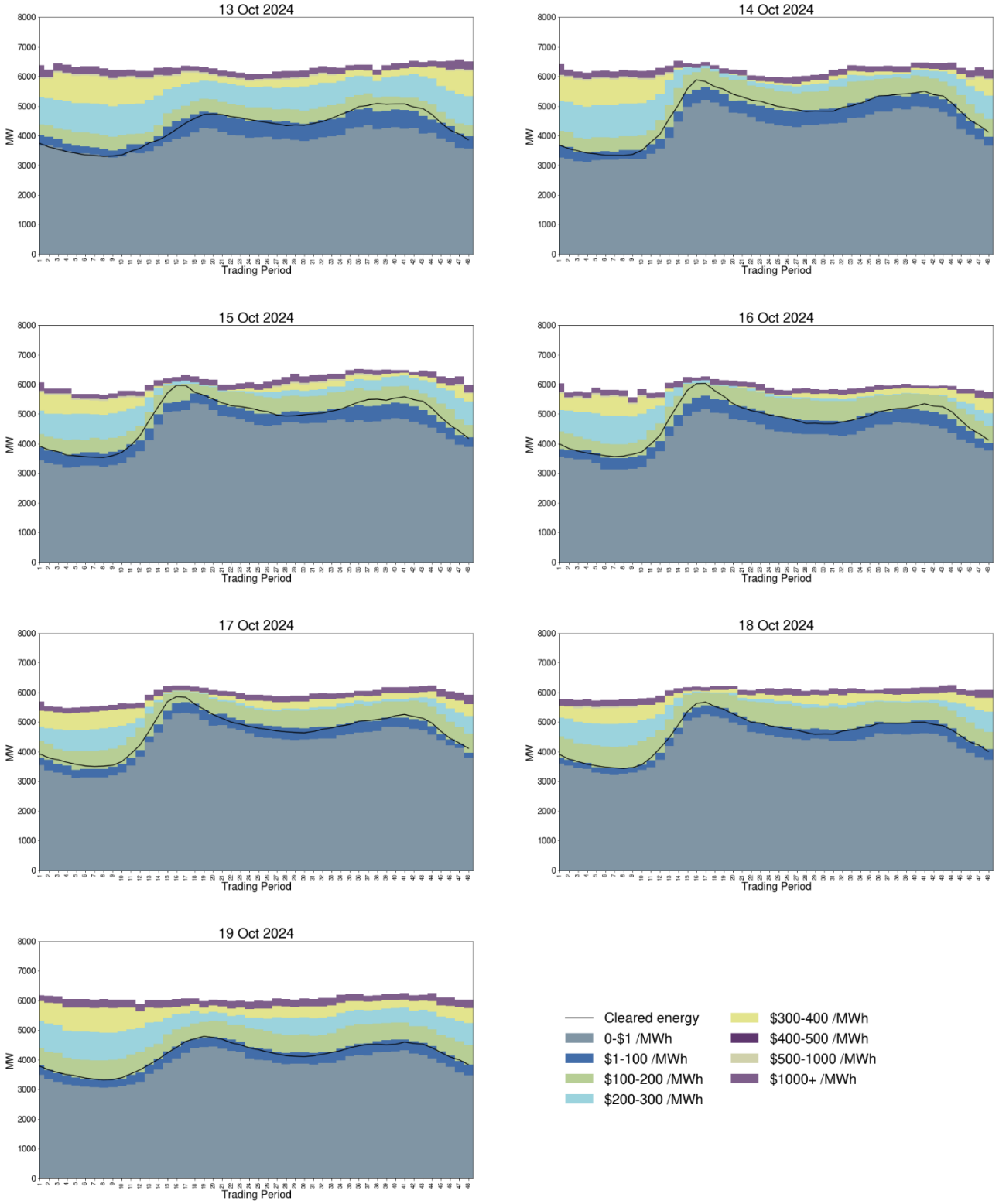


12. Offer behaviour

12.1. Figure 21 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 within the $100-$200/MWh band this week. There continues to be increased offers within the $50-$200/MWh range with much thinner stacks in the offers above $400/MWh. This is likely due to hydro remaining close to historic mean levels and the continued availability of gas.

Figure 21: 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	Trading period	Status	Participant	Location	Enquiry topic
14/06/2023-15/06/2023	15-17/ 15-19	Passed to Compliance for advice	Genesis	Multiple	High energy prices associated with high energy offers
22/09/2023-30/09/2023	Several	Passed to Compliance for advice	Contact	Multiple	High hydro offers
1/07/2024-23/08/2024	Several	These trading periods are now part of a s16 review	N/A	N/A	High energy prices
3-4/09/2024 and 13-18/09/2024	Several	Further analysis	Contact Energy	Clutha scheme	Hydro offers