

Trading Conduct Report

Market Monitoring Weekly Report

1. Overview for the week of 15-21 January 2023

- 1.1. Most spot prices between 15-21 January 2023 appear to be consistent with market conditions, however, further analysis of hydro offers is underway.

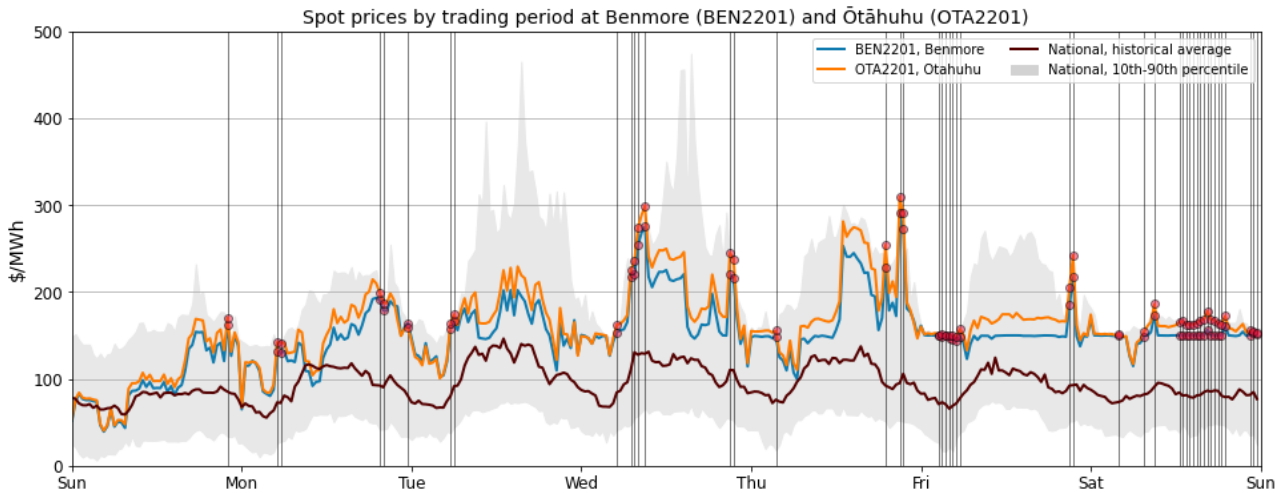
2. Spot Prices

- 2.1. This report monitors underlying wholesale price drivers to assess whether there are trading periods that require further analysis for the purpose of considering 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 exceeds its historical 90th percentiles.
- 2.2. Between 15-21 January 2023:
 - (a) The average wholesale spot price across all nodes was \$155/MWh.
 - (b) 95 per cent of prices fell between \$63/MWh and \$258/MWh.
- 2.3. Figure 1 shows spot prices at Benmore and Ōtāhuhu alongside their historic median and historic 10th- 90th percentiles adjusted for inflation.
- 2.4. Both peak and off-peak prices increased this week, with many instances of prices above the 90th historic percentile¹ - especially during off-peak. Prices were continuously above the historic average price, with prices flatlining at around \$150/MWh on Friday and Saturday. These are the highest spot prices seen in recent months.
- 2.5. The highest Benmore/Ōtāhuhu price occurred on Thursday 19 January, at 9:00 pm. The price at Ōtāhuhu was \$309/MWh and the price at Benmore was \$290/MWh.
- 2.6. The increased peak and off-peak prices occurred as demand continued to increase, as many continue to return from holiday, high temperatures likely increased air-conditioning load, and low rainfall increased load from irrigation. Furthermore, generation from wind was low, and hydro generation has been ramped back, in order to conserve water for a potentially dry summer and autumn (and especially to conserve North Island water for the February HVDC outage). Generation from Manapōuri particularly has reduced as lake levels there continue to fall. Thermal generation subsequently increased to its highest level in recent months.
- 2.7. Note, on Thursday and Friday there were negative final prices at ROX1101 which was due to a spring washer², with subsequent high prices at BDE111, while Invercargill-Roxburgh circuit 1 was on outage.

¹ For historic January prices (excluding the first 14 days)

² More information can be found here [Learning centre | Transpower](#)

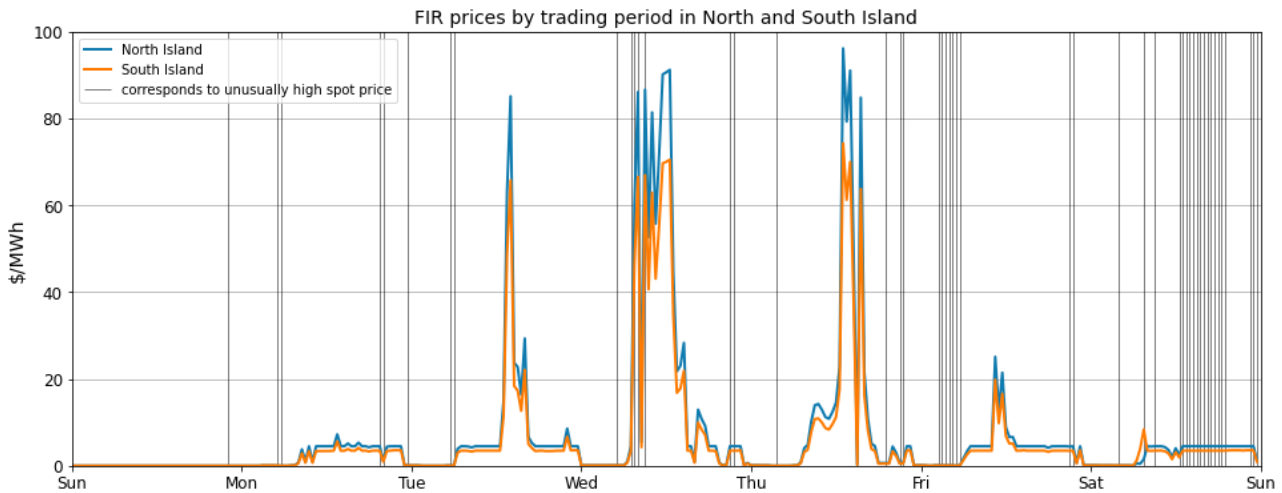
Figure 1: Wholesale Spot Prices between 15-21 January 2023



3. Reserve Prices

3.1. Fast instantaneous reserve (FIR) prices for the North and South Island are shown below in Figure 2. This week there were multiple times where both North and South Island FIR prices were above \$20/MWh, however, most of these instances did not coincide with high spot prices

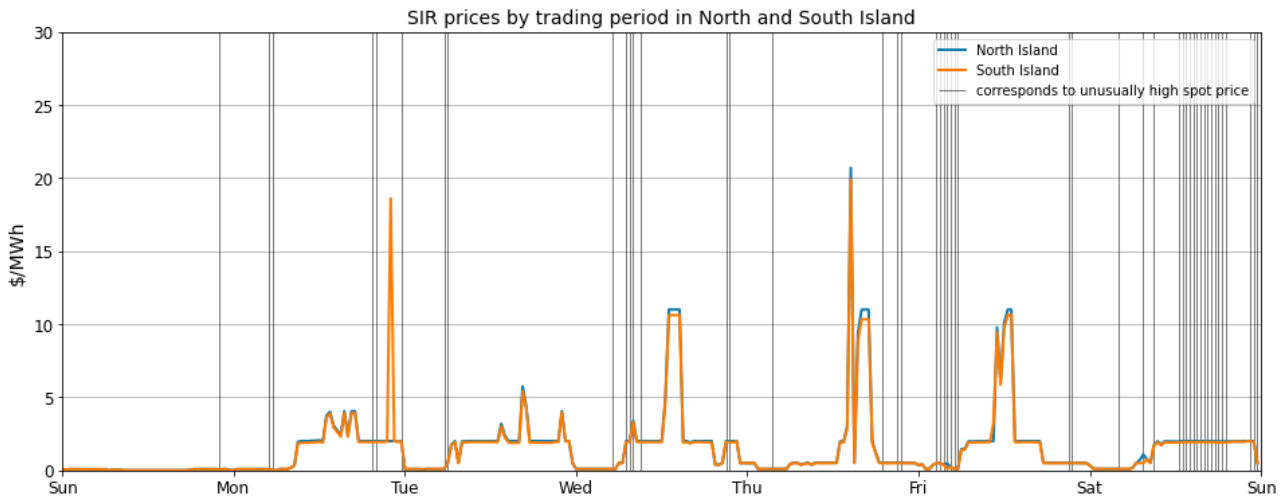
Figure 2: FIR prices by trading period and Island



3.2. Sustained instantaneous reserve (SIR) prices for the North and South Island are shown in Figure 3. Some North and South Island SIR prices were above \$20/MWh, but like FIR prices, most did not occur when spot prices were high.

3.3. Instances of high SIR and FIR prices likely arose from E3P running in the North Island and which required higher amounts of reserves to cover the risk of an E3P trip.

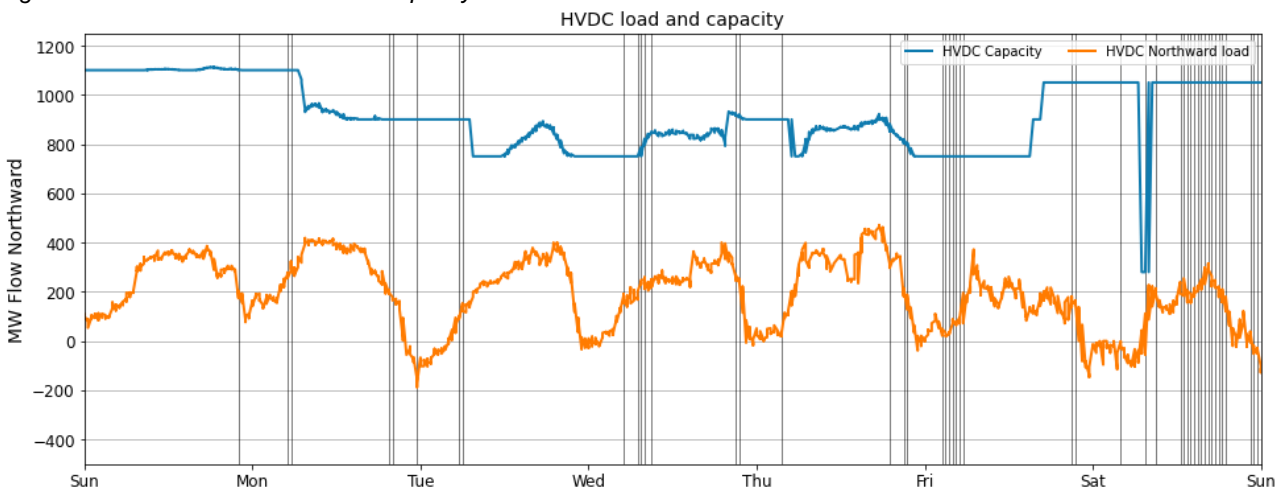
Figure 3: SIR prices by trading period and Island



4. HVDC

- 4.1. Figure 4 shows northward HVDC flow between 15-21 January 2023. HVDC flow was mostly Northward this week, but gradually declined in magnitude, with only around 200 MW sent north during the day on Friday and Saturday. There was Southward flow overnight on Tuesday and Friday.

Figure 4: HVDC northward flow and capacity

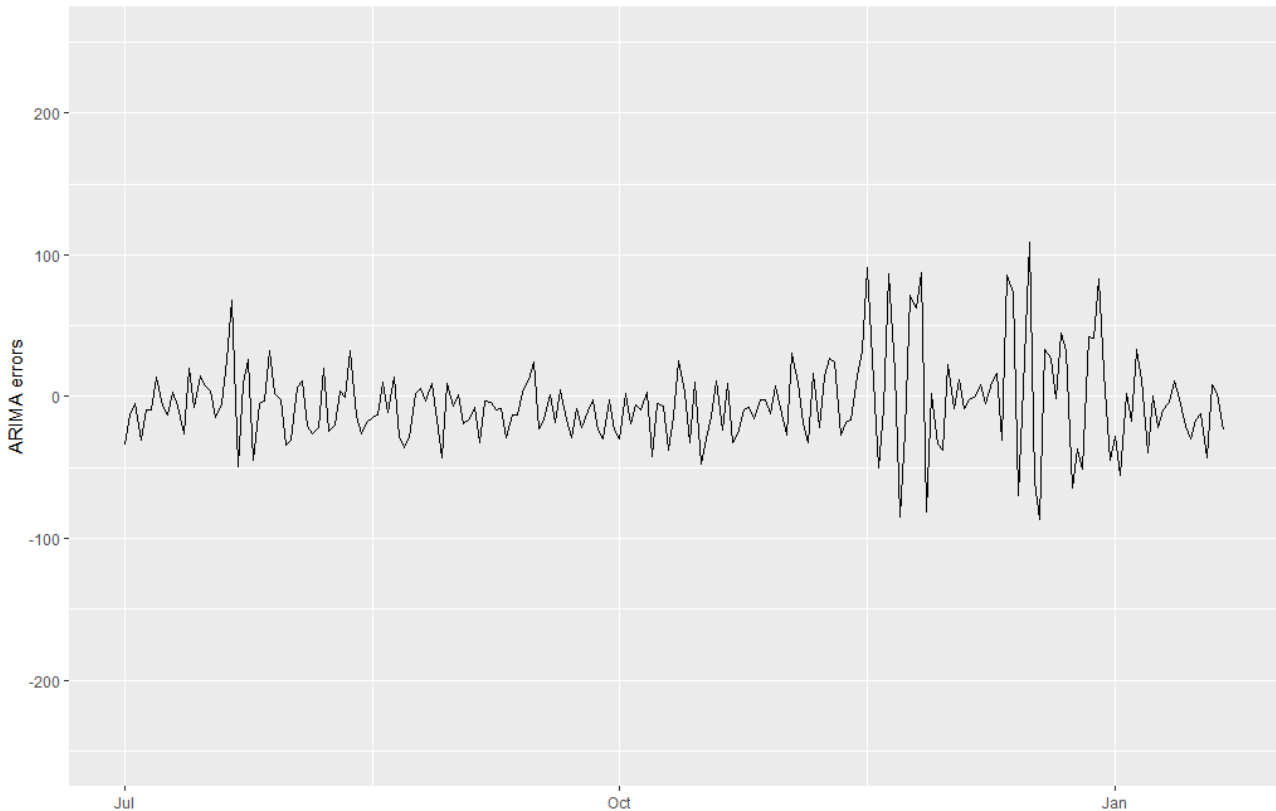


5. Regression Residuals

- 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 A³ on the trading conduct webpage.
- 5.2. Figure 5 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Residuals were relatively small, suggesting that prices on those dates appear to be largely aligned with market conditions.

³ <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-A-Regression-Analysis.pdf>

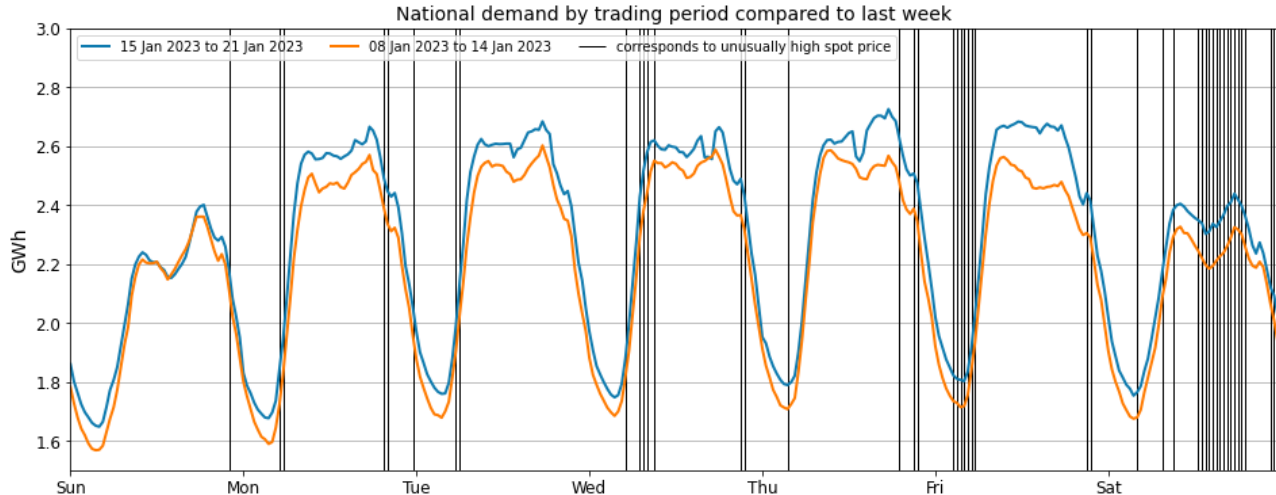
Figure 5: Residual plot of estimated daily average spot prices from 1 July 2022 – 21 January 2023



6. Demand

6.1. Figure shows national grid demand between 15-21 January 2023, compared to the previous week. Daily demand increased again this week as more people returned from holiday, temperatures across the country were high, and continued dry weather increased load from irrigation.

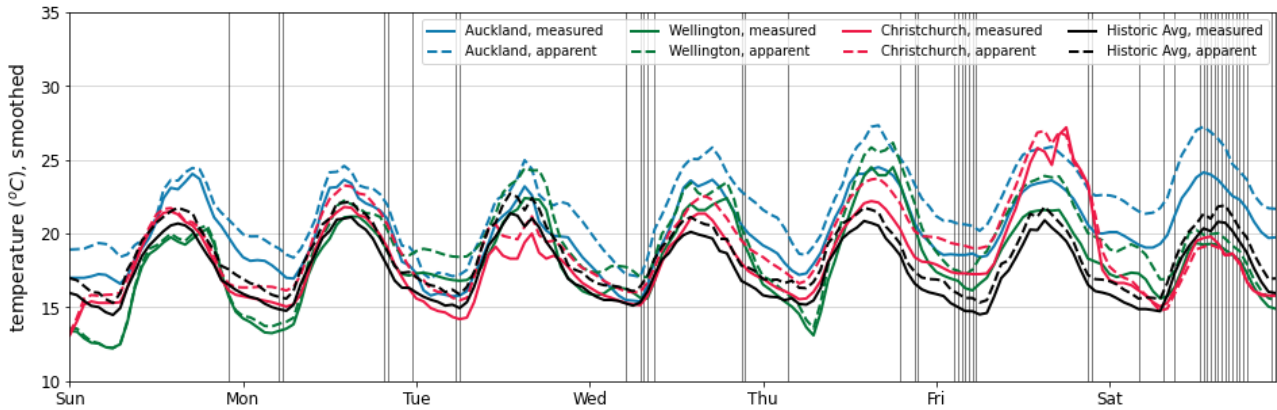
Figure 6: National demand by trading period compared to the previous week



6.2. Figure 7 shows hourly temperature at main population centres. 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. Between 15-21 January, temperature across all main centres were mostly above the historic average, at between 12-27 degrees. Temperatures were particularly high towards the end of the week.

Figure 7: Temperatures across main centres



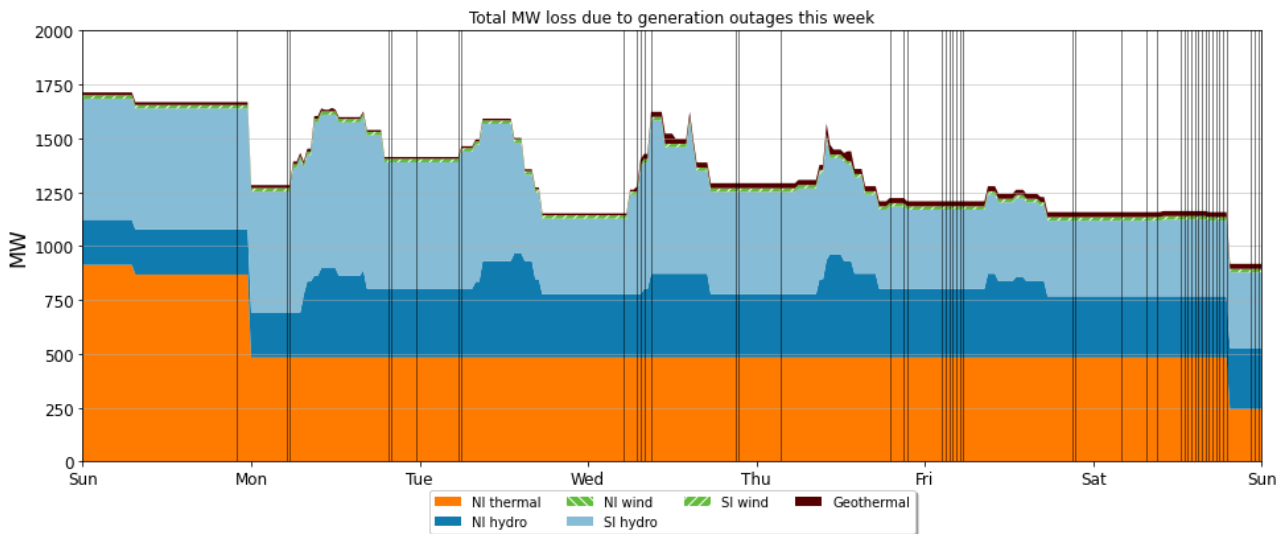
7. Outages

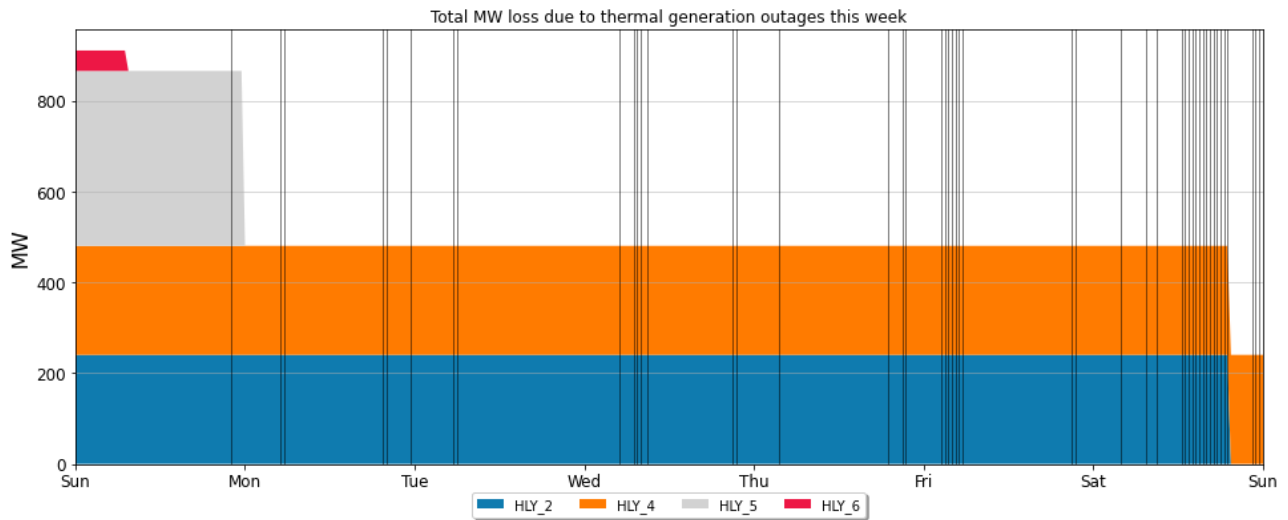
7.1. Figure 8 shows generation capacity on outage. Total capacity on outage between 15-21 January 2023 ranged between ~900 – 1750 MW. Outages stepped down from ~1,750 MW on Monday and ranged between ~1,200-1650 between Monday and Friday, as there were periodic North and South Island hydro outages during the day.

7.2. Notable outages include:

- (a) Huntly 5 ended an outage on Sunday.
- (b) Huntly 2 ended an outage on Saturday
- (c) Huntly 4 remains on outage.
- (d) Multiple Manapōuri units went on outage this week.
- (e) Rangipo went on outage multiple times this week.
- (f) Ōhau B and C had multiple outages this week

Figure 8: Total MW loss due to generation outages

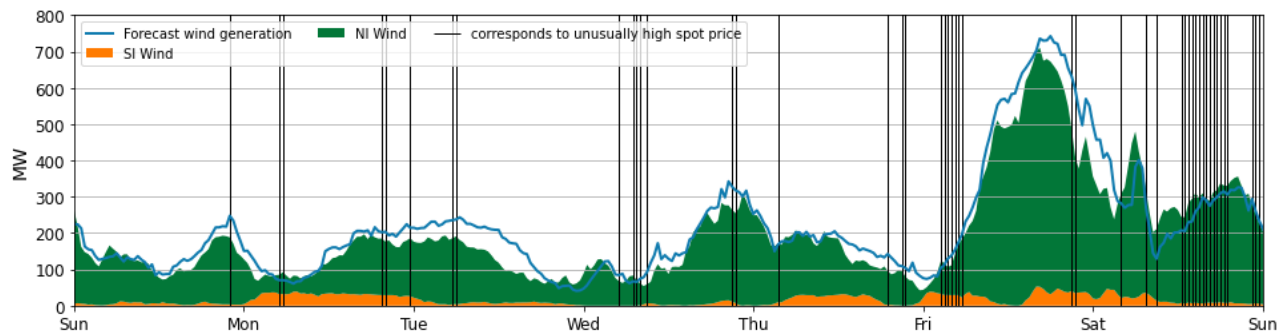




8. Generation

- 8.1. Wind generation, between 15-21 January 2023, varied between 50 and 700 MW. Wind generation was low, mostly under 200 MW between Sunday and Thursday. On Friday wind generation picked up, and was briefly generating at over 500 MW for a few hours on Friday afternoon, before dropping off again. High prices this week were largely impacted by low wind generation.

Figure 9: Wind Generation and forecast



- 8.2. Figure 10 shows generation of thermal baseload and thermal peaker plants between 15-21 January 2023. Huntly 1 ran during the day on Sunday. E3P returned from outage and began running at high loads between Monday and Saturday, with Huntly 1 also running during the day on Thursday. These are the highest levels of thermal baseload generation seen in recent months and contributed to the higher prices seen this week.
- 8.3. Essentially all the peakers, bar Whirinaki, ran this week, with Tuesday, Wednesday and Thursday seeing the highest amounts of peaker generation. Interestingly some peakers ran more similar to baseload than to actually cover peaks. This may be due to relatively low gas prices last week, as well as many generators wanting to conserve water.

Figure 10: Thermal Generation

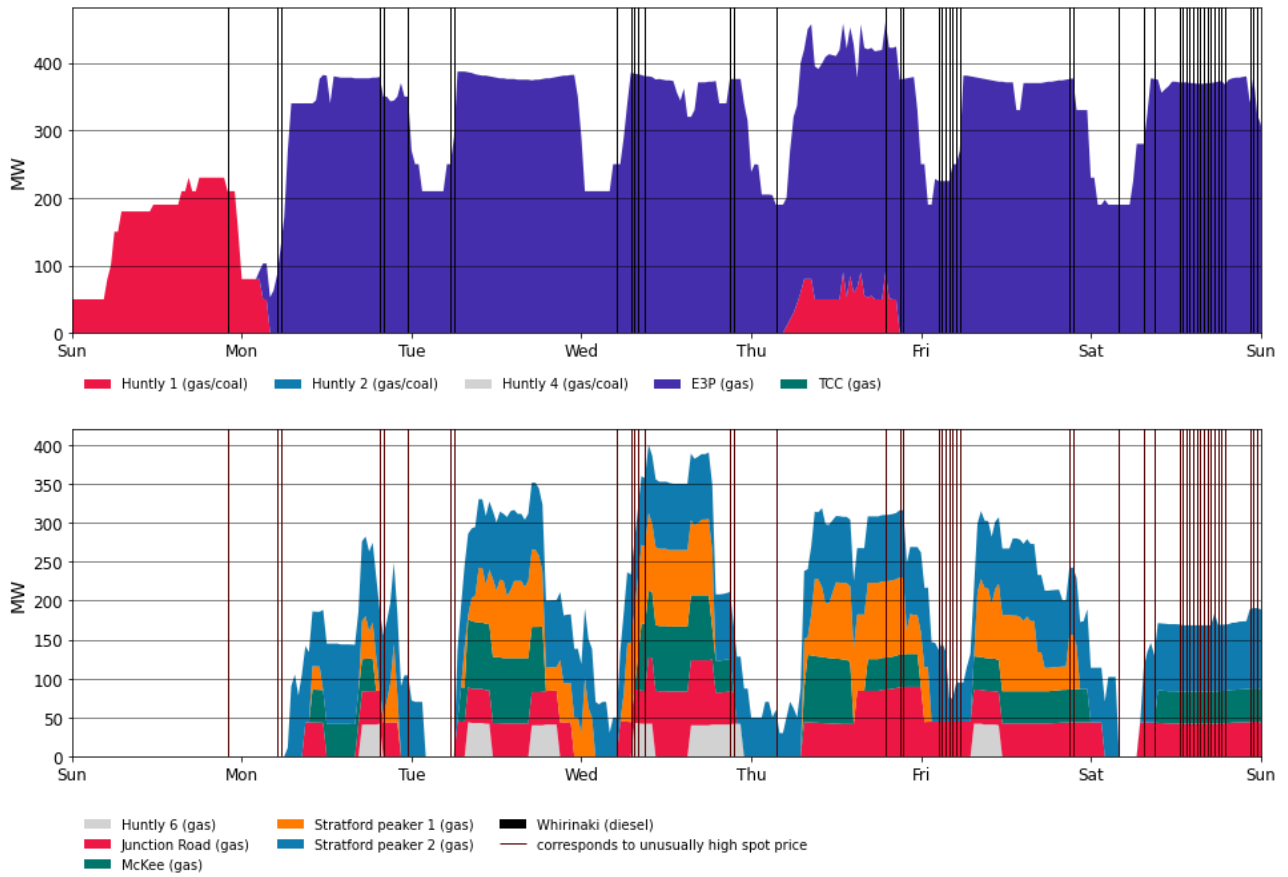
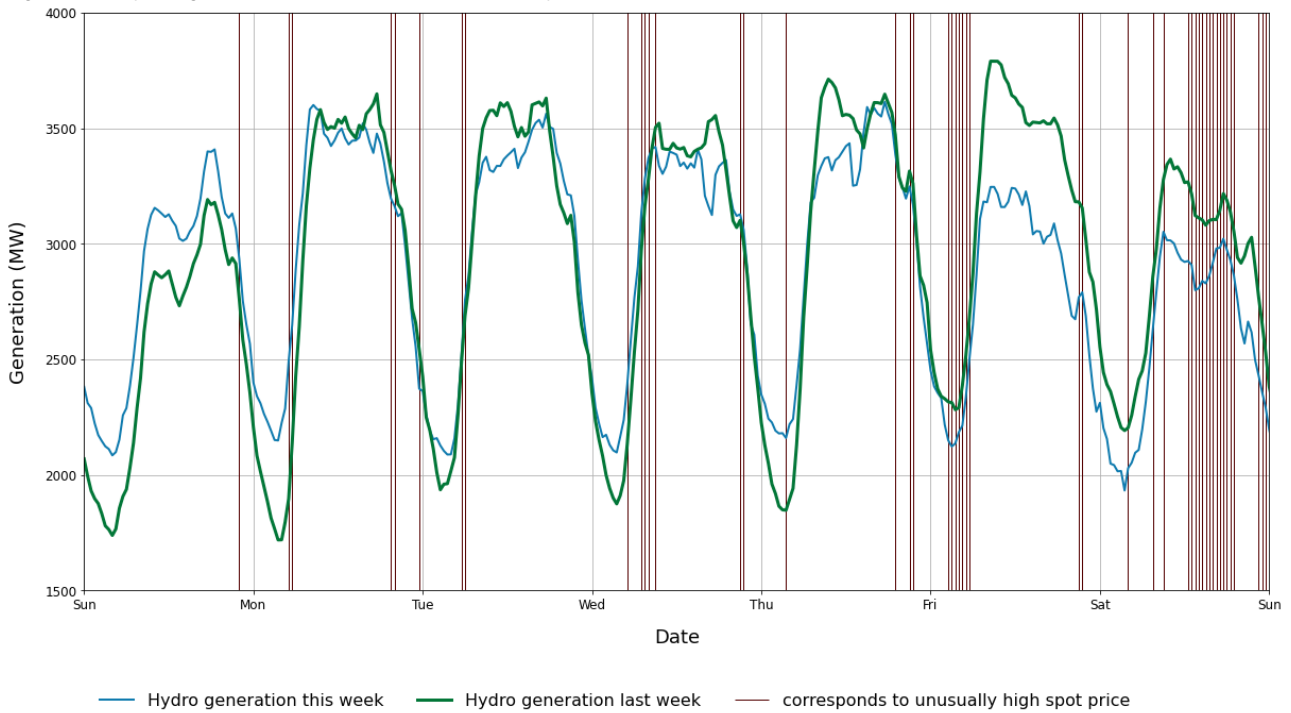


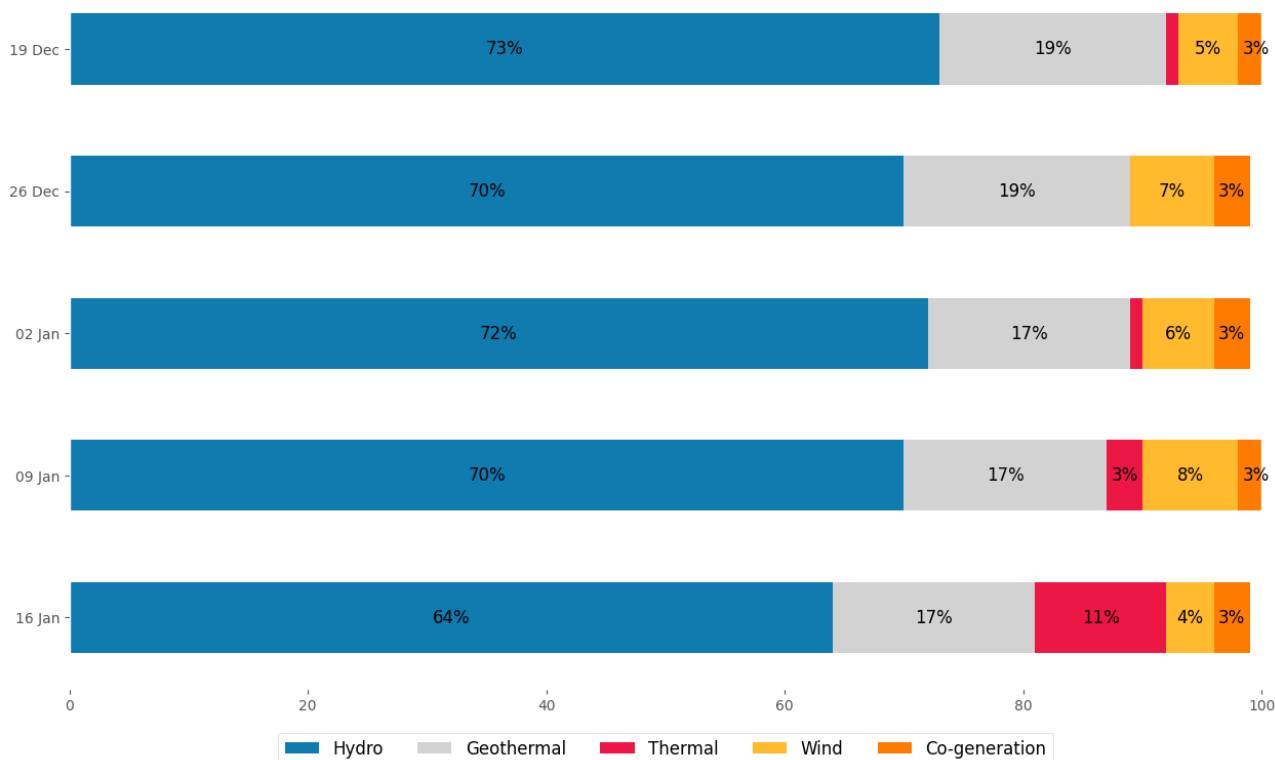
Figure 11: Hydro generation between 15-21 January compared to the previous week



8.4. Figure 11 shows total hydro generation in MW produced each trading period, compared to the same time in the previous week. Hydro generation was far less this week, when compared to the previous week, espically on Thursday, Friday and Saturday.

8.5. As a percentage of total generation, between 16-22 January, total weekly hydro generation totalled 64.3 percent, geothermal 17.3 percent, thermal 11 percent, wind 4.2 percent, and co-generation 3.1 percent.

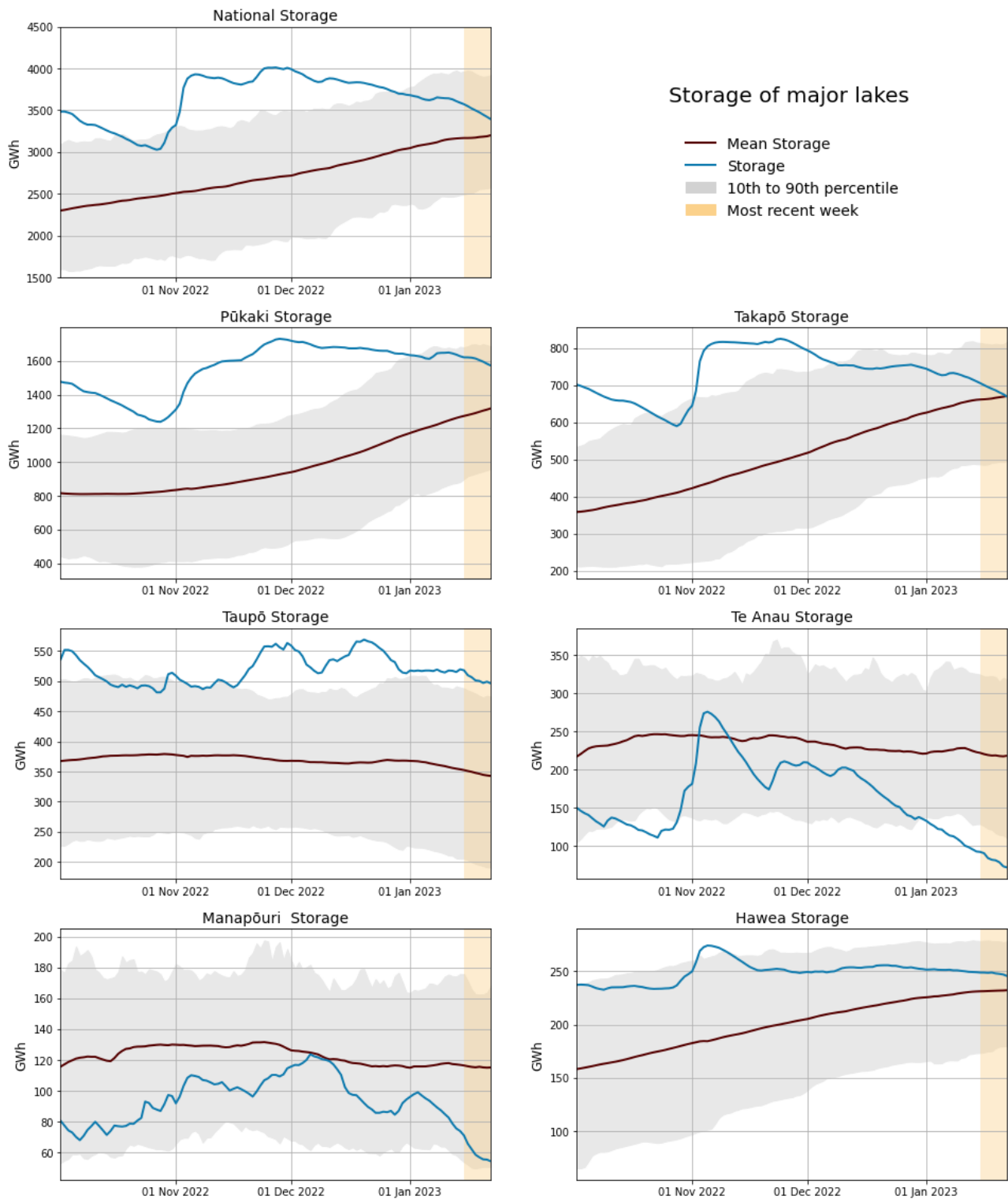
Figure 12: Total generation as a percentage each week between 19 December 2022 and 22 January 2023



9. Storage/Fuel Supply

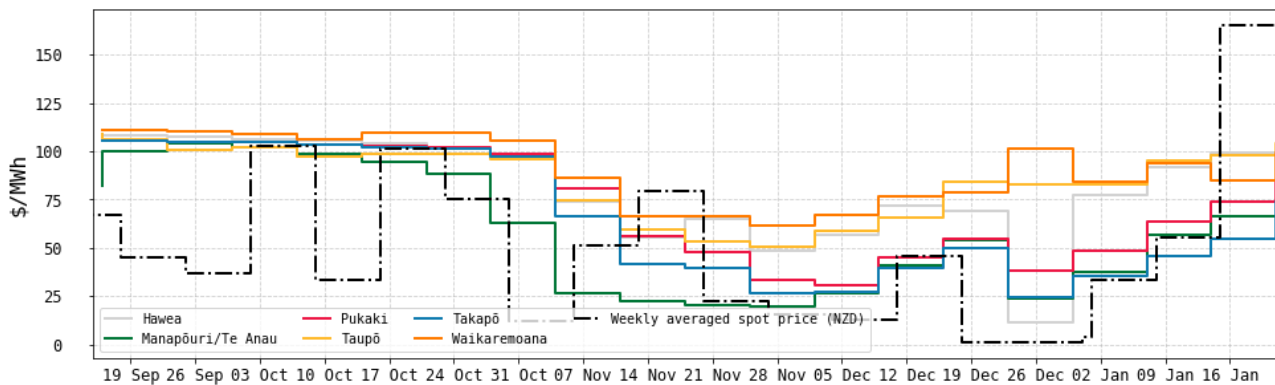
- 9.1. Figure 13 shows total controlled national hydro storage as well as the storage of major catchment lakes including their historical mean and 10th to 90th percentiles.
- 9.2. National hydro storage levels continue to decrease as inflows continue to be below average, especially in the South Island, but total storage is still around 84.7 per cent of nominal full.
- 9.3. All lakes, bar Taupō, are below their 90th percentile. Storage at Lake Te Anau has continued to decline, and is now well below its 10th percentile. Storage at Manapōuri has declined also, and its close to its 10th percentile.

Figure 13: Hydro Storage



10. JADE Water Values

Figure 14: JADE water values across various reservoirs between 15 September 2022 and 21 January 2023



- 10.1. The JADE⁴ 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 14 shows the national water values between 15 September 2022 and 21 January 2023 using values obtained from JADE. 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 B⁵ on the trading conduct webpage.
- 10.2. Towards the end of 2022 water values were falling, reaching a low in mid to late November, when national storage was high. Water values across all lakes, bar Waikaremoana, increased last week, as hydro inflows remain low. The weekly average spot price this week was greater than the highest water values.

11. Price versus estimated costs

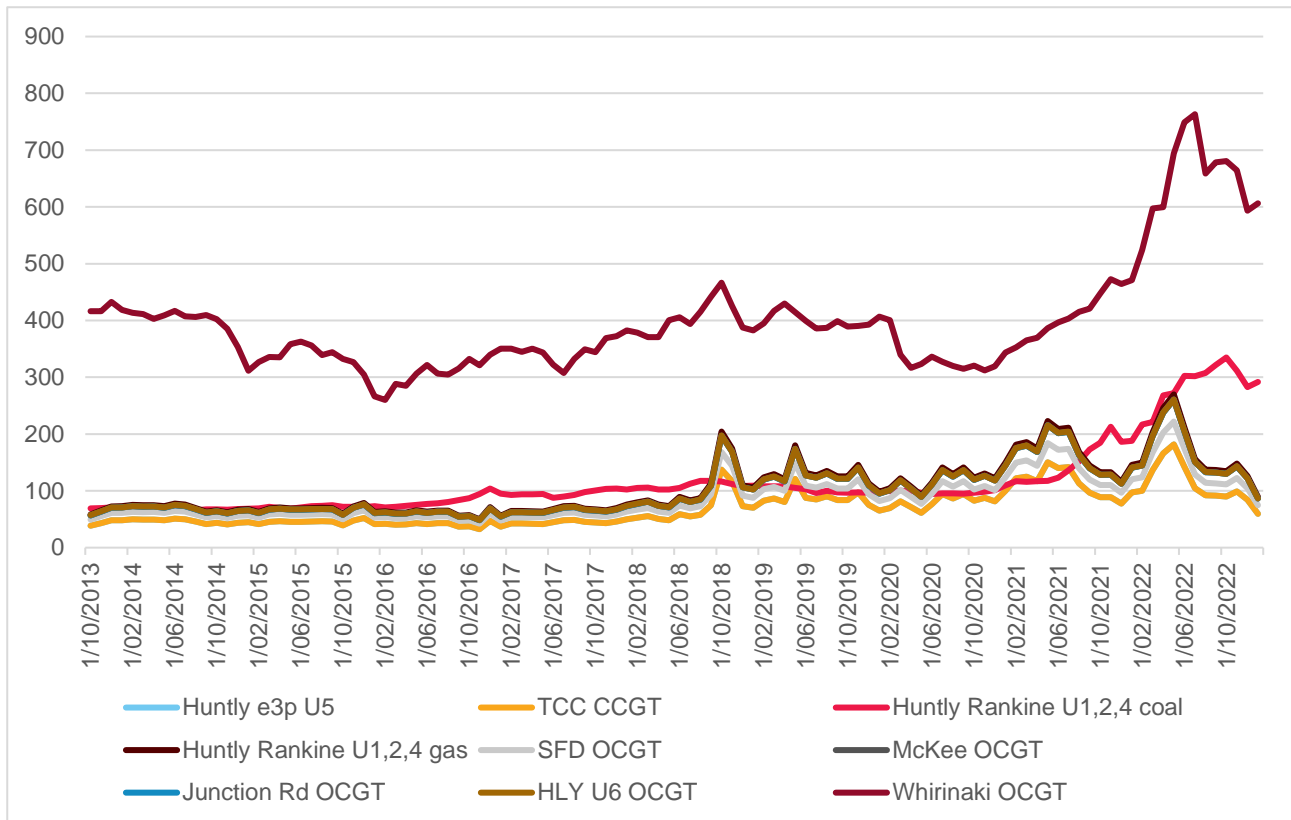
- 11.1. In a competitive market, prices should be close to (but not necessarily at) the short run marginal cost (SRMC) of the marginal generator (where SRMC includes opportunity cost).
- 11.2. The SRMC (excluding opportunity cost of storage) for thermal fuels is estimated using gas and coal prices, and 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 15 shows an estimate of thermal SRMCs as a monthly average up to 1 January 2023. The SRMC of gas fuelled plants has decreased, the SRMC of diesel has ticked up slightly, and the SRMC of coal has also increased.
- 11.4. In early January Indonesian coal was around ~\$470/tonne putting the latest SRMC of coal fuelled Huntly generation at ~\$290/MWh. The SRMC of Whirinaki has increased slightly to ~\$610/MWh. Both are likely reactions to the changing value of the New Zealand dollar and or increasing global demand.
- 11.5. The SRMC of gas run thermal plants decreased to between \$60/MWh and \$90/MWh, likely due to the reduced demand for gas fired generation during summer.
- 11.6. More information on how the SRMC of thermal plants is calculated can be found in Appendix C⁶ on the trading conduct webpage.

⁴ 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.

⁵ <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-B-JADE-water-value-model.pdf>

⁶ <https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf>

Figure 15: Estimated monthly SRMC for thermal fuels



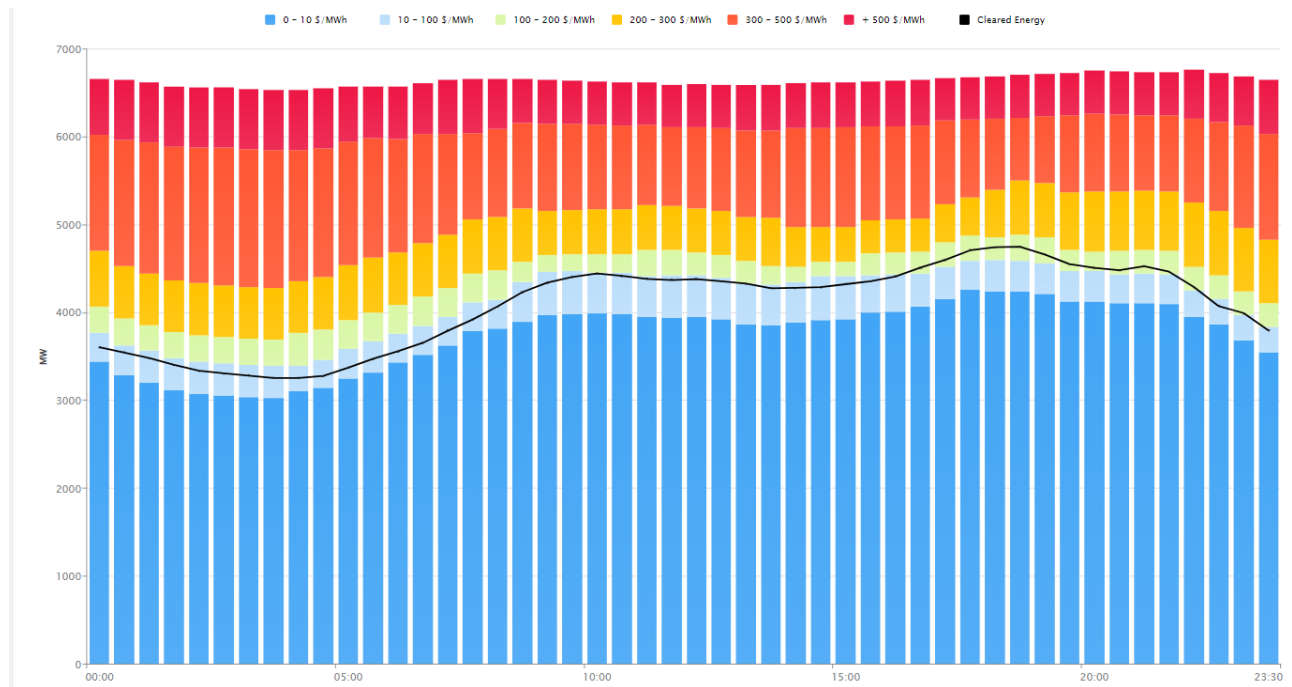
12. Offer Behaviour

- 12.1. Figure 16 shows this week's national daily offer stacks from WITS⁷. The black line shows cleared energy, indicating the range of the average final price. The majority of energy, between Monday and Saturday, was cleared in the \$100-200/MWh band. This is a large increase on the previous week, as low-priced hydro offers decreased, and \$100-\$200/MWh offers increased in quantity alongside demand also increasing.

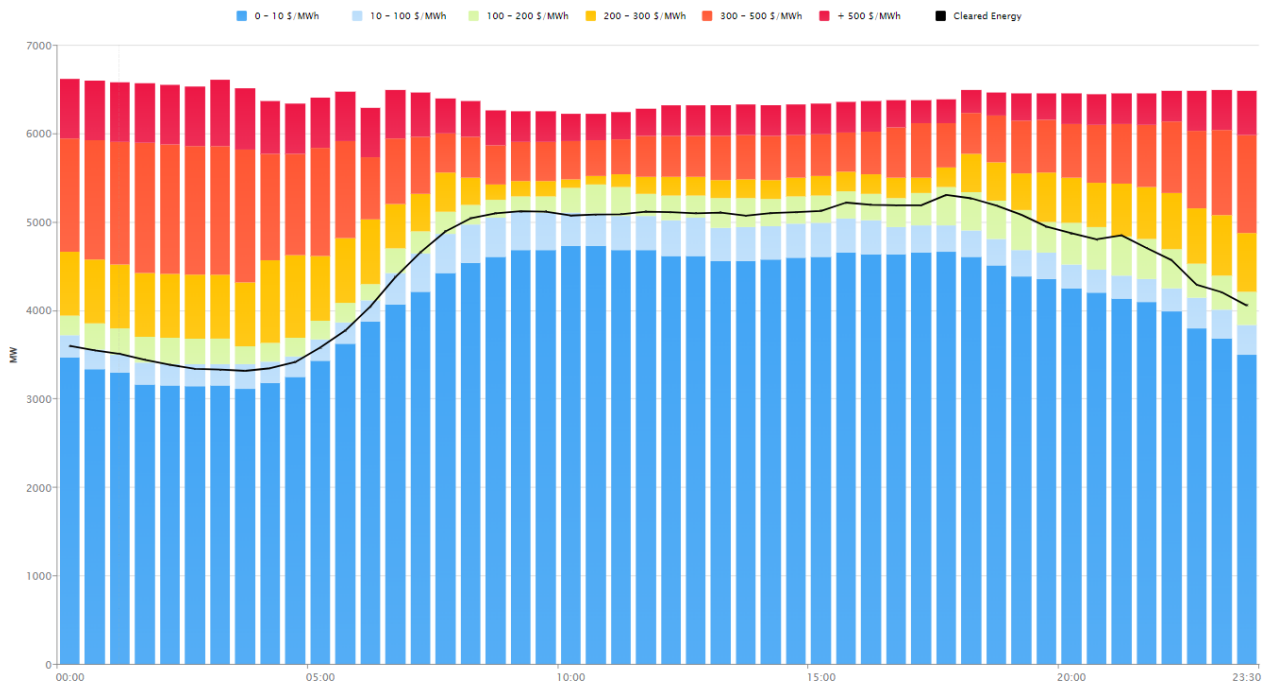
⁷ Cleared Energy Stack | WITS (electricityinfo.co.nz)

Figure 16: Daily offer stack from WITS

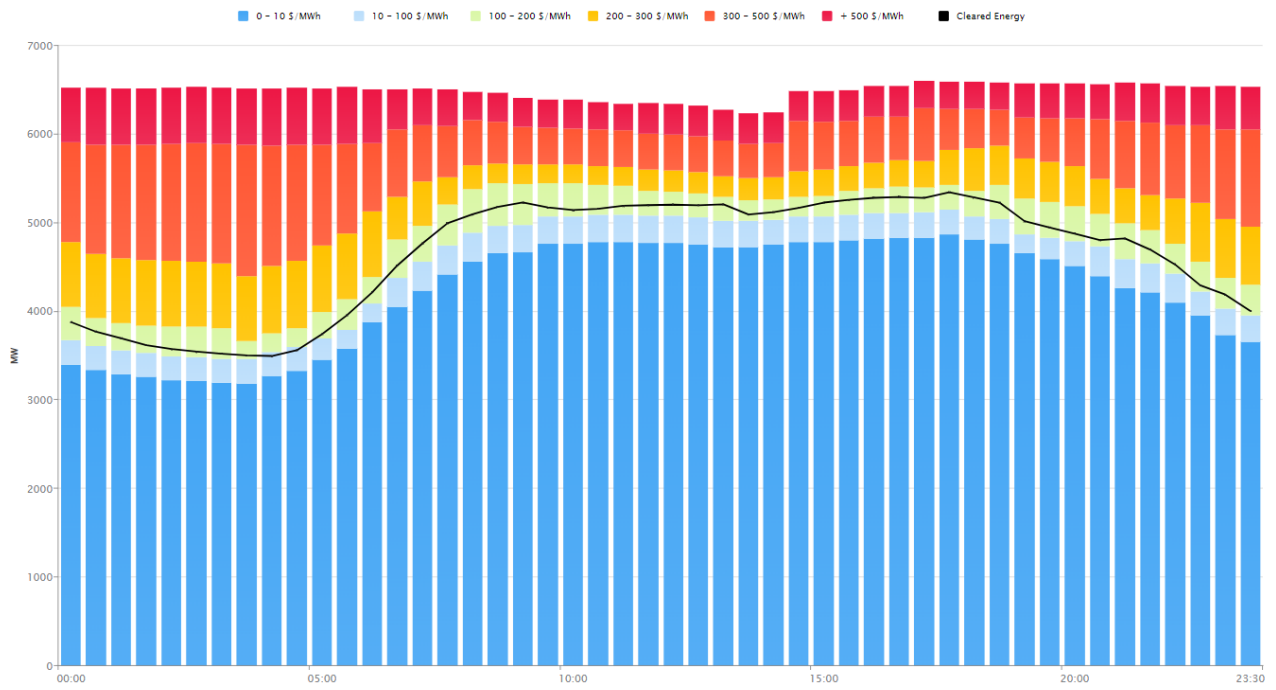
Sunday 15 January



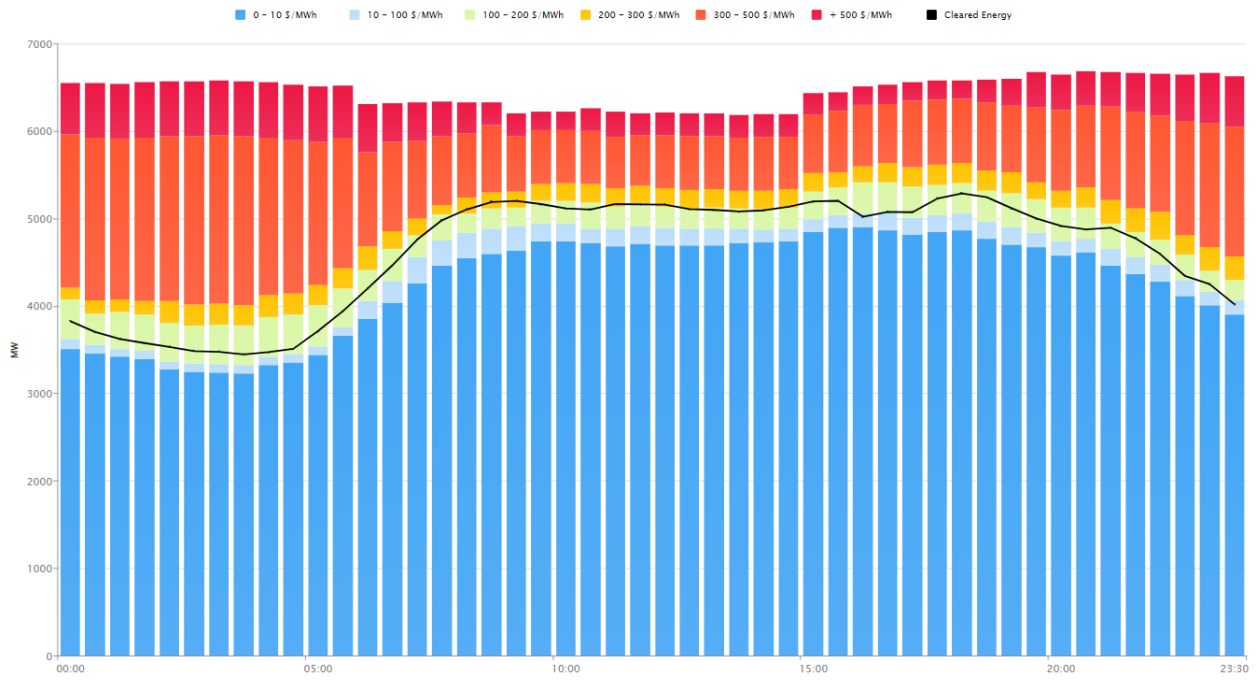
Monday 16 January



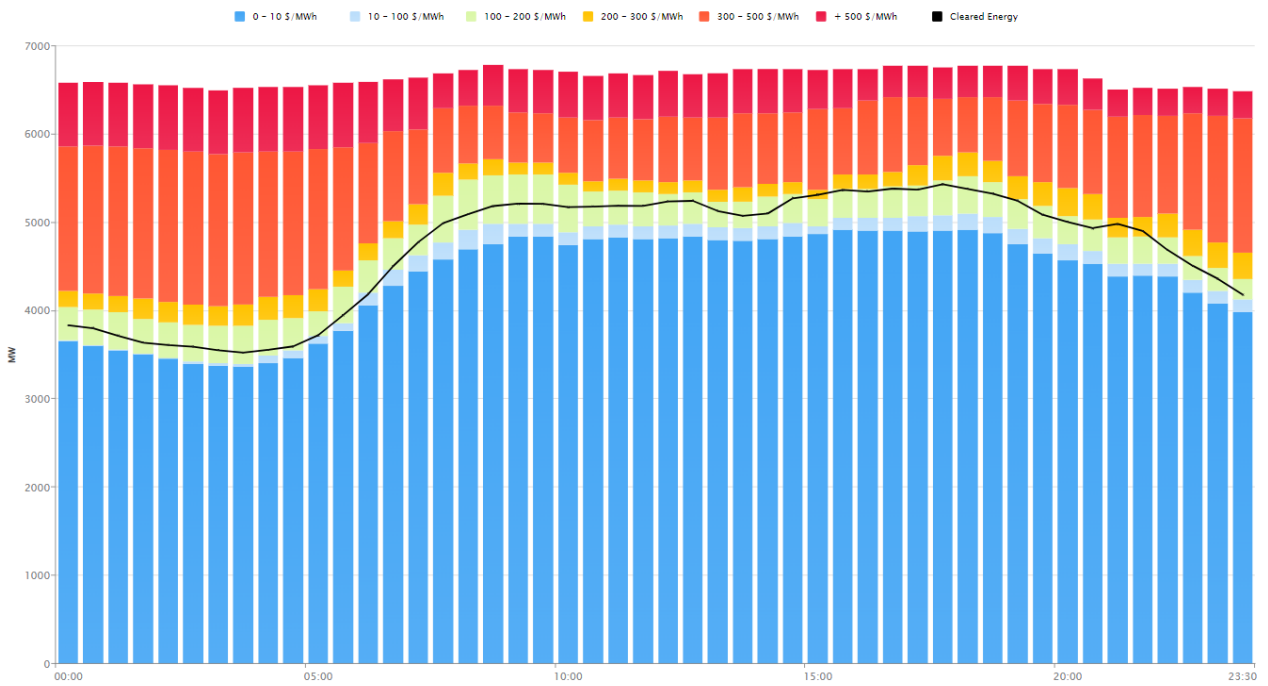
Tuesday 17 January



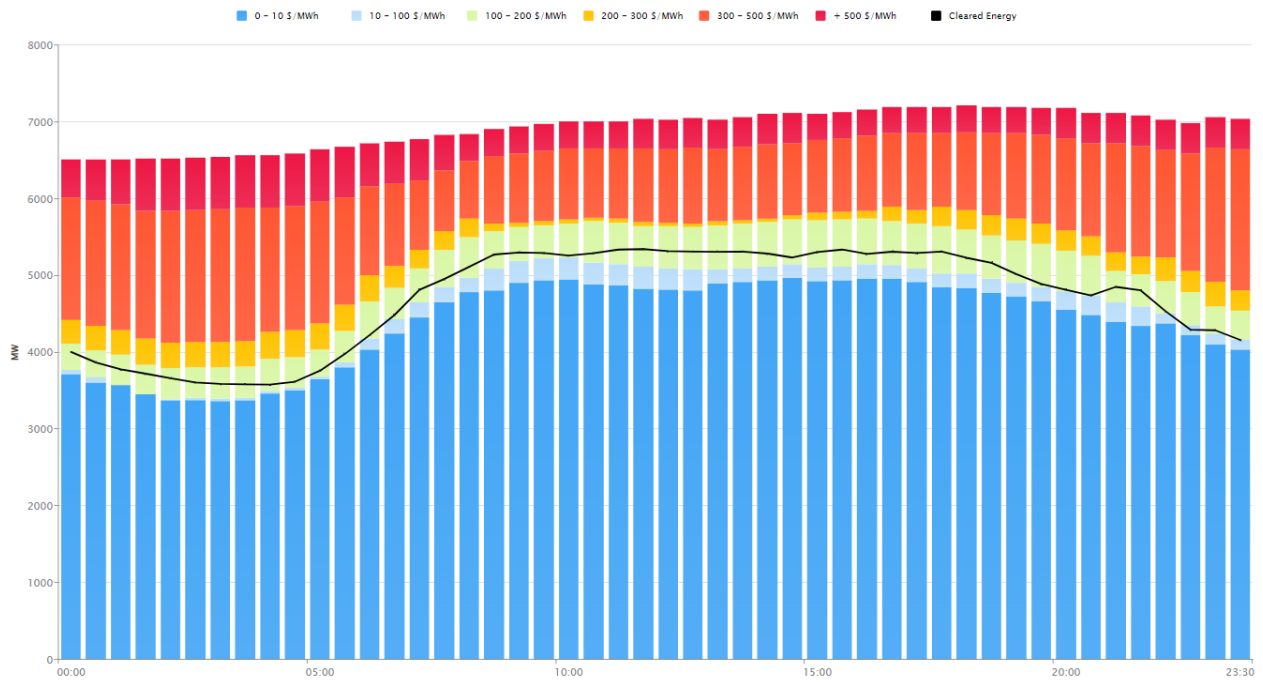
Wednesday 18 January



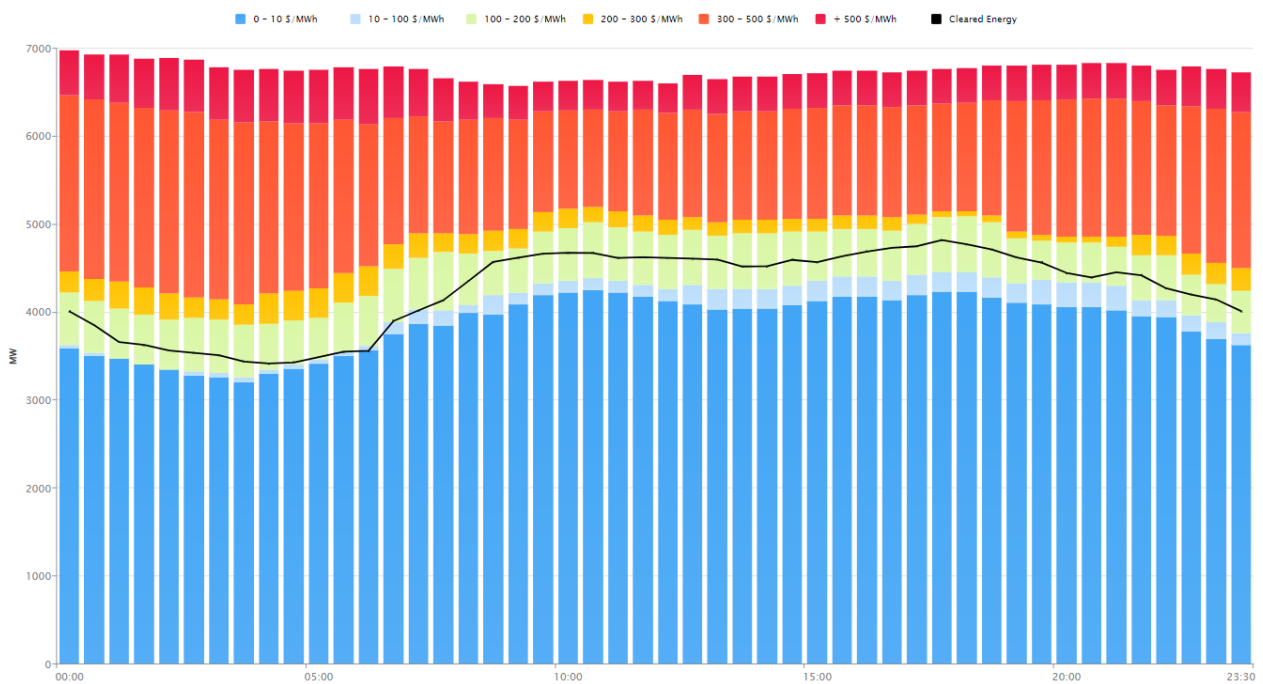
Thursday 19 January



Friday 20 January



Saturday 21 December



13. Ongoing Work in Trading Conduct

13.1. This week, all prices appeared to be consistent with supply and demand conditions, however, hydro offers this week are undergoing further analysis.

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	Notes
19/02/2022-24/02/2022	Several	Compliance enquiries in progress	After reviewing information received from Genesis regarding offers from Tekapo B while Lake Tekapo was spilling, this case has been passed to compliance to assess if the offers were compliant with trading conduct rules.
07/10/2022	15-16	Further analysis	The Monitoring team is making enquires with Genesis regarding offers changes to final tranche prices at Huntly 5 for trading period 15-16.
13/12/2022-16/12/2022	Several	Further analysis	The Authority will continue analysis into the high energy prices.
15/1/2023-21/1/2023	Several	Further analysis	The Authority will continue analysis into the high energy prices associated with high hydro offers.