

# Trading Conduct Report

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## Market Monitoring Weekly Report

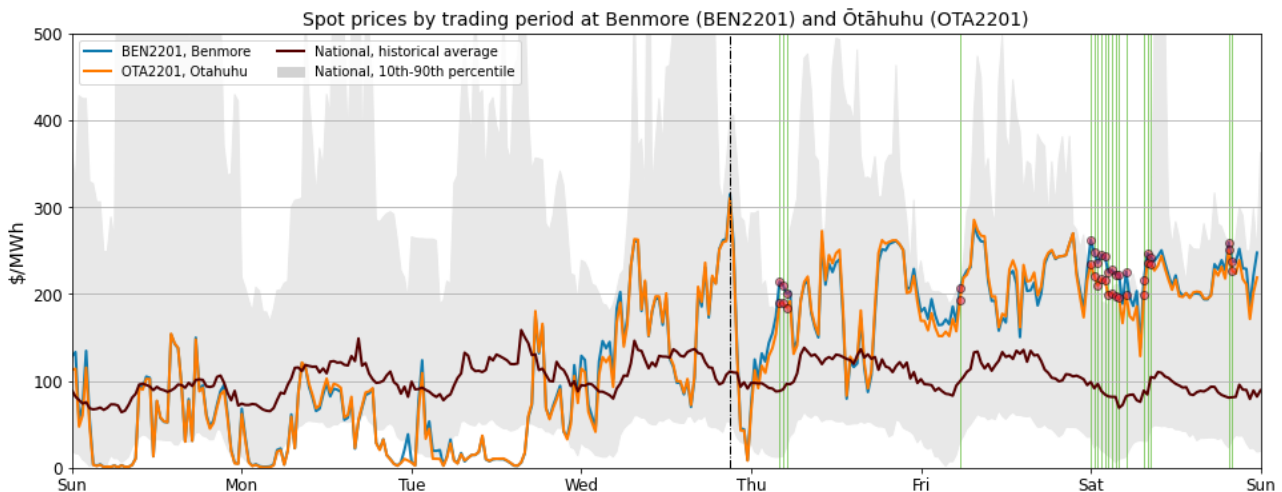
### 1. Overview for the week of 12-18 February 2023

- 1.1. Spot prices between 12-18 February 2023 appear to be consistent with market conditions.

### 2. Spot Prices

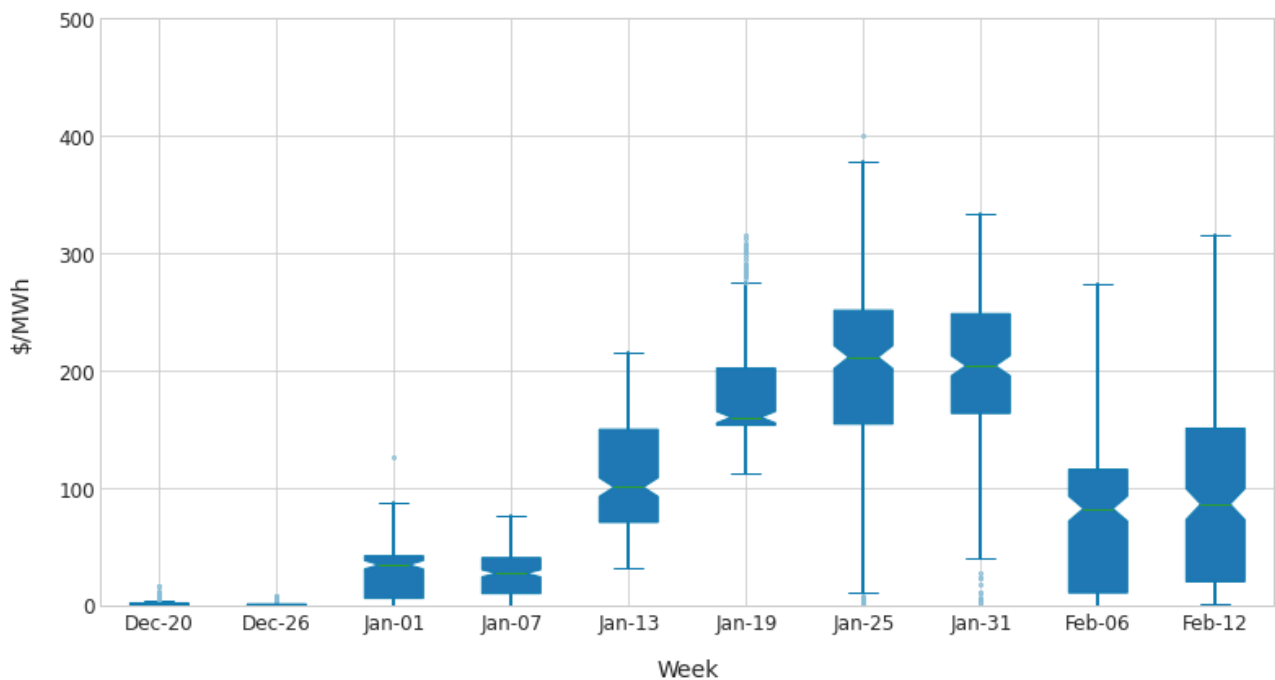
- 2.1. This report monitors underlying wholesale price drivers to assess whether there are trading periods that require further analysis for the purpose of considering potential non-compliance with the trading conduct rule. In addition to general monitoring, we also single out unusually high-priced individual trading periods for further analysis by identifying when wholesale electricity spot prices at any node exceeds its historical 90th percentiles. Note that this week, prices above the historic 90<sup>th</sup> percentile are highlighted with a translucent green line. Other high prices, but which didn't exceed the 90<sup>th</sup> percentile, are highlighted with a black dashed line.
- 2.2. Between 12-18 February 2023:
  - (a) The average wholesale spot price across all nodes was \$130/MWh.
  - (b) 95 per cent of prices fell between \$1.22/MWh and \$270/MWh.
- 2.3. Figure 1 shows spot prices at Benmore and Ōtāhuhu alongside their historic median and historic 10<sup>th</sup>- 90<sup>th</sup> percentiles adjusted for inflation.
- 2.4. Early in the week, as wind generation was high, peak and off-peak prices were mostly below \$100/MWh. From Wednesday onwards prices increased and were mostly between \$200-\$300/MWh.
- 2.5. The highest prices of the week occurred on Wednesday at 9pm, with the price at Benmore at \$314/MWh, and the price at Otahuhu at \$310/MWh. However, these prices did not breach the 90<sup>th</sup> percentile of historic February prices.
- 2.6. Prices breached the 90<sup>th</sup> percentile of historic February prices on Thursday and Friday mornings. Prices continuously breached the 90<sup>th</sup> percentile overnight on Saturday morning.

Figure 1: Wholesale Spot Prices between 11-18 February 2023



- 2.7. 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 per cent of prices fell). The "whiskers" extend to points that lie within 1.5 times the inter-quartile range (IQR)<sup>1</sup> of the lower and upper quartile, and then observations that fall outside this range are displayed independently. In mid-late January the median spot prices increased, as indicated by the higher green bars. This week, prices have fallen compared to prices in January.
- 2.8. High wind generation depressed spot prices early in the week, while from mid-week onwards, lower wind generation, and continued low lake levels across Te Anau and Manapouri, caused prices to increase. On Saturday, wind generation was very low, and prices on Saturday breached the 90<sup>th</sup> percentile overnight. Some hydro offers also continued to be high in both islands. Outages at some South Island hydro stations may have also caused prices to be higher, as they could not generate.

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

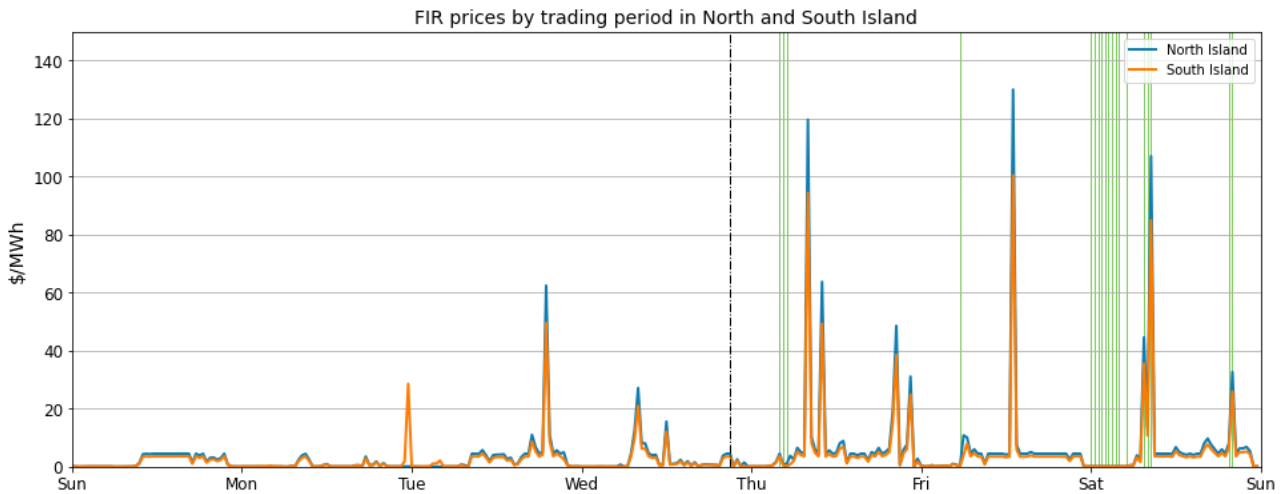


<sup>1</sup> [Quartile - Wikipedia](#)

### 3. Reserve Prices

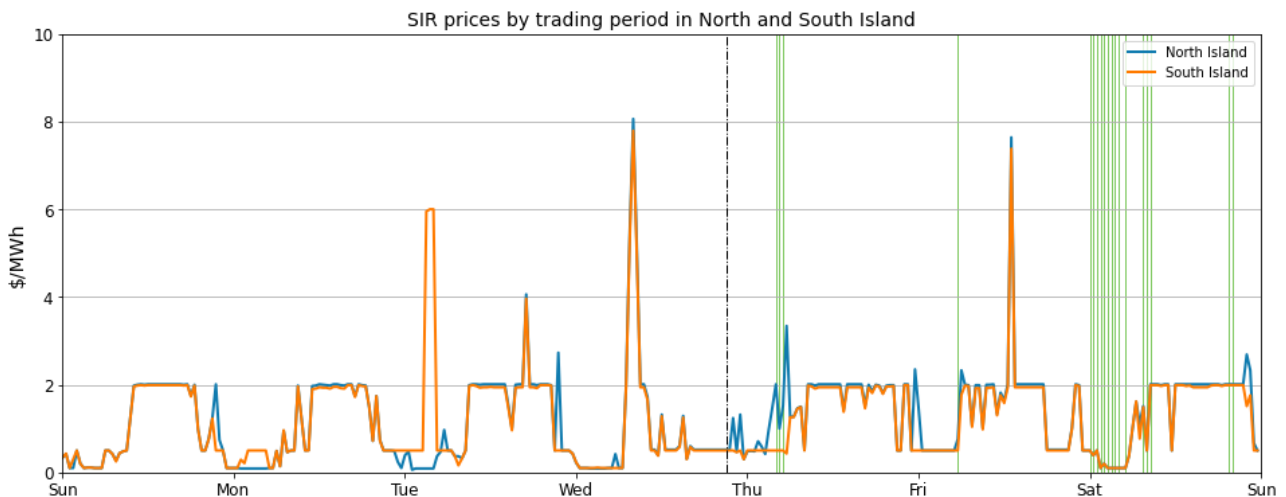
3.1. Fast instantaneous reserve (FIR) prices for the North and South Island are shown below in Figure 3. This week there were four instances where both North and South Island FIR prices were above \$20/MWh, with the highest of these occurring on Friday. Some of the high FIR prices co-occurred during times of high spot prices.

Figure 3: FIR prices by trading period and Island



3.2. Sustained instantaneous reserve (SIR) prices for the North and South Island are shown in Figure 4. All prices this week were below \$10/MWh.

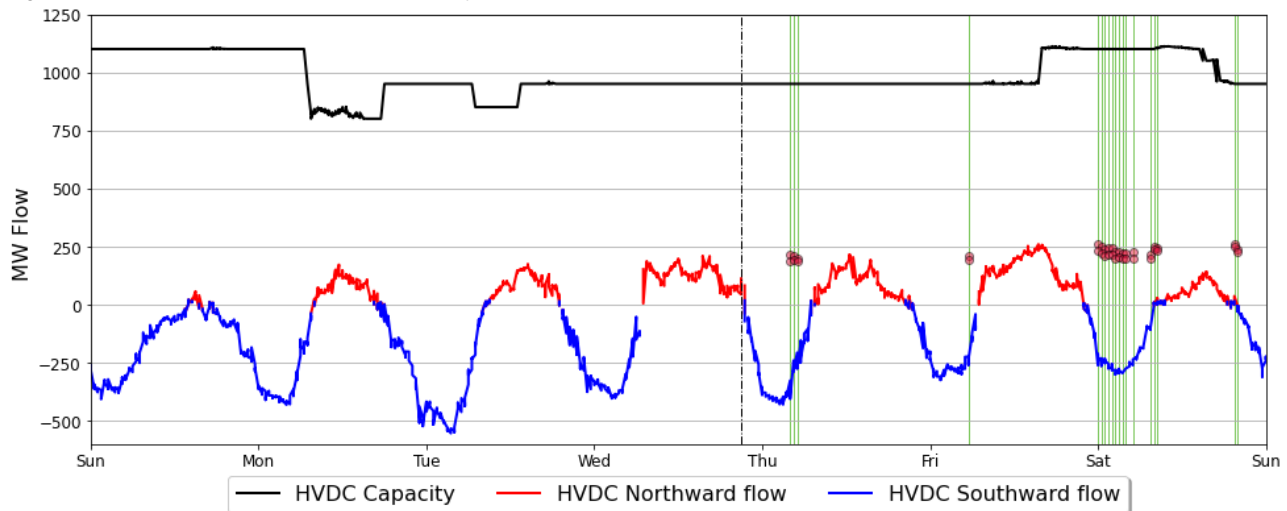
Figure 4: SIR prices by trading period and Island



## 4. HVDC

- 4.1. Figure 5 shows northward HVDC flow between 12-18 February. HVDC flows were mostly northward during the day from Monday onwards, but the magnitudes were below 250 MW. Overnight HVDC flows were southward, with larger magnitudes, being between 250-500 MW.

Figure 5: HVDC northward flow and capacity

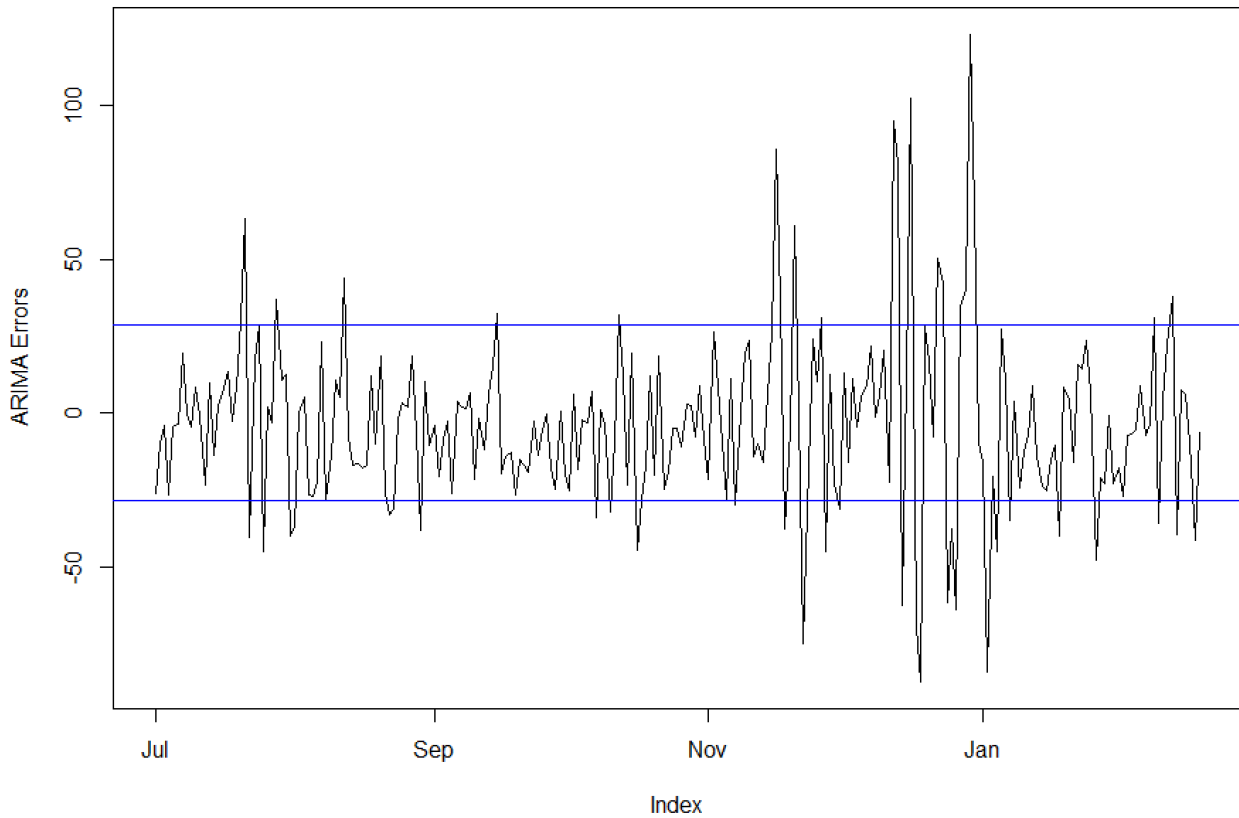


## 5. Regression Residuals

- 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<sup>2</sup> on the trading conduct webpage.
- 5.2. Figure 6 shows the residuals of autoregressive moving average (ARMA) errors from the daily model. Residuals were mostly relatively small, suggesting that prices on those dates appear to be largely aligned with market conditions. There was a residual larger than one standard deviation of the data, which occurred on Friday. Here the residual was negative, indicating that the modelled price was too large.

<sup>2</sup> <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-A-Regression-Analysis.pdf>

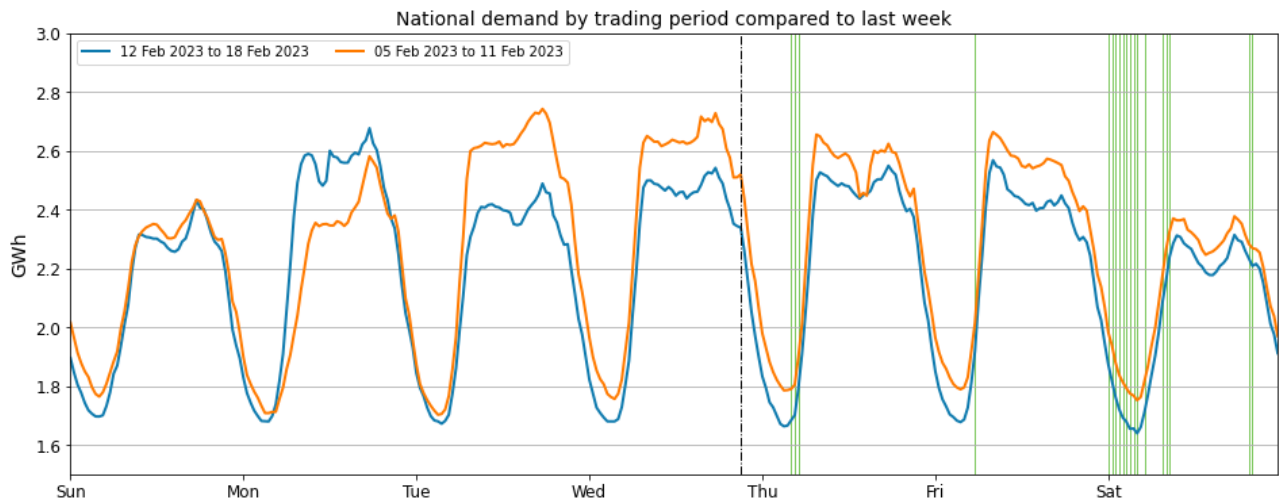
Figure 6: Residual plot of estimated daily average spot prices from 1 July 2022 – 18 February 2023. The blue lines show two standard deviations of the ARMA errors.



## 6. Demand

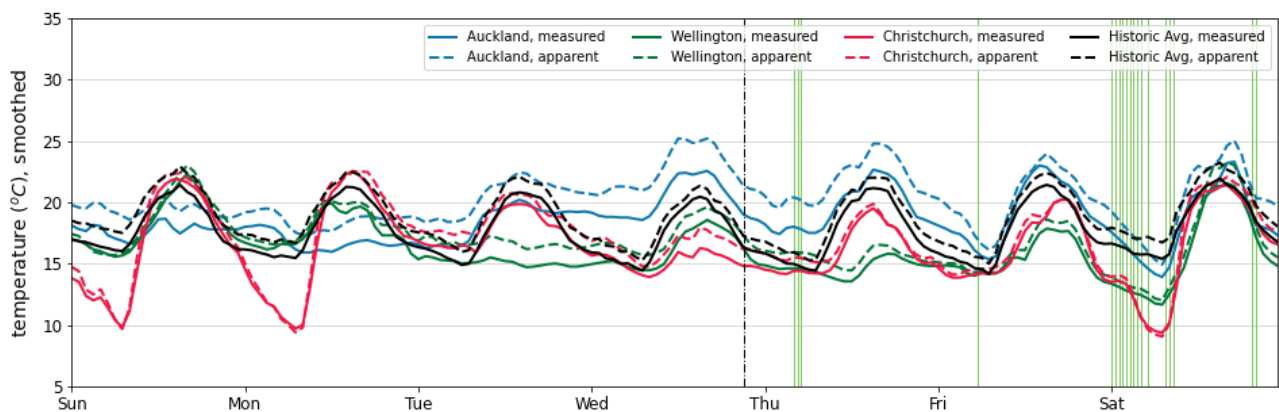
- 6.1. Figure 7 shows national grid demand between 12-18 February, compared to the previous week. Daily demand was lower than the previous week for all days, bar Monday as the previous Monday was Waitangi Day. There were large differences on Tuesday and Wednesday, as many were disconnected from power due to cyclone Gabrielle. Demand continued to be lower for the remainder of the week.

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



- 6.2. Figure 8 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 Sunday and Monday, temperatures across all main centres were mostly below historic average. From Tuesday onwards temperatures increased, especially in Auckland, which would have contributed to decreased demand.

Figure 8: Temperatures across main centres



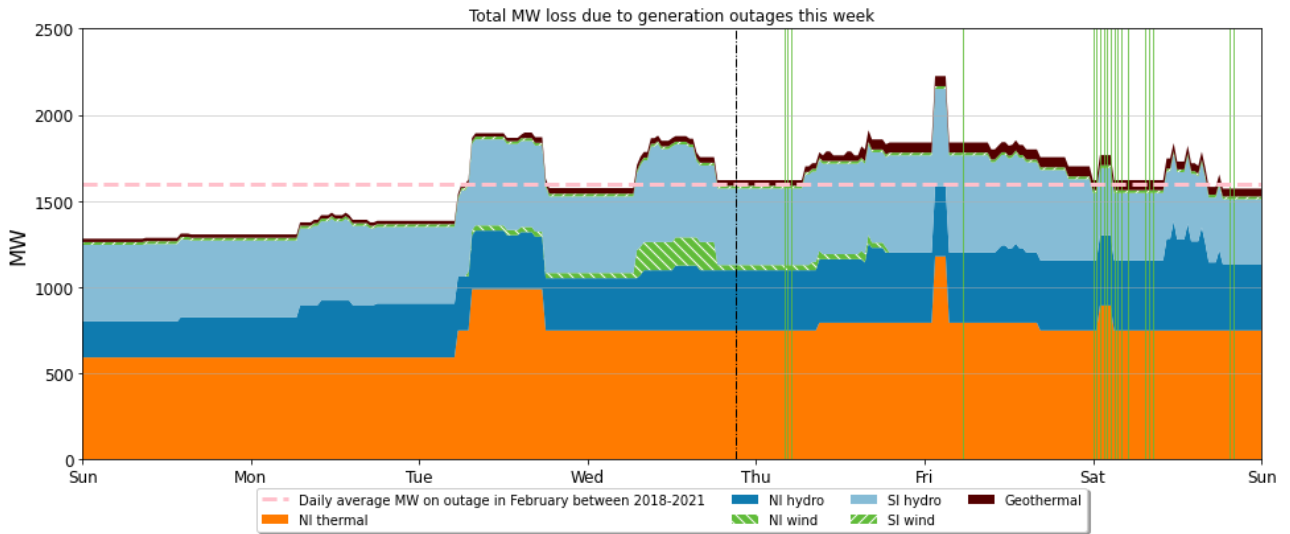
## 7. Outages

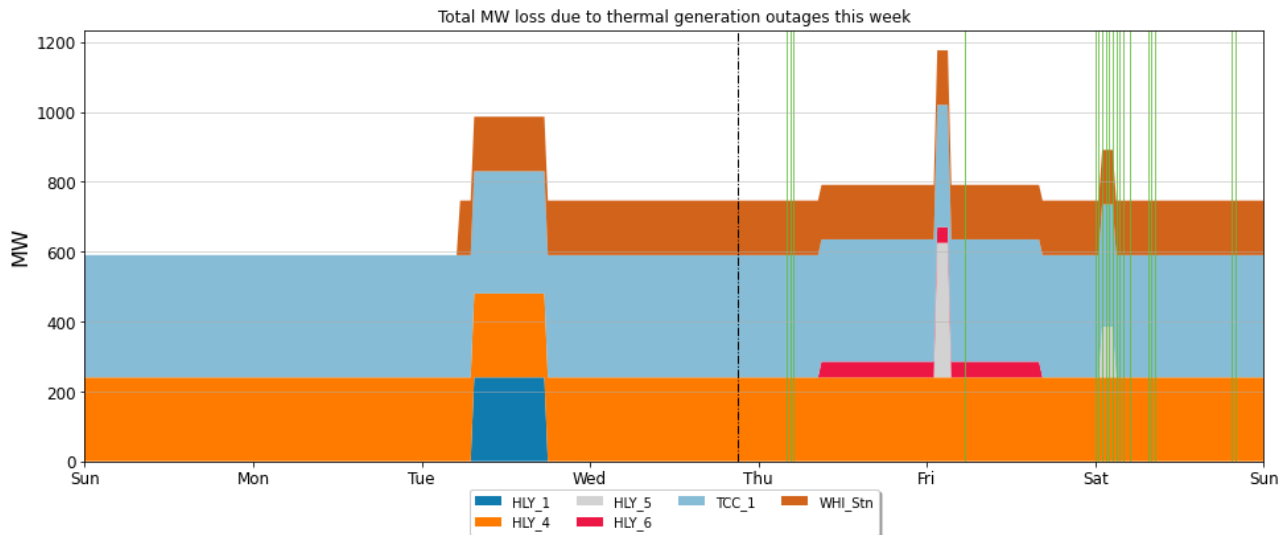
- 7.1. Figure 9 shows generation capacity on outage. Total capacity on outage between 12-18 February ranged between ~1,250 – 2,000 MW. Outages increased from Tuesday onwards, as Huntly 1 and Whirinaki went on outage due to storm related complications. There was also some North Island wind generation on outage on Wednesday.
- 7.2. Notable outages include:
- (a) Huntly 4 remains on outage.
  - (b) TCC remains on outage.
  - (c) Whirinaki entered on outage on Tuesday.

(d) Waipipi wind farm had an outage on Wednesday.

(e) Multiple Takapō units went on outage this week.

Figure 9: Total MW loss due to generation outages

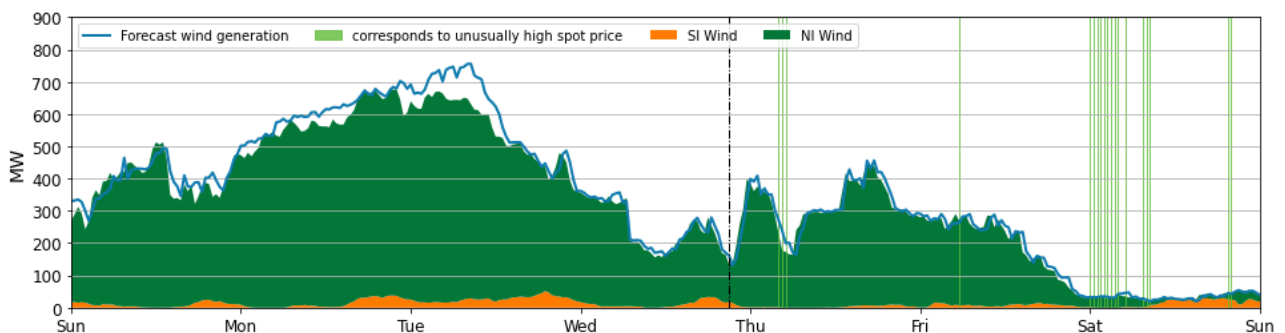




## 8. Generation

8.1. Wind generation, between 12-18 February, varied between ~50 -700 MW. Wind generation increased throughout Sunday to Monday evening, reaching roughly 700 MW. Wind decreased over Tuesday, reaching a low of 200 MW on Wednesday evening. The minimum in this wind generation coincided with the highest price spike. Prices above the 90<sup>th</sup> percentile on Thursday morning occurred as wind was below 200 MW and slightly less than forecast. The Saturday prices which breached the 90<sup>th</sup> percentile occurred during a time of very low, ~50 MW, wind.

Figure 10: Wind Generation and forecast.

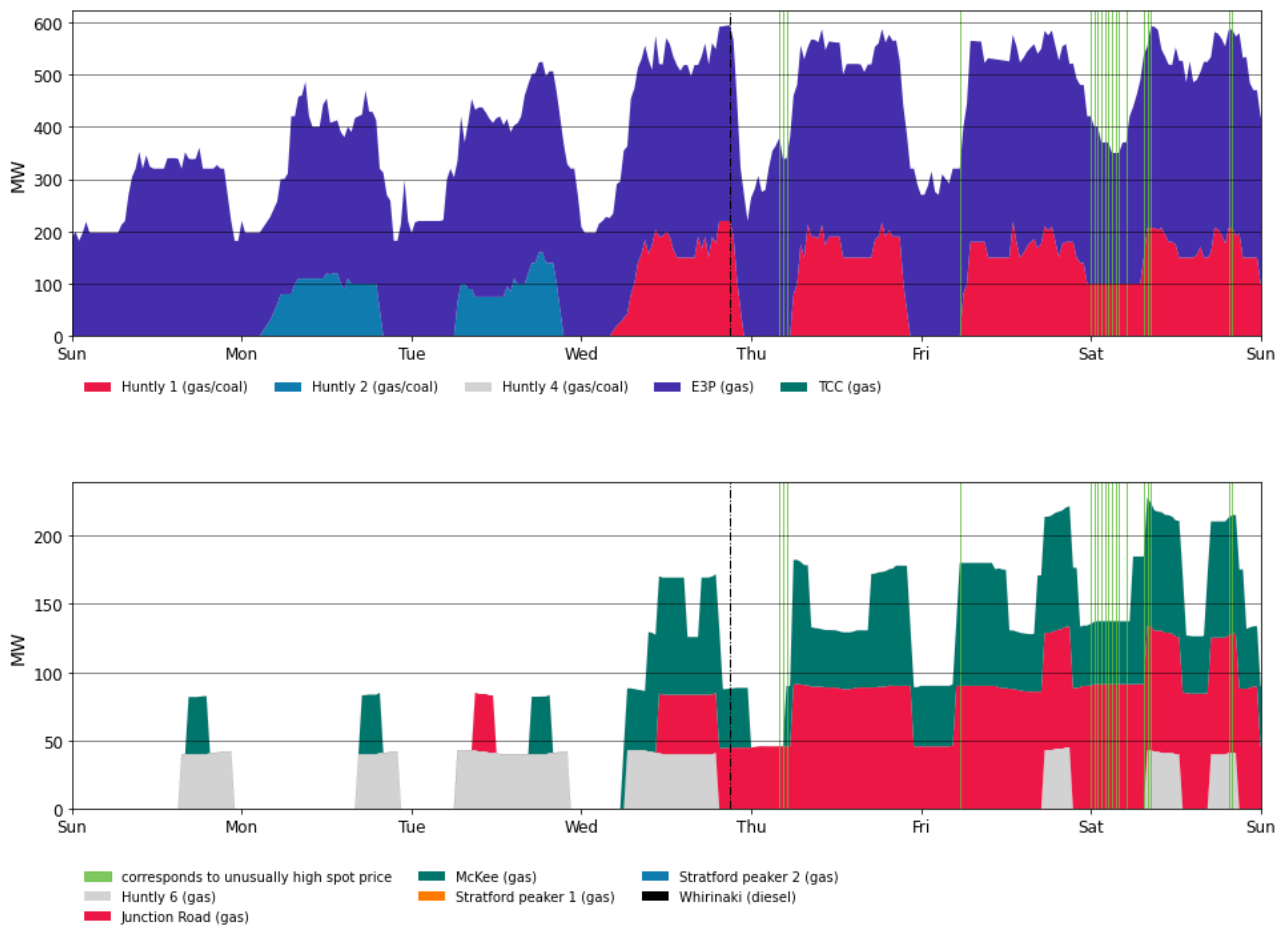


8.2. Figure 11 shows generation of thermal baseload and thermal peaker plants between 12-18 February. E3P (Huntly 5) ran all week. Huntly 2 also ran between Monday and Tuesday, while Huntly 1 ran between Wednesday and Friday. Huntly 1 ran overnight between Friday and Saturday.

8.3. Peakers ran only during the evening peak on Sunday and Monday. The amount of peakers increased between Tuesday and Friday, as the wind generation decreased. Peakers ran the hardest on Saturday when wind generation was at its lowest.

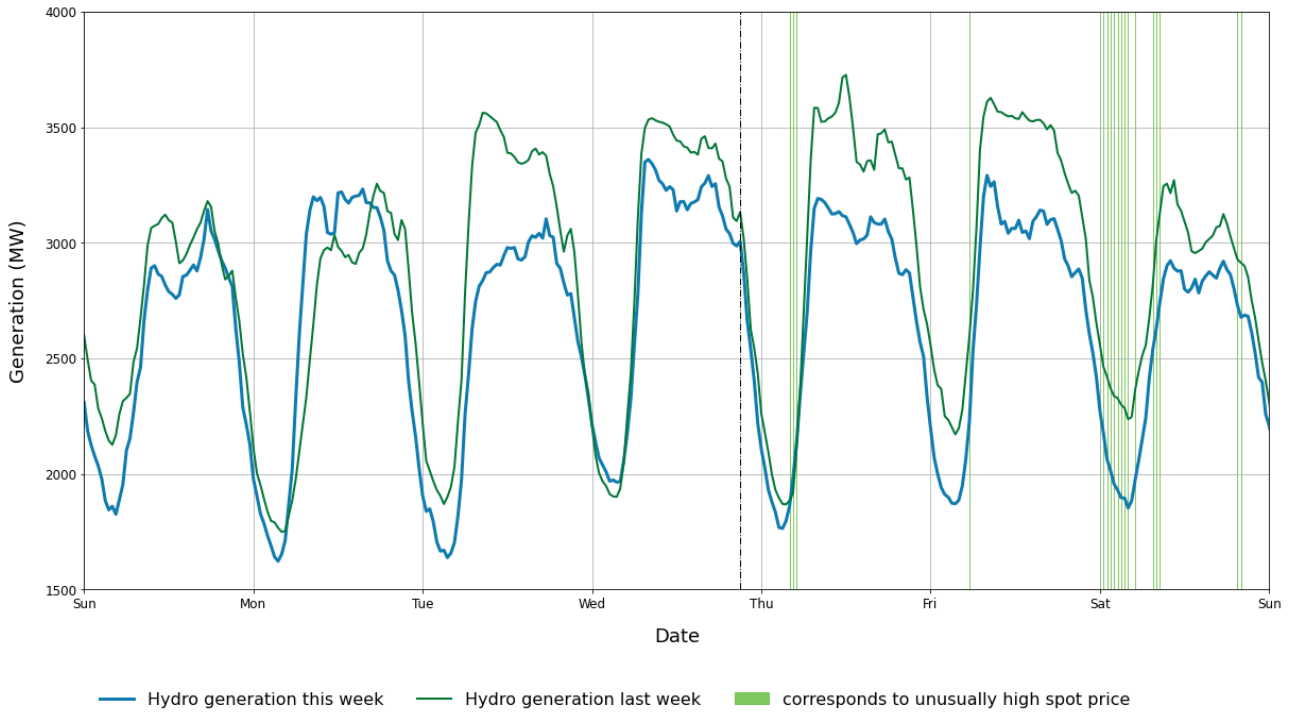


Figure 11: Thermal Generation



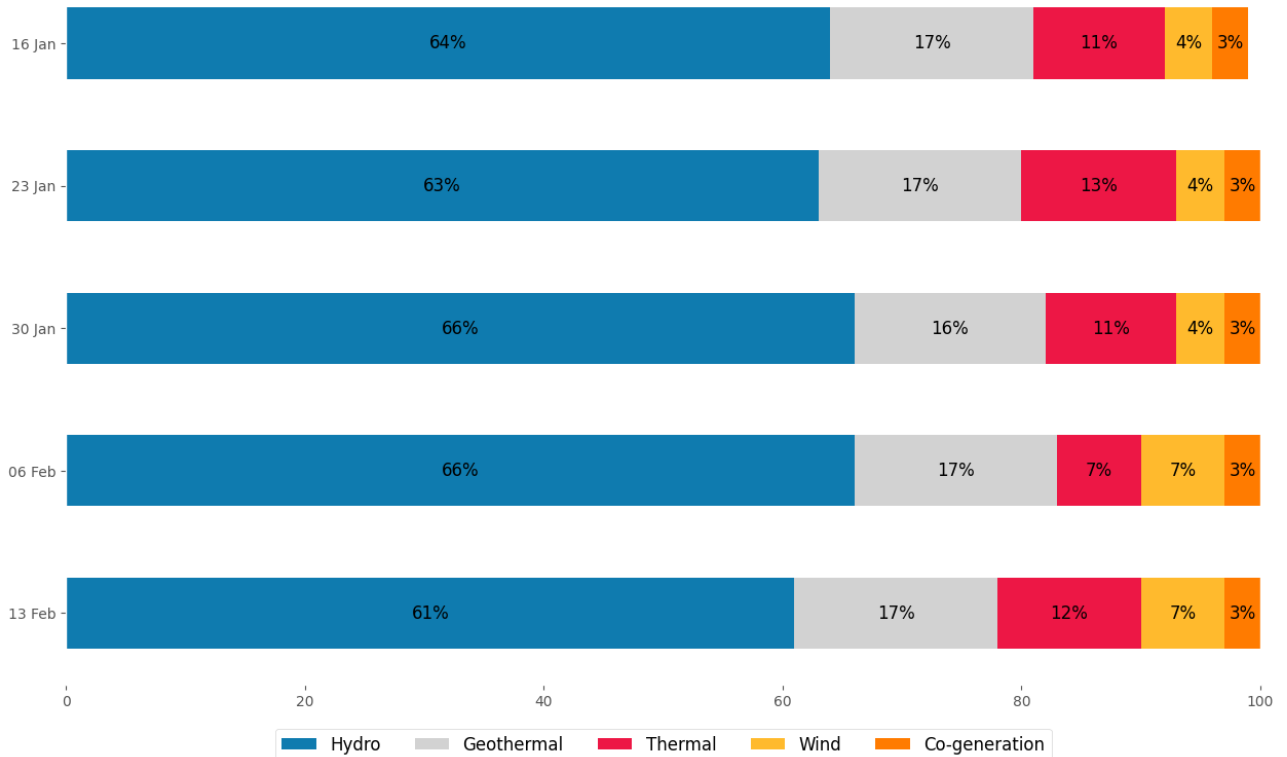
8.4. Figure 12 shows total hydro generation in MW produced each trading period, compared to the same time in the previous week. Hydro generation was lower than the previous week – largely due to, lower demand, higher North Island wind generation and continued low lake levels at Te Anau and Manapōuri, despite an increase in lake levels.

Figure 12: Hydro generation between 12-18 February compared to the previous week



8.5. As a percentage of total generation, between 13-19 February, total weekly hydro generation totalled 60.7 percent, geothermal 17.5 percent, thermal 12.5 percent, wind 6.5 percent, and co-generation 2.9 percent.

Figure 13: Total generation as a percentage each week between 16 January and 19 February 2023

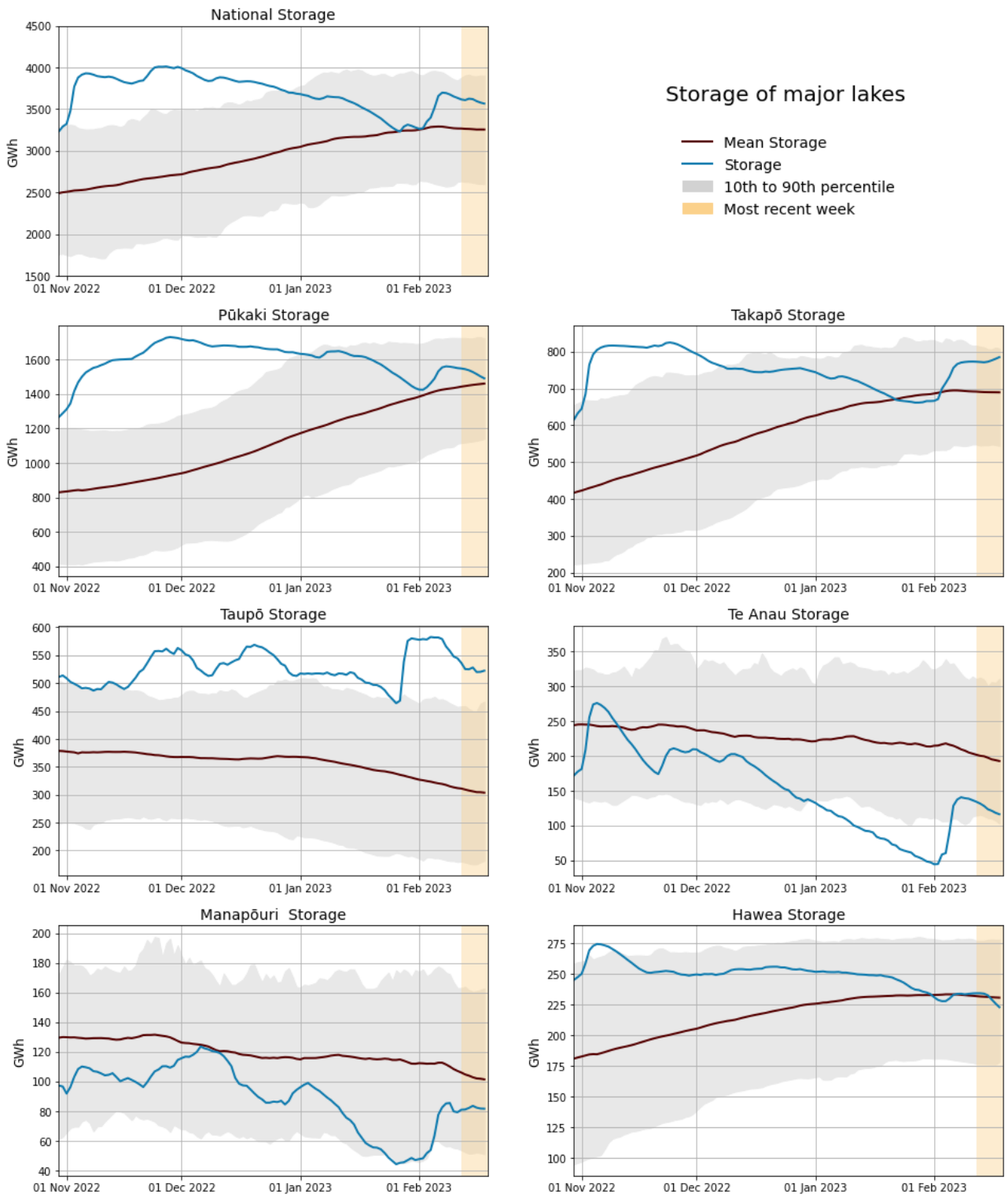


## 9. Storage/Fuel Supply

- 9.1. Figure 14 shows total controlled national hydro storage as well as the storage of major catchment lakes including their historical mean and 10<sup>th</sup> to 90<sup>th</sup> percentiles.
- 9.2. National hydro storage levels decreased overall this week. Takapō was the only lake which increased in storage, due to lower running from Takapō B, as units have been on outage. Otherwise, storage in all other lakes decreased. Total national storage is around 87 percent of nominal full.

Storage at Lake Te Anau and Manapōuri is declining again this week, however overall storage at the catchment remains at above their 10<sup>th</sup> percentiles.

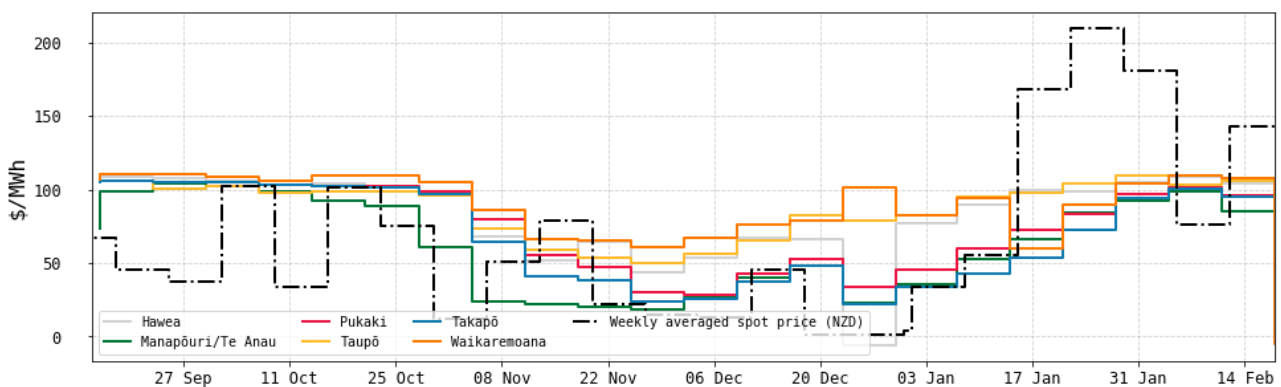
Figure 14: Hydro Storage



## 10. JADE Water Values

- 10.1. The JADE<sup>3</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 15 shows the national water values between 15 September 2022 and 4 February 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 B<sup>4</sup> on the trading conduct webpage.
- 10.2. At the beginning of 2023, water values were rising, as lake levels were declining. Water values across all lakes slightly decreased last week, with most lakes receiving some inflows. The weekly average spot price this week was higher than the highest water values.

Figure 15: JADE water values across various reservoirs between 15 September and 2022 and 18 February 2023



## 11. Price versus estimated costs

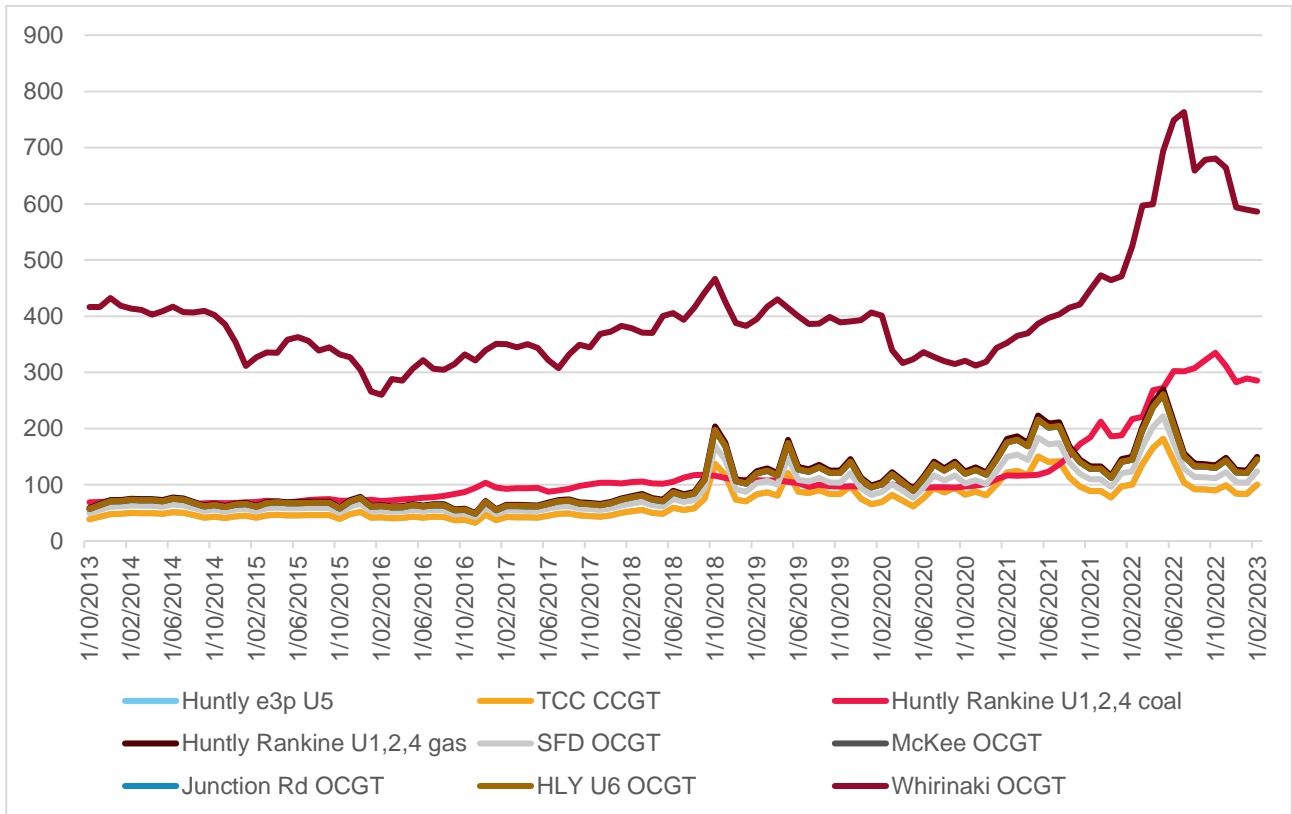
- 11.1. In a competitive market, prices should be close to (but not necessarily at) the short run marginal cost (SRMC) of the marginal generator (where SRMC includes opportunity cost).
- 11.2. The SRMC (excluding opportunity cost of storage) for thermal fuels is estimated using gas and coal prices, and 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 16 shows an estimate of thermal SRMCs as a monthly average up to 1 February 2023. The SRMC of gas fuelled plants has increased, while the SRMC of diesel and coal has remained relatively flat.
- 11.4. In early February Indonesian coal remained around ~\$480/tonne (NZD) putting the latest SRMC of coal fuelled Huntly generation at ~\$290/MWh. The SRMC of Whirinaki has increased slightly to ~\$590/MWh.

<sup>3</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.

<sup>4</sup> <https://www.ea.govt.nz/assets/dms-assets/29/Appendix-B-JADE-water-value-model.pdf>

- 11.5. The SRMC of gas run thermal plants increased to between \$90/MWh and \$130/MWh, likely due to the increase in gas demand.
- 11.6. More information on how the SRMC of thermal plants is calculated can be found in Appendix C<sup>5</sup> on the trading conduct webpage.

Figure 16: Estimated monthly SRMC for thermal fuels.



## 12. Offer Behaviour

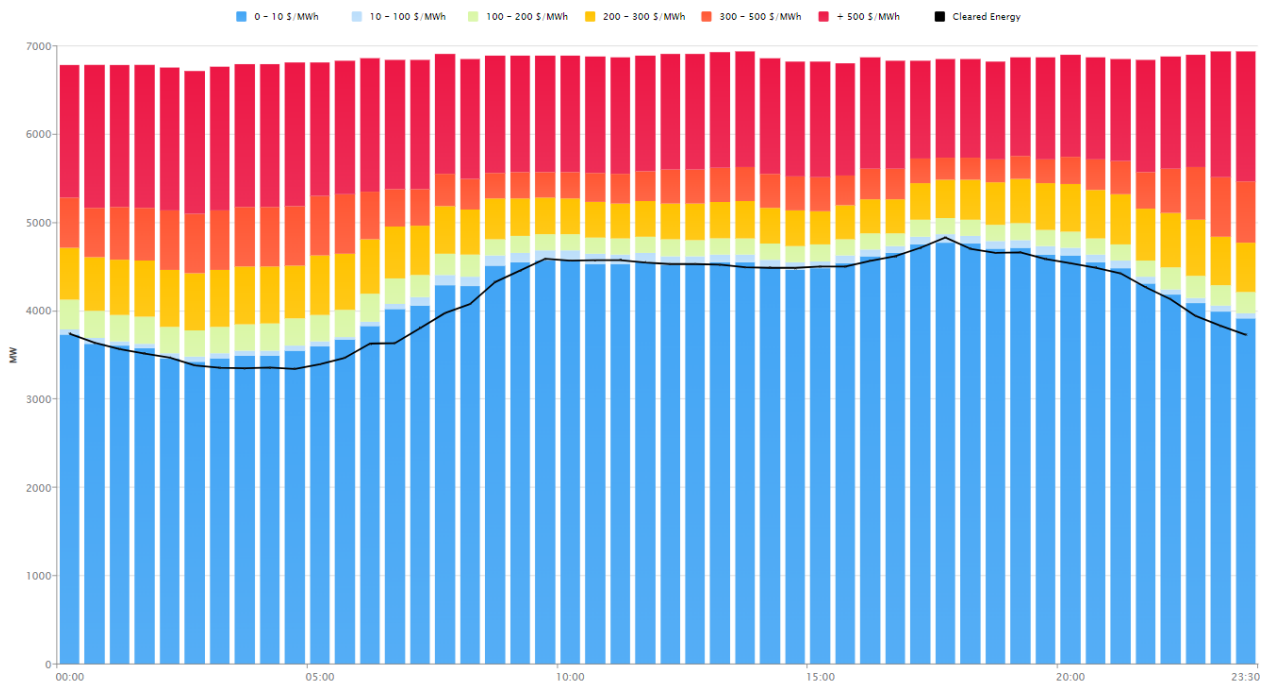
- 12.1. Figure 17 shows this week’s national daily offer stacks from WITS<sup>6</sup>. The black line shows cleared energy, indicating the range of the average final price. Between Sunday and Tuesday, the majority of energy, was cleared in the \$0-10/MWh or \$10-100/MWh band. From Wednesday onwards most energy cleared in the \$100-200/MWh or \$200-300MWh band. This shift to clearing in the higher priced bands reflects the lower amount of wind generation experienced this week.

<sup>5</sup> <https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf>

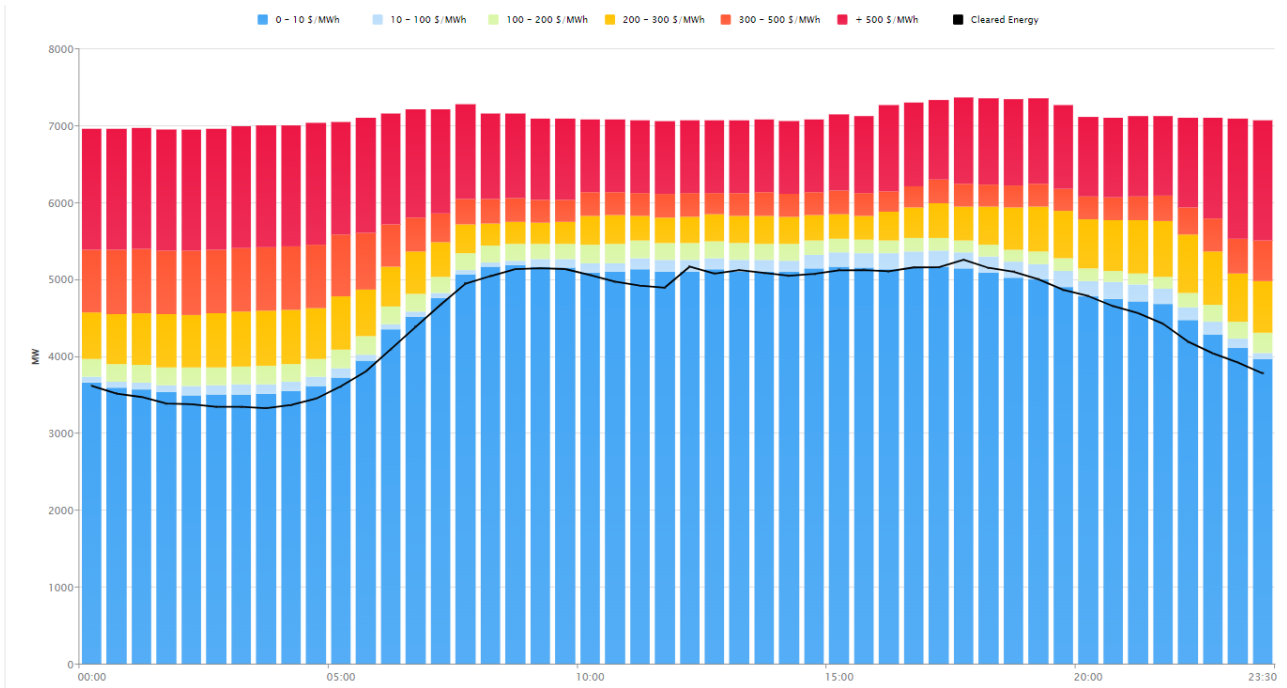
<sup>6</sup> [Cleared Energy Stack | WITS \(electricityinfo.co.nz\)](https://www.electricityinfo.co.nz/cleared-energy-stack)

Figure 17: Daily offer stack from WITS

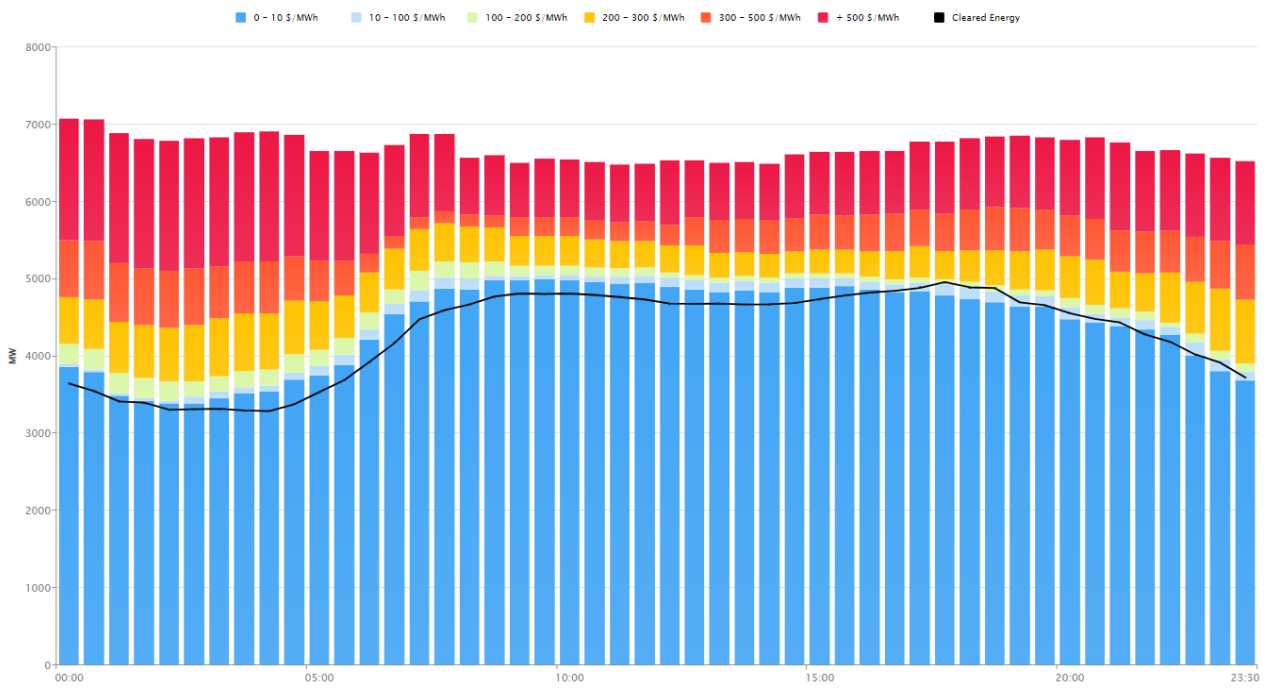
Sunday 12 February



Monday 13 February

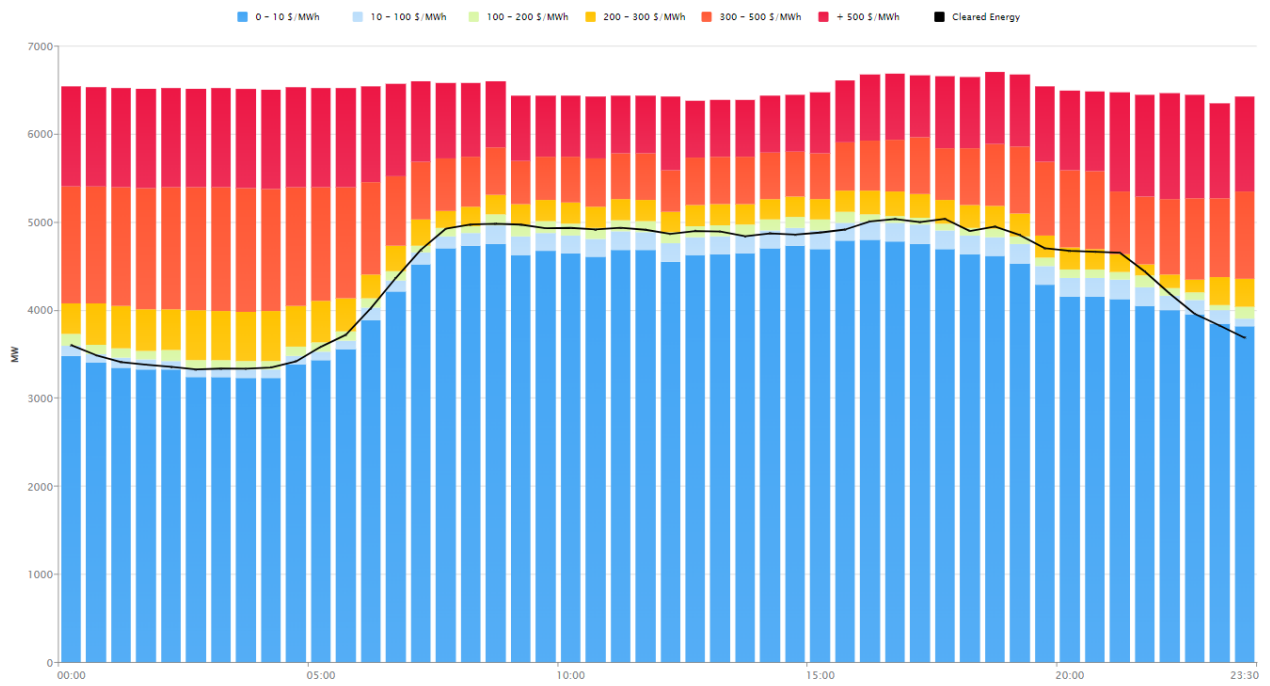


Tuesday 14 February

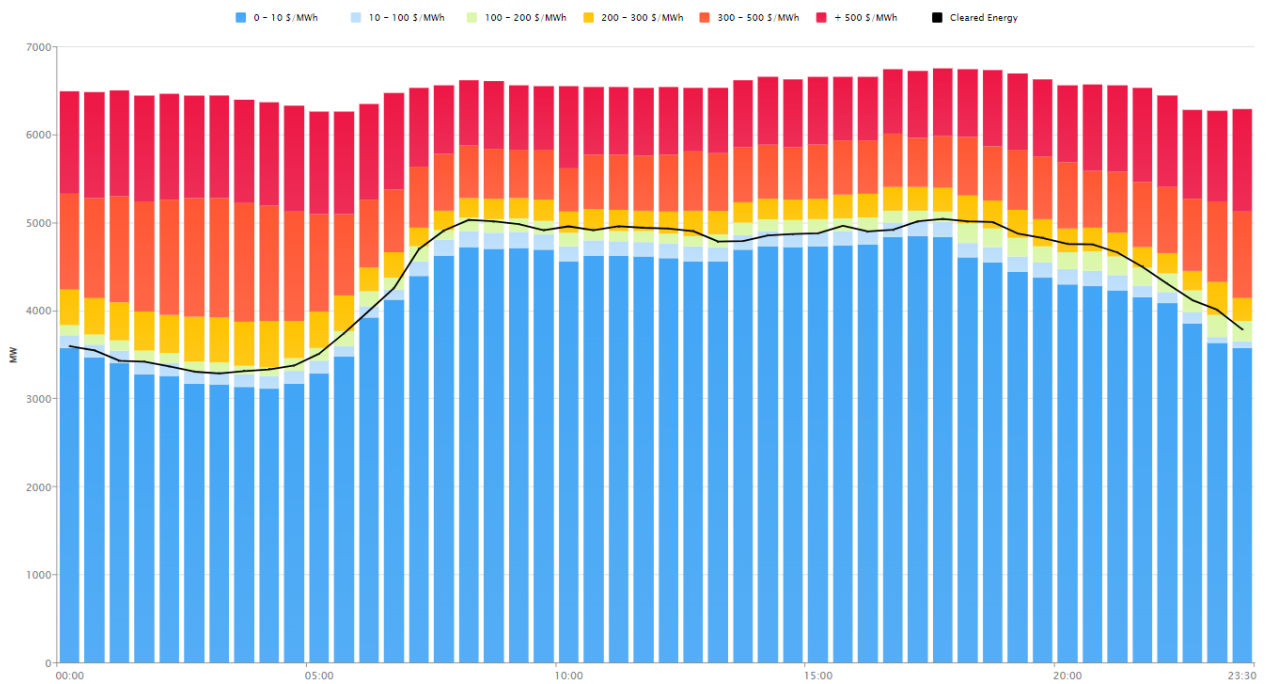




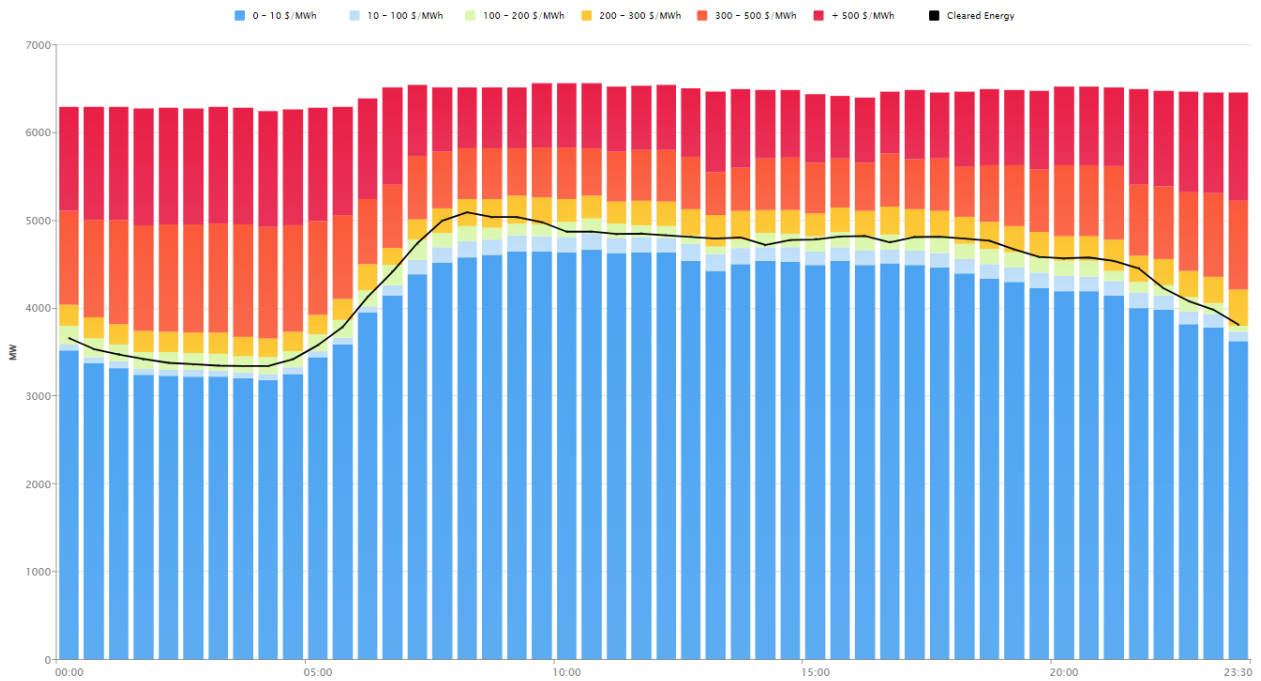
Wednesday 15 February



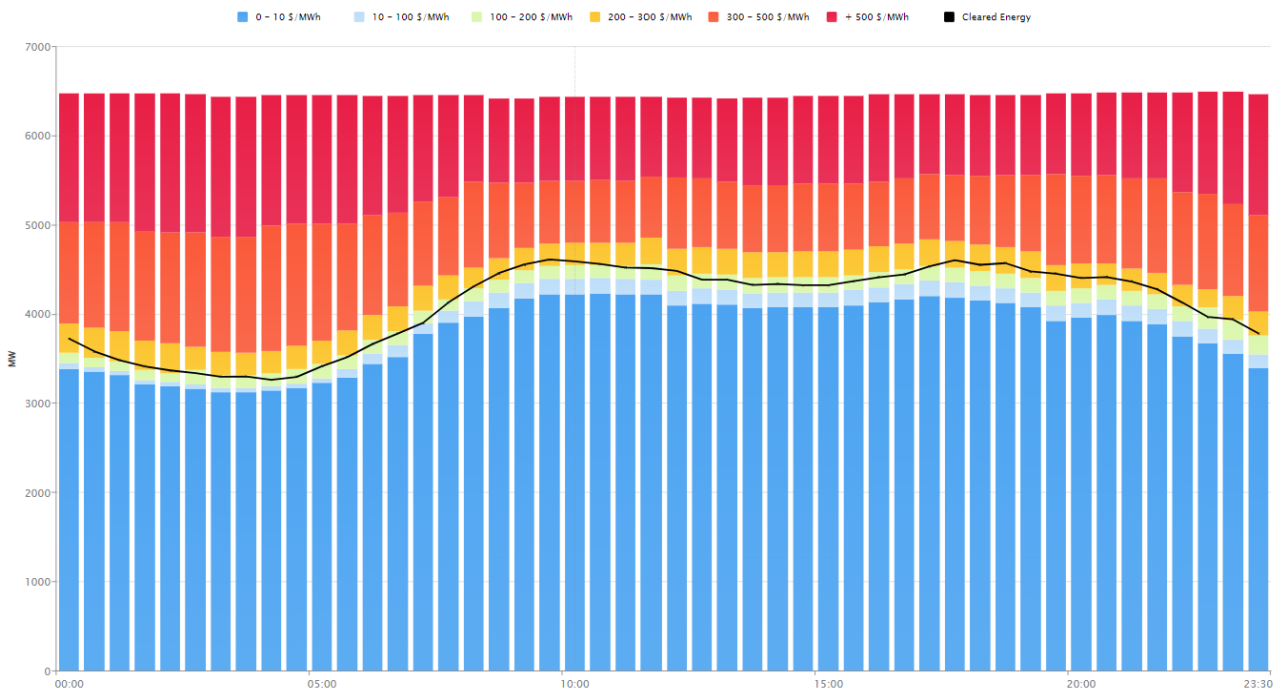
Thursday 16 February



### Friday 17 February



### Saturday 18 February



## 13. Ongoing Work in Trading Conduct

13.1. This week, all prices 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>Notes</b>
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 4/2/2023	Several	Further analysis	The Authority will continue analysis into the high energy prices associated with high hydro offers.