

# Trading Conduct Report

## Market Monitoring Weekly Report

### 1. Overview for the week of 29 January – 4 February 2023

- 1.1. Most spot prices between 29 January – 4 February 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. Note that this week, prices above the historic 90<sup>th</sup> percentile are highlighted with a translucent green line.
- 2.2. Between 29 January – 4 February 2023:
- (a) The average wholesale spot price across all nodes was \$178/MWh.
  - (b) 95 per cent of prices fell between \$2.20/MWh and \$329/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. Both peak and off-peak prices remained mostly high this week. There were, however, more instances of prices below \$100/MWh, when compared to the previous week, especially on the Sunday and Saturday. Spot prices repeatedly breached the 90<sup>th</sup> percentile of historic prices on Sunday, and then a few times throughout the week, mostly either during shoulder periods or overnight.
- 2.5. 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. Since mid-January the median spot prices, and the range of spot prices has increased, as indicated by the higher green bars and larger boxes and whiskers.
- 2.6. This week's high peak and off-peak prices occurred as high temperatures likely increased air-conditioning load. While lake levels did increase, most remain around their means, and NIWA has forecast continued drier conditions for many southern hydro catchment areas<sup>2</sup>. Furthermore, generation from wind was low and often below forecast levels. Generation from Manapōuri continues to be low, with the lake only now just above its low operating

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

<sup>2</sup> [Seasonal climate outlook February - April 2023 | NIWA](#)

range. Some high overnight prices could have been impacted by Manapōuri power station turning off overnight. Thermal generation this week remained high.

Figure 1: Wholesale Spot Prices between 29 January and 4 February 2023

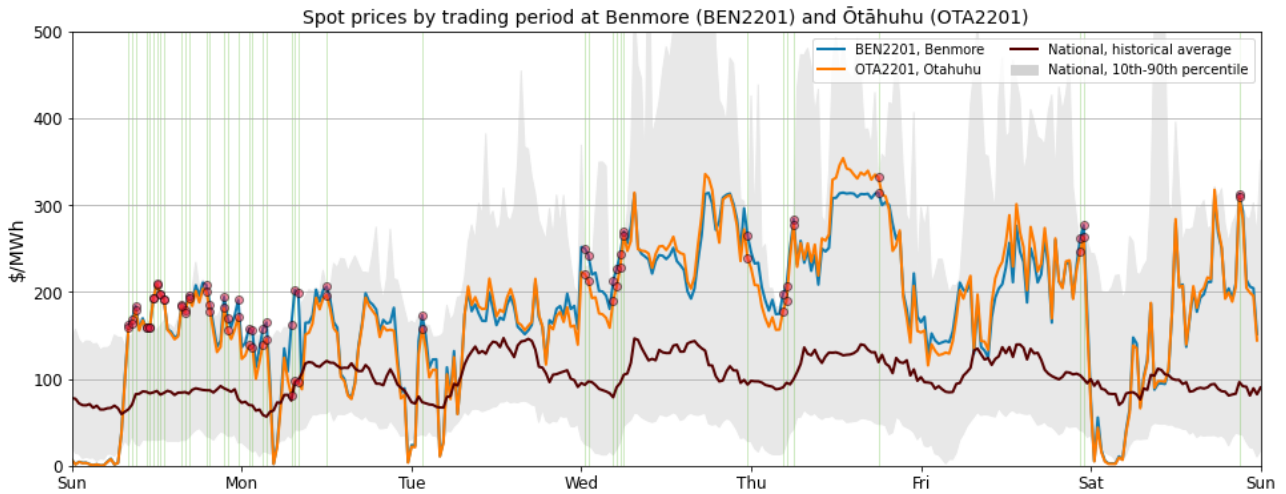
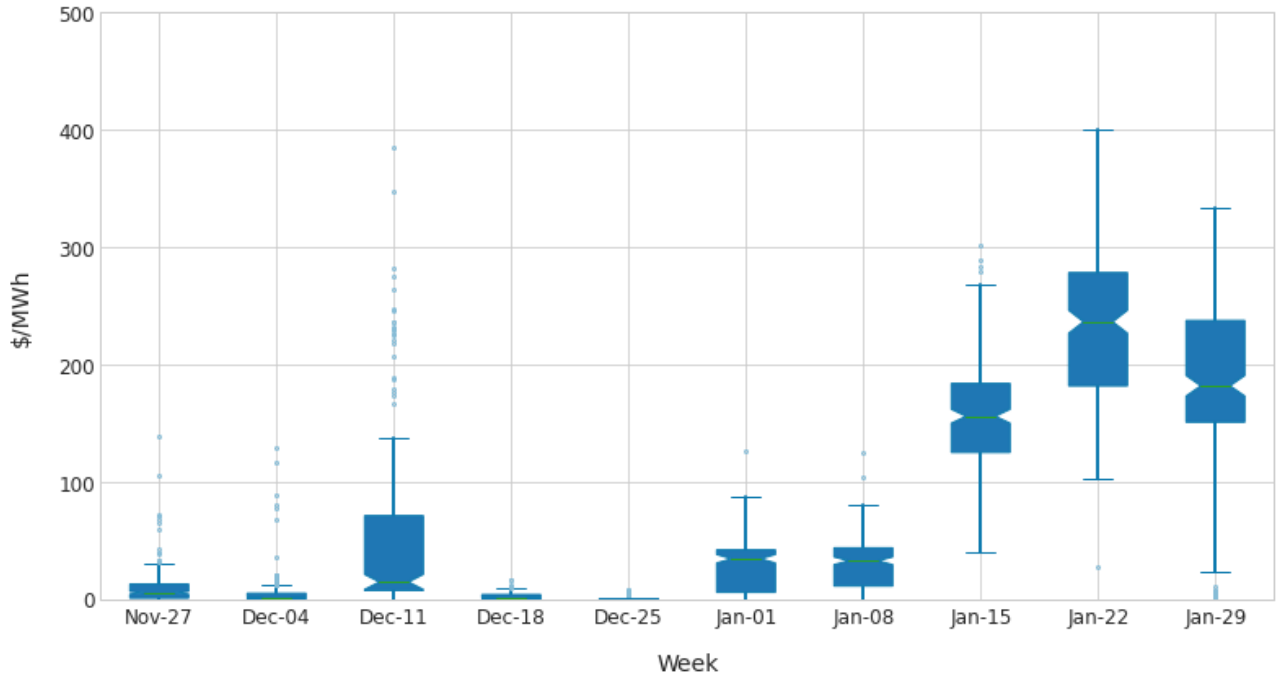


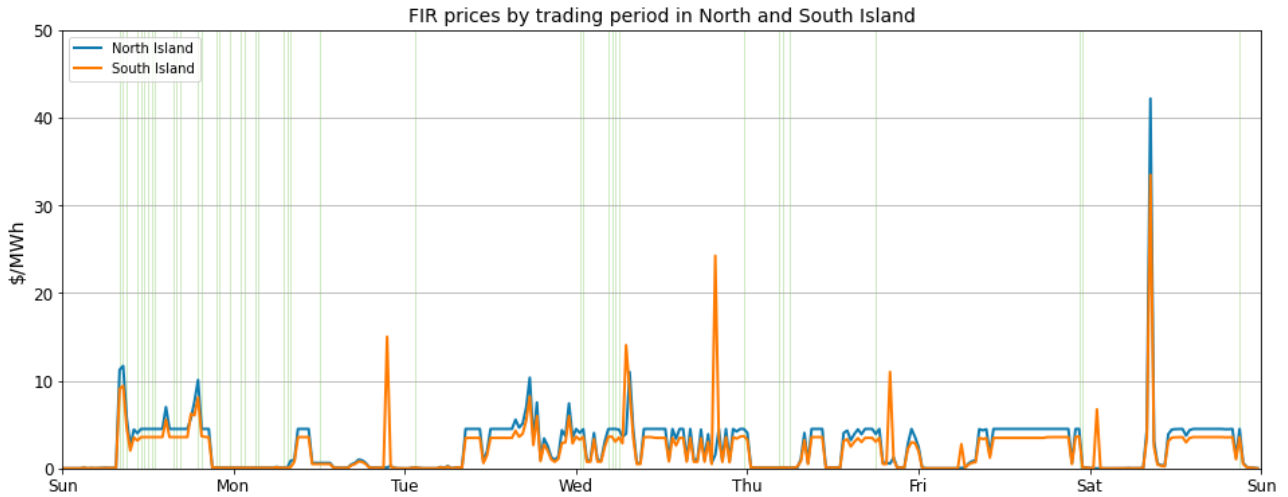
Figure 2: Boxplots showing the distribution of spot prices this week and the previous nine weeks



### 3. Reserve Prices

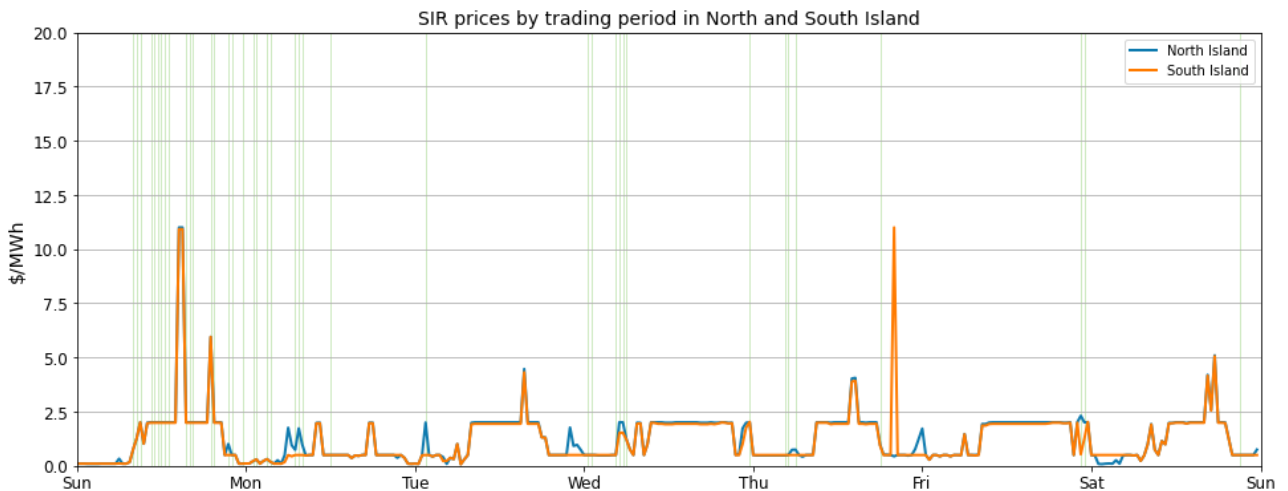
3.1. Fast instantaneous reserve (FIR) prices for the North and South Island are shown below in Figure 3. This week there were two instances where both North and South Island FIR prices were above \$20/MWh, with the highest of these occurring on Saturday in the North Island.

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. Some SIR prices were above \$10/MWh.
- 3.3. Instances of higher 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 4: SIR prices by trading period and Island

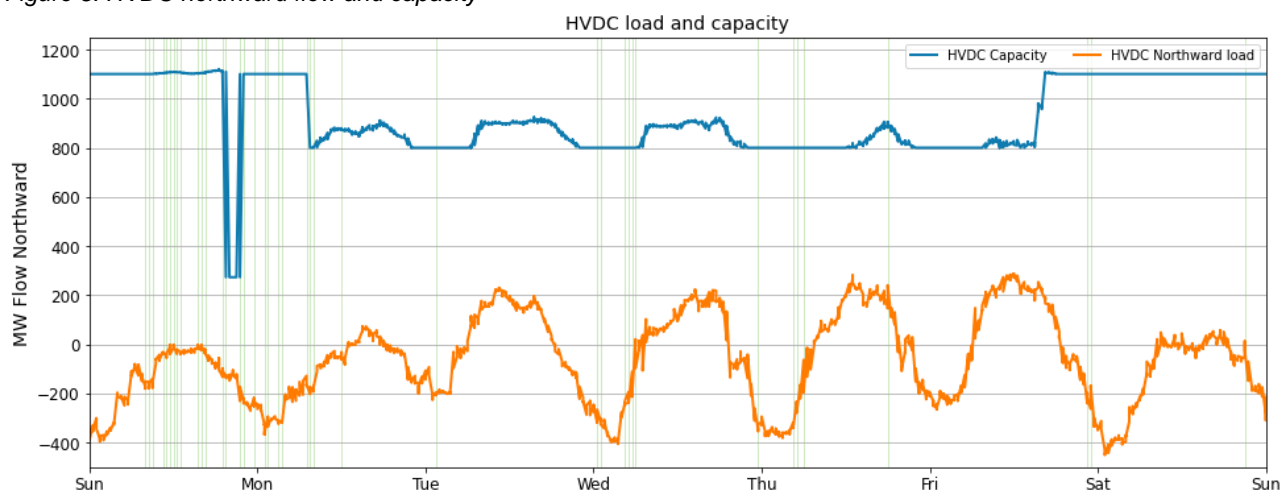


## 4. HVDC

- 4.1. Figure 5 shows northward HVDC flow between 29 January – 4 February 2023. Lower HVDC flows continue as South Island hydro offer prices remain high. HVDC flow was mostly southward this week, reflecting the contrast of declining southern lake levels and

nearly full northern lakes. Flow was northward on during the day between Tuesday and Friday.

Figure 5: HVDC northward flow and capacity

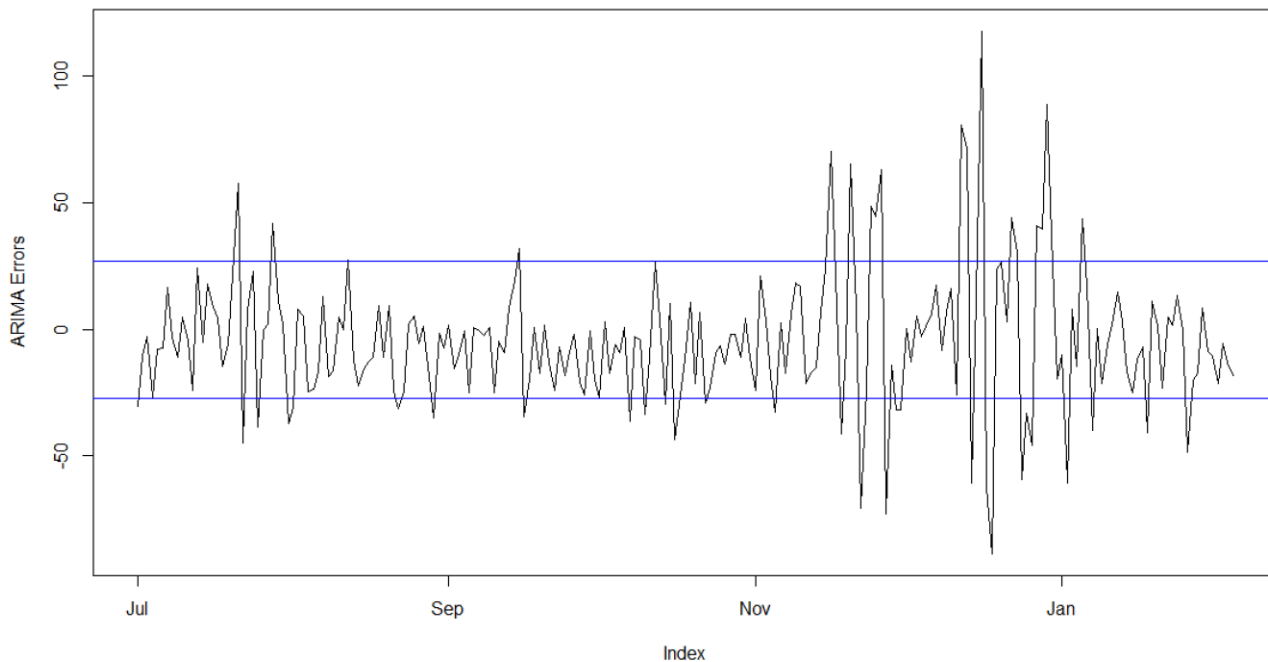


## 5. Regression Residuals

- 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>3</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 relatively small, suggesting that prices on those dates appear to be largely aligned with market conditions.

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

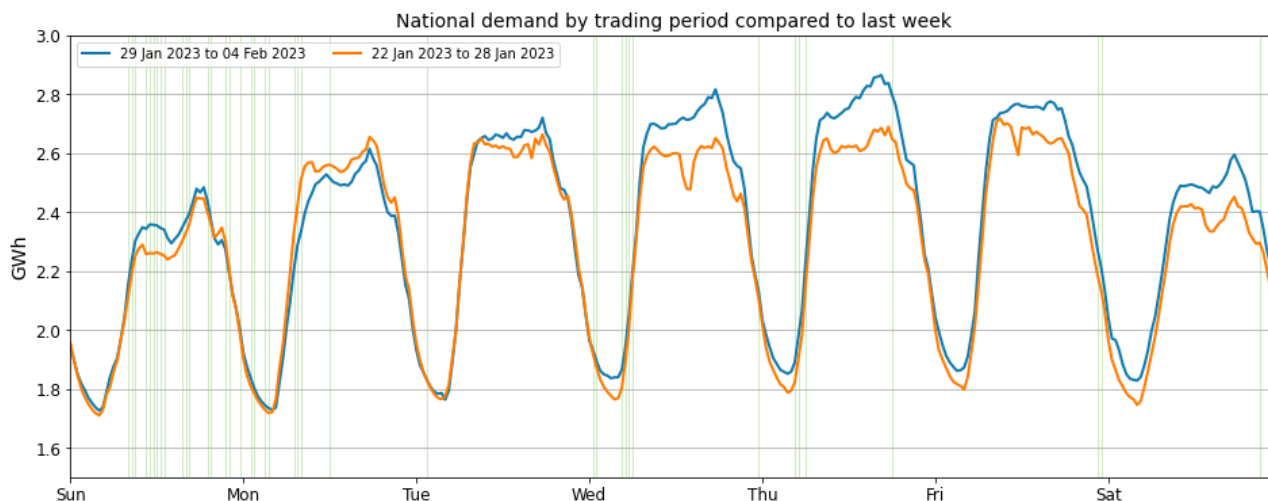
Figure 6: Residual plot of estimated daily average spot prices from 1 July 2022 – 4 February 2023. The blue lines show two standard deviations of the ARMA errors.



## 6. Demand

- 6.1. Figure 7 shows national grid demand between 29 January – 4 February, compared to the previous week. Daily demand was relatively similar to or lower than the previous week between Saturday and Tuesday. From Wednesday onwards demand was much higher than the previous week. This likely occurred as temperatures across the country were high, school returned, and continued high load from irrigation in drier regions.

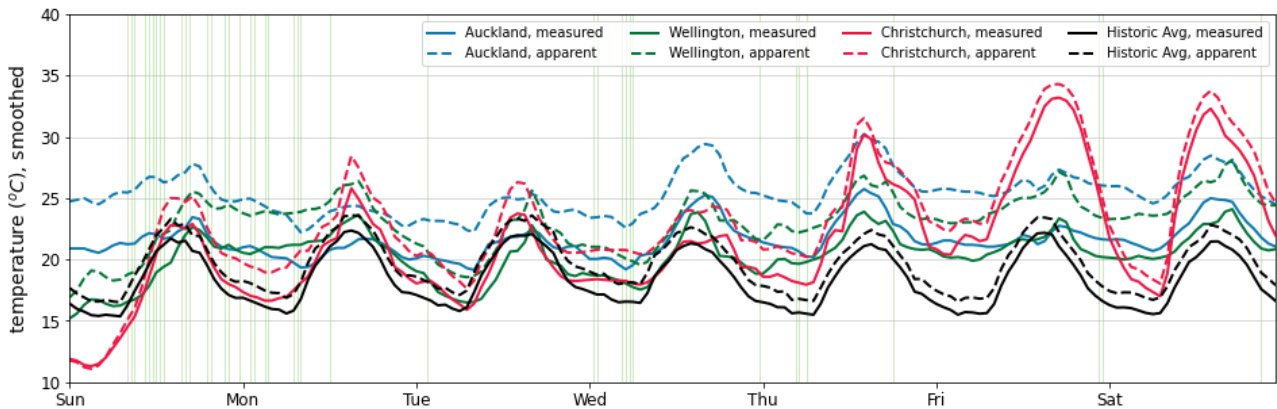
Figure 7: National demand by trading period compared to the previous week



- 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 29 January – 4 February, temperatures across all main centres were mostly above the historic average. Between Friday and Saturday temperatures in Christchurch nearly reached 35 degrees, while Wellington and Auckland both peaked above 25 degrees.

Figure 8: Temperatures across main centres



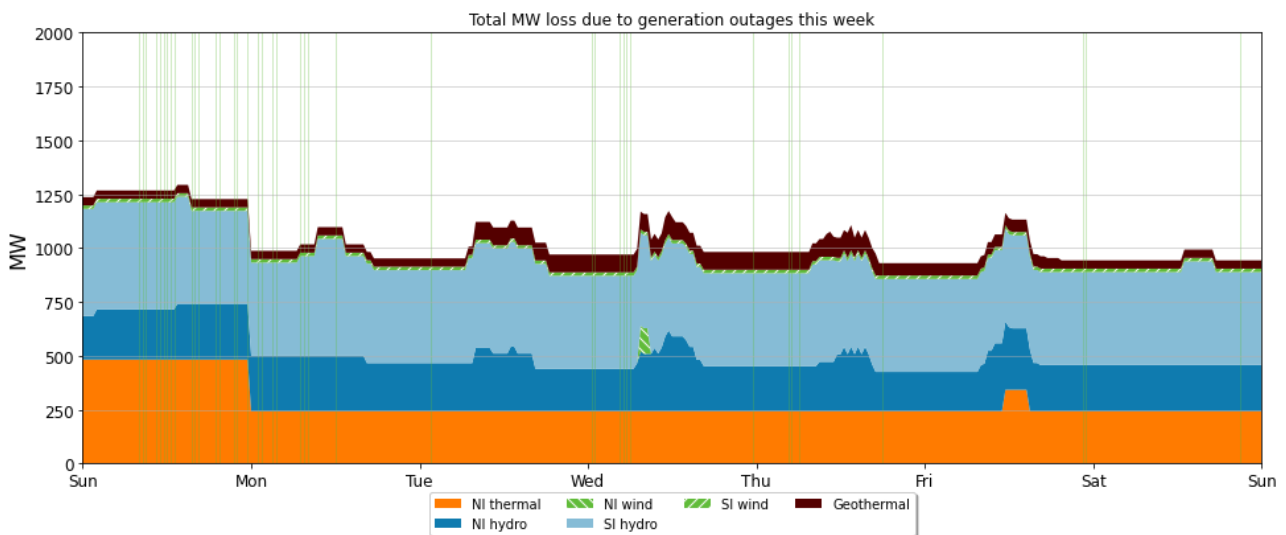
## 7. Outages

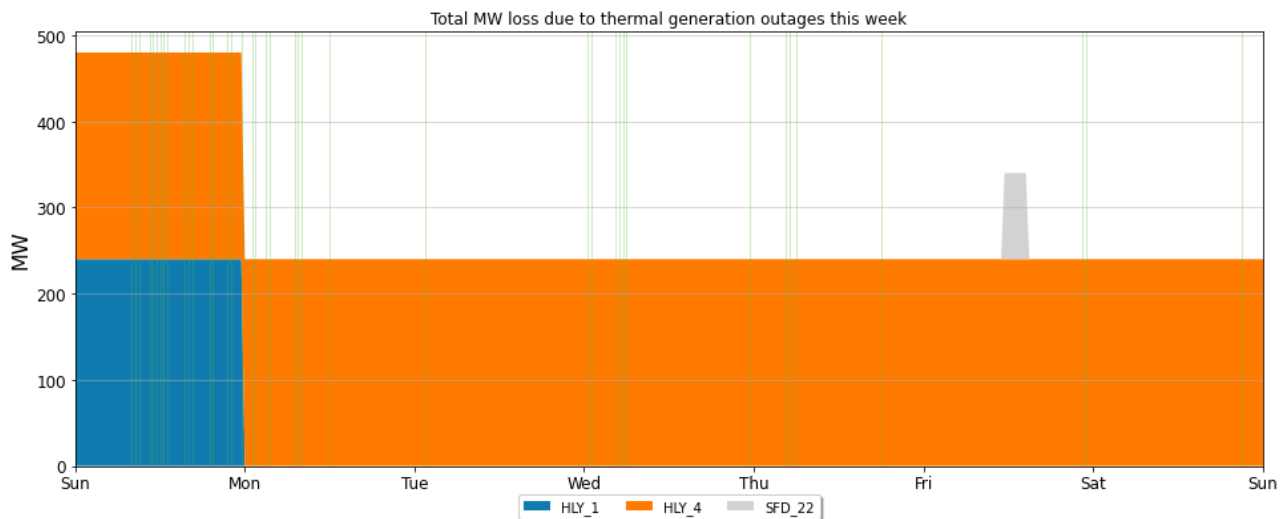
7.1. Figure 9 shows generation capacity on outage. Total capacity on outage between 29 January – 4 February ranged between ~900 – 1,250 MW. Outages were around ~1,250 MW on Sunday and ranged between ~900-1,100 for the rest of the week, as there were periodic North and South Island hydro outages during the day.

7.2. Notable outages include:

- (a) Huntly 4 remains on outage.
- (b) A Huntly 1 outage ended on Sunday.

Figure 9: Total MW loss due to generation outages

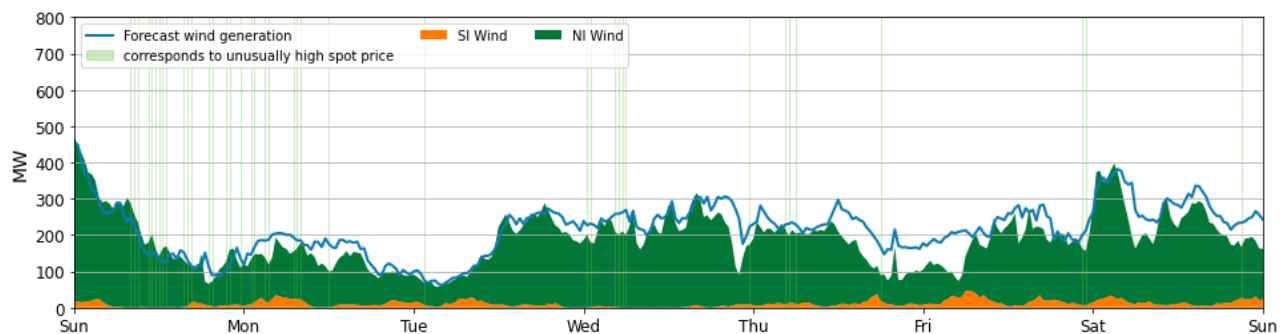




## 8. Generation

- 8.1. Wind generation, between 29 January – 4 February, varied between ~100 and 400 MW. Wind generation was low, mostly under 300 MW between the entire week. Between Wednesday and Saturday, there were some large differences between forecast and actual wind generation. This likely contributed to the higher spot prices seen on Wednesday, Thursday and Friday.

Figure 10: Wind Generation and forecast



- 8.2. Figure 11 shows generation of thermal baseload and thermal peaker plants between 29 January – 4 February. E3P (Huntly 5) ran all week, with it running close to capacity during the weekdays. Huntly 1 also ran between Monday and Friday – with it running at close to capacity on Thursday.
- 8.3. Essentially all the peakers, bar Whirinaki, ran this week, with Wednesday and Thursday seeing the highest amounts of peaker generation. Again some peakers ran more similar to baseload than to actually cover peaks this week.

Figure 11: Thermal Generation

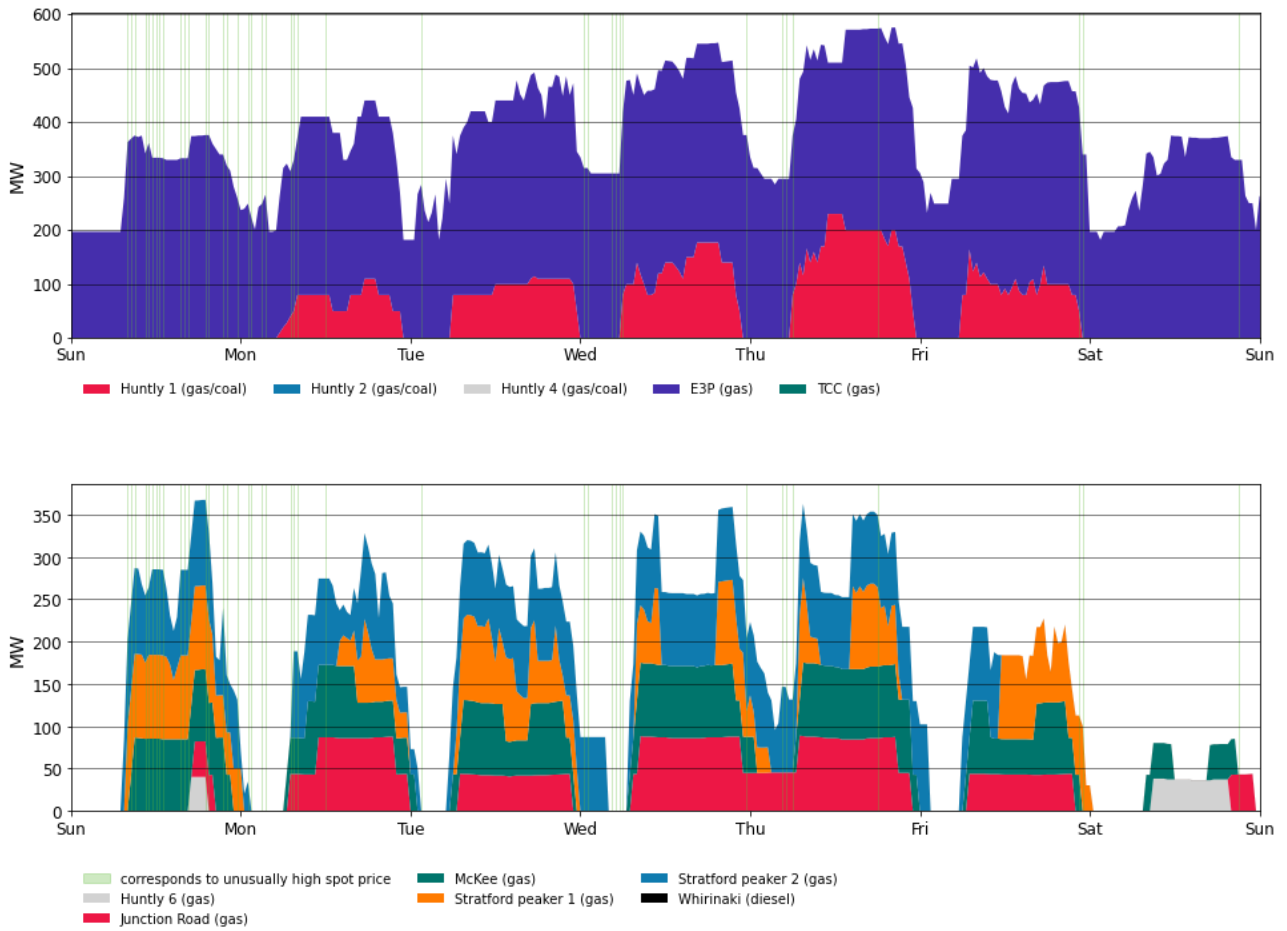
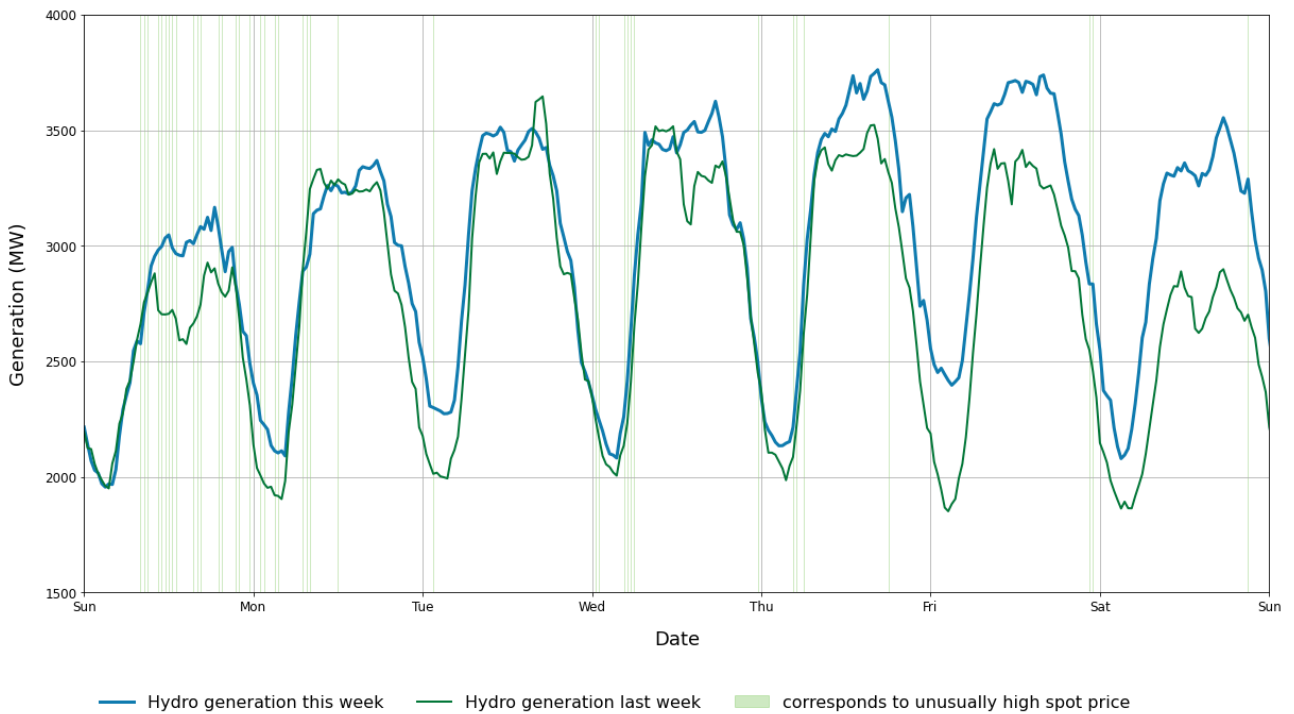


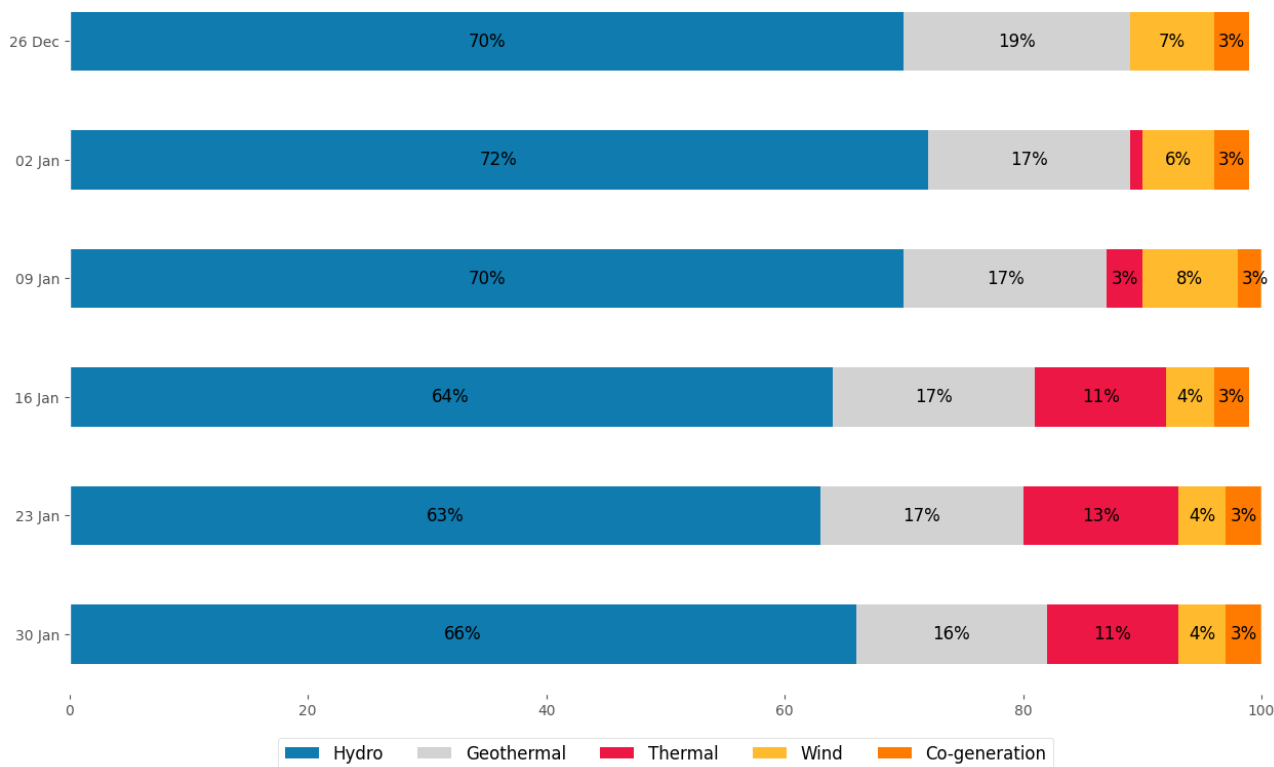
Figure 12: Hydro generation between 29 January – 4 February compared to the previous week





- 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 higher than the previous week – largely due to higher North Island generation, as the Northern hydro catchments approached and reached capacity last week.
- 8.5. As a percentage of total generation, between 30 January – 5 February, total weekly hydro generation totalled 65.9 percent, geothermal 16.5 percent, thermal 11 percent, wind 3.7 percent, and co-generation 2.9 percent.

Figure 13: Total generation as a percentage each week between 19 December 2022 and 5 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 increased overall this week, as Taupō remained high and South Island catchments received some inflows. Total storage is still around 84.7 per cent of nominal full.
- 9.3. Storage at Lake Te Anau and Manapōuri increased this week, however overall storage at the catchment remains at 32 per cent of full. However, these inflows have brought the lakes above their minimum operating range.
- 9.4. Storage at Taupō remained steady well above the 90<sup>th</sup> percentile this week as spill occurred. Figure 15 shows the outflows last week from Karapiro. Due to the heavy rainfall in the Waikato last week, Karapiro was above the LDR (Limit of Discretionary Release) meaning it was spilling. As flows were above 500 cubic metres of water per second this resulted in flooding across walking tracks and a carpark in Hamilton.

Figure 14: Hydro Storage

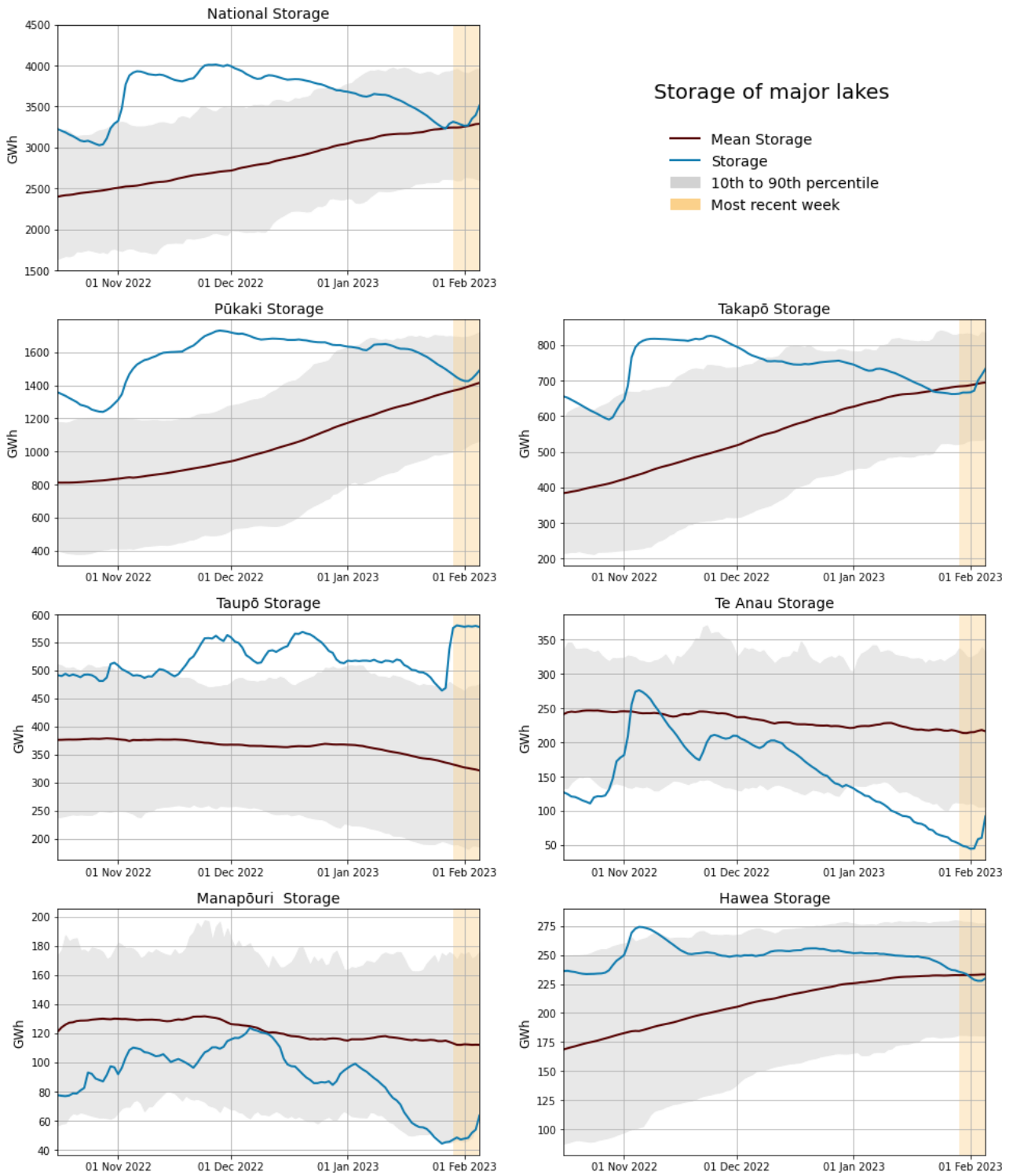
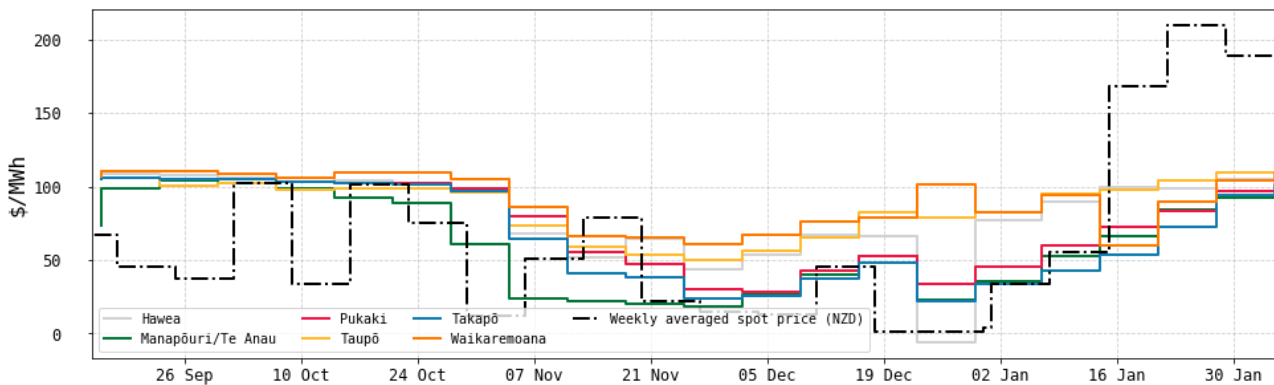


Figure 15: Outflows last week from Karapiro



## 10. JADE Water Values

Figure 16: JADE water values across various reservoirs between 15 September and 2022 and 4 February 2023



- 10.1. The JADE<sup>4</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 16 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>5</sup> 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 increased last week, with North and South Island water values converging. The weekly average spot price this week was greater than the highest water values.

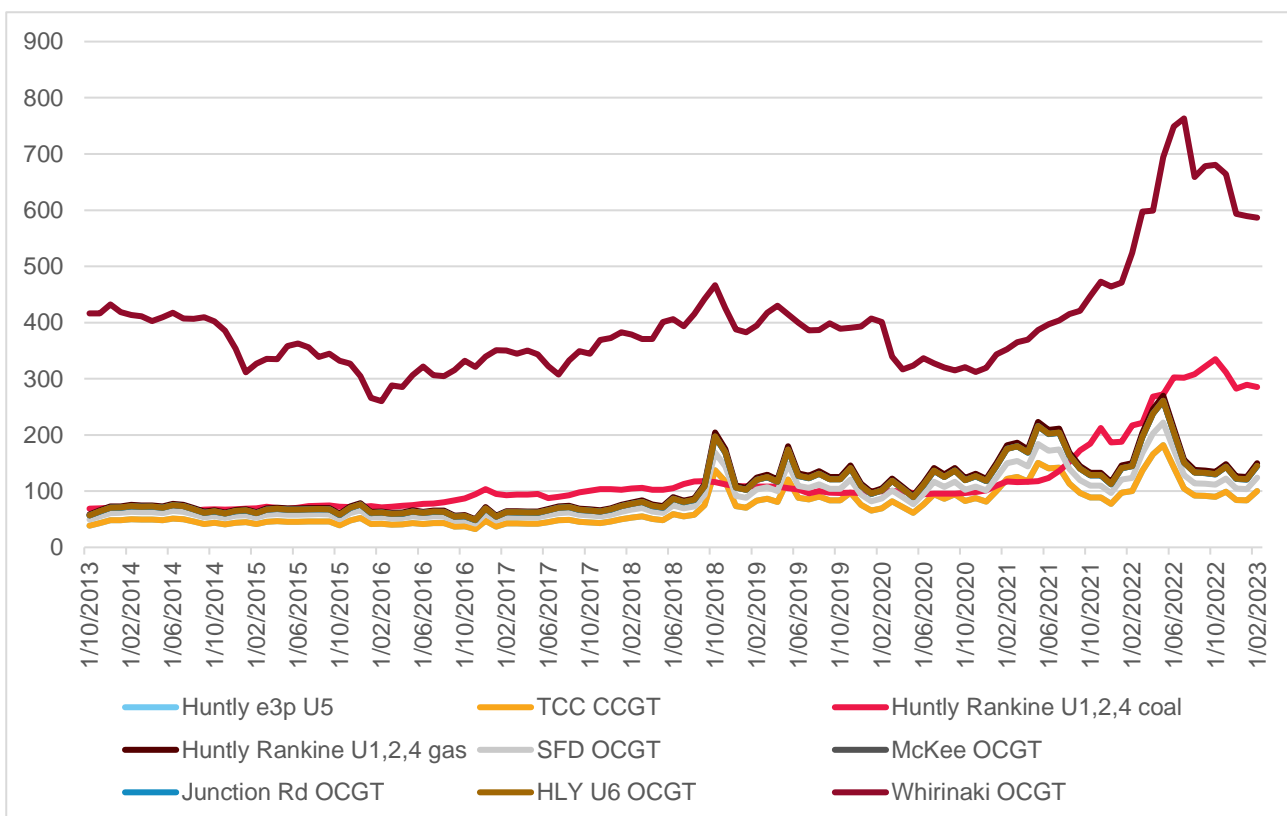
<sup>4</sup> JADE (Just Another DOASA Environment) is an implementation of the Stochastic Dual Dynamic Programming (SDDP) algorithm of Pereira and Pinto. JADE was developed by researchers at the Electric Power Optimisation Centre (EPOC) for the New Zealand electricity market.

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

## 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 17 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.
- 11.5. The SRMC of gas run thermal plants decreased to between \$90/MWh and \$130/MWh, likely due to the increased demand.
- 11.6. More information on how the SRMC of thermal plants is calculated can be found in Appendix C<sup>6</sup> on the trading conduct webpage.

Figure 17: Estimated monthly SRMC for thermal fuels



## 12. Offer Behaviour

- 12.1. Figure 18 shows this week's national daily offer stacks from WITS<sup>7</sup>. The black line shows cleared energy, indicating the range of the average final price. The majority of energy, between Sunday and Tuesday, was cleared in the \$100-200/MWh band. While between

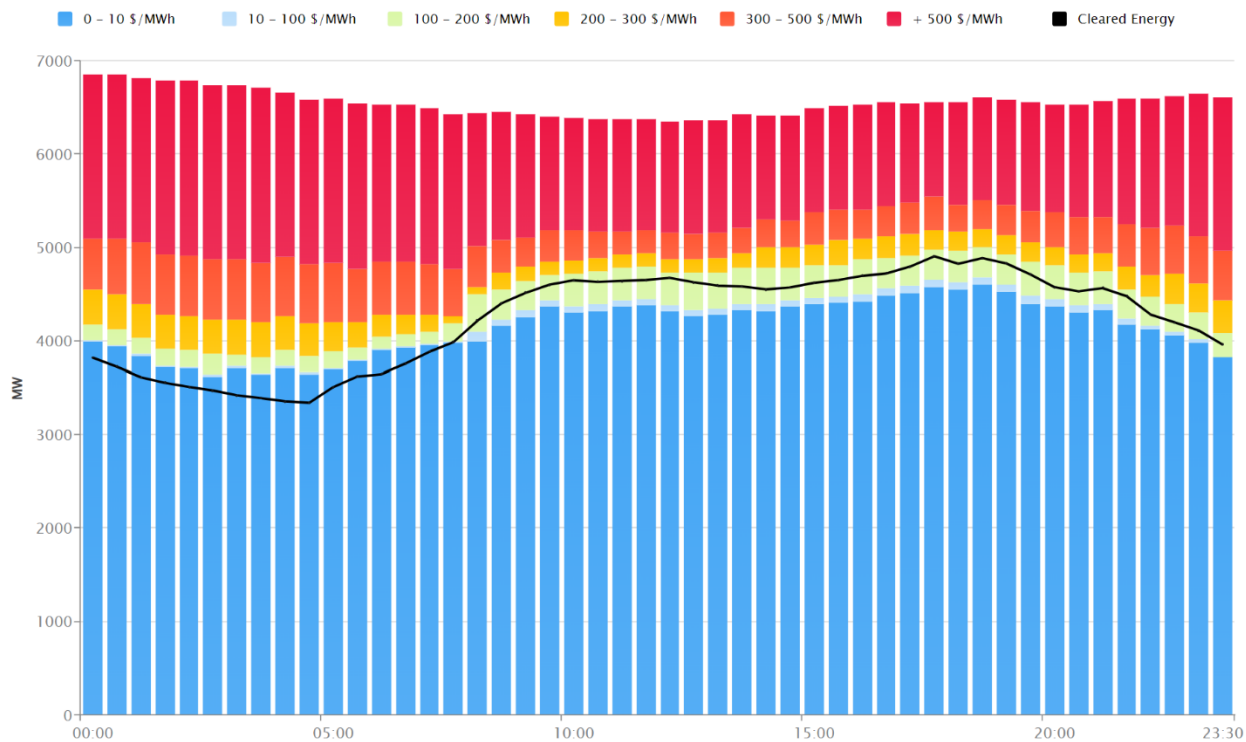
<sup>6</sup> <https://www.ea.govt.nz/assets/dms-assets/30/Appendix-C-Calculating-thermal-SRMCs.pdf>

<sup>7</sup> [Cleared Energy Stack | WITS \(electricityinfo.co.nz\)](#)

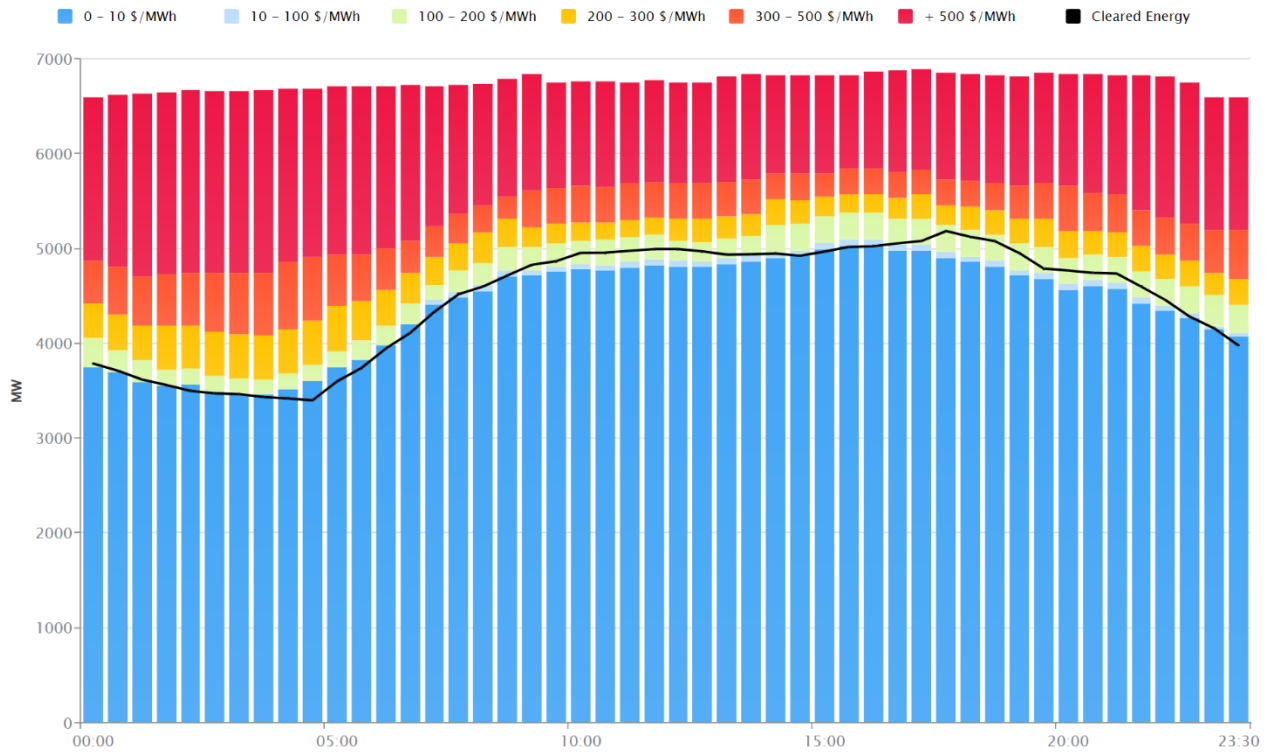
Wednesday and Friday, the majority of energy was cleared in the \$200-\$300/MWh band. There was a noticeable decline in \$100-200/MWh priced offers as the week progressed. This was due to both thermal and hydro offers increasing out of that band.

Figure 18: Daily offer stack from WITS

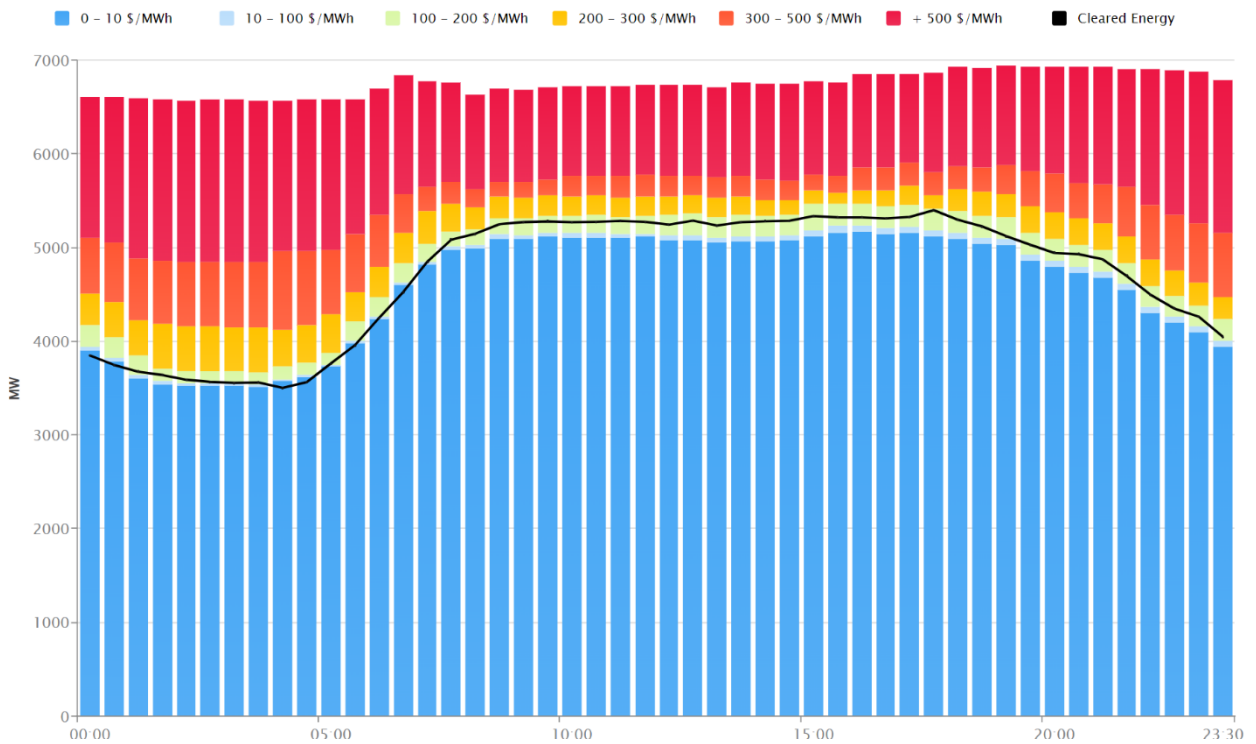
Sunday 29 January



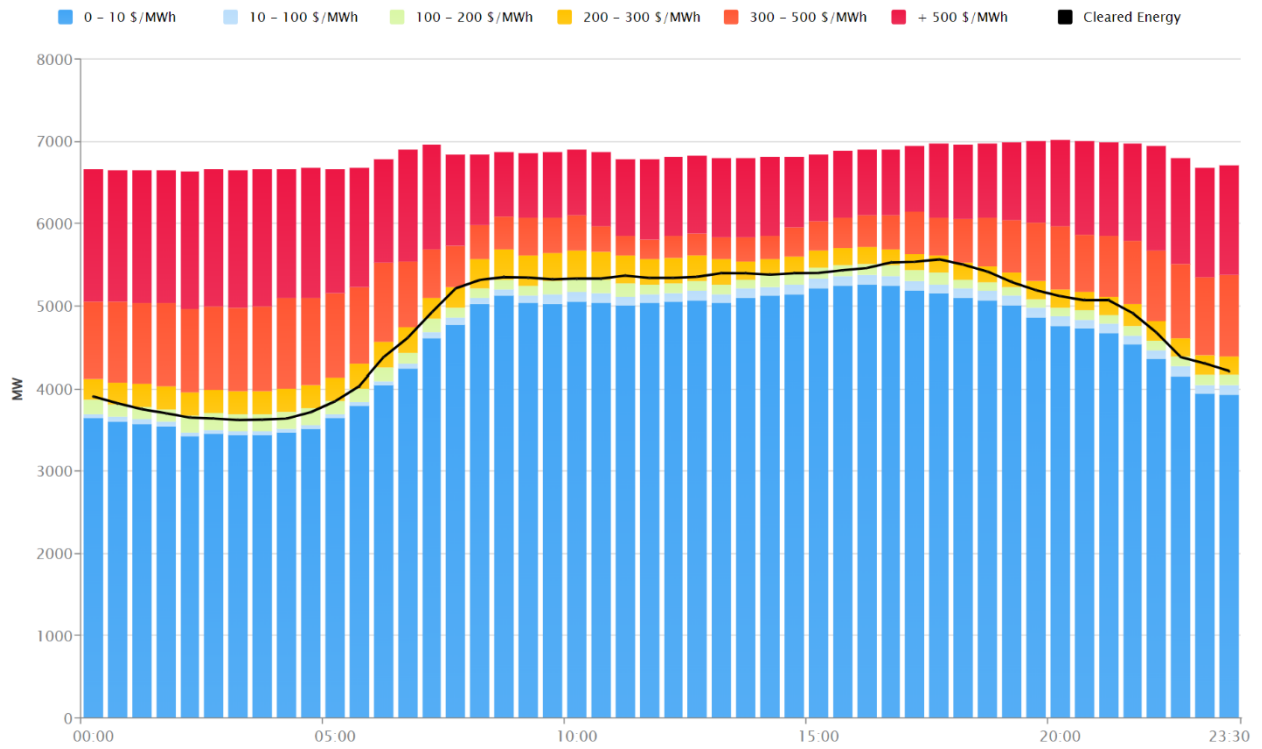
Monday 30 January



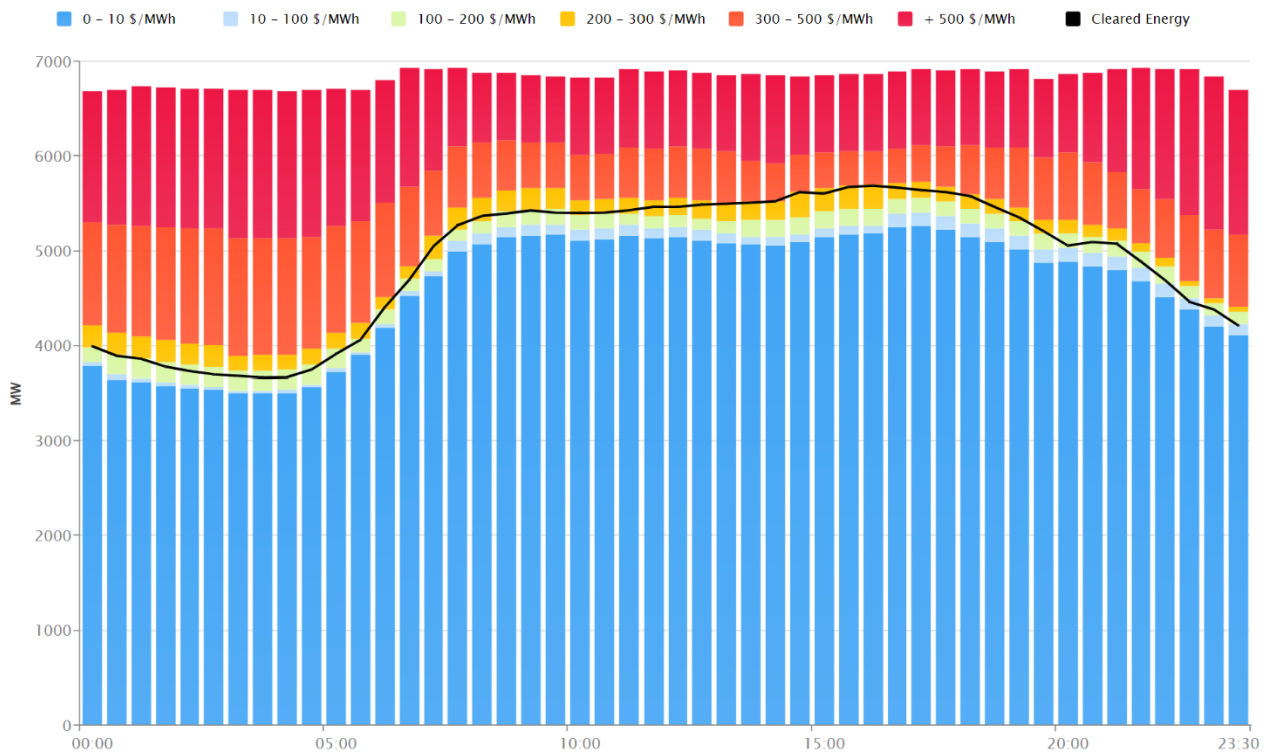
Tuesday 31 January



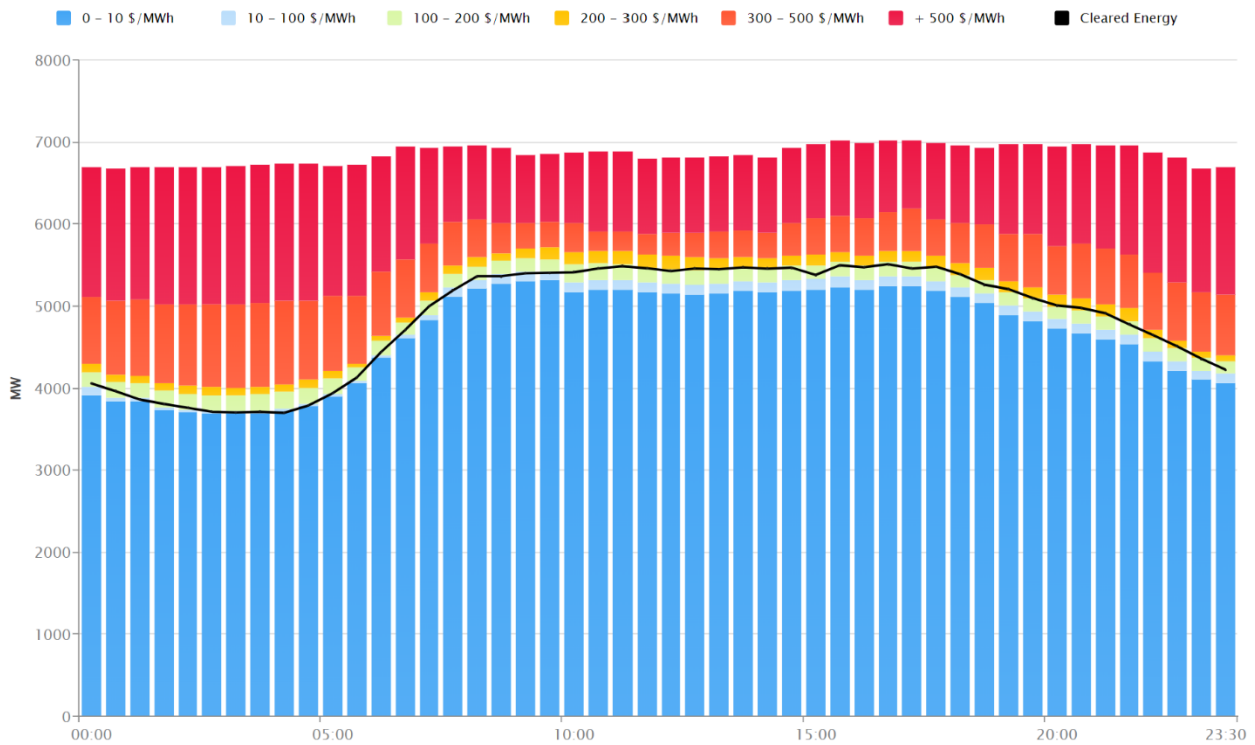
Wednesday 1 February



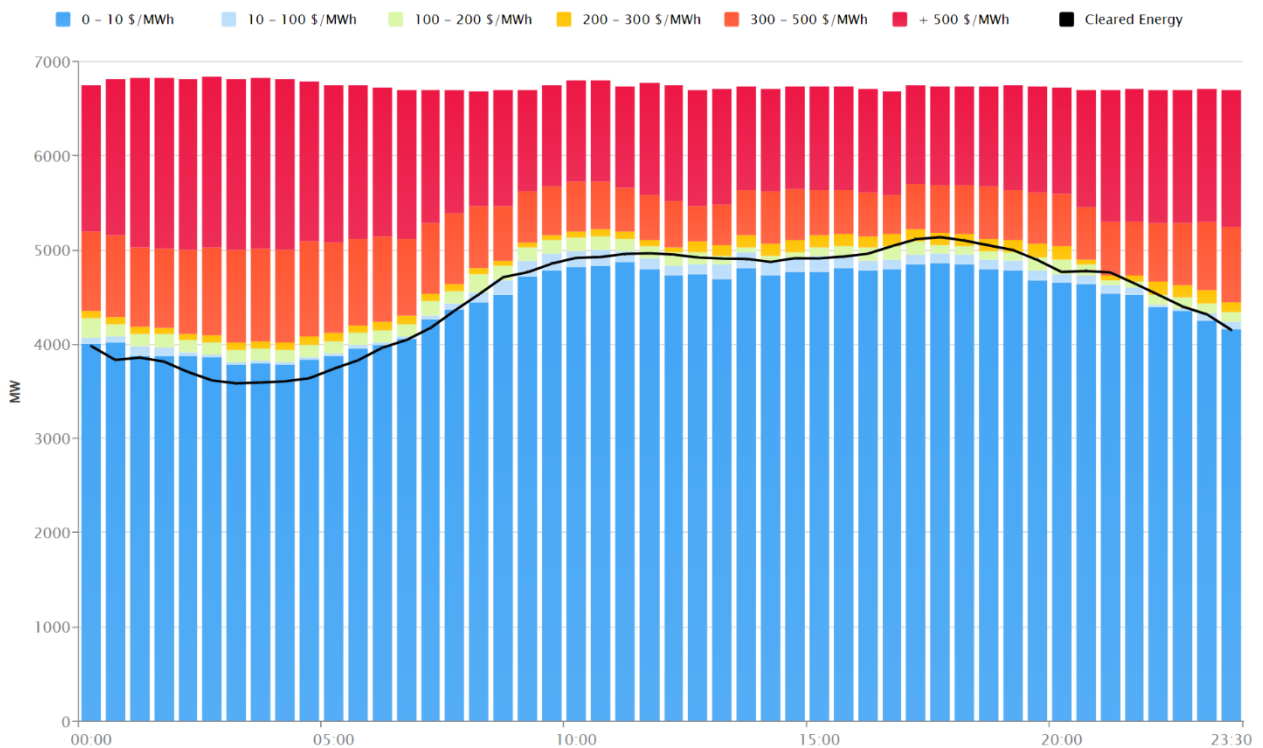
Thursday 2 February



### Friday 3 February



### Saturday 4 February



## 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

<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.