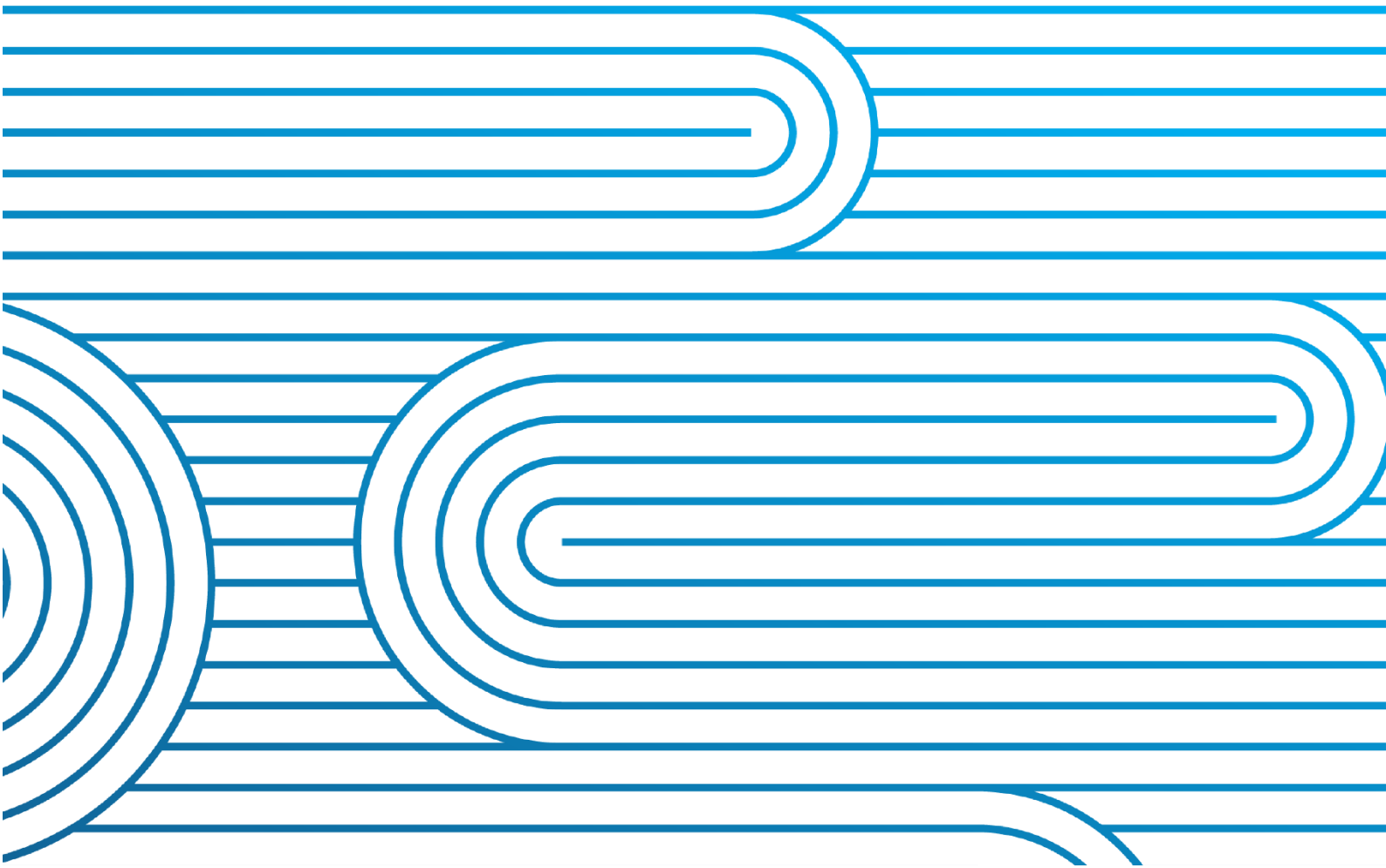
TRANSPOWER

Monthly System Operator and system performance report

for the Electricity Authority

October 2021



Report Purpose

This report is Transpower's review of its performance as system operator for October 2021, in accordance with clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

A detailed system performance report (Code obligated) is provided for the information of the Electricity Authority (Authority).

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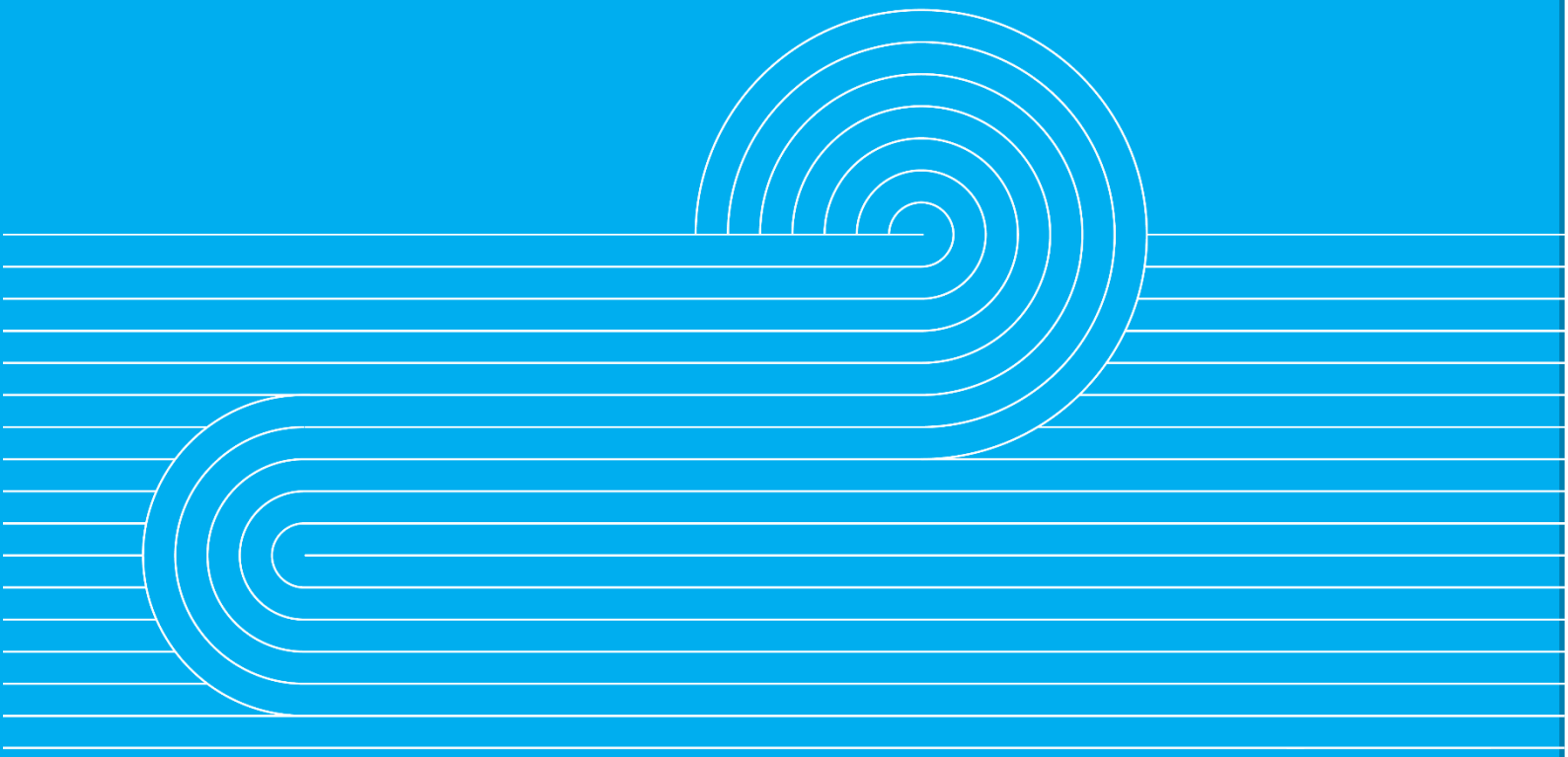
System operator performance



1 Highlights this month

- Our COVID-19 response is now focussed on extended term management. We are encouraging vaccinations (particularly in the control rooms) and identifying longer-term recommendations such as testing.
- We are continuing to respond to the 9 August event, progressing actions identified from the three reports already published and held an industry briefing.
- We presented our work to refresh the external KPIs with the Authority at the Authority's System Operations Committee (SOC) meeting on 1 November.
- We completed the development stage of the second phase of the RTP project; deployment testing began in November.
- All North Island AUFLS providers were onboarded and set up in the new Extended Reserves regime this month.
- We submitted a summary of the of the consultation feedback on the AUFLS Technical Requirements (ATR) document to the Authority on 18 October.
- We delivered the Future Security & Resilience (FSR) draft Phase 1 report to the Authority on 18 October. The draft report will go out for consultation with market participants in November.
- The Authority signed the statement of work for the Transpower actions to revise the System Operator's ancillary service settlement and the Grid Owner's loss and constraint excess settlement for the December 2019 Undesirable Trading Situation (UTS). We met with the Authority's auditors to agree what we would provide and the timetable for doing so. We are on track to deliver in line with expectations.
- National hydro storage is above the 90th percentile of historic averages. This follows several months of unseasonably heavy rainfall in the South Island.
- We reported four System Operator breaches in October – incorrect rating for three- winding transformers on 20 July (no market impact), grid emergency load shedding on 9 August (VoLL between $210,000 and $420,000), incorrect processing of daylight-savings offers (market impact less than $100), not updating Market System model functionality with return of pole 3 of the HVDC.
- On Friday 8 October, an incident with one of the major national carriers impacted all inbound and outbound public switched telephone network (PSTN) telephony to our control rooms as well as to and from the control rooms of many of our connected parties. While we were able to utilise cellular networks and establish points of connection to use on the day, the incident has identified an opportunity to improve our resilience.
- We opened a new Conflict of Interest item in October - the System Operator's Power Systems Engineer assigned to manage Mercury's Karapiro commissioning upgrade previously worked at Mercury. We have implemented controls to actively manage the potential conflict, including management oversight and sign-off of all commissioning/testing documentation.

2 Customers and other relationships

9 August demand management event

We held a planned industry briefing, responding to the event and published reports from the 9 August demand curtailment. These briefings will continue and include opportunities for the industry to work together. More information on our response is in section 3 of this report.

KPI refresh

We presented our work to refresh the external KPIs with the Authority at the Authority's System Operations Committee (SOC) meeting on 1 November. There is enthusiasm from all parties to continue this work. It will provide actionable ways in which to drive the right outcomes for the evolving industry changes, and to link into how the System Operator performance is evaluated (including how we incorporate consideration of events such as 9 August).

RTP workshops

The industry engagement webinar on changes to Dispatchable Demand under the Real Time Pricing regime was presented in October.

3 Risk & Assurance

COVID-19 response

Our attention is now focussing on extended term management of COVID-19 once New Zealand reaches a plateau level of vaccination, and lockdown controls are released.

In the near-term we are encouraging vaccination (particularly for the control room teams) and maintaining our hygiene and separation protocols. We have arrangements for urgent access to saliva testing should this be required.

There is more work to be done on identifying longer-term recommendations that may require investment. The basis of these is vaccination, access to quick turnaround testing, and facilities that allow for separation to limit spread across the team members.

9 August demand management event

The System Operator's independent report (PBA Report) was published on the Transpower website on 12 October. Transpower also commissioned an independent investigation on stakeholder communication performed by Thompson Lewis that was released on 12 October. These are in addition to the Electricity Authority Phase 1 report, an immediate assurance review (published on 10 September). These Transpower reports and other responses to 9 August 2021 are available on the Transpower website.

The emerging themes from these reports relate to the System Operator's event management process, readiness and communications. The System Operator has developed a programme or work to oversee the response to the recommendations from each of the investigations. The immediate focus is on the actions due to be completed by 30 November. The sequencing of activities is such that the immediate

actions will provide inputs into the longer-term deliverables and assist in their completion

We continue to support the Authority with its Phase 2 investigation, as well as with the MBIE investigation.

Pakuranga-Whakamaru cable

Following this second incident on this underground cable (refer to section 16 of this report), the Grid Owner has requested that the System Operator refrain from or minimise switching Pakuranga-Whakamaru Cable 1 to minimise risk. With the light loads due to lockdowns and warmer weather, there are expected to be frequent requests (most weekends and many nights) for this asset to be removed to assist with voltage management. Options and risks of alternative controls are being investigated to ensure that the Grid Owner has full visibility of the potential impact of this request on system security.

4 Compliance

We reported four System Operator breaches in October:

Breach #1:	Incorrect rating for three-winding transformers
Event date:	15 July 2021
Date reported:	13 October 2021
Description:	On 24 June 2021, the System Operator implemented the modelling of reverse branch limits in the market system. However, the weekly dispatch schedule run on 15 July 2021 highlighted some infeasibilities caused by the incorrect modelling of the reverse branch limit for three-winding transformers (due to the way direction of flow is measured for three-winding transformers). An override was applied to the market system to correct the error and a process implemented to ensure future model updates correctly account for the ratings of three-winding transformers. There was no market impact.

Breach #2:	Grid emergency load shedding
Event date:	9 August 2021
Date reported:	14 October 2021
Description:	The System Operator finalised its September interim self-report. The self-breach relates to the incorrect Demand Allocation Notice. The estimated market impact is based on a nominal range of the value of lost load (VoLL) developed by the Authority in its Real Time Pricing (RTP) consultation paper. Applying the range, the total VoLL for the customer curtailments (WEL + Electra) was $210,000 to $420,000. The VoLL for all other electricity distribution businesses (non-customer curtailments) was $0 to $76,000.

Breach #3:	Daylight-savings offers processed incorrectly
Event date:	4 April 2021
Date reported:	19 October 2021

Description: The market system does not correctly account for the extra hour that occurs at the end of daylight-saving and offers were flagged based only on the submitted time and not the latest COMIT ID record as used by NZX. This means an offer submitted at 02:53 (during the first period between 02:00 – 03:00) would be flagged as a later offer than one submitted at 02:31 (during the second period between 02:00 – 03:00). The error affected five Waitaki River stations for two trading periods. The estimated market impact was minimal (less than $100). The system operator is working with NZX to develop a solution, expected to go-live with RTP 2 in March 2022. If deployment does not occur prior to the end of March, the system operator will instruct participants not to reoffer generation during the extra hour 02:00 – 03:00.

Breach #4: Market System model functionality not updated with return of Pole 3 od the HVDC
Event date: 29 August and 3 September 2021
Date reported: 22 October 2021
Description: The System Operator is required to update HVDC functionality and limits in the market whenever there is a change to the HVDC functionality affecting its performance/capability. However, on two occasions the System Operator did not update the Market System when changes were made to the Pole 3 voltage mode of operation. The HVDC did not set the risk on either occasion and there was no market impact. The System Operator is currently investigating a tool solution for a reduced voltage off-normal indicator to be implemented onto the HVDC dispatch overview display.

5 Impartiality of Transpower roles

We opened a new Conflict of Interest item in October. The System Operator's Power Systems Engineer assigned to manage Mercury's Karapiro commissioning upgrade previously worked at Mercury. The employee will provide input into the commissioning/testing documentation and will prepare the final compliance documentation for System Operator sign-off. While there is no threat to the System Operator's independence (from the Grid Owner), there is a potential perception around the System Operator's impartiality (as regards all participants). The System Operator has implemented controls to actively manage the potential conflict, including management oversight and sign-off of all commissioning/testing documentation.

We have six open items in the register that are being actively managed in accordance with our Conflict of Interest procedure.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
29	**Preparing the Net Benefit test – system operator involvement:** The system operator is reviewing how it can provide information for use by the grid owner undertaking a Net Benefit Test.	Operations Planning Manager
31	**Discussions concerning Demand Response:** A system operator employee is part of a Transpower working group investigating the possible future use of the Transpower demand	SO Market and Business Manager

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
	response platform. The system operator role is to provide the system operator perspective on any demand response proposals. Impartiality mitigations have been implemented to ensure the grid owner is not treated more favourably than any other participant with respect to demand response.	
39	**New SO Compliance & Impartiality Manager:** This relates to potential perception; the person filling this role also works for Transpower's legal team on a part-time basis. Workstreams will be allocated accordingly.	GM Operations
40	**General system operator/grid owner dual roles:** This is a general item that will remain permanently open to cover all employees with a dual system operator/grid owner role. The item documents the actions necessary to ensure impartiality in these circumstances; these items will be monitored to ensure their continue effectiveness.	SO Compliance & Impartiality Manager
41	**General relationship situation:** This is a general item that will remain permanently open to cover all potential conflicts of interest arising under a relationship situation. This item documents the actions necessary to prevent an actual conflict arising and will be monitored by the SO Compliance & Impartiality Manager to ensure their continued effectiveness.	SO Compliance & Impartiality Manager
42	**Mercury KPO upgrade:** The Power Systems Engineer assigned to manage the KPO upgrade previously worked at Mercury. The employee will provide input into the commissioning/testing documentation and will prepare the final compliance documentation for SO sign-off. Controls have been implemented, including management oversight and sign-off of all commissioning/testing documentation.	Power Systems Engineering Assurance Manager

6 Project updates

6.1 Market design and service enhancement project updates

Progress against high value, in-flight market design, service enhancement and service maintenance projects are included below along with details of any variances from the current capex plan.

Real Time Pricing (RTP)

Development for Phase 2 is complete with functional and system testing planned for completion in early November. Deployment testing has already commenced. Phase 3 work continues to progress with active work being undertaken on the high-level design, detailed requirements, user interface and business processes. Transition planning was also held this month to revisit the cutover concept to ensure gaps and any further development work is identified. The project is tracking on time both with respect to time and costs.

Business user preparation for Phase 2 deployment continues with operational procedure updates nearing completion and training modules under review. A refreshed business change plan for Phase 2 is currently being reviewed. The October industry engagement webinar on changes to Dispatchable Demand was

completed, work will commence on the final webinar of this series, the new lower compliance trading options for small generators and load participants.

AUFLS Customer Portal Launch
This month we completed the onboarding of all affected North Island AUFLS providers onto the AUFLS application in the customer portal. All providers have now been set up. The team has received the required feeder configuration information from several participants already and is working with the other parties to make sure this information is received by 5 November 2021.

In addition, the System Operator completed a review of the consultation feedback on the AUFLS Technical Requirements (ATR) document. A summary was submitted to the Authority on 18 October. Transpower will await the final Authority Board approval from the November Board meeting.

7 Technical advisory hours and services

Technical advisory hours and a summary of all technical advisory services (TAS) to which those hours related (SOSPA 12.3 (d) refers) will be provided in the next quarterly report.

Future Security & Resilience (FSR)
This TAS is to provide advice to the Electricity Authority for their FSR programme of work. The team delivered the draft Phase 1 report on 18 October – a significant milestone. This draft report includes feedback from Authority staff. It also incorporates feedback from an external US based consultant commissioned by the Authority. The report then was peer reviewed by independent consultants, Sapere.

The draft report will go out for consultation with market participants in November.

TAS work
TAS work relating to Battery Offering Reserves (TAS 100) - The project team successfully completed integration testing of Battery Energy Storage System (BESS) reserve offers, using the test environment. All requested datasets (dispatch logs, bids and offers, and final reserve prices) were provided to NZX, as planned, by 1 November. Internal user acceptance testing and regression testing are planned throughout November

December 2019 UTS (TAS 101) - The Authority signed the statement of work for the Transpower actions to revise the System Operator's ancillary service settlement and the Grid Owner's loss and constraint excess settlement for the December 2019 Undesirable Trading Situation (UTS). Transpower has successfully updated test environments with the revised final pricing data and produced revised settlement information using the revised data. Testing has included replication of the required interactions with the NZX Clearing Manager. We also met with the Authority's auditors to agree what we would provide and the timetable for doing so. We are on track to deliver in line with expectations.

8 Outage planning and coordination

Outage Planning – near real time

Outage numbers are very high, with high assessment workloads for operations planning engineers. Outage numbers typically climb at this time of year with improved weather and lower demands, but we are seeing some outage numbers for some weeks approaching 200+ outages.

New Zealand Generation Balance (NZGB) analysis

November's NZGB report forecasts no N-1-G generation shortfalls for the next six months for all scenarios and generation assumptions.

9 Power systems investigations and reporting

No items to report.

10 Performance metrics and monitoring

System Operator performance against the performance metrics for the financial year as required by SOSPA 12.3 (a) will be provided in the next quarterly report.

11 Cost-of-services reporting

This will be provided to the Authority in late 2021.

12 Actions taken

A full list of actions taken regarding the system operator business plan, statutory objective work plan, participant survey responses and any remedial plan, as required by SOSPA 12.3 (b) will be provided in the next quarterly report.

System performance

13 Security of supply

At the end of October 2021, national hydro storage was 129% of average for the time of year; above the 90th percentile of historic averages. This is a result of several months of unseasonably heavy rainfall in the South Island which has improved the overall storage position. With abundant hydro generation in recent weeks, we have seen very high northward transfer across the HVDC; the exception being a period of southward transfer between 1:30 am and 6:00 am October 30 when wind generation was high and hydro low. This was the first time the transfer has been southward since 24 September. Thermal generation has also been low as a result of the improved hydro position.

In the National Institute of Water and Atmospheric Research's (NIWA) latest climate outlook they have moved to "La Niña Alert", predicting an 80% chance of the development of a formal La Niña between November-January. This forecast would result in below average rainfall over the main southern hydro catchments for this period.

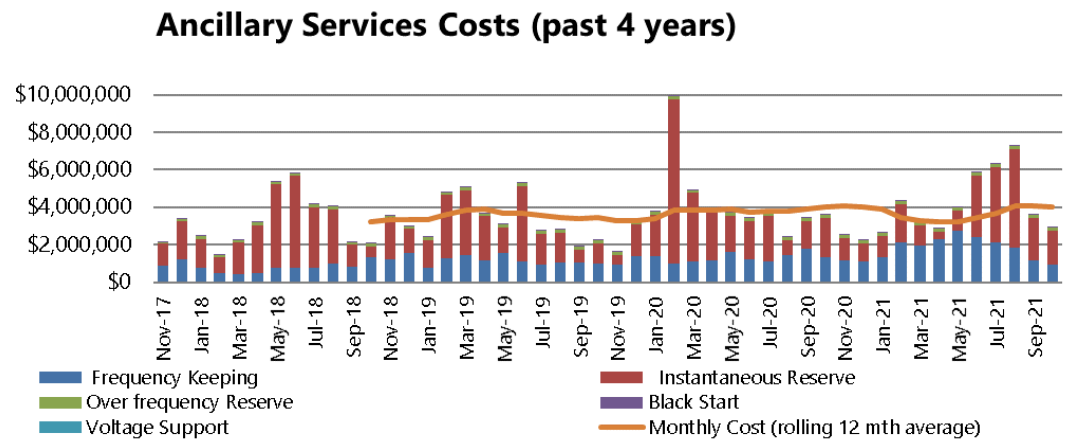
We saw an extended period of price separation between Southland and the rest of the country from 27 September to 1 October. This separation was the result of a planned outage on the Clyde-Twizel 2 line, which lead to constrained supply along remaining Naseby-Roxborough and Clyde-Twizel 1 lines.

Price separation was also seen between 6:00pm and 7:00pm on 26 October, where prices at Invercargill were very low. This was caused by a lightning storm, therefore the potential loss of Clyde-Twizel circuits 1 and 2 were treated as a single contingency. Combined with the Naseby-Roxburgh circuit being on outage, this caused a binding constraint in the Southland region.

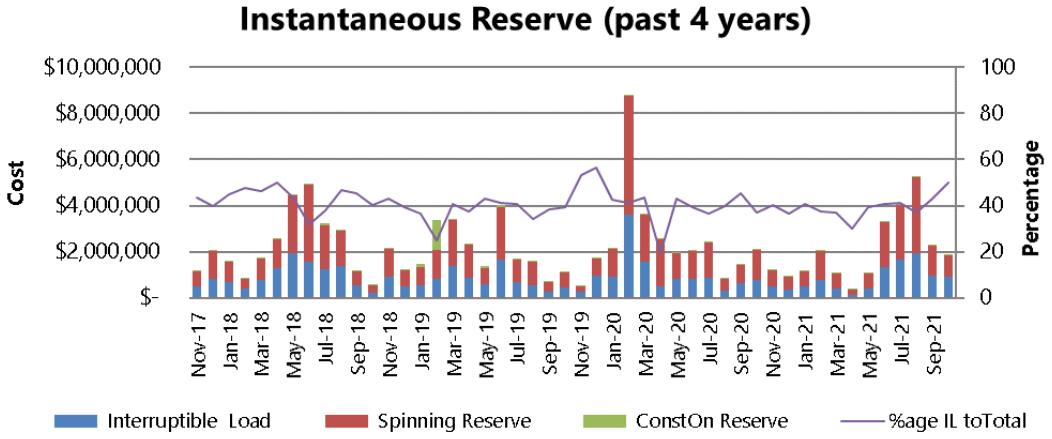
A further period of price separation was observed throughout the day on 28 October due to the HVDC setting the risk in the North Island. The reason for the price separation was due to the reduced ability of the HVDC to self-cover risk during a period of filter outages. There were some reserve price spikes during this period.

National weekly demand continues to decline due to warmer temperatures.

14 Ancillary services

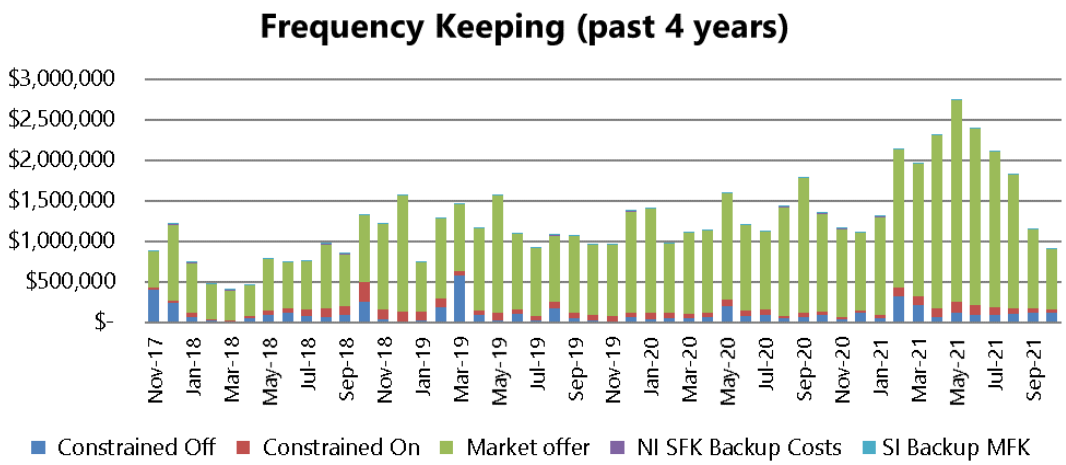


This month's ancillary services costs were $2.97 million, a further decrease of $662k (18.2% decrease) from the previous month and less than half the cost in August ($7.31 million). While the cost of frequency keeping has been falling, the decrease in overall costs is mainly due to a significant decrease in costs associated with instantaneous reserves.

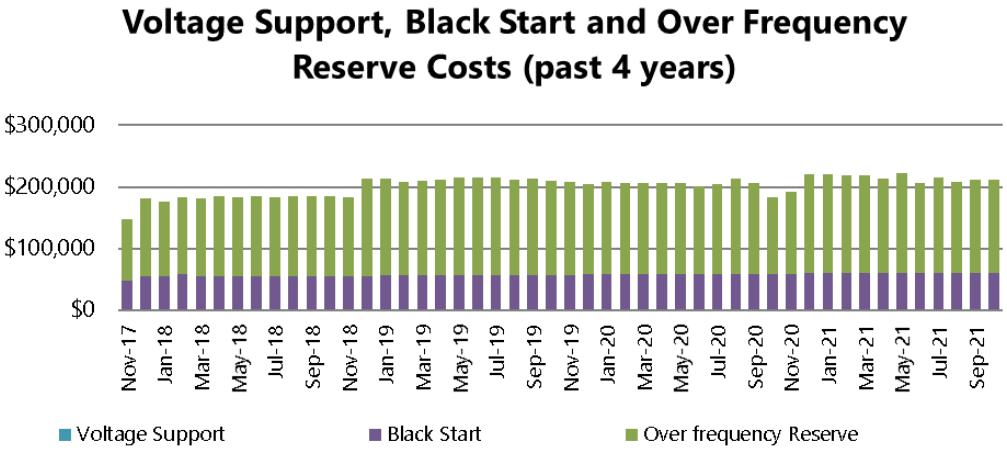


This month's instantaneous reserve costs were $1.85 million, a decrease of $421k (18.5% decrease) from the previous month, and a 65% decrease from August ($5.28 million). The overall quantity of both fast and sustained reserves procured were approximately the same as the previous month. However, the average price per megawatt of reserves fell significantly in October (especially in the South Island).

For reference, the major contributor to the high costs in August was an increase in the average price for fast instantaneous reserves in the North Island which fell again in September.



This month's frequency keeping costs were $908k, a decrease of $242k on the previous month (21% decrease). This majority of the decrease was due to a $237k drop in frequency keeping costs in the North Island. This costs in the South Island were fairly stable compared to the previous month.



Over frequency remained stable at $152k this month. Black start costs remained at $60k. There are currently no voltage support costs.

15 Commissioning and Testing

Commissioning of Turitea Wind Farm continued in October. Commissioning of the full station (118 MW) will run through until November 2021.

16 Operational and system events

Ohaaki geothermal

On 5 October, there was a loss of 39 MW generation due to a failure of operation during planned bus work at Ohaaki geothermal.

Pakuranga-Whakamaru Cable 2 trip

On 11 October, Pakuranga-Whakamaru Cable 2 tripped on closure resulting in a frequency blip of 50.55 Hz. The cable is now out of service until repairs can be undertaken. This is the second incident on this underground cable, the Grid Owner has requested that the System Operator refrain from or minimise switching Pakuranga-Whakamaru Cable 1 to minimise risk (the risk is identified in section 3 of this report)

Telephony

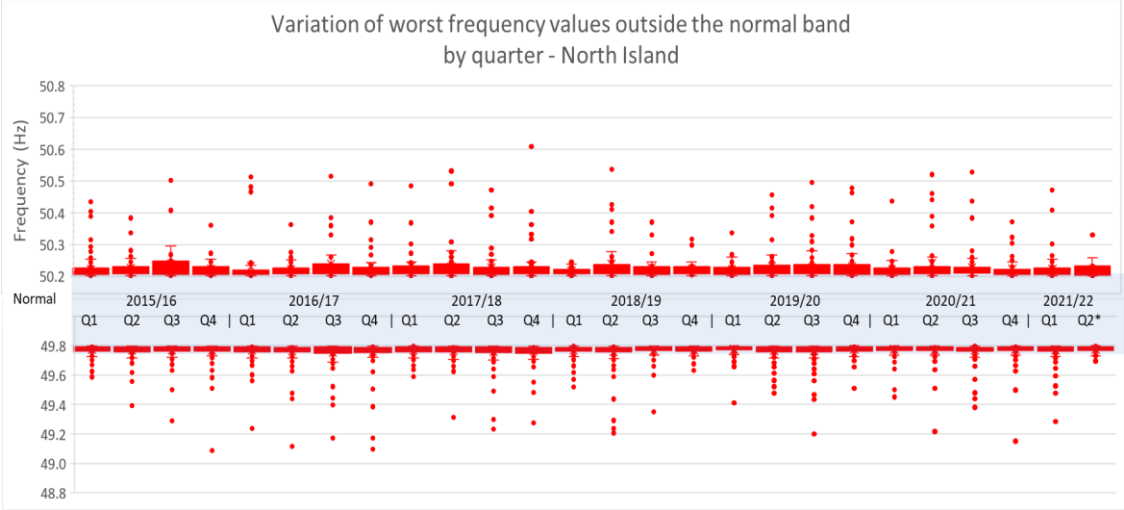
On Friday 8 October, an incident with one of the major national carriers impacted all inbound and outbound public switched telephone network (PSTN) telephony to our control rooms as well as to and from the control rooms of many of our connected parties. While we were able to utilise cellular networks and establish points of connection to use on the day, the incident has identified an opportunity to improve our resilience. We are investigating additional cellular handsets and establishment of a back-up process for calling between parties in the event of a similar disruption.

17 Frequency fluctuations

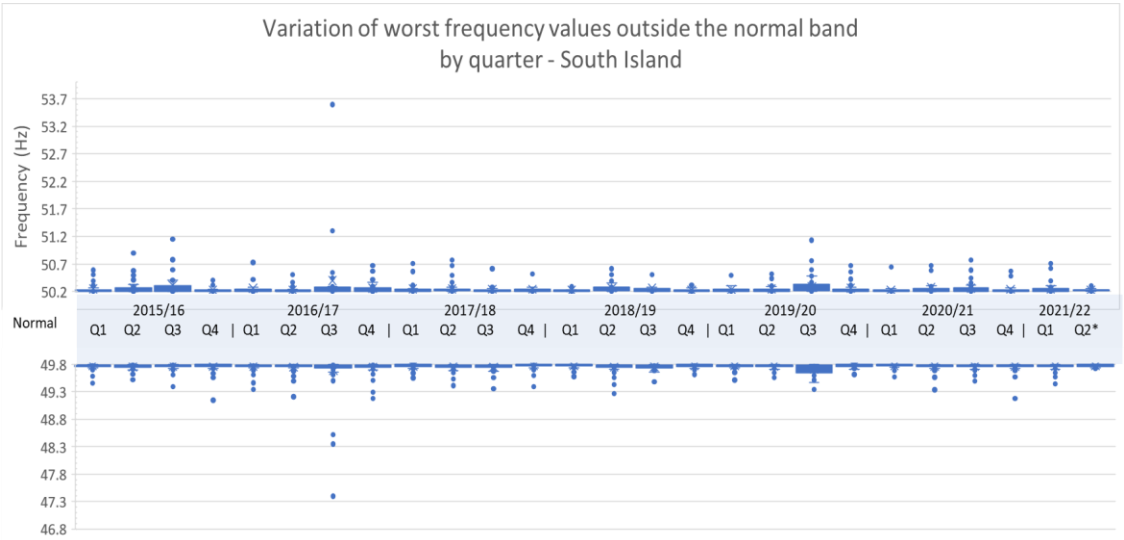
17.1 Maintain frequency in normal band (Frequency value)

The following charts show the distribution of the worst frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period.

North Island



South Island



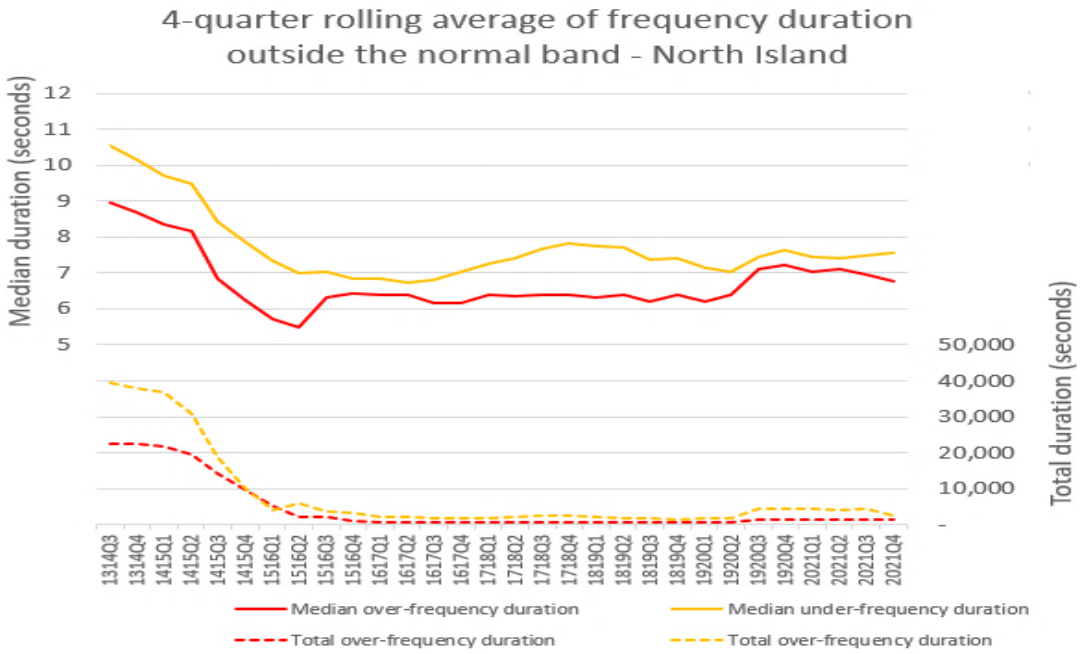
*2021/22 Q2 contains data for October only

Note: These box and whisker charts show the distribution of data. The “box” represents the distribution of the middle 50% of the data, the “whiskers” indicate variability, and outliers are shown as single data points.

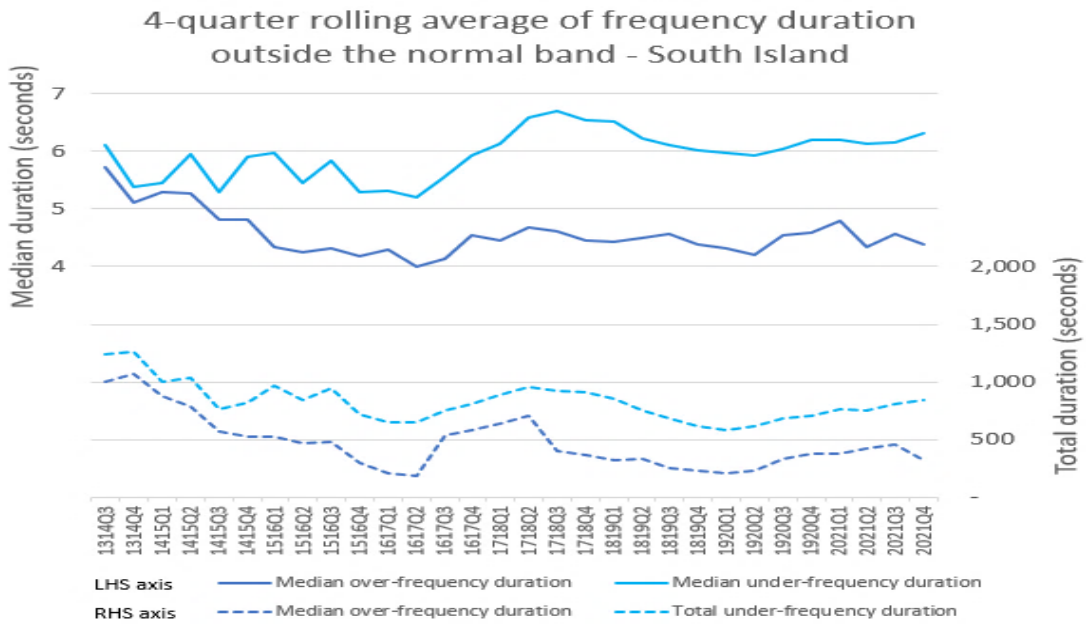
17.2 Recover quickly from a fluctuation (Time)

The following charts show the median and total duration of all the momentary fluctuations above and below the normal band for each island. The information is shown as a 4-quarter rolling average to illustrate trends in the data.

North Island



South Island

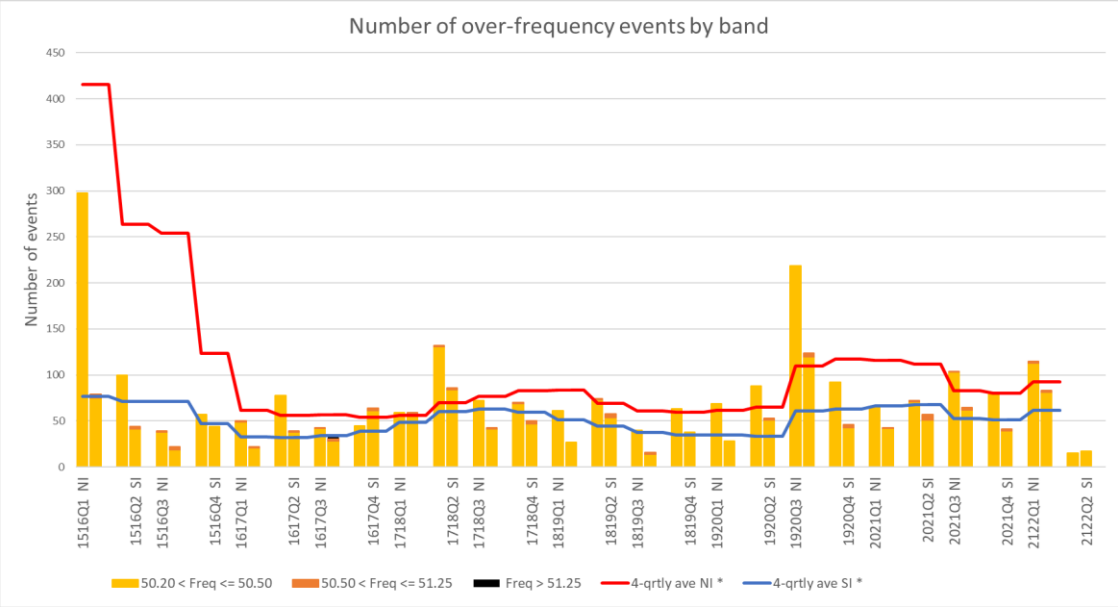


*These graphs have not been updated since 2021/22 Q1; they will only be updated at the end of each quarter

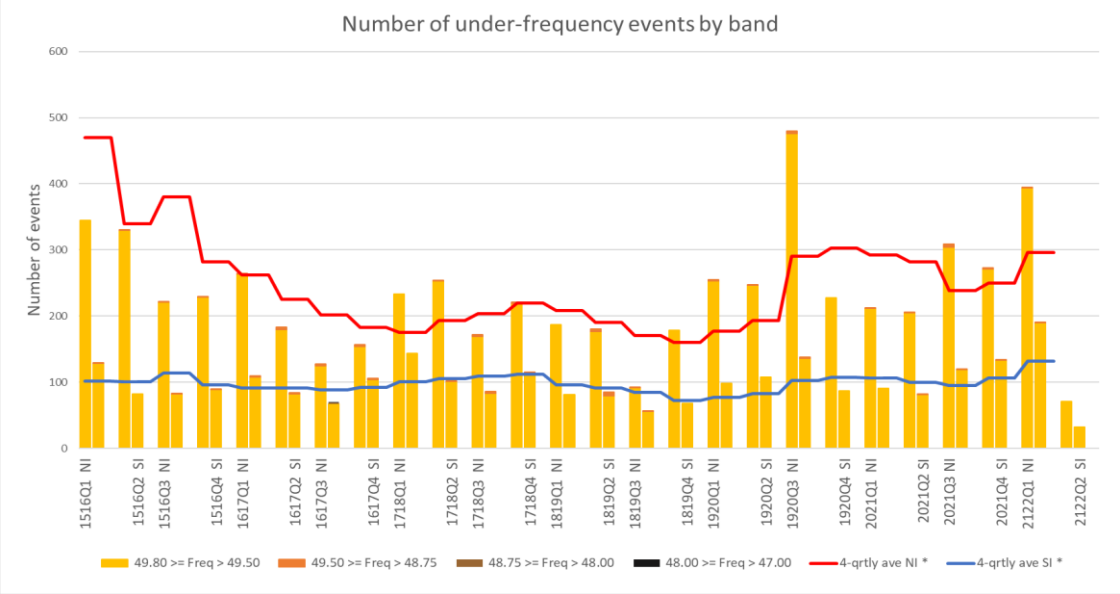
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

The following charts show the number of momentary fluctuations outside the frequency normal band, grouped by frequency band, for each quarter since Q1 2015/16. The information is shown by island, including a 4-quarter rolling average to show the prevailing trend.

Over-frequency events



Under-frequency events



* 4-quarterly rolling averages for NI and SI are only updated at the end of each quarter

17.4 Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

18 Voltage management

Grid voltages did not exceed the Code voltage ranges during the reporting period.

19 Security notices

The following table shows the number of Warning Notices, Grid Emergency Notices and Customer Advice Notices issued over the last 12 months.

Notices issued	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	1	-	-
Grid Emergency Notice	-	2	-	1	1	-	-	1	-	4	2	-
Warning Notice	-	-	-	1	-	-	-	-	1	4	-	-
Customer Advice Notice	12	10	8	4	4	8	14	14	11	42	34	9

20 Grid emergencies

The following table shows grid emergencies declared by the system operator.

Date	Time	Summary Details	Island
		None.	

Appendices

Appendix A: Discretion

Event Date and Time	Description
4/10/2021 3:09	GLN0332 GLN0 Discretion Max : 0 GLN Bus M tripped Last Dispatched MW: 65.4
4/10/2021 18:30	OKI2201 OKI0 Discretion Max : 0 Issue with a switch at the OKI bus that tripped OKI generation. Contact advised of discretion applied and not to change their electronic offers. Last Dispatched MW: 39
5/10/2021 3:50	ARG1101 BRR0 Discretion Max : 0 BLN_KIK_1 tripped. Last Dispatched MW: 10
10/10/2021 11:38	HLY2201 HLY5 Discretion Min : 190 Rule 13.82A claimed, resource consent. Required for system security for morning peak. Last Dispatched MW: 153.64
11/10/2021 11:00	OKI2201 OKI0 Discretion Min : 10 OKI claimed 13.82 (A) with a Plant safety minimum of 10MW. NAP+NTM+OKI combined risk higher than HLY U5 due to OKI_WRK 1 outage. HLY U5 Hz Keeping with control min of 230MW. SPD's least cost solution is to have OKI+NAP+NTM at or below 230MW. Last Dispatched MW: 5
11/10/2021 11:59	OKI2201 OKI0 Discretion Min : 10 OKI claim 13.82 (A). Last Dispatched MW: 10
11/10/2021 11:59	OKI2201 OKI0 Discretion Max : 10 OKI claim 13.82 (A). Last Dispatched MW: 10
12/10/2021 19:30	WHI2201 WHI0 Discretion Min : 10 SI residual 17, NI residual 215. Load still increasing. Last Dispatched MW: 25
12/10/2021 19:32	WHI2201 WHI0 Discretion Min : 10 Last Dispatched MW: 25. SI residual 17, NI residual 215. Load still increasing. Last Dispatched MW: 25. Half hour generators ramping. Dispatched on merit at 0840 above 10MW minimum. Some offered generation constrained at OHK, ATI, ARI so residual less than indicated
17/10/2021 17:29	ARG1101 BRR0 Discretion Max : 0 for BLN KIK circuit switching Last Dispatched MW: 0
22/10/2021 4:30	ARG1101 BRR0 Discretion Max : 0 Due to ARG_BLN_1 PSO, and return to service of ARK_KIK_1 Last Dispatched MW: 11.5