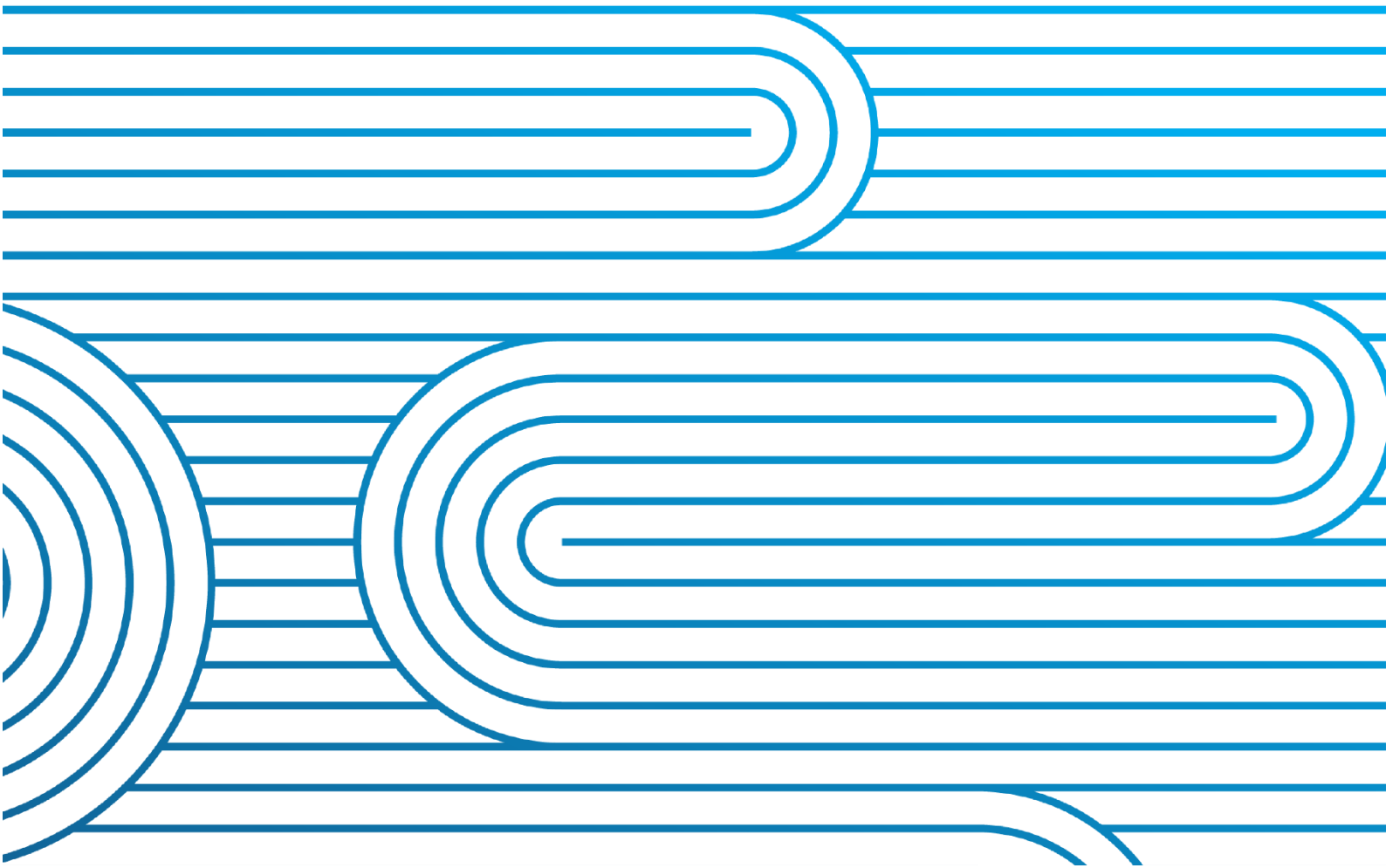
TRANSPOWER

Monthly System Operator and system performance report

for the Electricity Authority

November 2021



Report Purpose

This report is Transpower's review of its performance as System Operator for November 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).

Contents

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System Operator performance

1 Highlights this month

- We are introducing a COVID-19 Policy which takes effect on 15 December 2021. Everyone working on or attending Transpower premises must be fully vaccinated. Employees will have until 31 January 2022 to be fully vaccinated. Those who are not fully vaccinated will be required to work from home from Wednesday 15 December 2021.
- The System Operator completed all actions relating to the 9 August management event due to be completed by 30 November as required. We also held our second industry briefing on 30 November to take participants through the updated procedure to incorporate controllable load information and to provide progress updates on contact lists and notices. Whilst these actions will help our communication and processes in a similar event, we recognise that further actions and initiatives are required to help avoid insufficient generation being available to meet peaks.
- The draft future security and resilience report went out for consultation with market participants on Monday 29 November. We held three workshops to ensure these challenges and opportunities are addressed in a timely and efficient manner.
- Security of Supply is currently looking healthy with hydro storage hovering between 120-130% of average for the time of year. However, we are heading into a dry summer (as announced by NIWA), with little change on the gas supply front. In this context, we support the review of the security of supply policy, further initiatives around industrial demand flexibility, and access to gas fuel supply and contracts.
- The Real Time Pricing project is on schedule and within budget. We are working with the Authority to support their efforts for industry engagement through calendar year 2022 which will be crucial for industry readiness.
- All 15 North Island distributor AUFLS providers have been set up in the AUFLS Customer Portal with their feeder configuration information confirmed.
- The AUFLS Technical Requirements (ATR) document was approved at the Authority's November Board meeting. It will be incorporated by reference into the Code and will come into force at the same time as the Extended Reserve Code amendment on 21 December 2021.
- The Asset Capability Statement application of the customer portal went live on 8 December 2021.
- We have released an RFP for consultancy support to assist with development of an Operational Excellence programme. Engagement expected to begin in March 2022. Scope will include recommendations from the investigations into the events of 9 August that relate to our control room operating processes and practices.
- We took part in a Transpower-led successful New Zealand GridEx exercise that involved a wide range of participants both from within and outside the industry which simulated a series of physical and cyber attacks.

- We presented our planned methodology for the KPI refresh project to all members of our division. The session was attended by our service provider advisor from the Authority.
- The fieldwork for the first Business Assurance audit - Under-Frequency Event (UFE) SOSPA audit - has been completed and a draft report is being prepared.
- The Senior Leadership Team has completed its Control Self-Assessment to verify the effectiveness of the 10 critical controls which make up the Operations Bowtie.
- We reported two System Operator breaches in November, neither has any market impact.

2 Customers and other relationships

9 August demand management event

The System Operator held an industry briefing on 30 November to take participants through the updated procedure to incorporate controllable load information and to provide progress updates on contact lists and notices.

Future security and resilience (FSR) workshops

We delivered three industry workshops in late November / early December to discuss the draft Phase 1 report. Feedback from these workshops was positive, with no significant new opportunities or challenges identified. Written feedback closes on 14 December 2021. All feedback will be considered before finalising and republishing the report in early 2022. Phase 2 will deliver a roadmap by mid-March 2022.

KPI refresh

We presented our planned methodology for the KPI refresh project to all members of our division. The session was attended by our service provider advisor from the Authority.

3 Risk & Assurance

COVID-19 response

We are introducing a COVID-19 Policy which takes effect on 15 December 2021. As part of this policy:

- All roles must be performed by a fully vaccinated staff
- All new employees must be fully vaccinated as a condition of employment
- Everyone attending Transpower premises must be fully vaccinated.

Employees will have until 31 January 2022 to be fully vaccinated. Those who are not fully vaccinated will be required to work from home from Wednesday 15 December 2021.

From 15 December 2021, contractors, suppliers, service provides, consultants and visitors must be fully vaccinated against COVID-19 to enter our premises.

As part of a wider programme of work on control room practices, we plan to engage specialist support to assist us in optimising our rostering while meeting recommended COVID-19 controls and other identified improvements.

We have arrangements for urgent access to saliva testing should this be required.

9 August demand management event

The System Operator completed all actions due by 30 November as required. These included recommendations from the Authority phase 1 review, the PBA review and the Thomson Lewis review.

The attention is now on more enduring activities. As such, the baseline list of controllable load information created is now being managed and the procedure to incorporate this information in a real-time energy shortfall scenario has been published.

Whilst these actions will help our communication and processes in a similar event, we recognise that further actions and initiatives are required to help avoid insufficient generation being available to meet peaks.

Security of supply

We are heading into a dry summer (as announced by NIWA), with only some improvements on the gas supply front. In this context, we support the review of the security of supply policy, further initiatives around industrial demand flexibility, and access to gas fuel supply and contracts.

Business Assurance audits

The fieldwork for the Under-Frequency Event (UFE) SOSPA audit has been completed and a draft report is being prepared. The Managing Conditional Offers and RMT Operational Change audits are now being planned. The remaining two audits on the programme will be progressed after Christmas.

Critical controls for the Operations risk bowtie

The Operations Senior Leadership Team is completing its Control Self-Assessment (CSA) to verify the effectiveness of the ten critical controls which make up the Operations risk bowtie. A more robust assessment methodology has been implemented this year to ensure more consistency in scoring, and consideration of best practice elements of risk controls including monitoring and testing.

Operational Excellence

An opportunity has been identified to review our control room operating practices including our processes, change management practices, training, capability, capacity, and behaviours providing us with assurance that this important part of our operation is best prepared for a rapidly evolving future. We have issued an RFP for consultancy support with development of this programme with the engagement expected to commence in March 2022.

GridEx exercise

GridEx is a simulation exercise that dry runs situations which might seriously affect the security of the electricity supply in New Zealand. This year the scenario was a series of cyber and physical security attacks. We worked through real-time response and recovery plans with two gentailers and one distributor. We worked alongside representatives from the National Cyber Security Centre (NCSC), CERT-NZ, the Department of Prime Minister and Cabinet (DPMC), the New Zealand Police and Civil Defence Emergency Management (CDEM). Another gentailer and four distributors observed the exercise. An exercise such as this one is incredibly valuable for its ability to familiarise participants with intense and time-critical events.

Lessons learned from this event will inform preparations for the industry-based exercise planned for next year. This exercise is one of the actions agreed to as part of the review into the insufficient generation incident on 9 August 2021.

4 Compliance

We reported two System Operator breaches in November:

Breach #1:	FHL-RDF circuits monitored ends were incorrect in the network model
Event date:	14 July 2021 to 22 July 2021
Date reported:	3 November 2021
Description:	The System Operator incorrected modelled the Fernhill_Redcliff 1 and 2 circuits (did not update the monitored ends to reflect the Grid Owner's updated offer). There was no market impact, as there were no constraints created during the relevant period.

Breach #2:	SPS not enabled in the network model - SFT built incorrect binding constraint
Event date:	13 October 2021
Date reported:	23 November 2021
Description:	Due to a modelling error in the weekly SCADA model change, a special protection scheme was not enabled and the SFT tool built an incorrect binding constraint to protect the thermal limit of the associated circuit. There was no market impact, the schedule including the constraint was not dispatched; and a pricing error claim accepted.

5 Impartiality of Transpower roles

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

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
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 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.	SO Market and Business Manager
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)
The project is currently on schedule and within budget.

Phase 2 is in acceptance testing, and on track for late March deployment (there are no market impacts). The business change activity for Phase 2 (procedure updates and training) is on track, with the first round of training released in early December. Phase 3 detailed planning is underway to set the work schedule for next year. Transition planning for the Phase 3 deployment is underway and we are working with the NZX and the Authority on this.

The project has experienced higher than anticipated resource turnover over the last two months due to various factors but predominantly driven by comparative market pressures resulting from lockdowns, particularly at the border limiting overseas talent entering the country. This has primarily impacted our development and test teams. Replacement resourcing has been identified and is being brought on and impact analysis is underway to assess any IP and related project implications. Our regular key

resource risk analysis has been increased and mitigation options are being investigated to limit ongoing turnover as much as possible. We are taking this into account as we revisit our earlier planning to finalise our detailed workplan for the remaining phases of the project; this activity will be complete in the new year.

We are working with the Authority to support their efforts for industry engagement through calendar year 2022 which will be crucial for industry readiness.

AUFLS Customer Portal Launch
All 15 North Island distributor AUFLS providers have been set up in the AUFLS Customer Portal with their feeder configuration information confirmed.

In addition, the AUFLS Technical Requirements (ATR) document was approved at the Authority's November Board meeting. This decision was published in the Authority's Market Brief on 16 November. The ATR will be incorporated by reference into the Code and will come into force at the same time as the Extended Reserve Code amendment on 21 December 2021.

ACS Customer Portal Launch
The Asset Capability Statement application of the customer portal went live on 8 December 2021. Several external training workshops were held with industry participants leading up to go live. Drop-in sessions for participants for one-on-one support are available between 13-15 December 2021 and during the second half of January 2022.

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)
The draft FSR report on ten opportunities and challenges to the future security and resilience of the New Zealand power system went out for consultation with market participants on Monday 29 November. Feedback from the three industry workshops was positive, with no significant new opportunities or challenges identified. Written feedback closes on 14 December 2021. All feedback will be considered before finalising and republishing the report in early 2022.

The project team has now turned its attention to developing an associated roadmap to ensure these challenges and opportunities are addressed in a timely and efficient manner.

TAS work
TAS work relating to Battery Offering Reserves (TAS 100) - Internal user acceptance testing and regression testing have been taking place throughout November. By the end of November, all user acceptance testing and regression testing completed successfully. The TAS is running to schedule and budget and the final report will be shared with the Authority in December.

December 2019 UTS (TAS 101) - The Authority engaged the System Operator to revise the Ancillary Service settlement and the Grid Owner loss and constraints excess (LCE) settlement. We have successfully provided revised ancillary services settlement information to the NZX Clearing Manager. We have also updated the information required to update the LCE calculation. The LCE resettlement process for actions to correct will be completed by 20 January 2022 following confirmation by the NZX Clearing Manager of the final LCE amount and payment of the same.

Full process replications took place in test environments updated with the revised final pricing data, including replication of the required interactions with the NZX Clearing Manager prior to the data updates being made in production. We also engaged with the auditors appointed by the Authority to oversee the process.

8 Outage planning and coordination

Outage Planning – near real time

Outage numbers have been high through the spring but are starting to dip as we approach the summer break. We are seeing increasing numbers for late January and into February.

We have particularly assessed the impact of a First Gas outage over Auckland Anniversary weekend but have seen no system security impacts.

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

National hydro storage remains high – hovering between 120-130% of average for the time of year, this is the result of above average inflows in both North and South Island catchments. Towards the end of the month, the rainfall pushed Lake Tekapo above its operating range indicating spill. This has led to high hydro utilisation, which, coupled with high wind generation, has meant that renewable energy has contributed significantly to the generation mix, 90% and above.

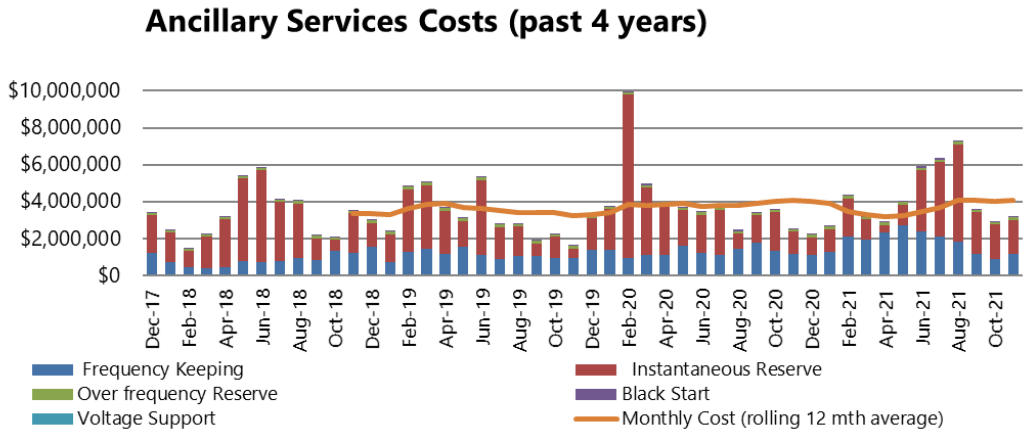
As a result of high hydro and wind utilisation, and the continued decrease of demand seen at this time of the year, prices at Haywards have been trending lower than was seen at this time last year.

On Monday 22 November, there was a period of price separation caused by an unplanned outage on Pole 3 of the HVDC link. The outage posed a risk of low residual generation for the evening peak in the North Island until more thermal generation was offered into the market.

The National Institute of Water and Atmospheric Research (NIWA) has officially announced a La Niña event will occur this summer. This represents a similar outlook to the same time last year and would entail below average rainfall in South Island catchments during this period (although high "one-off" inflow events could still occur). This will be monitored closely by the security of supply team. We will be having a meeting with the Authority to discuss policy settings.

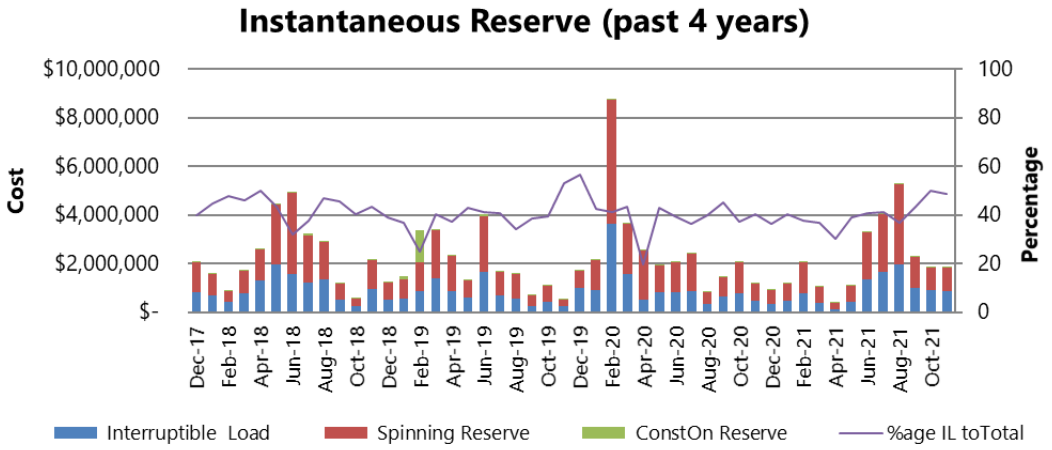
We will be providing a response to the Martins Jenkins dry-year event review of 2021 at the Security and Reliability Council (SRC) meeting on 2 March 2022.

14 Ancillary services

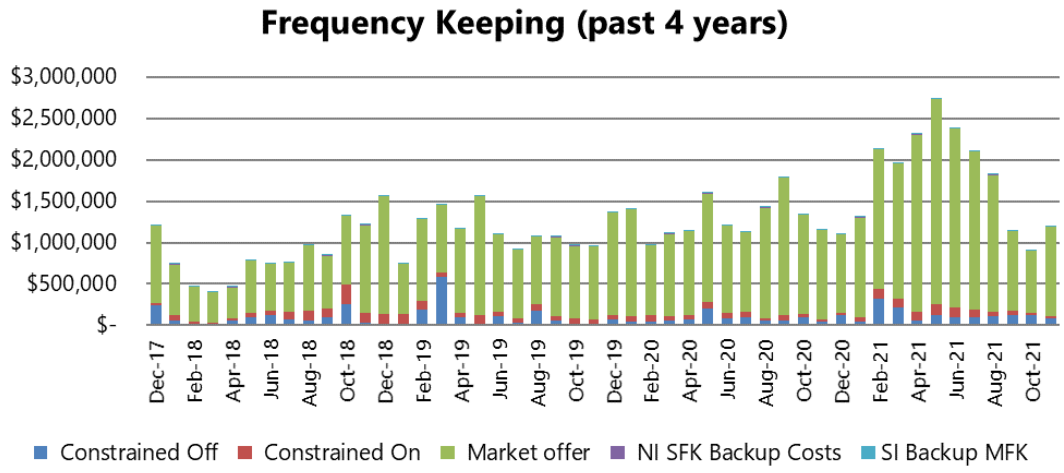


This month's ancillary services costs were $3.24 million, an increase of $267k (9.0% increase) from the previous month. While the cost of instantaneous reserve has been

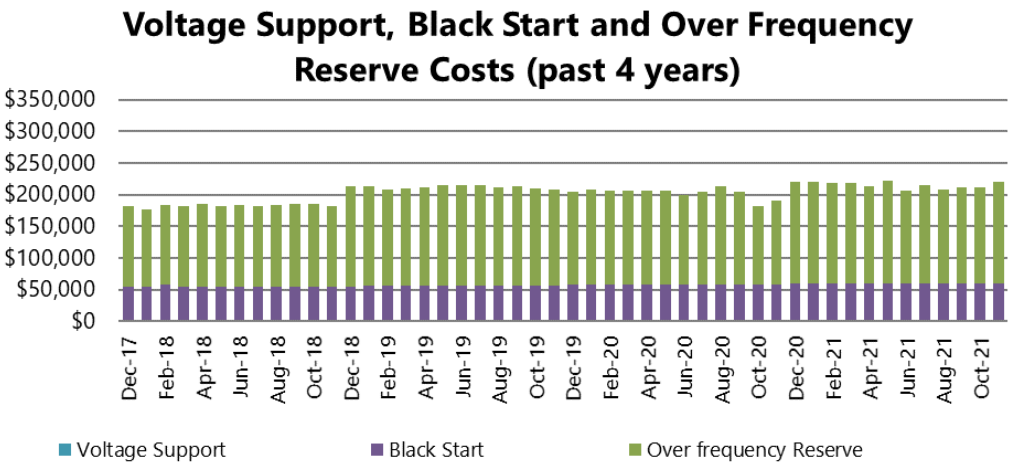
fairly consistent with the previous month, the frequency keeping costs increased by $291k (32% increase) compared to the previous month.



This month's instantaneous reserve costs were $1.82 million, little change from the previous month, only a small decrease of $32k (1.8% decrease). This change was comprised of a $38k decrease in interruptible load costs and a $10k increase in spinning reserves costs (constrained off decreased by $3.8k). 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 South Island fast reserves rose significantly while the average price per megawatt of South Island sustained reserves fell in November.



This month's frequency keeping costs were $1.2 million, an increase of $291k on the previous month (32% increase). This increase was due to a $263k rise in frequency keeping costs in the South Island. This was accompanied by a less drastic increase in North Island frequency keeping costs compared to the previous month.



Over frequency increased slightly this month to $160.2k this month due to increased asset availability. Black start costs remained at $60k. There are currently no voltage support costs.

15 Commissioning and Testing

Commissioning of Turitea Wind Farm continued in November. Commissioning of the full station (118 MW) will run through until 2022.

16 Operational and system events

HVDC Pole 3 outage

Following an alarm early on 22 November, the Grid Owner requested that Pole 3 be removed from service pending an inspection of the indicated asset.

Pakuranga-Whakamaru cables – implications on voltage

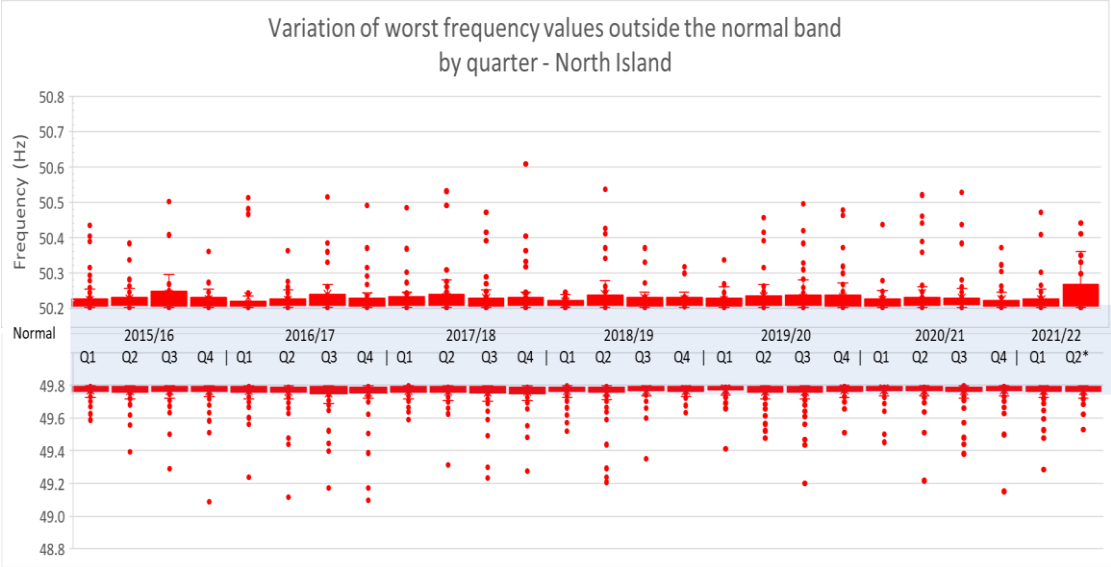
Over periods of low load it becomes challenging to maintain voltage without removing underground cables Pakuranga-Whakamaru 1 and 2. We have worked with the Grid Owner on a process to minimises the amount of switching on these cables (as this has the potential to apply stress on the cable joints).

17 Frequency fluctuations

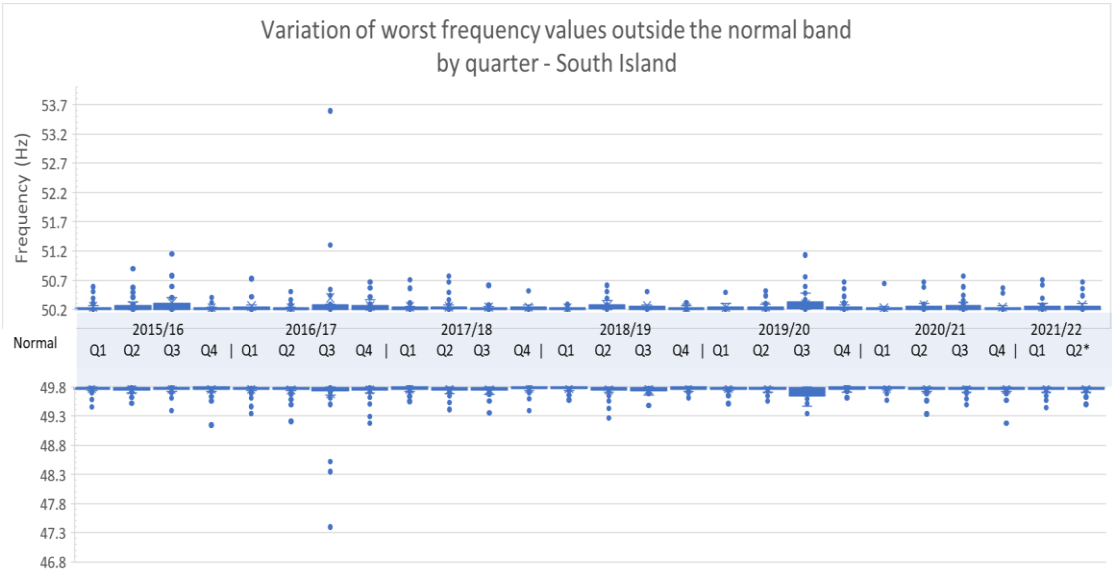
17.1 Maintain frequency in normal band (Frequency value)

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



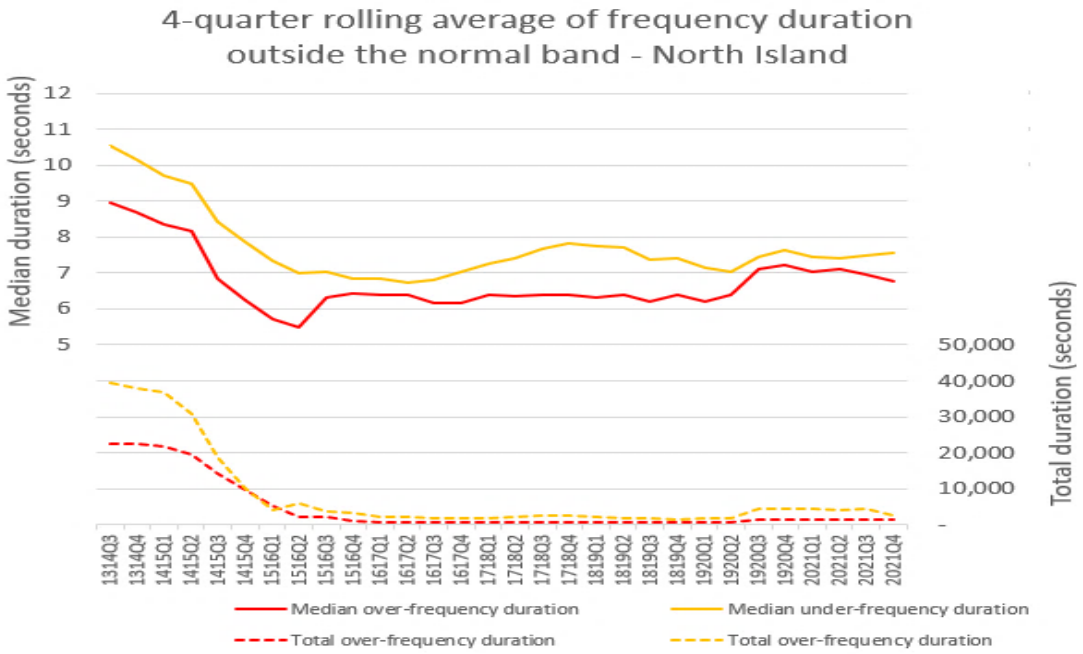
*2021/22 Q2 contains data for October and November only

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.

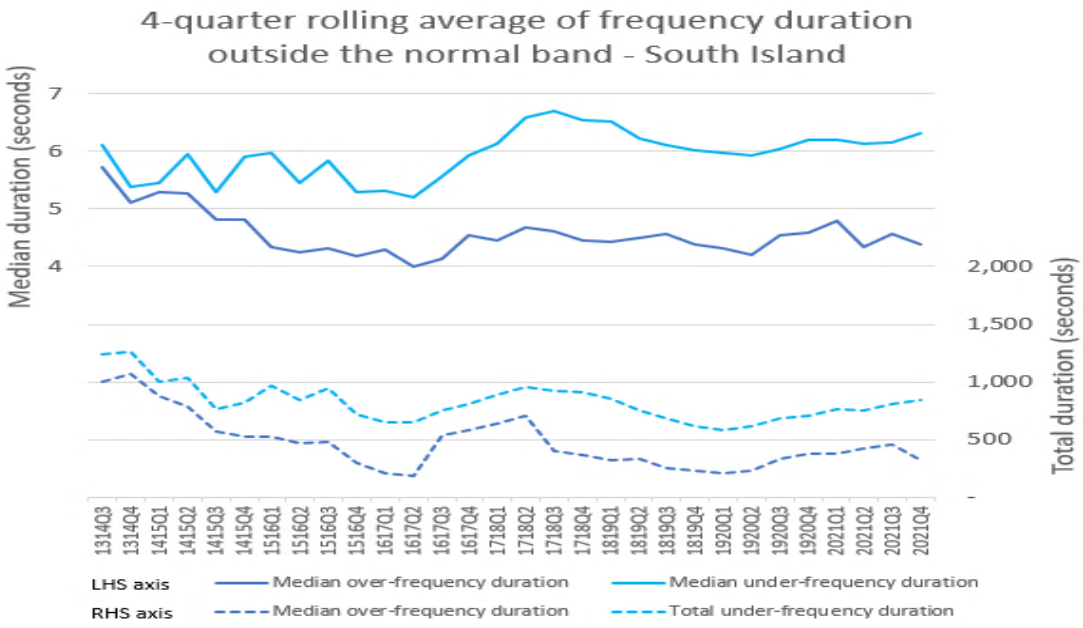
17.2 Recover quickly from a fluctuation (Time)

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

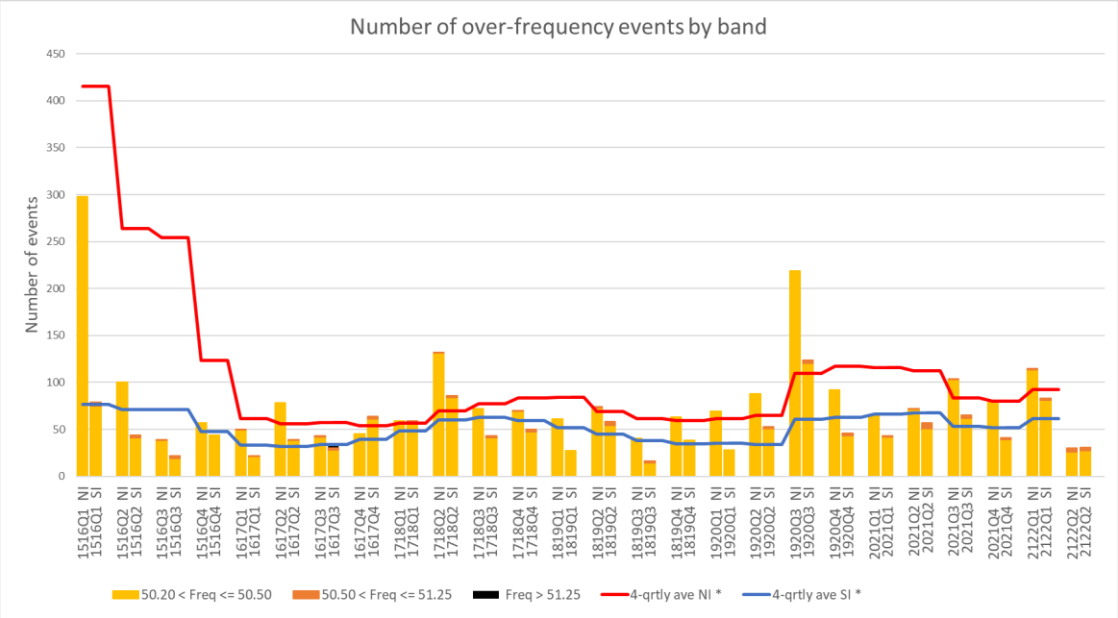


*These graphs have not been updated since 2021/22 Q1; they will only be updated at the end of each quarter

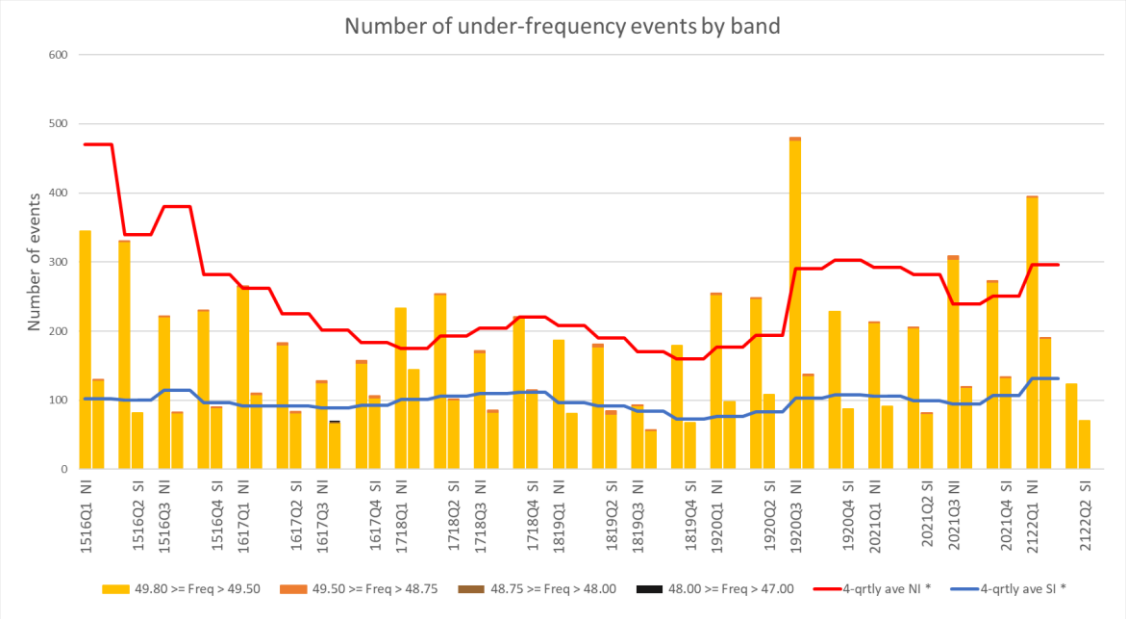
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21
Demand Allocation Notice	-	-	-	-	-	-	-	-	1	-	-	-
Grid Emergency Notice	2	-	1	1	-	-	1	-	4	2	-	2
Warning Notice	-	-	1	-	-	-	-	1	4	-	-	-
Customer Advice Notice	10	8	4	4	8	14	14	11	42	34	9	7

20 Grid emergencies

The following table shows grid emergencies declared by the System Operator.

Date	Time	Summary Details	Island
25/11/21	08:34	A grid emergency was declared to assist with load and generation at Tekapo A Substation following the tripping of the 110 kV Albury – Tekapo A circuit.	S
25/11/21	08:57	A grid emergency was declared to allow a temporary system split to be placed on Kawerau Transformer T2 during a planned outage. This was necessary as studies indicated overloads could occur for a contingency on 110 kV Edgecumbe – Kawerau Circuit 1.	N

Appendices

Appendix A: Discretion

Event Date and Time	Description
31/10/2021 12:34 (Start: 1/11 01:34 End: 1/11 02:00)	HLY2201 HLY5 Discretion Min : 190. Genesis claimed clause 13.82a for HLY5 due to breaching resource consent if running below their minimum. For security purposes HLY5 constrained to their minimum of 190MW Energy. Last Dispatched MW: 161.17
31/10/2021 13:03 (Start: 1/11 02:03 End: 1/11 04:00)	HLY2201 HLY5 Discretion Min : 190. Genesis claimed clause 13.82a for HLY5 due to breaching resource consent if running below their minimum for security purposes. HLY U5 absorbing 160 Mvars and without this, high voltage violations would occur due to reactive plant outages. HLY5 constrained to their minimum of 190 MW Energy. Last Dispatched MW: 177.55
1/11/2021 15:05	HLY2201 HLY5 Discretion Min : 190. Genesis claimed clause 13.82A, cannot meet dispatch and run below minimum of 190 MW due to resource consent breach. For security purposes (HLY5 needed for voltage support, currently absorbing 140 MVars, and will be needed for the morning peak), HLY5 constrained on to their minimum. Last Dispatched MW: 161.64
2/11/2021 21:47	KPA1101 KPI1 Discretion Max : 0. OPK-KPI-2 Tripped. KPI were doing 14 MW at the time. Discretion to 0 MW required for accurate dispatch solution. Last Dispatched MW: 14
2/11/2021 22:15	KAW1101 KAG0 Discretion Max : 0 KAG tripped from 107 MW. Discretion to 0 MW required for accurate dispatch solution. Last Dispatched MW: 107
14/11/2021 18:00	ARG1101 BRR0 Discretion Max : 0. ARG_BLN_1 on outage from 07:00. For switching purposes, ARG_KIK_1 Power System Operations outage was applied to, BRR to discretion to zero during switching. Last Dispatched MW: 11
16/11/2021 15:55	COL0661 COL0 Discretion Max : 30. West Coast split. KUM_OTI, HKK_KUM and GYM_KUM tripped. Discretion on COL due to COL_HOR violations. Last Dispatched MW: 20.61
18/11/2021 23:49	ARG1101 BRR0 Discretion Max : 0. Discretioned off in preparation for the ARG_KIK_1 PSO/return of ARG_BLN_1. Last Dispatched MW: 11
19/11/2021 13:01	HLY2201 HLY5 Discretion Min : 190. Last Dispatched MW: 183.64
21/11/2021 18:29	ARG1101 BRR0 Discretion Max : 0. Discretion to zero to enable switching for planned outage of ARG_KIK_1. Last Dispatched MW: 10
22/11/2021 2:12	WHI2201 WHI0 Discretion Min : 10. Due to low residual situation, generation needed for evening peak. Last Dispatched MW: 25.2
24/11/2021 19:26	TKA0111 TKA1 Discretion Max : 0. TKA discretioned to 0 currently off due to Albury_Tekapo A circuit. Ended when trader claimed BF. Last Dispatched MW: 0
24/11/2021 19:57	TKA0111 TKA1 Discretion Max : 0. TKA discretioned to 0 currently off due to Albury_Tekapo A circuit. Ended when TKA returned and Islanded. Last Dispatched MW: 0
25/11/2021 12:45	HLY2201 HLY5 Discretion Min : 190. Claimed 13.82A resource consent, minimum run of 190 MW. Required for system security and voltage control. Last Dispatched MW: 185.51
26/11/2021 3:57	ARG1101 BRR0 Discretion Min : 0. Discretioned off while switching on the BLN KIK cct to safely open/close the ARG disconnectors. Last Dispatched MW: 11.5
26/11/2021 4:00	ARG1101 BRR0 Discretion Max : 0. Discretioned off while switching on the BLN KIK cct to safely open/close the ARG disconnectors. Last Dispatched MW: 11.5