TRANSPOWER

MONTHLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

November 2019

Keeping the energy flowing




TRANSPOWER

Transpower New Zealand Limited The National Grid

Report Purpose

This report is Transpower's review of its performance as system operator for November 2019, 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

- We have published some studies of North Island hydro storage during the Q1 HVDC 2020 outages, which can be found on our website.
- We shared our security assessment of the HVDC outage, including risks to thermal fuel supply, at a cross-agency security of supply meeting.
- As part of our risk and assurance work, we carried out a business continuity exercise targeted at team managers, and several system operator staff took part in a two-day GridX simulation of a sustained cyber and physical attack to the New Zealand power system.
- On 2 December, Genesis' Huntly station was the first customer successfully transitioned to their new dispatch platform under the transition phase of the Dispatch Service Enhancements (DSE) project.
- We finalised the credible event review of busbar for frequency.
- The system operator is preparing a report on the Northland outage which occurred on 27 November. This was classified as a moderate level incident.

2 Customer

Cross-agency security of supply meeting

In November, we attended our regularly scheduled meeting with representatives from the Ministry of Business, Innovation and Employment, Gas Industry Company, Electricity Authority and First Gas. We shared our security assessment of the HVDC outage, including risks to thermal fuel supply.

Meridian – Pukaki Contingent Storage

In November, Meridian announced they have gained access to an additional 367 GWh of contingent storage at Lake Pukaki under emergency conditions. We met with them to discuss their management plan and constraints for operating Lake Pukaki and we are now investigating the impact on the modelling of the Electricity Risk Curves and Security of Supply Forecasting and Information Policy.

Planned Outage Coordination Process (POCP) – Genesis

Genesis has written to the Electricity Authority expressing concerns about the POCP review process and some of the discussions held in the workshops. We understand the Authority is responding to Genesis' letter accordingly. We have contacted the Genesis representative on the working group, who is happy to continue as a member and has agreed to contact the Chair directly if they have any further concerns.

3 Risk & Assurance

The observations and interviews for two SOSPA audits was completed in November. These audits relate to how the system operator processes test plans on behalf of asset owners, and how the system operator manages a system event including a grid emergency.

We carried out a business continuity exercise in November, targeted at the level of team managers. The exercise was a roundtable discussion which simulated an earthquake in Wellington and triggered a Coordinated Incident Management System (CIMS) structure to be setup in Hamilton. This was a valuable opportunity for the team managers to apply their CIMS training and share experiences of previous real-life events/exercises with the group.

Several members of system operator staff took part in the two-day GridX simulation of a sustained cyber and physical attack to the New Zealand power system. This was another opportunity to practice our CIMS response to a major event, and further grow our capability in this space. The teams performed very well and were able to successfully navigate the situation.

4 Compliance

We did not report any system operator breaches to the Authority during November. However, we will be reporting the following breaches in December:

- 3916 – Incorrect information in schedules during loss of SCADA
- 3866 – Incorrect advice given for bona-fide offers while in stand-alone dispatch
- 3901 – Incorrect double counting of Tiwai Line 4 Load

We have nine outstanding breaches with the Authority Compliance team.

Appendix A shows instances where the system operator has applied discretion under 13.70 of the Code.

5 Separation of Transpower roles

The entries below are the open issues in the conflict of interest register. These issues are being handled in accordance with our policy for managing conflicts of interest.

There was one new conflict of interest issue recorded in November. This relates to the system operator investigating a loss of SCADA on 31 October 2019. This investigation is the first to be undertaken using our new 'Significant Event' reporting procedure.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
9	HVDC Outages 2019/20	Operations Planning Manager
18	Recommendations from Conflict of Interest Review	Compliance and Risk Manager
21	Staff interest in generator commissioning	GM Operations
22	Security classifications for PI Vision database access	SO Power Systems Group Manager
26	Response to 14 December UFE recommendation	SO Power Systems Group Manager
27	System operator employee partner to work for grid owner	SO Power Systems Group Manager
28	Investigation into loss of SCADA 31 Oct 2019	SO Power Systems Group Manager

Greater detail on each of the open conflict of interest issues is provided in the next quarterly report.

6 HVDC 2020 outages

A summary of our forecast for the New Zealand Generation Balance (NZGB) over the outage period was shared in our December NZGB report. We have continued to provide a detailed analysis for a number of scenarios, including reduced thermal generation due to the scheduled Ahuroa and Pohokura outages. Analysis based on current outage information shows that N-1-G shortfalls[1] may be possible during the Ahuroa outage. However, these shortfalls have reduced significantly as some customers have rescheduled outages away from this period. A final teleconference with industry participants was on Thursday 12 December.

Inaccurate offers in the week-ahead schedules

In advance of the HVDC outage, we have been discussing options with the Electricity Authority for ensuring participants update their offers in the week ahead schedules, as this can have implications for the accuracy of our security assessments. As an interim solution, the Electricity Authority Chief Executive has issued a letter to the Chief Executives of relevant market participants. In the long term, we are jointly working on a potential Code change.

7 Project updates

7.1 Market design and system enhancement project updates

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

Real Time Pricing (RTP)

We are continuing to develop the solution requirements, including exploring the potential scope to co-optimise interruptible load and demand dispatch products. We are also consulting with our market team to understand the business impact of the changes to our current market functions so these changes can be appropriately managed.

Dispatch Service Enhancements (DSE)

On 2 December, Genesis' Huntly station was the first customer successfully transitioned to their new dispatch platform under the transition phase of the DSE project. Genesis are still using GENCO as their first dispatch channel, until their other stations can be transitioned over. We are working with participants to complete a further two transitions by March 2020.

[1] The difference between the available generation capacity and the capacity required to securely supply demand **after** the occurrence of the worst case contingent event (i.e. reserves need to be restocked to cover the next worst case contingent event).

Wind Offer Arrangements

Post go-live, an issue was identified which impacted the way market system calculates price during trading periods where the system cuts over to stand-alone dispatch, and a workaround was temporarily employed. A permanent fix was deployed on 10 December.

Extended Reserve (AUFLS)

This month, we began a technical advisory service piece of work to produce a report detailing options for collating data from the industry to baseline the Extended Reserves project. We have achieved our first milestone; to establish an agreed set of research questions and draft the data specification to support data collection. The draft data specification has been shared with a sample of distribution companies for comment.

Credible Event Review

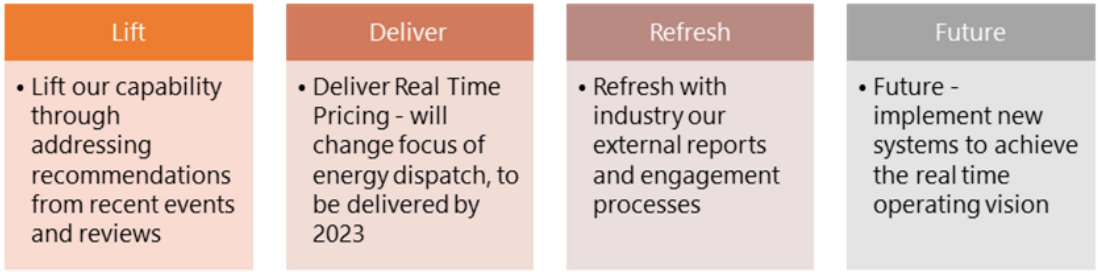
Following industry consultation, we responded to feedback and finalised the credible event review of busbar for frequency. The review results in very little change to the current situation – Manapouri (MAN) is still the only busbar managed as an extended contingent event (ECE) under N-1 conditions, all other buses are treated as 'Other' for N-1 and N-1-1. The only amendment to the present situation is that now MAN will be treated as 'Other' during bus outages (N-1-1), previously this had been treated as ECE. The new policy takes effect on 13 Jan 2020.

New Generating Technology for Ancillary Services

We started a literature review to inform our report recommending the changes required to enable Battery Energy Storage Systems (BESS) and other inverter-controlled devices to offer into the market as instantaneous reserve. The report is due April 2020.

7.2 Other projects

Operations "Big 4" – Lift, Deliver, Refresh, Future



Lift:

- We completed the actions from the Deloitte maturity check on risk and assurance.

Deliver:

- The detail for the RTP project is included in section 7.1.

Refresh:

- We were involved in the third Planned Outage Co-ordination Process (POCP) meeting on 13 December. This meeting covered tool functionality. A survey was sent to industry participants to provide input to this discussion.

Future:

- Progress against the Outage Planning Enhancements project is on track.

8 Technical advisory hours and services.

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

9 Outage planning and coordination

Outage Planning

Outage numbers for December are significantly high (>150, close to 200 in some weeks). As system operator we assess all outages for system security issues.

The Kupe gas outage was completed on 27 November. This affected thermal generation, and although there were some concerns of generation shortfalls during the Te Mihi–Whakamaru outage (13-15 November), these did not eventuate.

10 Performance metrics

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

We will provide the Authority with a draft report on the cost-of-services for financial year 3 (2018/19), following the publication of Transpower's financial information disclosures.

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

During the month, there were a number of large inflow events which increased national storage by 44%. National storage is currently at 94% of full, significantly above average for this time of year. Market prices dropped throughout the month from an average in the order of $100/MWh to close to $80/MWh.

Another large inflow event at the start of December pushed many of the lakes above their operating ranges, resulting in spilling.

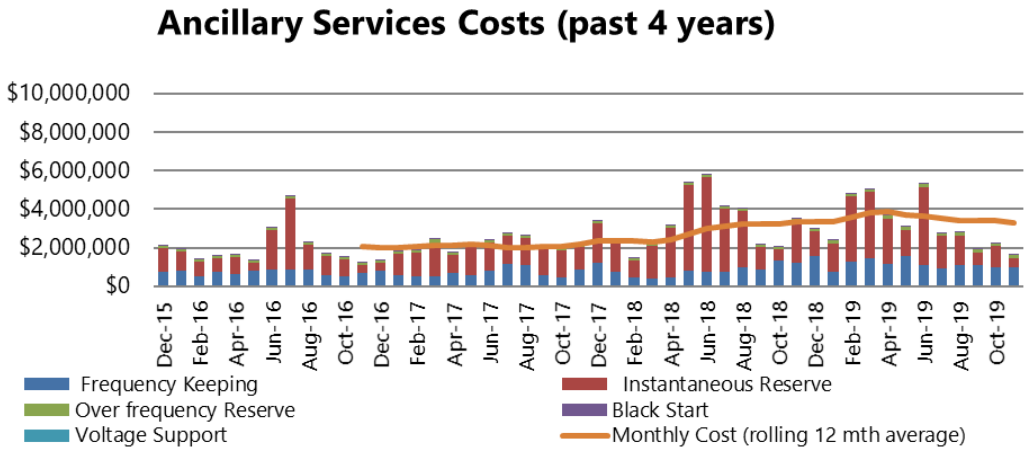
In late November, Meridian announced that they have re-evaluated the engineering constraints for access to the remaining 367 GWh of contingent storage in Lake Pukaki. Currently only 178 GWh of the consented contingent storage at this lake is considered available. With this change, a total of 545 GWh of contingent storage will be available at Lake Pukaki. We are currently working to incorporate this change to our modelling and policy framework, and we are working with Meridian to understand the constraints of operation at this lower lake level. We are hoping to incorporate these changes in Q1 2020.

We have published some studies of North Island hydro storage during the Q1 HVDC 2020 outages, which can be found on our website. This analysis shows that there is little risk to national security of supply through this period, supported by the current healthy North Island hydro storage levels.

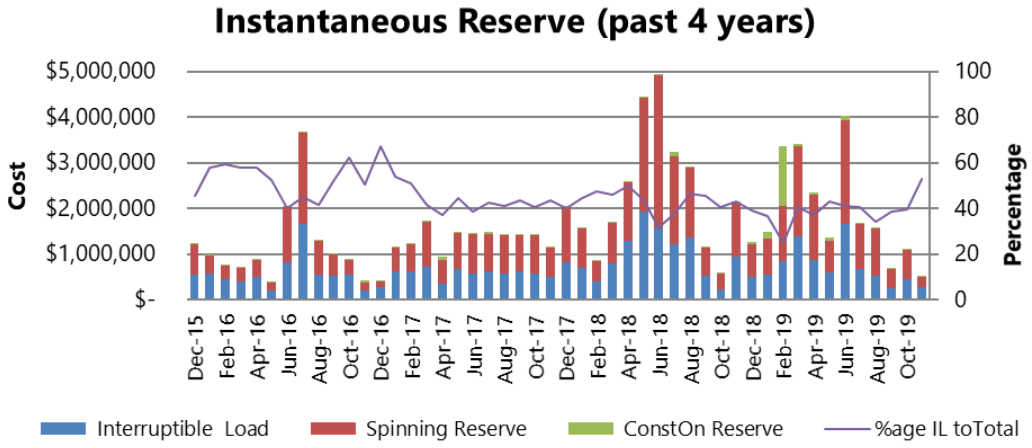
Following its planned outage, Kupe was back in full production by 28 November. Beech Energy (who operate the platform) kept industry well informed of progress throughout the month on the Gas Industry Company notification webpage. As a result of less available gas, the Huntly Rankine units shifted their use of fuel from gas to coal. This re-balancing of fuel use from the station kept the station output steady and ensured Huntly unit 5 could meet maximum capacity if needed.

New Zealand's two largest thermal generating units also had planned outages starting in November. Genesis' Huntly unit 5 was on outage from 15 to 22 November. Contact's Stratford combined cycle plant was on outage from 14 November to 1 December, however it has not been offering into the market in recent weeks.

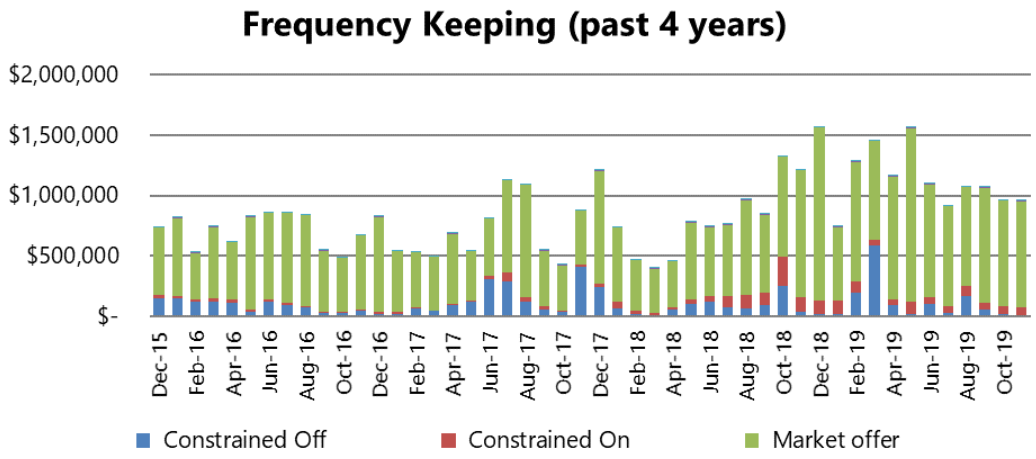
14 Ancillary services



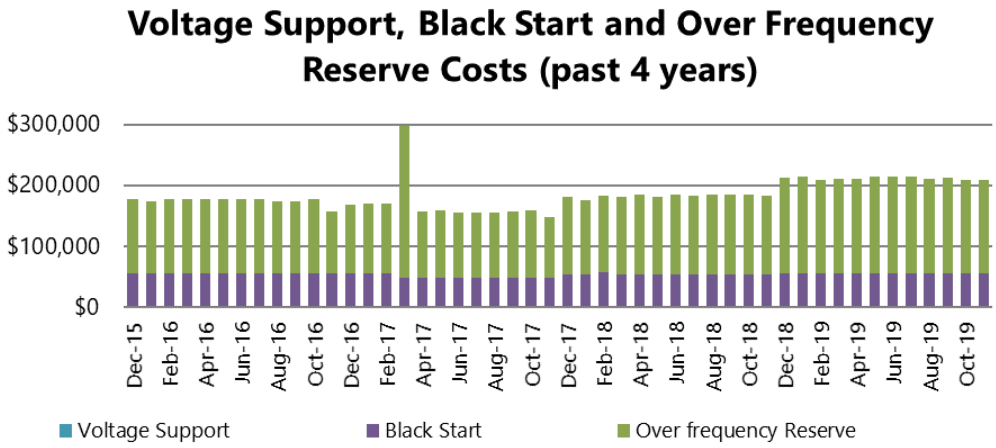
There was a 27% decrease in the overall ancillary service costs this month, from $2.3 million to $1.7 million. The November costs are the lowest since February 2018. The reduction was driven by the costs for instantaneous reserve costs halving since October.



Instantaneous Reserve costs deceased this month by $620 k (55%) to $502 k. The costs for November are similar in magnitude to those in September; though these are both low compared to the average costs of ancillary services per month for the rest of 2019. The reduction in cost is attributed to the spinning reserves, which for the four largest generators reduced in the range of 51% to 87%, due to both a reduction in the volume of reserves required and the prices offered.



This month's frequency keeping costs in November were $961 k, which is roughly the same magnitude as for October. Both constrained on and off costs reduced, by $1 k (2%) and $9 k (41%) respectively, while market procurement costs increased by $7 k (1%).



This month the availability fee paid for Over Frequency Reserves was lower than the contracted value as one of the contracted Manapouri units was unavailable.

15 Commissioning and Testing

Generator commissioning

Mercury have announced their Turitea Wind Farm will be extended to 60 Turbines, with potential injection of 222 MW into Linton Substation at 220kV. Transpower, with representatives from grid owner and system operator, are in discussion with Mercury

to identify connection options and their operational impacts so that Mercury can make an informed decision on how to connect to the grid.

16 Operational and system events

Northland outage on 27 November

At 09:34 on 27 November, the Huapai-Marsden circuit tripped while the Bream Bay-Huapai circuit was out of service. This resulted in an approximate 180 MW loss of supply to the Northland region. The system operator controllers instigated a limited restoration of Northland via the 110 kV circuits while additional analysis was undertaken of protection information relating to the tripping. A risk assessment undertaken by the CIMS group determined that manual restoration of the tripped circuit was appropriate, and the restoration switched to the 220 kV circuits. Restoration was complete to Transpower substations at 11:15. The Bream Bay–Huapai circuit was also recalled to service, and Northland was restored to N-1 security at 11:31.

The system operator is preparing a report. This was classified as a moderate level incident.

Haywards current transformer fire

On 30 November, a current transformer at the Haywards substation failed, resulting in the tripping of one of the Haywards 110 kV buses. There was no loss of supply due to sufficient redundancy connected to a separate 110 kV bus. However, this tripping did result in disconnection of HVDC equipment, including five synchronous condensers, which highlighted a secondary power system oscillation issue between the HVDC and a generator. We applied constraints to the HVDC transfer which managed to remove the oscillations. We are investigating the cause of the oscillations. They are different to those previously reported in July, which were due to faulting voltage measurement equipment at Haywards.

SCADA outages

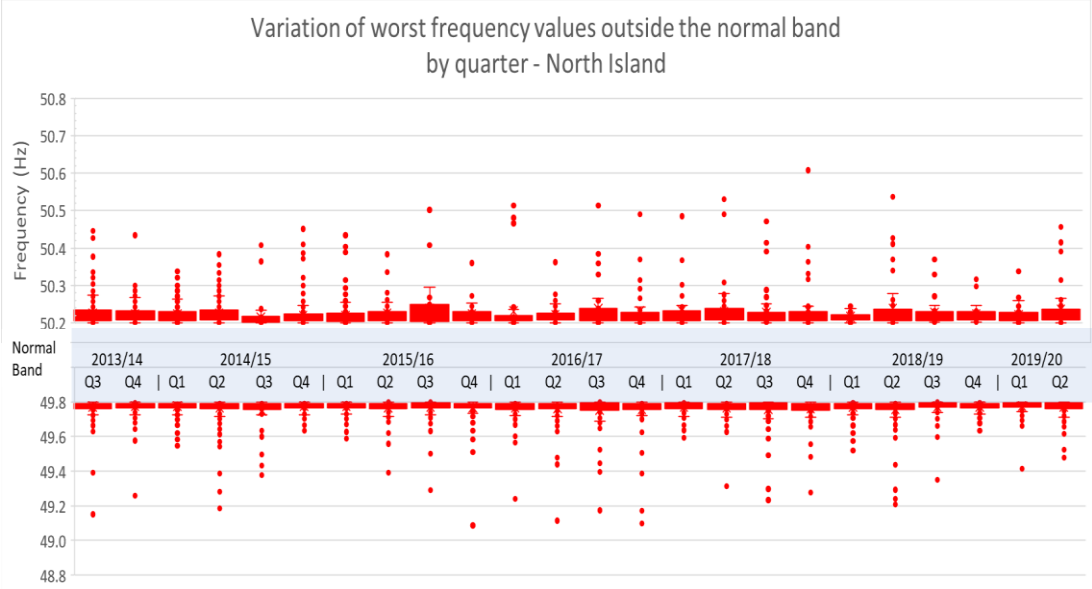
The system operator is preparing a report on SCADA outage on 31 October (details of the outage are contained in the October monthly report); this was classified as a moderate level incident.

17 Frequency fluctuations

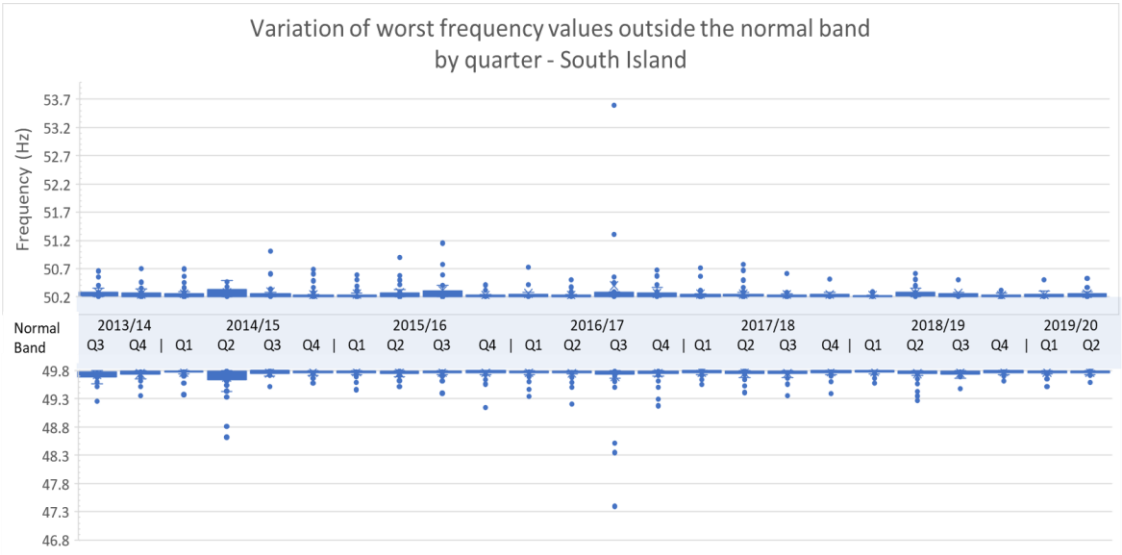
17.1 Maintain frequency in normal band (Frequency value)

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



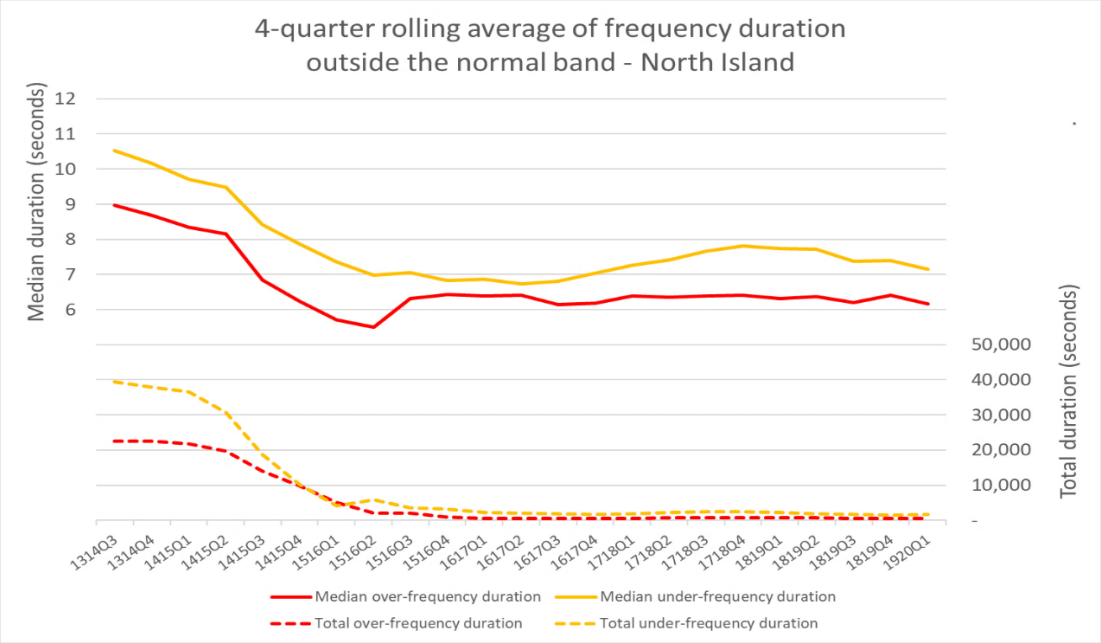
* 2019/20 Q2 contains data for October and November only

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.

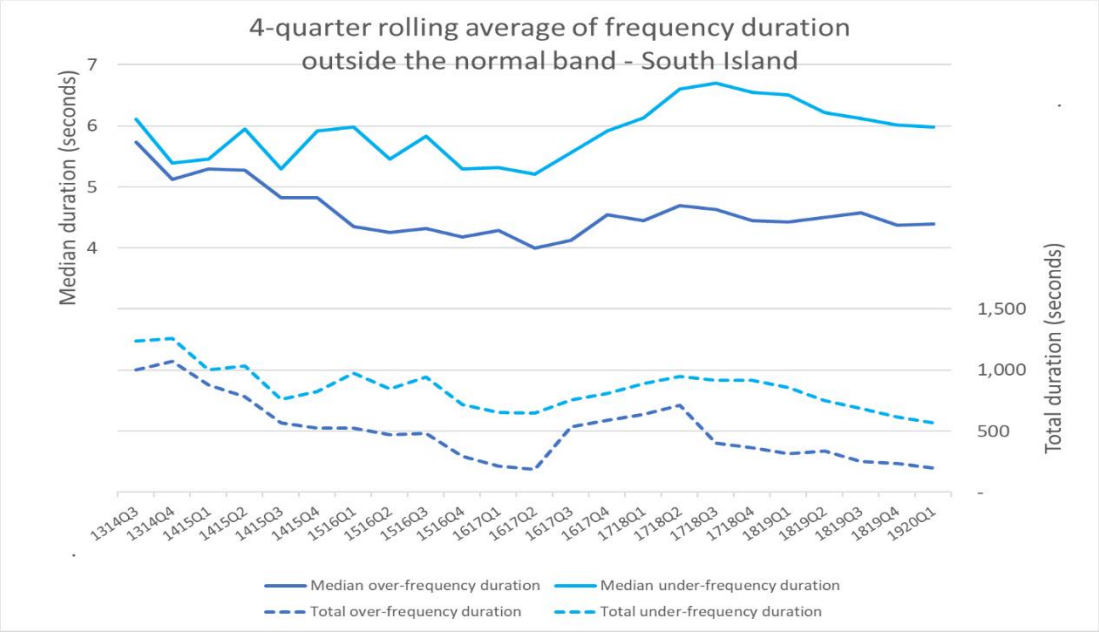
17.2 Recover quickly from a fluctuation (Time)

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

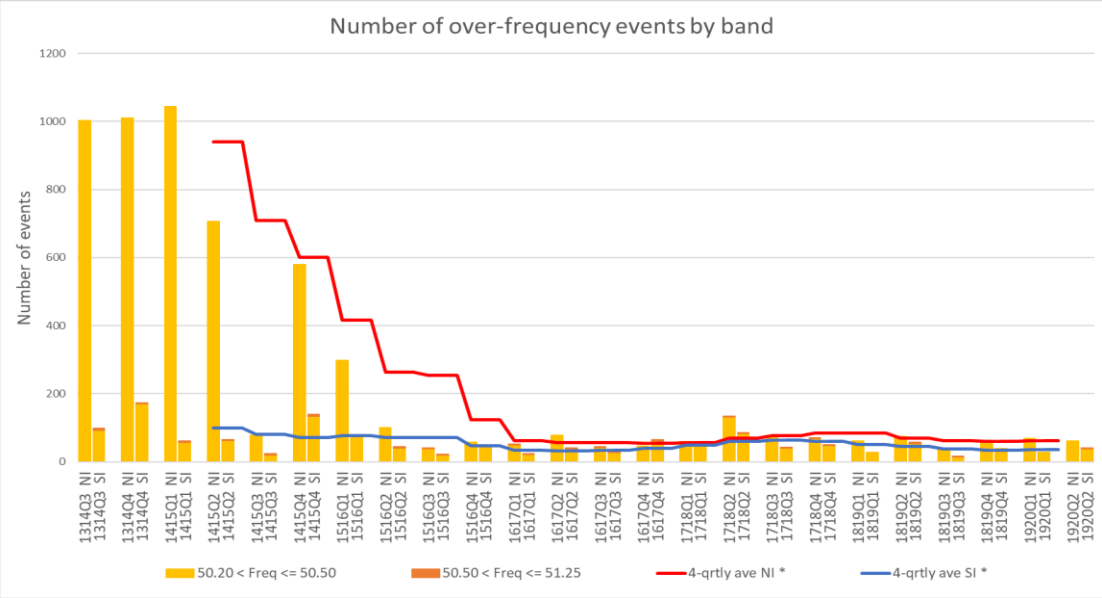


* These graphs have not been updated since 2019/20 Q1; they will only be updated at the end of each quarter

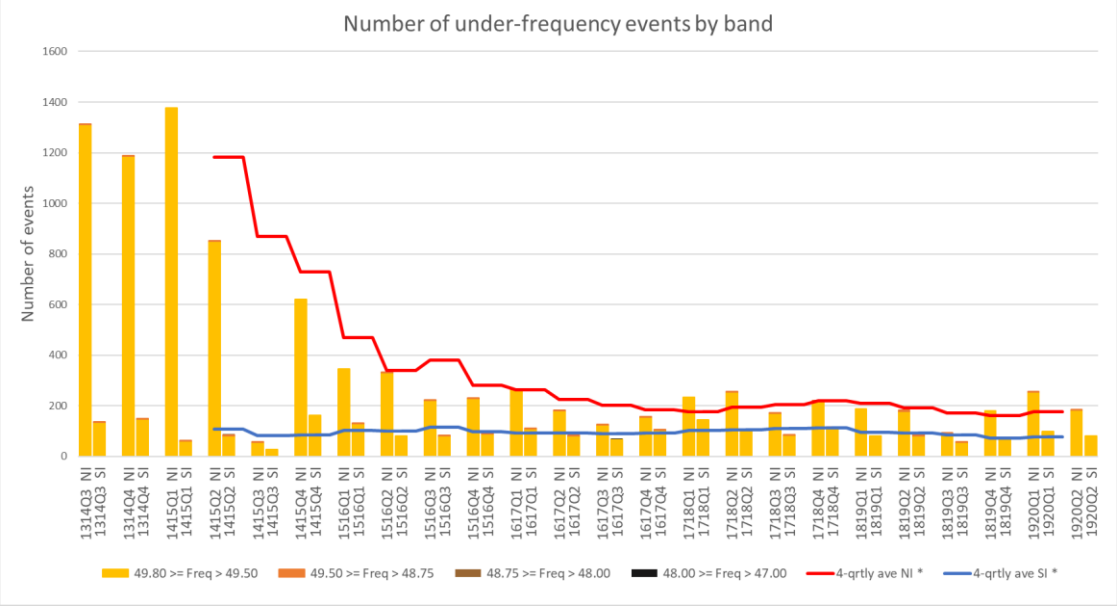
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

The following charts show the number of momentary fluctuations outside the frequency normal band, grouped by frequency band, for each quarter since 2014. The information is shown by island, including a 4-quarter rolling average to show the prevailing trend.

Over-frequency events



Under-frequency events



Note: The 2019/20 Q2 contains data for October and November only.

* 4-qtrly averages for NI and SI will only be 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-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	-	-	1	-	-	-	-	1	-	1	3
Warning Notice	-	-	-	-	-	-	1	-	-	-	-	-
Customer Advice Notice	20	16	6	7	4	8	17	9	14	6	15	15

20 Grid emergencies

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

Date	Time	Summary Details	Island
27-Nov-19	10:22	A grid emergency was declared to assist with restoring supply following the tripping of 220 kV Huapai – Marsden Circuit 1.	N
27-Nov-19	16:47	A grid emergency was declared to enable pre-contingent load management to avoid an overload on one of the 110 kV Hamilton-Piako-Waihou circuits for the tripping of the other one.	N
30-Nov-19	18:15	A grid emergency was declared to enable the grid to be reconfigured following the tripping of Haywards 110 kV Bus B.	N

Appendix A: Discretion

Event Date and Time	Description
11-Nov-2019 11:00	RPO2201: Rangipo circuit tripped. Last Dispatched MW: 0
28-Nov-2019 02:03	HLY2201: Genesis claimed Clause 13.82(a) with a minimum capability of 182MW. Last Dispatched MW: 178.99