MONTHLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

April 2020

Keeping the energy flowing

TRANSPOWER

Report Purpose

This report is Transpower's review of its performance as system operator for April 2020, 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).

Table of Contents

Report Purpose ii

System operator performance 5
1 Highlights this month 5
2 Customers and other relationships 5
3 Risk & Assurance 6
4 Compliance 6
5 Separation of Transpower roles 6
6 HVDC 2020 outages 7
7 Project updates 7
8 Technical advisory hours and services. 10
9 Outage planning and coordination 10
10 Power systems investigations 11
11 Performance metrics 11
12 Cost-of-services reporting 11
13 Actions taken 11

System performance 12
14 Security of supply 12
15 Ancillary services 13
16 Commissioning and Testing 15
17 Operational and system events 15
18 Frequency fluctuations 16
19 Voltage management 19
20 Security notices 19
21 Grid emergencies 19

Appendix A: Discretion 20

This page is intentionally blank.

System operator performance

1 Highlights this month

- We continue work with stakeholders, including the Authority, to manage our COVID-19 response.
- With the nationwide COVID-19 level 4 lockdown, we were concerned that the anticipated reduction in commercial and industrial loads would result in high system voltages overnight. Our power system studies gave us assurance that the power system would remain manageable based on what we were expecting to occur and the mitigation measures available to us.
- Other power system studies we performed during this COVID-19 lockdown period investigated how AUFLS may respond with the demand profile changing and how the reserve management tool (RMT) modelled AUFLS considering the large industrial loads not operating. Separate Customer Advice Notices (CANs) were sent out to inform the industry that RMT was modified and the AUFLS change was assessed as having no impact.
- COVID-19 has had a minor timing effect on the Real Time Pricing project. There is a delay to the completion of the solution requirements of three weeks and the high-level design of two weeks. The business case completion date remains 10 July.
- We completed the Extended Reserves technical advisory service (TAS) report and submitted it to the Authority for review.
- With the HVDC 2020 outages completed, we have initiated a lessons-learned exercise to complete in May.
- We received a report from the Electricity Authority's independent reviewer on the risk assessment and communication in the planning and implementation of the HVDC outages by both grid owner and system operator. This report is supportive of system operator planning and approaches.
- Security of supply is not a concern despite North Island inflows for the year to date being the lowest sequence since 2003. The market is well placed to enable conservation of North Island storage for a number of reasons, one of which is that South Island storage is close to average for the time of year.
- We published our Annual Security of Supply Annual Assessment on 30 April. This year's assessment concluded that generation would need to be built in the next half of this decade and that there is a sufficiently large pipeline of consented projects ready to go to meet this need.

2 Customers and other relationships

COVID-19 response

Our most significant customer engagement over this month was discussions in relation to managing the COVID-19 situation, including with the Authority.

3 Risk & Assurance

COVID-19 response

We continue to update the industry via our dedicated COVID-19 webpage with links to relevant system operator information.

To ensure the ongoing ability for us to provide our control room services and protect our people, we have introduced two additional control rooms in the control centres, Perspex screens and social distancing markers as well as a range of hygiene measures.

Business process audits

We have been progressing two business process audits under our annual SOSPA audit plan (the Medium-term load forecast and Conflict of interest), with initial data gathering and interviews completed. We have also agreed the terms of reference for the final audit on our Outage Planning Policy.

Software audits

The software audits of the Reserve Management Tool (RMT) and Scheduling Pricing and Dispatch (SPD) software were completed as required under the Code, with no defects raised. A general comment was made by the auditor that solve times for SPD are starting to approach the agreed limit. We will continue to monitor solve times to identify if this becomes an issue.

Annual SOSPA audit plan

We are preparing the 2020/21 annual SOSPA audit plan to share with the Authority before the end of the year.

4 Compliance

We did not report any system operator breaches to the Authority in April.

We continue discussions with the Authority concerning some participant behaviour in not offering the correct ramp rates which is creating infeasibilities impacting the production of final price schedules.

We have five 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.

One item has been opened in the register during April.

- Security of Supply Annual Assessment (SOSAA) – we identified a potential conflict of interest during the development of our SOSAA regarding the inputs for the RCPD sensitivity. Our assessment used publicly available information (from Concept Consulting), rather than information from the grid owner.

We have 13 open items in the register.

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
29	Preparing the Net Benefit test – SO involvement	Operations Planning Manager
31	Discussions concerning Demand Response	SO Market and Business Manager
32	Use of the same legal advisor	SO Power Systems Group Manager
33	Sharing working space during lockdown	Grid and Systems Operations Manager
34	Impartial response to COVID-19 pandemic	General Manager Operations
35	Annual security of supply assessment – RCPD sensitivity inputs	SO Market and Business Manager

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

6 HVDC 2020 outages

With the HVDC 2020 outages completed, we have initiated a lessons-learned exercise to complete in May.

We received a draft report from the Electricity Authority's independent reviewer on the risk assessment and communication in the planning and implementation of the HVDC outages by both grid owner and system operator. This report is supportive of system operator planning and approaches.

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)

The impacts of the COVID-19 level 4 and level 3 lockdown on progress over March, April and into May are now clear. The current phase of the project requires high levels

of effective collaboration as we work to complete the Solution Requirement and Design workshops. The effect of this is a delay to the completion of the solution requirements of three weeks and the high-level design of two weeks. The business case completion date remains 10 July in line with the previously forecast impact of the introduction of the TAS087 scope covered in CR003.

The status of the two recent change requests are:

CR002 – Pre-funding build phase through to end August 2020. This has been approved and budgets and timelines amended accordingly.

CR003 - TAS087: Improve dispatchable demand under RTP. There has been a minor extension of scope, cost and time for the initiation phase to include this component; the timing also incorporates the impact of COVID-19 lockdown. A change request will be submitted in early May. The project time status will remain in an amber status until CR003 has been received and approved by the Authority.

Dispatch Service Enhancements (DSE)
Work continues to focus on transitioning Mercury, Trustpower, Genesis and Vector to ICCP solutions before the next tranche of participants are scheduled to commence their transitions in June/July (these participants will be using web services solutions). We are having ongoing conversations with participants about the impacts of the COVID-19 lockdown on their transition plans; no major impacts have been identified to date.

Situational Intelligence
During April, the project team completed training in the Agile project management methodology. This is in preparation for sprint zero (pre-planning and organisation stage) which is on schedule for completion in early May.

Extended Reserves (AUFLS)
We completed the Extended Reserves TAS report and submitted it to the Authority for review. We met with the Authority on 1 May to discuss next steps for the project.

Sensitivity Schedules
We are developing a proof of concept which investigates the sensitivity of prices and carbon emissions to changes in demand, specifically the impact of +/- load variations. We intend to make the upper and lower sensitivities of the forecast price and carbon emissions available to market participants on the Transpower system operator website in June.

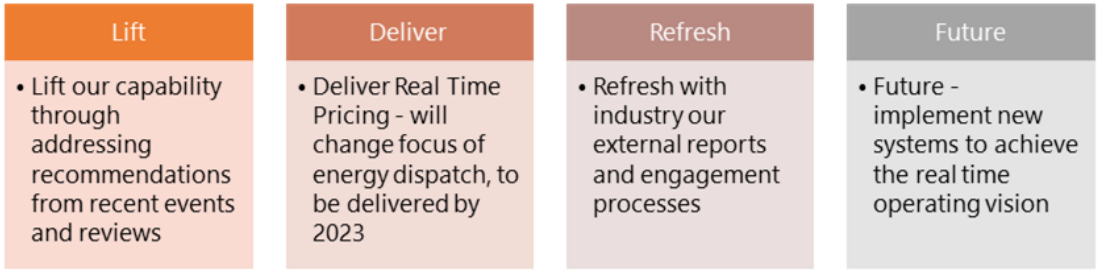
Market System (MS) Simplification
We are working with our IST division to understand potential delays that may occur to commissioning the MS Simplification project in June 2020 due to COVID-19 constraints. We are also looking at the potential impacts any delay may have on the portfolio of projects.

7.2 Other projects and initiatives

Energy Futures: New Generating Technology for Ancillary Services
A TAS report was completed and was submitted to the Electricity Authority in early May. We are now underway with the TAS for the next phase, which will recommend changes required to Parts 8 and 13 of the Code. Changes are necessary to adapt to the expected change in power system security resulting from an uptake of inverter-based generating technologies.

Inertia monitoring project
The pilot inertial monitoring project for New Zealand's power system has started. Equipment was transported and installed in four of eight sites before the COVID-19 level 4 lock-down. These devices have been actively monitoring the system and recording data. A fifth installation has now been put in place in Christchurch enabling the trial to commence.

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



- We have prepared the terms of reference for undertaking a follow-up audit of our use of command language in the control rooms.
- We are looking how we can continue to engage with industry to undertake restoration exercises while remote working.
- The advanced RiskView training that was scheduled was cancelled due to lockdown. A new date has not been established.
- The final report for the POCP review has been published on our website. As system operator, we will review the recommendations, cost potential POCP tool changes, and provide a response to the Transmission Advisory Group (TAG). We will then respond to any recommendations the TAG makes on POCP.
- A project to make outages pending approval visible in POCP is now underway. It is due to commission in June 2020.
- The detail for the RTP project is included in section 7.1.

Continuous business improvement initiatives
Operating Control and Assurance process review is progressing well although it has been slowed by a couple of weeks due to access to subject matter experts from the control room during the COVID-19 lockdown. A recommendation report for Operating Control will be complete late-May and Assurance in June.

Review of the end-to-end modelling process is nearing completion with several areas identified for improvement. Next steps will be to prioritise these areas and actions put in place for to improvements.

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.

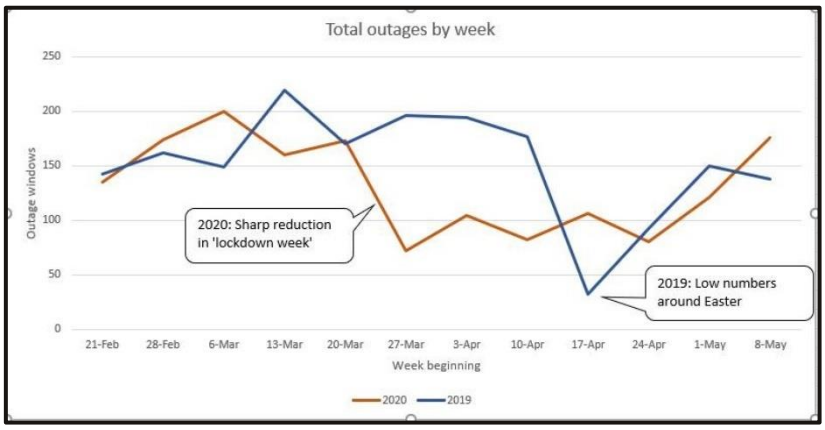
9 Outage planning and coordination

COVID-19 response

As a result of the COVID-19 response we are seeing changes in system conditions, variations to planned outages, and an increase in short-term changes to outage plans. We have considered our approach to outage coordination and assessment in this environment and have published an outline of our approach on our COVID-19 webpage

Near real time

In the COVID-19 environment, we continue to experience low demand and high volumes of outage changes.



The chart compares grid owner outage numbers with last year. Outage numbers are now climbing with some high volumes for May. We have also seen a large number of short notice requests within the 3-week lead time (57 in March and 85 in April – some of these requests cover multiple outages).

Our operations planning team who assess the operational impacts on the system has been busy managing the outage churn assessments and rework and have handled a higher number (20) of complex issues during April.

10 Power systems investigations

Moderate incident: Wellington region loss of supply 12 March 2020

We are continuing with our investigation into the 12 March 2020 Wellington region loss of supply in accordance with our new significant incident reporting process. Our final report is due to the Electricity Authority in June 2020.

11 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.

12 Cost-of-services reporting

We provided the Authority with a final report on the cost-of-services for financial year 3 (2018/19) in February.

13 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

14 Security of supply

From late March and throughout April, we saw a sharp drop in demand as the country moved into the COVID-19 level 4 lockdown. New Zealand's energy demand dropped 20 per cent; 5 per cent coming from major users and the remainder coming from residential, commercial, and medium-sized industrial users. This drop in demand improved margins and did not cause any security of supply issues.

The drop in demand from major users lead to a reduction of around 150 MW in reserves as much of the interruptible load is provided by large industrial users. This increased the cost of HVDC transfer for a single pole tripping.

The gas market also saw a large drop in demand and associated gas prices. Those with access to gas storage took advantage of the low prices - Ahuroa gas storage facility appears to have increased 700 TJ, indicating is has been filling at injection rates close to its daily maximum. During the month the Pohokura outage and inspections were successfully completed. This signalled the end of the run of major infrastructure outages in Q1 2020 (HVDC, Pohokura, Ahuroa).

North Island inflows for the year to date were the lowest sequence since 2003. As a result, North Island hydro storage is at 61 per cent of average. However, with South Island storage being close to average for the time of year, low North Island storage does not present a security of supply issue.

The market is well placed to enable conservation of North Island storage for the following reasons:

- North Island inflows typically start to rise at this time of year.
- The HVDC is back from outage allowing greater transfer of South Island energy.
- In COVID-19 level 3, greater levels of interruptible load have returned to the system supporting greater levels of HVDC transfer.
- Demand is down due to the COVID-19 situation.
- Thermal fuel supply chains and storage are looking healthy.

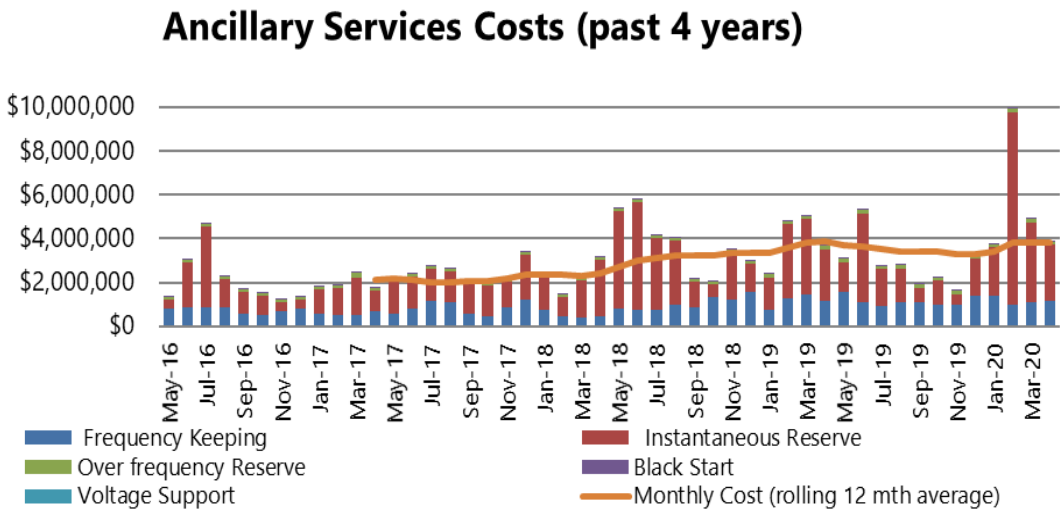
As we move through COVID-19 level 3 and into COVID-19 level 2, we expect to see demand start to gradually ramp up.

Security of Supply Annual Assessment

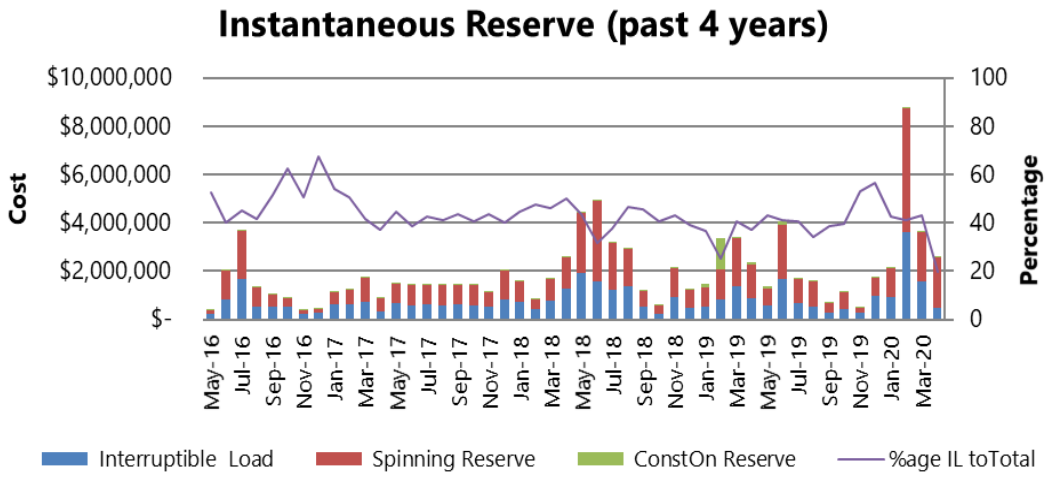
We published our Annual Security of Supply Annual Assessment on 30 April. This year's assessment concluded that generation would need to be built in the next half of this decade and that there is a sufficiently large pipeline of consented projects ready to go to meet this need. This year we used the software package Matlab, instead of MS Excel, for the analysis. Matlab enabled us to more easily consider a wide range of sensitivities and demand forecasts, including a sensitivity looking at what would happen if demand growth was flat for the next 18 months and then

returned to pre-COVID-19 levels over the next six months. We are planning to do more work on potential COVID-19 impacts later in the year.

15 Ancillary services

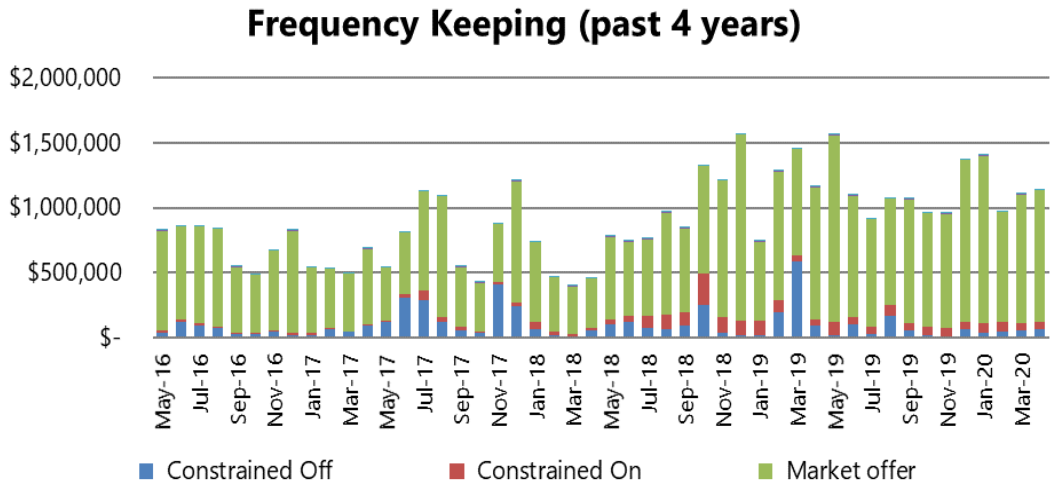


This month's ancillary services costs were $3.9 million, a decrease of $1m (21 per cent decrease) from last month. This decrease is mostly attributable to the decrease in instantaneous reserve costs of $1 million. The decreased instantaneous reserve costs were a result of the HVDC outages finishing at the end of March.

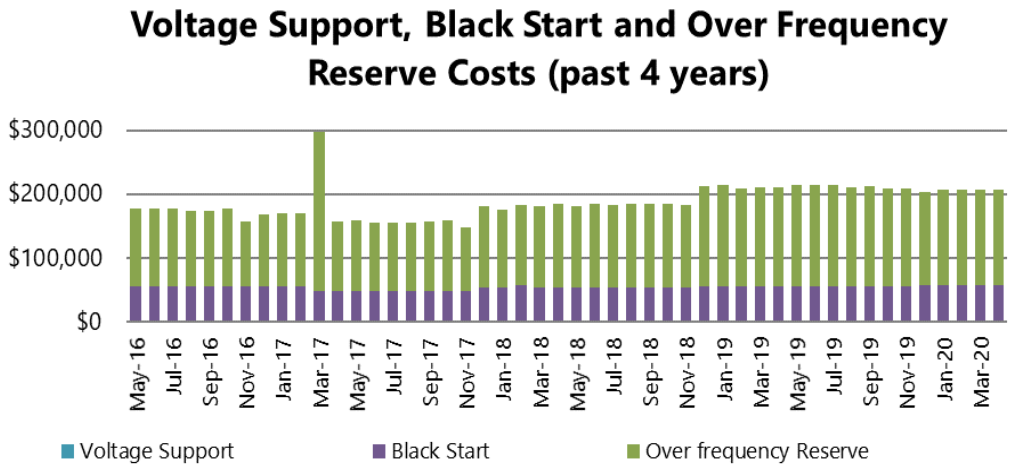


This month's instantaneous reserve costs were $2.6 million, a decrease of $1 million (29 per cent decrease) from the previous month and once again the main driver for overall change in ancillary services costs for the period. This decrease in costs was caused by the large change in interruptible load costs. Interruptible load costs for the month were $0.5 million, a decrease of $1.1 million (68 per cent decrease); the spinning reserves during the month increased by $7k (no substantive change to the previous month) and constrained on costs were similar in magnitude to last month, at $16k.

The reduction in instantaneous reserve costs were a result of the HVDC outages finishing at the end of March. Reserve requirements and prices were greater during the HVDC outages as there was no self-cover for the loss of an HVDC pole and the capacity for sharing reserves across the HVDC was reduced. The cost reduction observed in April was due to a reduction in Interruptible Load costs. A smaller quantity of Interruptible Load was available during COVID-19 level 4 lockdown restrictions, when most industrial load was required to shut down production.



This month's the frequency keeping costs were $1.1 million, a small increase of $31k to the previous month (3 per cent increase). Constrained on costs stayed around the same and constrained off costs increased by $13k. Frequency keeping procurement costs increased by $18k.



The over frequency costs and black start costs did not vary this month; these were $148k and $58k respectively.

There are currently no voltage support costs.

16 Commissioning and Testing

Network modelling and commissioning

Commissioning and modelling work has been high and is likely to grow in the coming month as work is rescheduled after the COVID-19 level 4 restrictions. Lead times for this work are important to enable time for Real Time Systems and engineering teams to update SCADA and other models.

17 Operational and system events

High voltages

With the nationwide COVID-19 level 4 lockdown, we were concerned that the anticipated reduction in commercial and industrial loads would result in high system voltages overnight. Leading into the lockdown we performed power system studies to anticipate the system state overnight accounting for possible scenarios such as Huntly unit 5 not generating. This analysis gave us assurance that the power system would remain manageable based on what we were expecting to occur and the mitigation measures available to us. We have been actively managing voltage through the low loads.

Automatic under-frequency load shedding (AUFLS)

Due to the changing demand profile we identified that AUFLS may not respond as we expect. As system operator, via a customer advise notice (CAN), we requested that participants inform us if they have concerns about being able to meet their obligations. One response was received from a South Island distributor and was assessed as having no impact.

Exempt AUFLS load

Most large industrial users in the North Island are exempt from providing AUFLS. We include these exemptions in our reserve management tool (RMT) to ensure we model the correct AUFLS response. With the reduction in industrial load during lockdown we modified the RMT value for exempt AUFLS load. This was communicated to industry via a CAN, and we will continue to monitor and adjust RMT as industry load come back on after lockdown. One benefit of the RMT change was less reserve required to cover high HVDC northwards transfer.

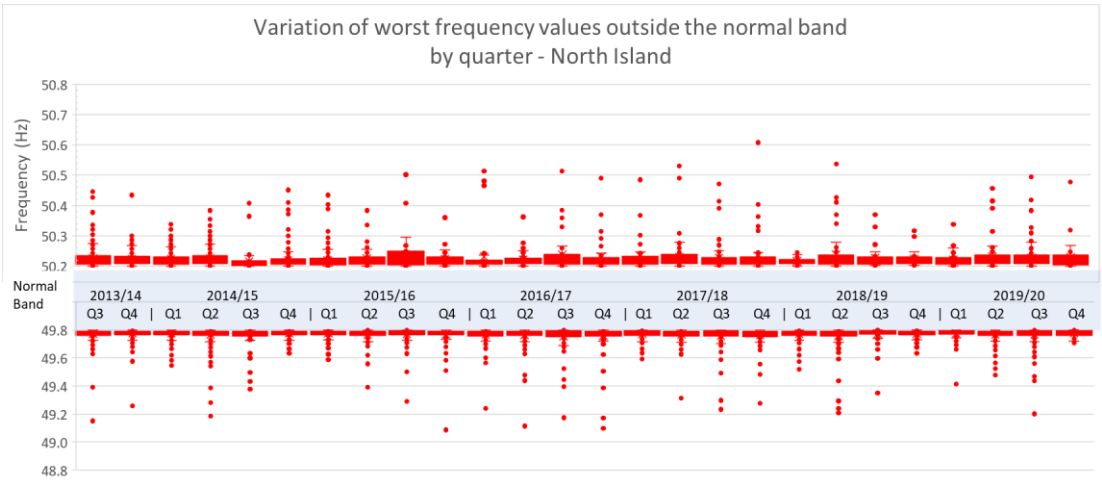
18 Frequency fluctuations

The rise in both the occurrence and durations of frequency excursions outside of the 49.8 – 50.2 Hz deadband in the 2019/20 Q3 correlates strongly with the HVDC outages that lasted over the majority of that quarter. This trend is has not continued now that the outages are completed.

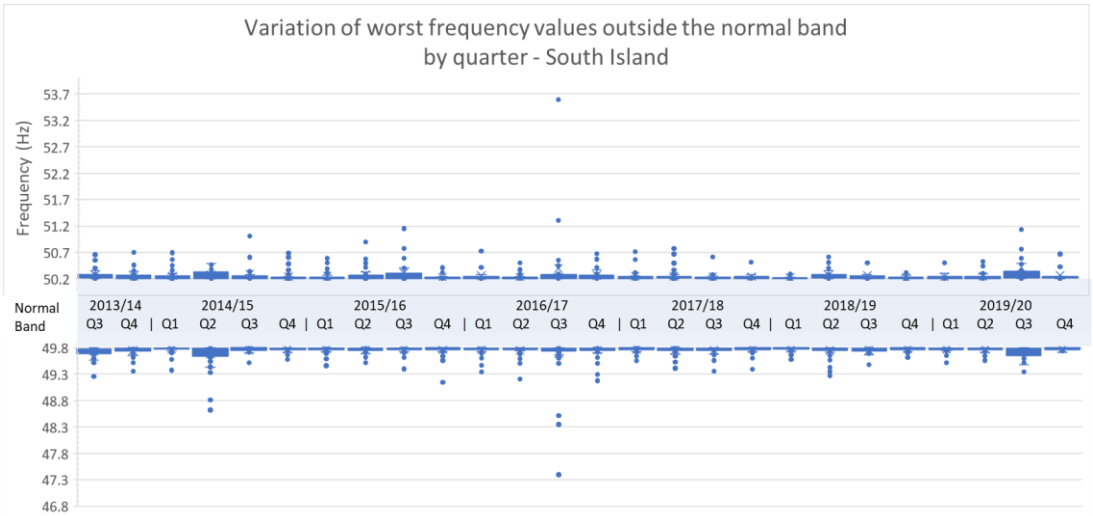
18.1 Maintain frequency in normal band (Frequency value)

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



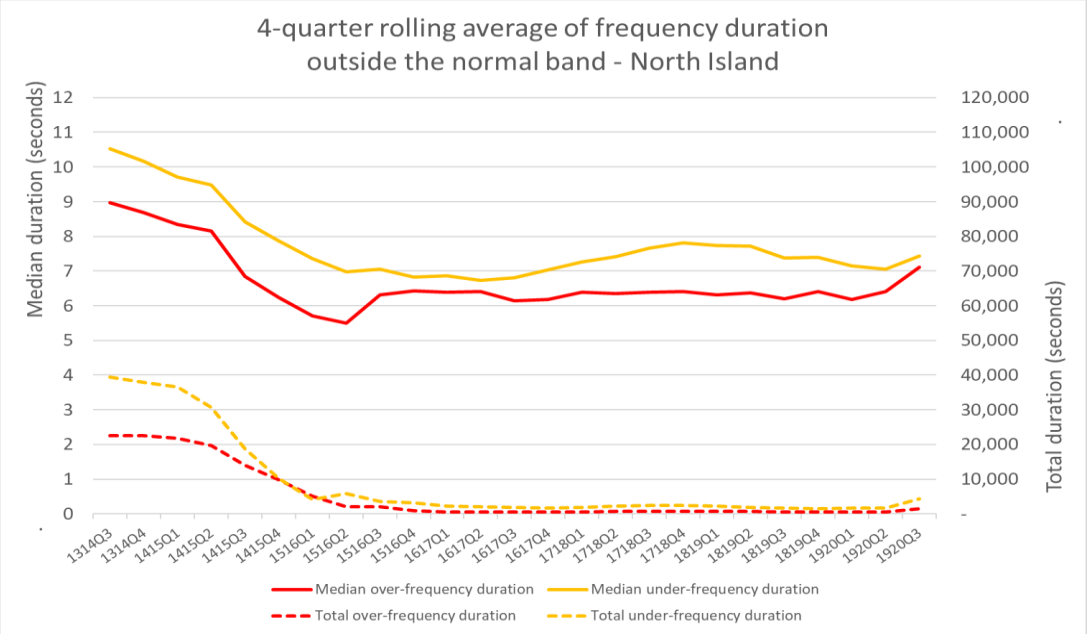
* 2019/20 Q4 contains data for April only

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.

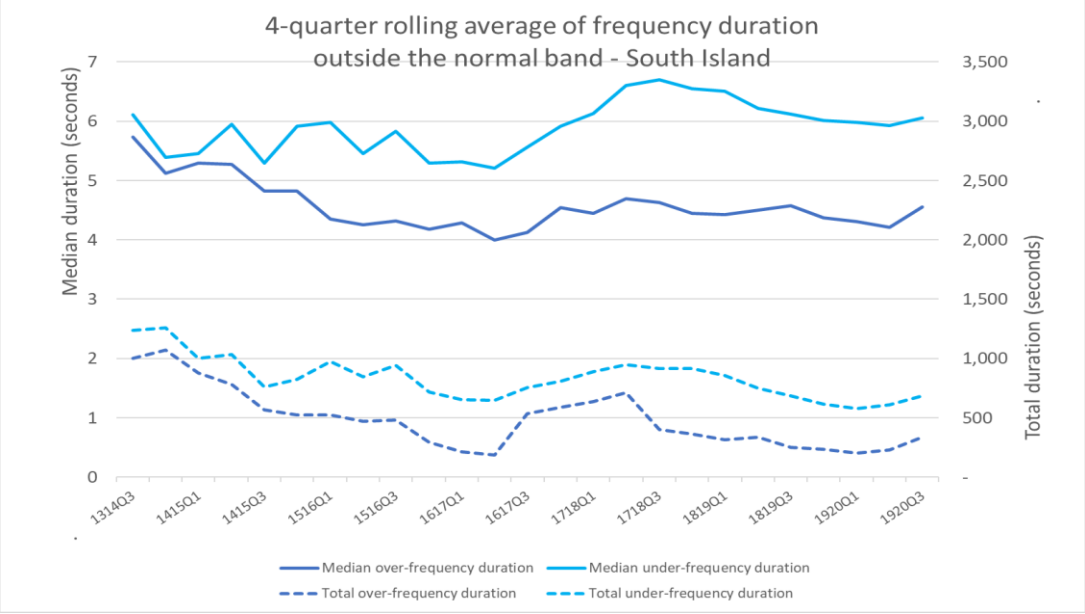
18.2 Recover quickly from a fluctuation (Time)

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

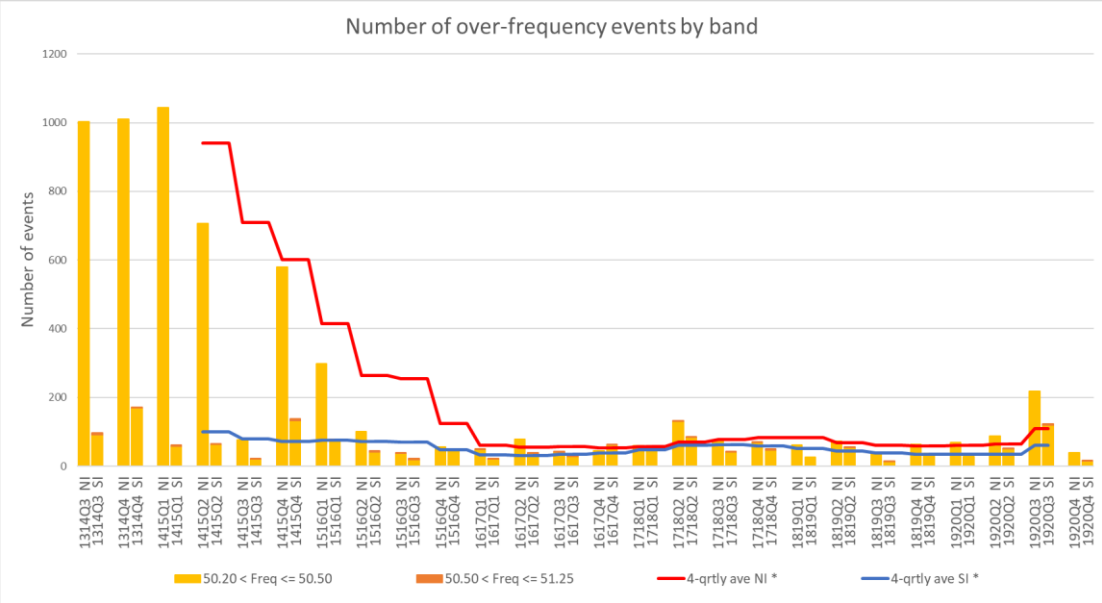


* These graphs have not been updated since 2019/20 Q3; they will only be updated at the end of each quarter

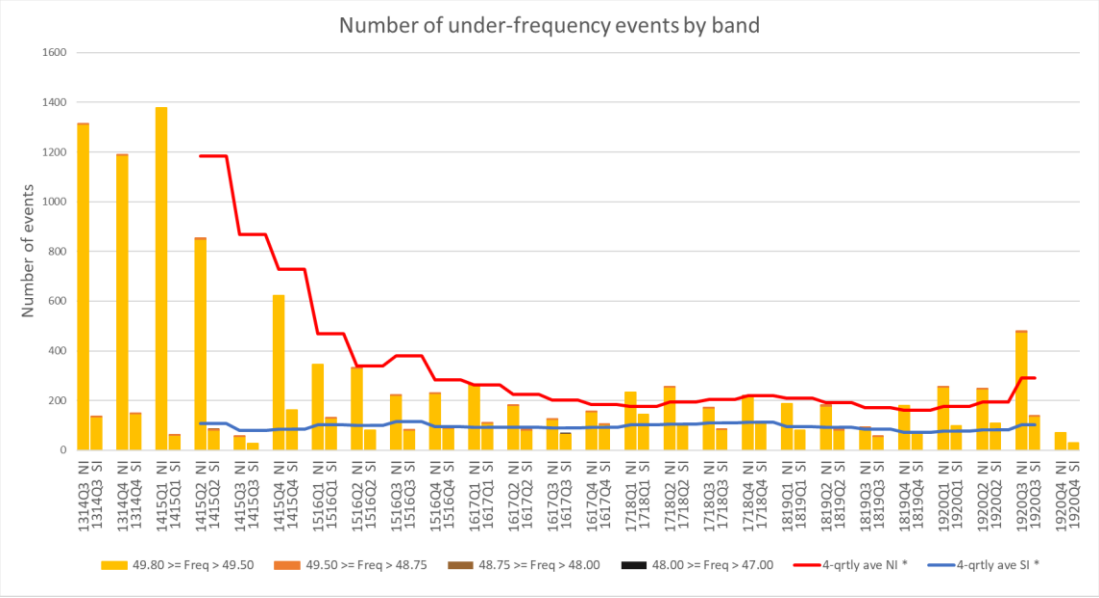
18.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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 Q4 contains data for April only.

* 4-qtrly averages for NI and SI will only be updated at the end of each quarter

18.4 Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

19 Voltage management

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

20 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	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	-	-	1	-	1	3	-	-	-	1	-
Warning Notice	-	1	-	-	-	-	-	-	1	-	2	-
Customer Advice Notice	8	17	9	14	6	15	15	14	6	21	14	13

21 Grid emergencies

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

Date	**Time**	**Summary Details**	**Island**
		None.	

Appendix A: Discretion

Event Date and Time	Description
	None.