MONTHLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

May 2020

Keeping the energy flowing

TRANSPOWER

Report Purpose

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

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System operator performance

1 Highlights this month

- We have been preparing for the review and reset of our agreement with the Electricity Authority for the delivery of the system operator service (SOSPA); negotiations commence next quarter.
- Our HVDC 2020 lessons learned exercise provided us with strongly positive feedback both internally and from our external stakeholders for our approach and detail of our communications, planning, collaboration and governance arrangements.
- RTP project: Approval of change requests by the Authority project steering committee has been obtained for additional scope, time and budget to include additional system security for dispatch products and to provide funding through to when the Authority expect their Board to approve the capital delivery phase. The delivery business case is due to the Authority on 10 July.
- Trustpower and Genesis completed cut overs to the new DSE platform in April and May.
- National hydro storage levels have declined quite quickly after a dry sequence starting around mid-May (which continues today) and an extended run of below average inflows. While this will put upward pressure on prices, current modelling indicates we are not likely to pass through any Electricity Risk Curves. This is underpinned by thermal fuel availability and the re-entry of Contact's Stratford combined cycle plant into the market.
- The next step with our sensitivities schedule project is to make the upper and lower sensitivities to the load forecast available on our website in June.
- We have started the pre-work on the next full update of the System Security Forecast (SSF), due to be released in December 2020.
- To ensure we maintain readiness with many of our incident response team members remote working, we worked with Transpower's Grid Delivery division on an event simulation on Wednesday 15 May. The event simulated injury to a member of the public and a loss of supply.
- From 16 May 2020, the reporting line of the Real Time System Group moved from Grid Delivery to Operations.

2 Customers and other relationships

SOSPA 2 reset

During the next quarter (July to September 2020), we will commence the review and reset of our agreement with the Electricity Authority for the delivery of the system operator service (SOSPA). There are strict parameters around timing and the elements that can be negotiated (i.e. commercial funding details and any other aspects of the contract agreed by both parties prior to the review period). Any agreed changes will take effect on 1 July 2021, for the next year funding period. In June we will provide the Authority with details and supporting information of both our performance in the

existing SOSPA term (SOSPA 1) and our planned capex and opex expenditure for the new SOSPA term (SOSPA 2) for analysis and validation prior to the negotiations commencing.

Reducing customer security to N-security

We have prepared a report for publication on our website to communicate to our customers when outages will reduce their security to N-security [1] for the 10 week-ahead period. We expect to publish this on a weekly basis from mid-June. We provide regular notices to our directly connected customers when they are placed on N-security during individual outages, but this report will provide a look ahead view by customer.

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.

The additional precautions we have applied to the control rooms has enabled us to continue operations without any reduction in service.

Business process audits

Field work for the audit of our Conflict of Interest procedure has been completed and we await the final report from KPMG. The remaining audits for this financial year are also underway. These are the Outage planning audit and an additional business audit, outside of our original audit plan, National Coordination Centre (NCC) Procedural Comms. The addition audit is the result of an Enterprise audit for an HVDC setting error recommending that we complete an NCC procedural audit.

Annual SOSPA audit plan

We are currently seeking internal review of the 2020/21 annual SOSPA audit plan prior to sharing it with the Authority before the end of the year.

4 Compliance

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

The Authority compliance committee met during May and closed three breaches for the system operator. A warning letter was sent to the Compliance Manager for the event when a network model error incorrectly modelled Haywards 11 kV and 33 kV market nodes and was used in real-time. The other items were closed with no further action by the Authority.

We have three outstanding breaches with the Authority compliance team.

[1] N security means an interruption to supply when a single asset (circuit, transformer, generator) disconnects from the power system

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.

Three items were opened in the register during May.

- 35 – Annual security of supply assessment – RCPD sensitivity inputs
- 36 – Grid request for information
- 37 – Participant request for information

Four entries were closed.

- 9 – HVDC Outages 2019/20
- 28 – Investigation into loss of SCADA 31 Oct 2019
- 35 – Annual security of supply assessment – RCPD sensitivity inputs
- 36 – Grid request for information

We have 11 open items in the register.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
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
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
37	Participant request for system operator information via the wrong process	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

We completed a lessons learned exercise, including canvassing ideas and feedback from a subset of stakeholders. We provided a lessons learned document to the Authority's Market Monitoring team. We had strongly positive feedback both internally and from our external stakeholders for approach and detail of our communications, planning, collaboration and governance arrangements. We also captured some

suggestions for improvements: earlier development and recognition of scenarios, tailored HVDC refresher training for real-time teams, and encouraging stakeholders to raise concerns earlier.

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 project is in the capital delivery phase preparing the Delivery Business Case due to the Authority on 10 July. Solution Requirements and High Level Design are nearing completion and detailed planning for the build and implement phase is well underway. Work is continuing on the operational and market support impacts, with a change manager having been recruited into the project team to assist with the planning and execution of the business change required over the next two years. Work with the Authority on the industry engagement model to prepare market participants and wider industry for the changes that RTP will introduce is progressing well. The approach is being adjusted to accommodate expected ongoing reduced travel and lower appetite for industry gatherings by planning a move to an on-line delivery model.

Approval of change requests by the Authority project steering committee has been obtained for additional scope, time and budget to include additional system security for dispatch products and to provide funding through to when the Authority expect their Board to approve the capital delivery phase. The introduction of these scope items has affected the milestone dates for completion of Solution Requirements, High Level Design and the Delivery Business Case. The Authority have advised that any further delay to the Delivery Business Case milestone will impact their ability to have the next phase approval put to their August Board meeting.

Dispatch Service Enhancements (DSE)
Trustpower and Genesis completed cut overs to the new DSE platform in April and May. Work continues with Vector and Mercury to complete transitions before the next tranche of participants are scheduled to commence transition in June/July (using web services solutions).

Situational Intelligence
The first development sprint has been completed, delivering real time dispatch generation data from SCADA and the market system into the Situational Intelligence application. Sprint two is underway and due for completion early June.

Extended Reserves (AUFLS)
We are continuing to work with the Authority to develop the TAS statement of work for the next phase of the project. The TAS will commission the system operator to carry

out a formal procurement process to select a vendor who will deliver a data portal to collect the 2-block AUFLS data from North Island providers.

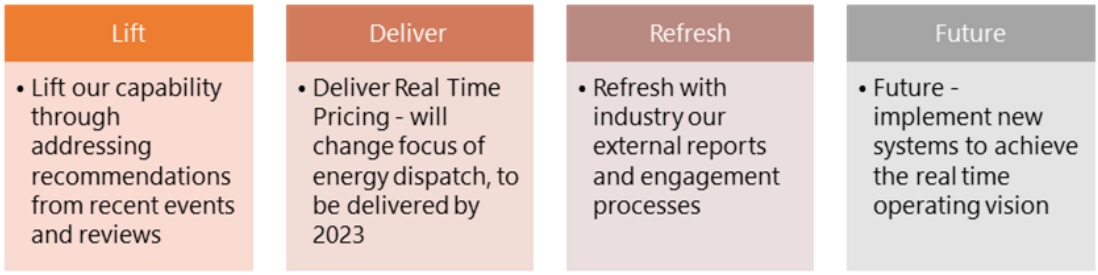
Sensitivity Schedules
We are continuing to develop a proof of concept (POC), investigating the sensitivity of prices and carbon emissions to changes in demand, specifically the impact of +/- load variations. The focus has been on briefing the Authority senior leadership team about the project and working with the Authority on a communications plan for making the POC to visible to the industry. The project is on track for the upper and lower sensitivities to the load forecast to be available on our website in June.

7.2 Other projects and initiatives

Energy Futures: New Generating Technology for Ancillary Services (TAS89)
A final draft TAS report has been delivered to the Authority which recommends changes required to Parts 8 and 13 of the Code for reserve types, and the removal of technical performance requirements out of the Code and into the ancillary service procurement plan. The solution the team recommends is pragmatic and would not involve a large timely and expensive market system change.

Energy Futures: Requirements for inverter connected resources (TAS91)
We are continuing to work on TAS91, to recommend changes to Parts 8 and 13 of the Code to adapt to the expected change in power system security resulting from an uptake of inverter-based generating technologies. The report is due in August 2020.

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



- The advanced RiskView training that was scheduled, was cancelled due to lockdown has been rescheduled for late-June.
- The second phase of the Customer Portal Project is on hold while the project team explores alternative solution options.
- The detail for the RTP project is included in section 7.1.

Continuous business improvement initiatives
Operational Fax Review: Work to implement removal of operational fax has been delayed by COVID-19. We are developing a revised plan to enable the work to continue if the current approach cannot be progressed by the end of June.

Operational Control Review: The review is complete with the improvement recommendations endorsed, including changes to checklists, revising guidelines and training. We are now developing an implementation plan to action these recommendations.

Assurance Review: We have completed interviews with several external parties to obtain input on use of assurance. Workshops for 'solution ideation' are underway. A report with recommendations will be made available in mid-June.

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

Whilst outage numbers in May were lighter than 2019, the amount of rework, outage cancellations and churn has been very high due to the cancellations and rescheduling during Alert levels 3 and 4. May saw 46 outage changes within less than three weeks' notice. As New Zealand entered level 2, we saw a fall in short notice changes to the outage plan. We are seeing increased volumes, however, for June. (563 outages for June 2020, compared with 524 in June 2019 – with potential of some short notice outages during the month.) This is potentially a result of deferrals from the lockdown periods.

10 Power systems investigations and reporting

System Security Forecast (SSF)

The next full update of the SSF is due to be released by December 2020. The full SSF update is time and resource intensive, so this year we have been looking at how additional automation could introduce efficiencies. This pre-work is going well.

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

Our May NZGB report showed one anticipated N-1-G shortfall [2] under normal conditions. A Customer Advice Notice advising the shortfall was published, and the shortfall has now been resolved by rescheduling of generation outages.

As we moved through COVID-19 level 3 into level 2, demand largely returned to pre-COVID levels:

- Large industrials that we can monitor are now at around 96 per cent of their pre-COVID levels. Tiwai's Potline 4 and Marsden Point are still yet to return which combined make up approximately 1 per cent of national demand. Uncertainty remains around these two loads as both are yet to conclude reviews of their operations, including if their business in New Zealand remains viable in their pre-COVID forms.
- Residential and commercial load is, somewhat counter-intuitively, showed early signs of an increase as we entered level 2. The first full week in level 2 saw a 1 per cent rise in demand compared to the same time last year when adjusted for weather. At this early stage we assume this increase has been driven by additional residential heating with people working from home while commercial businesses are now also open and heating their space at the same time.

National hydro storage levels have declined quite quickly after a dry sequence starting around mid-May (which continues today) and an extended run of below average inflows. National storage level currently sit at 80 per cent of average; 83 per cent in the South Island and 51 per cent in the North Island. There is still quite a lot of head room between current storage and the Electricity Risk Curves (ERCs). While this will put upward pressure on prices, current modelling indicates we are not likely to pass through any ERCs.

This assessment is further supported by a loosening gas market underpinned by:

- a 10 – 20 per cent reduction in Methanex gas consumption as global methanol demand and prices drop in a post-COVID world
- a robust thermal fuel supply chain with the successful completion of Pohokura pipeline inspections, and no major infrastructure outages planned in the short term
- growing storage levels of both gas and coal as electricity generators capitalise on low gas prices. During levels 3 and 2, storage in Ahuroa

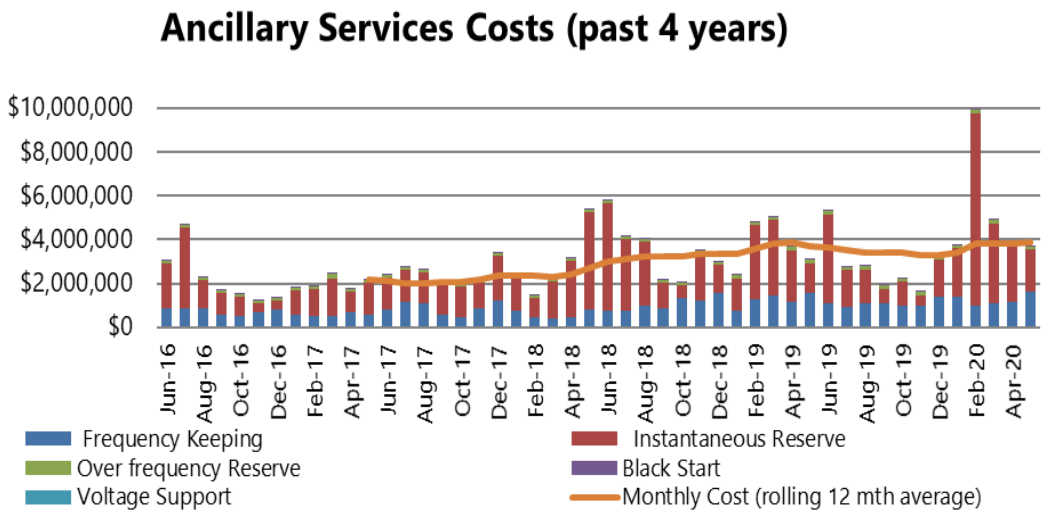
[2] N-1-G shortfall: The difference between the available generation capacity and the capacity required to securely supply demand after the occurrence of the worst case contingent event (i.e. reserves need to be restocked to cover the next worst case contingent event).

increased by 1,800 TJ, and the Huntly Rankine units are running on low priced gas, conserving and building their coal stockpile.

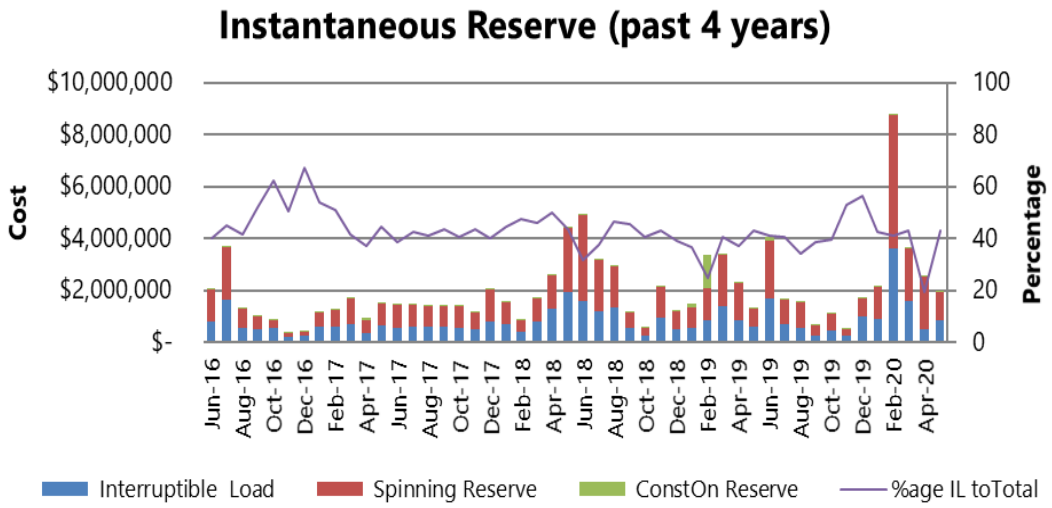
In addition, Contact Energy's Stratford combined cycle plant has recently re-entered the market. We expect the thermal station to run through the winter months.

While security of supply is comfortable, market prices are up. This is driven partly by low North Island storage which is at 50 per cent of average of the time year, and lower South Island storage. In addition, while Tekapo storage is 130 per cent of average for the time of year, its capacity is below 50 per cent due to outages making output lower than we would expect given its high storage levels. These two effects combined with increasing demand and an extended run of low wind generation have pushed prices up 70 per cent to an average of $174/MWh in the last week of May.

15 Ancillary services

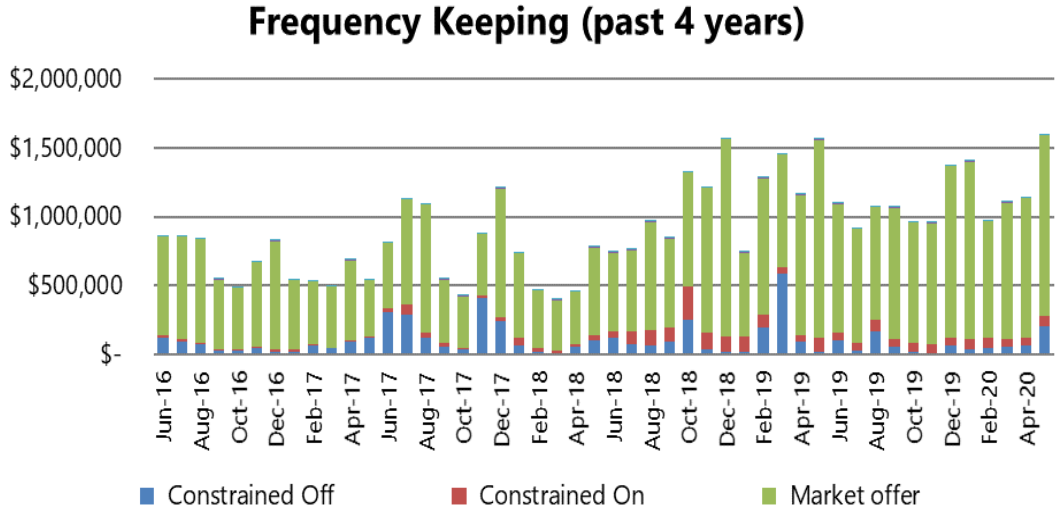


This month's ancillary services costs were $3.7 million, a decrease of $185k (5 per cent decrease) from last month. The decrease is a result of a decrease in instantaneous reserve costs of $644k (counterbalanced by an increase in frequency keeping costs of $459k).



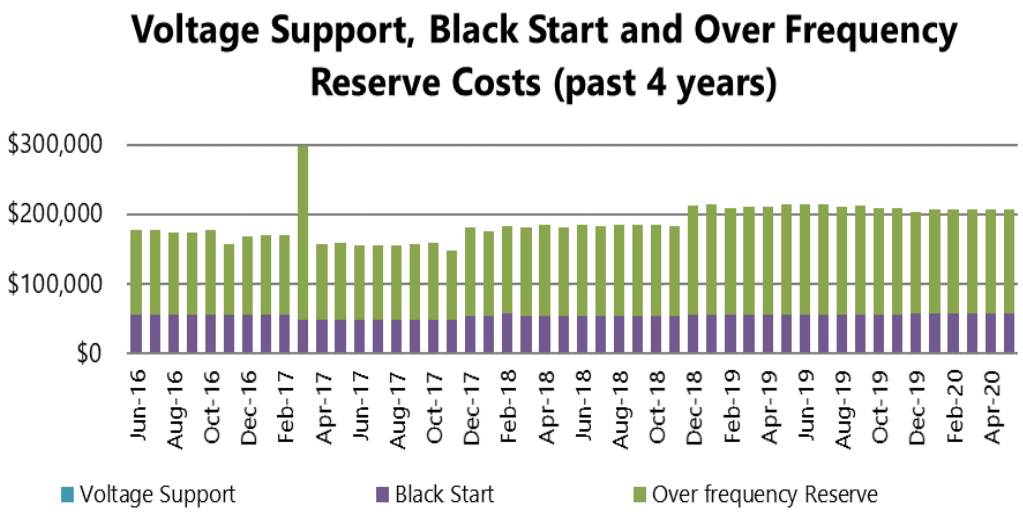
This month's instantaneous reserve costs were $1.9 million, a decrease of $644k (25 per cent decrease) from the previous month and once again instantaneous reserve costs were the main driver for overall change in ancillary services costs for the period. This decrease in costs was caused by the change in spinning reserves. Spinning reserves costs for the month were $1.1 million, a decrease of $1 million (47 per cent decrease); the interruptible load costs during the month increased by $330k (66 per cent increase) and constrained on costs were halved over the month to $7.7k (a decrease of 52 percent).

The reduction in instantaneous reserve costs were a result of a large increase in the offered quantity of fast instantaneous reserve. Industrial load returned as COVID-19 restrictions were relaxed, increasing the availability of Interruptible Load.



This month's frequency keeping costs were $1.6 million, a large increase of $459k to the previous month (40 per cent increase) as Genesis withdrew their Waikaremoana generation due to low lake levels. Constrained on costs stayed around the same, but

constrained off costs increased by $137k (201 per cent increase) and frequency keeping procurement costs increased by $301k (30 per cent increase).



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

Generation testing and commissioning

We continue to work with several existing asset owners on new generation commissioning activities. In addition, we are responding to enquiries from new asset owners looking to install renewable generation in New Zealand.

17 Operational and system events

With the benign weather and reduced amount of work being undertaken, we have had very few operational events of note. Operators in the control rooms have adapted well to the protocols using separate desks, team shift bubbles and working remotely. Some of the innovations that were put in place will be continued as they encourage digital collaboration.

Incident response readiness

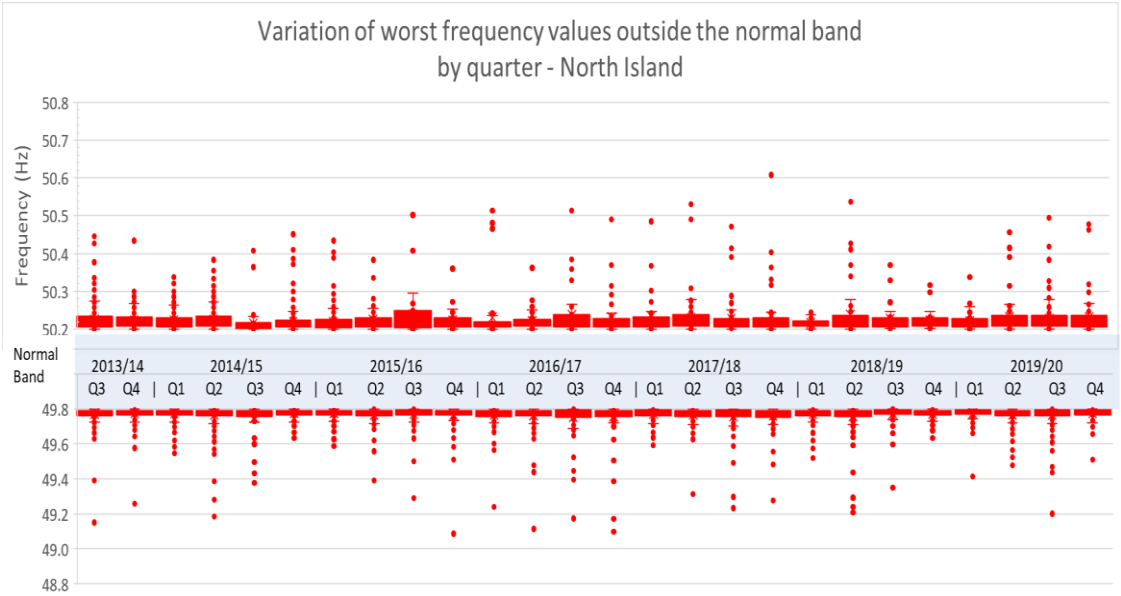
To ensure we maintain readiness with many of our incident response team members remote working, we worked with Transpower's Grid Delivery division on an event simulation on Wednesday 15 May. The simulation involved injury to a member of the public, loss of supply, and was the first such event held using Microsoft Teams. Event will be reviewed for lessons learned.

18 Frequency fluctuations

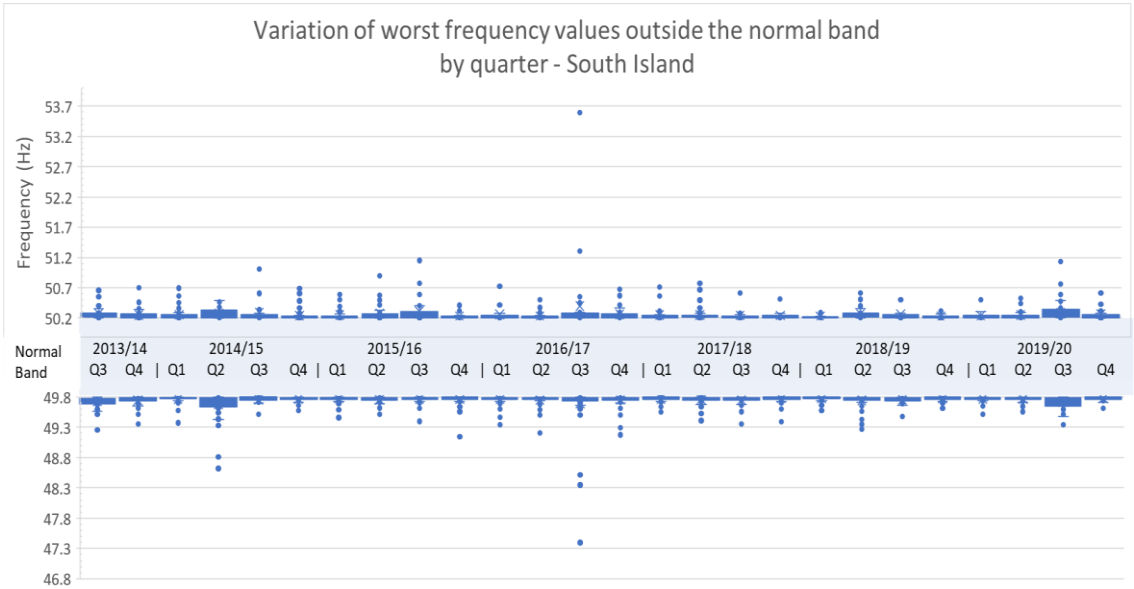
18.1 Maintain frequency in normal band (Frequency value)

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



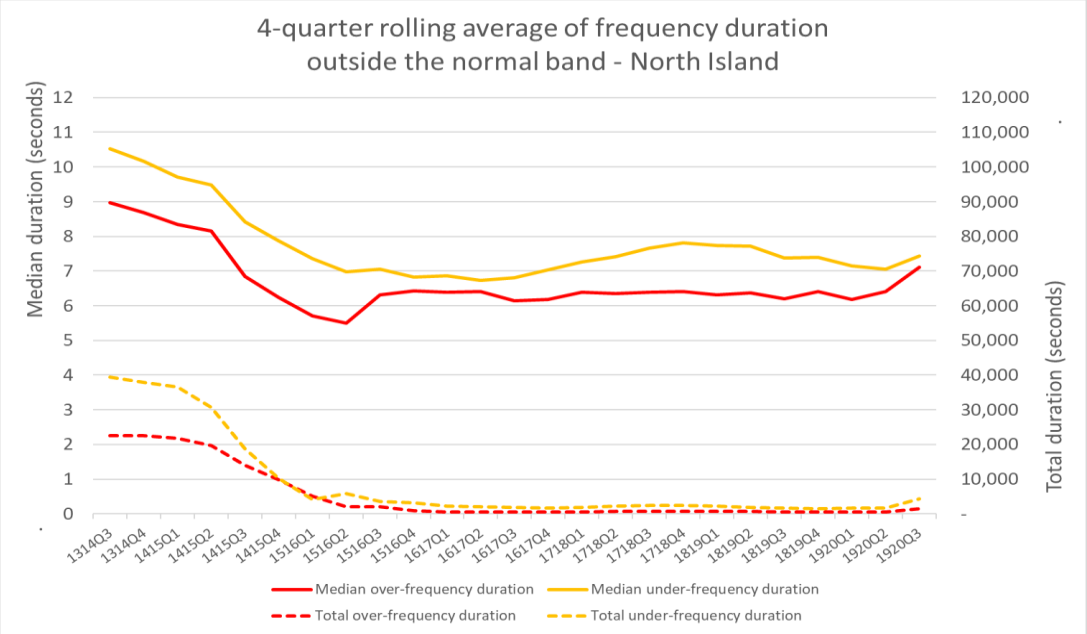
* 2019/20 Q4 contains data for April and May only

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.

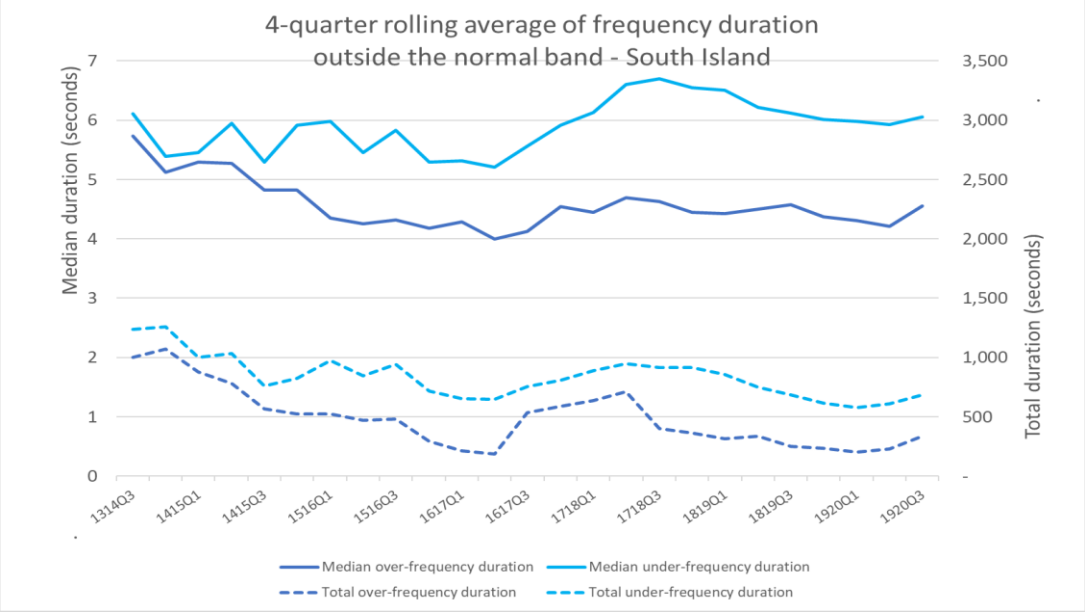
18.2 Recover quickly from a fluctuation (Time)

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

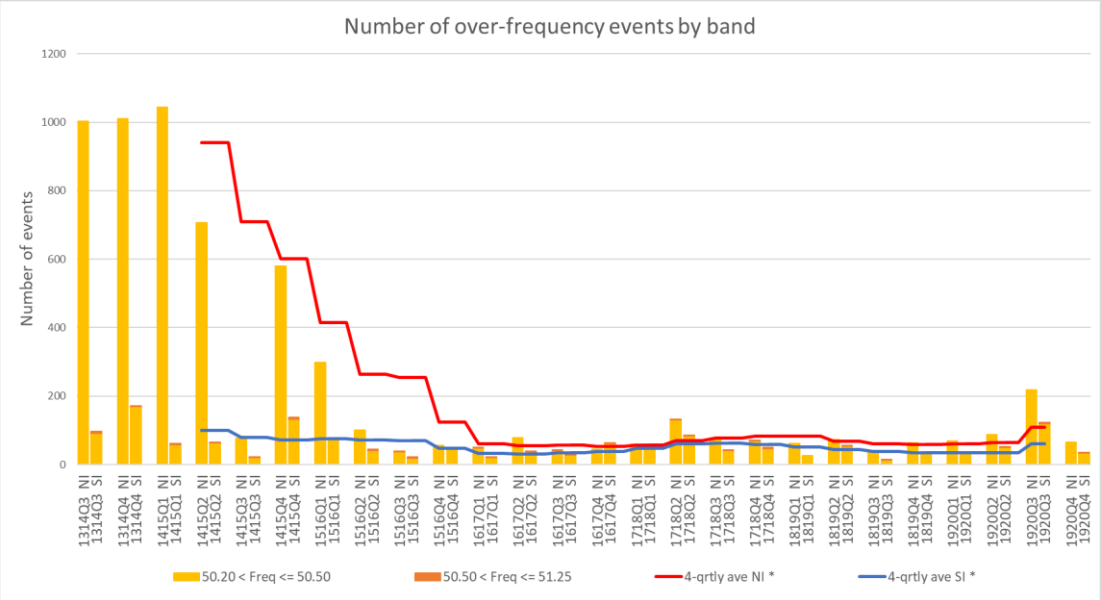


* These graphs have not been updated since 2019/20 Q3; they will only be updated at the end of each quarter

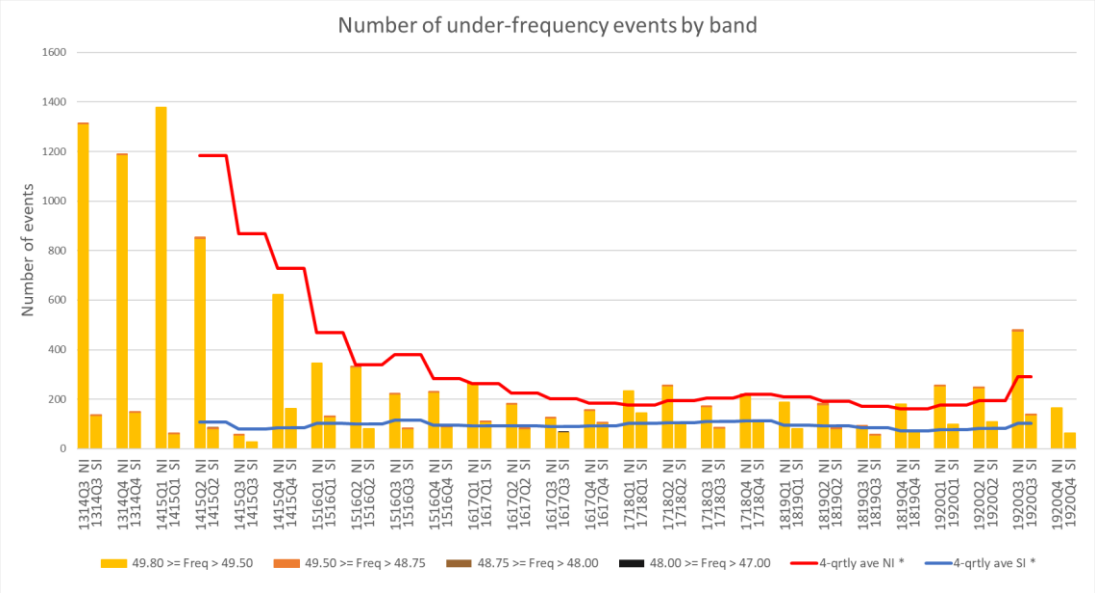
18.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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 and May 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	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	-	1	-	1	3	-	-	-	1	-	-
Warning Notice	1	-	-	-	-	-	-	1	-	2	-	-
Customer Advice Notice	17	9	14	6	15	15	14	6	21	14	13	10

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
05-May-2020 20:09	HLY2201 HLY4: HLY U4 tripped Last Dispatched MW: 110