MONTHLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

February 2021

Keeping the energy flowing

Transpower New Zealand Limited The National Grid

Report Purpose

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

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

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System operator performance

1 Highlights this month

- **COVID-19 response:** We reactivated our Operational incident management team with additional protocols to protect our control room staff when Alert levels increased. We are working with the incident management team to review plans for changes in Alert levels, particularly for when we see short, sharp changes in Alert levels.
- **Operational impact of Tiwai exit:** We are assessing the impacts of Tiwai's exit on transient stability and management of a bi-pole tripping. Initial results indicate there could be operational limits to manage under certain generation and loading scenarios in Southland. We are now working to identify the likelihood of these scenarios occurring before communicating with industry.
- **Market and Security of Supply:** Prices are above average for this time of year reflecting gas availability and lower-than-usual lake levels. Whilst the risk to Security of Supply is low, we are seeing significant noise in the market. We have initiated monthly meetings with industry (via a webinar) and with the Electricity Authority and the Ministry of Business, Innovation and Employment (MBIE).
- **Projects highlights:** Real Time Pricing is progressing well and tracking to time and budget, with phase 1 on target for deployment in May. The Dispatch Service Enhancements project has transitioned all participants to the new dispatch platforms.
- **Waipipi**: All turbines have now been commissioned and our focus is moving to assessing final Code compliance and validation of asset models against test results.
- **2030 Code and market evolution sprint:** We ran a sprint to consider what the market may look like in 2030 and what the system operator needs to do to be ready. The outcome of the sprint will help clarify our thinking and enable discussions with industry.
- **Simulation exercise for loss of supply scenario:** On 24 February we held a simulation exercise for the scenario of a parallel black start and restoration of the North Island core grid. Our system operator and grid control operational teams were joined by representatives from Mercury, Genesis Energy, Contact Energy, Powerco and WEL Networks.

2 Customers and other relationships

MBIE and Electricity Authority

In response to a request from the Minister late last year, we met with staff and management from MBIE and the Authority to brief them on the roles and responsibilities of the parties in a developing security of supply event.

Wholesale Market Information Disclosure Stakeholder Briefing

We presented new Outage Disclosure Guidelines at the Electricity Authority Wholesale Market Information Disclosure Stakeholder Briefing.

Gas Industry Company

We met with Gas Industry Company and Concept Consulting, who took us through a study they have completed (at the Minister's request) on short term gas supply and demand. Their analysis and assumptions were largely consistent with our own.

3 Risk & Assurance

COVID-19 Response

Due to the increase in Alert levels within the Auckland region and the remainder of New Zealand, our Operational incident management team (IMT) was reactivated in February with additional protocols reactivated to protect our control room staff. When Alert levels were decreased, we stood down our IMT and additional protocols. We are working with the IMT to review plans for changes in Alert levels, particularly for when we see short, sharp changes in Alert levels.

SOSPA audits

Our SOSPA audits for Regional Contingency Planning and Event Management are underway by KPMG and Deloitte, respectively. The annual software audit scope for the Reserve Management Tool (RMT) and Scheduling Pricing & Dispatch (SPD) will begin in March.

Simulation exercise for loss of supply scenario

On 24 March, we ran a joint black start simulation exercise that included both system operator and grid operational teams and representatives from Mercury, Genesis Energy, Contact Energy, Powerco and WEL Networks.

The scenario was a parallel black start and restoration of the North Island core grid. A parallel black start is where we divide our operational team into two, one team carries out a black start from Maraetai and heads north to Huntly and Auckland while the second team black starts Tokaanu and heads south to the Taranaki and Wellington. Our objective was to share and test our contingency planning with key industry participants. The exercise provided an opportunity to trial a proposed back up communication process using text over satellite. This showed good potential and findings will be shared with industry.

Feedback from the event was positive with participants wanting to see more of this type of collaborative training in the future. We gained some valuable insights from our external participants regarding their assets and internal processes which we will incorporate into our contingency plans. The exercise identified some specific challenges with restoration to the Hawkes Bay and we are commencing a series of workshops to review this part of our contingency planning.

4 Compliance

We reported one system operator self-breach in February.

This breach related to a reverse-flow constraint on 14 December. Under the Policy Statement, the system operator must correctly apply security constraints. An automatically created system constraint had been generated to manage potential offload violations on the Studholme_Timaru circuit. However, due pre- and post-

contingent flows being in different directions, the constraint did not bind. With no constraint binding, the market did not see appropriate signals in the forward schedules. This required a plan to use discretion in real time to create a manual constraint (although ultimately this was not required).

We have six outstanding breaches with the Authority compliance team.

5 Impartiality of Transpower roles

No items were opened in the register during February.

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
27	**System operator employee partner to work for grid owner:** The partner of a system operator employee started work with the grid owner. Confidentiality obligations have been explained to both employees and will be monitored to prevent a conflict of interest arising.	SO Power Systems Group Manager
29	**Preparing the Net Benefit test – system operator involvement:** The system operator is reviewing how it can provide information for use by the grid owner undertaking a Net Benefit Test.	Operations Planning Manager
31	**Discussions concerning Demand Response:** A system operator employee is part of a Transpower working group investigating the possible future use of the Transpower demand 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
33	**Sharing working space during lockdown:** A staff member sharing workspace with their partner who works for another industry participant. Both parties are managing the conflict accordingly to maintain the confidentiality of information.	Grid and Systems Operations 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

6 Project updates

6.1 Market design and system 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)

Overall, the project is progressing well and tracking to time and budget. Phase 1 remains on target for deployment on 6 May. A slight delay to the Oracle upgrade project means we have made some adjustments to the project's environment. The

focus for phase 1 continues to be on testing with system testing now largely completed, manual regression testing underway and User Acceptance Testing resources engaged. Business preparation for phase 1 deployment is on schedule with new training modules ready for review at the end of February and procedure updates in progress.

For the phase 2 work, the Oracle delay has had an impact on the RTP project's design resourcing, this has meant that some of the high level design work has slowed, however this is not expected to have any subsequent impact on our phase 2 dates.

Dispatch Service Enhancements (DSE)
We have transitioned all participants to the new dispatch platforms. The DSE project will be progressing into full close-out in March.

Extended Reserves (AUFLS)
Detailed planning has confirmed that the build of the AUFLS data portal will take 10 sprints and be commissioned by mid-June 2021. Part of this is detailed roadmap planning; this has continued with the Authority in order to inform the Authority's consultation document.

6.2 Other projects and initiatives

Business Improvement - Modelling working group established
We established a modelling working group last year to implement a program of modelling improvement initiatives. These initiatives were largely surfaced through an end-to-end review of the modelling process completed in 2020 and includes the process to make the required changes to the market model.

This working group has created a collaborative forum that:

- has representation from end-to-end modelling groups within Transpower, including the system operator function
- discusses common issues and makes action plans to address them
- evaluates and prioritises resolving issues in a consistent and structured way
- can engage with projects on modelling related queries and implications.

The group is now meeting fortnightly and actively working through implementing improvements. Recent successes include:

- Improved Excel templates for outage blocks which has resulted in improved usability and ensures all key information is being correctly transferred between the different parties.
- Establishment and ongoing improvements to a model issue tracker providing a consolidated view of modelling errors. This aids visibility and collaboration on fixes and remediation activities across the modelling groups.
- Increased collaboration and improvement to market model documentation resulting in error reduction when new generators are introduced into the market system.

2030 Code and market evolution sprint

As part of our future thinking work to ensure we are prepared for the changes we expect to see by 2030, we conducted a discovery sprint with Creative HQ in the week of 1-5 March. The main objective of this sprint was to discern what evolution the market and Code might need to deliver the electrified future described in our Whakamana i te Mauri Hiko report.

As part of the sprint we interviewed 25 diverse stakeholders across the industry, analysed both work already undertaken in New Zealand and internationally, and tested our conclusions against a panel of industry stakeholders, including from the Authority.

We will share findings with the Authority in due course.

7 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.

8 Outage planning and coordination

Outage Planning – near real time

Outage numbers continued to remain high in February and there are some busy outage weeks planned over the coming months. The number of planned outages in January was 370. This included 63 short notice outage requests of which 24 were submitted with less than 3 weeks' notice. For February, there are 700 outages scheduled.

Assessment of Grid Owner Annual Outage Plan (2021/22) and outage planning forum

The draft annual outage plan was published on 28 January 2021. Customer consultation with interested participants and system operator assessment of the plan is now in progress. The annual outage planning forum is scheduled for 24 March.

Outage Planning events or items of note

During a Kikiwa bus outage, a contingency caused unwanted violations. This was largely due to a concurrent outage but also due to unusual conditions on the day. Approval was gained to put Kikiwa T1 into service. This is now an option offered to the system operator, which provides more options for outages in the area.

We had a two-day planned outage of Huntly_Te Kowhai_1 in January. It is a difficult outage due to high voltages overnight at Te Kowhai, especially in a low load period. The outage went ahead and was well coordinated between Transpower, TRC, WEL and several other stakeholders.

HVDC outages

The annual HVDC outage ran successfully from Thursday 18 February to the following Tuesday (six days, with a full bipole outage over the weekend). We had provided customers with an overview of the outage at a briefing in December at which they raised no concerns. With a backdrop of high prices, prices during the HVDC outages were only slightly increased on recent prices.

9 Power systems investigations and reporting

Operational impact of Tiwai exit

The significant change in load in the Southland region, following Tiwai's exit results in new transient stability limits and challenges managing a bi-pole tripping. Initial work on these issues has been presented to our Senior Leadership Team, and we are extending this work to quantify the likelihood of these conditions occurring to better understand the potential impact on the market before communicating with industry.

NZGB Analysis

We published our February NZGB report, which also includes forecasts through the winter period to September. Under our base scenarios, we are seeing no shortages, but once we overlay low-gas and no-wind scenarios we see some shortages. The availability of Genesis' third Rankine at Huntly should reduce these.

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

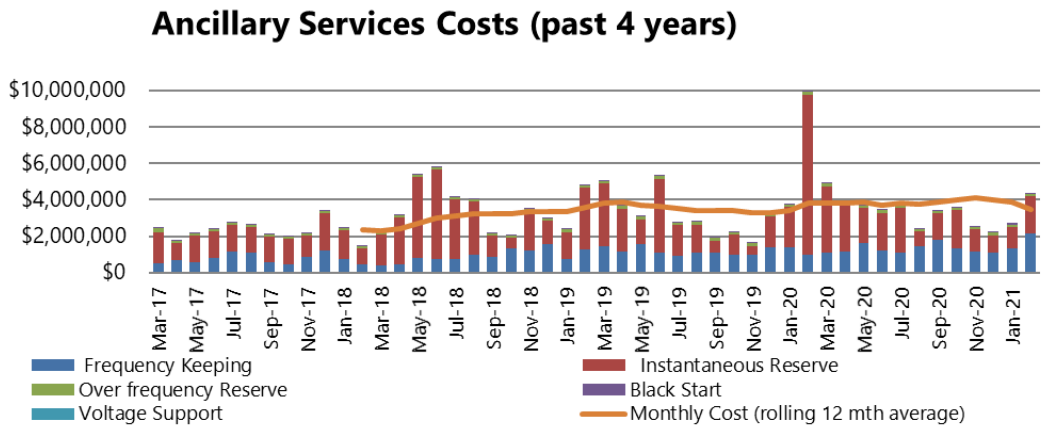
13 Security of supply

Hydro inflows continue to be below average. As a result, hydro storage less than 80 per cent of average for the time of year which is just below the 10th percentile of the historical storage position. Gas constraints continue as the result of a downgraded Pohokura forecast. This is reflected in gas spot prices, which are as high as is typically seen in winter. Although generators often use contracted gas for generation, there is indication that additional supply will be at a higher price than previous years. These gas and hydro positions are combining to create market prices averaging around $200/MWh; much higher than is usual at this time of the year. Future price estimates reflect expectations of a tight winter ahead with all-time highs on the horizon.

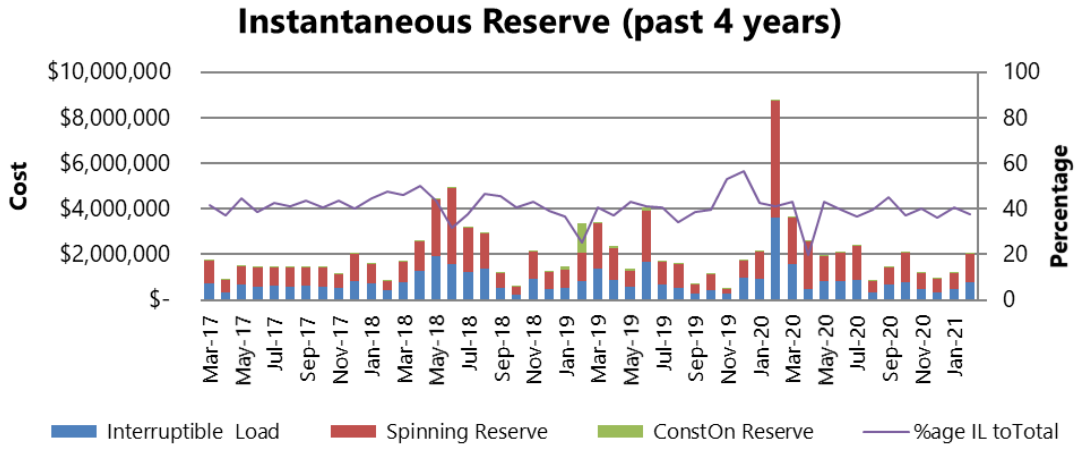
In response to current conditions, Genesis is bringing on a third Rankine at limited capacity. This unit, like the others, can run on coal. The coal stockpile is at its highest level for five years. While our modelling indicates that the actual risk to security of supply is still low this year, since none of the hydro storage projections cross the risk curves, the combination of circumstances is creating noise from the market as generators and retailers look to form hedge positions or find fuel needed to run their plant. We are having regular conversations with relevant parties to check our assumptions, as well as with the Authority and MBIE to ensure our messaging to stakeholders is consistent. In addition, we held an industry briefing on 28 February to remind participants of roles and responsibilities for managing security of supply and our current risk assessment and assumptions. In the absence of material inflows in the next couple of weeks, we expect this position to quickly change and we are continuing to closely monitor the developing situation.

Long term, the market is responding to these price signals by building generation, particularly, to replace gas. A good example of this is Tauhara - which is expected to replace Taranaki Combined Cycle plant with geothermal in 2023.

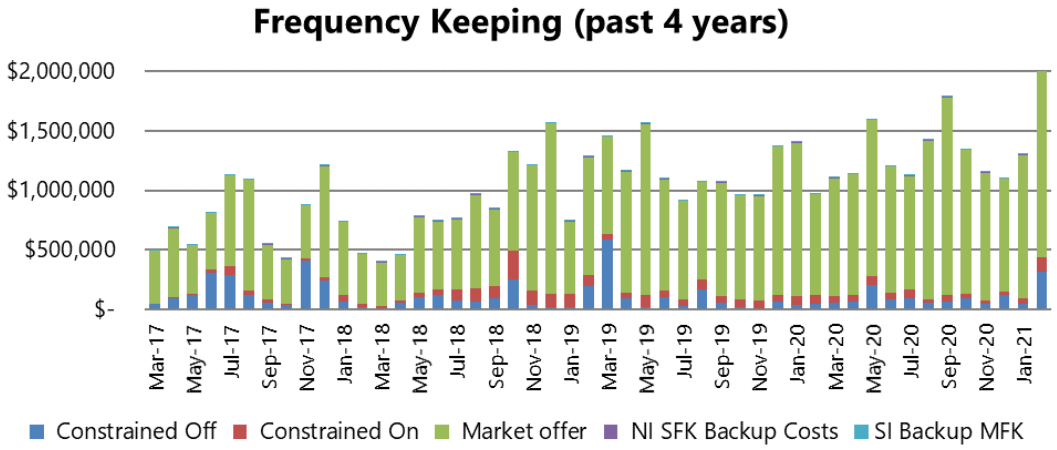
14 Ancillary services



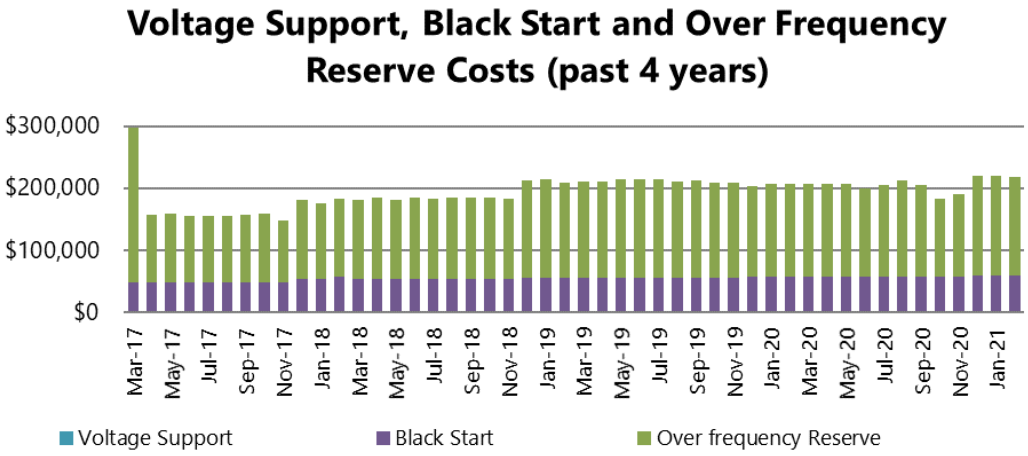
This month's ancillary services costs were $4.4 million, an increase of $1.9 million (62 per cent increase) from last month. This arose due to increases in instantaneous reserve costs and frequency keeping costs.



This month's instantaneous reserve costs were $2.0 million, an increase of $864k (73 per cent increase) from the previous month. $574k of this increase is attributable to spinning reserves, and $292k to interruptible load; constrained on payments reduced by $1k. This is a result of an increase in both the quantity and price of reserves procured over the course of the month; with a large spike in both the quantity and price of reserves procured during the HVDC outage.



This month's frequency keeping costs were $2.1 million, an increase of $825k to the previous month (63 per cent increase). The increase was due to a $486k (41 per cent) increase in market costs and $271k (557 per cent) increase in constrained off payments. Although there were consistently high prices over the course of the month, one of the drivers for the increase was the high cost of frequency keeping during the HVDC outage.



The over frequency costs decreased slightly this month to $159k. Black start costs remained at $60k. There are currently no voltage support costs.

15 Commissioning and Testing

Generation testing and commissioning

All turbines have now been commissioned at Waipipi and our focus is moving to assessing final Code compliance and validation of asset models against test results.

Given the deferral of Tiwai's potential exit, we have started to be approached in our role as system operator regarding several grid connected generation projects. We are also starting to see solar projects move past feasibility stage (both grid and distribution connected). This has highlighted the need to be clear when Transpower deals with customers whether we are doing so in our role as grid owner, system operator or both, especially when producing high level responses.

We have begun a review of distributors' published connection process information and how it links to Transpower. Our goal is to identify gaps and produce a useful reference guide to share with distributors to clarify required interactions with Transpower as either the grid owner or system operator.

16 Operational and system events

No significant operational events to report.

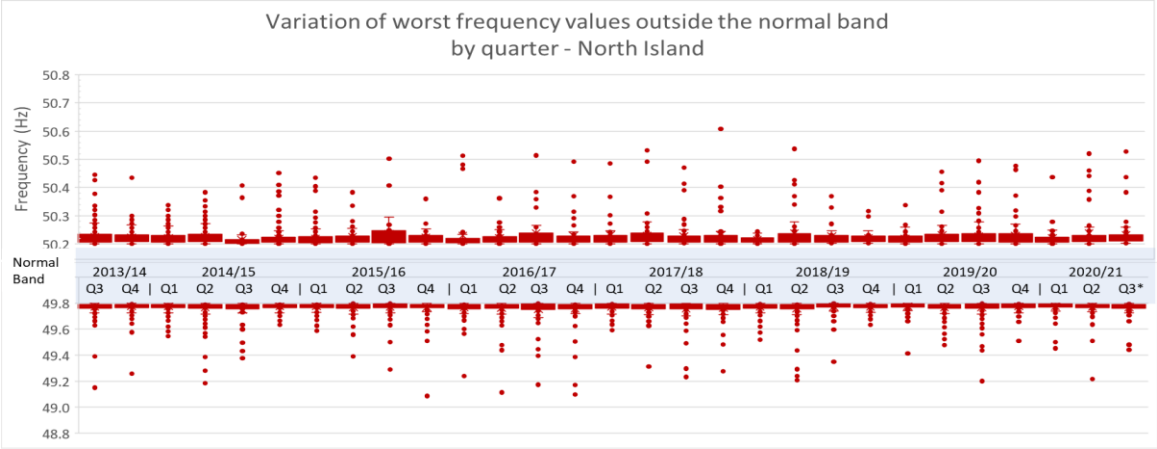
17 Frequency fluctuations

The number of minor excursions were higher than normal this month. These occurrences correlate strongly with the HVDC outages on 20-23 February. As these outages and the consequent reduction in HVDC modulation effectiveness would explain the observed increase, no further analysis is proposed unless this trend is observed to continue.

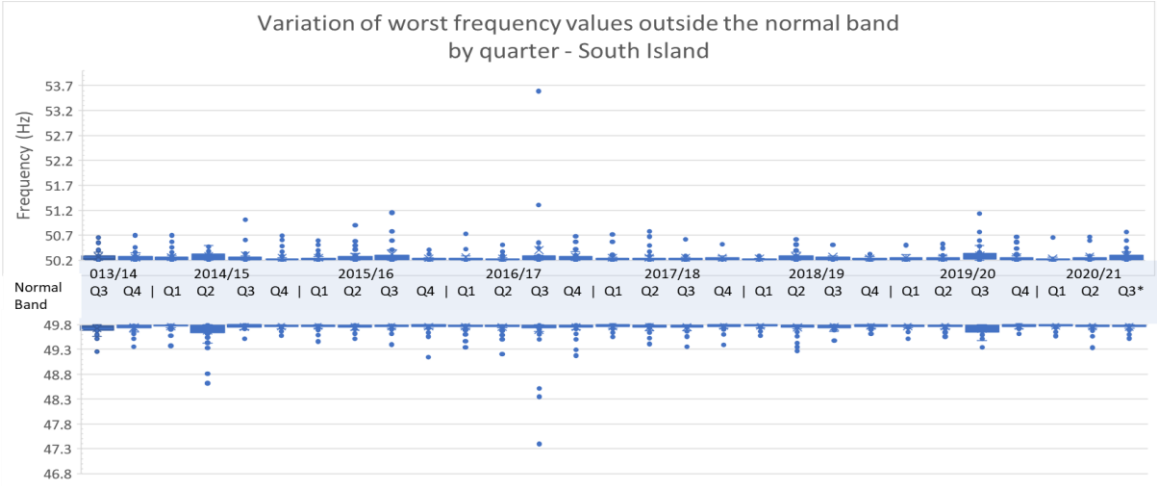
17.1 Maintain frequency in normal band (Frequency value)

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



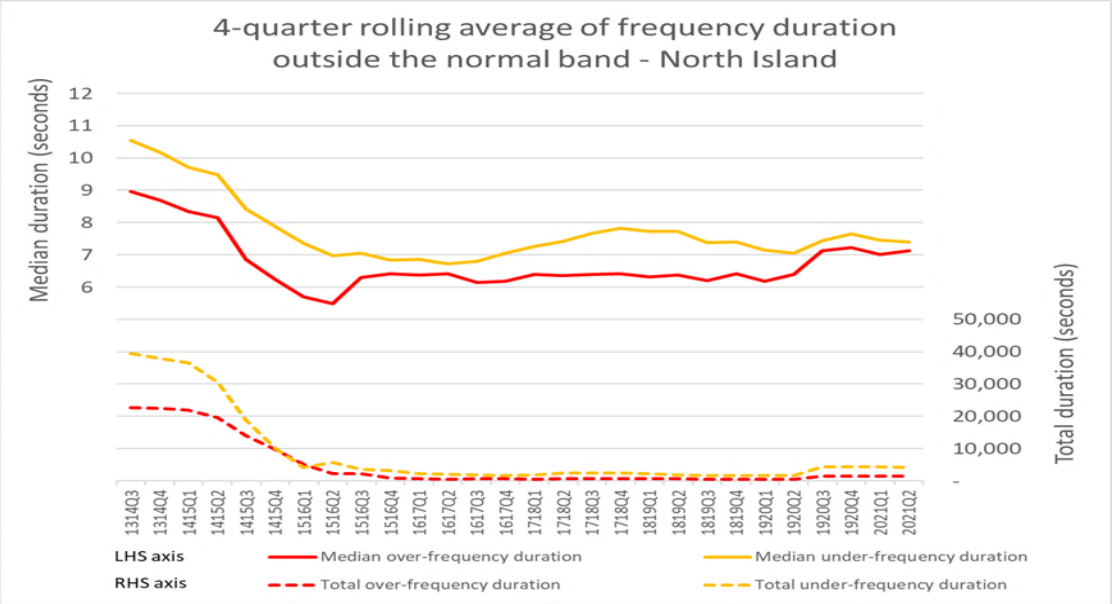
* 2020/21 Q3 contains data for January and February only

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.

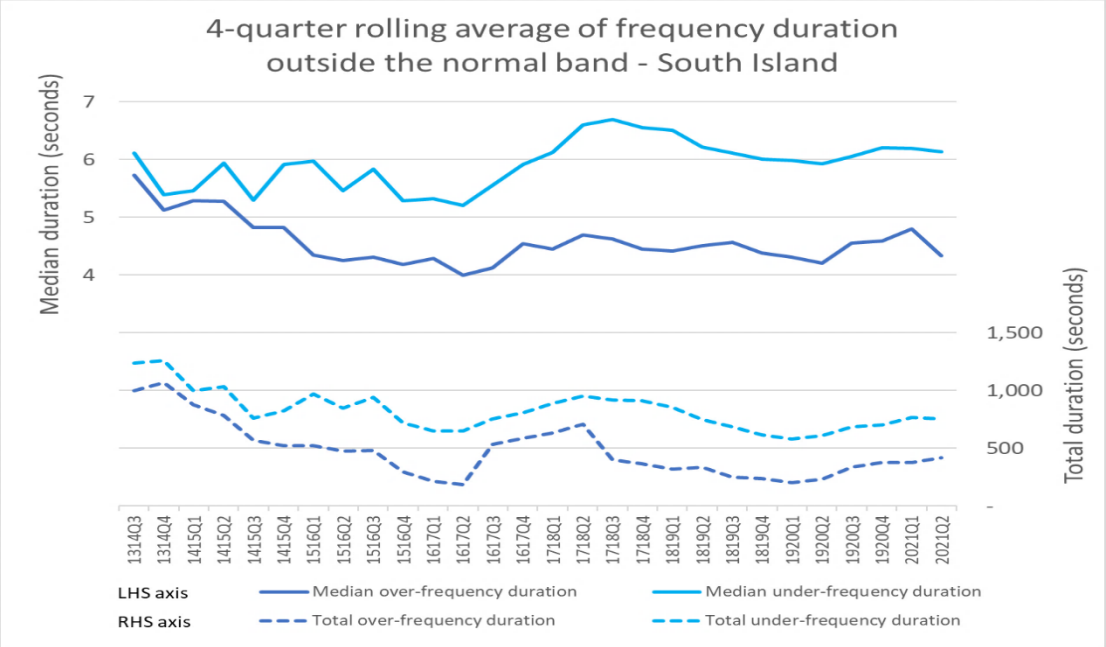
17.2 Recover quickly from a fluctuation (Time)

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

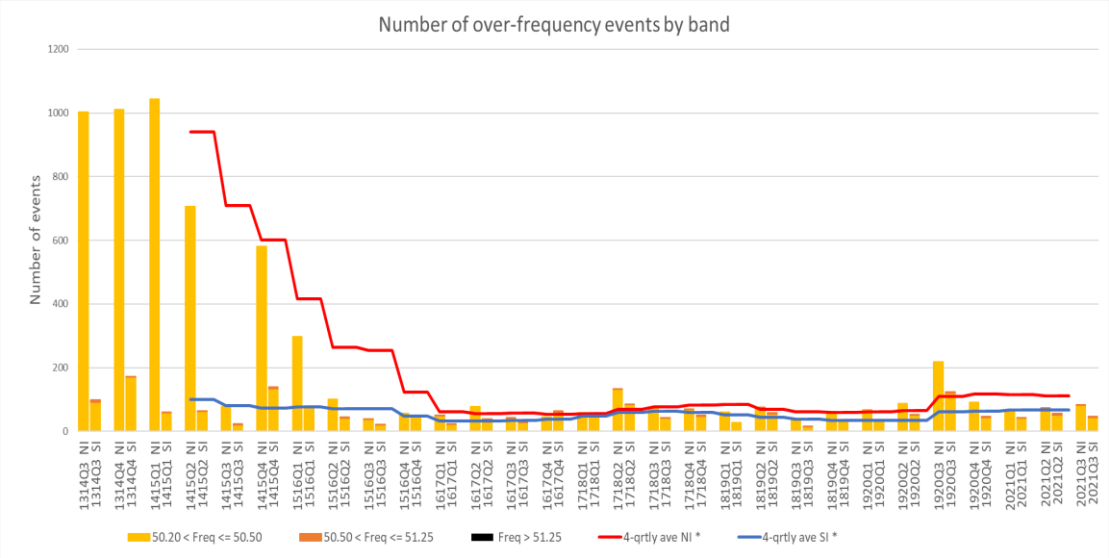


* These graphs have not been updated since 2020/21 Q2; they will only be updated at the end of each quarter

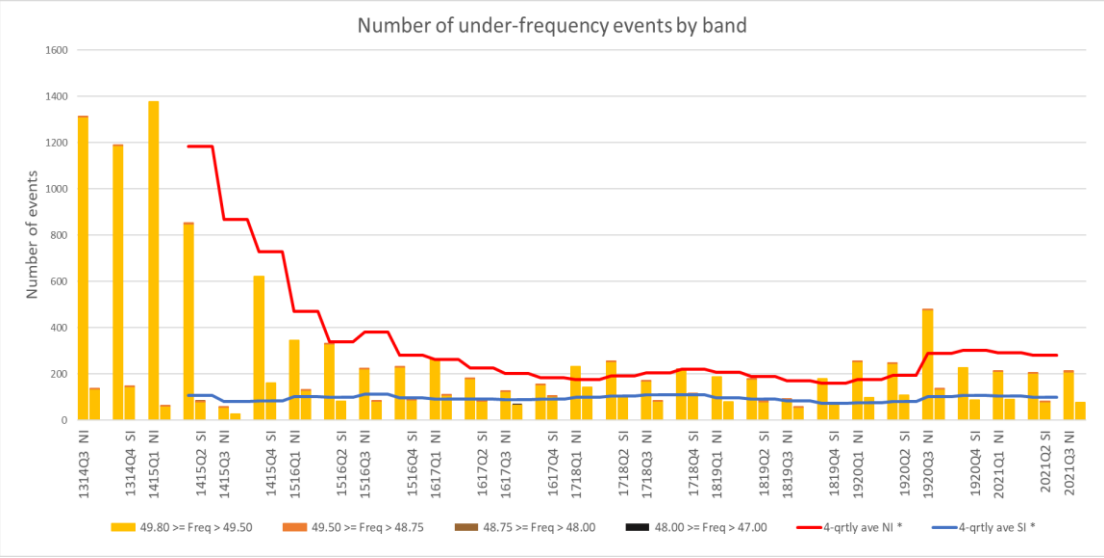
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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 2020/21 Q3 contains data for January and February 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	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	1	-	-	1	-	-	-	1	-	2	-	1
Warning Notice	2	-	-	-	-	-	-	-	-	-	-	1
Customer Advice Notice	14	13	10	13	11	15	9	6	12	10	8	4

20 Grid emergencies

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

Date	Time	Summary Details	Island
24/03/21	14:02	A grid emergency was declared to allow a grid reconfiguration to alleviate steady-state over-loading on 110 kV Fernhill-Redclyffe circuit 1 following the loss of generation at Tuai Power station. The parallel Fernhill-Redclyffe circuit 2 was out of service for planned work at the time.	N

Appendix A: Discretion

Event Date and Time	Description
20-Feb-2021 06:54:25	JRD1101 JRD0 Discretion Max : 0 CST_SFD_JRD_1 Auto Reclosed which tripped JRD G71 & 72 Last Dispatched Mw: 33.33
12-Feb-2021 10:09:34	MAN2201 MAN0 Discretion Max : 390 TWI Line 2 extended offload Last Dispatched Mw: 565
04-Feb-2021 11:16:58	SFD2201 SFD21 Discretion Max : 0 Contact claimed rule 13.82A. Not required for security Last Dispatched Mw: 50