MONTHLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

May 2021

Keeping the energy flowing

TRANSPOWER

Report Purpose

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

- The immediate security of supply pressure has eased with gains in hydro storage due to a large inflow event on 11-12 May. This has taken us to a position where we are unlikely to cross the 1% curve in the near term (outside of exceptional circumstances).
- Real Time Pricing (RTP) phase two development is making good progress, inter-project dependencies are being closely managed; specifically risk around congestion of final stage test environments to ensure any potential impacts on RTP phase delivery are effectively mitigated.
- Sprint nine of ten of the Extended Reserves (Automatic Under Frequency Load Shedding (AUFLS)) Data Portal project is now completed. User Acceptance Testing with a distributor took place early June. A project variation seeking access to the project contingency funds was approved in May, but the does not impact the approved project budget and timeframes. A Technical Advisory Services (TAS) Statement of Work (SoW) is underway to scope and effort to roll out the data portal to North Island Distributors and to conduct a Transpower industry consultation on the AUFLS Technical Requirements (ATR) document.
- We are scoping a current state assessment of security and resilience as part of our work with the Authority to address the Electricity Price Review (EPR) G2 recommendation (Future Security and Resilience (FSR) work programme). This is being developed into an ongoing work programme to deliver the future scenarios.
- We worked with Transpower's Grid Delivery division and market participants in the Hawkes Bay when low water levels in Lake Waikaremoana potentially risked the ability for Tuai to support demand peaks.
- We detected South Island power oscillations between Manapouri and Clyde of 1.7 Hz since 4 May. These are correlated with the operations of Manapouri G1 generating unit which Meridian is investigating.
- We provided training to Major Electricity Users' Group (MEUG) members on the use of the Planned Outage Coordination Process (POCP) as part of encouraging large users to use the tool to enable them to get early warnings of major outages, and to help them meet their own compliance obligations.
- We created an education package for new connections to support them effectively participate in the market in real time. As part of this roll-out, a team from our Hamilton control centre visited Top Energy at Ngawha Geothermal.
- We surveyed Electricity Distribution Businesses (EDBs) on their intentions around the use of controlled load (hot water and other ripple-controlled loads) once the Regional Coincident Peak Demand (RCPD) incentive was removed.
- We published a report on proposed changes to the Code to better incorporate inverter connected resources, which contains a two-plus year roadmap of investigations required to support the review.
- We published an update on our website to the procedure PR-EA-010 Planned asset testing while connected to the power system. Details of the update will be shared at the June Asset Owner Engineering Forum.
- We sent out our participant survey and have received some good feedback as well as helpful suggestions to improve our processes. This closed in mid-June.

2 Customers and other relationships

Security of Supply Stakeholder Engagement

Inflow events in May and more gas becoming available (see Section 13 for details) has taken us to a position where we are unlikely to cross the 1% curve in the near term (outside of exceptional circumstances). As a result, we discontinued daily reporting to the industry on 18 May. Should the storage position return to within seven days of the 1% risk curve, daily reporting will resume.

Meetings continue with Ministry of Business, Innovation and Employment (MBIE), the Electricity Authority (Authority), and the Gas Industry Company (GIC) on a fortnightly basis.

We also engaged with the Electricity Retailers' Association of New Zealand (ERANZ), the Electricity Networks Association (ENA), the Security and Reliability Council (SRC), and the Authority regarding process and accountabilities for an official conservation campaign and rolling outages.

Major Energy Users' Group (MEUG)

Our Operations Planning group provided training to MEUG members on the use of the Planned Outage Coordination Process (POCP). With the support of the Electricity Authority, we have been encouraging large users to use the tool to enable them to get early warnings of major outages, and to help them meet their own compliance obligations. Oji, Pan Pac, Alinta, Norske Skog, Rio Tinto and NZ Steel attended, and we will continue to work with them to assist them in using the tool.

Support for new connections

While we have streamlined the process for new generation to connect to the grid, we have identified an opportunity to support these new connections in how to effectively participate in the market in real time. An education package is being created and in mid-May a team from our Hamilton control centre visited Top Energy at Ngawha Geothermal to build relationships and share information related to the system operator requirements and operational processes. Feedback was very positive, and this service will be incorporated as part of connecting new participants for now on.

Asset Owner Engineering Forum

We are preparing for our annual Asset Owner Engineering Forum on 29 June. Currently we have approximately 30 confirmed external attendees ranging from major generation and distribution companies, a selection of consultancy companies and a number of potential new connects. The forum offers the opportunity for the system operator and asset owners to interact, encouraging collaboration at a technical level, and the chance to discuss any challenges in meeting the required Asset Owner Performance Obligations. This year's forum is themed around embracing new connections, with the aim of informing improvement initiatives for enabling the participation of new technology in New Zealand and activities to facilitate better integration with a forward-looking lens.

Annual system operator participant survey

We sent out our participant survey in April and have received some good feedback as well as helpful suggestions to improve our processes. This closed in mid-June and responses will be provided to the Authority as a System Operator Service Provider Agreement (SOSPA) deliverable for the end of the financial year.

3 Risk & Assurance

SOSPA audits

The Event Investigation audit was completed in May with two medium risk findings and one low risk finding relating to prioritising events, improving staff awareness and timely closure of events. The last SOSPA audit for 2020/21, Managing Grid Offers, is on track for completion by 30 June 2021. Planning for the 2021/2022 Audit Plan is underway.

Business Continuity Planning

During May, we undertook a business continuity exercise as part of our ongoing capability build. This provides an opportunity for us to check the content of plans and continue to train our people. The exercise was undertaken in a workshop environment and simulated a cyber-attack impacting key systems, including the loss of the Wholesale Information and Trading System (WITS), Supervisory Control and Data Acquisition (SCADA) and Inter-Control Centre Communications Protocol (ICCP). Overall, the exercise went well, with some good lessons being identified to feed back into our plans as part of lifting our preparedness.

EDB load control survey

The system operator surveyed Electricity Distribution Businesses (EDBs) on their intentions around the use of controlled load (hot water and other ripple-controlled loads) once the Regional Coincident Peak Demand (RCPD) incentive was removed. This was to determine if any changes in behaviour (for example ceasing load control activities once the incentive expired) may lead to increased peak loads and associated security issues. The majority of EDBs have responded with the information requested and the system operator is analysing this information to determine potential impacts and if any modelling scenarios need to be developed for the various security products the system operator provides (i.e. security of supply and New Zealand Generation Balance (NZGB)).

4 Compliance

We did not report any system operator breaches in May.

We have seven outstanding breaches with the Authority compliance team.

On 2 May 2021, Genesis Energy's Huntly station unit 5 generator (Huntly Unit 5) tripped. The disconnection of generation from Huntly Unit 5 removed 271 MW of injection into the power system resulting in an under-frequency event. We are currently finalising our Causation Report, which includes information from both Genesis and the grid owner on the circumstances around the event. We expect to submit this report to the Authority in mid-June.

5 Impartiality of Transpower roles

No items were opened in the register during May.

We have five open items in the register that are being actively managed in accordance with our Conflict of Interest procedure.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
29	**Preparing the Net Benefit test – system operator involvement:** The system operator is reviewing how it can provide information for use by the grid owner undertaking a Net Benefit Test.	Operations Planning Manager
31	**Discussions concerning Demand Response:** A system operator employee is part of a Transpower working group investigating the possible future use of the Transpower demand response platform. The system operator role is to provide the system operator perspective on any demand response proposals. Impartiality mitigations have been implemented to ensure the grid owner is not treated more favourably than any other participant with respect to demand response.	SO Market and Business Manager
39	**New SO Compliance & Impartiality Manager:** This relates to potential perception; the person filling this role also works for Transpower's legal team on a part-time basis. Workstreams will be allocated accordingly.	GM Operations
40	**General system operator/grid owner dual roles:** This is a general item that will remain permanently open to cover all employees with a dual system operator/grid owner role. The item documents the actions necessary to ensure impartiality in these circumstances; these items will be monitored to ensure their continue effectiveness.	SO Compliance & Impartiality Manager
41	**General relationship situation:** This is a general item that will remain permanently open to cover all potential conflicts of interest arising under a relationship situation. This item documents the actions necessary to prevent an actual conflict arising and will be monitored by the SO Compliance & Impartiality Manager to ensure their continued effectiveness.	SO Compliance & Impartiality Manager

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)

Phase one of the project was deployed successfully on 13 May, ahead of the baseline date of 8 June 2021. Focus has now almost entirely shifted to phase two, development is making good progress, business procedure reviews are underway and training development is scheduled to commence this month. Requirement validation for phase three is in progress.

There are a large number of projects affecting similar systems and business functions active over the next few months. Inter-project dependencies are being closely managed, specifically risk around congestion of final stage test environments to ensure any potential impacts on RTP phase delivery are effectively mitigated.

The project team presented at the Authority's June Industry Engagement session and we are collaborating on the framework for the next cycle of industry education.

Extended Reserves (Automatic Under Frequency Load Shedding - AUFLS)
The AUFLS Data Portal project has been progressing well with sprint nine, of ten, now completed. The solution delivery is moving into the final delivery stage. The team prepared for external User Acceptance Testing with two distributors in early June; due to issues raised by one distributor only one was completed.

Furthermore, additional requirements sizing and testing effort has been required in order to ensure that "in scope" features and functionality are appropriately tested to ensure a quality delivery. A project variation seeking access to the project contingency funds was approved in May. This does not impact the Authority's expectations with regards to the approved project budget and timeframes.

In parallel, the System Operator has been working with the Authority confirming a Technical Advisory Services (TAS) Statement of Work (SoW) and effort to roll out the data portal to North Island Distributors and to conduct a Transpower industry consultation on the AUFLS Technical Requirements (ATR) document.

6.2 Other projects

Future Security and Resilience (FSR) work programme
We are scoping a current state assessment of security and resilience as part of our work with the Authority to address the Electricity Price Review (EPR) G2 recommendation (Future Security and Resilience (FSR) work programme). This work involves an international benchmarking exercise to look at other countries' work in this area. This scoping is enabling us to develop into an ongoing work programme to deliver the future scenarios. The project manager leading this programme came onboard at the beginning of June, is quickly coming up to speed, and is in the process of developing SoWs for phases 1 and 2 of this work.

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
While we continued to see high volumes of work requiring outages over May, numbers are expected to drop as we enter the winter season. Careful management and proactive actions ahead of potential weather-related issues kept unplanned outages low with no customer impacting incidents.

NZGB Analysis
Generation balances have generally improved since April, with a reduction in the number of forecast shortfall dates. Applying low gas, no wind assumptions, minor N-1-G shortfalls are forecast in early June, mid-August and early October. The shortfall in early June was not present in the May NZGB Report.

The Grid Owner published its Annual Outage Plan for 2021-22 on 3 May 2021. NZGB now reflects this published plan.

9 Power systems investigations and reporting

South Island power system oscillations

South Island power system oscillations between Manapouri and Clyde of 1.7 Hz have been detected since 4 May. While these were not at a level to cause concern, Meridian and Contact were asked to provide information of any plant changes, but none were identified. Subsequently we have correlated the oscillations with the operations of Manapouri G1 generating unit. Meridian is investigating.

Reliability standards for inverters

We completed our investigation and published a report to the Authority on proposed changes to the Code to better incorporate inverter connected resources. This included a summary of the technical differences to be considered between synchronous and inverter generation, Code clauses to review in Part 8 and 13, and a two-plus year roadmap of investigation required to support the review.

New Electricity Market Information Dataset Released

Annually we prepare and publish a PowerFactory (DIgSILENT) dataset of the New Zealand power system via the Electricity Authority's website. This dataset is referred to as the Electricity Market Information (EMI) dataset and enables people to perform their own power system analysis using the same information as the system operator. This dataset is particularly useful for anyone considering connecting new generation in New Zealand, as it can be used to perform connection studies.

This year's EMI Dataset, released in May, contains updates affecting both steady-state and dynamic load-flow simulations and can also perform fault studies on the core grid. Users are advised to run the case files in PowerFactory 2019 SP4. This will ensure stable performance that reflects the expected system response and behaviour to simulated tripping events and fault conditions.

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

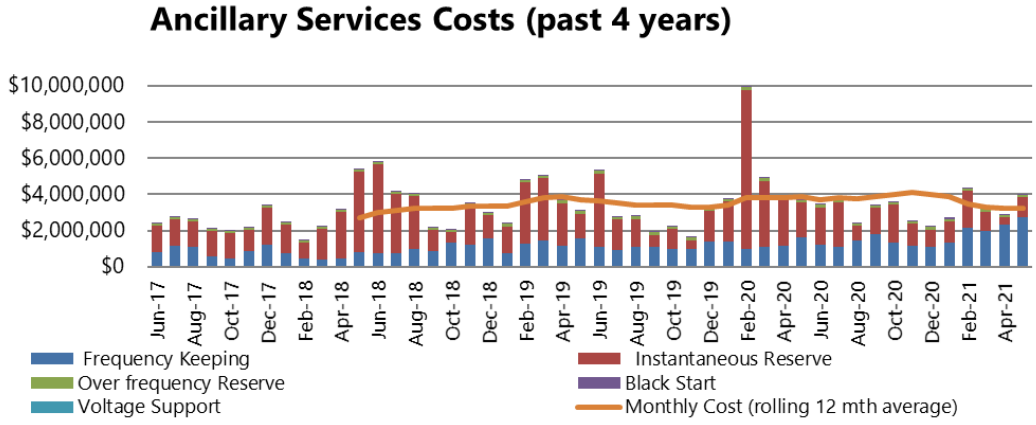
13 Security of supply

The immediate pressure has eased with gains in hydro storage driven by small frequent inflow events that kept storage moving sideways, and a large inflow event ahead of cold change on 11-12 May. The sustained heavy rainfall in Canterbury in the last week of May only resulted in moderate inflows into the Waitaki catchment. At the end of May, South Island storage levels rose to 76% of average for the time of year and overall national storage was 73% of average. The national storage remains at this level in early June, though North Island hydro storage continues its slow decline, dropping to 26% of average (10% of total full). Meridian reports that snowpack has started building for the year and is currently at 106% of average.

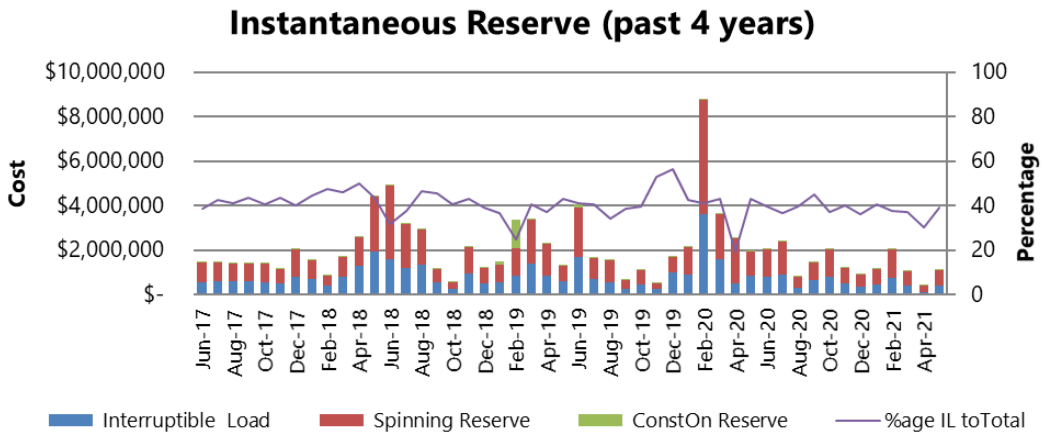
Thermal generation improved with Huntly 5 returning to service this month. In addition, Genesis secured additional gas for this winter from Methanex and Ballance Agri-Nutrients. This means the amount of gas now available to electricity generators is aligned with our thermal assumptions within the risk curves.

This has taken us to a position where we are unlikely to cross the 1% curve in the near term (outside of exceptional circumstances). As a result, we discontinued daily reporting to the industry on 18 May. Should the storage position return to within seven days of the 1% risk curve, daily reporting will resume. Although this is good news, storage levels are still lower than average for the time of year and we are still vulnerable to another low inflow sequence, asset failures, or any other combination of events. We continue to monitor the situation closely.

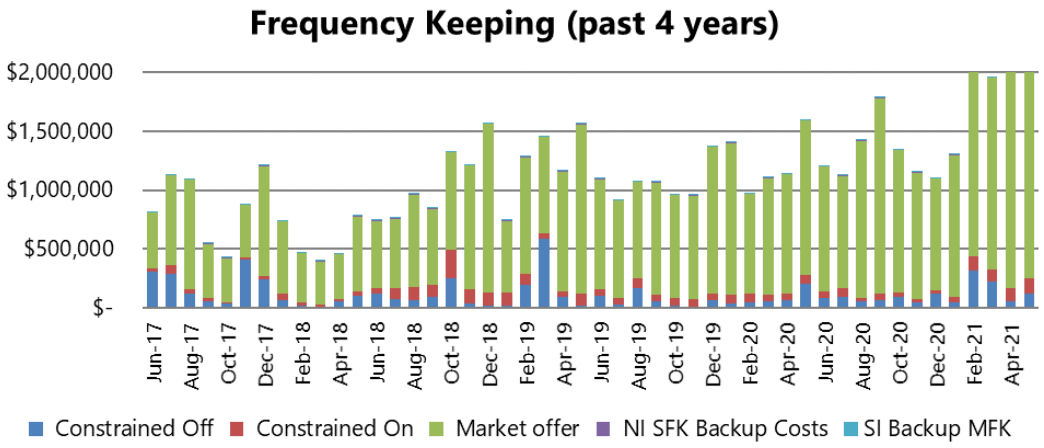
14 Ancillary services



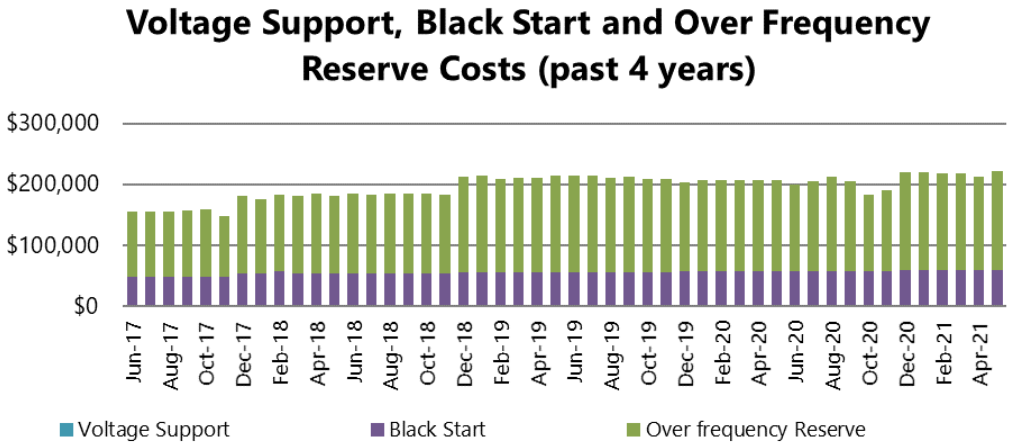
This month's ancillary services costs were $4.05 million, an increase of $1.12 million (38% increase) from last month. The cost of frequency keeping increased slightly but the most significant increase in costs were associated with instantaneous reserves.



This month's instantaneous reserve costs were $1.08 million, an increase of $687k (173% increase) from the previous month. $388k of this increase is attributable to spinning reserves, and $304k to interruptible load; constrained on payments decreased by $5k. This is was impacted by an increase in the price for both fast and sustained instantaneous reserves but the most significant impact on the cost increase was a 36% increase in the quantity of instantaneous reserves procured in the North Island over the course of the month.



This month's frequency keeping costs were $2.7 million, an increase of $428k to the previous month (19% increase). The increase was due to a $346k (16%) increase in market costs, and a $64k (104%) increase in constrained off payments. The costs incurred for frequency keeping in the South Island fell again in May to $687k, while in the North Island increased significantly by $493k to $2.05 million.



The over frequency costs increased slightly this month to $163k. Black start costs remained at $60k. There are currently no voltage support costs.

15 Commissioning and Testing

Asset testing procedure update

We published on our website an update to the procedure PR-EA-010 Planned asset testing while connected to the power system. Details of the update will be shared at the June Asset Owner Engineering Forum. Asset Owners need to be familiar with this procedure to ensure the success, and avoid delays to, any planned commissioning or testing. Guidelines on testing and modelling requirements can also be found under the Asset Testing section of the Transpower website.

16 Operational and system events

Hawkes Bay regional capacity issues

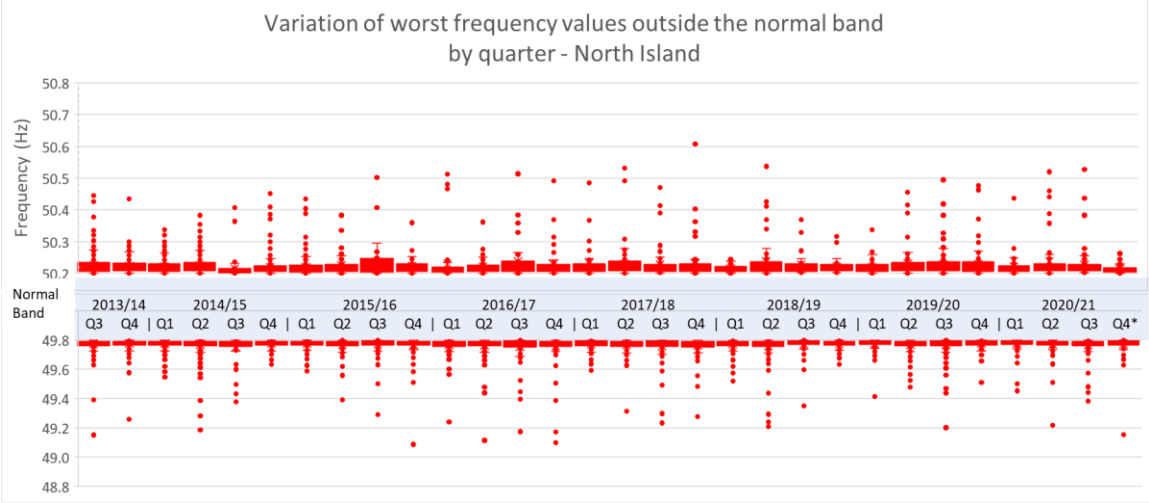
Low water levels in Lake Waikaremoana, potentially risking the ability for Tuai to support demand peaks in the Hawkes Bay, prompted the system operator to work collaboratively with Transpower's Grid Delivery division and market participants in the region to identify and communicate contingency plans involving grid reconfiguration should they be required to maintain supply. Water levels have now risen to levels that alleviate this risk.

17 Frequency fluctuations

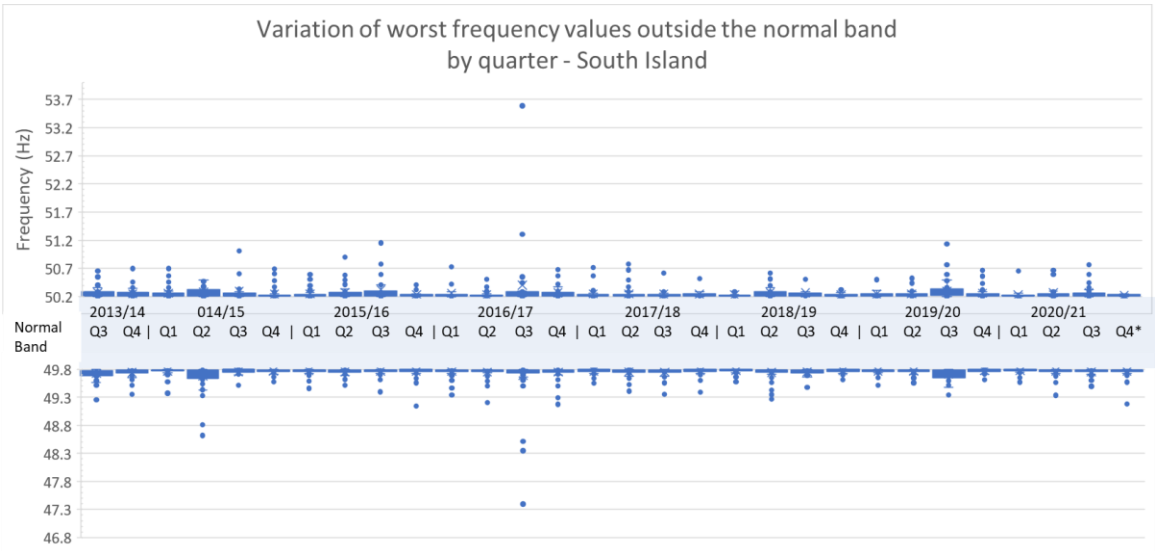
17.1 Maintain frequency in normal band (Frequency value)

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



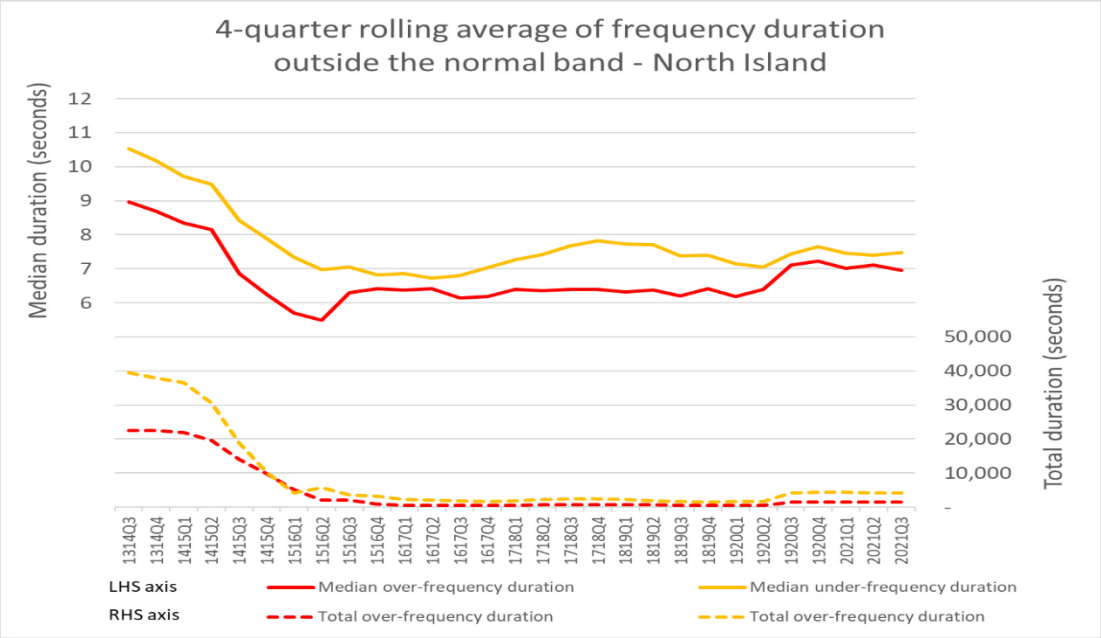
* 2020/21 Q4 contains data for April and May only

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.

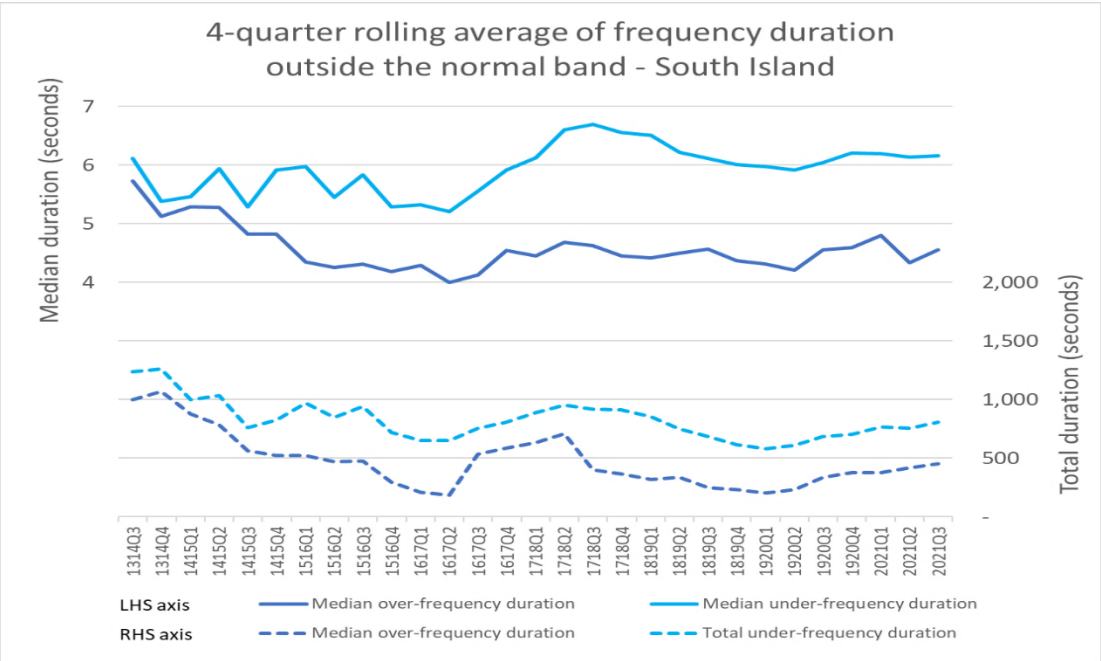
17.2 Recover quickly from a fluctuation (Time)

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

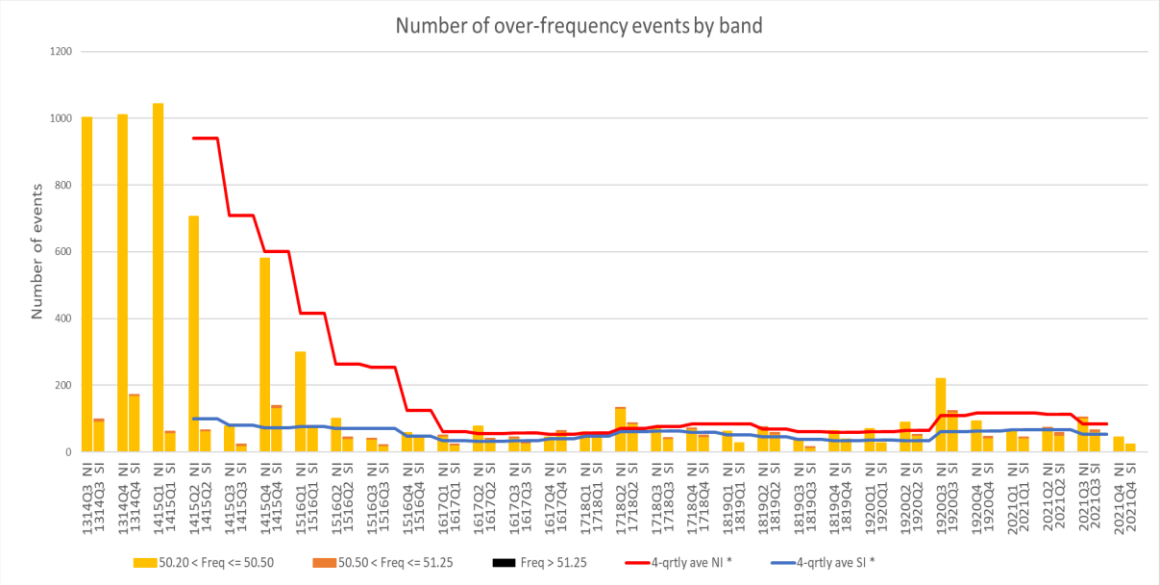


* These graphs have not been updated since 2020/21 Q3; they will only be updated at the end of each quarter

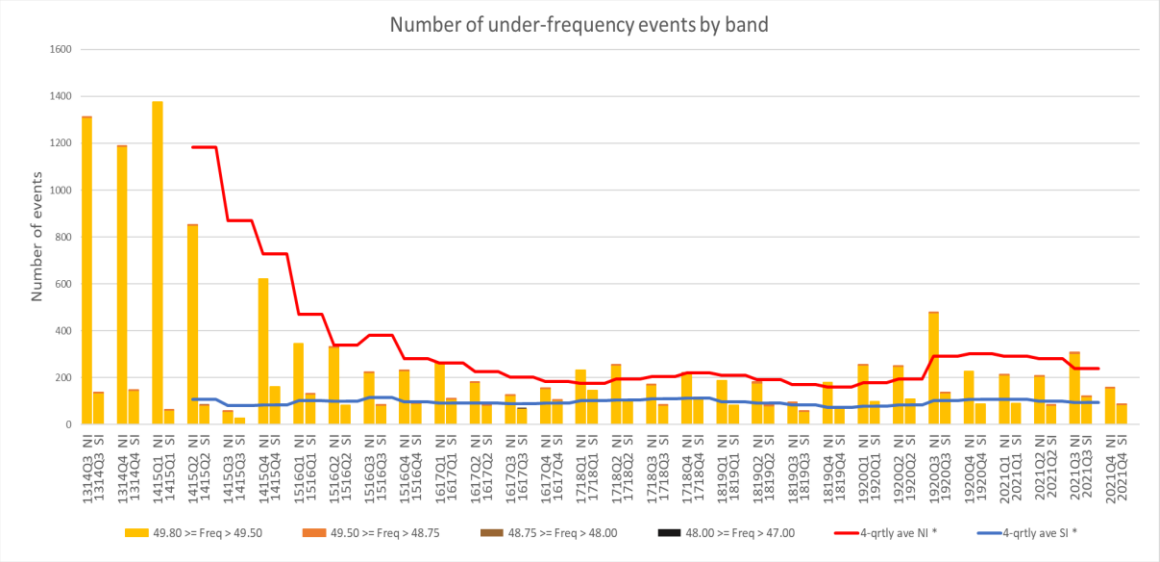
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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 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

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	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	1	-	-	-	1	-	2	-	1	1	-	-
Warning Notice	-	-	-	-	-	-	-	-	1	-	-	-
Customer Advice Notice	13	11	15	9	6	12	10	8	4	4	8	14

20 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
10-May-2021 13:17	MAN2201 MAN0 Discretion Max: 578. MAN discretioned down from 678 MW to 578 MW to allow room for MAN to restore the partially offloaded TWI L2. Last Dispatched MW: 678