Monthly System Operator and system performance report

for the Electricity Authority

January 2023

Report Purpose

This report is Transpower's review of its performance as system operator for January 2023, 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).

Contents

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System Operator performance

1 Key points this month

- Winter 2023 challenges – The Authority requested the system operator investigate a number of options to alleviate some of the challenges: 1) sensitivity analysis, 2) wind forecast, 3) changing frequency bands, and 4) controllable demand input as a market product. The TAS105 Phase 1 report assessing these four options was delivered on 31 January.
- Low Hydro Southland - Low hydro storage in Southland has presented challenges to manage voltage stability. We have established a system operator working group to assess security risks and potential grid reconfigurations.
- Real Time Pricing – All minor defects identified following go-live have been resolved via patch releases. Phase 4 of the project is on track to be delivered on 27 April.
- New Zealand Generation Balance – There are no forecasted shortfalls for the next 200 days, with the exception of a potential low-margin day in May due to a grid outage impacting generation on the Wairakei Ring. We are also monitoring outages and risks associated with the HVDC outage in February/March.
- 9 August - The System Operator and the Authority are finalising an agreed summary of facts and joint penalty submissions for presentation to the Rulings Panel on 17 February 2023.
- Business Assurance Audit – The System Operator Load Forecast Audit has been drafted and will presented to the Authority following internal review.
- Upper North Island Voltage Management – The system operator requested that the Pakuranga-Whakamaru_1 circuit outage be extended until 7 February. This approach managed the risks of switching cable circuits over the Auckland Anniversary and Waitangi weekends.
- Severe weather - The system operator kept in close touch with all parties impacted by the Auckland flooding with a focus on minimising risk to end consumers. In anticipation of Cyclone Gabrielle, we took proactive precautions, including identification of potential risk associated with high-speed winds that could impact wind generation. We closely monitoring load levels with distribution networks ahead of time and have been working closely with them during the declared Grid Emergency. More details on the event will be included in the February monthly report and Q3 report.

2 Customers and other relationships

The system operator has been supporting the industry-led Flex Forum initiative since November 2022. In January, we contributed to a workshop on how the initiative might further formalise its governance and structure and attended the monthly group meeting where we supported discussion on winter capacity and coordination challenges.

In mid-January, we attended the latest ESIG webinar in their series, Ancillary Services from an Energy System with a High Share of Variable Renewable Energy. This webinar covered the re-designed ancillary service market in ERCOT (Electric Reliability Council of Texas). In particular, the new ERCOT Contingency Reserve Service (ECRS) recently introduced for the purpose of restoring or maintaining the frequency of the ERCOT system or providing capacity for large and sustained net-load ramps.

3 Risk & Assurance

Risk Management Framework
The Authority has provided a scope for the next Deep Dive risk paper to cover the threat of not having power system assets available with a winter 2023 lens.

Business assurance audits
The System Operator Load Forecast audit has been drafted and the findings are being worked through by management. Three remaining System Operator Audits are planned for this year: Voltage stability assessment tool (VSAT) change management; ancillary service contract management, and real-time management of simultaneous feasibility test (SFT) constraints.

4 Compliance

We did not self-report any system operator breaches in this reporting period.

<u>9 August</u>

The system operator and the Authority are finalising an agreed summary of facts and joint penalty submissions for presentation to the Rulings Panel on 17 February 2023.

5 Impartiality of Transpower roles

We have three open items in the Conflict of Interest Register (below). These 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
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

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
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 service 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)
Following the successful deployment of Phase 3 into production on 18 October (which went live in the market at midnight on 1 November), a small number of minor defects were identified following go-live. These were resolved through an initial patch release in December, followed by a final defect release in January. Phase 4 development and testing is continuing in parallel and will be delivered on 27 April 2023.

Operational Excellence
The programme plan has been updated following internal feedback and the programme scope is being finalised. The workstream lead has now joined the programme team and will transition to fulltime over the coming month. Detailed solution design has begun, and Operations Managers will convene in mid-February for a two-day kick-off event.

KPI Refresh Programme
Work is underway on the next stage of the KPI refresh programme, which will roll out performance metrics reporting with an external focus, based on the external outcomes discussed with the Authority. Teams from the Authority and Transpower Operations have participated in a series of sessions and proposed measures that are now being refined. The metrics that are being developed will inform a revised incentives agreement with the Authority for 2023/24. The draft document will also be reviewed at the Transpower System Operations Committee in March.

Future Security and Resilience (FSR) Programme
The draft Issues Paper relating to common quality (Part 8 of the Code) has been completed. It is currently in the review cycle with the Authority prior to submission to their Board.

The FSR tracking indicators to help guide the speed/course of the roadmap delivery have been agreed. We are working with the Authority to identify the data sources, data communication methods and our role in providing the data.

Extended Reserves – AUFLS Project
Individual distributor transition plans are scheduled to be submitted by March for the team to assess against our ability to manage Extended Contingent Event risks during the transition, which will commence in 2024.

As part of business-as-usual activities, the system operator has been asked by the Authority to assess the performance of AUFLS based on data submitted for the 2021 year. The assessment will include both the South and North Island schemes. The assessment report is to be completed and submitted to the Authority by 31 March 2023.

The Authority is also following up which direct connects who have requested equivalence arrangements to address their AUFLS obligations, as many had exemptions, which were cancelled by the Authority last year. It is likely the Authority will allege breaches against those who have not yet applied for an equivalence.

7 Technical advisory hours and services

Technical advisory hours and a summary of all technical advisory services (TAS) 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
As we are in the summer months, we continue to have very high outage volumes. Looking ahead these are forecast to continue until April at least. Some weeks are around 150 to 180 transmission outages a week, with additional generation outages. We have been coordinating with the grid owner on risks to outages as a result of low Southland generation and will continue to do so in the event Southland lake levels drop into low operating ranges again.

The grid owner published its draft annual outage plan at the end of January, and we will be assessing security impacts from this plan in March after the grid owner has completed its customer consultations.

We have communicated the security and generation margin impacts to participants ahead of this year's HVDC outage in the second half of February.

New Zealand Generation Balance (NZGB) analysis
The NZGB tool is forecasting no shortfalls for the next 200 days. There are some lower margin periods in February due to generation plant outages and the HVDC outages respectively. There is also one lower margin day in May due to a grid outage impacting generation on the Wairakei Ring. We will monitor this period closely.

9 Power systems investigations and reporting

No items to report.

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

The next cost of services reporting, for 2021/22 will be delivered to the Authority early in 2023.

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

Security of supply outlook

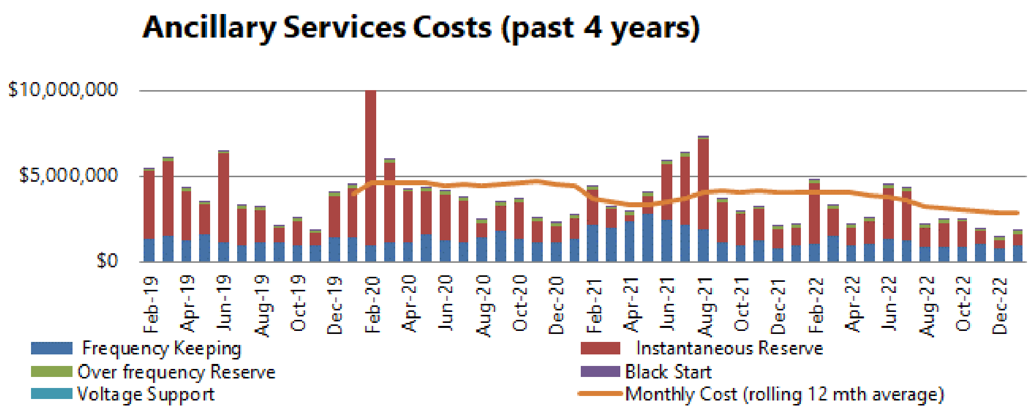
National hydro storage continued to decrease through January with national hydro storage nearing average for the time of year. This was the result of a prolonged dry sequence in the South Island. However, a material inflow event in the South Island during early February pushed hydro storage back above average. Meanwhile, the North Island, which holds 13% of national storage has been well above average with full hydro lakes resulting from consistent and often large inflow events.

As a result of the dry sequence in the South Island, Lakes Manapouri and Te Anau were reaching their low operating range, limiting their output. The system remains stable, but it has increased the workload for both the control room and Operations Planning. The inflow event in early February lifted storage out of the low operating ranges, but we are continuing our assessments of potential impacts of low generation in the region to identify any issues resulting and mitigations required if low output continues (noted below in operational and system events).

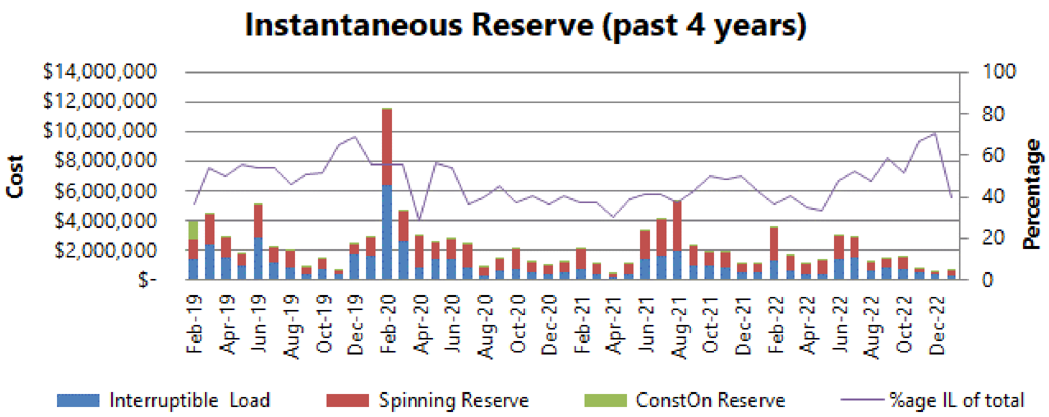
Prices peaked in January as storage declined, resulting in more thermal generation operational on the system. High prices are also more pronounced during periods of low wind generation such as we experienced this quarter. In line with this, renewable generation has also dropped from 95% or higher over the holiday period to around 85%. Prices and thermal generation have eased back following the large early February inflow event.

Further details in the weekly market update report: [Weekly Summary and Security of Supply Reporting | Transpower]

14 Ancillary services

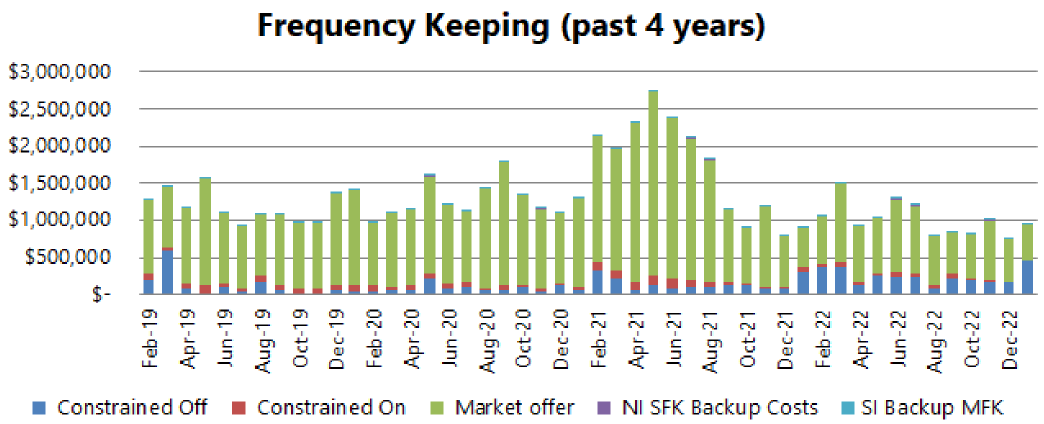


This month's ancillary services costs were $1.83 million, an increase of $358k (24% increase) from the previous month, this was driven by increases in both instantaneous reserve costs and frequency keeping costs. Instantaneous reserve costs increased by $166k (34% increase) while frequency keeping costs increased by $188k (25% increase).



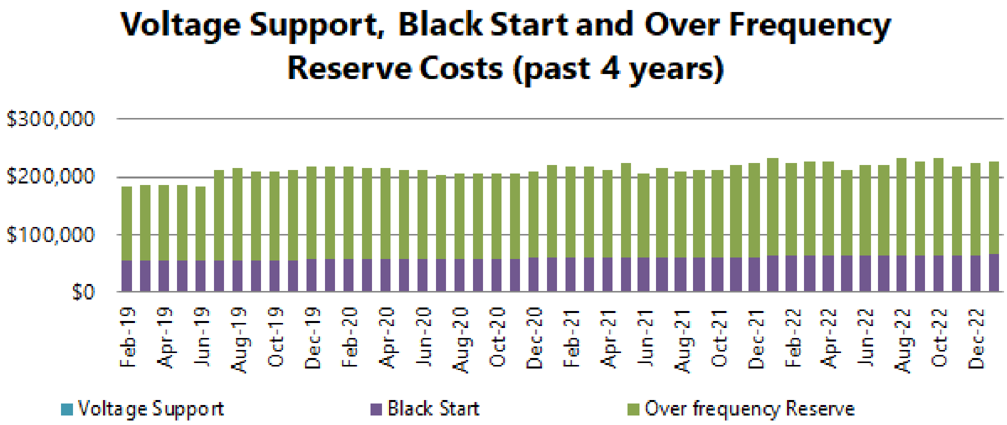
This month's instantaneous reserve costs were $660 million, an increase of $166k (34% increase). This was influenced by an increase in spinning reserve costs of $247k (170% increase). The increase was partially offset by a decrease in interruptible load costs of $83k (24% decrease). Constrained on payments also increased by $1.8k (85% increase).

Overall quantities of fast and sustained reserves were higher than the previous month in both the North and South Islands. The average prices per megawatt of fast reserves increased slightly in the North and South Islands. The average prices per megawatt of sustained reserves increased marginally in the South Island and decreased marginally in the North Island.



This month's frequency keeping costs were $943k, an increase of $188k on the previous month (25% increase). Both constrained on and off costs increased this month; constrained on costs by $6k (131% increase) and constrained off costs by $281k (163% increase). National market costs for frequency keeping decreased by $99k (17% decrease) this month.

Both North Island and South Island frequency keeping costs increased this month by $100k (29% increase) and $89k (22% increase) respectively. Nationally, availability costs increased by $188k (25% increase) as a result of reduced availability.



Over frequency costs remained the same level as the previous month at $162k. Black start costs increased to $66k this month (6% increase) as a result of the new ancillary service contract arrangements. There are currently no voltage support costs.

15 Commissioning and Testing

No new items to report this period.

16 Operational and system events

Southland dry hydro

Although there was an inflow event in Southland in early February, we are continuing to assess potential impacts of low generation in the region. Niwa forecasts for the region are for normal or lower-than-average rainfall. As we did last year, we convened a system operator working group in mid-January and we are assessing security risks and considering options for potential grid reconfigurations.

If we consider a grid reconfiguration is necessary, we will follow the same process adopted last year, including consulting with participants (short-term consultation) and requesting the grid owner to complete an economic analysis. At this stage, we are completing our assessments and will share our studies with participants when these are completed. Note, the situation is slightly different to last year as we do not have outages related to the Clutha Upper Waitaki Lines Project (CUWLP).

Significant incident investigations

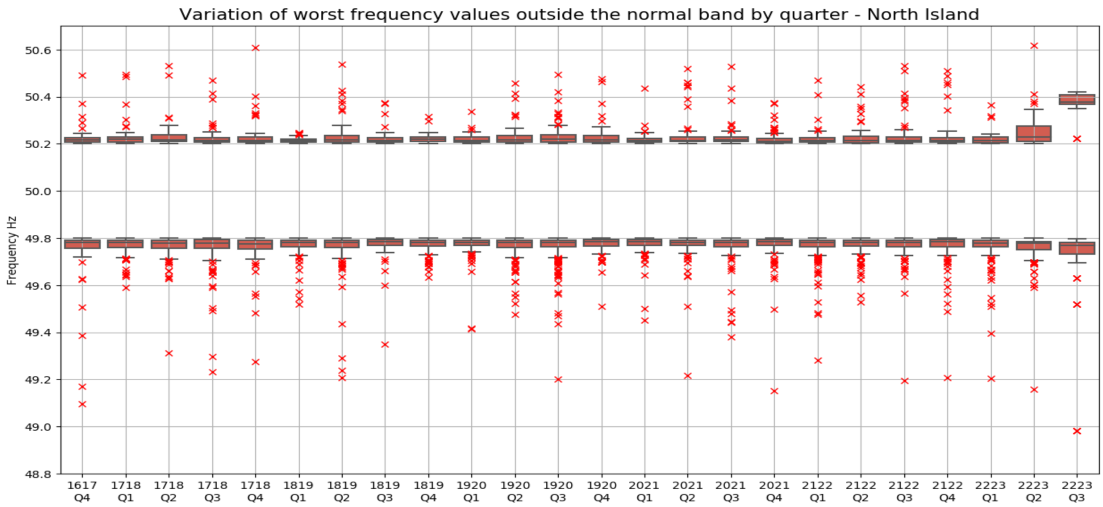
We are still awaiting feedback from the Authority on our proposal to change the significant incident criteria to ensure we are reporting on the right level of incidents considering associated consequences.

17 Frequency fluctuations

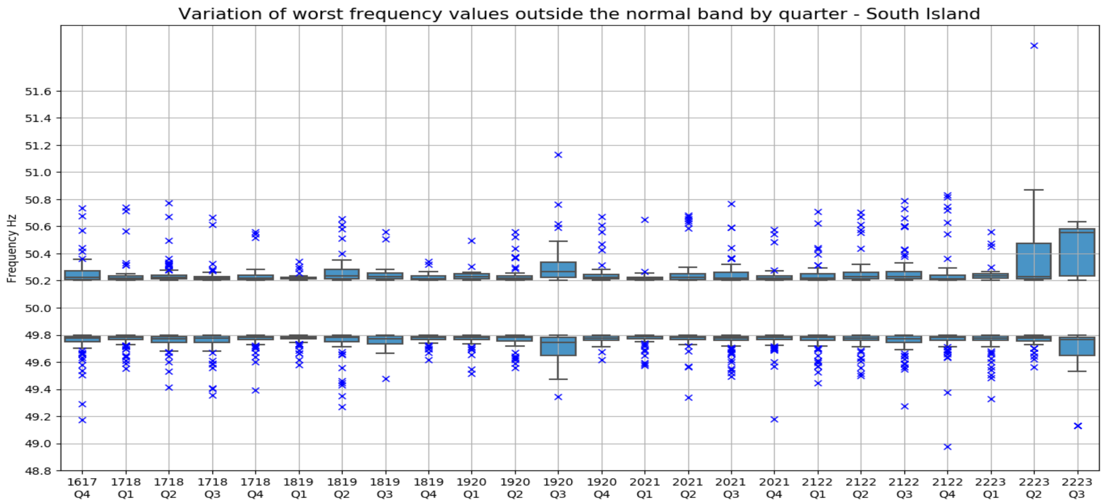
17.1 Maintain frequency in normal band (Frequency value)

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



*2022/23 Q3 contains data for January only

Note1: 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.

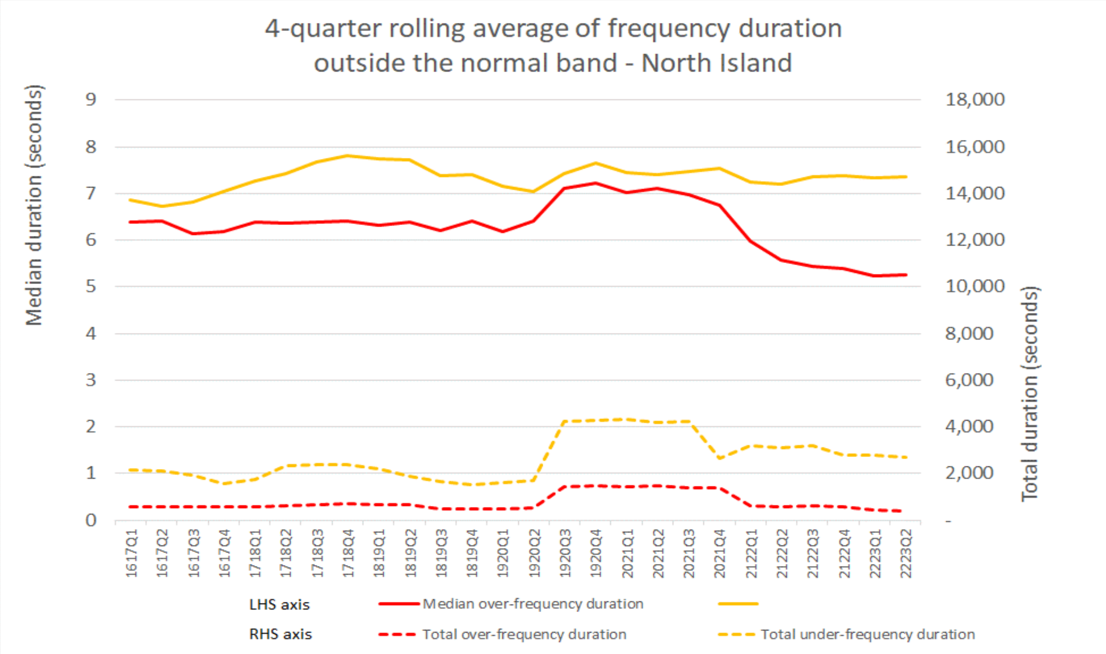
Note2: The "box" for Q2 2022/23 above the normal band is a reflection of more Tiwai excursions than average and the HVDC runback in October.

Note3: The "box" for Q3 2022/23 above the normal band is a reflection of nine Tiwai excursions and the Huntly unit 5 trip in January.

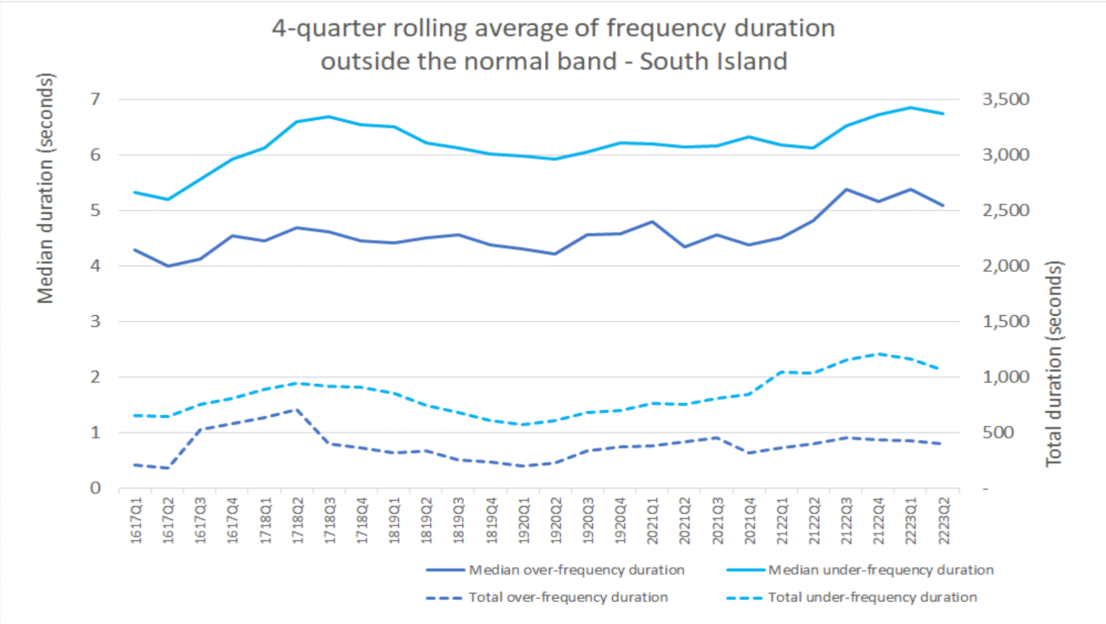
17.2 Recover quickly from a fluctuation (Time)

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

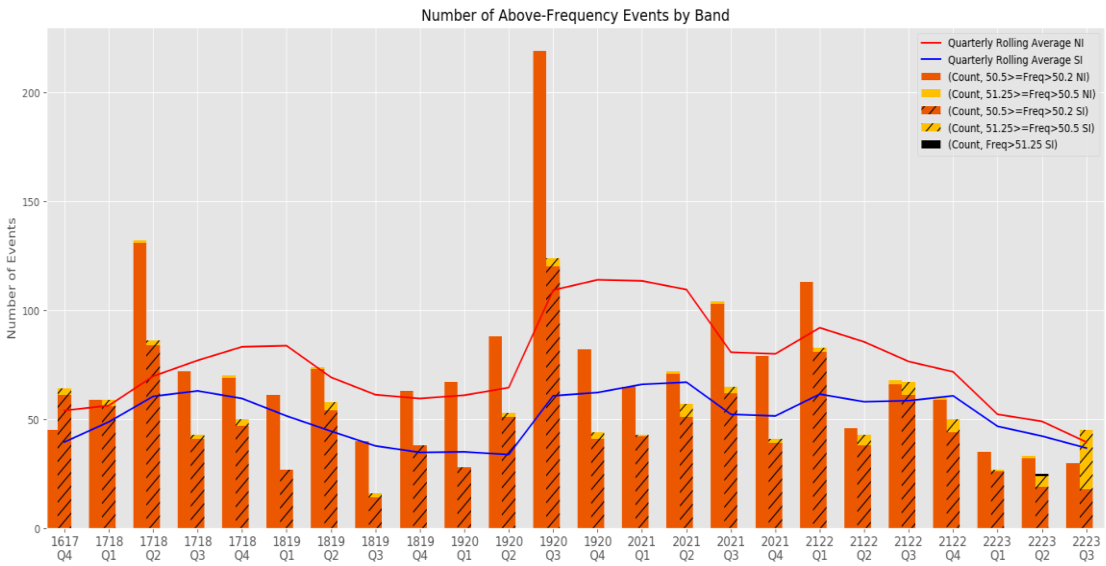


*These graphs have not been updated since 2022/23 Q2; they will only be updated at the end of each quarter

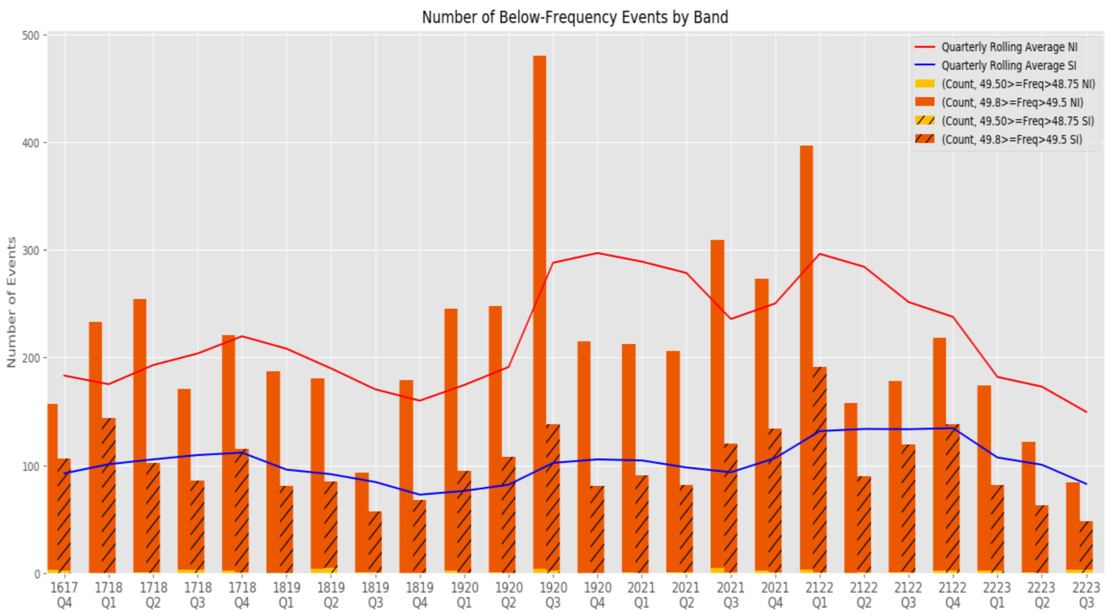
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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

Over-frequency events



Under-frequency events



2022/23 Q3 contains data for January only (the 4-quarterly rolling averages for NI and SI will only be comparable with previous quarters end of March).

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

Upper North Island Voltage Management

We assessed the ongoing requirement for an outage on the Pakuranga-Whakamaru_1 circuit, considering anticipated demand increases after the long weekends in February, increased generation from Huntly and contributions from the Otahuhu reactor. Consequently, the system operator requested that the outage be extended until 7 February. This approach balanced the risks of switching cable circuits over the Auckland Anniversary and Waitangi weekends, with risks to security over the peak periods moving forward through the rest of the summer.

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	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	-	-	-	-	1	-	-	1	1	1	-	-
Warning Notice	-	-	-	-	1	-	-	-	-	1	-	-	-
Customer Advice Notice	7	9	15	14	15	28	24	25	35	33	30	17	11

20 Grid emergencies

Date	Time	Summary Details	Island
		None.	

Appendices

Appendix A: Discretion

16 instances

In recent months, discretion has been reclassified to include the process to manage generators on minimum MW values overnight. As a result, the list of discretions in this report is much larger than recorded in previous months.

Event Date and Time	Description
1/01/2023 9:35	TKA0111 TKA1 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 01-Jan-2023 09:35 End: 01-Jan-2023 10:00 ABY-TKA trip Last Dispatched MW: 25
1/01/2023 18:49	NAP scheduled below their minimum operating run of 133 MW in various trading periods in 18:00 NRSL. SC called MRG Trader, who advised they would claim Rule 13.82A citing min run of 133 MW for plant safety. NI manual CE risk set to 132 MW from 23:00 to 07:00. Keeping NAP on at its minimum run is the least cost solution. Required for voltage support and over frequency reserves as well.
8/01/2023 18:31	NAP scheduled below their minimum operating run of 133 MW. Trader claimed Rule 13.82(a) citing minimum run of 133 MW for plant safety. NI manual CE risk set to 132 MW from 02:30 to 06:00 9 Jan. Keeping NAP on at its minimum run is the least cost solution. Required for voltage support and over frequency reserves as well.
9/01/2023 3:36	CYD2201 CYD0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 09-Jan-2023 03:36 End: 09-Jan-2023 04:00 Discretion applied to 0 MW as dispatched to 13 MW, trader advised unable to meet this and minimum is 70 MW for 1 unit. Last Dispatched MW: 13.41
18/01/2023 16:07	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 230 Start: 18-Jan-2023 16:07 End: 18-Jan-2023 17:30 TWI 1 extended potline, MCC does not want to come back to economic dispatch, discretioned down to current value Last Dispatched MW: 407
19/01/2023 13:08	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 155 Start: 19-Jan-2023 13:08 End: 19-Jan-2023 13:30 TWI Line 1 extended offload. Last Dispatched MW: 328.94
25/01/2023 13:07	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 186 Start: 25-Jan-2023 13:07 End: 25-Jan-2023 14:30 ext. Potline Last Dispatched MW: 360
25/01/2023 14:26	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 186 Start: 25-Jan-2023 14:26 End: 25-Jan-2023 15:30 ext potline Last Dispatched MW: 186
25/01/2023 22:38	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 0 Start: 25-Jan-2023 22:39 End: 25-Jan-2023 23:00 MAN Dispatched below safe running range (49.8 MW) MAN has a min of 80MW. Claimed 13.82A. SC decided to apply Energy only discretion to 0 to bring them off until end of TP and then re assess. Still being used for reserves. Last Dispatched MW: 49.81

Event Date and Time	Description
25/01/2023 23:01	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 0 Start: 25-Jan-2023 23:01 End: 26-Jan-2023 00:30 MAN Dispatched below safe running range at start of new TP (49.4 MW) MAN has a min of 80 MW. Earlier claimed 13.82A. Energy only discretion to 0 MW re applied until 01:00. Still being used for reserves. Last Dispatched MW: 0
26/01/2023 1:36	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 0 Start: 26-Jan-2023 01:36 End: 26-Jan-2023 02:00 Applied discretion for energy to 0 MW as dispatched 1.3 MW, rough running range is under 80 MW. Needed for reserves so discretioned energy only. Last Dispatched MW: 1.29
27/01/2023 11:14	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 240 Start: 27-Jan-2023 11:14 End: 27-Jan-2023 11:30 line 3 extended off load Last Dispatched MW: 300
27/01/2023 11:15	OHC2201 OHC0 Discretion Clause 13.70, Part 13 EN Max : 153 Start: 27-Jan-2023 11:15 End: 27-Jan-2023 12:00 line 3 extended off load Last Dispatched MW: 183.27
27/01/2023 11:15	OHB2201 OHB0 Discretion Clause 13.70, Part 13 EN Max : 153 Start: 27-Jan-2023 11:15 End: 27-Jan-2023 12:00 line 3 extended off load Last Dispatched MW: 183.27
27/01/2023 11:16	BEN2202 BEN0 Discretion Clause 13.70, Part 13 EN Max : 398 Start: 27-Jan-2023 11:16 End: 27-Jan-2023 12:00 line 3 extended off load Last Dispatched MW: 458.29
28/01/2023 21:15	HLY_5 scheduled below their minimum operating run of 182 MW in the NRSS and NRSL for the morning trough of 29 JAN. Genesis Trader advised they would claim Rule 13.82A citing min run of 182 MW for plant safety. NI manual CE risk set to 181 MW from 23:30 to 07:00. OPS case indicated MW price would increase by between $160 - $220 MW/h and HLY 5 required for voltage support during the morning trough.