QUARTERLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited
July to September 2019

Keeping the energy flowing




TRANSPOWER

Transpower New Zealand Limited The National Grid

Report Purpose

This report is Transpower's review of its performance as system operator for Q1 2019/20 (July to September 2019), in accordance with clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

As this is the final self-review report of the quarter, additional information is included as per SOSPA clause 12.3. This includes performance against the performance metrics year to date, and actions taken in regard to the system operator business plan, statutory objective work plan, participant survey responses, and any remedial plan agreed under clause 14.1(i). A summary of technical advisory services for the quarter is also provided.

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

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Commentary

This section provides a high-level update for this quarter. The remainder of the report provides supporting detail in two sections:

- System operator performance, and
- System performance.

Update (July to September 2019)

Security of Supply

- The new version of the Security of Supply Forecasting and Information Policy (SoSFIP) came into effect on 1 August 2019.
- We changed our weekly reporting to make it more customer-centric.
- We published updated thermal fuel supply disruptions scenarios.

HVDC 2020 outages

- We held a joint industry briefing with Transpower's grid owner on the HVDC 2020 outages.
- We are continuing to work with the grid owner, gas industry and generators regarding the planning of the HVDC 2020 outages.
- We engaged a consultant to provide an independent review of the grid owner's testing plan for the Pole 2 valve-based electronics.

Low residual situations

- We issued our first two customer advice notices on low residual situations; these notifications are designed to improve our forward-looking market information, a lesson from our experiences during the November 2018 HVDC outages.

Dunedin fire

- We collaborated with Transpower as grid owner to minimise risk around a large fire on Flagstaff hill near our Halfway Bush and Three Mile Hill substations.

Real Time Pricing (RTP)

- The RTP project capital phase is well underway.
- The initial business case was approved by the Authority Board.

Dispatch Service Enhancements (DSE)

- The DSE project was deployed into production on 8 August 2019.
- Two new dispatch interfaces were successfully commissioned into the market system.
- The first participant is likely to transition to the new interfaces from October.
- A further (and final) interface is due to be deployed on 24 October.

Wind Offer Arrangements

- The new wind offer arrangements went live on 19 September.

Annual self-review

- We published our system operator self-review for 2018/19 that sets out our assessment of how we've performed the system operator service and the actions we've taken to meet our strategic goals.

Black-start testing

- We worked with Meridian to successfully complete the Aviemore black start test.

System Security Forecast (SSF) minor update

- The six-monthly review of the SSF was completed with revised documents being published on our website.

Upper South Island restoration workshop

- We hosted an Upper South Island restoration workshop, involving generators and distributors in the region.

Asset Owner engineering forum

- We hosted our annual gathering for New Zealand's generation and distribution asset owners, encouraging collaboration at a technical level.

Planned Outage Coordination Process (POCP) review

- Our first meeting for the POCP review was held on 11 October.

Kupe gas outage

- We have been discussing the impact of the Kupe gas outage, scheduled from 30 October–27 November, which is concurrent with planned outages, with the relevant generators.

New initiatives

Business continuity planning – gas outage

- We started work with First Gas on business continuity planning in the event of a pipeline outage.

Operations "Big 4" programme

- We created the Operations "Big 4" programme of work to ensure we are well placed to meet the needs of future industry changes, as well as supporting our commitment to review external deliverables with customers.

Enabling new connections

- Transpower is examining its role in building the connections from the core grid to new generation and load, from a grid owner and system operator perspective.

Current investigations

Review of NEM separation August 2018

- We published our review on whether New Zealand could benefit from implementing any of the eight recommendations made by the Australian Energy Market Operator (AEMO) on our website in September.

Argentina, Uruguay and Paraguay blackout

- We have been following the investigation and findings from the 16 June 2019 Argentina, Uruguay and Paraguay blackout. Depending on availability of accessible information, we aim to identify any lessons for New Zealand.

System operator performance

1 Customers and other relationships

Annual self-review

We provided our annual self-review of the system operator service for 2018/19 to the Electricity Authority on 30 August. The review sets out how we performed, including the actions we took to meet our strategic goals, our response to the Authority's recommendations from last year's review and our progress against our business plan initiatives.

System Security Forecast (SSF) minor update

The six-monthly review of the SSF was completed, with revised documents being published on the website. These revisions include the impact of new committed projects such as the Ngawha Geothermal expansion, New Plymouth substation exit, the Junction Road generator, Ohinewai capacitors, Turitea Wind Farm, Te Awamutu capacitors, Otahuhu T4 replacement, Otahuhu T2 decommissioning and Penrose T10 decommissioning, and the Kikiwa Reactor.

Upper South Island restoration workshop

We hosted an Upper South Island restoration workshop at the Omaka training centre. This involved our customers in the region: Buller Electricity, Marlborough Lines, Nelson Electricity, Network Tasman, Trustpower and Westpower. It was the latest in a series of workshops to discuss restoration of the respective island core grid and regional restoration following a blackout.

Asset Owner engineering forum

This forum, which we hosted in Wellington, is an annual gathering for New Zealand's generation and distribution asset owners. It offers an opportunity for asset owners to interact with system operator team members and other asset owners, and encourages collaboration at a technical level. The forum also provides an opportunity to discuss any challenges asset owners may have in meeting the required Asset Owner Performance Obligations. This year's forum had a focus on the successful commissioning of assets, with the aim of clarifying, informing and improving the commissioning process. We had a great turnout with attendance from Contact, Genesis, Trustpower, Mercury, Todd Energy, Tilt Renewables, Pioneer Energy, Refining NZ, Mainpower, Counties Power, The Lines Company, Powerco, Northpower, Electricity Authority, Auckland University, Victoria University and Canterbury University.

Planned Outage Coordination Process review

Our first meeting for the POCP (Planned Outage Coordination Process) review was held on Friday 11 October. The meeting included representatives from generators, the Electricity Authority, Transpower (as grid owner and system operator), MEUG, NZX, the FTR manager and traders. We have not had any interest from network companies, but we are following up on this and will look at ways to engage with them as we progress. We are now seeing 1,500 logins to POCP a month compared to 118

in 2013. People are clearly using it more since 2013, and the review will highlight if they have different requirements.

Enabling new connections
Transpower is examining its role in building the connections from the core grid to new generation and load, from a grid owner and system operator perspective. This is one of Transpower's Te Mauri Hiko workstreams; the purpose of these workstreams is to help inform what the market will look like and if changes are needed, posing questions about dry years and other issues.

Incident Management - Grid Ex V
This is an incident management industry exercise run by the US regulator FERC. We have been invited to play a part on 13 and 14 November. Teams from Transpower as grid owner and as system operator will be set up to respond to a series of incidents, both cyber and physical in nature. We will share lessons and challenges, and those of other agencies, from being part of this worldwide exercise. Regular involvement helps us prepare for the real event.

2 Risk & Assurance

We received the final report for the audit of our Real Time Risk Adjustments process and are now agreeing and finalising actions. This was one of our business assurance audits for the 2018/19 year.

We have started the first of our planned audits for this year – an audit of the Test Plan process. This has involved interviews with both internal staff and external participants.

We started work with First Gas on business continuity planning to ensure that we are aware of the interactions and impacts for each organisation during a major event.

The audit of the Reserve Management Tool change processes was completed as an identified action of the breach in January 2019. There are four recommendations which have been assigned and are underway. Three are due for completion in December 2019 and one by July 2020.

Four members of the Operations senior leadership team completed a two-day training session on CIMS (Coordinated Incident Management System) level 4.

3 Compliance

July

We reported one new system operator breach to the Authority in July. This relates to the recent upgrades to the SCADA hardware which impeded an automated update process. The issue degraded information used in the load forecast which is an input into the published forward-looking schedules. There was no market or operational impact from the error.

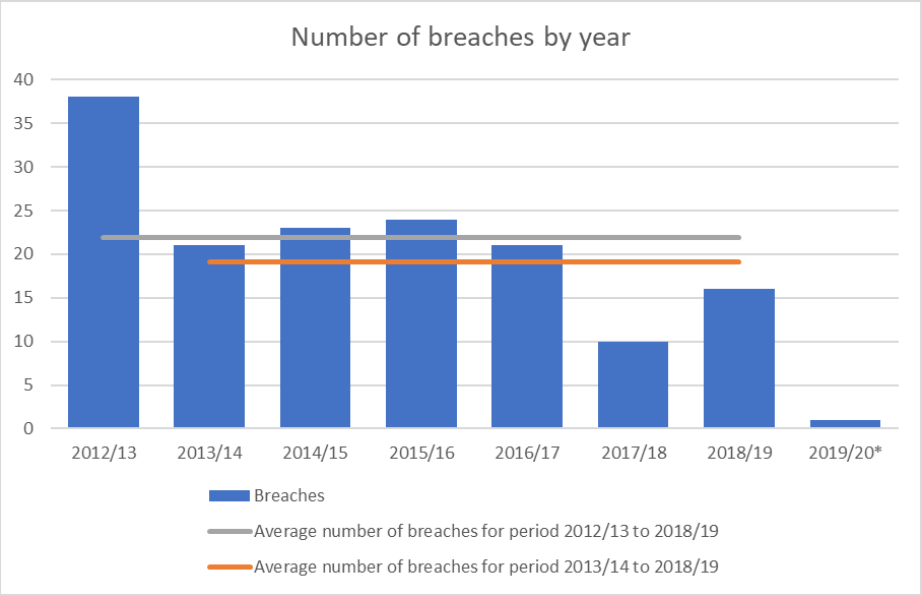
August

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

September

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

We have four outstanding breaches with the Authority Compliance Team. For one of these, the Reserve Management Tool corrupt file input breach, a settlement meeting was held in August with Meridian and the grid owner. All parties agreed there was no need for a formal settlement as all parties agreed that the actions being taken by the system operator in response to the breach satisfied their concerns. Subsequently the Authority Board compliance committee has closed this breach and will issue a warning letter to the system operator.



* Data is only for 3 months

This quarter we have reported one breach.

We are continuing to strengthen our operational controls, improve processes and tools, and build our people capability with a goal to continue to this trend of reducing the number of breaches.

Refer to Appendix A for instances where the system operator has applied discretion under 13.70 of the Code.

3.1 Update on South Island AUFLS event (2 March 2017)

Actions from the 2017 South Island AUFLS event

This section provides updates on the 3 outstanding actions from the 13 identified, that were still open at the end of the 2018/19 year. As at the end of Q1 2019/20, the progress is as follows:

- Action 7. Review procedures across Transpower regarding handover of tools and systems to ensure the tools and systems are able to be effectively operationalised.
    - *Update status*: Complete

We have created a change lead role (Practice and Change Specialist) to provide oversight and ensure the effective delivery of operational change arising from any project across Transpower. We have developed a process which is now being applied to all operational change. The changes driven from project delivery continue to have a strong focus on business change management. A maturity model is currently being assessed to identify next steps.

- Action 12. Identify, review and address performance of risk management controls, specifically focused on high impact low probability (HILP) event interactions.
    - *Update status*: Overdue

      We received the draft Deloitte review into Transpower's risk framework for managing HILP events in September. The review considers how well our risk management framework used for HILP events aligns with good practice (ISO 31000). The review was very positive, and commended improvements over the last 24 months. Transpower management is considering three recommendations made by Deloitte for implementation to further strengthen our framework. We expect to complete our review by the end of October 2019.

      Two of the key controls associated with the 2 March AUFLS (HILP) event which did not operate as effectively as required were operational communications and the auto sync process/tool. We have undertaken significant work in these areas to strengthen their effectiveness as part of addressing the event investigation recommendations, including:

      - Improving operational communications.
      - Increased training in the use of the auto sync process/tool.
- Action 13. Review Transpower's processes for reporting of major power system events, compliance breaches and material failures by Transpower to comply with its own standards and procedures.
    - *Update status*: Overdue

      We have shared the major incident reporting principals and process overview with the Authority, and tabled these at the August System Operations Committee (SOC) meeting.

      We have developed a document for system operator major incident reporting that is going through the approval process.

      Grid owner incident reporting will be dealt with separately (outside this action) considering the latest RCP3 Commerce Commission requirements.

      Staff training for adopting ICAM (Incident Cause Analysis Method) for reporting is scheduled for October.

      The major incident reporting procedure includes that breaches identified (system operator, grid owner or any asset owner) will be

reported via a separate compliance process as soon as possible rather than at the completion of the investigation.

We are updating the system operator compliance policy (SP-SD-002) and associated event reporting and investigation procedure (PR-RR-003) to strengthen requirements for the timely reporting of breaches. Completion date expected end of October 2019.

The complaint raised by the Electricity Authority with the Rulings Panel concerning 12 alleged breaches relating to the 2 March 2017 event is progressing.

4 Separation of Transpower roles

The entries below are the open issues in the conflict of interest (COI) register. These issues are being handled in accordance with our policy for managing conflicts of interest.

There were no new COI issues recorded this quarter.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
9	**HVDC outages 2019/20**: The nature and size of the potential impact of the outages requires prudent management of the system operator and grid owner roles in this process.	Operations Planning Manager
18	**Recommendations from the Advisian conflict of interest review**: Ensure that the recommendations are fully implemented across the whole of Transpower to strengthen our conflict of interest management around the dual roles.	Compliance and Risk Manager
21	**Staff interest in generator commissioning**: Manage the personal conflict of a staff member who has a family relationship with the project lead for a generation commissioning project.	GM Operations
22	**Security classifications for PI Vision database access**: Seek assurance that Transpower's information security policies have been adhered to and applied for the implementation of PI vision.	SO Power Systems Group Manager
26	**Response to 14 December UFE recommendation**: Ensure the system operator maintains role separation with regard to determining the causer of the event – including with the provision of information and carrying out the process	SO Power Systems Group Manager

5 HVDC 2020 outages

Joint industry briefings

In July, we held a joint industry briefing with Transpower's grid owner on the HVDC 2020 outages. Grid owner representatives set out the outage programme work during the 13-week period. System operator representatives provided advice on generation margins during the outages, the treatment of frequency keeping during the outages, the system operator review of the testing plan and provided reminders of the changes to the NZGB (New Zealand Generation Balance) and industry notifications for low residual situations. The briefing was well attended by traders, generators, retailers, large users and the Authority. We are continuing to work with grid owner representatives and industry.

The next HVDC industry briefing is scheduled for 30 October.

HVDC expert engagement

We engaged an independent consultant from Canada to review testing requirements and reinforce impartiality. The third party, TransGrid Solutions (TGS), has experience with the New Zealand HVDC, and has also been involved with other HVDC valve-based electronics (VBE) projects around the world. In their report, TGS concluded that in their opinion the proposed grid owner testing covered a wide-range of tests to prove that the new VBE would not impact the dynamic performance of the HVDC link. In addition, they recommended two further tests. They also recommended that some of the tests be carried out at both Haywards and Benmore. The system operator has formally conveyed the output of TGS review to the grid owner and asked them to update their proposed testing accordingly. The grid owner has subsequently modified their proposed testing to take the TGS recommendations into account.

Outage scheduling

Transpower's grid owner rescheduled the HVDC 2020 bipole outages during the January–April period to weekend dates. We analysed generation scenarios during this time (including reduced gas and no wind). Adequate margins are seen in NZGB for all these scenarios, which confirms a lower risk of generation shortfalls during the weekend, compared to the original weekday dates.

A Pohokura gas outage has been scheduled for 11–24 March 2020; this is during the January–April window for the planned HVDC 2020 outages. Regular discussions with generators and the gas industry have helped us to test generation assumptions during the HVDC outages and subsequent to the Pohokura outage notification, Genesis has rescheduled a Huntly 1 outage. We continue to analyse several generation scenarios during this time (including reduced gas and no wind) and provide this additional analysis in our NZGB monthly reports.

Generation margins

Adequate margins are seen in NZGB during the January–April 2020 HVDC and March Pohokura outages. We have raised concerns about concurrent grid owner Karapiro project outage, the grid owner is now looking to reschedule. This is because, during concurrent outages of two circuits connected to Karapiro, Karapiro generation will be

constrained by up to 40 MW. In addition, to prevent spilling of water, Mercury would also limit upstream Waikato generation

6 Project updates

6.1 Market design and system enhancement project updates

Progress against high value, in-flight market design and service enhancement projects is included below along with details of any variances from the current capex plan.

Real Time Pricing (RTP)
The capital phase is well underway. We are working with the Authority to finalise plans, including project assurance. Internally, focus is on the business analysis required to inform the IST project deliverables. We have completed work to estimate effort for demand dispatch generation products and submitted this to the Authority.

A draft report to provide an independent quality health check was completed by consultants IQANZ. The report was very positive, concluding that the likelihood of the project meeting its objectives is "likely" given the strong foundations in place. The recommendations in the report are designed to strengthen existing practices which will support the project as it moves towards its delivery stage.

Dispatch Service Enhancements (DSE)
The project was deployed into production on 8 August 2019. This has been a challenging project and we will be conducting a review.

During this quarter, the Authority Board approved requests for additional budget and time to deliver the original scope of the business case, as well as an extension to deliver additional functionality and capitalisation of costs to transition individual participants onto new platforms. The GM Operations attended the Authority Board meeting to answer any questions the Board raised.

The new dispatch interfaces were successfully commissioned into the market system on 8 August. Delivery of the additional functionality is on track for 24 October.

The transition team is engaging with participants to plan transition from Genco to the new dispatch platform of their choice. The first participant is likely to transition to the new interfaces from October and we have started to plan the transition activities for this customer.

Wind Offer Arrangements
The new wind offer arrangements went live on 19 September enabling wind generation to be offered in the same way as other generation is offered into the market (through multiple tranches and unrestricted offer prices). This follows Code changes which were gazetted at the end of July and IST changes which were deployed into the market system on 5 September.

Situational Intelligence
The scope of the investigation was extended to enable additional technical concepts to be proven. We are in the final stages of the expanded investigation phase, and the project is tracking to meet its investigation phase targets. Our team is finalising the estimates for the delivery business case, which will be delivered at the end of October.

Extended Reserves (AUFLS)
We sent a letter to the Authority confirming the system is secure for identified extended contingent event (ECE) risks with the existing 2-block AUFLS scheme. This letter also confirmed that Transpower in its role as system operator sees benefit to New Zealand in moving to a simple 4-block AUFLS scheme, as less load may be shed responding to an ECE or 'other' event.

We received a technical advisory service statement of work from the Authority, which engages the system operator to support the Authority develop a paper on how to reset the project. This was presented to the Authority Board on 3 October.

6.2 Other projects

Credible Event Review
The classification of busbar frequency risk, based on a previously applied methodology, has been completed and a report drafted. The recommendation is to classify Huntly and all other North Island busbars as 'other' risks for both N-1 and N-1-1 conditions. The recommendation for Manapouri is to classify it as an ECE risk for N-1 conditions and 'other' for N-1-1 conditions. All other South Island busbars are recommended as being classified as 'other' for all conditions.

Energy Futures
We spoke with Reactive Technologies to understand the service they offer in monitoring system inertia. At this stage we are engaging with them to understand the likely costs and benefits of such a system. The aim is to determine if and when New Zealand would want to invest in a system of this nature. Reactive Technologies has just signed a six-year service deal with National Grid UK, however their inertia context is significantly different to that of New Zealand's.

Operations "Big 4" programme
This programme of work focuses on enhancing our operational services to meet the needs of future industry changes, as well as supporting our commitment to review external deliverables with customers. Governance has been established, and management of this work started across the programme. The focus of the four workstreams are to:

1. lift our capacity to address recent events and reviews
2. deliver real-time pricing
3. work with industry to refresh our key reports and processes
4. deliver our real-time operating vision.

All Ideas Matter (AIM)

We recognise the experience of our people to identify and provide ideas to help us to continue to improve our service. We have developed an internal portal to provide a way of registering and tracking these ideas which we have called "All Ideas Matter" (AIM). To date we have had 58 ideas come through AIM and of those 23 have been completed, 55 per cent of ideas are for systems and tools, 33 per cent for process and 12 per cent for people. Some of the ideas have been picked up by current projects and others have been picked up by the OPTI team or other teams to manage.

7 Technical advisory hours and services

The following table provides the technical advisory hours for Q1 and a summary of technical advisory services to which those hours related (SOSPA 12.3 (d) refers).

TAS Statement of Work (SOW)	Status	Hours worked during Q1
TAS SOW 82 – Real Time Pricing	In progress	462.25
TAS SOW 83 - Provide ROM for system changes to support removal of constrained on payments for ramp-constrained generation	In progress	3.00
TAS SOW 84 - Deliver interim operational guideline for new connection of new generation technology in the wholesale market	Finished	82.00
TAS SOW 86 - Extended Reserve: 2 to 4-block migration scoping	Finished	100.00
Total hours		**647.25**

8 Outage planning and coordination

There were two short notice HVDC outages in July to remedy the HVDC oscillation fault identified in May. The long-term solution is now in place with no subsequent reoccurrence of oscillations.

Low Lake Waikaremoana storage in July led to us having discussions with Genesis so we can learn how the river is being managed and can best assist with fuel conservation, particularly when it impacts outages and pricing in the region.

There were two significant, successful, Manapouri bus outages this quarter, both of which required agreements with Meridian to remove a unit prior to the outage due to potential lack of AUFLS overnight. There were also outages of the Kawerau bus which required significant planning effort and generation constraints. For the Kawerau outages we published a customer advice notice to provide information ahead of the outages, in line with our outage planning policy.

Kupe gas outage

A Kupe gas outage has been scheduled for 30 October–27 November. This could restrict gas for Huntly generation. During this time there are planned outages of Stratford generation, Huntly generation and generation from the Tokaanu station. Our October NZGB report has flagged one N-1-G shortfall on 20 November, due to these concurrent generation outages and high load. We are discussing this period with the relevant generators. Further shortfalls may be anticipated due to reduced gas availability. These were also signalled in the NZGB report.

9 Power systems investigations

Review of the Australian National Electricity Market (NEM) separation August 2018

Transpower's review to understand if New Zealand could benefit from implementing any of the eight recommendations made by the Australian Energy Market Operator (AEMO) was published on our website in September. Our review is based on the AEMO investigation of the separation event and takes into consideration the New Zealand context.

A summary of the report was tabled at the SOC meeting in May 2019 and will be presented at the Security and Reliability Council (SRC) in October.

Argentina, Uruguay and Paraguay blackout

We have been following the investigation and findings from the 16 June 2019 Argentina, Uruguay and Paraguay blackout, with an aim of identifying any lessons for New Zealand. We joined a webex in July hosted by the Electric Power Research Institute (EPRI) on what they have determined so far, and a broader discussion on equipment and system failures leading to blackouts. Depending on availability of accessible information, we will be preparing an overview report to share with industry.

United Kingdom power outage

Another significant power system event we are following is the major loss of power on 9 August 2019 in the United Kingdom which impacted over 1 million customers. As with the other events, we will be preparing an overview report to share with industry.

10 Performance metrics

The following dashboard shows system operator performance against the performance metrics for the financial year to date as required by SOSPA 12.3 (a).

Those metrics with a weighting will be used in the calculation of the system operator incentive payment.

		Annual Target	Actual to date	Weighting
Our customers are informed and satisfied				
Annual participant survey result		81%	Not currently available	5
Annual participant survey result response rate - First tier stakeholders		80%	Not currently available	
On-time special event preliminary reports		90% ≤ 10 business days	No projects to date	5
Future thinking and insights	Future thinking report	≥ 1	0	5
	Publicly available market insights	≥ 8	13	5
Quality of written reports		100% of standard	100%	
We maintain Code compliance and meet our SOSPA obligations				
Market breaches remain below threshold		≤ 3 @ ≥ $40k	0	10
Breaches creating a security risk - below threshold/within acceptable range		≤3	0	10
On-time Code and SOSPA deliverables		100% (54)	100%	10
We deliver projects successfully				
Improved project delivery	Service Maintenance projects	≥ 60% on time	0%	
		≥ 60% on budget	100%	
	Market Design and Service Enhancement projects	≥ 60% on time	0%	
		≥ 60% on budget	100%	
Accurate capital planning		≥ 50%	0 to date	10
We are committed to optimal real time operation				
Sustained infeasibility resolution		80% ≤ 10am or equiv	90%	5
High spring washer resolution		80% ≤ 10am or equiv	0 to date	
Our tools are fit for purpose				
Capability functional fit assessment score		75.00%	Not currently available	
Technical quality assessment score		65.00%	Not currently available	
Sustained SCADA availability		99.90%	99.99%	10
Maintained timeliness of schedule publication		99.00%	99.99%	10

11 Cost-of-services reporting

The feasibility study into implementing annual cost-of-services reporting to the Authority is required in financial year 2 (SOSPA 12.6). This was completed in September 2017.

We will provide the Authority with a draft report on the cost-of-services for financial year 3 (2018/19) in mid-November, following the publication of Transpower's financial information disclosures.

12 Actions taken

The following table contains a full list of actions taken during Q1 regarding the system operator business plan, statutory objective work plan, participant survey responses and any remedial plan, as required by SOSPA 12.3 (b).

Item of interest	Actions taken

(i) To give effect to the **system operator business plan**:	• We are considering options for changes to POCP to enable greater information disclosure by energy market participants. Our first meeting for the POCP review will be held on 11 October.
	• We delivered the final version of our Security of Supply strategy to the Electricity Authority in July.
	• In supporting market development initiatives, we have:
	  • Started the capital phase of the RTP project this quarter.
	  • Successfully commissioned the DSE project dispatch interfaces into the market system and are aiming to transition the first participant to the new interfaces from October.

(ii) To comply with the **statutory objective work plan**:	• We have been consulting with Authority staff in order to develop interim measures for efficient energy market operation (optimal dispatch) and efficient reserves procurement (reserve management objective). This is the first stage of developing metrics for the next financial year; the work to date will be presented to the Authority at the November SOC meeting. • As part of the Security of Supply strategy, we delivered a draft version of our strategic vision for the security of supply function to provide the appropriate investment signals in a changing mix of generation sources.
(iii) In response to participant responses to any **participant survey**:	**Area of growth identified in the June 2019 survey** • *Regular meetings required and education program*: we continue to hold regular meetings such as the asset owner forum and have started the capital phase for an Operations customer portal which aims to make information more easily accessible.
(iv) To comply with any **remedial plan** agreed by the parties under SOSPA 14.1	N/A – No remedial plan in place.

System performance

13 Security of supply

National storage decreased during the quarter, as there have been no significant inflow events since June. This is expected at this time of the year.

During July, although South Island storage levels dropped during the month, storage was 118 per cent of average for the time of year. This underpinned the high levels of hydro generation seen throughout the month. By September, South Island storage was 88 per cent of average with Hawea and Tekapo lake levels well below average.

Despite the deterioration in storage levels, security of supply risk remains low for two reasons: demand is reducing as summer approaches and we anticipate high inflows in the South Island to start from November. Snow pack is healthy at 112 per cent of average which typically starts to release in November.

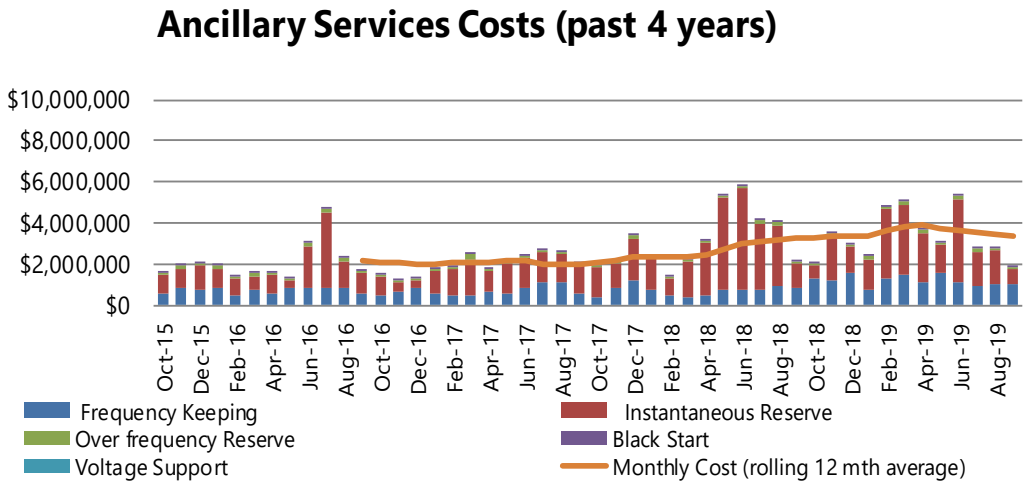
Security of Supply Forecasting and Information Policy (SoSFIP)
The new version of the SoSFIP came into effect on 1 August 2019. The policy relates to the operational management of security of supply and the key change is the inclusion of contingent storage for risk analysis. We hosted an industry workshop on 4 July to discuss and explain the changes to the SoSFIP which was well received by industry participants.

Security of Supply strategy
We delivered a draft of our security of supply strategy to the Authority in July. The Authority provided feedback which we will incorporate before providing a final version.

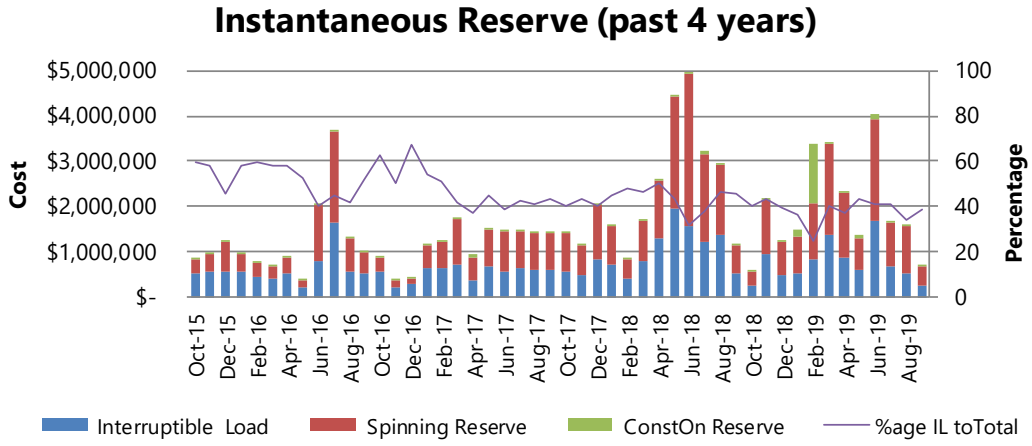
We continue to make good progress on the actions in this strategy, including making improvements to the security of supply webpages and our weekly reporting, plus carrying out a review of our rolling outage procedures in an emergency supply situation.

Thermal fuel supply disruptions
In September, we published updated ‘thermal fuel supply disruptions’ scenarios, as Electricity Risk Curves (ERCs) and Simulated Storage Trajectory (SST) scenarios. These assess the impact of thermal fuel limitations on security of supply. The scenarios, that include both short-term high impact restrictions (such as a gas pipeline outage) and a longer more sustained restriction, show the system can manage through thermal fuel limitations. The risk increases in these scenarios, but there are no near-term (2019/20 year) concerns for security of supply.

14 Ancillary services

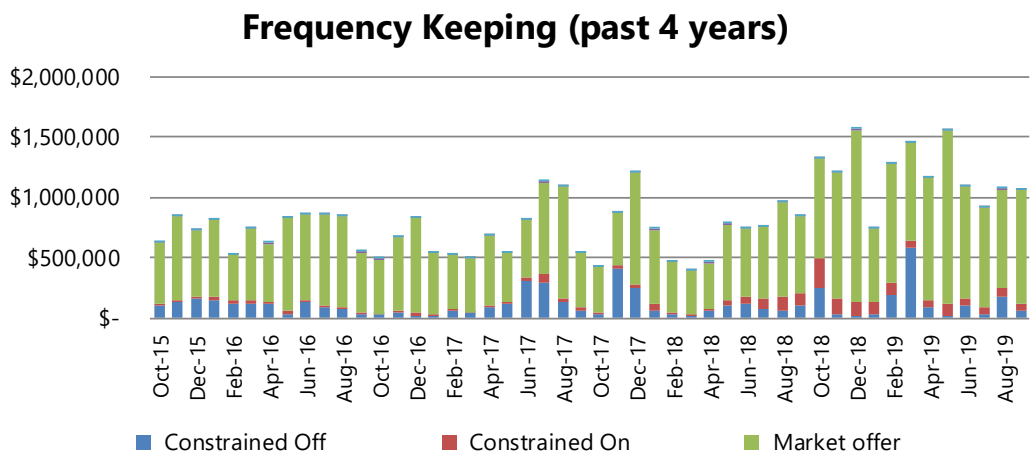


The monthly overall ancillary service costs have reduced significantly since June when there were high instantaneous reserves costs. This quarter the costs were on average $2.54 million per month, compared to $5.36 million in June.



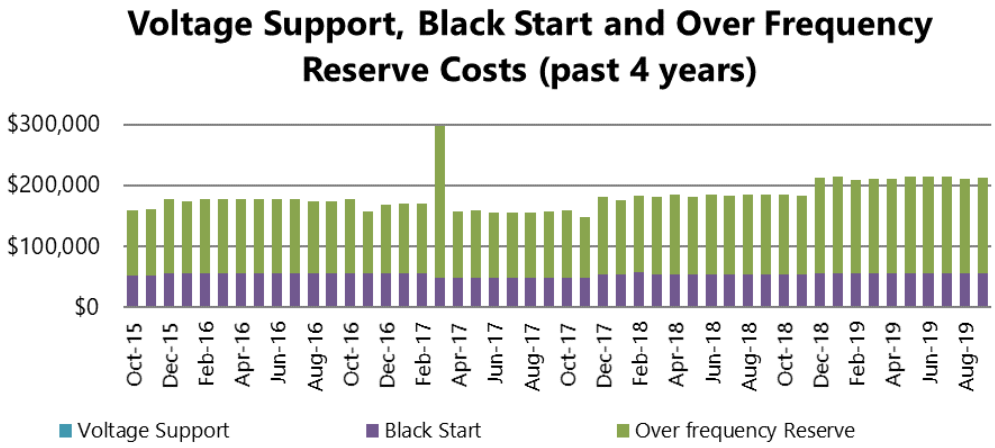
Instantaneous Reserve costs have decreased since June.

On 5 August, the price of instantaneous reserves (both fast and sustained) rose above $200/MWh compared to the more typical prices of less than $10/MWh. This situation was driven by the highest peak load of the year pushing energy and reserve prices up; at 10am when the reserve supply was tight, coupled with high energy prices ($545/MWh), the sustained instantaneous reserves price cleared at $348/MWh.



Frequency costs have risen since mid-2018 as a reflection of increased energy offers following the gas outages.

The variation in the frequency keeping costs this quarter reflects changes in the constrained-off costs. The details of these changes are in section 14.1 of this report.



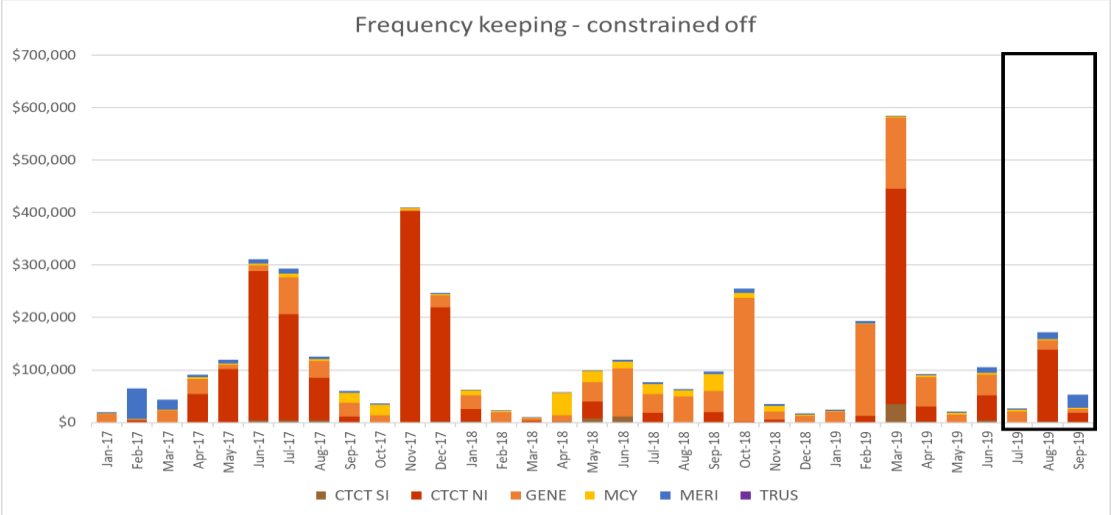
The Black Start costs and Over Frequency Reserve costs tend to remain fixed at the contracted value of $56k and $159k respectively. However, in August, the availability fee paid for Over Frequency Reserves was lower as one of the contracted units was unavailable.

There are currently no Voltage Support costs.

14.1 Constrained on/off costs

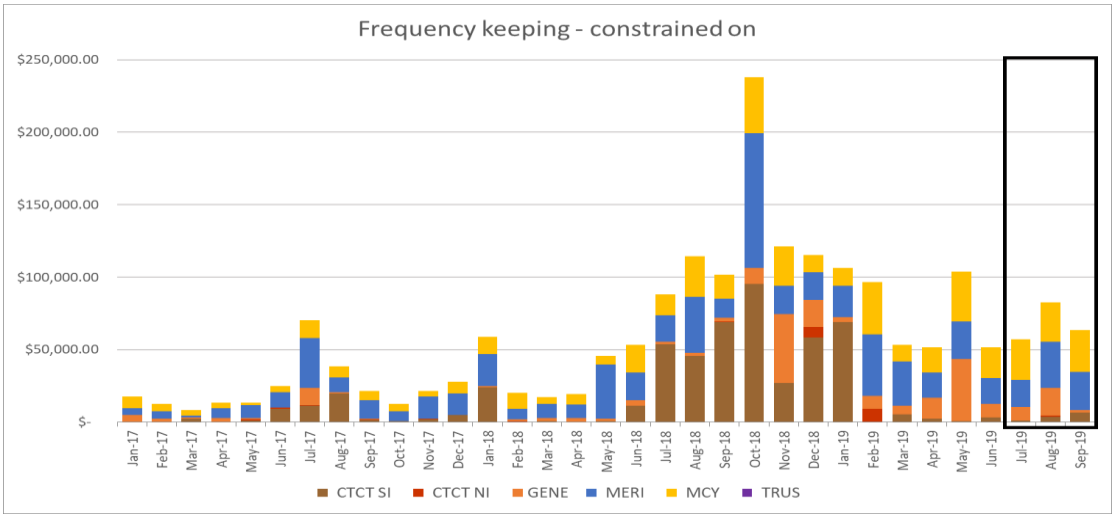
Note: Where there is a high payment, as opposed to in increasing/decreasing trend, it will often relate to payments over a small number of trading periods.

Frequency Keeping



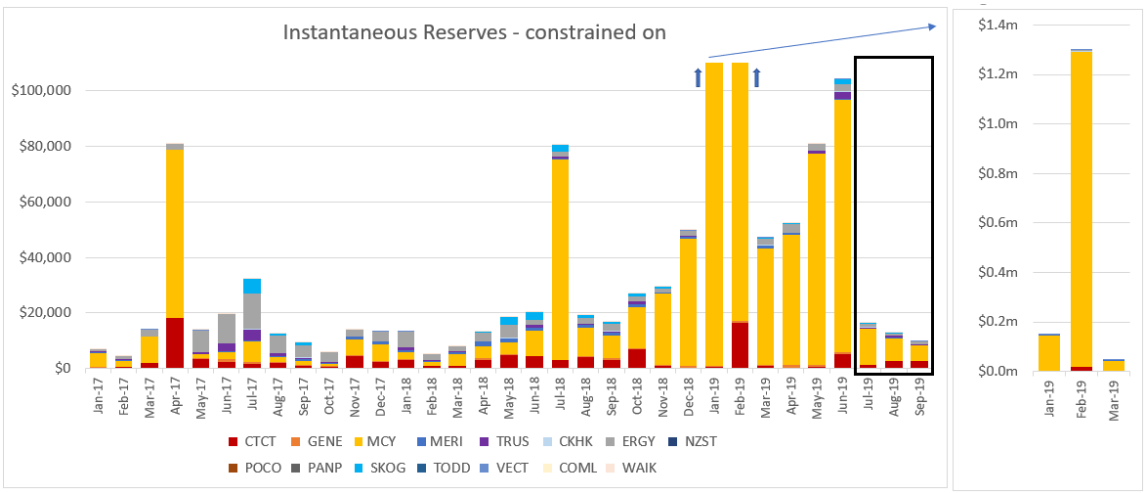
The increase in Frequency Keeping constrained-off costs in August were due to payments to Contact Energy for Stratford, totalling $137,130.

The two highest payments for trading periods, totalling $16,000, were for trading periods 41 and 42 on 18 August, when the Stratford plant was constrained down as it was offering energy close to the top of its capacity. As the cleared energy price was much higher than the Stratford offer price, the calculated constrained off costs were high.



Constrained-on costs for frequency keeping were higher in August than in the other two months this quarter. The highest payment was for trading period 48 on 29 August when a binding ramp rate for Huntly unit 4 resulted in high price generation being constrained on, despite cheaper generation being available.

Instantaneous Reserves



The constrained-on costs for Instantaneous Reserves are much lower this quarter.

Note: The graph shows the costs for the January to March 2019 on a different axis as they are considerably higher than constrained on amounts for instantaneous reserves for any other period. This was a data issue and the Clearing Manager is currently reprocessing this period. The changes in the amounts will be reflected in subsequent invoices.

15 Commissioning and Testing

Windfarm connection activity increase

We are actively dealing with connection applications for multiple windfarms. We are in discussions with Tilt (Waipipi) and Mercury (Turitea) on generation asset information for their new windfarms.

Solar farm connection

We are engaging with the designer for the Maranga Ra Solar Farm to work through compliance with the Code asset owner performance obligations.

Other commissioning

We are continuing to work on commissioning activities for the gas turbines at Junction Road, and the expansion of the geothermal station at Ngawha.

The Junction Road gas turbine generating station (104 MW), being commissioned near Carrington Street substation in New Plymouth (NPL), cannot begin generation until NPL T8 is decommissioned as part of the Taranaki project works needed to exit NPL substation. Any delays could impact on generator commissioning which is currently scheduled to inject power into the grid early February 2020.

The new Ngawha unit (37 MW geothermal), being commissioned close to Kaikohe (KOE), may now be distribution connected as the asset transfer of KOE bus back to Transpower is no longer proceeding. This may change some responsibilities

associated with the commissioning from Transpower back to Top Energy which will need to be worked through.

Distribution connected generation

We are being regularly approached in regard to smaller distribution connected generation for commissioning support, some at short notice with commissioning only months away. In one case a generator was found to have connected to the power system without providing a notice of intention to connect. Providing no formal notice is a breach of the Code and has been raised with the offending asset owner, who has agreed to self-breach. We are working retrospectively with the asset owner to obtain asset information and determine any obligations they might have.

Black start testing

We worked with Meridian to complete the Aviemore black start test on 17 August. This included successful demonstration of the remote synchronisation functionality. The next black start test will be Contact's Clyde station in October.

16 Operational and system events

July

HVDC Oscillations

There was a three-hour outage on 1 July to replace secondary systems associated with Pole 2 voltage measuring equipment. This was a response to an issue identified in May causing oscillations on the grid. Further oscillations were detected following this initial outage and a second outage of 12-hours occurred on 27 July to replace the entire voltage measurement device which has appeared to resolve the issue. As system operator, we have been monitoring this situation for three months. If nothing further is observed before 27 October, we will close this issue and write a summary report.

August

Short HVDC Pole 2 outage

There was a short HVDC Pole 2 outage during the early hours of 2 August due to an issue with the water cooling system. We issued a customer advice notice (CAN).

Silverdale transformer removed from service

A grid emergency notice (GEN) was issued on 5 August to enable a Silverdale transformer (T1) to be removed from service due to loading issues (particularly cold weather coupled with a load shift from Albany). Silverdale load was initially picked up by a second Silverdale transformer (T2) until a temporary replacement was installed while the normal transformer undergoes repair.

Low residual situations

We issued our first two CANs on low residual situations in August, both for Monday morning peaks. We introduced these notifications to improve information to the market following our experiences during the November 2018 HVDC outages. We closely monitored actual loads and intermittent generation (particularly wind). Whilst prices were high (around $650/MWh at peak for the first instance), in real time

normal reserve requirements were able to be met, due in part to participant response to the CAN.

September

Dunedin fire

The system operator team collaborated with Transpower as grid owner to minimise risk around a large fire on Flagstaff hill near our Halfway Bush and Three Mile Hill substations. This included recall of a planned outage of the South Dunedin–Three Mile Hill circuit.

Multiple Frequency Keeper (MFK) application

On 12 September, there was a fault with the way the MFK application received dispatch instructionsfrom the market system. This was raised as a priority 1 job for immediate response. While this was being addressed, the energy coordinators manually entered the dispatch values for a period of 5hrs - at worst every 5 mins due to ramping plant. A temporary solution is currently in place to generate dispatch IDs for the MFK application. A permanent fix is scheduled for late-October.

Maraetai bus risk classification

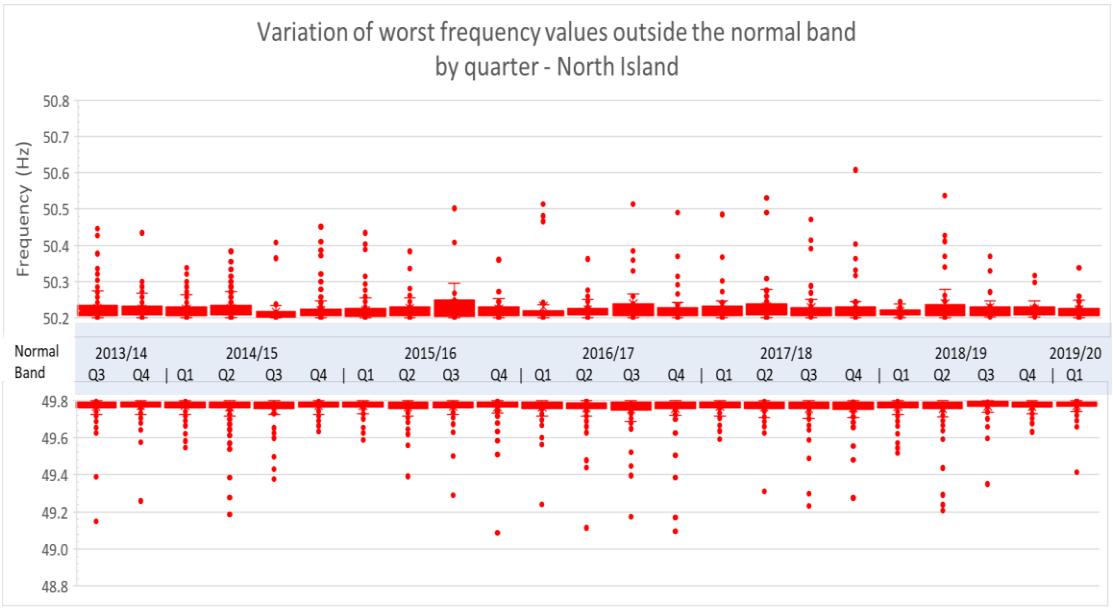
We informed participants of a change in the risk classification of the Maraetai (MTI) bus during this year's bird nesting season. The risk has reduced this season after completion of work at MTI by the grid owner, with generation on a single bus setting the size of the risk which maybe up to 180MW. To avoid the procurement of unnecessary reserves by including a fixed 180MW risk in our tools, we will monitor actual generation output and adjust the risk in real-time should MTI become the risk setter. The downside is the forward schedules are not going to give advance warning of this happening, but our analysis shows historically there is a very low likelihood MTI will become the risk setter during the nesting period.

17 Frequency fluctuations

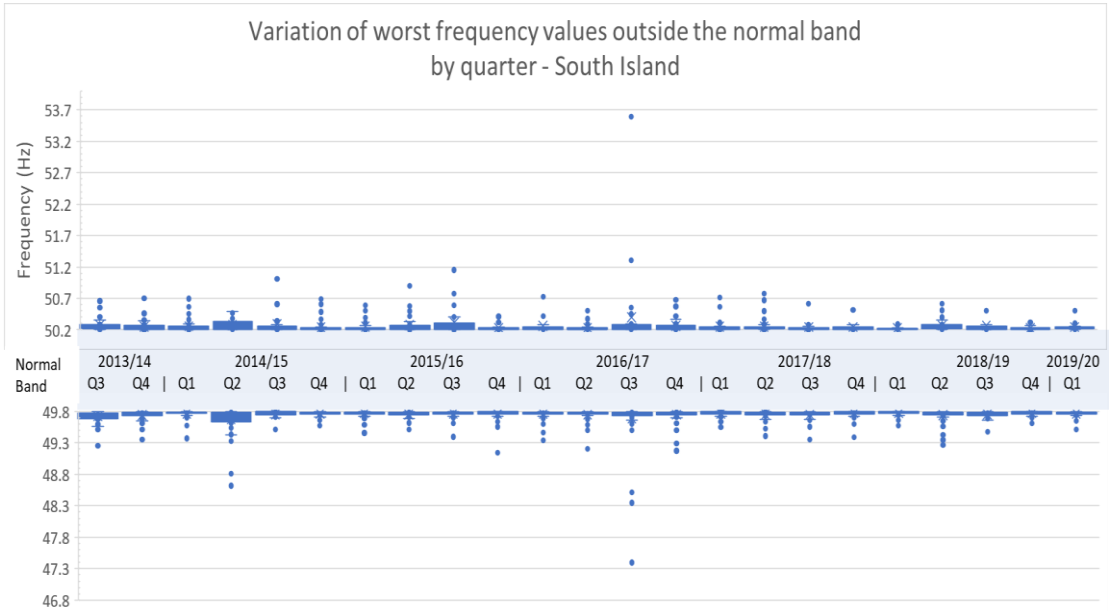
17.1 Maintain frequency in normal band (Frequency value)

The following charts show the distribution of the worst frequency excursion outside the normal band (49.8 to 50.2 Hz) by quarter since July 2014, including the reporting period.

North Island



South Island

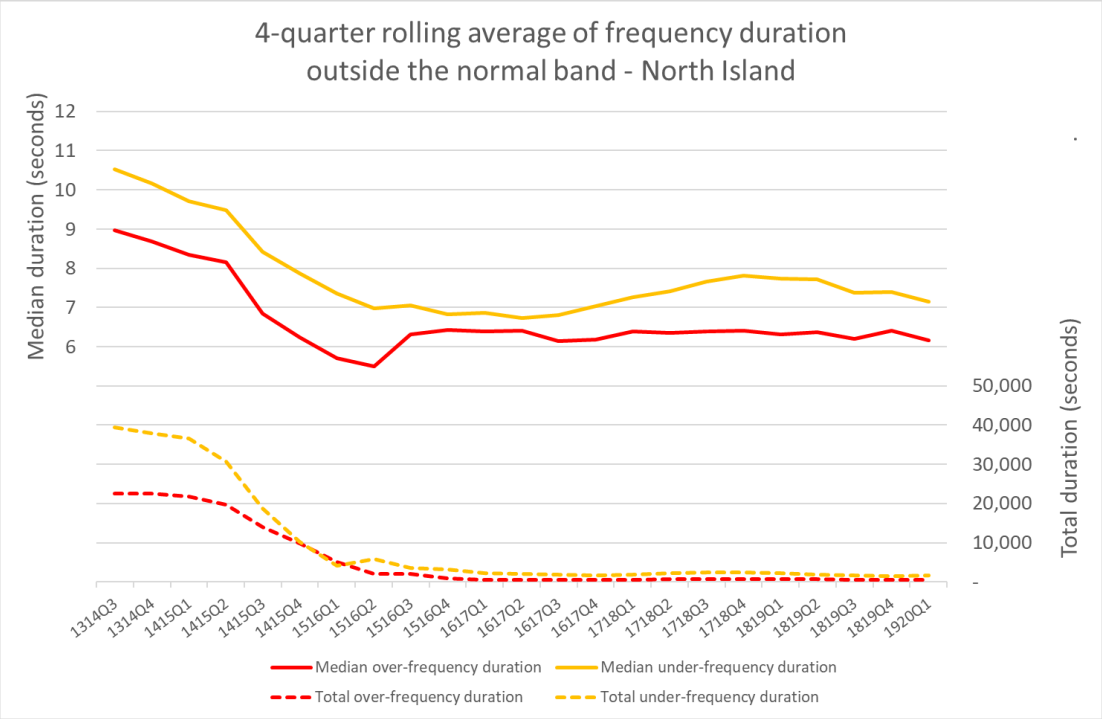


Note: These box and whisker charts show the distribution of data. The “box” represents the distribution of the middle 50% of the data, the “whiskers” indicate variability, and outliers are shown as single data points.

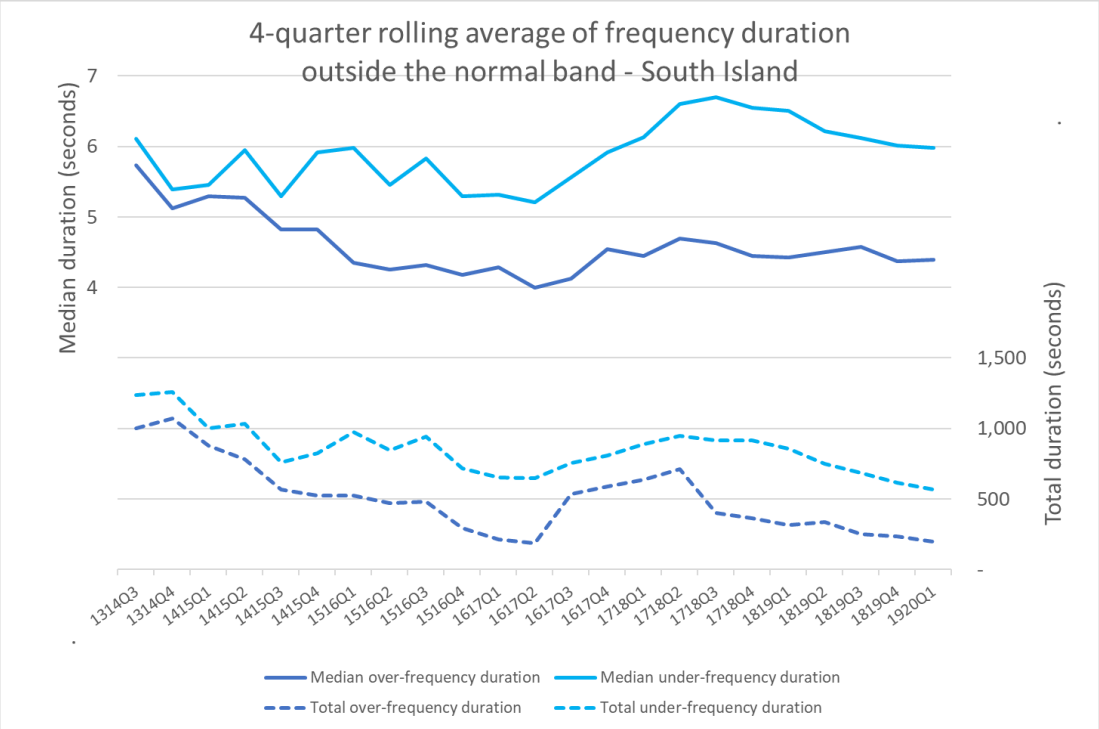
17.2 Recover quickly from a fluctuation (Time)

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



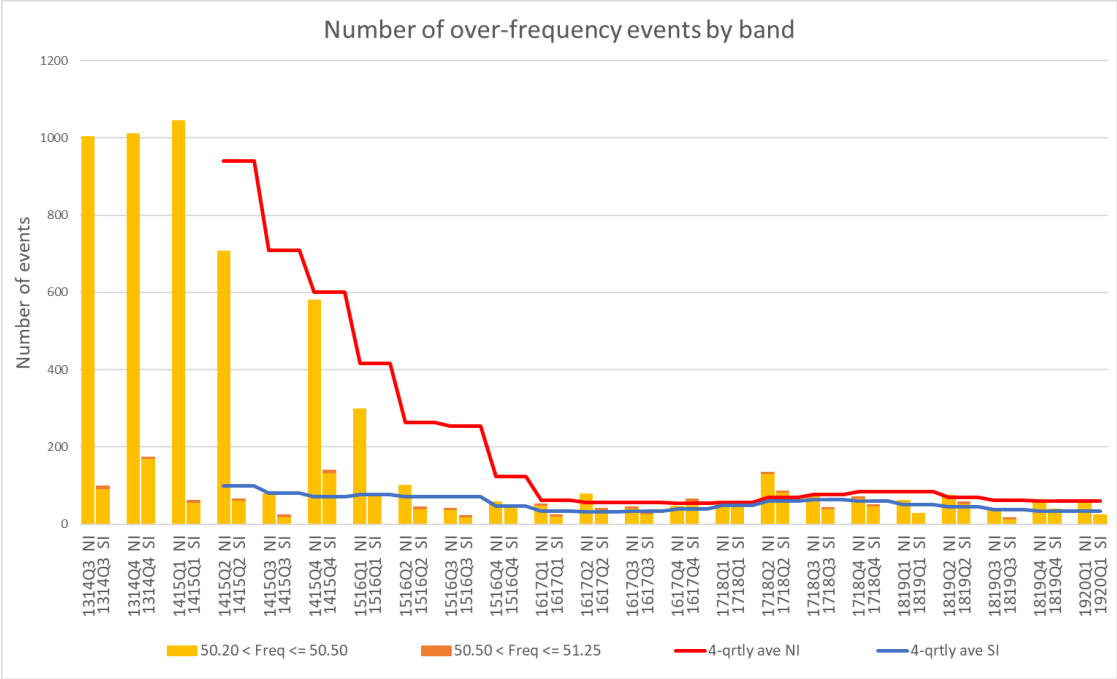
South Island



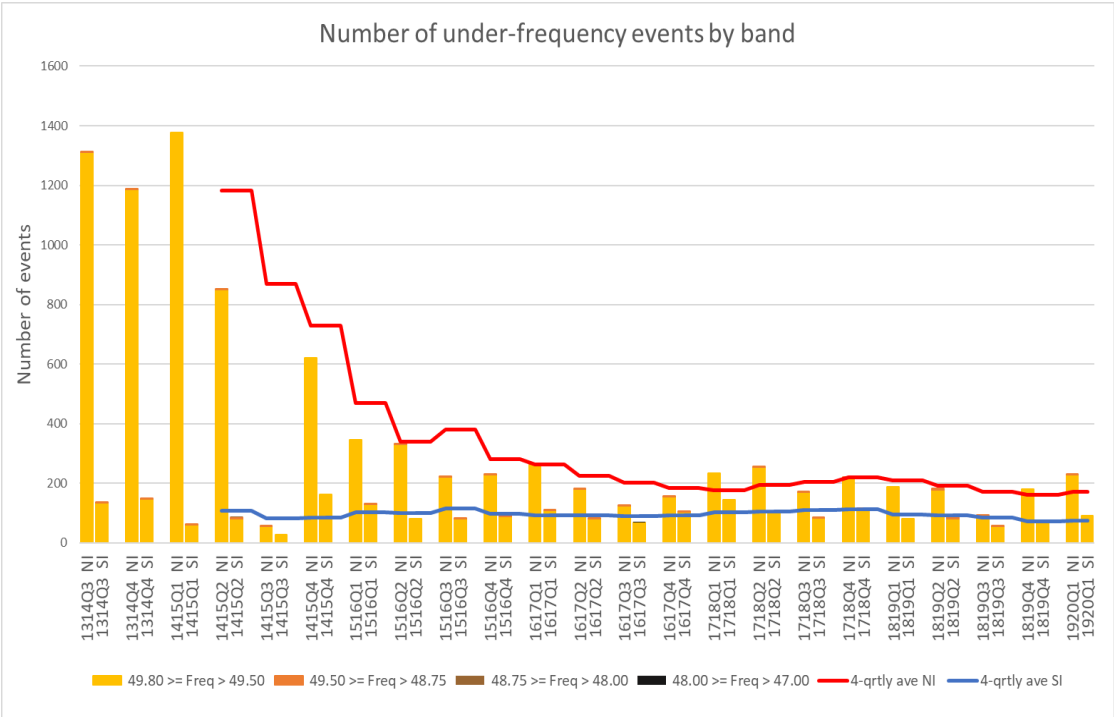
17.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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



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

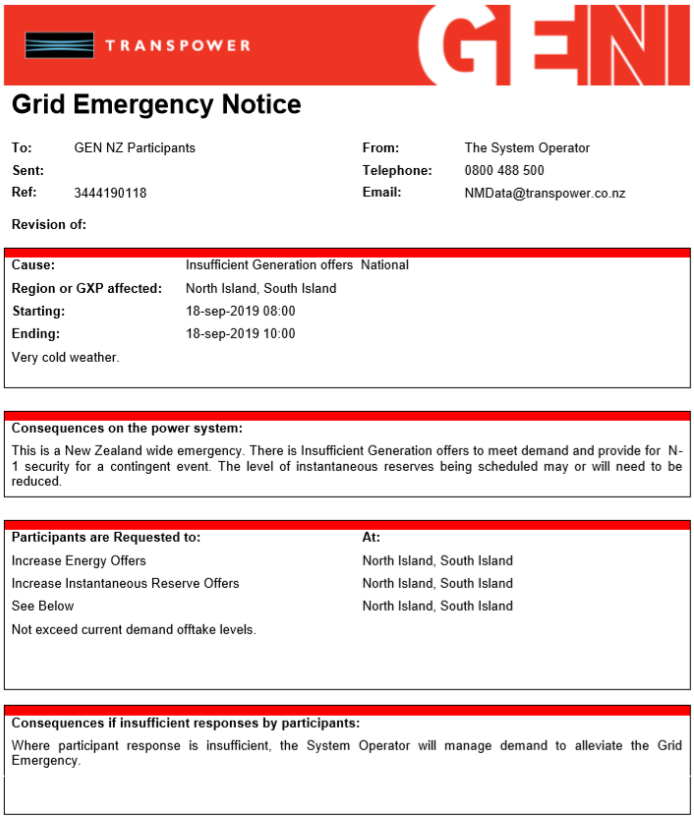
Grid voltages did not exceed the Code voltage ranges during the reporting period.

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	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	July-19	Aug-19	Sep-19
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	-	-	-	-	1	-	-	-	-	1	-
Warning Notice	-	1	-	-	-	-	-	-	1	-	-	-
Customer Advice Notice	6	20	20	16	6	7	4	8	17	9	14	6

We have recently updated our notices. Each notice type is now colour coded which has a clearer call-to-action for recipients. We have also standardised the wording used in the notices. An example of the new GEN is shown below:



TRANSPOWER GEN

Grid Emergency Notice

To: GEN NZ Participants
Sent:
Ref: 3444190118
Revision of:

From: The System Operator
Telephone: 0800 488 500
Email: NMData@transpower.co.nz

Cause: Insufficient Generation offers National
Region or GXP affected: North Island, South Island
Starting: 18-sep-2019 08:00
Ending: 18-sep-2019 10:00
Very cold weather.

Consequences on the power system:
This is a New Zealand wide emergency. There is Insufficient Generation offers to meet demand and provide for N-1 security for a contingent event. The level of instantaneous reserves being scheduled may or will need to be reduced.

Participants are Requested to:	At:
Increase Energy Offers	North Island, South Island
Increase Instantaneous Reserve Offers	North Island, South Island
See Below	North Island, South Island

Not exceed current demand offtake levels.

Consequences if insufficient responses by participants:
Where participant response is insufficient, the System Operator will manage demand to alleviate the Grid Emergency.

This notice is issued in accordance with Technical Code B - Emergencies, Schedule 8.3, Part 8

20 Grid emergencies

The following table shows grid emergencies declared by Transpower as system operator from July to September 2019.

Date	Time	Summary Details	Island
Jul-19		None	
Aug-19	18:05	5 August: A grid emergency was declared to reconfigure the grid to allow Silverdale Supply Transformer T1 and 220 kV Albany-Silverdale Circuit 1 to be removed from service. This was done in order to manage the potential for Silverdale T1 to be overloaded following a tripping of 220 kV Albany-Silverdale Circuit 2.	North
Sep-19		None	

Appendix A: Discretion

July

Event Date & Time	Event Description
18-Jul-2019 02:30:53	NAP2201 NAP0: Due to a tripping of NAP. Last Dispatched MW: 134
18-Jul-2019 10:38:06	MAN2201 MAN0: Return of an extended potline 1. Last Dispatched MW: 666
22-Jul-2019 14:30:38	MAN2201 MAN0: Extended potline process. Last Dispatched MW: 738
30-Jul-2019 08:13:12	ARG1101 BRR0: Due to a tripping of BLN_KIK_1. Last Dispatched MW: 11.5
30-Jul-2019 08:29:04	ARG1101 BRR0: Due to a tripping of BLN_KIK_1; an offer change was received. Last Dispatched MW: 0
30-Jul-2019 10:52:36	MAN2201 MAN0: Extended potline Line 2 restoration. Last Dispatched MW: 666
31-Jul-2019 07:26:00	COL0661 COL0: Limited generation due to West Coast tripping. Last Dispatched MW: 12

August

Event Date & Time	Event Description
07-Aug-2019 10:07:28	HWA1101 PTA3: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 09:44:42	HWA1101 PTA1: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 09:44:51	HWA1101 PTA2: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 09:44:58	HWA1101 PTA3: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 10:01:39	HWA1101 PTA1: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 10:01:50	HWA1101 PTA2: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 10:01:59	HWA1101 PTA3: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 0
08-Aug-2019 10:43:17	HWA1101 PTA1: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 11
08-Aug-2019 10:43:23	HWA1101 PTA2: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 11
08-Aug-2019 10:43:27	HWA1101 PTA3: Required for HWA_WVY split closed for voltage support Last Dispatched MW: 11
27-Aug-2019 06:57:47	WHI2201 WHI0: Morning ramp up, keep unit sync'd. Last Dispatched Mw: 25

Event Date & Time	Event Description
27-Aug-2019 07:02:42	WHI2201 WHI0: Morning ramp up, keeping unit sync'd Last Dispatched Mw: 25. Constrained on for 1 dispatch only at 07:04, after which it was assessed WHI was not required after all, Discretion ended at 07:06, WHI dispatched off at 07:08.
28-Aug-2019 06:58:04	ARG1101 BRR0: To allow switching of ARG_BLN_1 Last Dispatched MW: 11
28-Aug-2019 12:56:14	ARG1101 BRR0: To allow for the return switching of ARG-BLN-1 Last Dispatched MW: 11

September

Event Date and Time	Description
23-Sep-2019 13:58:34	MAN2201 MAN0: Extended Potline return 47MW. Last Dispatched Mw: 333
25-Sep-2019 13:04:02	BWK1101 WPI0: High VSAT (Voltage Situational Awareness Tool) for Grid Zone 14 loss of Manapouri G1. Last Dispatched Mw: 0