QUARTERLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited
July to September 2018

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 (July to September) 2018, 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 regards 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 highlights successful management of significant events and operational issues by the system operator. It provides additional commentary (not Code or SOSPA required) relating to aspects of system operator performance or system performance. The remainder of the report provides supporting detail (which is Code or SOSPA required) in two sections:

- System operator performance, and
- System performance.

Conflict of Interest – We received a final report from Advisian following their review of our role impartiality policies and procedures. The report will be presented at the next System Operator Committee meeting in November by Fraser Clark from Advisian. We have started the work to address recommendations from the report. Our plan is to complete these by March 2019.

SOSPA deliverables – We submitted all the required SOSPA deliverables for 2017/18 as planned on 31 August. This included the SO Self Review and Assessment report 2017/18, the draft capital plan (for the 2-year period 2019/20 – 2020/21), the draft capital roadmap (for the 2-year period 2021/22 and 2022/23), and the SO ICT Strategic Roadmap (from 2018/19 to 2028/29). In addition, we met with the Authority to present the strategic roadmap to talk through the content and enable familiarisation of the plan.

Security of supply – We have received broad industry support for proposed changes to the treatment of thermal fuel limitations in the Hydro Risk Curves. We intend to consult on our review of the Security of Supply Forecasting and Information Policy (SOSFIP) with a proposal to include contingent storage in the HRCs. This consultation will be in parallel with the Authority's OCC trigger work and will take place in November.

Dry Summer - We published our Lower South Island Dry Summer System Security report, which identifies the limitations within the Southland area and possible actions that could be taken to mitigate the impacts of a dry summer.

Credible events - Our Power Systems Group have performed stability studies for the lower South Island, and the issues identified are now being put through our credible event review methodology to determine if they should be mitigated pre or post event.

Emerging technologies programme: Battery Storage Investigation – The final draft of the technical report is currently being prepared for release externally. The intention is to publish the report in November 2018.

Real Time Pricing (RTP) - The next Technical Advisory Services work has started. This work includes the completion of the market design components and providing support to the Authority for the secondary consultation on an option to implement a real-time pricing mechanism.

People news - Sally Holloway, Grid and SO Manager, started with us on 13 August.

System operator performance

1 Compliance

July

We published the report into the events of 2 March 2017 and have accepted five of the twelve breaches alleged by the Authority surrounding these events. One of the accepted breaches is against our principal performance obligations.

August

We reported one breach of the Electricity Industry Participation Code 2010 in August. This related to the modelling of embedded generation at Cobb.

On 27 August we attended an Authority breach settlement meeting to address industry issues arising from the South Island AUFLS event of 2 March 2017. This meeting was attended by Meridian Energy, Contact Energy, Transpower (both as system operator and grid owner).

September

We reported one breach in September. This breach relates to the incorrect application of a constraint on McKee generation during a short notice outage. The error was quickly identified preventing system impact and use of the pricing error mechanism prevented any market impact to participants.

Appendix A shows instances where the system operator has applied discretion under 13.70 of the Code.

2 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.

Efficient Procurement of Extended Reserves
The project team has continued to support the Authority in preparation for their Board Meeting on 3 October. The work involves progressing an option to enable Transpower to develop a revised selection methodology. This action requires the approval of the Authority Board. The project team is currently awaiting the Authority Board decision on the next steps of the Extended Reserves Programme.

Real Time Pricing (RTP)
The next Technical Advisory Services work has started. This work includes the completion of the market design components and providing support to the Authority for the secondary consultation on an option to implement a real-time pricing mechanism.

Dispatch Service Enhancement

The detailed design and transition process planning is continuing. The test team has started test-scripting based on the requirements and detailed design. The team is planning for the next industry workshop in November. Participant technical integration documentation is being completed, which will be shared with participants prior to the workshop in November.

Wind Offer Arrangements
The delivery business case has been completed and reviewed. The Authority requires Board approval to start the Wind Generation Offers project. This is expected to be approved at the Authority November Board meeting. The project is expected to start in early November.

3 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).

Our customers are informed and satisfied		Annual Target	Actual to Date
Improved annual participant survey result		80%	Not currently available
Improved annual participant survey result response rate		25%	Not currently available
On-time special event preliminary reports		90% ≤ 10 business days	No projects to date
Industry leadership and insights	Edge technology report	≥ 1	0
	Publicly available market insights	≥ 8	3

We maintain Code compliance and meet our SOSPA obligations		
Market breaches remain below threshold	≤ 3 @ ≥ $45k	0
Breaches creating a security risk remain below threshold/within acceptable range	≤3	0
On-time Code and SOSPA deliverables	100%	100%

We deliver projects successfully			
Improved project delivery	Service Maintenance projects	≥ 60% achieved for approved time/budget	None completed
	Market Design and Service Enhancement projects	≥ 60% achieved for approved time/budget	50%
Accurate capital planning		≥ 50%	None completed

We are committed to optimal real time operation		
Sustained infeasibility resolution	100% ≤ 2 business days	100%
	80% ≤ 1 business day	100%
High spring washer resolution	100% ≤ Code obligations	100%
	80% ≤ 1 business day	100%

Our tools are fit for purpose		
Improved capability functional fit assessment score	74.74%	Not currently available
Improved technical quality assessment score	50.60%	Not currently available
Sustained SCADA availability	99.90%	99.95%
Maintained timeliness of schedule publication	99%	100%

4 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**:	• Developed the first cut of an integration plan for system operations and grid real time operations for the Transpower efficiency programme; identifying technology, process and people changes over the next five years. • Developed a draft outage planning policy to be consulted on within the next quarter. • Scoped actions for expanding and strengthening provision of security of supply information • Provided a TAS report to assist the Authority to progress incorporation of battery energy storage systems into the wholesale energy markets • Reviewed the Security of Supply Forecasting and Information Policy, including treatment of contingent storage. • Engaged an external third part to review our processes for ensuring impartiality between Transpower's grid owner and system operator roles • Scoped the options for improving the design and use of the market system for the management of large-scale system events • Progressed actions resulting from the review of the 2 March 2017 system event.
(ii) To comply with the **statutory objective work plan**:	**Review of the Security of Supply Forecasting and Information Policy (SOSFIP)** • Completed the review and will go out for consultation in November.
(iii) In response to participant responses to any **participant survey**:	Considered options for addressing the two areas of growth identified in the May 2018 survey - communications around operations, and promotion and growth of education and information provision.
(iv) To comply with any **remedial plan** agreed by the parties under SOSPA 14.1	N/A – No remedial plan in place.

5 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 and a proposed approach submitted to the Authority.

6 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 76 – RTP Complete Develop Solution Approach	Closed	54.00
TAS SOW 77 – Review Governor Response changes that have occurred to the normal frequency management	Closed	4.00
TAS SOW 79 – Efficient Procurement of Extended Reserve: Technical Requirements Schedule Review Expanded Scope and other support	In progress	235.50
TAS SOW 81 – Wind Offer Arrangements	In progress	981.25
TAS SOW 82 – Real Time Pricing	In progress	297.50
Total hours		**1572.25**

7 Separation of Transpower roles

Since the creation of the Operations division and implementation of Transpower-wide training on role impartiality and conflict of interest, we have had a number of issues raised to the register. These issues are being handled in accordance with Transpower's policy for managing conflicts of interest. A summary of the open items raised on the conflict of interest register is set out below:

- System operator staff involvement with grid owner project
- Outage planning policy (to be consulted on in November)
- Ensuring consistent information provided for outage information
- Management of actions from role impartiality review
- Confidentiality of participant information

System performance

8 Operational and system events

July

Cold weather later in the second week of the school holidays and into the following week resulted in markedly increased loads, pushing up prices (in one instance, a price of $2,000 was reached for a five-minute period) and reducing generation margins to low levels (during peak periods). An industry warning notice notifying a potential lack of offered generation was issued for a period during the morning peak on 25 July.

A short notice Pole 3 outage, lodged by Transpower as grid owner, for four hours on 21 July was completed 1.5 hours early. The work, to complete bushing repairs at Oteranga Bay, was advised to industry only 3 days before the outage took place (normal notice of HVDC outages is not less than 2 weeks). The grid owner advised the work was urgent and a result of storm damage which, if left untreated, could have resulted in additional and more significant asset damage and the unavailability of Pole 3 for a sustained period.

On 7 July the Hobson-Wairau Rd cable 1 was taken out of service by Transpower as grid owner due to a link box cable sheath joint heating up following water intrusion into the cable duct. The cable was returned to service on the 23 July following testing of the repairs. There was no impact on customers due to the redundancy afforded by the 220kV network around and through the Auckland CBD.

On 2 July both our grid and system operations teams lost visibility of SCADA from 11:58 to around 12:38, and system operations teams also lost visibility to the market system during much of that time. Both applications were running but could not be accessed. Market dispatch continued successfully using the Stand-Alone Dispatch

application; no asset switching was undertaken. The loss of access was triggered by a planned IP network change (as part of a firewall migration initiative) that was completed shortly before the incident. This change unintentionally disconnected access to the Southern Data Centre (SDC). The problem was identified promptly, and the issue resolved quickly. Following the event, the tools have been reviewed and improvements have been identified by Transpower's IT division.

August

On 9 August, a tripping of the Kawerau T12 interconnecting transformer resulted in a 30 per cent overload of the Kawerau T13 interconnectors transformer for approximately 30 minutes. A Grid Emergency Notice (GEN) was declared at Edgecumbe, Kawarau and Matahina. The response by the coordinators was fast with a re-dispatch of generation in the first few minutes. However, the slow ramping capability and the resource consents of the affected generation (Matahina and Kawerau Geothermal) resulted in the T13 transformer overload taking longer than expected to be cleared. These interconnectors have previously been assessed as not justifying treatment as a credible risk under the Policy Statement. However, Transpower as grid owner has expressed concern at the time to reduce the overload given the likelihood of asset damage. The event is under review to identify process and tool improvements to enable post event overloading of these assets to be managed promptly.

In conjunction with inspection and repair work currently to cable terminations part of six circuits and three tie lines at the Otahuhu substation by Transpower as grid owner, Transpower as system operator has initiated an in-depth study of system risk, specifically in Auckland and Northland. We have worked with Transpower as grid owner to establish preferred contingency plans for each of the main risks that have been identified. We have consulted with the industry and advised them of the risks and the impact of the outages. We have also revisited all existing planned outages in the upper North Island to determine the impact on the Otahuhu situation and the subsequent viability of other already planned outages. As a result, we have negotiated changes to the September/October planned grid outages. We are continuing with this work to examine the outages in November including planned generator outages as well as grid outages. At the same time, we are working with Transpower as grid owner to identify opportunities to bring forward other grid maintenance work on the affected circuits needing cable termination repairs the out of service Otahuhu circuits, not currently planned for this year.

September

On 14 October, the Systems Operator Operation Managers hosted an industry forum for Generation Operation Managers from Meridian, Contact Energy, Mercury, Genesis, Trustpower and Nova as well as representatives from the Electricity Authority. The forum was an initiative of our Operations Managers to provide an opportunity to communicate some of the key focus areas that came out 2nd March SI AUFLS event in a positive and proactive manner. The forum was well received, and

we plan to make it a regular event – annually or more frequently if there is sufficient appropriate content for there to be interest.

On 17 September, both Cromwell – Frankton 1 and 2 circuits tripped in succession causing loss of supply to Queenstown during a snow storm. Cognisant of the terrain, conditions, and the high likelihood of the unseasonal snow being the causal event, Transpower as grid owner coordinated a response enabling the assets to be returned to service within eight minutes minimising the impact.

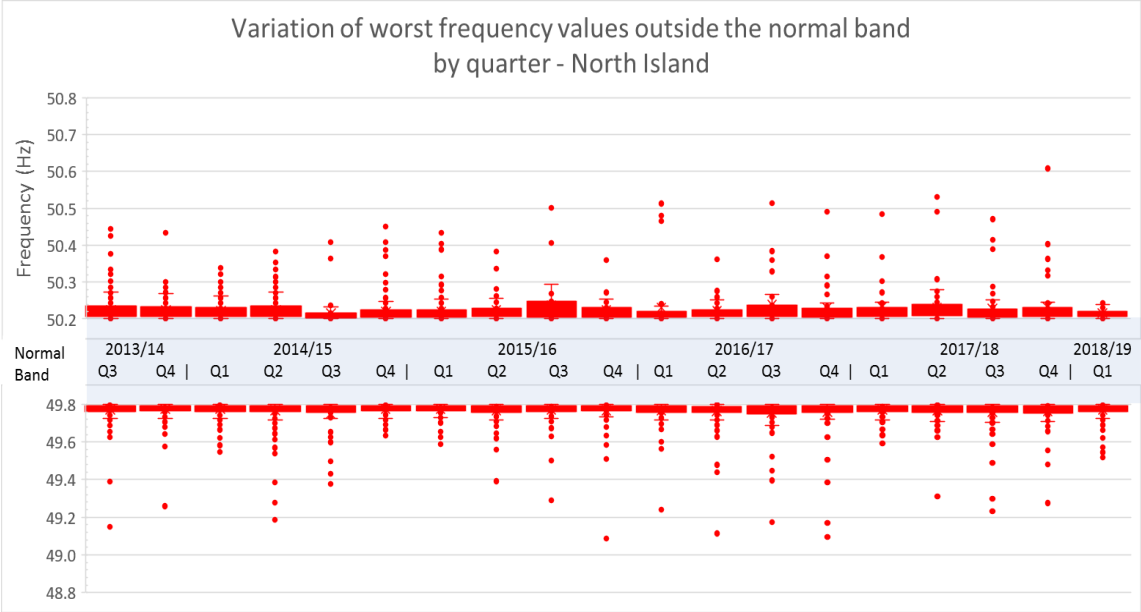
Working with Genesis Energy, the Systems Operation team planned and successfully practiced a black start of the Tokaanu Power Station on Saturday 6 October. A co-ordinator and power systems engineers travelled to the site to be on location over the event to liaise with the control centre throughout the test and evaluate black start performance. Further details will be included in next month's report.

9 Frequency fluctuations

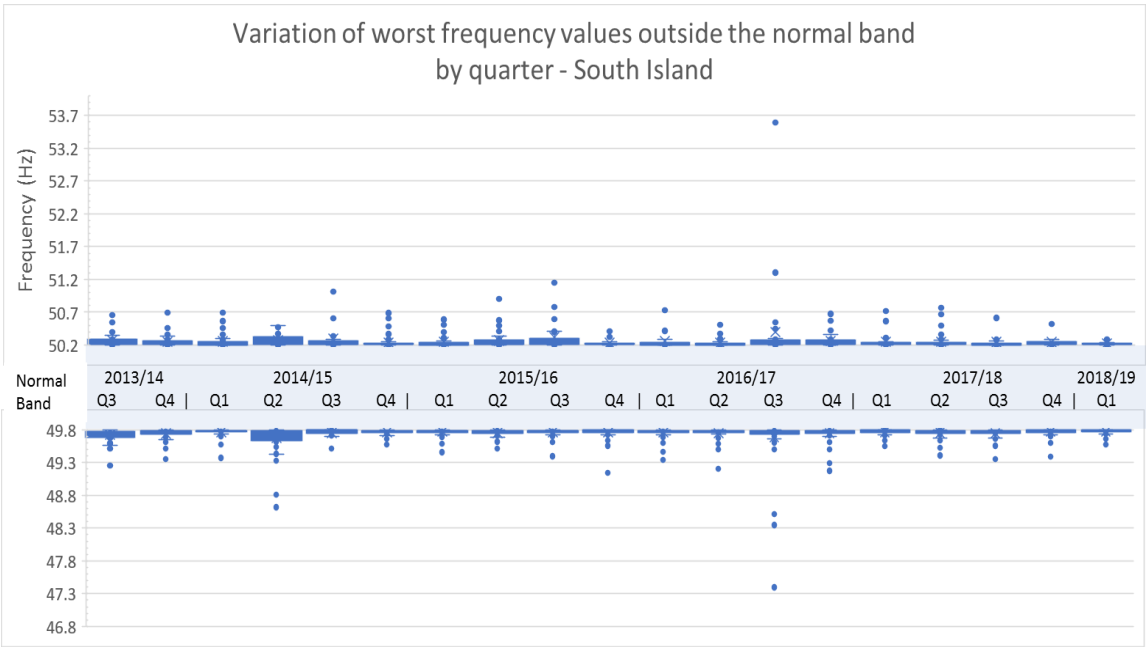
9.1 Maintain frequency in normal band (Frequency value)

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

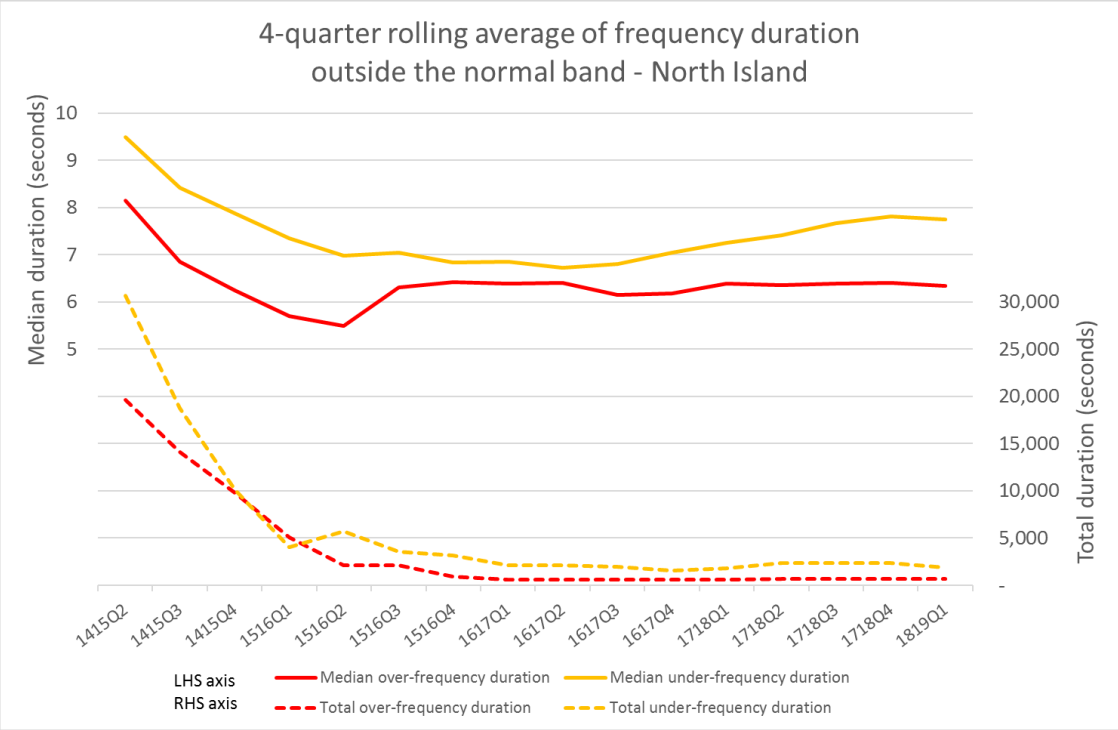


Note: These box and whisker charts show the distribution of data. The “box” represents the distribution of the middle 50% of the data, the “whiskers” indicate variability, and outliers are shown as single data points.

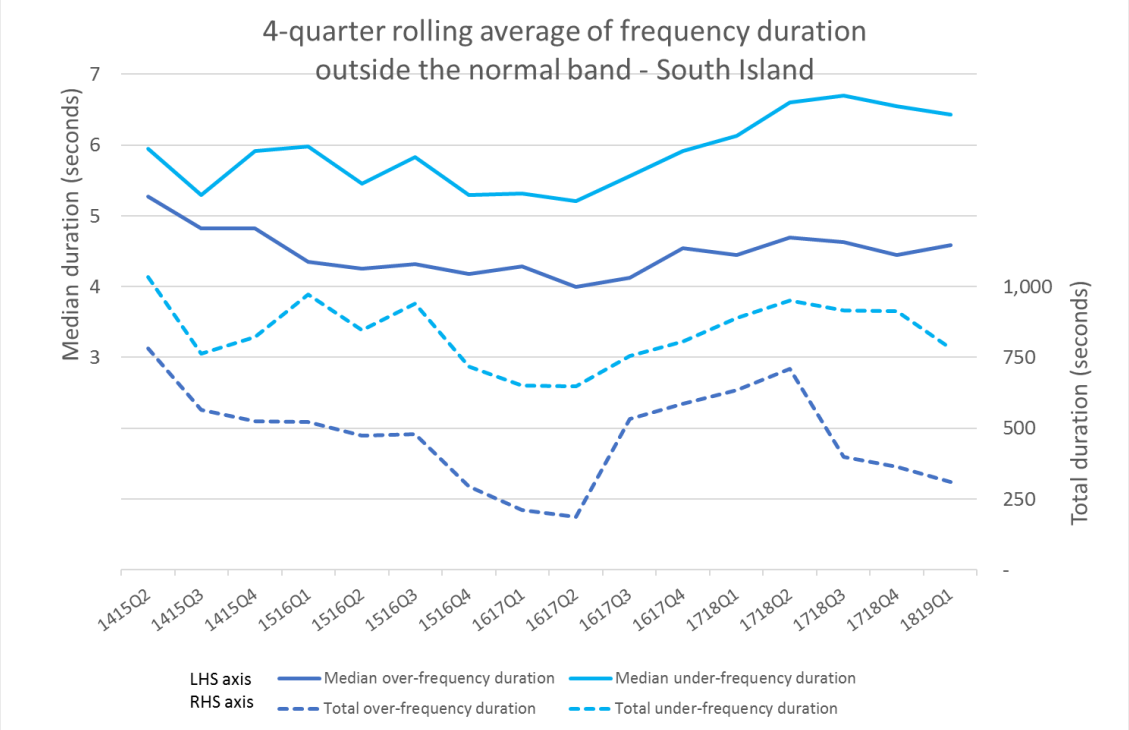
9.2 Recover quickly from a fluctuation (Time)

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



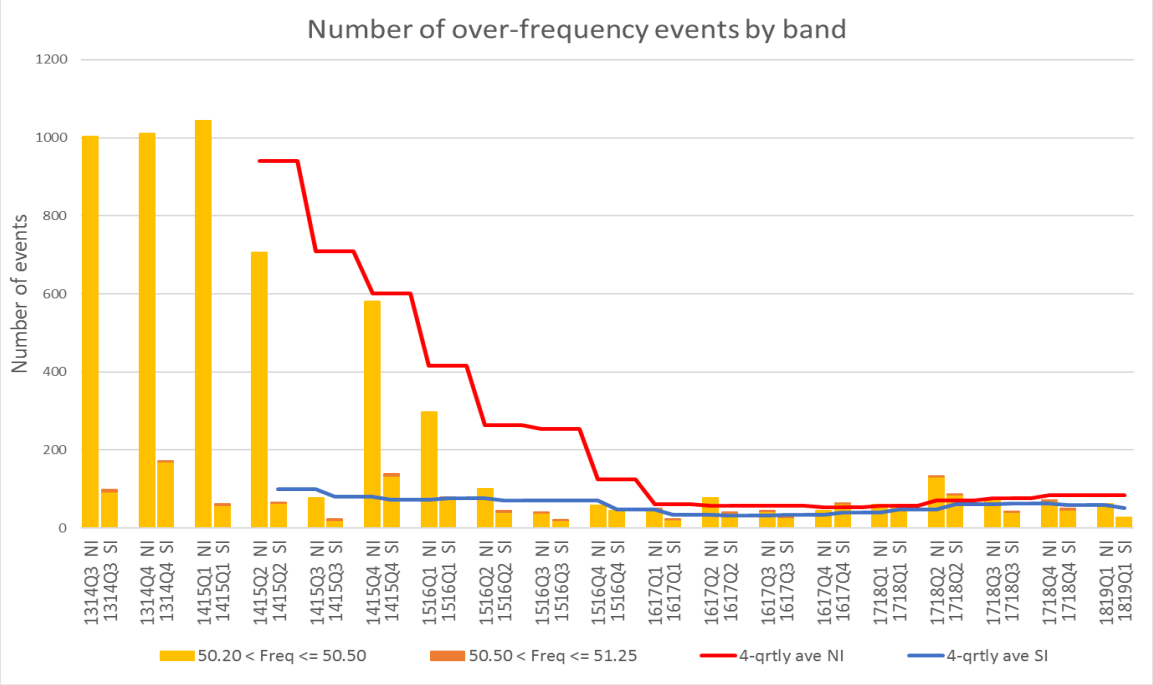
South Island



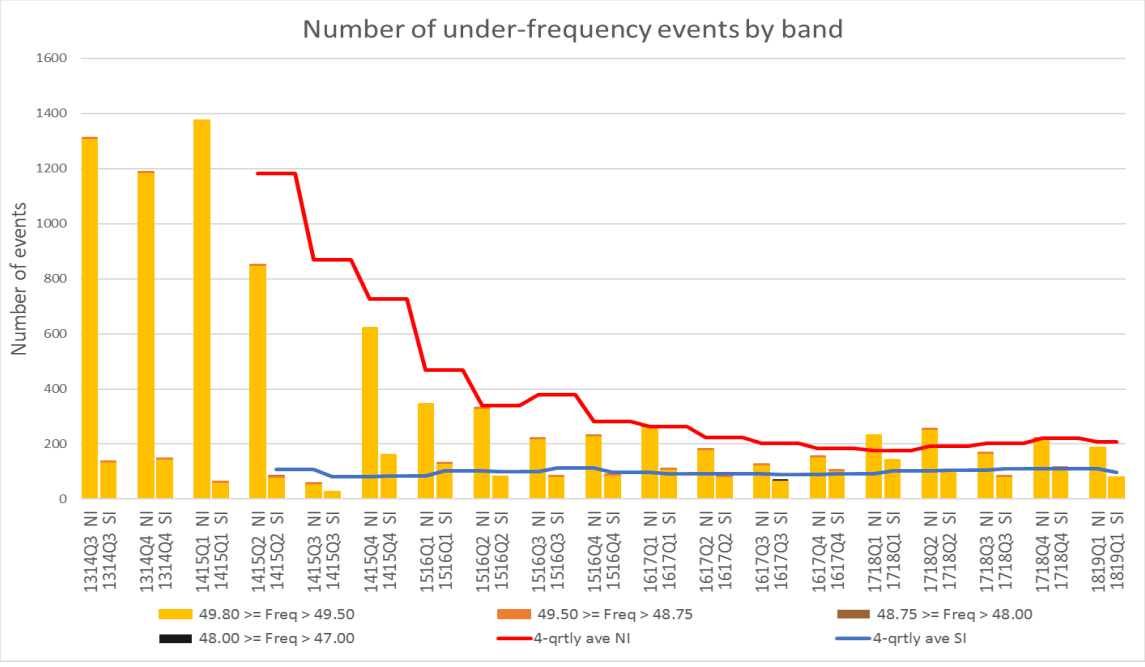
9.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

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



9.4 Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

10 Voltage management

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

11 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-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	1	-	3	1	-	1	1	-	-	1	-
Warning Notice	-	-	1	-	-	-	-	-	1	1	-	-
Customer Advice Notice	1	8	1	3	6	4	10	12	4	2	9	9

12 Grid emergencies

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

Date	Time	Summary Details	Island
Jul-18		None	
9-Aug-18	09:58	A grid emergency was declared to allow the reconfiguration of the network to alleviate overloading caused by the tripping of 220 / 110 kV inter-connecting transformer, Kawerau T12.	N
Sep-18		None	

13 Security of supply

This quarter saw above-average inflows overall. The following table shows monthly inflows for both islands as a percentage of average for the time of year.

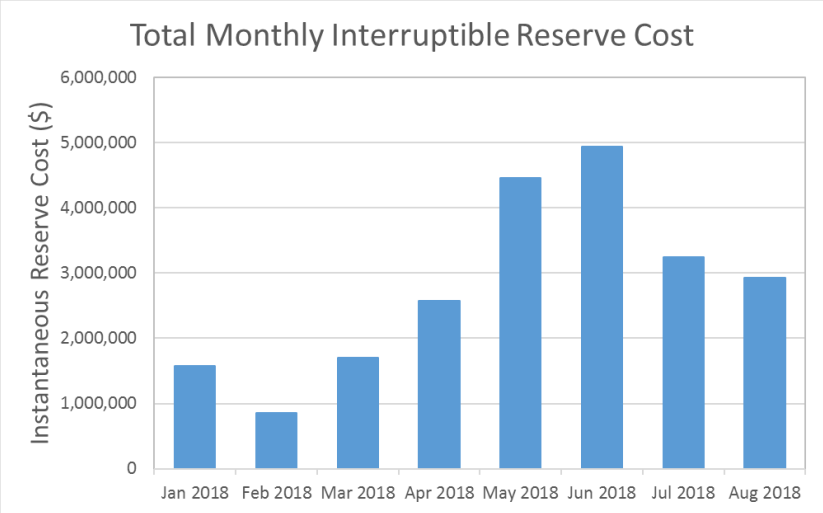
	July	August	September
North Island	115%	122%	90%
South Island	168%	88%	81%

National hydro storage decreased from 107% to 71% of average for the time of year over the quarter, from 1 July to 30 September. The hydro risk status remains at ‘Normal’.

Due to low inflows in the South Island, we are starting to see greater south transfers overnight on the DC. We are engaging with the South Island hydro generators to keep a watching brief on this situation.

14 Ancillary services

The cost of reserves had been increased steadily throughout the year (see chart below) with May and June the highest monthly cost of reserves since November 2012. Since demand for reserve has been relatively stable since February, the increase in cost was driven primarily by an increase in the cost of reserves, particularly Sustained Instantaneous Reserve.



Although we have not spoken to generators about the reasons, our suspicion is that the drivers for the underlying increase in SIR prices were driven by hydrology. The strong hydrology reduced the amount of reserves being offered from hydro generators as their main aim was to clear water and therefore clear for energy.

The high reserve costs experienced in May and June did not occur in July, August or September (September data is not shown on the graph as it is not currently available). However, we are continuing to actively monitor reserve costs.

We have started the annual ancillary services tender process. This year we will be tendering for Over-Frequency Reserves in both the North and South Islands, and a Black Start provider in the South Island.

Refer Appendix B for Ancillary Services Graphs.

Appendix A: Discretion

July

Event Date & Time	Event Description
03-Jul-2018 07:38:48	WHI2201 WHI0 : Required for System Security
03-Jul-2018 07:41:24	WHI2201 WHI0 : Required for System Security
03-Jul-2018 22:03:21	MKE1101 MKE1 : Required for System Security
25-Jul-2018 07:34:14	WHI2201 WHI0 : SRC shortfall AMPK
25-Jul-2018 07:55:33	WHI2201 WHI0 : Required for System Security
30-Jul-2018 12:00:03	MAN2201 MAN0 : Required for extended potline restoration

August

Event Date & Time	Event Description
01-Aug-2018 23:41	MAN2201 MAN0 : Required for TWI Potline 2 restoration
05-Aug-2018 23:46	MAN2201 MAN0 : For TWI Potline 2 restoration
06-Aug-2018 4:36	MAT1101 ANI0 : ANI generation tripped
08-Aug-2018 21:36	MAT1101 MAT0 : Tripping on KAW_T12
08-Aug-2018 21:39	KAW1101 KAG0 : Tripping on KAW_T12
08-Aug-2018 23:10	MAN2201 MAN0 : Extended potline, Line 2
08-Aug-2018 23:46	MAT1101 MAT0 : KAW_T12 tripping
12-Aug-2018 23:50	MAN2201 MAN0 : Line 2 Offload restoration
15-Aug-2018 23:57	MAN2201 MAN0 : Required for system security
19-Aug-2018 23:46	MAN2201 MAN0 : Potline Return - Line 2
27-Aug-2018 0:00	MAN2201 MAN0 : Extended potline change to provide Meridian with capacity required to restore reduction line.
29-Aug-2018 23:47	MAN2201 MAN0 : Required to manage Potline 2 restoration
30-Aug-2018 6:30	WGN0331 : Required for system security (SIR)
30-Aug-2018 6:30	WGN0331 : Required for system security (FIR)

September

Event Date and Time	Description
03-Sep-2018 11:49:00	MAN2201 MAN0 : Potline return - Line 2
10-Sep-2018 18:40:55	WHI2201 WHI0: Required for system security
10-Sep-2018 18:42:43	WHI2201 WHI0: Required for system security
11-Sep-2018 07:01:03	ARG1101 BRR0: Required for system security
11-Sep-2018 12:30:20	ARG1101 BRR0: Required for system security
14-Sep-2018 11:52:20	MAN2201 MAN0: Potline return - Line 2
26-Sep-2018 07:21:07	OHC2201 OHC0: Required for system security

Appendix B: Ancillary Services Graphs