QUARTERLY SYSTEM OPERATOR AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited
October to December 2017

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 Q2 (October to December) 2017, 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 in the 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).

Table of Contents

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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.

Pricing Error Process

Two pricing error claims occurred in October of which one was not upheld. This brings the total to four pricing errors for the year to date. Each error is managed through an event review process mitigating the issue from re-occurring.

Under the current RTP proposal the pricing error process is currently expected to remain, not dissimilar to that of overseas models. This would allow participants the opportunity to challenge prices should they appear incorrect. In a complex nodal pricing market this would appear prudent particularly during the early stages of go live with participants coming to terms with the new pricing model.

NCCW evacuation

In the early morning of Sunday 12 November, operation of the building sprinkler system in Waikoukou resulted in evacuation of NCC Wellington following water ingress. Full system management was taken up from NCC Hamilton, with additional resource called to the Hamilton site for the balance of the day and for the evening shift. Wellington co-ordinator resource was provided into Hamilton for two days following the evacuation. While NCC Wellington was out of service, a temporary dispatch facility was established on Waikoukou level 5 and was operational on the 14th. NCC Wellington service resumed on the 20th (pm shift).

Over-Frequency Reserve

Additional over-frequency reserve (OFR) was purchased during the reporting period for the North Island to ensure sufficient reverses to manage over frequency in the island in the event of an HVDC trip. This need was identified from our operational tools. It is expected in the future with the proposed shift to 4 block North Island AUFLS as part of the Efficient Procurement of Extended Reserves project, the need for additional OFR would be reduced. A Customer Advice Notice (CAN) was sent to industry on the 14th of November on this topic.

Upper South Island Restoration

On 8 November a double circuit tripping caused a loss of approximately 80MW of load in North Canterbury, Nelson, Marlborough and the West Coast. Full load restoration was completed quickly due to pre-existing contingency plans, training and the availability of backup operational staff.

System operator performance

1 Compliance

October

No breaches were reported in October.

Two pricing error claims occurred in October of which one was not upheld. This brings the total to four pricing errors for the year to date. Each error is managed through an event review process mitigating the issue from re-occurring. With respect to the upheld pricing error claim from October, this was reported as a breach of the Code in November.

Under the current RTP proposal the pricing error process is currently expected to remain, not dissimilar to that of overseas models. This would allow participants the opportunity to challenge prices should they appear incorrect. In a complex nodal pricing market this would appear prudent particularly during the early stages of go live with participants coming to terms with the new pricing model.

November

One Code breach was reported. This related to the pricing error that occurred in October, concerning acceptance of dispatchable demand bids from WITS into the market system. The breach had a minor market impact.

Several complex circumstances came together at the same time, allowing the error to occur. In order for the week-ahead dispatch schedule to solve, bids and offers are copied into future days in order to provide placeholder values until these are updated by traders. The validation logic for dispatchable demand bids had caused more recent bids entered in WITS to be overwritten by ‘invalid’ bids by a separate process. To prevent this situation from reoccurring, Transpower’s critical systems analysts liaised with the WITS Manager to change the WITS rollover processing.

December

No breaches were reported in December.

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 majority of the project is on hold pending the recommendation on options from the Authority Board, now due in February. In the meantime, Transpower continues to support the Authority with input and options assessment. Transpower continues to work on the capital component of this work, to both make changes to the Reserve

Management Tool (RMT) and develop a tool to support extended reserves block data collection. Testing is now complete for this tool change with RMT audit to commence in early December and deployment planned for the end of January.

The approved capital project underway deviates from the current Capex Plan with an increased approved capital cost (approved $525k against Capex Plan of $195k). Although the approved completion date currently aligns with the Capex Plan, this is now at risk given the delays in confirming direction and options.

Real Time Pricing

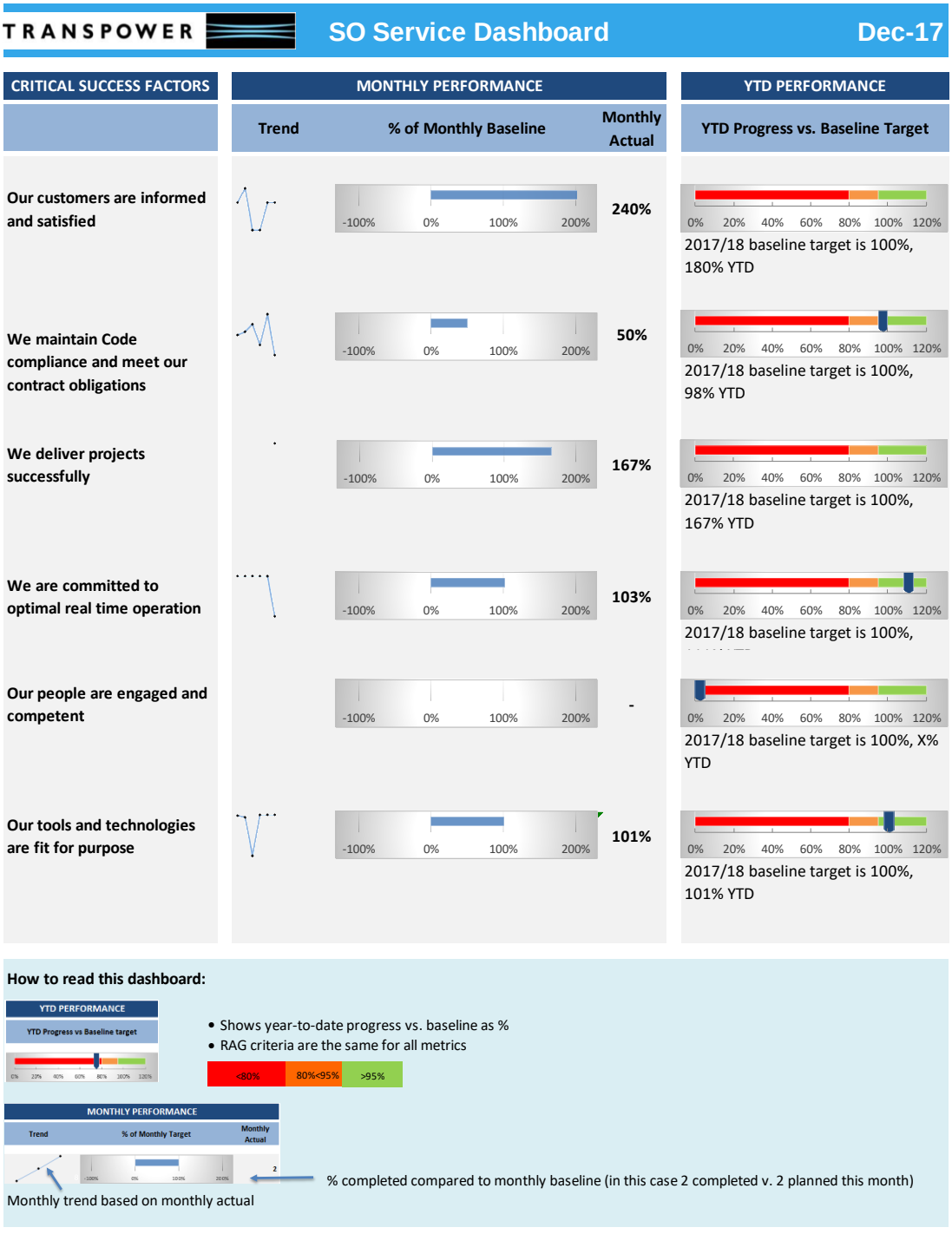
Support to the Authority for the consultation period for real time pricing continues. Transpower's focus is currently on the issues raised during submissions to understand design implications. Planning commenced for the next phase which will refine the requirements, confirm the solution and develop the capital business case. Time and cost of this work aligns with the current Capex Plan.

Dispatch Service Enhancement (formerly known as EDF Phase III)

The project has progressed the solution requirements and is in the final process of review before seeking approval. The Proof of Concept has been progressing well with a demo provided. Communications were sent out to industry early November, with further communications sent mid December to confirm the industry workshop in February. Preliminary delivery planning has commenced.

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). Overall the system operator are exceeding performance metric targets; taking into consideration the fact that some metrics are unable to be measured at this point in the year.



4 Actions taken

The following table contains a full list of actions taken during Q2 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**:	• Completed computer modelling for Energy Storage Systems • Commenced system changes to support implementation of Extended Reserves
(ii) To comply with the **statutory objective work plan**:	**Policy and procedure alignment with CRE** Over this period 20 documents have been checked against CRE. **Review of SOSFIP** Analysis of treatment of contingent storage was completed. Extent of any changes required to the SOSFIP were considered and discussed with the Authority. A decision paper is on track to be completed in Quarter 3. **Review of the Security Policy – Interconnecting transformers** Commenced analysis in Quarter 2. On-track to meet target completion by June 2018.
(iii) In response to participant responses to any **participant survey**:	N/A – Participant survey is yet to occur.
(iv) To comply with any **remedial plan** agreed by the parties under SOSPA 14.1 (i):	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). We completed our investigation of the feasibility of cost of service reporting and presented our findings to the Authority in early September. We are awaiting feedback from the Authority.

6 Technical advisory hours and services

The following table provides the technical advisory hours for Q2 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 Q2
TAS SOW 65 – Assessment of implementing the load aggregator participant type and block demand dispatch. Close out report in train.	In Close out	142.25
TAS SOW 69 – RTP Consultation Support	In Progress	222.75
TAS SOW 70 – EPER: Project Support September 2017	Closed	
TAS SOW 71 – Battery storage as a source of ancillary services	In progress	2.00
TAS SOW 72 – EPER Project Support Oct – Dec 2017	In progress	368.50
TAS SOW 73 – Evaluating Options to Improve System Operator Load Forecast	In progress	50.00
Total hours		**785.50**

7 Separation of Transpower roles

As system operator, Transpower has not been materially affected by any other role or capacity Transpower has under the Code or under any agreement.

In this quarter one conflict of interest was registered. An engineer, working for Transpower in its capacity as grid owner, requested access to the Asset Capability database, for the purposes of coordinating protection changes with a third party as is required under Part 8 of the Code. This request was denied as Asset Capability information is restricted to the system operator. The engineer was at the time a new employee to the company and was instructed about the decision and how it supports the required separation of roles at Transpower.

System performance

8 Operational and system events

October

No material weather-related or system events occurred during October.

November

Loss of supply events:

At 02:43 on 8 November there was a simultaneous tripping of the two in-service Upper South Island (USI) 220kV circuits. Shortly thereafter the 66kV/110 kV West Coast network tripped as it could not support the total USI load. Approximately 80MW of load was lost in North Canterbury, Nelson, Marlborough and the West Coast. A grid emergency was declared to reconfigure the grid for restoration using existing contingency plans. Final restoration instructions were issued at 05:19.

HLY5 outage:

The planned two week Huntly U5 outage (ended 18th) saw several evenings where residual generation was low. No actual shortages arose and no warning notices were issued. On U5's return to service a faulty Point of Wave relay at Huntly (Genesis Energy equipment) presented a raised risk of trip concern at reconnection. This was resolved by a collaborative effort across System Operator, Grid Owner and Genesis. A lengthy delay in U5's return to service could have negatively impacted the HVDC outage scheduled in the following week.

December

A large number of tropical storms throughout the first 2-3 weeks of December caused numerous trippings. These were predominantly in the North Island although the South Island wasn't completely spared (the West Coast was struck early in the month). Impacts were generally modest with most incidents being circuit auto recloses (there were some fairly minor losses experienced at Te Kaha and National Park).

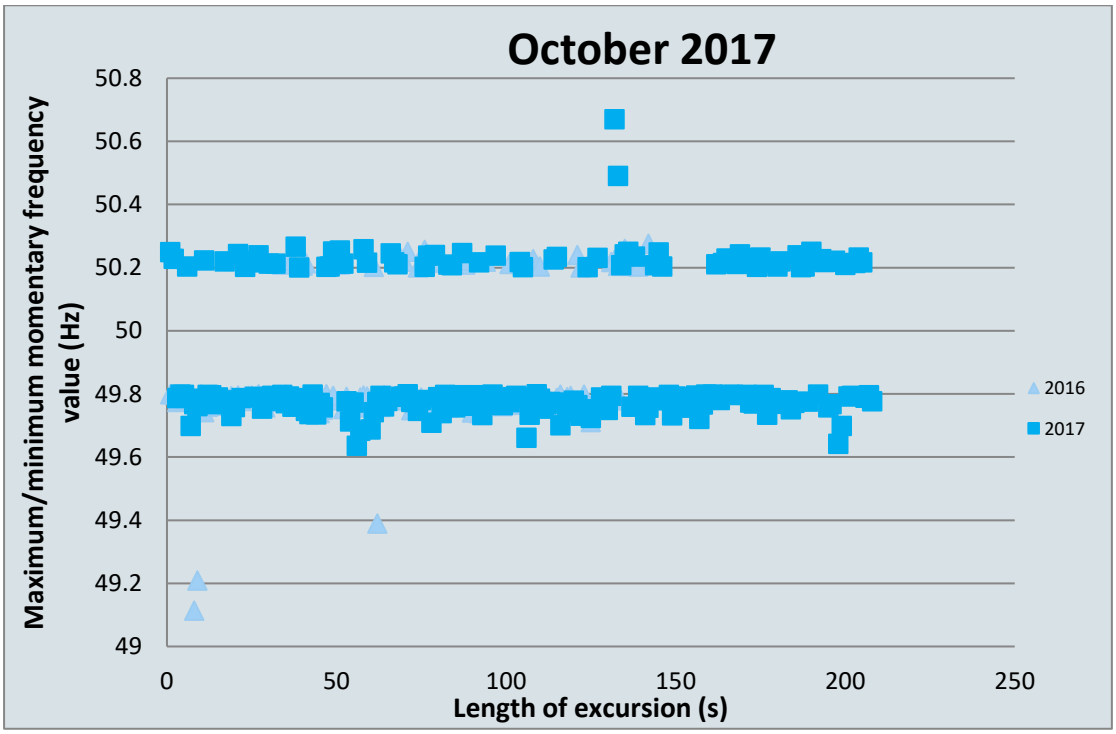
A Henderson bus tripping (caused by birds) resulted in a loss of approx. 60 MW's of load within the Vector network, though there was no loss of connection from Transpower assets.

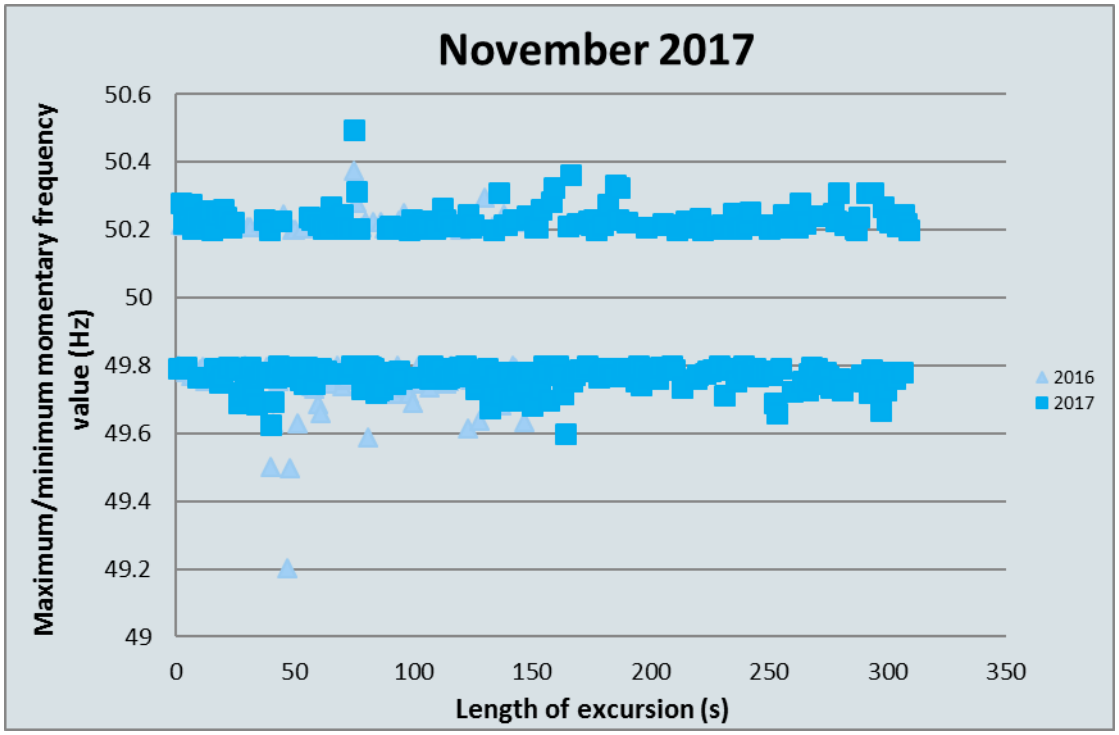
Very dry South Island conditions, with lower than average lake levels and inflows, resulted in significant south flow on the HVDC throughout the month.

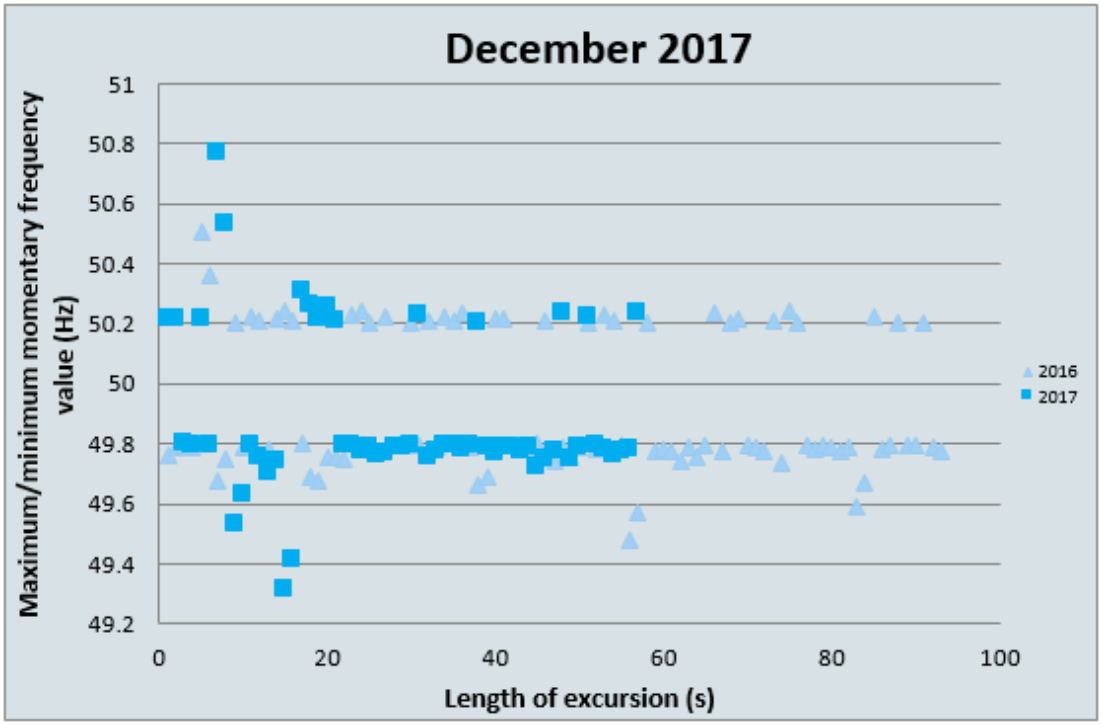
9 Frequency fluctuations

9.1 Maintain frequency in normal band and recover quickly from a fluctuation

The following charts show the maximum or minimum frequency reached and length of each frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period.







9.2 Maintain frequency and limit rate occurrences during momentary fluctuations

The tables below show the total number of momentary fluctuations outside the frequency normal band, recorded in each island, for each month over the last 12 months and the 12 month cumulative totals, grouped by frequency band.

North Island

Frequency Band	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Annual rate
55.00 > Freq >= 53.75													
53.75 > Freq >= 52.00													
52.00 > Freq >= 51.25													
51.25 > Freq >= 50.50												1	**1**
50.50 > Freq >= 50.20	22	11	10	8	16	22	6	22	31	41	85	5	**279**
50.20 > Freq > 49.80													
49.80 >= Freq > 49.50	45	30	52	55	59	42	52	92	89	91	135	27	**769**
49.50 >= Freq > 48.75	2		1			3						1	**7**
48.75 >= Freq > 48.00													
48.00 >= Freq > 47.00													
47.00 >= Freq > 45.00													

South Island

Frequency Band	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Annual rate
55.00 > Freq >= 53.75													
53.75 > Freq >= 52.00			1										**1**
52.00 > Freq >= 51.25													
51.25 > Freq >= 50.50	1	1	1	1	1	1		2	1	1		1	**11**
50.50 > Freq >= 50.20	12	9	7	16	18	28	11	17	28	29	47	8	**230**
50.20 > Freq > 49.80													
49.80 >= Freq > 49.50	22	19	27	29	33	45	36	50	58	46	42	13	**420**
49.50 >= Freq > 48.75						2						1	**3**
48.75 >= Freq > 48.00			1										**1**
48.00 >= Freq > 47.00			1										**1**
47.00 >= Freq > 45.00													

Note: Frequency excursions for March include simultaneous over-frequencies and under-frequencies that occurred when the South Island was split into two electrical islands on 2 March.

9.3 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	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	-	4	1	1	1	-	-	1	-	-	1	-
Warning Notice	-	-	-	-	-	-	-	-	2	-	-	1
Customer Advice Notice	11	7	24	10	16	23	2	6	6	1	8	1

12 Grid emergencies

The following table shows grid emergencies declared by the system operator from October to December.

Date	Time	Summary Details	Island
Oct		None	
08-Nov-17	02:44	A grid emergency was declared to assist with restoration following the tripping of the two 220 kV circuits feeding the top of the South Island and subsequent loss of supply to the Nelson, Marlborough, and Buller regions and part of North Canterbury.	S
Dec		None	

13 Security of supply

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

	October	November	December
North Island	112%	102%	67%
South Island	61%	76%	73%

National hydro storage decreased from 121% to 82% of average for the time of year between 1 October and 31 December.

In December we made some updates to our Hydro Risk Curves (HRCs), which we use to reflect the risk of extended energy shortages. These latest revisions reflected the most up-to-date demand forecast data, and resulted in a significant decrease in the HRCs. Given the significant step change in the HRCs caused by this demand forecast update, we are investigating options for updating our demand forecast more regularly (historically it has only been done annually).

14 Ancillary services

Nothing to report.

Refer Appendix B for Ancillary Services Graphs.

Appendix A: Discretion

October

Event Date & Time	Event Description
9/10/2017 12:11:03 PM	MAN2201 MAN0. Extended Potline L3 186MW return.
9/10/2017 12:28:48 PM	MAN2201 MAN0.
12/10/2017 11:53:09 AM	MAN2201 MAN0 Extended Potline 2.
16/10/2017 8:38:56 AM	MAN2201 MAN0. Extended Potline 2. MAN has approval to vary from electronic dispatch to manage the TWI reduction line offload. MEL to return to Economic Dispatch once line reduction has been completed
17/10/2017 2:11:50 PM	MAN2201 MAN0. Return Potline 2 to service.
19/10/2017 7:31:56 AM	WHI2201 WHI0. Dispatched on to cover other ramping plant and kept on for morning peak due to forecast shortfall.
24/10/2017 2:15:17 PM	MAN2201 MAN0. Extended Potline 2 return.
27/10/2017 2:50:54 PM	TKB2201 TKB1. Tripped.

November

Event Date & Time	Event Description
8/11/2017 1:47:09 AM	COL0661 COL0. Clear COL-HOR violations Last Dispatched Mw: 39
8/11/2017 4:14:17 AM	COL0661 COL0. To resolve COL_HOR violations <8 mins. Last Dispatched Mw: 39
8/11/2017 4:43:26 AM	COL0661 COL0. To resolve COL_HOR violations <8 mins. Last Dispatched Mw: 35

9/11/2017 12:00:24 PM	MAN2201 MAN0. Return of Extended Potline 2. Last Dispatched Mw: 555
14/11/2017 12:02:33 PM	MAN2201 MAN0. To provide room for Extended Potline Line 2 restoration now. Last Dispatched Mw: 738
14/11/2017 12:10:14 PM	MAN2201 MAN0. To provide room for Extended Potline Line 2 restoration now. Last Dispatched Mw: 555
14/11/2017 12:13:48 PM	MAN2201 MAN0. To provide room for Extended Potline Line 2 restoration now. Last Dispatched Mw: 625
20/11/2017 1:41:46 PM	MAN2201 MAN0. To allow restoration of TWI Potline Last Dispatched Mw: 555
23/11/2017 11:58:09 AM	MAN2201 MAN0. Manage TWI reduction line 2 restoration Last Dispatched Mw: 333
23/11/2017 1:44:34 PM	WRK0331 TAA0. To manage dispatch following WRK T30 tripping.
27/11/2017 2:02:01 PM	MAN2201 MAN0. To allow restoration of TWI Potline. Last Dispatched Mw: 444
30/11/2017 12:02:37 PM	MAN2201 MAN0. TWI extended reduction line offload, Line 2 Last Dispatched Mw: 333

December

Event Date & Time	Event Description
4/12/2017 12:00:36 PM	BEN2202 BEN0. To allow restoration of TWI Potline.
4/12/2017 12:01:11 PM	MAN2201 MAN0. To allow restoration of TWI Potline.
6/12/2017 11:38:12 AM	MAN2201 MAN0. To allow restoration of TWI Potline.
7/12/2017 12:58:50 AM	MAN2201 MAN0. Emergency Potline.
20/12/2017 12:04:49 PM	MAN2201 MAN0. Extended Potline 2, 183MW.

Appendix B: Ancillary Services Graphs