SO MONTHLY OPERATIONAL AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

October 2016

Keeping the energy flowing

TRANSPOWER

Transpower New Zealand Limited The National Grid

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Report Purpose

This report is Transpower's review of its performance as system operator for October 2016, in accordance with clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

Operational issues and a detailed system performance report (Code obligated) are provided for the information of the Electricity Authority (Authority).

1 Operational and system performance update

An under frequency event occurred on 3 October when the Taranaki Combined Cycle plant tripped while generating at 350MW. This caused North Island frequency to fall to 49.24Hz and South Island to 49.34Hz; no load was lost (other than scheduled interruptible load). Restoration was achieved in approximately 35 minutes. Reserve Adjustment Factors were not reset as per the new policy.

Kawerau transformer fault

On 28 September, Transpower (as grid owner) advised of elevated gas levels within Kawerau transformer KAW_T12 interconnecting bank. KAW_T12 and KAW_T13 were re-rated to 60 MVA and 80 MVA respectively (to protect assets until they could be inspected). Market constraints reflecting these ratings reduced generation at Kawerau and Matahina, occasionally leading to close to zero prices in the region. These constraints affected area generation throughout the period of the outage.

System operator personnel worked with other Transpower personnel to assess grid asset alternatives (such as grid reconfigurations; a return to service of an available older – though less capable – T12 transformer, etc.). Industry was regularly informed of the situation and of efforts to both repair the faulted assets and the alternatives being considered.

The KAW_T12 unit was repaired and returned to service on the evening of 20 October.

National Market for Instantaneous Reserves (NMIR)

The NMIR was commissioned on 20 October (the planned date) at the end of a 1 hr 10 min market system outage (6 minutes less than planned). This implementation followed extensive training for system coordinator and support personnel. In addition, extensive information for, and direct contact with, industry personnel laid the groundwork for this change in system and market operations.

Implementation of reserve sharing was planned to be staged, as follows:

- 60MW sharing limit from 15:00 20 October to 12:00 3 November
- 120MW sharing limit from 12:00 3 November to 12:00 17 November
- 220MW sharing limit from 12:00 17 November onwards.

The staged approach is intended to provide experience to operational and market personnel with the new arrangements before the fullest extent of sharing becomes operational. Implementation has proceeded to plan and experience to date indicates the intended full sharing will go ahead on 17 November.

Voltage management

Managing voltage in the mid-upper South Island has recently become more difficult with the combination of high lower South Island generation, high HVDC north transfers and times of low generation in the Waitaki valley. Even with regular

removal of ISL_KIK and ISL_LIV circuits there have been occasions where reserves of reactive capability have been at a lower than comfortable level. This situation is being investigated further and additional management options considered.

2 Market design and system enhancement project updates

Progress against in-flight market design and service enhancement projects is included below along with details of any variances from the current Capex Plan.

National Market for Instantaneous Reserves – This is a key initiative under the Reserves and Frequency Management Programme. The project commissioned on schedule on 20 October. Project close is underway.

EDF Phase III – This project will refresh the dispatch functionality within the market system to reduce barriers to entry and enable future dispatch products to be implemented. The investigation project completed with an initial business case and associated consultation paper delivered to the Authority. The appropriation process is now underway. The capital phase of the project is planned to commence in 2017/18.

Efficient Procurement of Extended Reserves – Project published consultation documentation on the TRS and prepared for industry briefing sessions.

Gate Closure – This project will reduce the gate closure time from 2 hours to 1 hour in the market system. The investigation project continued. The business case has been provided to the Authority for review and approval. Once the business case is approved the capital phase will commence with delivery expected on 30 June 2017.

Real Time Pricing – Work continues on the development of the market and systems changes associated with Real Time Pricing (RTP). Decisions and assumptions workshops are now completed and the initial decisions and assumptions report will be released following the final review. The first of the stakeholder requirements workshops was run on 1 November and further workshops are scheduled through November and early December.

3 Security of Supply update

Inflows were around average over the month of October. South Island storage levels are around average for this time of year. North Island storage levels remain above average. The hydro risk meter remained at normal. For the month of October:

- North Island inflows were 108% of average[1]
- South Island inflows were 89% of average[2]
- hydro generation met 66% of demand.

As at 1 November, aggregate primary New Zealand storage was 107% of average.

Annual security of supply assessment has commenced for 2017.

4 Compliance update

Transpower as the system operator reported two breaches of the Code in October.

A modelling error introduced as part of a regular market system update caused the wrong inputs to be used in the dispatch schedules. The error was corrected promptly in real time and a number of process and tool changes are being implemented to prevent a similar incident occurring in the future.

For the second event a long non-response schedule failed to complete due to scheduled system maintenance extending longer than expected and having an impact on market system performance. The maintenance process was updated to account for the potential issue.

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

The Authority alleged and upheld pricing error claims for select periods on trading days 13, 16, 17, 18, and 19 October 2016 relating to observed sub-optimal market solutions in final pricing. Transpower identified the root cause of the sub-optimal solutions: a solver parameter in a specialised section of the Scheduling, Pricing and Dispatch (SPD) code allowed SPD to cease looking for a solution before an optimal result was found. While the parameter was set to improve performance of SPD in 2009 as part of the Market System Project, this condition has only been observed under specific market conditions and since a new solver was deployed in March 2016. A fix has been developed and is being tested and audited for planned inclusion in the market system on 20 November.

5 SOSPA

The System Operator Strategic Plan was provided to the Authority on 28 October.

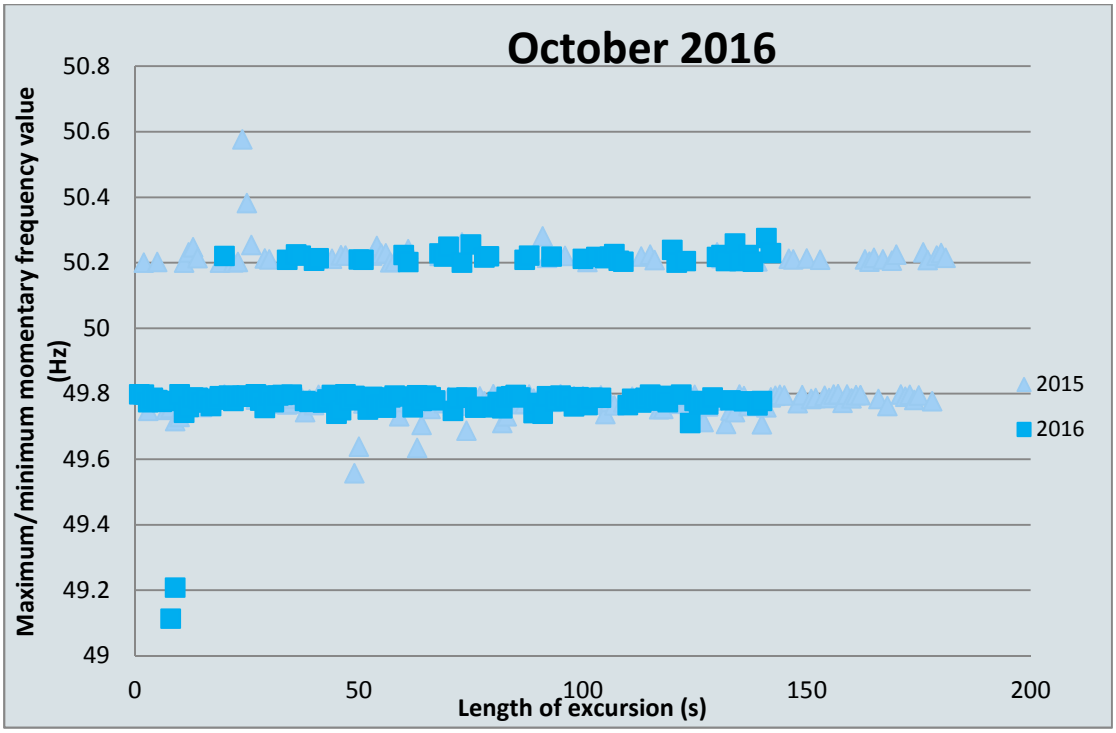
[1] Measurements are based on daily inflow values.
[2] Measurements are based on daily inflow values.

6 Operational management

6.1 Frequency fluctuations

Maintain frequency in normal band and recover quickly from a fluctuation

The chart below shows 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.



Maintain frequency and limit rate occurrences during momentary fluctuations

The table below shows the total number of momentary fluctuations outside the frequency normal band, recorded in both Islands, over the last 12 months. The 12 month cumulative totals, grouped by frequency band, are compared to the frequency performance objective (PPO).

Frequency Band	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Annual rate	PPO target
55.00 > Freq >= 53.75														**0.2***
53.75 > Freq >= 52.00														**2***
52.00 > Freq >= 51.25														**7**
51.25 > Freq >= 50.50	1	3		1	3						2		**10**	**50**
50.50 > Freq >= 50.20	52	37	10	18	31	30	42	29	25	13	32	39	**358**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	173	111	84	101	118	125	106	89	128	102	153	101	**1391**	
49.50 >= Freq > 48.75		1	1		1		2		1		2	2	**10**	**60**
48.75 >= Freq > 48.00														**6**
48.00 >= Freq > 47.00														**0.2**
47.00 >= Freq > 45.00														**0.2**

***** South Island

Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

6.2 Voltage management

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

6.3 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	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	2	1	4	2	2	2	5	2	3	2	1	2
Warning Notice	-	-	-	-	-	-	3	2	2	5	1	-
Customer Advice Notice	9	16	3	7	19	11	12	3	8	7	5	12

6.4 Grid emergencies

The following table shows grid emergencies declared by the system operator in the reporting period.

Date	Time	Summary Details	Island
03/10/16	15:59	A grid emergency was declared to close the 110 kV Arapuni Bus split due to lightning in the vicinity.	N
25/10/16	21:12	A Grid Emergency was declared to allow the grid to be re-configured following the tripping of 110 kV Edendale-Invercargill Circuit 1.	S

7 Ancillary services

The tender for over-frequency reserve was completed during October. Of note, costs for this service have reduced by over $200,000 over the next two years. This reversed the trend of the last few years which saw the costs increasing at about $100,000 a year.

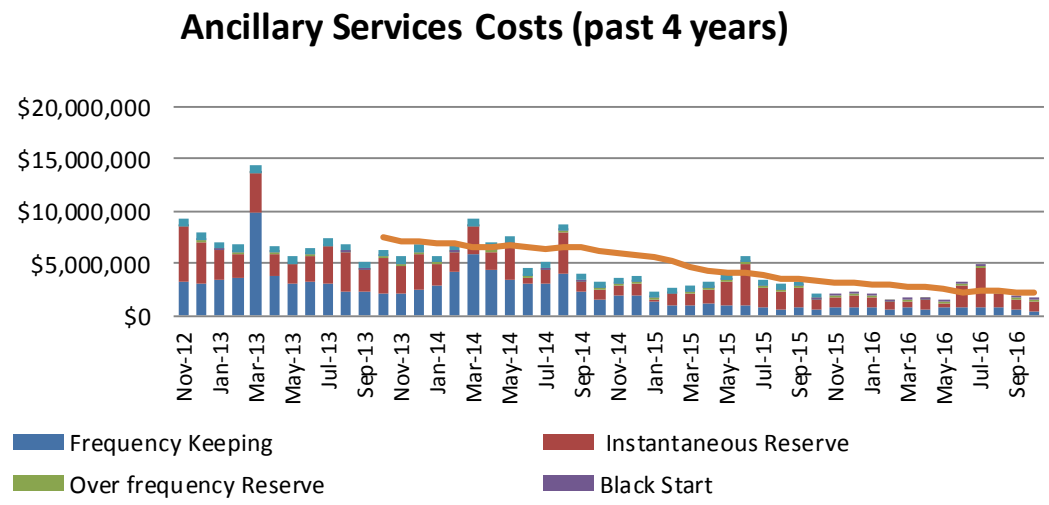
This can be attributed to the procurement mechanisms that have encouraged new competition into the market and seen incumbent providers reducing their fees in order to remain competitive. This meant costs have reduced while still maintaining the same level of MW procured.

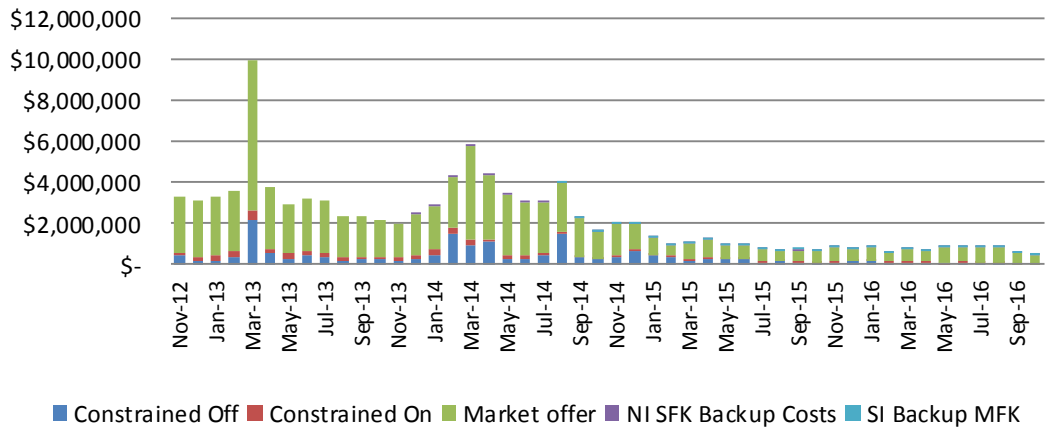
Refer Appendix A for graphs.

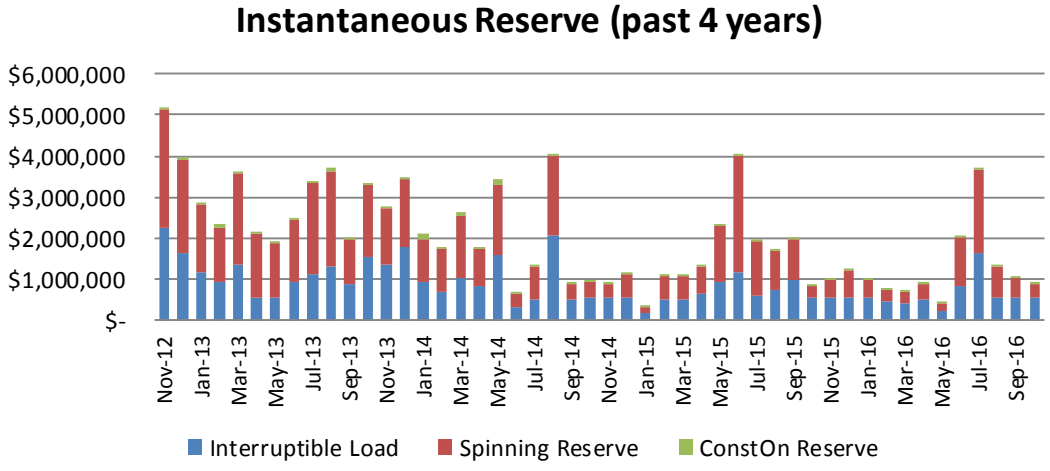
8 Separation of Transpower roles

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

Appendix A: Ancillary Services Graphs







Appendix B: Discretion

Event Date & Time	Subject	Event Description
16/10/2016 12:57:51 AM	DISCRETION	MAT1101 MAT0 Discretion Clause 13.70, Part 13 ENR Min : 19 Start: 16-Oct-2016 00:57 End: 16-Oct-2016 06:00 Notes: Trader claimed a rule exemption under 13.82a for dispatch to 19MW to comply with resource consent. Last Dispatched Mw: 17.95
16/10/2016 1:01:08 AM	DISCRETION	MAT1101 MAT0 Discretion Clause 13.70, Part 13 EN Min : 19 Start: 16-Oct-2016 01:01 End: 16-Oct-2016 01:30 Notes: Trader claimed a rule exemption under 13.82a to a min dispatch of 19MW to comply with resource consent. Last Dispatched Mw: 17.95
16/10/2016 10:15:54 PM	DISCRETION	MAT1101 MAT0 Discretion Clause 13.70, Part 13 EN Min : 19 Start: 16-Oct-2016 22:15 End: 17-Oct-2016 05:00 Notes: Claimed Rule Exemption 13.82a to a minimum dispatch of 19MW to comply with resource consent. Trader confirmed they would generate at least 19MW until at least 05:00 tomorrow morning. Last Dispatched Mw: 18.7