SO MONTHLY OPERATIONAL AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

November 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 November 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

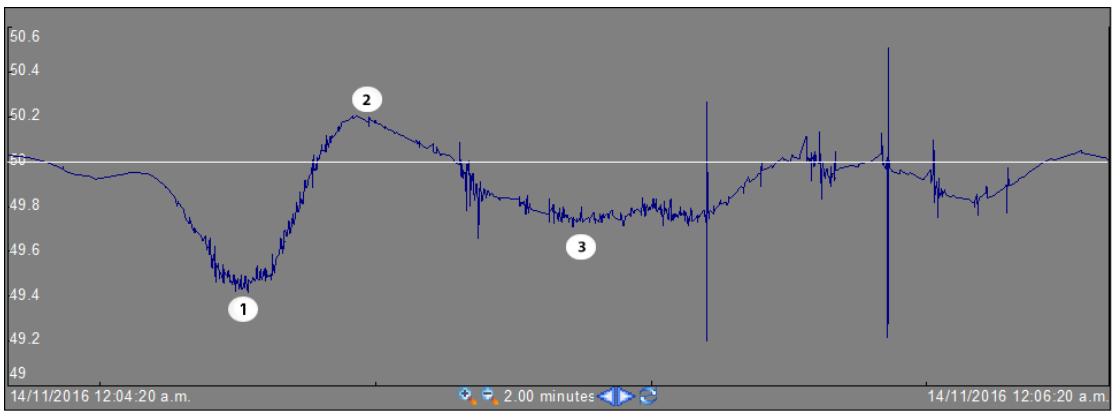
Kaikoura earthquake

Our control room in Wellington was closed at 02:00 after the earthquake to allow for structural integrity checking of Transpower House to be undertaken. Power system management continued unaffected from the Hamilton site only until 18:00 when dispatch resumed from Wellington. Grid management continued unaffected at both of Transpower's Christchurch and Auckland sites.

Transpower's assets remained intact and in operation, apart from the Culverden substation where a transformer tripped and bus was damaged. This damage resulted in a loss of supply into the MainPower network which serves North Canterbury and Kaikoura. Although supply to MainPower's feeder at Culverden was available from around 14:00 on the 14th it was not restored until 16:00 on the 15th due to damage sustained in the MainPower network.

System frequency fluctuated during the quake and is shown (below) for the two minutes starting just prior to the quake. An initial fall in frequency was later established to be due to some wind generation shutting down (from movement of oil inside transformers next to each turbine) (1 on the chart) followed by normal frequency recovery (2 on the chart) from other generators compensating for the fall in frequency.

This was then followed by unexpected demand pickup (3 on the chart) causing frequency to fall again slightly 30 seconds to a minute after the start of the quake. This is thought to have resulted from an unusually large number of people getting up early in the morning due to the quake.



Although recent experience has not highlighted any particular concerns, co-ordinator emergency operating procedures are undertaking a special review in light of the recent experience (regular review cycle is three years).

National Market for Instantaneous Reserve

The National Market for Instantaneous Reserve (NMIR) was fully commissioned on 17 November, a significant milestone in the efficient management of the power system.

Due to the normal variations of the wholesale market, trader behaviour, and outages, it is not feasible to determine the overall market impact of NMIR over a short time frame.

However, following the implementation, periods have been observed during which no reserves were being procured in the South Island with South Island risk covered entirely from the North Island. Our analysts continue to follow the national reserve market and report on ancillary service costs.

HVDC outages

The annual HVDC maintenance outages occurred between 25 to 29 November. Poles 2 and 3 were out of service separately and also concurrently during the period between 06:30 on 26 November and 22:00 on the 27th - a full bi-pole outage. No operational issues arose during the outage period noting Huntly Unit 5 was also on outage, although Huntly Rankine units were in operation on occasion. During the bi-pole outage single island frequency keeping (MFK) was applied and the features of the new NMIR were unavailable.

HVDC overload

On 30 November, Transpower, as grid owner, altered its offer for the HVDC to reflect new operating and overload conditions. This change, which at times enables asymmetric transfer on the HVDC, increases HVDC self-cover from 528 to 650 in the north direction. This will generally increase the level of HVDC transfer possible prior to the HVDC becoming the binding critical event risk, promoting competition and efficiency in the electricity market.

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 with post go-live deployments completed by 8 December. 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 – The project published consultation documentation on the Technical Requirements Schedule (TRS) and undertook industry briefing sessions. Submissions on the TRS consultation closed on 29 November and are currently under review.

Gate Closure – This project will reduce 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 approved the capital phase will commence with delivery expected on 30 June 2017.

Real Time Pricing – Work continues on development of the market and systems changes associated with Real Time Pricing (RTP). Stakeholder requirement workshops have been running through November. The team is now reviewing the requirements documentation. The final requirements workshops are scheduled for early December. Risk workshops have been held and the initial risk bow tie developed, with more work required to further define the controls.

3 Security of Supply update

Inflows increased in the North and South Island in the second half of November. South Island storage levels remain around average for this time of year, while North Island storage levels are close to maximum. The hydro risk meter is set to normal.

For the month of November:

- North Island inflows were 119% of average[1]
- South Island inflows were 106% of average[2]
- hydro generation met 68% of demand.

As at 1 December aggregate primary New Zealand storage was 119% of average.

Work continues on the 2017 Security of Supply Annual Assessment.

4 Compliance update

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

The first breach concerned payment of instantaneous reserve amounts owing to providers, where two providers' amounts were swapped as a result of a manual error. Once the error was identified the amounts were washed-up in the following months.

The second breach concerned a modelling error introduced as a result of a recent SCADA upgrade. In combining the model the market system uses with the SCADA model, an error was created that reset a previously 'null' (blank) value with a zero. This change caused the load of some nodes in the real time pricing schedule to be double-counted, which affected the calculated prices. No other schedules were affected and there was no market impact.

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

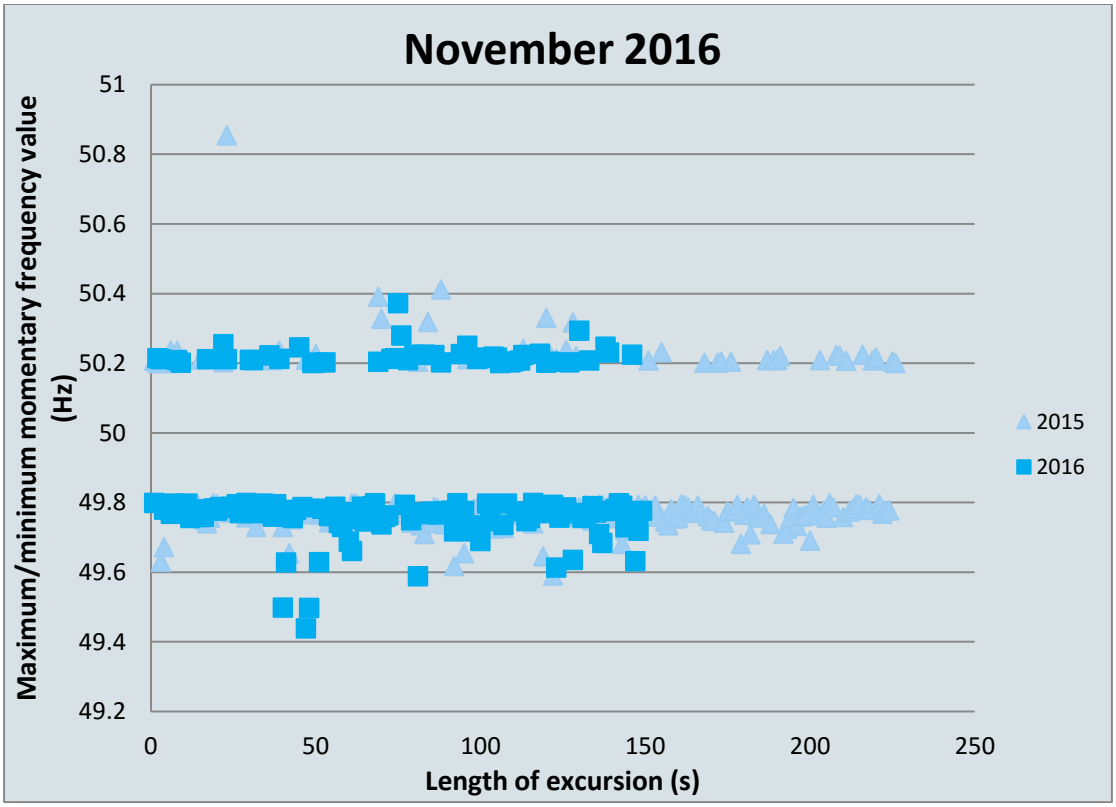
[1] Measurements are based on daily inflow values.
[2] Measurements are based on daily inflow values.

5 Operational management

5.1 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	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-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	3		1	3						2			**9**	**50**
50.50 > Freq >= 50.20	37	10	18	31	30	42	29	25	13	32	39	45	**351**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	111	84	101	118	125	106	89	128	102	153	101	101	**1319**	
49.50 >= Freq > 48.75	1	1		1		2		1		2	2	3	**13**	**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

On 27 November Transpower received queries from two frequency keeping service providers with respect to the time error reaching the 5 second limit. The system operator's systems showed the time error to be within 1 second at that point. The queries are being further investigated.

5.2 Voltage management

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

5.3 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	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	1	4	2	2	2	5	2	3	2	1	2	-
Warning Notice	-	-	-	-	-	3	2	2	5	1	-	-
Customer Advice Notice	16	3	7	19	11	12	3	8	7	5	12	26

5.4 Grid emergencies

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

Date	**Time**	**Summary Details**	**Island**
		None.	

6 Ancillary services

The two-year over frequency reserve contracts came into effect on 1 December while the instantaneous reserve and frequency keeping contracts were rolled-over for 12 months.

The table below provides a summary of the contracted services for 2016/17 (including existing long term contracts).

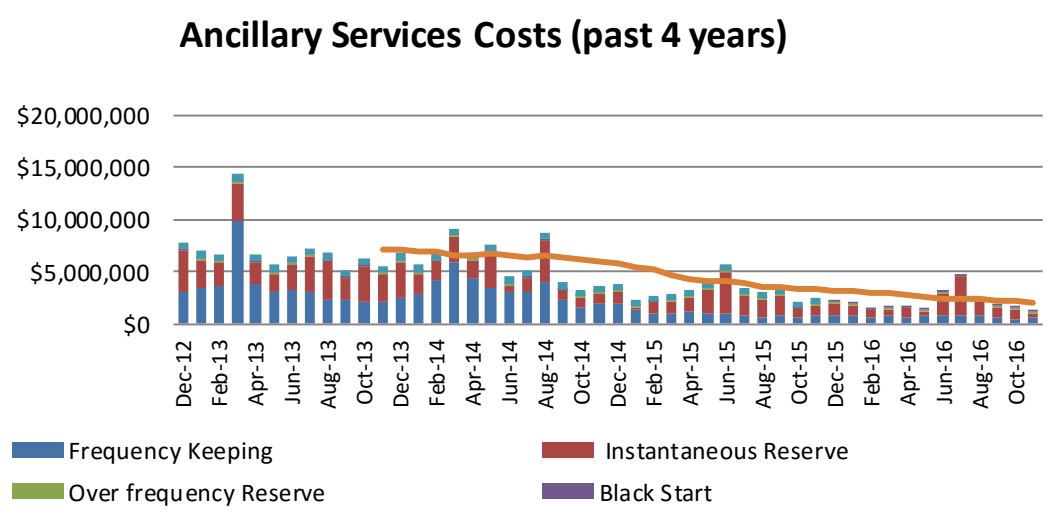
Ancillary Service Agent	MFK	Back-Up SFK	IR	OFR	BS
Contact Energy	✓	✓	✓	✓	✓
Counties Power			✓		
EnerNOC			✓		
Genesis Energy	✓	✓	✓		✓
King Country Energy			✓		
Meridian Energy	✓	✓	✓	✓	✓
Mercury Energy	✓	✓	✓		✓
Nga Awa Purua (Mercury)				✓	
Norske Skog			✓		
Northpower			✓		
Pan Pac			✓		
Powerco			✓		
Trustpower	✓		✓		
Tuaropaki (Mercury)				✓	
Vector			✓		
WEL Networks			✓		
Wellington Electricity Lines			✓		
Winstone Pulp International			✓		

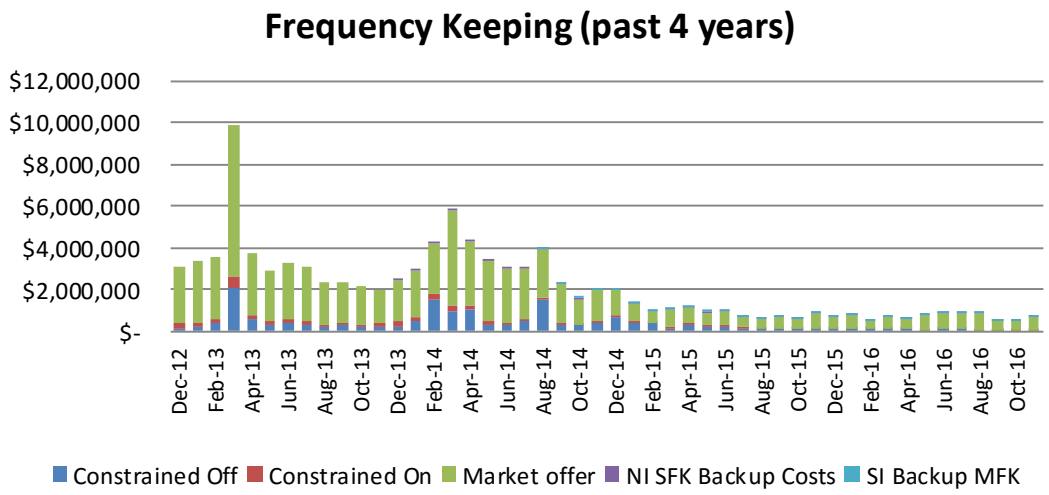
Refer Appendix A for Ancillary Services Graphs.

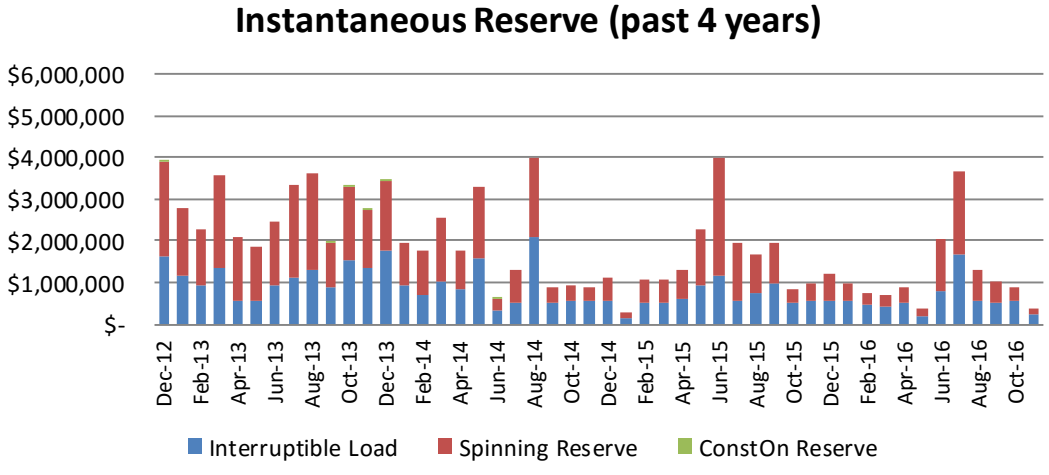
7 Separation of Transpower roles

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







Note: IR Cost May 2012 = 14.129M, IR Cost Jun 2012 = 8.164M

Appendix B: Discretion

Event Date & Time	Subject	Event Description
1/11/2016 9:30:53 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 515 Start: 01-Nov-2016 09:30 End: 01-Nov-2016 10:00 Notes: TWI Line 1 restoration Last Dispatched Mw: 700.23
2/11/2016 9:57:49 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 552 Start: 02-Nov-2016 09:57 End: 02-Nov-2016 10:30 Notes: Extended potline Line 2. Last Dispatched Mw: 738
4/11/2016 3:23:52 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 690 Start: 04-Nov-2016 03:23 End: 04-Nov-2016 04:00 Notes: Last Dispatched Mw: 720.94 Security violations after CYD TWZ 1 and CYD ROX 2 trippings
4/11/2016 3:38:21 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 710 Start: 04-Nov-2016 03:38 End: 04-Nov-2016 04:00 Notes: Last Dispatched Mw: 690 Security violations after CYD TWZ 1 and CYD ROX 2 trippings
4/11/2016 6:59:24 AM	DISCRETION	MAT1101 ANI0 Discretion Clause 13.70, Part 13 EN Min : 10 Start: 04-Nov-2016 06:59 End: 04-Nov-2016 07:30 Notes: ANI cannot meet dispatch and for security reasons an accurate dispatch was required. Last Dispatched Mw: .99
4/11/2016 9:30:28 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 527 Start: 04-Nov-2016 09:30 End: 04-Nov-2016 10:00 Notes: Line 1 restoration. Last Dispatched Mw: 712.3
6/11/2016 10:06:30 PM	DISCRETION	OHC2201 OHC0 Discretion Clause 13.70, Part 13 ENR Max : 154 Start: 06-Nov-2016 22:06 End: 06-Nov-2016 22:30 Notes: Last Dispatched Mw: 37.62
7/11/2016 10:06:41 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 603 Start: 07-Nov-2016 10:06 End: 07-Nov-2016 10:30 Notes: Potline 2 Last Dispatched Mw: 788
11/11/2016 9:26:13 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 EN Max : 481 Start: 11-Nov-2016 09:26 End: 11-Nov-2016 09:50 Notes: Return of extended duration potline (Line 1) Last Dispatched Mw: 666
14/11/2016 9:32:31 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 ENR Max : 528 Start: 14-Nov-2016 09:32 End: 14-Nov-2016 10:00 Notes: Potline 1. Last Dispatched Mw: 713
29/11/2016 9:25:45 AM	DISCRETION	MAN2201 MAN0 Discretion Clause 13.70, Part 13 ENR Max : 558 Start: 29-Nov-2016 09:25 End: 29-Nov-2016 10:00 Notes: Return of extended line Last Dispatched Mw: 738