SO MONTHLY OPERATIONAL AND SYSTEM PERFORMANCE REPORT

FOR THE ELECTRICITY AUTHORITY

Transpower New Zealand Limited

April 2017

Keeping the energy flowing




TRANSPOWER

Transpower New Zealand Limited The National Grid

Table of Contents

Report Purpose

This report is Transpower's review of its performance as system operator for April 2017, 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

Cyclones Debbie and Cook

The upper North Island suffered two major cyclone weather events in April – Cyclone Debbie (5 April) and Cyclone Cook (13 April).

- On 5 April, Wiri T2 tripped (Cyclone Debbie) resulting in a loss of supply to the Wiri area of 72 MW.
- On 13 April, Edgecumbe-Waiotahi tripped resulting in 6 MW of load lost.

Each event caused significant damage and impacted affected communities. Despite the extreme nature of the weather events, no other material power system events occurred.

Key market observations

National demand has started to increase as we head into winter. This combined with declining hydro storage levels in the South Island have seen the rolling 7 day average prices increase $10 throughout April, ending the month at approximately $54.

The lower South Island hydro generation has resulted in the typical peak HVDC transfer north drop from the 600-800 MW range in summer to the 400-600 MW range in April. The lower HVDC transfer has reduced the instances of island price separation because the HVDC has been less constrained, and less likely to become the binding risk.

The average load forecast inaccuracy for April was 1.7%. This is higher than the average of 1.2% for the previous five months. This result can be explained by several events occurring during April that impacted upon the accuracy of the load forecast (e.g. Easter falling later than last year, cyclones Debbie and Cook, and ANZAC Day falling on a Tuesday, which meant that Monday 24 April was not a typical working day due to people taking leave). While holidays are factored into our load forecast, they are inherently less predictable, therefore leading to increased inaccuracy.

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.

Efficient Procurement of Extended Reserves – Planning for the implementation phase is now underway along with investigation into tool changes required to support the change in block allocations.

Gate Closure – The Gate Closure project is well advanced with functional testing underway, the deployment plan being drafted and training underway. Regression testing and UAT will take place in May. The project is tracking within budget and is tracking for go-live on 29 June.

Real Time Pricing – Design input into the Authority's consultation paper due for release in June has been completed. Planning for support through the consultation period is underway. This next phase of engagement will provide support, advice, technical management and assurance activities. Requirements and design work are expected to recommence in October 2017.

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

3 Security of Supply update

Since February, hydro storage has been declining due to low inflows in the South Island. Inflows into major South Island hydro catchments have been approximately 60% of what we normally expect. This is in the lowest 5th percentile of inflows when compared to the 85 years of historical information we have available.

As a result of the low inflows we are approaching the 1% percent hydro risk curve. Under this scenario we are obliged to step up our reporting as we approach 1% and plan to do this from 19 May 2017. This will comprise publication of additional daily information on our website – including information on the available and utilised capacity for south transfer on the grid. This is not unusual, we initiated the same daily reporting in both 2012 and 2015.

April inflows have been above average in the North Island and below average in the South Island. Storage levels were at 63% of total at the end of the month. The hydro risk meter is set to normal.

For the month of April:

- North Island inflows were 241% of average[1]
- South Island inflows were 64% of average[2]
- Hydro generation met 64% of demand.

As at 1 May, aggregate primary New Zealand storage was 88% of average.

4 Compliance update

Transpower (as system operator) reported two breaches of the Code in April. In December 2016, a bona fide discretionary constraint was mistakenly applied to one generator instead of another for a period of approximately 20 minutes, resulting in negligible market and operational impact. In January 2017, the system operator gave erroneous information to the clearing manager for the purposes of calculating ancillary services costs. The magnitude of the error was minor and washed-up the following month.

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

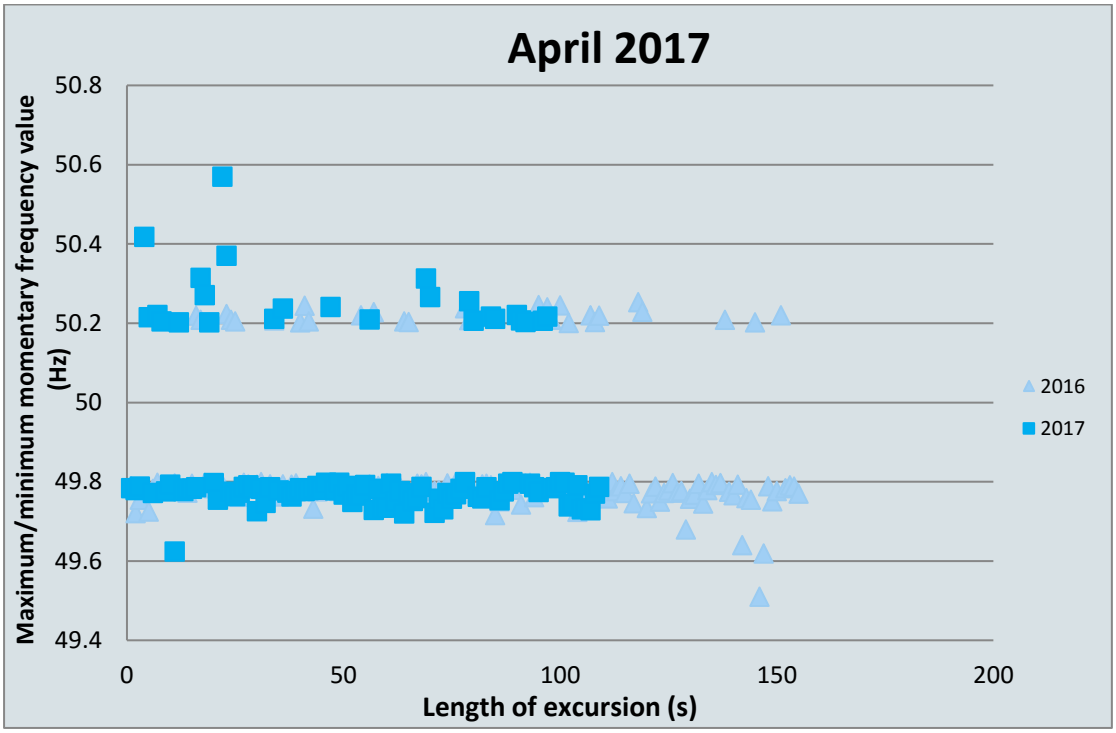
[1] Measurements are based on daily inflow values.
[2] Measurements are based on daily inflow values.

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, for each month over the last 12 months and the 12 month cumulative totals, grouped by frequency band.

Frequency Band	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-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					2			1	1	1	1	1	**7**
50.50 > Freq >= 50.20	42	29	25	13	32	39	45	32	34	20	17	24	**352**
50.20 > Freq > 49.80													
49.80 >= Freq > 49.50	106	89	128	102	153	101	101	59	67	49	79	84	**1118**
49.50 >= Freq > 48.75	2		1		2	2	3	1	2		1		**14**
48.75 >= Freq > 48.00											1		**1**
48.00 >= Freq > 47.00											1		**1**
47.00 >= Freq > 45.00													

Note the 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.

Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

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	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	5	2	3	2	1	2	-	-	-	4	1	1
Warning Notice	3	2	2	5	1	-	-	-	-	-	-	-
Customer Advice Notice	12	3	8	7	5	12	26	7	11	7	24	10

5.4 Grid emergencies

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

Date	Time	Summary Details	Island
04-Apr-17	23:32	A grid emergency was declared to assist with restoration of supply at Tangiwai Substation following a tripping during planned switching.	N

6 Ancillary services

We are processing a request from a generation owner to provide instantaneous reserves at one of their generation stations in the North Island. We expect this provider to be entering the market late May or June.

We are investigating, in conjunction with Grid Owner investigations, high voltage situations in the upper North Island (UNI). We are currently establishing the magnitude of the issue and associated timeframes, which will be followed by an investigation into possible solutions, including voltage support contracts. We are working closely with the Grid Owner in this instance as they are investigating long term solutions to voltage management in the UNI.

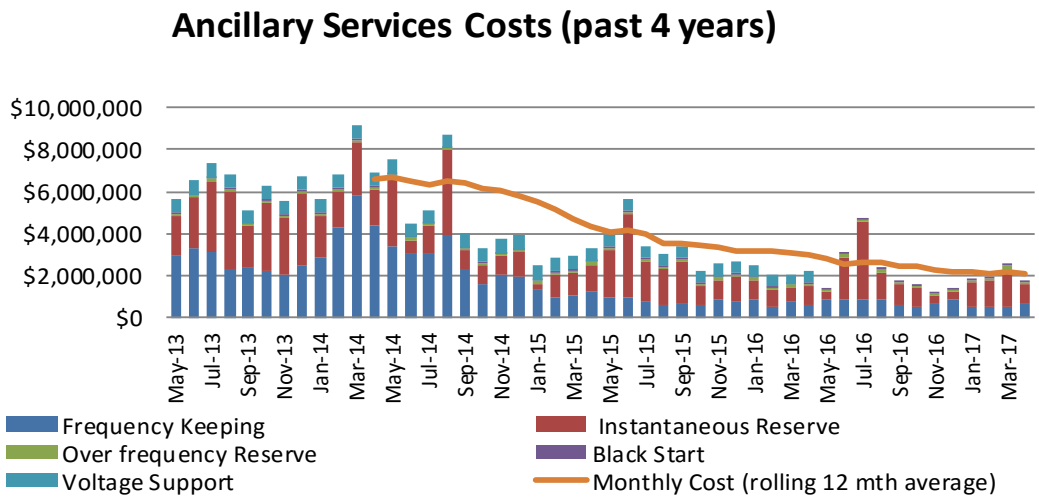
There will be an industry workshop on 18 May 2017 to examine the Northland and Auckland Regional System Restoration plans. This is part of Transpower's System Restoration Planning programme of work. The workshop will be attended by representatives from Transpower, Vector, Top Energy, Northpower and RefiningNZ.

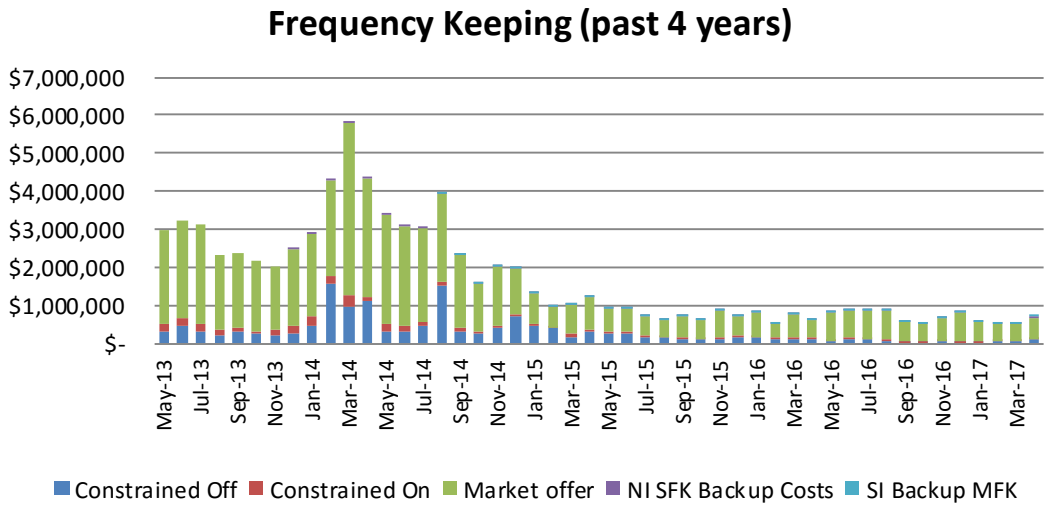
Refer Appendix A for Ancillary Services Graphs.

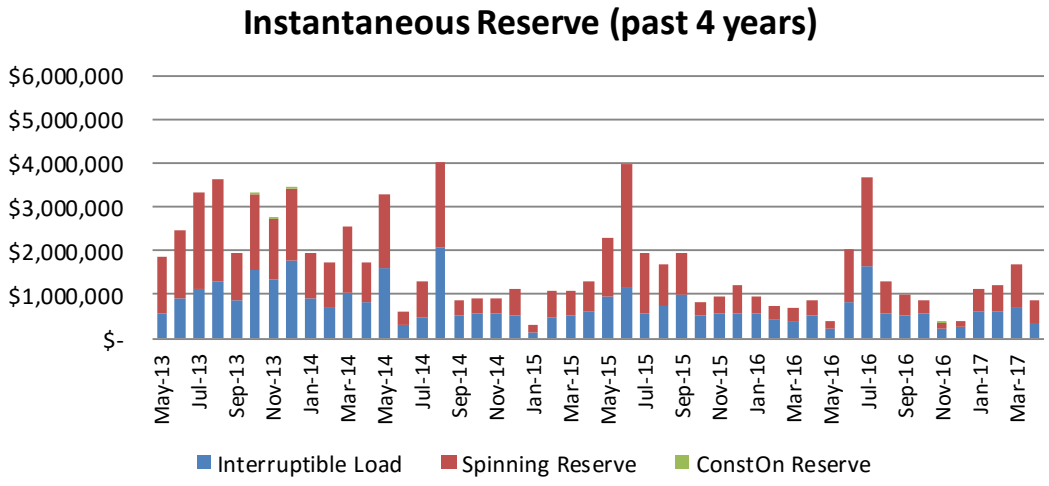
7 Separation of Transpower roles

In performing the system operator role, 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
2/4/2017 1:52:00 AM	DISCRETION	HLY2201 HLY5 Discretion Clause 13.70, Part 13 ENR Min : 182 Start: 02-Apr-2017 01:52 End: 02-Apr-2017 02:00 Notes: Claimed minimum due to resource consent issues as per rule exemption of Code Part 13 Subpart 2 Clause 13.82 (a). Required for security. Last Dispatched Mw: 165.28
2/4/2017 1:59:10 AM	DISCRETION	HLY2201 HLY5 Discretion Clause 13.70, Part 13 ENR Min : 182 Start: 02-Apr-2017 01:52 End: 02-Apr-2017 02:00 Notes: Claimed minimum due to resource consent issues as per rule exemption of Code Part 13 Subpart 2 Clause 13.82 (a). Required for security. Last Dispatched Mw: 165.28
2/4/2017 2:00:23 AM	DISCRETION	HLY2201 HLY5 Discretion Clause 13.70, Part 13 ENR Min : 182 Start: 02-Apr-2017 02:00 End: 02-Apr-2017 02:30 Notes: Claimed minimum due to resource consent issues as per rule exemption of Code Part 13 Subpart 2 Clause 13.82 (a). Required for security. Last Dispatched Mw: 165.28
4/4/2017 5:34:12 PM	DISCRETION	WHI2201 WHI0 Discretion Clause 13.70, Part 13 ENR Max : 25 Start: 04-Apr-2017 17:34 End: 04-Apr-2017 18:00 Notes: Last Dispatched Mw: 25
4/4/2017 10:50:06 PM	DISCRETION	RPO2201 RPO0 Discretion Clause 13.70, Part 13 ENR Max : 0 Start: 04-Apr-2017 22:50 End: 04-Apr-2017 23:30 Notes: Required off for removal of RPO_WRK_1 & RPO_TNG_1. Last Dispatched Mw: 60
9/4/2017 5:51:20 AM	DISCRETION	KAW0113 Discretion Clause 13.70, Part 13 FIR Max : 38 Start: 09-Apr-2017 05:51 End: 09-Apr-2017 06:00 Notes: Last Dispatched: IntF: 59 IntS: 59
22/4/2017 3:13:37 AM	DISCRETION	TWH0331 TRC1 Discretion Clause 13.70, Part 13 ENR Max : 35 Start: 22-Apr-2017 03:13 End: 22-Apr-2017 03:30 Notes: To clear post contingent TWH 220kv voltage violation. Last Dispatched Mw: 45
22/4/2017 3:25:50 AM	DISCRETION	TWH0331 TRC1 Discretion Clause 13.70, Part 13 ENR Max : 30 Start: 22-Apr-2017 03:25 End: 22-Apr-2017 05:00 Notes: To clear post contingent TWH 220kv voltage violation. Last Dispatched Mw: 35
22/4/2017 5:25:07 AM	DISCRETION	TWH0331 TRC1 Discretion Clause 13.70, Part 13 ENR Max : 37 Start: 22-Apr-2017 05:25 End: 22-Apr-2017 06:00 Notes: To clear post contingent TWH 220kv voltage violation. Last Dispatched Mw: 30
24/4/2017 3:23:01 AM	DISCRETION	TWH0331 TRC1 Discretion Clause 13.70, Part 13 ENR Max : 30 Start: 24-Apr-2017 03:23 End: 24-Apr-2017 03:30 Notes: -10MVAr N-1 voltage violations on Tripping for HLY_TWH1 cct Last Dispatched Mw: 43
24/4/2017 3:23:01 AM	DISCRETION	TWH0331 TRC1 Discretion Clause 13.70, Part 13 ENR Max : 30 Start: 24-Apr-2017 03:23 End: 24-Apr-2017 05:00 Notes: -10MVAr N-1 voltage violations on Tripping for HLY_TWH1 cct Last Dispatched Mw: 43
24/4/2017 3:42:03 AM	DISCRETION	KUM0661 KUM0 Discretion Clause 13.70, Part 13 ENR Max : 3 Start: 24-Apr-2017 03:42 End: 24-Apr-2017 05:00 Notes: Security N-1 voltage violations KIK_T2 Last Dispatched Mw: 0
24/4/2017 3:50:13 AM	DISCRETION	SFD2201 SFD21 Discretion Clause 13.70, Part 13 ENR Min : 25 Start: 24-Apr-2017 03:50 End: 24-Apr-2017 04:00 Notes: Security N-1 voltage violations for tripping of HLY_TWH 1. Require SFD 25MW for -30mvars Last Dispatched Mw: 0
27/4/2017 10:16:02 AM	DISCRETION	MAT1101 MAT0 Discretion Clause 13.70, Part 13 ENR Max : 69 Start: 27-Apr-2017 10:16 End: 27-Apr-2017 10:30 Notes: Last Dispatched Mw: 70