System Operator Reports
June 2015

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority for June 2015

Purpose of Report

This report summarises Transpower's review of its performance as system operator for June 2015, as required under clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

Any relevant operational issues are also provided for the information of the Electricity Authority (Authority). A separate detailed System Performance report will be provided to Authority staff.

1. Summary of Month from an Operational and System Performance Perspective

Operational

North and South Island storms

Very cold and, in some areas (notably Taranaki and Wanganui areas), wet weather was experienced from 18-25 June 2015. Despite near record low temperatures in the south, the power system has coped well reflecting current good hydro storage conditions. Peak loads ranged between 100-200 MW higher in the North Island and 100 MW higher in the South Island compared to the period before the cold weather. Peak demand reached 6817MW on 23 June (compared to the record peak of 7272MW on 15 August 2011).

Snowstorms had a severe impact in the West Coast and South Canterbury regions. Heavy snow fall resulted in a number of outages (of varied duration) within those regions over three days, with losses of supply at Albury, Coleridge, Tekapo, Arthurs Pass and Castle Hill, and loss of generation at Tekapo A and Coleridge. Accessing disconnected substations, inspecting tripped circuits and reaching damaged assets was challenging due to lying snow.

Prices were relatively low during the storms period (a reflection of the good hydro storage) meaning some large thermal generation was not being offered regularly into the market. This has resulted in an offer stack that is lower than might be expected (see Figure 1 opposite), which meant the system operator issued a number of standby residual (SRC) notices during the period, alerting industry to potential for shortages at the peaks.

Multiple units, particularly the 2nd Huntly unit, have been effectively removed from the market by significant volumes of cheap hydro generation. Generation companies require extended periods of high prices to justify running thermal plant; however, current market pricing is showing extended periods of low prices with high prices only over peaks.

System co-ordinators actively managed the dispatch system load forecast to ensure advance schedules provided an accurate picture of demand expectations over morning and evening peaks. The system operator was generally comfortable with only a few minor, short term shortages during times when generation plant was ramping. SRC notices were issued (as above) but the majority of potential shortages noted had disappeared by real time.

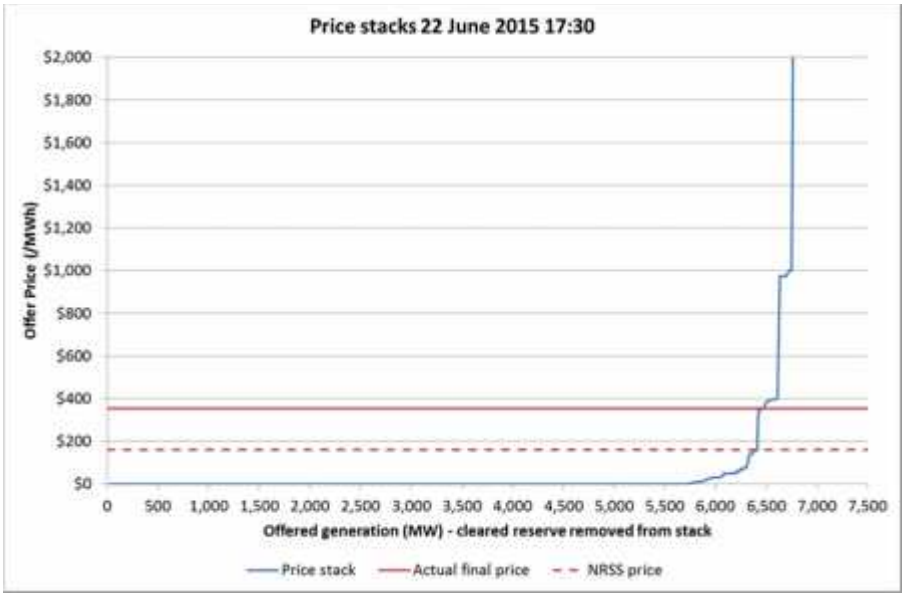


Figure 1 – Price stacks for 17:30 trading period on 22 June

Solar storms

A series of major solar flares were recorded during late June. While these resulted in severe NOAA Scale: G4/high geomagnetic K-index (8) warnings (a cue for NCC to consider if any lower South Island assets should be removed from service to prevent electromagnetic flow damage) and very public night time light shows the warnings did not require any operational response by the system operator (beyond consideration of planning options).

Gas industry critical contingency exercise

On 24 June 2015 the system operator participated in the gas industry's annual critical contingency exercise, Exercise Validation. Participation was limited by the nature of the exercise – the scenario had minimal potential impact on major gas-fired generation plants. A number of operational matters, both internal to the system operator and externally with the Critical Contingency Operator, were noted for attention.

2. Market

There were no outages, exceeding two hours in duration, to the market systems during June 2015.

3. Business Performance

Business Plan

The system operator has finalised its business plan for 2015/16 following the Authority's review and feedback in this month. Work has commenced to enable the system operator to deliver on its key business initiatives for 2015/16. From (and including) the July 2015 performance report onwards the system operator will provide a monthly progress update against the business plan from the July 2015 performance report onwards.

Policy Statement Review

The system operator is currently reviewing its Policy Statement. The review is well underway and the system operator is on target to provide a draft for consultation to the Authority in November/December 2015.

Significant Project Update – Reserves and Frequency Management Programme

The Reserves and Frequency Management (RFM) programme is currently progressing as per the schedule agreed between the system operator and the Authority. The RFM industry forum on 19 June 2015 was well attended, and planning for the next RFM industry engagement group (21 July 2015) has commenced.

Programme component projects are progressing at different stages as described below:

- Efficient Procurement of Extended Reserves Implementation – The system operator provided the Authority with a scope, project plan, and forecast of the work. The joint project team also developed a high level summary of options for managing the operational phase of the work.

- Inter-island Instantaneous Reserve Sharing Implementation – SIR sharing is scheduled to be implemented in early October 2015 following the SO Tools project completion.

- Normal Frequency Management Strategy (TASC 49) – A short list of future options was finalised during June, with benchmarking work ongoing. Additional work requested by the Authority to analyse test data from the system test on 25 June has put pressure on the agreed timeframe for completion of TASC 49.

- National Market for Frequency Keeping – Work on this project is on hold pending the outcome of TASC 49.

- Review of Instantaneous Reserve Markets (TASC 47) – The final report for TASC 47 was submitted to the Authority in June. This will be closed out in July.

- RMT Study Tool – The Solution Options and Development Approach (SODA) has been endorsed. The benefits identification process is now complete, with benefits reviewed and approved. Planning and estimation has been completed and the Initial Business Case has been drafted and submitted for review by programme management in preparation for the challenge session.

- Security Tool Implementation for New HVDC Controls – Due to PRISM's deployment delay, a decision memo has been drafted to reconfirm this project will progress as planned. Functional testing continued during this period, and early integration testing has commenced. Development of the e-learning training is continuing and is planned to be completed end of July, with training starting on 10 August.

Significant Project Update – PRISM

User Acceptance testing (UAT) was scheduled to begin on 6 July but has been deferred until August due to ongoing defect remediation. The issue has been escalated to vendor senior management and an agreement reached for the vendor to provide the critical fixes required to commence UAT on 10 August 2015. This will further delay commissioning of PRISM until November, which will impact on other projects, such as HVDC Security Tools, where dependencies exist.

4. Security of Supply Update

June 2015 hydrology was wet, with aggregate storage remaining above average and very high levels of hydro generation during the month.

NZ aggregate storage levels are 114% of average for this time of year. The hydro risk meter is currently set at "normal". In the unlikely event of significant equipment failure, the Security of Supply status could change quickly.

5. Compliance Report

There were no breaches of the principal performance obligations during June 2015.

Two breaches of the Code relating to modelling errors were reported to the Electricity Authority during June 2015. The first was identified during scheduling time, and the second occurred during real time when adjustments were made during an outage.

6. Ancillary Services

The system operator and Meridian have been in discussions since March this year about a black start test at Manapouri, scheduled to be undertaken in 2015. A number of logistical, technical and commercial concerns were identified during the test planning and could not be resolved in time for a test this year. The Manapouri black start test has therefore been postponed with a rescheduled test date yet to be determined. In the meantime, the system operator is investigating the feasibility of bringing forward next year's North Island test at Tokaanu.

Trustpower is planning to commence offering its Patea station into the Multiple Frequency Keeping market this month.

The system operator has almost completed its investigations into the cost allocation issues that occurred earlier this year. Breach reports are planned to be submitted to the Authority in July. The system operator has now processed more than half of the required wash-ups and is on track to have these completed for the August processing run.

Ancillary Service Costs

The costs of ancillary services for the month of June 2015 are set out in Appendix A (as required by clause 82.1 of the Procurement Plan).

There has been a notable spike in instantaneous reserve costs in May and June, to a level which hasn't been seen since August 2014. This is likely due to a combination of factors at play, but appears to be primarily due to a decrease in the quantity of offered reserves. In particular, some of the thermals weren't running (due to availability of renewable generation) which removed any reserves offered by those units. At the same time, there has been an observable decrease in the amount of interruptible load offered over the peak periods, resulting in higher priced reserves during these times.

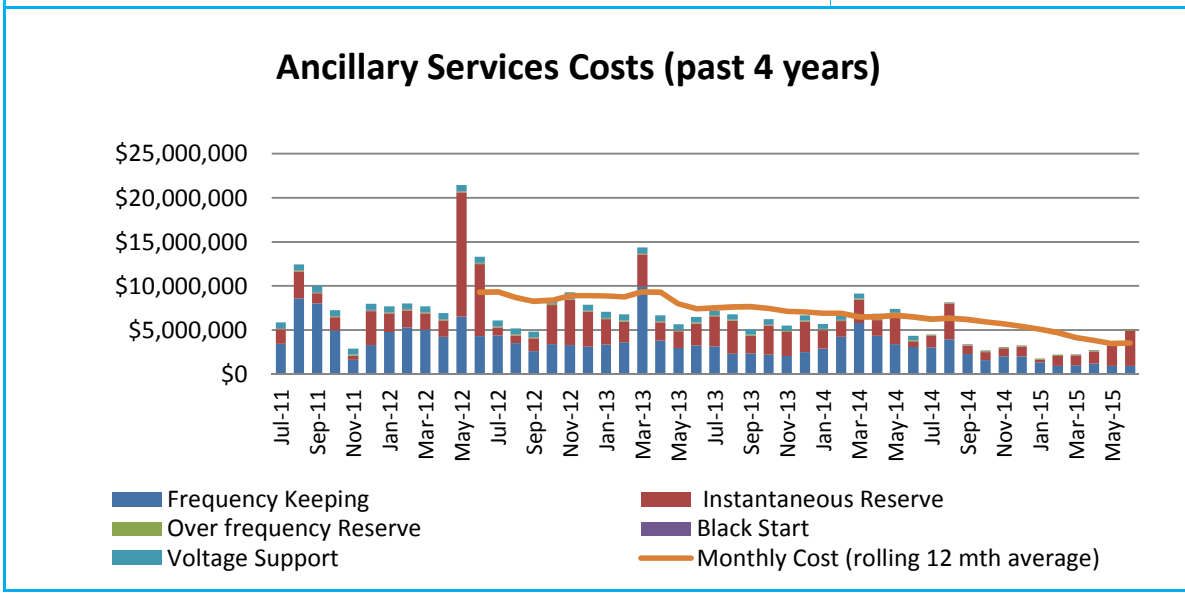
7. Code 7.10: Separation of Transpower Roles

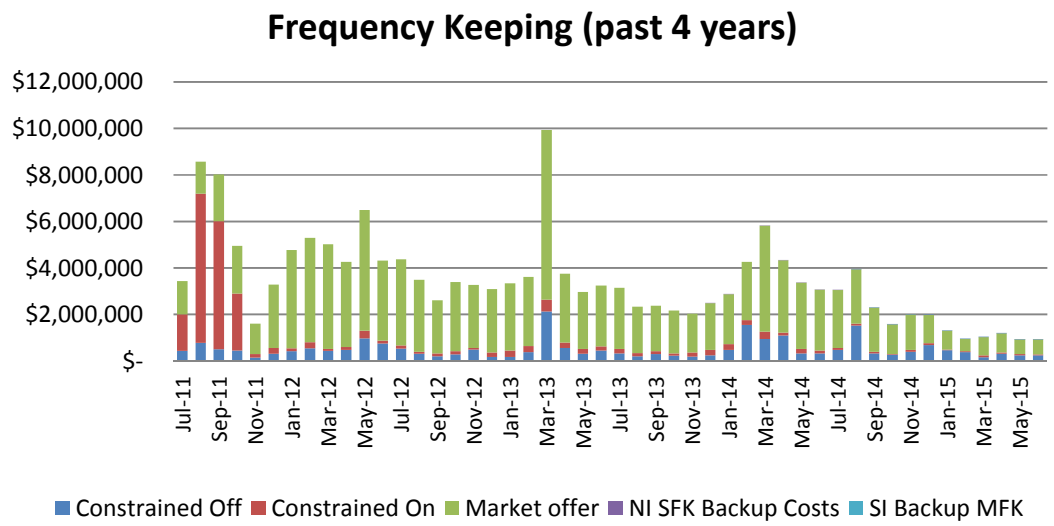
In performing its role as system operator, Transpower has not been materially affected by any other role or capacity Transpower has under the Code or under any agreement.

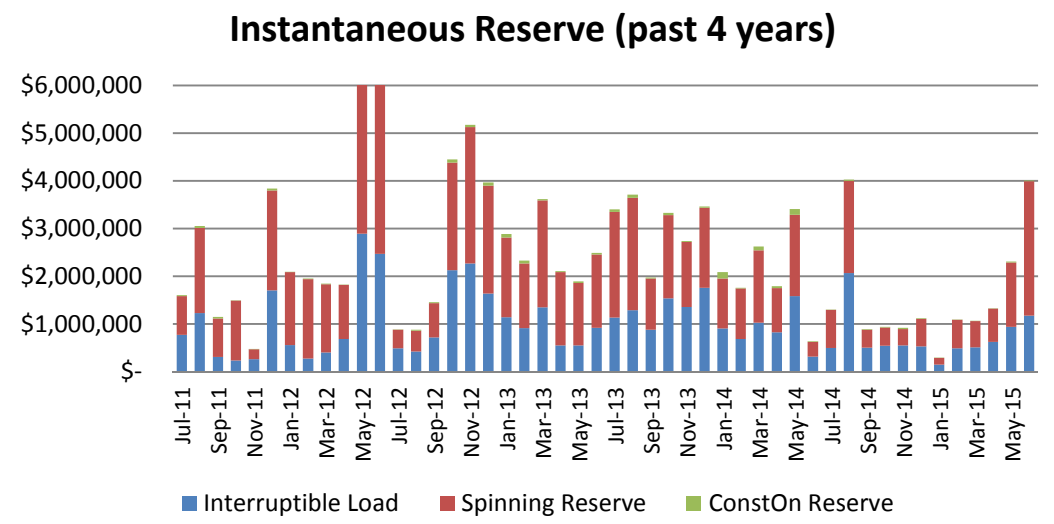
Appendix A – Ancillary Service Costs for June 2015

Note: The scale for the Instantaneous Reserve (Past 4 Years) graph has been reduced to clarify detail. Two months data, May and June 2012, overly influenced the graph scale.

		Cost	
Frequency Keeping	Constrained Off	$	254,220
	Constrained On	$	37,455
	Market offer	$	636,298
	NI SFK Backup Costs	$	2,716.67
	SI Backup MFK	$	2,232.00
	Total monthly Cost	**$**	**932,922**
Instantaneous Reserve	Spinning reserve	$	2,816,671
	Interruptible Load	$	1,175,884
	Constrained On	$	16,383
	Total monthly Cost	**$**	**4,008,938**
Over Frequency Reserve	**Total monthly Cost**	**$**	**114,551**
Black Start	**Total monthly Cost**	**$**	**52,487**
Voltage Support	**Total monthly Cost**	**$**	**-**
All Ancillary Services	**Total monthly Cost**	**$**	**5,108,899**







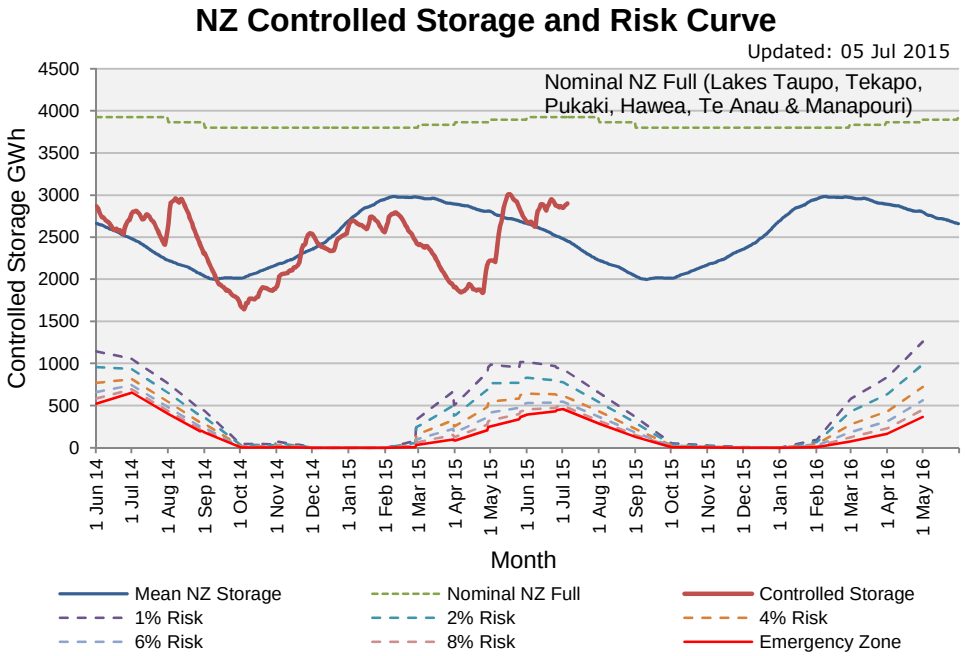
Note: IR Cost May 2012 = 14.129M, IR Cost Jun 2012 = 8.164M

Appendix B – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

As at 05 July 2015, aggregate primary New Zealand storage is 114% of average.

The graph below compares New Zealand hydro storage to the hydro risk curves.



Hydro Storage and Generation

North Island inflows during June 2015 were 129% of average.

South Island inflows during June 2015 were 157% of average.

Measurements are based on daily inflow values.

Hydro generation met 65% of demand during June 2015.

System Performance Report

To the Electricity Authority

June 2015

Purpose

This System Performance Report summarises power system performance each month. The detailed reporting of system events is intended to provide an understanding of the nature of system events that occur in the normal course of the real time co-ordination of security and to identify emerging issues in system operation.

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

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1. Summary of System Performance

This system performance report covers the month of June 2015.

Principal Performance Obligations

The system operator met the Principal Performance Obligations during the reporting period.

System Events

A number of momentary rises in South Island frequency occurred during June 2015 due to emergency pot-line off-loads at Tiwai Point aluminium smelter, as follows:

- 21st June 21:51, South Island frequency 50.71 Hz;
- 22nd June 06:11, South Island frequency 50.61 Hz;
- 23rd June 13:25, South Island frequency 50.53 Hz;
- 23rd June 17:51, South Island frequency 50.53 Hz;
- 28th June 11:06, South Island frequency 50.48 Hz.

On 18 June 2015 a storm passed across the country impacting supply, particularly in the central South Island area. During that time reliable supply was lost to a number of substations, as follows.

- From 16:18 load was progressively lost from Albury Substation as, in turn, connected party feeders tripped. By 16:50 there was no connected load at the station. Feeders were not returned to service until the following evening.
- The 66 kV Coleridge – Hororata circuit 2 tripped at 16:31. The Coleridge – Hororata circuit 3 tripped intermittently until 16:53 when it tripped and stayed out. This left Coleridge Power Station connected to the system solely by the trans-alpine Coleridge – Otira circuits. Coleridge – Hororata circuits were returned to service by the 15.30 trading period on 22 June 2015.
- The connected party feeder at Coleridge Power Station was lost at 19:44. This was not restored until midday on 21 June 2015.
- Intermittent tripping of 66 kV Coleridge-Otira circuits 1 & 2 commenced at 18:23. A number of losses of connection (of varying duration) occurred at Coleridge Power Station, as well as Arthurs Pass and Castle Hill substations until 21:04, when connection was lost to Coleridge. Supply was restored to Castle Hill and Arthurs Pass substations at 21:12, but lost again at Castle Hill at 21:46. Supply to Coleridge and Castle Hill was not restored until 20 June 2015 when the Coleridge – Otira Circuits were returned to service.
- Connection was lost to Albury and Tekapo A Substations when the 110 kV Timaru – Tekapo A circuit 1 tripped at 21:11. The circuit was initially restored but tripped again at 22:35, and was not restored until the following day.

On 29 June 2015 at 14:31 the Halfway Bush 110 kV bus tripped resulting in a loss of supply to the 110 kV load and a partial loss of supply to the 33 kV load. Supply was restored after 26 minutes.

Other noteworthy events occurring during the reporting period:

- On 19 June 2015 at 11:12 Takapu Road 110 kV bus A2 tripped. There was no disruption to supply.

- The past 12 months has been a period of lower-than-average system trippings. June 2015 represented a return to average levels.

- The storm that affected New Zealand from 18 to 20 June 2015 resulted in 16 trippings of grid equipment, and a similar number of feeder connections, during a 24 hour period, including those indicated above. These were largely restricted to the central South Island area, mainly due to snow loadings on equipment, with minimal trippings elsewhere. The floods in the North Island resulted in minimal grid issues.

2. Principal Performance Obligations

2.1 Avoid Cascade Failure

No instances of cascade failure occurred during the reporting period.

2.2 Frequency

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. The majority of excursions are within 0.4 Hz of the normal band and frequency typically returns to within the normal band within 2 minutes.

Maintain Frequency and limit rate occurrences during momentary fluctuations

The following table 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	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	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	1	1		2			1	2	1	1	4	**14**	**50**
50.50 > Freq >= 50.20	336	345	420	244	360	165	26	25	47	153	252	308	**2681**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	452	401	585	351	375	204	24	15	44	174	315	295	**3235**	
49.50 >= Freq > 48.75		1		2	5	2	1	1	1				**13**	**60**
48.75 >= Freq > 48.00					1								**1**	**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

The time error performance criteria are:

- Time error must be managed within +/- 5 seconds.
- Time error must be eliminated at least once every day.

Time Error Compliance Table		Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15
Time Error Management	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Error Elimination	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. Operational Management

3.1 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	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	5	4	3	7	3	5	1	4	-	2	3	1
Warning Notice	8	21	7	8	11	23	29	27	31	10	12	-
Customer Advice Notice	33	16	10	28	22	20	11	12	12	13	32	11

3.2 GRID EMERGENCIES

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

Date	Time	Summary Details	Island
29/06/15	14:41	A Grid Emergency was declared to facilitate load restoration after the tripping of the Halfway Bush 110 kV bus.	S

A summary of grid emergencies that have occurred in the last 12 months is shown in the following table.

Island	Region	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Total
North Island	Northland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Auckland	-	-	-	4	-	-	-	-	-	-	-	-	**4**
	Zone 1	3	1	-	-	-	-	-	-	-	1	-	-	**5**
	Waikato	-	-	2	2	2	4	1	2	-	-	3	-	**16**
	Bay of Plenty	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Hawkes Bay	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Taranaki	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Bunnythorpe	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Wellington	1	-	-	-	-	-	-	-	-	-	-	-	**1**
	North Island (all)	1	-	-	-	-	-	-	-	-	-	-	-	**1**
	Lower North Island	-	1	-	-	-	-	-	-	-	-	-	-	**1**
North & South Islands		1	1	-	1	-	-	-	-	-	-	1	-	**4**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	1	1	-	1	-	-	-	-	-	-	-	**3**
	Otago	-	-	-	-	-	-	-	1	-	-	-	-	**1**
	Southland	-	-	-	-	-	-	-	1	-	1	-	1	**3**
	South Island (all)	-	-	-	-	-	1	-	-	-	-	-	-	**1**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 CUSTOMER ADVICE NOTICES (CANS)

Eleven CANs (Customer Advice Notices) were issued in the reporting period:

- four related to the planned activation and deactivation of HVDC Frequency Keeping Control;

- two related to dispatching from back-up tools due to an unplanned Market Systems outage on 2 June;
- two were issues as part of a gas contingency planning exercise;
- one related to an outage on HVDC Pole 2 on 4 June;
- one advised of an HVDC Multiple Frequency Keeping test running from 25 June to 2 July 2015; and
- one advised of a change to the modelled quantity of North Island Automatic Under-Frequency Load Shedding in the Reserve Management Tool.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of two-hundred and fifty-seven SRC notices were issued during the reporting period based on the SDS (system operator's own load forecasting tool). These SRC notices were in respect of trading periods on 2nd – 5th, 7th – 9th, 11th, 13th – 18th, 22nd – 25th June 2015.

3.5 VOLTAGE MANAGEMENT

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

3.6 OUTAGE MANAGEMENT

The following table shows the number of outages over the last 12 months where operational measures (generation agreements, load management agreements or grid re-configurations) were required to allow the outage to proceed. Load agreements generally require the distributor to manage load at one or more grid exit points. Generation agreements are required to ensure that sufficient regional generation is available to provide energy or reactive support during the outage to maintain security standards. Grid re-configurations typically involve splitting the network during the outage to manage post contingency power flows. Security of supply is sometimes reduced by grid re-configuration.

Island	Region	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Total
North Island	Northland	-	1	2	5	3	3	3	7	6	12	8	7	**57**
	Auckland	2	3	6	4	3	1	1	6	4	8	11	5	**54**
	Waikato	3	5	10	10	9	3	4	10	9	8	11	7	**89**
	Bay of Plenty	5	5	-	6	7	6	3	4	4	6	4	4	**54**
	Hawkes Bay	1	-	-	5	2	2	2	4	6	6	7	3	**38**
	Taranaki	-	1	1	2	7	-	4	4	3	2	5	2	**31**
	Bunnythorpe	-	-	2	7	4	1	5	4	4	8	7	4	**46**
	Wellington	3	4	3	12	9	10	11	9	8	9	6	7	**91**
Total		14	19	24	51	44	26	33	48	44	59	59	39	**460**
South Island	Nelson Marlborough	5	2	4	10	14	8	7	6	4	6	8	3	**77**
	West Coast	10	6	4	10	11	8	8	8	6	5	10	7	**93**
	Christchurch	4	2	4	7	10	6	5	8	7	7	7	6	**73**
	Canterbury	4	4	2	6	7	4	4	5	2	2	6	1	**47**
	Otago	-	2	9	2	4	2	1	3	2	3	5	-	**33**
	Southland	5	5	2	1	3	3	1	2	4	5	3	1	**35**
Total		28	21	25	36	49	31	26	32	25	28	39	18	**358**

3.7 CONSTRAINTS

SUMMARY: Security constraints binding during the month

The following table shows the binding constraints during the reporting period.

Additional information on security constraints can be found on the following website address: *http://www.systemoperator.co.nz/security-management#cs-147305*. This information includes constraint equations and a brief summary of their purpose.

Island	Region	Branch	Description	Total
North Island	Auckland	BOB_OTA2.2__BOB_OTA1.2__BOB_OTA1__OTA__LN	This is an SFT generated constraint. Its purpose is to protect Bombay-Otahuhu 2 for a tripping of Bombay-Otahuhu 1.	2
	Bunnythorpe	BPE_T1_or_BPE_T2_or_BPE_T3_W_O_1	The effect of this constraint is to manage flows through the remaining in-service Bunnythorpe 220/110 kV interconnecting transformers for an extended contingency event of a single Bunnythorpe 220/110 kV interconnecting transformer when either one of the Bunnythorpe 220/110 kV interconnecting transformers T1, T2 or T3 is out of service.	4
	Hamilton	KIN_TRK1.2__OHK_WRK.1__OHK_WRK__TRK__LN	This is an SFT generated constraint. Its purpose is to protect Kinlieth-Tarukenga 1 for a tripping of Ohakuri-Wairakei 1.	6
		KIN_TRK1.1__OHK_WRK.1__OHK_WRK__KIN__LN	This is an SFT generated constraint. Its purpose is to protect Kinlieth-Tarukenga 1 for a tripping of Ohakuri-Wairakei 1.	1
	Hawkes Bay	RDF_T3&T4_W_P_1	The effect of this constraint is to manage flows through Redclyffe T3 & T4 to prevent the in service transformer from overloading for a contingency of the other transformer.	1
South Island & HVDC	HVDC	BEN_HAYP2max	The purpose of this constraint is to limit the flow on HVDC from Benmore to Haywards to the Asset Owner offered capability for Pole 2.	9
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 2.	1
		NSY_ROX.1__CYD_TWZ1.1__CYD_TWZ1__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 1.	3
	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	This is an SFT generated constraint. Its purpose is to protect Coleridge-Hororata 2 for a tripping of Coleridge-Hororata 3	9
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	This is an SFT generated constraint. Its purpose is to protect Coleridge-Hororata 3 for a tripping of Coleridge-Hororata 2	10
		COL_HOR_2&3_O_1A_z	The effect of this constraint is to limit generation from Coleridge Power Station for voltage stability reasons when Coleridge-Hororata 2 and 3 are out of service.	1
Grand Total				**47**

Constraints binding during last 12 months

The following table shows constraints which bound during the reporting period for a duration of more than 4 trading periods and those binding for more than 48 trading periods during the previous 12 months.

Island	Region	Constraint	Reporting period		Previous 12 months	
			Number of trading periods that constraint bound	Percentage of trading periods	Number of trading periods that constraint bound	Percentage of Trading periods
North Island	Bunnythorpe	BPE_T1_or_BPE_T2_or_BPE_T3_W_O_1	4	0.28%	0	0.00%
	Hamilton	KIN_TRK1.2__OHK_WRK.1__OHK_WRK__TRK__LN	6	0.42%	0	0.00%
	Hawkes Bay	RDF_T3&T4_S_P_1	0	0.00%	87	0.50%
South Island & HVDC	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	9	0.63%	83	0.47%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	10	0.69%	71	0.41%
		HOR_KBY_ISL1.2__HOR_KBY_ISL2.2__:S__HOR_ISL2__ISL__LN	0	0.00%	128	0.73%
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	1	0.07%	102	0.58%
	HVDC	BEN_HAYP2max	9	0.63%	101	0.58%

4. System Events

4.1 Significant System Events

The following table shows significant events (frequency excursions and connection point events) which occurred during the reporting period.

Significant frequency excursions

Date	Time	Summary Details	Island	Freq (Hz)
21/06/15	21:51	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.71
22/06/15	06:11	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.61
23/06/15	13:25	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.53
23/06/15	17:51	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.53

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
18/06/15	20:58	Coleridge-Otira Circuit 1 tripped resulting in a loss of connection to Coleridge Power Station due to earlier trippings.	12 gen 0 load	1287

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
18/06/15	21:11	Timaru-Tekapo A Circuit 1 tripped resulting in a loss of supply to Albury and Tekapo A substations and a loss of connection to Tekapo A generation.	ABY 0 MW TKA 23 MW gen 2 MW load	33
18/06/15	22:35	Timaru-Tekapo A Circuit 1 tripped resulting in a loss of supply to Albury and Tekapo A substations and a loss of connection to Tekapo A generation.	ABY 0 MW TKA 17 MW gen 1.5 MW load	716 711
29/06/15	14:31	Halfway Bush 110 kV bus tripped resulting in a loss of supply to the 110 kV feeders and a partial loss of supply to the 33 kV grid exit point.	40	26

4.2 SYSTEM EVENTS DURING REPORTING PERIOD

System events that occurred during the reporting period are summarised below:

Contingent events

Event	Number	Summary
Loss of single AC transmission circuit	26	These related to trippings of • Arapuni-Hangatiki 1 (auto reclose) • Bombay-Hamilton 1 (auto reclose) • Coleridge-Hororata 2 • Coleridge-Hororata 3 (3 x) • Coleridge-Otira 1 (3 x) • Coleridge-Otira 2 (2 x auto reclose, 1 x trip) • Dobson-Reefton-Inangahua 2 • Huntly-Stratford 1 (auto reclose) • Hororata-Islington 1 (2 x) • Hororata-Islington 2 • Islington-Kikiwa 1 (3 x auto reclose) • Kinleith-Tarukenga 1 (auto reclose) • Mangere-Roskill 2 (auto reclose) • Masterton-Upper Hutt 1 (auto reclose) • Timaru-Tekapo A 1 (3 x)
HVDC Start/Stop	0	
Supply Transformer	4	These related to trippings of • Blenheim T1 • Halfway Bush T1, T2 • Wanganui T2
Loss of grid reactive plant	4	This related to tripping of • Albany Capacitor Bank C1 • Kikiwa Static Synchronous Compensator STC2A • Islington Capacitor Bank C26 (2 x)
Loss of single generation units	11	These related to trippings of • Cobb G6 • Glenbrook Co-generation • Highbank G1 • Kapuni GT2 • Mokai generation • Ohaaki G1 • Onepu TOPP1 • Otahuhu CCGT generation • Poihippi G1 • Te Uku wind generation • Wheao generation
Total during reporting period	**45**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	
Loss of interconnecting transformer	0	
Loss of bus bar section	2	This related to trippings of • Halfway Bush 110 kV bus • Takapu Road 110 kV bus A2
Total during reporting period	**2**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	8	This related to • Bunnythorpe-Tokaanu 2 (auto reclose), resulting voltage disturbance caused a commutation failures on HVDC P2 • Brunswick-Stratford 1 & 2 (auto reclose), resulting voltage disturbance caused a commutation failures on HVDC P2 & P3 • Coleridge-Otira 1 & 2 (2 x trip, 1 x auto reclose) • Kinleith-Tarukenga 2 (auto reclose) & Kinleith Cogeneration • Opunake-Stratford 1 & 2 (auto reclose) • Roxburgh-Three Mile Hill 1 & 2 A/R (multiple trippings)
Demand change	5	These related to • Tiwai NZAS Standby Potline 2 Emergency off-load (5 x)
Generation	0	
Total during reporting period	**13**	

Other disturbances

Event	Number	Summary
Feeder trippings	69	Various locations
Total during reporting period	**69**	

4.3 SYSTEM EVENTS – TREND

	Jul-14	Aug-14	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Total	Average Events per month
Contingent Event – transmission	16	8	14	19	9	11	13	10	8	13	8	26	**155**	12.9
Contingent Event – generation	23	12	12	1	16	12	19	10	14	6	11	11	**147**	12.3
Contingent Event – Supply transformer	0	2	4	4	1	1	2	3	2	3	3	4	**29**	2.4
Contingent Event – Reactive plant	0	1	9	1	2	1	7	4	2	3	6	4	**40**	3.3
Contingent Event - HVDC	0	0	2	2	7	0	1	0	3	0	0	0	**15**	1.3
Extended Contingent Event HVDC	0	0	0	0	0	0	0	0	0	0	0	0	**0**	0.0
Extended Contingent Event Inter-connecting Transformers	0	0	0	1	0	0	0	0	1	0	2	0	**4**	0.3
Extended Contingent Event Busbar	1	0	0	2	0	1	0	0	1	2	1	2	**10**	0.8
Other Event – AC transmission	1	1	0	2	3	0	2	1	4	0	1	8	**23**	1.9
Other Event – Demand	1	1	2	1	5	0	1	2	1	1	2	5	**22**	1.8
Other Event – Generation	0	1	2	1	1	0	3	1	4	0	1	0	**14**	1.2