

System Operator Reports

August 2015

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- Section 2 System Performance Report



SYSTEM OPERATOR

TRANSPower



Keeping the energy flowing

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

Purpose of Report

This report summarises Transpower's review of its performance as system operator for August 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. Business Plan Progress Update

The System Operator Business Plan outlines the key business initiatives to be undertaken in the 2015/16 financial year to enable us to meet the strategic goals set out in the System Operator Strategic Plan 2015-2020.

There are eight key business initiatives, each pertaining to one or more strategic goals, with a number of associated key performance indicators (KPIs). Performance to date is very good with over 90% of the measurable 2015/16 KPI's forecast to be on track – three KPIs are presently not being measured due to insufficient information. Performance on each key business initiative is summarised in Appendix A.

2. August Summary from an Operational and System Performance Perspective

Operational and System Performance

August 2015 was a quiet month operationally with few planned outages and little in the way of events (no material asset or weather-related events). Demand peaks and prices were generally modest and managing evening peaks presented few challenges, despite some thermal plant not being offered.

Recent announcements of impending thermal plant withdrawals from service do, however, point to a period in future where, in the absence of an appropriate industry response, managing peaks, especially during dry periods or very cold weather events, may become more challenging, more often.

As the system operator we will assist the process to inform industry through a recently announced work stream to review the impact of thermal decommissioning <https://www.systemoperator.co.nz/activities/current-projects/impact-thermal-generator-decommissioning>.

System co-ordinator training - Security Tool Implementation for New HVDC Controls

System co-ordinators commenced training ahead of a market system release that will automate a number of high risk manual activities associated with the use of HVDC frequency keeping control. The training has utilised a self-learning, rather than classroom facilitated, approach. This has enabled more efficient utilisation of co-ordinator time, and a reduction in training times.

The release will assist co-ordinators to deliver more accurate and reliable transitions into and out of the HVDC frequency keeping control mode, which in turn facilitates national frequency keeping markets and enabling this new mode to be available over a wider range of dispatch scenarios.

3. Market

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

4. Business Performance

Policy Statement Review

The system operator is currently reviewing its Policy Statement, as per its Code obligations and as part of key business initiative 1. 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. A special RFM engagement group was held in August 2015 to review proposed new instantaneous reserves products. The next engagement group is scheduled for 17 September 2015. The RFM programme forms part of key business initiative 4.

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

- Efficient Procurement of Extended Reserves Implementation – The majority of the work packages relating to workshop 1 were completed, including an updated version of the technical requirements schedule. Presentations and organisation for the first workshop, including an activity on the outcome based approach, were completed for the Authority.
- Inter-island Instantaneous Reserve Sharing Implementation – A customer advisory notice (CAN) will be sent after completion of the Security Tools project (10 September) to inform industry that SIR sharing has been introduced to this project. SIR sharing functionality has been built as part of the Security Tools project, and will be included as part of project deployment. However, the functionality is not planned to go into production until 29th September, following Authority approval.
- Normal Frequency Management Strategy (TASC 049) – The Normal Frequency Management Strategy project (TASC 049) has completed a benchmark review and detailed assessment of interim and future options. Outputs and recommendations were drafted and were under final management review prior to submission to the Authority.
- National Market for Frequency Keeping – Work is on hold pending the outcomes of TASC49 Normal Frequency Management Strategy.
- National Market for Instantaneous Reserve – The initial business case has been approved. Solution requirements workshops are underway.
- RMT Study Tool – The RMTSAT Study Tool Investigation has been completed, and a challenge session held. Feedback from the challenge session is under consideration. The project capital phase is currently on hold pending further review of the business case and associated budget (a result of the challenge session discussion with the business owner and GM, System Operations).

- **Security Tool Implementation for New HVDC Controls** – The Security Tools Project has come to the end of the delivery phase with training progressing well and to plan. Training is due to be completed by 4 September. Deployment will occur on Thursday 10 September 2015.

Significant Project Update – PRISM

The project continues to make progress in resolving critical defects identified during testing and which must be resolved to enable commissioning. Progress has not been as rapid as planned. Despite the various measures put in place over the last few months, the project is now forecasting to deliver later than planned and will require a budget increase (this will require Transpower Board consideration). Final planning was underway to confirm the impact. It is expected a formal request will be raised with the Authority in October to seeking a time and budget extension for PRISM and any other relevant projects impacted by the PRISM delay.

Significant Project Update – Project Aardwolf

Project Aardwolf analysis to identify the capital expenditure to maintain the market system as part of the SOSPA negotiation has been completed and final sign-off is being obtained. The project will be closed in September and has been a crucial input to the achievement of key business initiative 5.

5. Security of Supply Update

Storage has been declining during August 2015, despite above average inflows. This is normal (and expected) as typically demand is high and inflows are low during this time of year.

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.

6. Compliance Report

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

During August 2015 seven breaches of the Code were reported, including:

- five related to ancillary services monthly processing. A review was initiated to address the errors and ensure the integrity of the end to end process. Completion of this review has determined a number of actions related to the errors and other aspects of the process;
- one related to the incorrect application of a constraint; and
- one related to an incorrect input to forward looking schedules.

7. Ancillary Services

The system operator has now completed processing all the wash-ups required to fix-up the cost allocation errors that occurred earlier this year. The system operator has reported five consequential Code breaches to the Authority.

Ancillary Service Costs

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

8. 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 – Business Planning Update KPI Table

Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
1. Assisting the Authority to meet its competition, reliability and efficiency objective (the CRE objective)	2	-	2	-	-	-	Work has commenced on both KPIs with both presently on track.
2. Developing an efficient balance between risk, reliability and resilience	3	-	3	-	-	-	Work has commenced on all KPIs with all presently on track.
3. Seeking opportunities to add value through the provision of information to support an efficient market	3	-	2	-	1	-	Work has commenced on two KPIs with both of these on track. The third KPI, relating to publishing event reports within four weeks, is currently NA as there have been no events to report against in 2015/16 to date.
4. Improvements to deliver a system operator service that meets or exceeds expectations and represents value for money	6	-	3	1	2	-	Work has commenced on four KPIs with three of these on track. The other KPI, related to determining additional economic capability, is at risk due to being put on hold due to illness of a crucial resource. There is insufficient information available to assign a rating for the remaining two KPIs, relating to project commissioning, so these are NA at this stage.
5. A transparent business and requirements roadmap for investments required to deliver the system operator service	2	-	2	-	-	-	Work has commenced on both KPIs with both presently on track.
6. Building capability, and promoting a professional, responsive service culture	5	1	4	-	-	-	One KPI, relating to implementing a study version of vSPD for analyst use, has been completed ahead of schedule. Work has commenced on the remaining four KPIs with all presently on track.



Key Business Initiative	# of KPIs	Complete	On track	At risk	NA	Missed	Comments
7. Engaging with and understanding the Authority, market participants and consumers	5	-	5	-	-	-	Work has commenced on all five KPIs with all on track.
8. Maximising opportunities arising from being part of the wider Transpower business	12	2	9			1	Two KPIs, relating to an MOU for generator commissioning and a baseline for comparing future staff turnover, have been completed ahead of schedule. One KPI, related to the development of a common fatigue management policy, has been missed. Work has commenced, or is shortly planned to commence, on all other KPIs, with all presently on track.
Totals	38	3	30	1	3	1	

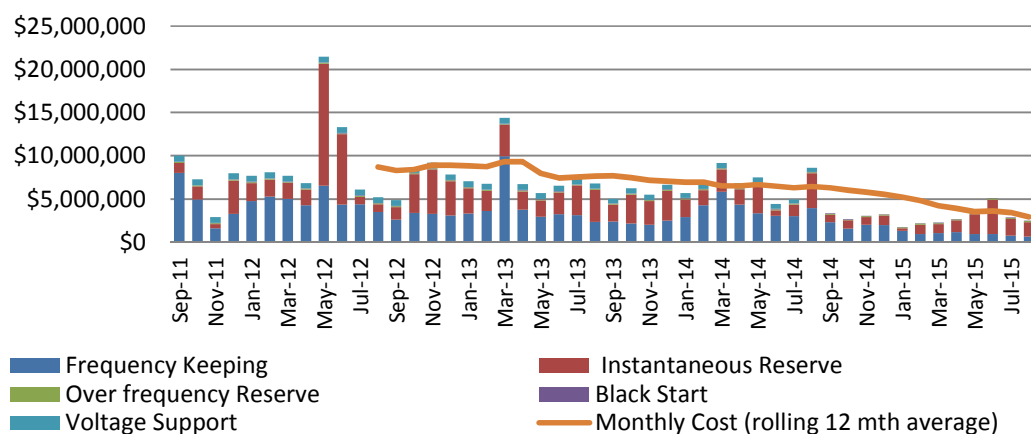


Appendix B – Ancillary Service Costs for August 2015

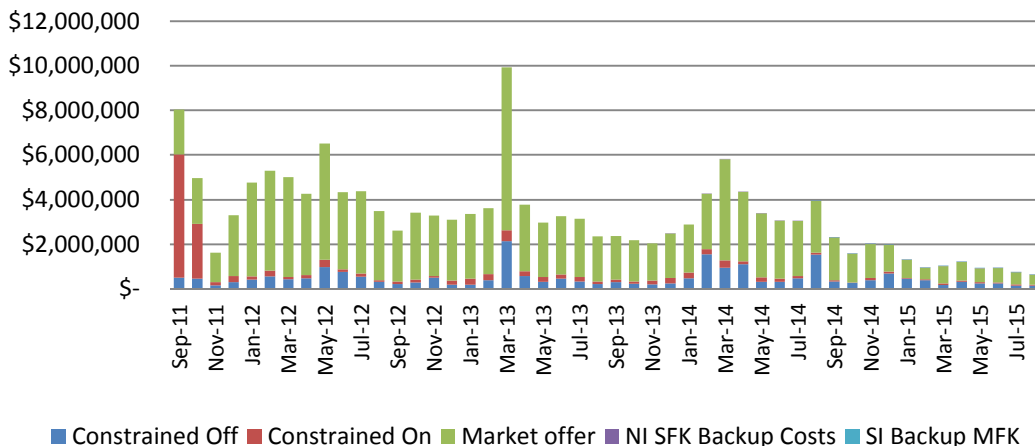
Note: The scale for the Instantaneous Reserve (Past 4 Years) graph has been reduced to clarify detail. Two months data, May and June 2012, overly influenced the graph scale.

		Cost
Frequency Keeping	Constrained Off	\$ 143,108
	Constrained On	\$ 35,764
	Market offer	\$ 448,471
	NI SFK Backup Costs	\$ 2,716.67
	SI Backup MFK	\$ 2,232.00
	Total monthly Cost	\$ 632,292
Instantaneous Reserve	Spinning reserve	\$ 933,427
	Interruptible Load	\$ 752,388
	Constrained On	\$ 4,392
	Total monthly Cost	\$ 1,690,207
Over Frequency Reserve	Total monthly Cost	\$ 119,229
Black Start	Total monthly Cost	\$ 52,487
Voltage Support	Total monthly Cost	\$ -
All Ancillary Services	Total monthly Cost	\$ 2,494,215

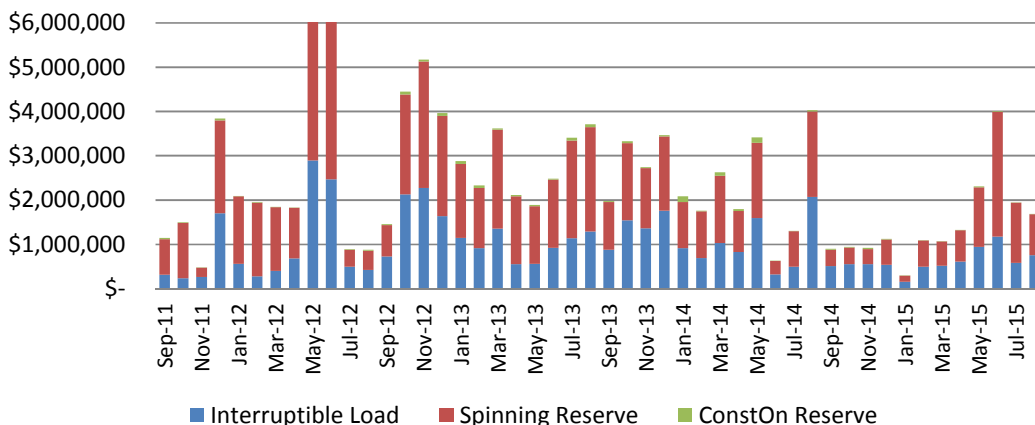
Ancillary Services Costs (past 4 years)



Frequency Keeping (past 4 years)



Instantaneous Reserve (past 4 years)

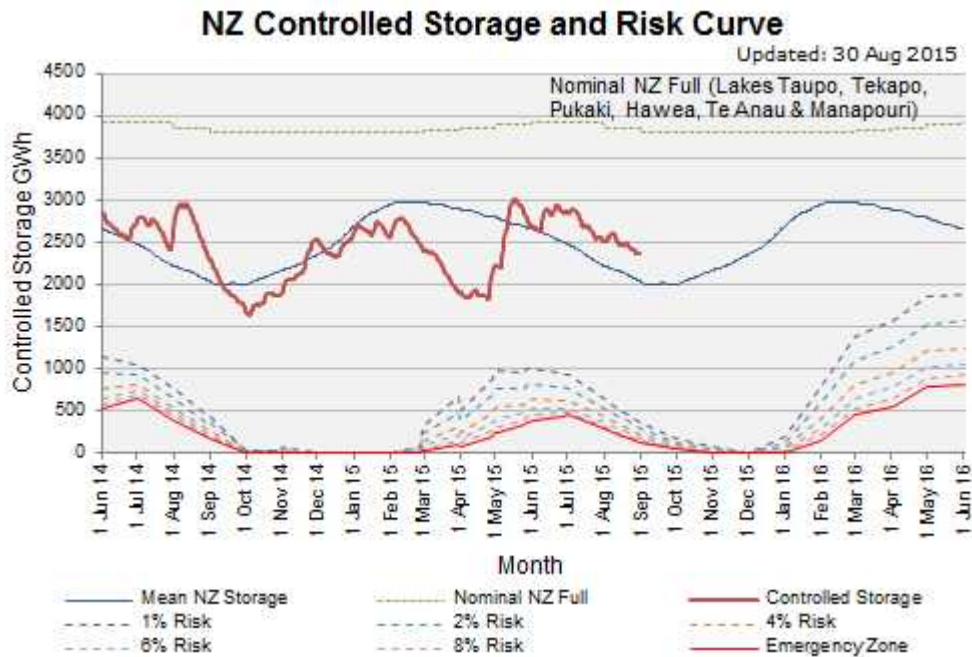


Note: IR Cost May 2012 = 14.129M, IR Cost Jun 2012 = 8.164M

Appendix C – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

As at 1st September 2015, aggregate primary New Zealand storage was 114% of average. The graph below compares New Zealand hydro storage to the hydro risk curves.



Hydro Storage and Generation

North Island inflows during August 2015 were 125% of average.
South Island inflows during August 2015 were 118% of average.
Measurements are based on daily inflow values.
Hydro generation met 65% of demand during August 2015.

System Performance Report

To the Electricity Authority

August 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

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1. SUMMARY OF SYSTEM PERFORMANCE

This system performance report covers the month of August 2015.

Principal Performance Obligations

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

System Events

- On 13 August at 14:17 an emergency potline off-load at Tiwai Point aluminium smelter resulted in a momentary frequency rise in the South Island to 50.62 Hz.
- On 22 August at 05:37 an emergency potline off-load at Tiwai Point Aluminium Smelter resulted in a momentary frequency rise in the South Island to 50.51 Hz.
- On 24 August at 16:35 National Park supply transformer T1 tripped resulting in a loss of supply to National Park Substation. Supply was restored after 630 minutes.

Other noteworthy events occurring during the reporting period:

- On 15 August at 14:20 Kikiwa 220 kV bus 'B' tripped. The associated voltage disturbance resulted in the loss of approx 23 MW of load and approx 15 MW of generation in the area.
- On 18 August at 12:29 an emergency potline off-load at Tiwai Point aluminium smelter resulted in a momentary frequency rise in the South Island to 50.46 Hz.

2. PRINCIPAL PERFORMANCE OBLIGATIONS

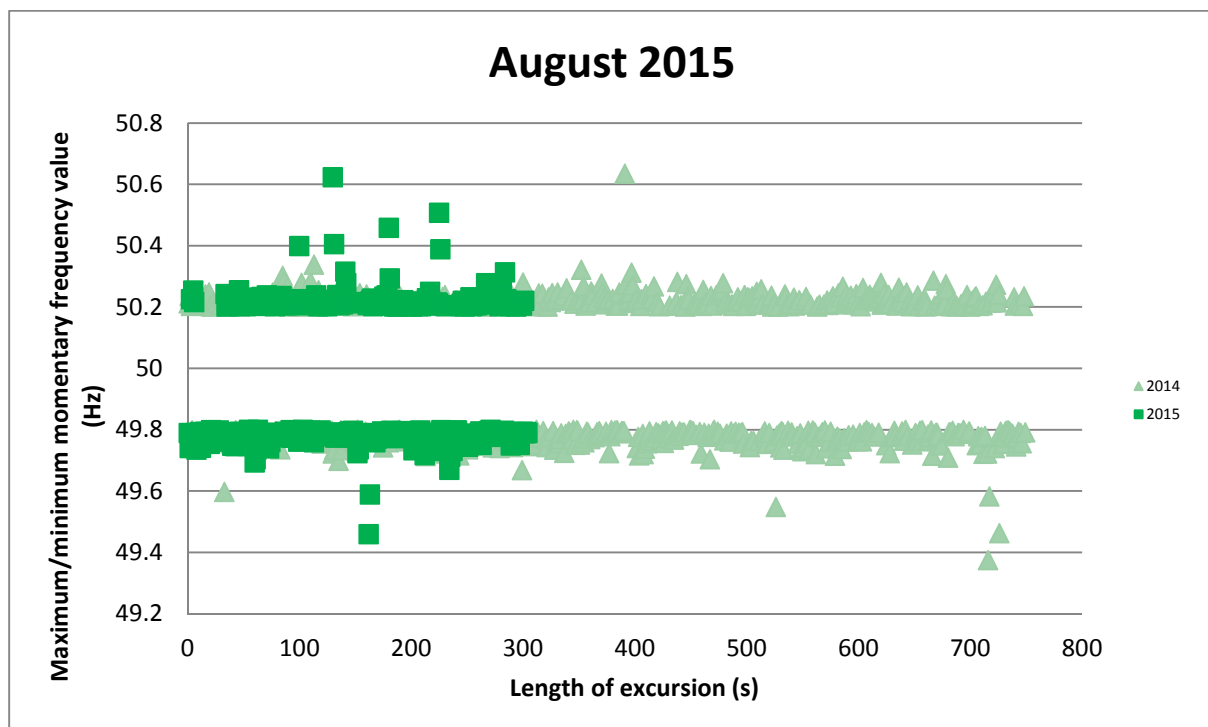
2.1 AVOID CASCADE FAILURE

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 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	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-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		2			1	2	1	1	4	2	2	16	50
50.50 > Freq >= 50.20	420	244	360	165	26	25	47	153	252	308	104	131	2235	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	585	351	375	204	24	15	44	174	315	295	141	170	2693	
49.50 >= Freq > 48.75		2	5	2	1	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		Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-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	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	3	7	3	5	1	4	-	2	3	1	-	-
Warning Notice	7	8	11	23	29	27	31	10	12	-	-	1
Customer Advice Notice	10	28	22	20	11	12	12	13	32	11	5	6

3.2 GRID EMERGENCIES

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

Date	Time	Summary Details	Island
		None	

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

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

3.3 CUSTOMER ADVICE NOTICES (CANs)

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

- two related to HVDC frequency keeping control being disabled on 22 August 2015 during live-line work on the HVDC line;
- one advised of a new constraint developed for a planned outage on 110 kV Blenheim – Stoke Circuit 1;



- one advised of new constraints developed for planned 110 kV Hamilton – Karapiro circuit outages;
- one advised of changes to system operator tools to facilitate HVDC frequency keeping control and round-power operation; and
- one advised of procedural changes around the closing of the Arapuni 110 kV bus split for bus outages at Arapuni.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of 236 SRC notices were issued during the reporting period based on the SDS (the system operator's own load forecasting tool). These SRC notices were in respect of trading periods on 4th – 6th, 10th – 13th, 17th – 21st, 25th – 28th, and 31st of August.

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	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15	Total
North Island	Northland	2	5	3	3	3	7	6	12	8	7	-	3	59
	Auckland	6	4	3	1	1	6	4	8	11	5	3	7	59
	Waikato	10	10	9	3	4	10	9	8	11	7	4	6	91
	Bay of Plenty	-	6	7	6	3	4	4	6	4	4	3	2	49
	Hawkes Bay	-	5	2	2	2	4	6	6	7	3	-	-	37
	Taranaki	1	2	7	-	4	4	3	2	5	2	-	-	30
	Bunthythorpe	2	7	4	1	5	4	4	8	7	4	2	2	50
	Wellington	3	12	9	10	11	9	8	9	6	7	-	3	87
Total		24	51	44	26	33	48	44	59	59	39	12	23	462
South Island	Nelson Marlborough	4	10	14	8	7	6	4	6	8	3	2	2	74
	West Coast	4	10	11	8	8	8	6	5	10	7	6	3	86
	Christchurch	4	7	10	6	5	8	7	7	7	6	6	4	77
	Canterbury	2	6	7	4	4	5	2	2	6	1	2	2	43
	Otago	9	2	4	2	1	3	2	3	5	-	-	2	33
	Southland	2	1	3	3	1	2	4	5	3	1	4	2	31
Total		25	36	49	31	26	32	25	28	39	18	20	15	344



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
	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	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	4
		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	2
Grand Total				9

Constraints binding during last 12 months

The following table shows constraints during the reporting period that bound for a duration of four or more 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	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	4	0.27%	64	0.37%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	2	0.13%	53	0.30%
		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	0	0.00%	103	0.59%



4. SYSTEM EVENTS

4.1 SIGNIFICANT SYSTEM EVENTS

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

Significant frequency excursions

Date	Time	Summary Details	Island	Freq (Hz)
13/08/15	14:17	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.62
22/08/15	05:37	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.51

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
24/08/15	16:35	National Park Supply Transformer T1 tripped resulting in a loss of supply to National Park.	3.1	630

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	7	These related to trippings of <ul style="list-style-type: none"> • Coleridge-Otira 1 • Greymouth-Kumara 1 • Hamilton-Piako-Waihou 1 (auto reclose). • Henderson-Southdown 1 • Islington-Tekapo B 1 (auto reclose). • Naseby-Roxburgh 1 (auto reclose) • Pakuranga-Whakamaru 1
HVDC Start/Stop	0	
Supply Transformer	1	This related to tripping of <ul style="list-style-type: none"> • National Park T1
Loss of grid reactive plant	2	These related to trippings of <ul style="list-style-type: none"> • Haywards Synchronous Condensor SC2 • Kikiwa Static Synchronous Compensator STC2B
Loss of single generation units	6	These related to trippings of <ul style="list-style-type: none"> • Cobb Generation • Highbank G1 • Manapouri G2 • Waipori G2A1 (2x) • Whareroa generation
Total during reporting period	16	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	



Event	Number	Summary
Loss of interconnecting transformer	0	
Loss of bus bar section	1	This related to tripping of <ul style="list-style-type: none"> Kikiwa 220 kV 'B' bus
Total during reporting period	1	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	0	
Demand change	3	These related to <ul style="list-style-type: none"> Tiwai NZAS Standby Potline Emergency off-load (3 x)
Generation	1	This related to tripping of <ul style="list-style-type: none"> Matahina G1 & G2
Total during reporting period	4	

Other disturbances

Event	Number	Summary
Feeder trippings	34	Various locations
Total during reporting period	34	

4.3 SYSTEM EVENTS – TREND

	Sep-14	Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Total	Average Events per month
Contingent Event – transmission	14	19	9	11	13	10	8	13	8	26	11	7	149	12.4
Contingent Event – generation	12	1	16	12	19	10	14	6	11	11	13	6	131	10.9
Contingent Event – Supply transformer	4	4	1	1	2	3	2	3	3	4	0	1	28	2.3
Contingent Event – Reactive plant	9	1	2	1	7	4	2	3	6	4	3	2	44	3.7
Contingent Event - HVDC	2	2	7	0	1	0	3	0	0	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	1	0	0	0	0	1	0	2	0	0	0	4	0.3
Extended Contingent Event Busbar	0	2	0	1	0	0	1	2	1	2	0	1	10	0.8
Other Event – AC transmission	0	2	3	0	2	1	4	0	1	8	0	0	21	1.8
Other Event – Demand	2	1	5	0	1	2	1	1	2	5	2	3	25	2.1
Other Event – Generation	2	1	1	0	3	1	4	0	1	0	0	1	14	1.2

