System Operator Reports
August 2014

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority

Period from 1 August – 31 August 2014

Purpose of Report

This report summarises the results of the system operator's review of its performance for the period 1 August – 31 August 2014, 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 Authority. A separate detailed System Performance report is provided to Electricity Authority (Authority) staff.

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

1.1. Operational

South Island Multiple Frequency Keeping (MFK) was introduced into operations on 4 August, as planned. South Island MFK uses Contact Energy as the single MFK frequency keeper, pursuant to an ancillary services procurement contract tailored specifically for the single frequency keeping offers from that company. It is expected Meridian Energy will join the MFK frequency keeping market later in the year.

System Events

Two significant events occurred in the reporting period.

The first occurred on 5th August at 13:02 when a fault on the Masterton 110 kV bus caused the tripping of 110 kV Haywards-Upper Hutt Circuits 1 and 2, Masterton-Upper Hutt Circuits 1 and 2, and Mangamaire-Masterton Circuit 1. This resulted in a 53 MW loss of supply to Greytown, Masterton, & Upper Hutt Substations. Supply was restored to Upper Hutt after 43 minutes, Greytown after 54 minutes, and Masterton after 139 minutes. A grid emergency was declared for the period to 15:00.

The second occurred on 19 August 2014 at 18:00 (trading period 37). A shortage of energy and reserve offers resulted in a reserve deficit in real-time and final pricing. The system operator has published a report on the event.

- at 14:00 the NRSL for 18:00 showed a NI residual of 89MW, a SI residual of 31MW, 78MW of NI wind scheduled and prices scheduled high but feasible (NI: MW $582.79, FIR $0.01 and SIR $578.55)
- at 14:56 a warning notice was issued requesting additional energy offers for the NI and SI and reserves for the NI, along with decreases in demand from 17:30 to 19:30
- around 16:30 generators offering peaker generation were advised certain units would likely be dispatched in the trading periods from 17:00 (to avoid issues with slow start up)
- peaker units were dispatched in trading period 35 (17:00)
- at 17:15 NI 60s reserves were infeasible with an approximate 13.6 MW deficit
- one peaker unit was ramp rate constrained and one unit failed to start properly (a bona fide was claimed at 17:39)

- at 17:50 a grid emergency notice (GEN) was issued, as, despite ramp rate constraints having been overcome, reserves were still infeasible (worst 60s deficit ~ 120MW with 0MW SI residual and 57.5MW NI residual)
- additional SI generation was offered at 17:56 (this was dispatched in trading period 37) with further SI generation being offered at 18:07 (for trading period 38)
- the grid emergency ended at 19:07

Two material frequency excursions occurred:

- on 14th August at 21:40 an emergency potline off-load at Tiwai Point Aluminium Smelter resulted in a momentary frequency rise in the South Island to 50.63 Hz.
- 30 August when Clyde generator 1 tripped (a loss of 110MW generation), sending South Island frequency to 49:37Hz.

Operational Improvements

From 19 August roundpower operation was approved as the normal HVDC operational mode. This followed successful trial operations which commenced on 19 May. Round power mode of operation allows seamless dispatch from 1200MW DC north to 750MW DC south through zero, itself a benefit to both the market and power system.

Other benefits include:

- continuous frequency stabilization and reserve sharing between islands, creating a more stable power system with easier frequency keeping and minimised frequency disturbances during events
- market benefits from the removal of HVDC minimum constraints and a consequent reduced chance of price separation between islands
- roundpower also unlocks future market changes allowing national reserves and national frequency keeping.

Roundpower mode of HVDC operations is required for to forthcoming national frequency and reserves markets. The HVDC frequency keeping control (FKC) is also required for national frequency market development. That application will be tested further in September leading to trial operations in October.

On 21 August the system operator's remedial action scheme (RAS) application was turned on in the market system. This Authority-funded application enables more accurate modelling of security constraints for schemes that automatically reconfigure the power system to enable added pre event energy transfer. Previously, the System Operator applied more conservative, less accurate modelling in the market system to reflect the action of such special protection scheme, a less optimal position from a market participant's perspective.

1.2. Market

There were no outages of the market system exceeding two hours during August.

2. Business Performance

Significant Project Update

	Status	Implementation date	Update
Dispatchable demand	On Track	**'Go Live' date of 15 May 2014**	• Project is on track to close in late September/early October. • Norske Skog has confirmed it has an agreement in place with Transpower's division EMS to use the Grid Owner's GXP meter information. The SO is discussing a suitable start date for the two DCLSs with Norske Skog.

3. Security of Supply Update

New Zealand aggregate storage levels are 113% 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.

4. Compliance Report

There were no breaches of the principal performance obligations by the system operator during August. There were two breaches of the Electricity Industry Participation Code (EIPC) reported to the Authority during the month of August. The two events were:

- a failure to identify and model the effect of a loss of filters on the HVDC capability
- a miscommunication resulted in an incorrect calculation of costs for reserves provided at one generating station.

5. Ancillary Services

The system operator has sought a refund of availability fees payable under its ancillary services contract with an over frequency reserve provider, due to the long term unavailability of two of its contracted units.

It has taken action against a frequency keeping provider for failure to meet its contracted performance standards. Because of potential competition implications from removing a provider from the market, the system operator discussed the proposed action with the Authority before taking any action. An arrangement acceptable to all parties was reached.

Ancillary Service Costs

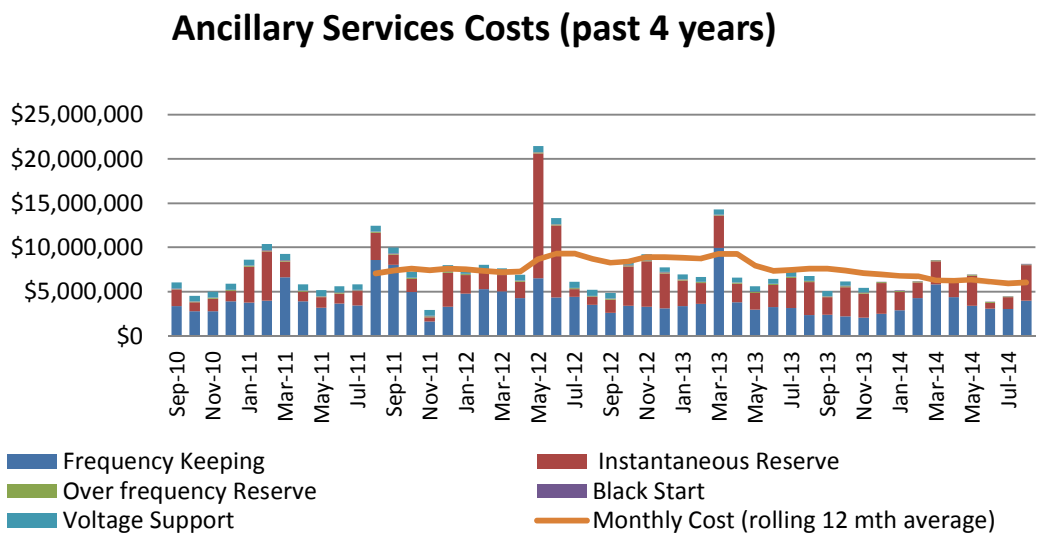
The costs of ancillary services for the month of August are set out in Appendix A (as required by clause 82.1 of the procurement plan).

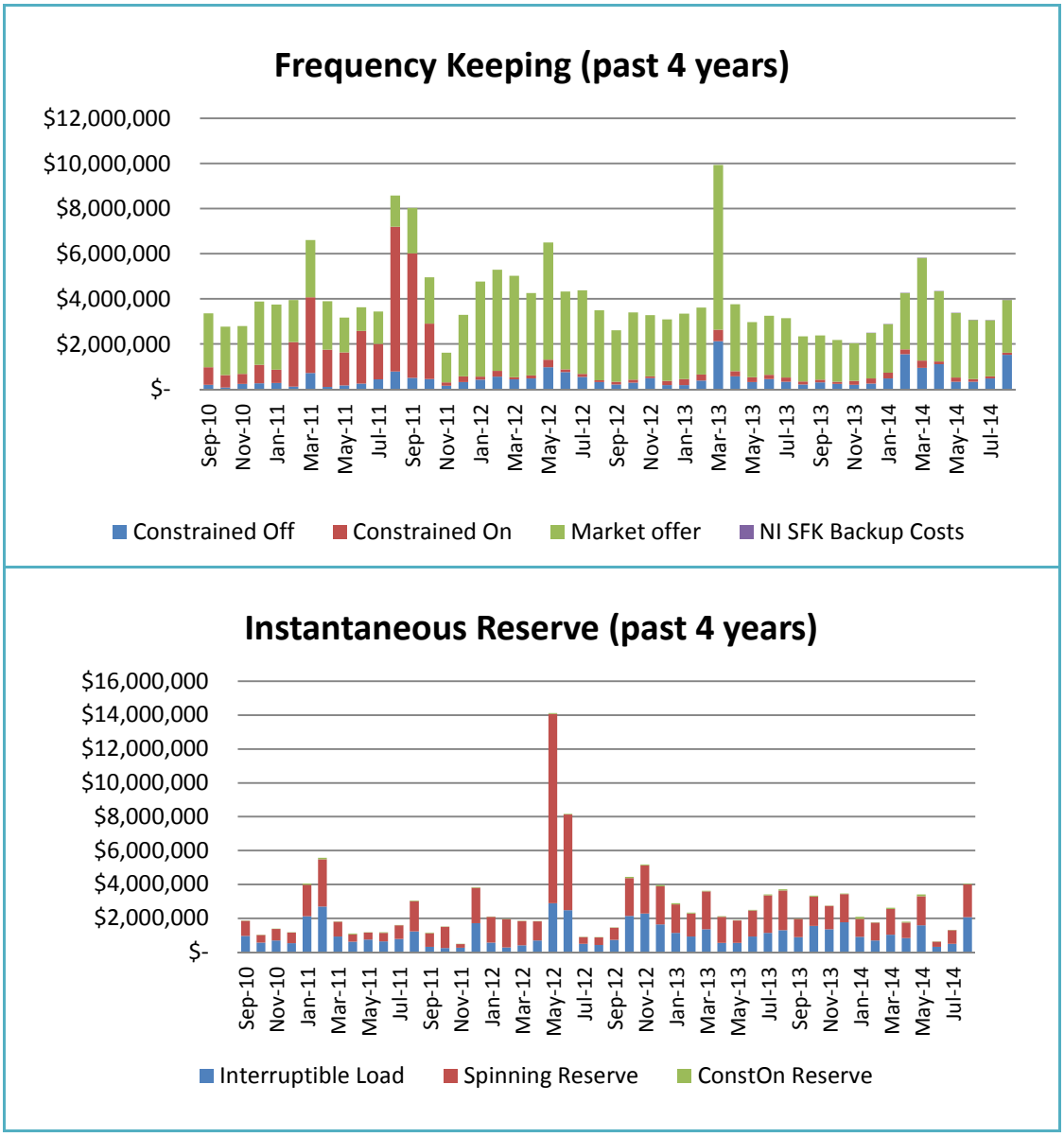
6. Code 7.10: Separation of Transpower Roles

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 August 2014

		Cost	
Frequency Keeping	Constrained Off	$	1,528,511
	Constrained On	$	89,921
	Market offer	$	2,334,183
	NI SFK Backup Costs	$	1,666.67
	Total monthly Cost	**$**	**3,954,282**
Instantaneous Reserve	Spinning reserve	$	1,931,864
	Interruptible Load	$	2,072,233
	Constrained On	$	25,269
	Total monthly Cost	**$**	**4,029,366**
Over Frequency Reserve	**Total monthly Cost**	**$**	**83,677**
Black Start	**Total monthly Cost**	**$**	**49,405**
Voltage Support	**Total monthly Cost**	**$**	**-**
All Ancillary Services	**Total monthly Cost**	**$**	**8,124,962**




Frequency Keeping (past 4 years)
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$-
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Jul-13
Sep-13
Nov-13
Jan-14
Mar-14
May-14
Jul-14
Constrained Off
Constrained On
Market offer
NI SFK Backup Costs

Instantaneous Reserve (past 4 years)
$16,000,000
$14,000,000
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$-
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
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Mar-13
May-13
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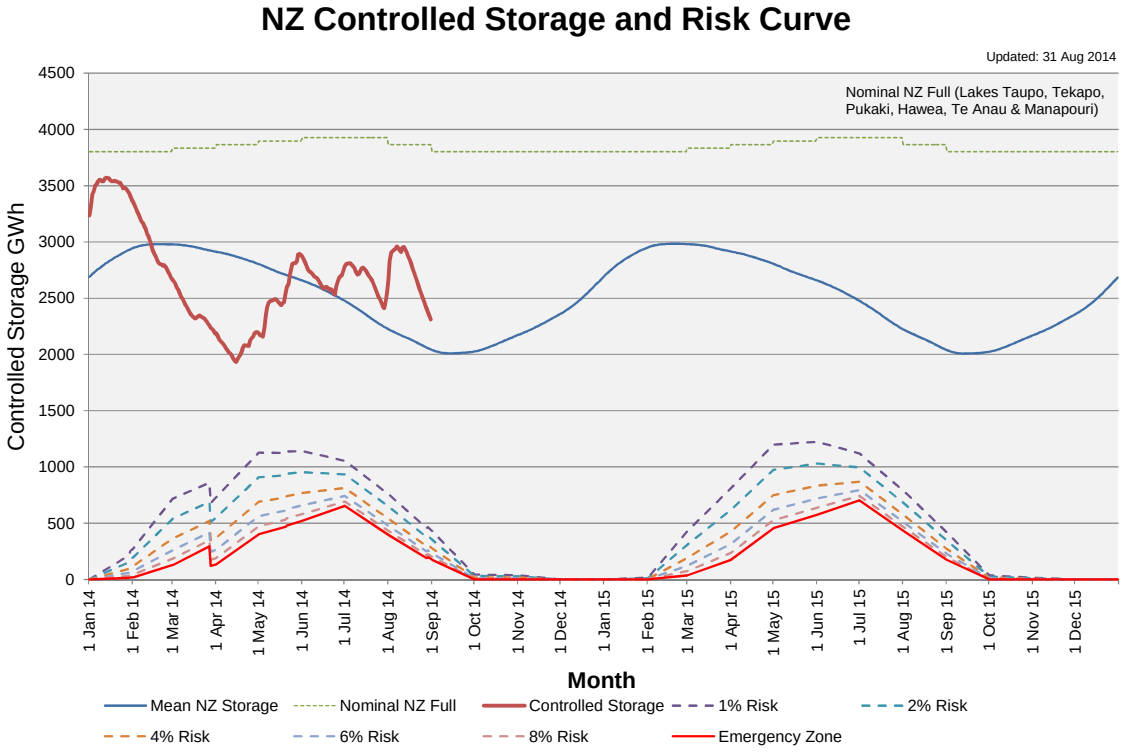
Nov-13
Jan-14
Mar-14
May-14
Jul-14
Interruptible Load
Spinning Reserve
ConstOn Reserve

Appendix B – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

Aggregate primary New Zealand storage is 113% of average for this time of year.
The graph below compares New Zealand hydro storage to the hydro risk curves.



Hydro Storage and Generation

North Island Inflows over the last calendar month have been 90% of average.
South Island Inflows over the last calendar month have been 183% of average.
Measurements are based on daily inflow values.

Over the last calendar month hydro generation has met 65% of demand.

System Performance Report

To the Electricity Authority

August 2014

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

Table of Contents

1. Summary of System Performance

This system performance report covers the month of August 2014.

Principal Performance Obligations

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

System Events

On 5th August at 13:02 a fault on the Masterton 110 kV bus caused the tripping of 110 kV Haywards-Upper Hutt Circuits 1 & 2, Masterton-Upper Hutt Circuits 1 & 2, and Mangamaire-Masterton Circuit 1. This resulted in a loss of supply to Greytown, Masterton, & Upper Hutt Substations. Supply was restored to Upper Hutt after 43 minutes, Greytown after 54 minutes, and Masterton after 139 minutes.

On 14th August at 21:40 an emergency potline off-load at Tiwai Point Aluminium Smelter resulted in a momentary frequency rise in the South Island to 50.63 Hz.

On 30th August at 00:35 a generating unit at Clyde Power Station tripped resulting in a momentary drop in South Island frequency to 49.37 Hz.

Other noteworthy events occurring during the reporting period:

On 20th August at 04:39, the 110 kV Inangahua – Kikiwa Circuit 1 tripped and auto-reclosed resulting in a momentary loss of connection to Murchison Substation.

2. Principal Performance Obligations

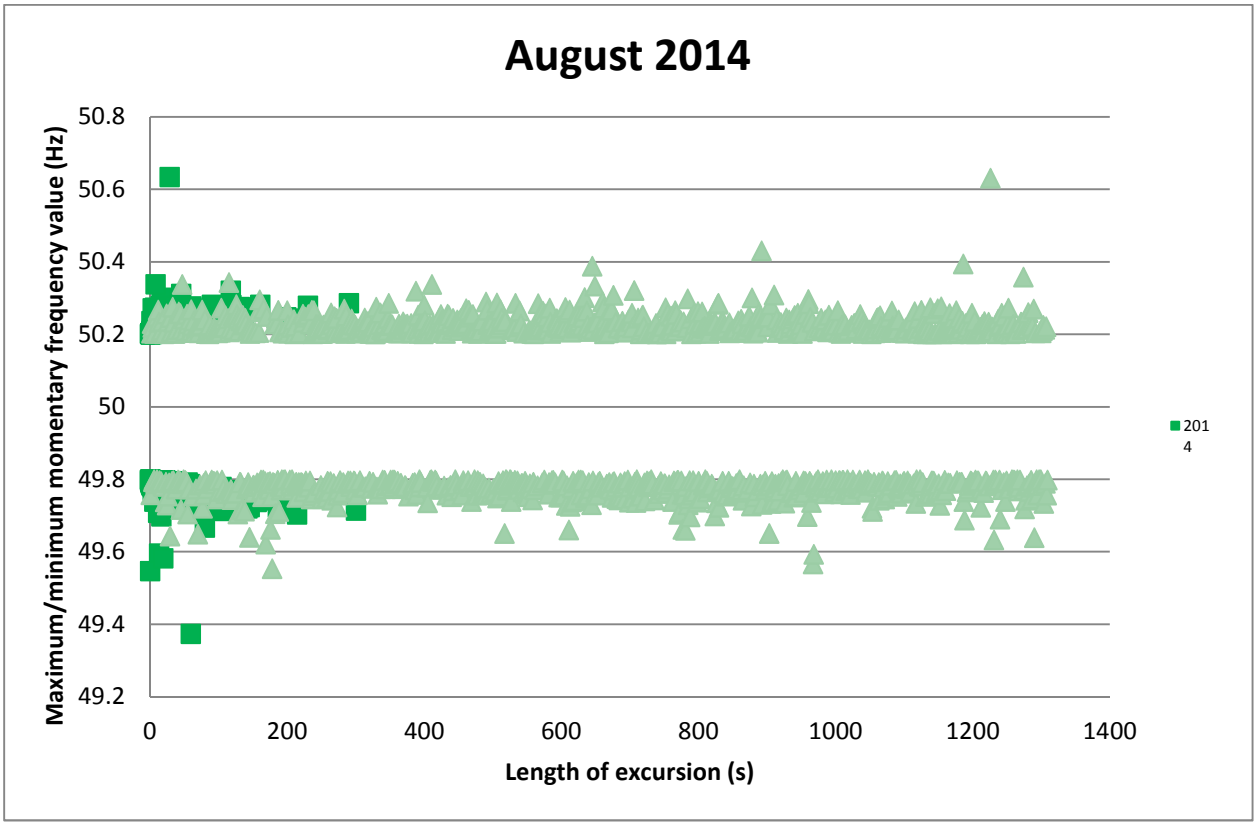
2.1 Avoid Cascade Failure

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 opposite 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 principal performance obligation (PPO).

Frequency Band	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Annual rate	PPO target
55.00 > Freq >= 53.75														**0.2***
53.75 > Freq >= 52.00			2										**2**	**2***
52.00 > Freq >= 51.25		2				3							**5**	**7**
51.25 > Freq >= 50.50	4	4	9	1	2		1	0	1	1	1	1	**25**	**50**
50.50 > Freq >= 50.20	709	797	582	267	364	333	398	545	430	206	336	345	**5312**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	692	789	605	396	450	386	610	639	485	208	452	401	**6113**	
49.50 >= Freq > 48.75	2	7	7	3		3	1	2				1	**26**	**60**
48.75 >= Freq > 48.00														**6**
48.00 >= Freq > 47.00			1										**1**	**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-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14
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-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	2	1	12	8	22	9	5	14	19	12	5	4
Warning Notice	-	-	2	-	-	-	-	-	1	-	8	21
Customer Advice Notice	31	63	86	48	18	12	18	24	17	4	33	16

3.2 Grid Emergencies

The following table shows grid emergencies declared by the System Operator in the reporting period.

Date	Time	Summary Details	Island
03/08/14	01:05	A grid emergency was declared to allow a 220 kV Islington – Kikiwa Circuit to be removed from service to assist with managing high voltages.	S
05/08/14	13:36	A grid emergency was declared to assist with system restoration after the loss of supply to Greytown, Masterton, and Upper Hutt Substations.	N
06/08/14	00:30	A grid emergency was declared to allow a 220 kV Pakuranga – Whakamaru Circuit to be removed from service to assist with managing high voltages.	N
19/08/14	17:50	A grid emergency was declared due to there being insufficient generation offers to meet demand and provide for N-1 security for a contingent event.	N + S

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

Island	Region	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Total
North Island	Northland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Auckland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 1	-	-	4	5	15	8	3	7	8	6	3	1	**60**
	Waikato	2	-	6	2	3	-	1	1	-	-	-	-	**15**
	Bay of Plenty	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Hawkes Bay	-	-	-	-	-	-	-	1	-	-	-	-	**1**
	Taranaki	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Bunnythorpe	-	1	-	-	1	-	-	-	-	-	-	-	**2**
	Wellington	-	-	-	-	-	-	-	-	-	-	1	-	**1**
	North Island (all)	-	-	2	1	1	1	1	-	-	-	1	-	**7**
	Lower North Island	-	-	-	-	-	-	-	-	1	1	-	1	**3**
North & South Islands		-	-	-	-	-	-	-	-	-	1	1	1	**3**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	1	-	-	**1**
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	-	-	-	1	-	-	5	9	3	-	1	**19**
	Otago	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Southland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	South Island (all)	-	-	-	1	-	-	-	-	-	-	-	-	**1**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 Customer Advice Notices (CANs)

Sixteen CANs were issued in the reporting period:

- three advised that a tripping of 220 kV Clyde – Twizel Circuits 1 and 2 was being managed as a single contingency due to an electrical storm in the vicinity on 2nd August
- two related to planned Multiple Frequency Keeper (MFK) testing
- two advised of a temporary change to HVDC capability due to an unplanned outage of Haywards STATCOM STC31
- two related to a planned outage of HVDC Pole 3
- one advised of a temporary change to HVDC capability due to planned, and unplanned, outages of Haywards Filter Bank F4
- one advised of the implementation of South Island Multiple Frequency Keeping on 4th August
- one advised of planned testing of HVDC frequency keeping control on 13th August
- one related to a change to HVDC risk classification during bus switching as a result of the July 24th tripping
- one related to HVDC round power operation
- one related to a new special protection scheme planned for implementation at Roxburgh in October
- one related to the implementation of the Remedial Action Scheme (RAS) tool in the market Systems.

3.4 Standby Residual Check (SRC) notices

A total of four hundred and seventy-nine SRC notices were issued during the reporting period based on the SDS (System Operator's own load forecasting tool). These notices were in respect of trading periods on 3rd – 9th, 11th – 20th, 22nd – 23rd, 25th – 28th August, and 1st September.

On 19 August a shortfall of energy and reserves resulted in declaration of a grid emergency.

3.5 VOLTAGE MANAGEMENT

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

3.6 OUTAGE MANAGEMENT

The following table shows the number of outages in 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 a distribution company to manage load at one or more grid exit points. Generation agreements are required to ensure 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-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Total
North Island	Northland	7	5	7	4	9	7	8	4	8	6	-	1	**66**
	Auckland	5	9	6	1	-	1	5	-	12	5	2	3	**49**
	Waikato	8	11	7	5	9	9	12	12	12	6	3	5	**99**
	Bay of Plenty	4	8	8	7	2	2	7	5	6	5	5	5	**64**
	Hawkes Bay	-	5	7	2	5	4	6	12	5	-	1	-	**47**
	Taranaki	-	3	2	3	5	5	4	5	2	2	-	1	**32**
	Bunnythorpe	3	5	6	6	7	6	7	3	5	-	-	-	**48**
	Wellington	9	8	9	4	10	13	13	17	12	6	3	4	**108**
Total		36	54	52	32	47	47	62	58	62	30	14	19	**513**
South Island	Nelson Marlborough	3	8	11	7	8	3	7	5	4	7	5	2	**70**
	West Coast	3	7	12	6	8	2	11	6	7	7	10	6	**85**
	Christchurch	4	8	7	3	7	3	4	5	2	5	4	2	**54**
	Canterbury	3	4	4	3	4	2	4	3	2	5	4	4	**42**
	Otago	5	2	1	-	-	-	3	2	4	-	-	2	**19**
	Southland	5	3	-	1	4	2	6	2	8	6	5	5	**47**
Total		23	32	35	20	31	12	35	23	27	30	28	21	**317**

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	Bunnythorpe	BPE_MTR1.1__TKU_WKM2.1__TKU_WKM2__BPE__LN	This is an SFT-generated constraint to protect Bunnythorpe-Mataroa 1 for a tripping of Tokaanu-Whakamaru 2.	2
		TKU_WKM2.1__RPO_WRK1.1__RPO_WRK1__WKM__LN	This is an SFT-generated constraint to protect Tokaanu-Whakamaru 2 for a tripping of Rangipo-Wairakei 1.	1
	Hamilton	ARI_KIN1.1__ARI_KIN2.1__ARI_KIN2__ARI__LN	This is an SFT-generated constraint. It is to protect Arapuni-Kinleith 1 for a tripping of Arapuni-Kinleith 2	2
		HAM_KPO1.2__HIN_KPO.1__HIN_KPO__CBG__LN	This is an SFT-generated constraint. It is to protect Hamilton-Karapiro 1 for a tripping of Hinuera-Karapiro 1.	5
	Taranaki	NPL_T8_O_2	The effect of this constraint is to manage	13

			flows through Hawera - Stratford circuit for an extended contingent event of Stratford T10 during low generation and high load on Taranaki 110kV network	
South Island & HVDC	HVDC	BEN_HAYP2max	This constraint is to limit the flow on HVDC from Benmore to Haywards to the Asset Owner offered capability for Pole 2.	83
		BEN_HAYmax	This constraint is to limit the flow on HVDC from Benmore to Haywards to the Asset Owner offered capability for HVDC.	8
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYDTWZ12__ROX__LN	This is an SFT-generated constraint to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 2.	6
		LIV_NSY.1__CYD_TWZ2.1__CYDTWZ12__NSY__LN	This is an SFT generated constraint to protect Livingstone-Naseby 1 for a tripping of Clyde-Twizel 2.	1
Grand Total				**121**

Constraints binding during last 12 months

The following table shows binding constraints during the reporting period with 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	RPO_TNG1.1__THI_WKM1.1__THI_WKM1__RPO__LN	0	0.00%	133	0.76%
	Edgecumbe	THI_WKM1.1__OHK_WRK.1__OHK_WRK__WKM__LN	0	0.00%	59	0.34%
	Hamilton	HAM_KPO1.2__HIN_KPO.1__HIN_KPO__CBG__LN	5	0.34%	0	0.00%
	Taranaki	NPL_T8_O_2	13	0.87%	0	0.00%
South Island & HVDC	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	0	0.00%	54	0.31%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	0	0.00%	67	0.38%
	Otago	NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	0	0.00%	161	0.92%
		NSY_ROX.1__CYD_TWZ2.1__CYDTWZ12__ROX__LN	6	0.40%	20	0.11%
		LIV_NSY.1__CYD_ROX1.1__CYDROX1!__NSY__LN	0	0.00%	61	0.35%
		LIV_NSY.1__CYD_ROX1.1__CYDROX1#__NSY__LN	0	0.00%	69	0.39%
	HVDC	BEN_HAYP2max	83	5.58%	149	0.85%
		BEN_HAYmax	8	0.54%	245	1.40%
		BEN_HAYP3max	0	0.00%	171	0.98%

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)
14/08/14	21:40	An emergency shutdown of a Tiwai potline resulted in a momentary rise in frequency in the South Island.	S	50.63 Hz
30/08/14	00:35	A generating unit at Clyde Power Station tripped resulting in a momentary drop in frequency in the South Island.	S	49.37 Hz

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
05/08/14	13:02	A fault on the 110 kV bus at Masterton substation caused the tripping of 110 kV Haywards-Upper Hutt Circuits 1 and 2, Masterton-Upper Hutt Circuits 1 and 2, and Mangamaire-Masterton Circuit 1 resulting in a loss of supply to Greytown, Masterton and Upper Hutt substations.	GYT 8 MST 29 UHT 17	54 139 43

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	8	These related to the tripping of : • Edgecumbe-Kawerau 2 (2 x) • Inangahua-Kikiwa 1 (auto reclose) • Islington-Kikiwa 1 (auto reclose) • Islington-Livingstone 1 (auto reclose) • Kaikohe-Maungatapere 1 (auto reclose) • Otahuhu-Whakamaru 2 (auto reclose) • Tuai-Wairoa 1.
HVDC Start/ Stop	0	
Supply Transformer	2	These related to the tripping of : • Castle Hill T1 • Tuai T15.
Loss of grid reactive plant	1	This related to tripping of • Haywards Static Synchronous Compensator STC31.
Loss of single generation units	12	These related to the tripping of: • Benmore G1 • Clyde G1 • Highbank G1 • Ngatamariki G4 • Onepu TOPP1 • Paerau generation (2 x) • Stratford U21 • Te Mihi G1, G2 • Waipori generation • Waitaki G2.

Event	Number	Summary
Total during reporting period	**23**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	
Loss of interconnecting transformer	0	
Loss of bus bar section	0	
Total during reporting period	**0**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	1	This related to the tripping of: • Haywards-Upper Hutt 1 & 2, Masterton-Upper Hutt 1 & 2, Mangamaire-Masterton 1 and Haywards STATCOM STC31.
Demand change	1	This related to the tripping of: • Tiwai NZAS Potline 3.
Generation	1	This related to the tripping of: • Waipapa G1, G2 and G3.
Total during reporting period	**3**	

Other disturbances

Event	Number	Summary
Feeder trippings	48	Various locations.
Total during reporting period	**48**	

4.3 SYSTEM EVENTS – TREND

	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Total	Average Events per month
Contingent Event – transmission	64	24	39	30	4	6	8	34	19	9	16	8	**261**	21.8
Contingent Event – generation	10	12	10	12	11	8	11	12	5	7	23	12	**133**	11.1
Contingent Event – Supply transformer	5	1	3	5	3	3	0	3	4	3	0	2	**32**	2.7
Contingent Event – Reactive plant	7	8	8	7	0	5	2	2	5	2	0	1	**47**	3.9
Contingent Event - HVDC	4	18	22	6	1	2	1	1	1	0	0	0	**56**	4.7
Extended Contingent Event HVDC	1	0	1	0	0	0	0	0	0	0	0	0	**2**	0.2
Extended Contingent Event Inter-connecting Transformers	0	0	1	1	1	0	0	0	1	1	0	0	**5**	0.4
Extended Contingent Event Busbar	3	0	0	1	1	1	1	0	0	1	1	0	**9**	0.8
Other Event – AC transmission	5	3	4	2	3	1	0	6	2	1	1	1	**29**	2.4
Other Event – Demand	1	1	1	0	2	2	1	0	1	1	1	1	**12**	1.0
Other Event – Generation	2	0	0	0	1	0	0	0	0	0	0	1	**4**	0.3