System Operator Reports
December 2013

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority

Period from 1 December – 30 December 2013

Purpose of Report

This report summarises the results of the System Operator's review of its performance for the period 1 December – 30 December 2013, 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 will be provided to Authority staff.

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

1.1. Operational

December was notable for continued high north flows on the HVDC, with southern lake levels remaining well above average. Pole 2 testing concluded during the month and the equipment entered into a trial period, to be concluded early in January. Testing of the frequency keeping control system was conducted later in the month.

A consequence of continued high HVDC north flows, low wholesale prices, and reduced northern North island generation was demonstrated in two system effects:

1. Managing upper North island voltage required the PAK_WKM_1 circuit to be removed from service on a number of occasions during evening hours' periods when load is diminished. The requirement to remove this circuit from operation was expected to be required regularly across the holiday period and proved to be the case
2. Low prices saw some wind farms removed from service unexpectedly and without notice, or change to offer, on occasions when, apparently, operational costs exceeded market returns.

One loss of supply event occurred on 10th December when FHL T1 tripped resulting in a 22MW loss of supply.

One under frequency event occurred on 5 December when OTC tripped at 365MW. A grid emergency was notified due to low energy and reserves residuals offers.

1.2. Market

During December there were no outages to the Market system that exceeded two hours.

2. Business Performance

Significant Project Update

	Status	Implementation date	Update
Dispatchable demand	On Track	May 2014	• The DD Code Amendment was gazetted on 12 December. • The draft Policy Statement changes have been approved SO Senior Management. A summary of the changes has been provided to the EA. • NZX's "change request to SPD" has been approved by the EA. The cost of this change is $3,593 (including contingency). The EA has confirmed that the SO can claim this additional expenditure through a formal change request if the current contingency budget is consumed.

3. Security of Supply Update

The NZ aggregate storage levels are 128% of average for the 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 December. There were no breaches of the Electricity Industry Participation Code (EIPC) reported to the Electricity Authority during the month of December.

5. Ancillary Services

There were no issues arising in ancillary services during the month of December.

Ancillary Service Costs

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

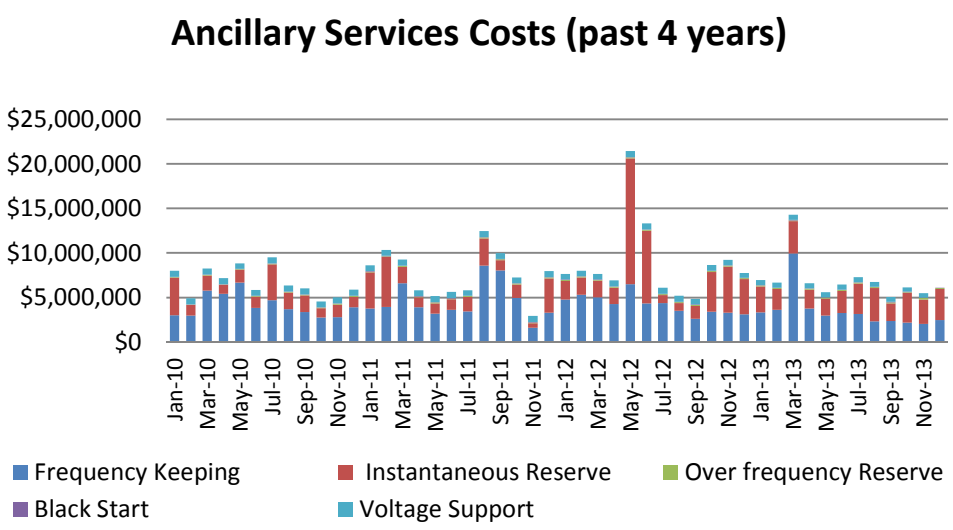
Of note the last of voltage support contracts ended on 30 November 2013 and there are no voltage support contracts going forward. This is reflected in the graph on page 4 which shows a zero figure for December 2013.

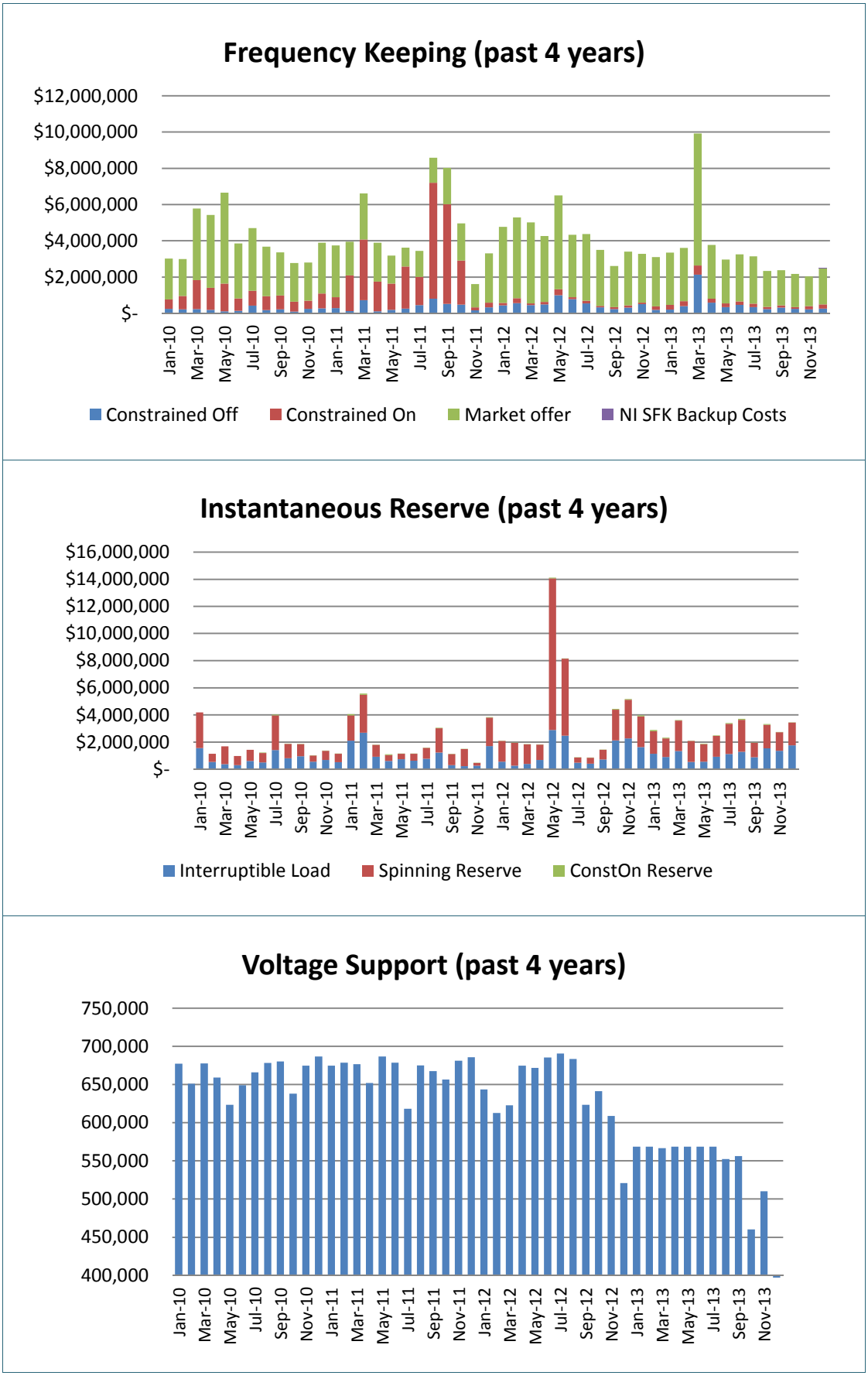
6. Code 7.10: Separation of Transpower Roles

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 2013

		Cost	
Frequency Keeping	Constrained Off	$	248,911
	Constrained On	$	232,538
	Market offer	$	2,006,766
	NI SFK Backup Costs	$	1,667
	Total monthly Cost	**$**	**2,489,882**
Instantaneous Reserve	Spinning reserve	$	1,676,549
	Interruptible Load	$	1,762,143
	Constrained On	$	26,697
	Total monthly Cost	**$**	**3,465,389**
Over Frequency Reserve	**Total monthly Cost**	**$**	**103,080**
Black Start	**Total monthly Cost**	**$**	**49,356**
Voltage Support	**Total monthly Cost**	**$**	**-**
All Ancillary Services	**Total monthly Cost**	**$**	**6,107,707**



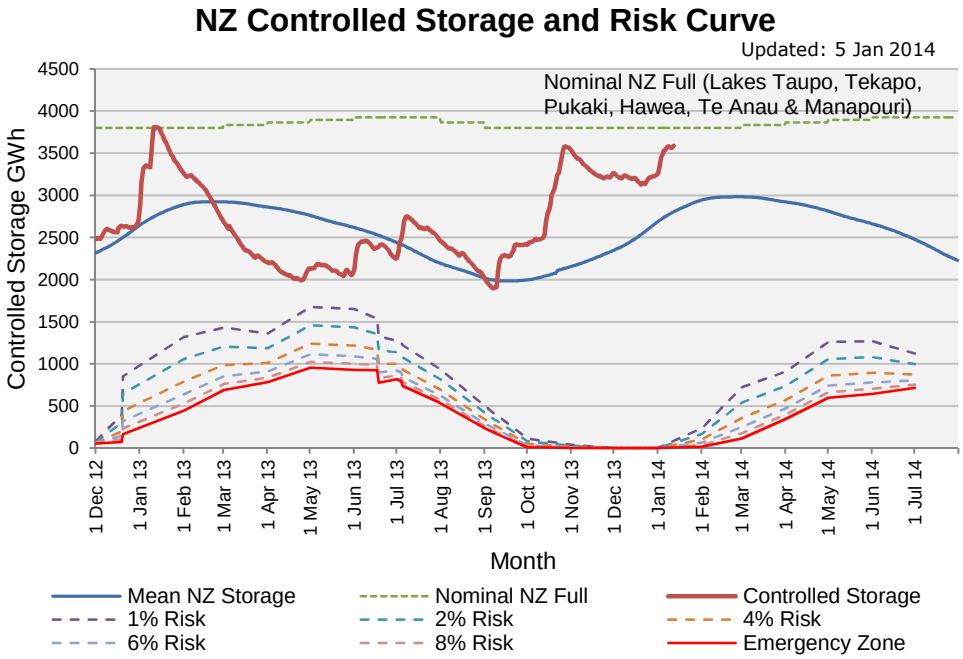

Frequency Keeping (past 4 years)
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$-
Jan-10
Mar-10
May-10
Jul-10
Sep-10
Nov-10
Jan-11
Mar-11
May-11
Jul-11
Sep-11
Nov-11
Jan-12
Mar-12
May-12
Jul-12
Sep-12
Nov-12
Jan-13
Mar-13
May-13
Jul-13
Sep-13
Nov-13
Constrained Off
Constrained On
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
$-
Jan-10
Mar-10
May-10
Jul-10
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
Interruptible Load
Spinning Reserve
ConstOn Reserve
Voltage Support (past 4 years)
750,000
700,000
650,000
600,000
550,000
500,000
450,000
400,000
Jan-10
Mar-10
May-10
Jul-10
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

Appendix B – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

Aggregate primary New Zealand storage is 128% 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 86% of average.

South Island Inflows over the last calendar month have been 88% of average.

Measurements are based on daily inflow values.

Over the last calendar month hydro generation has met 66% of demand.

System Performance Report

To the Electricity Authority

December 2013

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 December 2013.

Principal Performance Obligations

The System Operator met the Principal Performance Obligations during the reporting period.

System Events

On 5th December at 09:57 Otahuhu B Combined Cycle Gas Turbine tripped causing a momentary drop in frequency in the North Island to 49.16 Hz and in the South Island to 49.31 Hz.

On 7th December at 10:06 110 kV Edgecumbe – Matahina Circuit 2 tripped causing a partial loss of connection to Matahina Power Station. Connection was restored after 147 minutes.

On 10th December at 00:40, a planned HVDC Pole 2 commissioning test caused a momentary rise in South Island frequency to 50.70 Hz.

On 10th December at 07:32 Fernhill supply transformer T1 tripped during a planned outage on the parallel bank resulting in a loss of supply to Fernhill Substation. Supply was restored after 90 minutes.

On 14th December at 15:01 the 220 kV Rangipo – Tangiwai and Rangipo – Wairakei circuits tripped resulting in a loss of connection to Rangipo Power Station. Connection was restored after 25 minutes. Note the Rangipo bypass switch was closed at the time, effectively making the two circuits a single Tangiwai – Rangipo – Wairakei 'tee' circuit.

On 21st December at 03:34 the loss of generation at Manapouri Power Station resulted in the South Island frequency momentarily dropping to 49.27 Hz.

Other noteworthy events occurring during the reporting period:

On 5th December at 21:59 110 kV Haywards – Takapu Road Circuit 2 tripped and auto-reclosed. The associated voltage disturbance caused commutation failures on HVDC Poles 2 & 3.

On 12th December at 14:32 Haywards 220 / 11 0 kV inter-connecting transformer T5 tripped. It was returned to service after 75 minutes.

On 16th December at 21:26 110 kV Oamaru – Bells Pond – Studholme – Waitaki 2 tripped resulting in a loss of supply to Bells Pond Substation. Supply was restored after 30 minutes.

On 18th December at 16:54 110 kV Studholme – Timaru Circuit 1 tripped. The associated voltage disturbance resulted in approximately 28 MW of load being lost at Studholme, Timaru, and Temuka Substations.

On 22nd December at 23:58 66 the kV Coleridge – Otira Circuit 1 tripped and auto-reclosed resulting in a momentary loss of supply to Arthurs Pass and Castle Hill Substations.

On 28th December at 21:59 the 110 kV Bunnythorpe – Tangiwai Circuit 1 tripped and auto-reclosed. The associated voltage disturbance caused commutation failures on HVDC Poles 2 & 3.

On 30th December at 20:47 the 110 kV Edgecumbe – Waiotahi Circuit 1 tripped and auto-reclosed resulting in a momentary loss of supply to Waiotahi and Te Kaha Substations.

2. Principal Performance Obligations

2.1 Avoid Cascade Failure

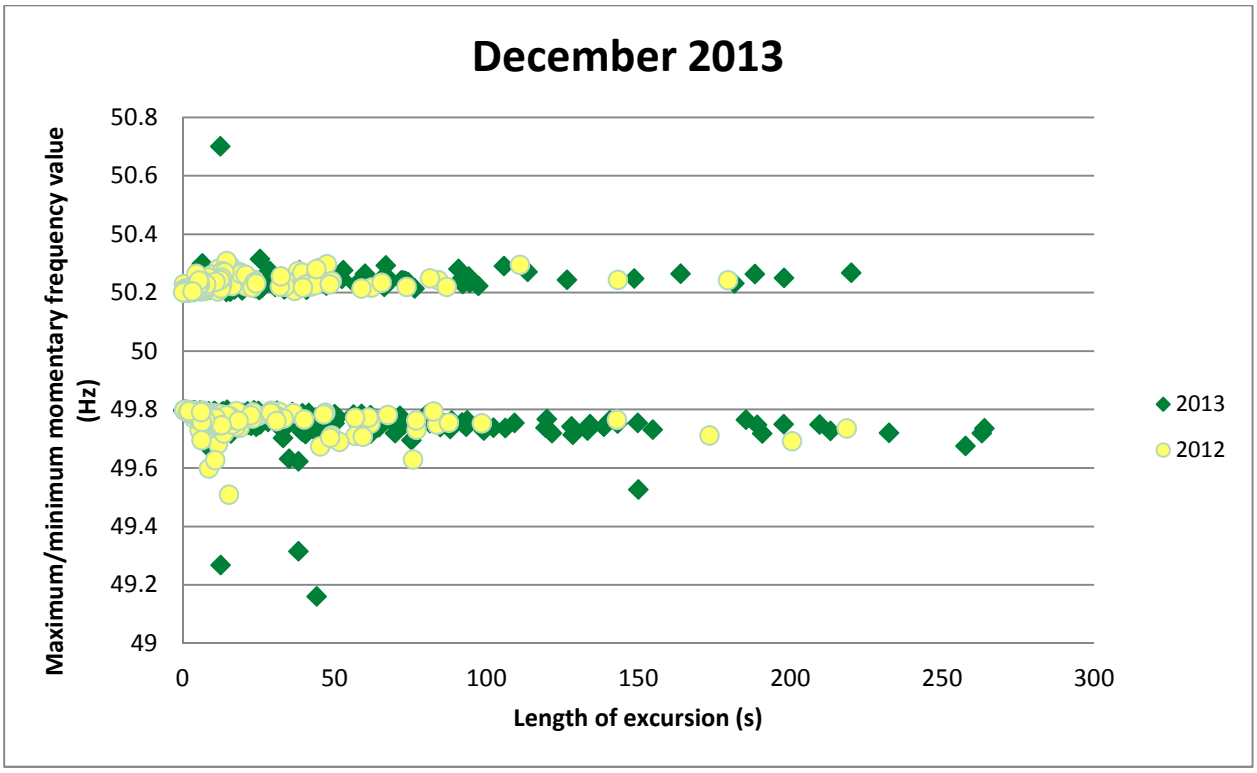
No instances of cascade failure occurred during the reporting period.

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	Jan - 13	Feb - 13	Mar - 13	Apr - 13	May - 13	Jun - 13	jul - 13	Aug - 13	Sep - 13	Oct - 13	Nov - 13	Dec -13	Annual rate	PPO target
55.00 > Freq >= 53.75														**0.2***
53.75 > Freq >= 52.00					1	1					2		**4**	**2***
52.00 > Freq >= 51.25			1	2						2			**5**	**7**
51.25 > Freq >= 50.50	1	2	2	4	8	2		1	4	4	9	1	**38**	**50**
50.50 > Freq >= 50.20	279	445	324	541	419	221	404	656	709	797	582	267	**5644**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	245	367	331	484	401	208	385	652	692	789	605	396	**5555**	
49.50 >= Freq > 48.75	1	1	2	6	9	4			2	7	7	3	**42**	**60**
48.75 >= Freq > 48.00		1	1	1	1								**4**	**6**
48.00 >= Freq > 47.00					1						1		**2**	**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		Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct -13	Nov-13	Dec -13
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	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	6	-	2	6	5	2	4	1	2	1	12	8
Warning Notice	-	-	1	-	3	2	3	1	-	-	2	-
Customer Advice Notice	30	35	39	43	67	41	27	15	31	63	86	48

3.2 GRID EMERGENCIES

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

Date	Time	Summary Details	Island
05/12/13	11:10	A grid emergency was declared due to a shortage of generation following the tripping of Otahuhu B CCGT.	N + S
05/12/13	23:42	A grid emergency was declared to close the Arapuni bus split to maintain security due to insufficient generation offers.	N
14/12/13	18:10	A grid emergency was declared to close the Arapuni bus split to maintain security while an electrical storm was in progress in the area.	N
25/12/13	00:21	A grid emergency was declared to allow the 220 kV Pakuranga-Whakamaru 1 circuit to be removed from service to assist with managing high voltages.	N
25/12/13	23:26		
26/12/13	22:44		
27/12/13	22:33		
31/12/13	00:20		

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

Island	Region	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Total
North Island	Northland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Auckland	1	-	-	-	-	1	-	-	-	-	-	-	**2**
	Zone 1	-	-	-	-	-	-	-	-	-	-	4	5	**9**
	Waikato	5	-	1	5	5	-	4	1	2	-	6	2	**31**
	Bay of Plenty	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Hawkes Bay	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Taranaki	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Bunnythorpe	-	-	1	-	-	-	-	-	-	1	-	-	**2**
	Wellington	-	-	-	1	-	-	-	-	-	-	-	-	**1**
	North Island (all)	-	-	-	-	-	1	-	-	-	-	2	1	**4**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Otago	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Southland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	South Island (all)	-	-	-	-	-	-	-	-	-	-	-	1	**1**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 CUSTOMER ADVICE NOTICES (CANS)

Forty-eight CANs (Customer Advice Notices) were issued in the reporting period:

- Twenty-eight related to the HVDC:
  - Ten related to frequency keeping control testing;
  - Nine related to additional reserve requirements for testing;
  - Two advised of daily testing schedules;
  - Two advised of temporary changes to the South Island frequency band for testing;
  - Two related to Pole 2 trial operation;
  - Two related to HVDC risk classification;
  - And one related to the revision of the HVDC offer.
- Ten related to circuit risk reclassification during electrical storms; these covered:
  - Clyde-Cromwell-Twizel Circuits 1 & 2 on 5th, 8th, & 29th December
  - Arapuni-Kinleith Circuits 1 & 2 on 14th December
  - Huntly-Stratford Circuit 1 / Stratford-Taumaranui Circuit 1 on 29th December
- Three related to the Haywards Static Synchronous Compensator;
- Three related to a temporary grid reconfiguration at Matahina Power Station;
- Two related to dispatching from backup tools on 5th December;
- And two advised of tuning tests on Multiple Frequency Keeping controls on 9th and 10th December.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

Three hundred & fifty two 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 – 6th, 9th – 12th, 16th, 18th – 20th, and 23rd December.

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	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Total
North Island	Northland	3	5	4	7	5	1	3	3	7	5	7	4	**54**
	Auckland	-	1	1	3	10	11	5	3	5	9	6	1	**55**
	Waikato	6	5	3	7	10	6	8	6	8	11	7	5	**82**
	Bay of Plenty	4	5	3	5	6	2	7	5	4	8	8	7	**64**
	Hawkes Bay	6	4	5	7	4	6	-	1	-	5	7	2	**47**
	Taranaki	2	7	1	6	1	3	-	-	-	3	2	3	**28**
	Bunnythorpe	1	7	7	3	3	4	1	3	3	5	6	6	**49**
	Wellington	12	16	10	13	11	9	4	4	9	8	9	4	**109**
Total		34	50	34	51	50	42	28	25	36	54	52	32	**488**
South Island	Nelson Marlborough	4	8	4	6	7	2	1	4	3	8	11	7	**65**
	West Coast	6	9	3	8	11	8	4	3	3	7	12	6	**80**
	Christchurch	2	5	5	7	3	2	3	2	4	8	7	3	**51**
	Canterbury	2	6	3	3	5	4	1	3	3	4	4	3	**41**
	Otago	-	2	2	4	5	-	2	4	5	2	1	-	**27**
	Southland	2	3	6	9	2	3	8	5	5	3	-	1	**47**
Total		16	33	22	37	33	19	18	21	23	32	35	20	**309**

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	RPO_TNG1.1__THI_WKM1.1__THI_WKM1__RPO__LN	This is an SFT generated constraint. Its purpose is to protect Rangipo-Tangiwai 1 for a tripping of Te Mihi-Whakamaru 1.	1
		BPE_MTR1.1__SFD_TMN1.1__HLSFTM11__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Stratford-Taumaranui 1.	1
		BPE_MTR1.1__HLY_SFD.1__HLSFTM11__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Huntly-Stratford 1.	4
	Edgecumbe	THI_WKM1.1__ATI_WKM.1__$ATIWKM1__WKM__LN	This is an SFT generated constraint. Its purpose is to protect Te Mihi-Whakamaru 1 for a tripping of Atiamuri-Whakamaru 1.	8
		THI_WKM1.1__OHK_WRK.1__OHK_WRK__WKM__LN	This is an SFT generated constraint. Its purpose is to protect Te Mihi-Whakamaru 1 for a tripping of Ohakuri-Wairakei 1.	5
		THI_WKM1.1__ATI_OHK.1__ATI_OHK__WKM__LN	This is an SFT generated constraint. Its purpose is to protect Te Mihi-Whakamaru 1 for a tripping of Atiamuri-Ohakuri 1.	6
		ATI_OHK.1__THI_WRK1.1__THI_WRK1__ATI__LN	This is an SFT generated constraint. Its purpose is to protect Atiamuri-Ohakuri 1 for a tripping of Te Mihi-Wairakei 1.	5
	Hamilton	ARI_HAM1.1__ARI_HAM2.1__$ARIHAM2__HAM__LN	This is an SFT generated constraint. Its purpose is to protect Arapuni-Hamilton 1 for a tripping of Arapuni-Hamilton 2	10
		ARI_KIN1.1__ARI_KIN2.1__ARI_KIN2__ARI__LN	This is an SFT generated constraint. Its purpose is to protect Arapuni-Kinleith 1 for a tripping of Arapuni-Kinleith 2	5
	Hawkes Bay	FHL_RDF1.1__FHL_RDF2.1__FHL_RDF2__RDF__LN	This is an SFT generated constraint. Its purpose is to protect Fernhill-Redclyffe 1 for a tripping of Fernhill-Redclyffe 2.	1
	Taranaki	SFD__T10__220KV__NPL_SFD2.1__NPL_SFD2__XF	This is an SFT generated constraint. Its purpose is to protect Stratford interconnecting transformer T10 for a tripping of New Plymouth-Stratford 2.	9
		HWA_WVY1.1__BPE_BRK2.1__:S__BPE_BRK2__WVY__LN	This is an SFT generated constraint. Its purpose is to protect Hawera-Waverley 1 for a tripping of Bunnythorpe-Brunswick 2.	13
		HWA_SFD1.1__BPE_BRK2.1__:S__BPE_BRK2__HWA__LN	This is an SFT generated constraint. Its purpose is to protect Hawera-Stratford 1 for a tripping of Bunnythorpe-Brunswick 2.	2
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.	3
		BEN_HAYmax	The purpose of this constraint is to limit the flow on HVDC from Benmore to Haywards to the Asset Owner offered capability for HVDC.	13
	Nelson	COB_STK2.2__COB_UTK1.1__COB_UTK1__COB__LN	This is an SFT generated constraint. Its purpose is to protect Cobb-Stoke 2 for a tripping of Cobb-Upper Takaka 1.	3
	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.	6
		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.	8
		NSY_ROX.1__CYD_TWZ1.1__CYDTWZ12__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1 for a tripping of Clyde-Twizel 1.	2
		NSY_ROX.1__CYD_TWZ2.1__CYDTWZ12__ROX__LN	This is an SFT generated constraint. Its purpose is to protect Naseby-Roxburgh 1	6

			for a tripping of Clyde-Twizel 2.	
	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	11
		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	9
Grand Total				**131**

Constraints binding during last 12 months

The following table shows the binding constraints binding 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	1	0.07%	132	0.75%
		BPE_MTR1.1__HLY_SFD.1__HLSFTM11__BPE__LN	4	0.27%	0	0.00%
	Edgecumbe	THI_WKM1.1__ATI_WKM.1__$ATIWKM1__WKM__LN	8	0.54%	18	0.10%
		THI_WKM1.1__OHK_WRK.1__OHK_WRK__WKM__LN	5	0.34%	11	0.06%
		ATI_OHK.1__THI_WRK1.1__THI_WRK1__ATI__LN	5	0.34%	0	0.00%
		THI_WKM1.1__ATI_OHK.1__ATI_OHK__WKM__LN	6	0.40%	0	0.00%
	Hamilton	ARI_HAM1.1__ARI_HAM2.1__$ARIHAM2__HAM__LN	10	0.67%	9	0.05%
		ARI_KIN1.1__ARI_KIN2.1__ARI_KIN2__ARI__LN	5	0.34%	1	0.01%
	Taranaki	HWA_WVY1.1__BPE_BRK2.1__:S__BPE_BRK2__WVY__LN	13	0.87%	0	0.00%
		SFD__T10__220KV__NPL_SFD2.1__NPL_SFD2__XF	9	0.60%	0	0.00%
South Island & HVDC	West Coast	COL_HOR2.1__COL_HOR3.1__COL_HOR3__COL__LN	11	0.74%	11	0.06%
		COL_HOR3.1__COL_HOR2.1__COL_HOR2__COL__LN	9	0.60%	3	0.02%
	Otago	NSY_ROX.1__CYD_TWZ1.1__CYD_TWZ1__ROX__LN	8	0.54%	72	0.41%
		NSY_ROX.1__CYD_TWZ2.1__CYD_TWZ2__ROX__LN	6	0.40%	90	0.51%
		NSY_ROX.1__CYD_TWZ2.1__CYDTWZ12__ROX__LN	6	0.40%	18	0.10%
	HVDC	BEN_HAYP2max	3	0.20%	158	0.90%
		HAY_BENmax	0	0.00%	48	0.27%
		HAY_BENP2max	0	0.00%	50	0.29%
		BEN_HAYmax	13	0.87%	273	1.56%
		BEN_HAYP3max	0	0.00%	255	1.46%
		BEN_HAYP3min	0	0.00%	60	0.34%

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)
05/12/13	09:57	Otahuhu B CCGT tripped resulting in a monetary drop in frequency in both the North & South Islands	N S	49.16 49.31
10/12/13	00:40	An HVDC Roundpower commissioning test resulted in a momentary rise in South Island frequency.	S	50.70
21/12/13	03:34	A sudden reduction in Manapouri generation resulted in a momentary drop in South Island frequency.	S	49.27

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
07/12/13	10:06	Edgecumbe-Matahina Circuit 2 tripped resulting in a partial loss of connection to Matahina Power Station.	22	147
10/12/13	07:32	Fernhill supply transformer T1 tripped during a planned outage on the parallel T2 bank resulting in a loss of supply to Fernhill.	22	90
14/12/13	15:01	The Rangipo-Tangiwai / Rangipo-Wairakei circuits tripped resulting in a loss of supply to Rangipo Power Station.	60	25

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	30	These related to trippings of • Atiamuri-Whakamaru 1 • Atarau-Reefton-Inangahua 1 (auto reclose) • Bombay-Hamilton 2 (auto reclose) • Bunnythorpe-Haywards 1 (2 x auto reclose) • Bunnythorpe-Tokaanu 1 (2 x auto reclose) • Bunnythorpe-Tokaanu 2 (2 x auto reclose) • Coleridge-Otira 1 (auto reclose) • Dobson-Greymouth 1 • Edgecumbe-Matahina 2 • Edgecumbe-Waiotahi 2 (auto reclose) • Gisborne-Tuai 2 (auto reclose) • Greymouth-Kumara 1 • Henderson-Maungatapere 2 (auto reclose) • Huntly-Stratford 1 (auto reclose) • Islington-Kikiwa 1 (auto reclose) • Mangere-Roskill 1 (auto reclose) • Oamaru-Bells Pond-Studholme-Waitaki 2 • Redclyffe-Tuai 1 (auto reclose) • Redclyffe-Wairakei 1 (auto reclose) • Rangipo-Tangiwai 1 / Rangipo-Wairakei 1 (Rangipo bypass disconnector closed) • Rangipo-Wairakei 1 • Studholme-Timaru 1 • Tuai-Wairoa 1 • Woodville-Dannevirke-Waipawa 2 • Whirinaki-Wairakei 1 (3 x auto reclose)

Event	Number	Summary
HVDC	6	These related to • HVDC Pole 2 (1 x planned trip during commissioning testing) • HVDC Pole 3 (5 x planned trip during commissioning testing)
Supply Transformer	5	This related to tripping of • Fernhill T1 (2 x) • Tuai T15 • Waipawa T33 (2 x)
Loss of grid reactive plant	7	These related to trippings of • Albany Static Var Compensator SVC7 • Haywards Filter Bank F8 (3 x) • Islington Static Var Compensator SVC3 • Marsden Static Synchronous Compensator STC6 • North Makarewa Capacitor Bank C1
Loss of single generation units	12	These related to trippings of • Aniwhenua G2 • Arapuni G8 • Kinleith Co-generation (6 x) • Manapouri Generation (1 x planned as part of Pole 2 commissioning, 1x unplanned) • Otahuhu B CCGT • Tauhara G1
Total during reporting period	**60**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	
Loss of interconnecting transformer	1	This related to • Haywards Interconnecting transformer T5
Loss of bus bar section	1	This related to • Penrose 220 kV D bus
Total during reporting period	**2**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	2	These related to the tripping of • Bunnythorpe-Tangiwai 1 A/R, commutation failures on HVDC Pole 2 & Pole 3 • Haywards-Takapu Road 2 A/R, commutation failures on HVDC Pole 2 & Pole 3
Demand change	0	
Generation	0	
Loss of supply bus bar section	0	
Total during reporting period	**2**	

Other disturbances

Event	Number	Summary
Feeder trippings	58	Various locations
Total during reporting period	**58**	

4.3 SYSTEM EVENTS – TREND

	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Total	Average Events per month
Contingent Event – transmission	22	9	13	23	24	27	19	16	64	24	39	30	**310**	25.8
Contingent Event – generation	8	14	15	12	7	14	17	17	10	12	10	12	**148**	12.3
Contingent Event – Supply transformer	0	3	2	10	3	1	3	3	5	1	3	5	**39**	3.3
Contingent Event – Reactive plant	3	6	2	6	5	6	10	6	7	8	8	7	**74**	6.2
Contingent Event - HVDC	0	2	5	11	9	13	0	0	4	18	22	6	**90**	7.5
Extended Contingent Event HVDC	0	0	0	0	0	0	0	0	1	0	1	0	**2**	0.2
Extended Contingent Event Inter-connecting Transformers	0	0	1	1	0	0	1	0	0	0	1	1	**5**	0.4
Extended Contingent Event Busbar	0	1	0	2	0	1	0	0	3	0	0	1	**8**	0.7
Other Event – AC transmission	3	1	0	1	2	1	2	1	5	3	4	2	**25**	2.1
Other Event – Demand	1	0	0	1	0	2	2	1	1	1	1	0	**10**	0.8
Other Event – Generation	1	4	3	1	1	2	0	0	2	0	0	0	**14**	1.2