System Operator Reports
November 2013

Contents

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

System Operator Operational and System Performance Report to the Electricity Authority

Period from 1 November – 30 November 2013

Purpose of Report

This report summarises the results of the System Operator's review of its performance for the period 1 November – 30 November 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

November was notable for a significant number of frequency events including the most significant operation of AUFLS relays for many years. Several events were associated with continued HVDC testing which took place regularly throughout the month. The majority of the HVDC tests scheduled for completion prior to the HVDC Pole 2 controls being offered for commercial operations were carried out during the month. A number of lightning storm events were also a feature.

AUFLS event

During a planned HVDC AC line fault test at 11:04am on the 12th of November the HVDC unexpectedly ran back ~850MW. This reduced northward transfer from 1024MW to 145 MW as a response to an unexpected, simultaneous disconnection of three filter banks at Benmore. The consequence was a North Island AUFLS event (a partial triggering of AUFLS Block 1) and a subsequent over frequency event in the South Island (triggering scheduled OFR – over frequency arming). AUFLS relays disconnected 401 MW of North Island load and 204 MW of interruptible load. North Island frequency fell to 47.8 Hz and then rose to 50.56 Hz. South Island frequency rose to 53.25 Hz. Restoration began within 30 minutes of the event and was completed within 105 minutes of the event.

Other frequency events

On 1 November a lightning strike resulted in HOR_KBY_ISL1 and 2 circuits disconnecting with a loss of supply of 13.5MW. On the 6th another lightning storm resulted in ARI_KIN1 and 2 tripping with 56MW connected to the ARI south bus and KIN generation (32MW) tripping along with the loss of 40MW of load at KIN.

On the 24th HVDC P3 tripped causing an IL event. Approximately 245MW of load was lost. North Island frequency fell to 48.95 Hz and South Island frequency rose to 52.81Hz. This event was unrelated to HVDC testing.

On 26th November at 08:19 during an HVDC Pole 2 test South Island frequency fell to 49.24 Hz and North Island frequency rose to 50.82Hz. The South Island IL provider's load tripped and was restored at 08:22.

On 28th November BPE-BRK 1 and BPE-BRK 2 circuits tripped. Approximately 75 MW load was lost in the lower North Island. While not regarded as an IL event some IL was reported as tripped, likely lost due to fault transients. Approximately 45MW of generation tripped.

Other events

On the 9th of November a circuit breaker fault at Hepburn Rd resulted in multiple transformer and circuit trippings in the Auckland area as well as the tripping of two Otahuhu GT synchronous units. Approximately 200 MW of load was lost. North Island frequency rose to 50.70Hz and South Island to 50.56Hz.

On 18th November a STK feeder tripped resulting in a 15MW loss of supply.

1.2. Market

During November 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	April 2014	• The latest round of DD Code review is complete. The EA is planning to gazette the DD Code on 12 December. The latest Code review has delayed progress on the Policy Statement review and the DCLS approvals documentation. However, this work can still be achieved within the existing project timeline. • The SO is assessing NZX's change request to SPD and will prepare a cost and time estimate for the change by 9 December.

3. Security of Supply Update

The NZ aggregate storage levels are 134% 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 November. There were two breaches of the Electricity Industry Participation Code (EIPC) and two breaches of the Policy Statement by the System Operator that were reported to the Electricity Authority during the month of November.

The breaches of the EIPC related to the use of unaudited software in the market system and the failure to complete a commenced schedule. The breaches of the Policy statement

related to the incorrect application of a market system constraint and an over procurement of reserves.

5 Ancillary Services

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

Ancillary Service Costs

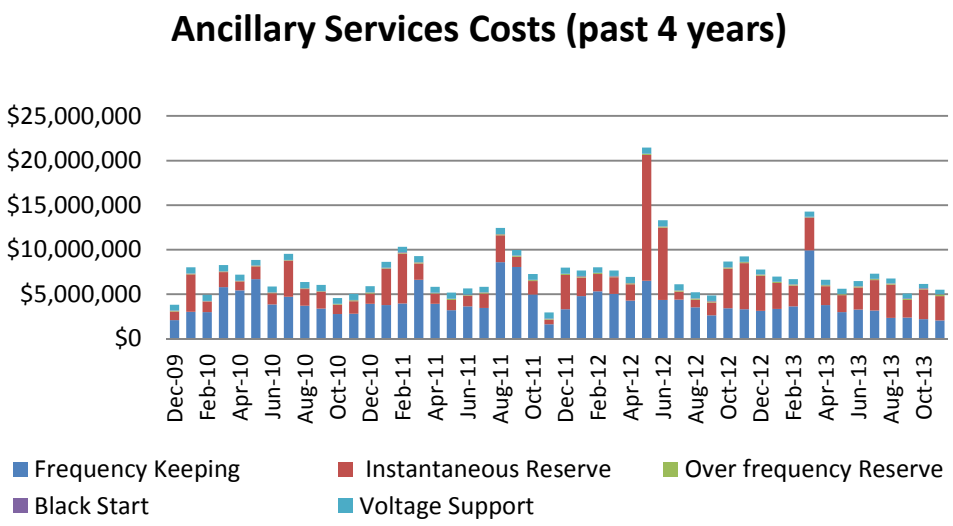
The costs of ancillary services for the month of November are set out in Appendix A (as required by clause 82.1 of the procurement plan).

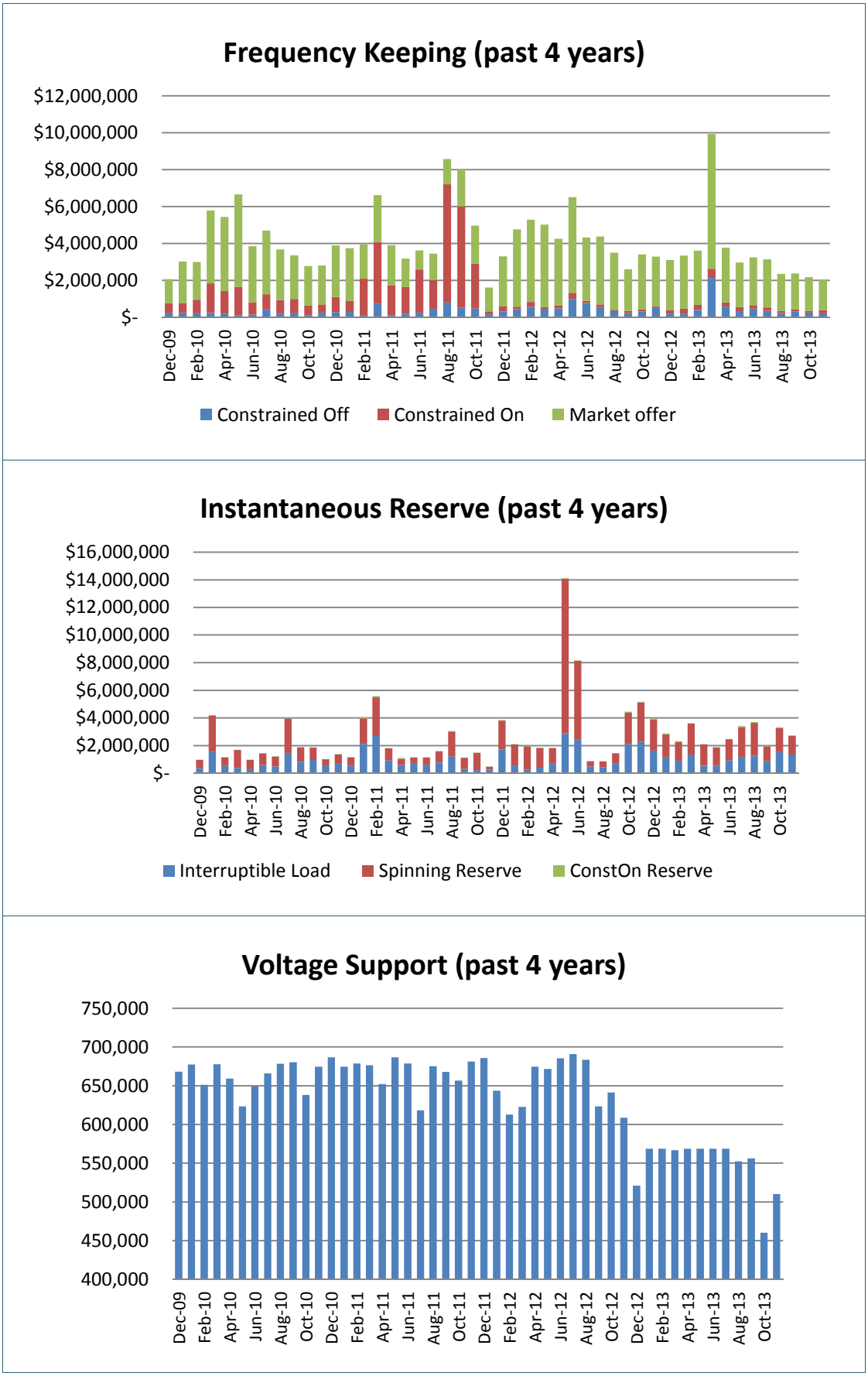
Code 7.10: Separation of Transpower Roles

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	$	200,427
	Constrained On	$	175,303
	Market offer	$	1,656,002
	Total monthly Cost	**$**	**2,031,732**
Instantaneous Reserve	Spinning reserve	$	1,363,695
	Interruptible Load	$	1,360,129
	Constrained On	$	19,126
	Total monthly Cost	**$**	**2,742,950**
Over Frequency Reserve	**Total monthly Cost**	**$**	**158,149**
Black Start	**Total monthly Cost**	**$**	**48,663**
Voltage Support	**Total monthly Cost**	**$**	**510,080**
All Ancillary Services	**Total monthly Cost**	**$**	**5,491,574**



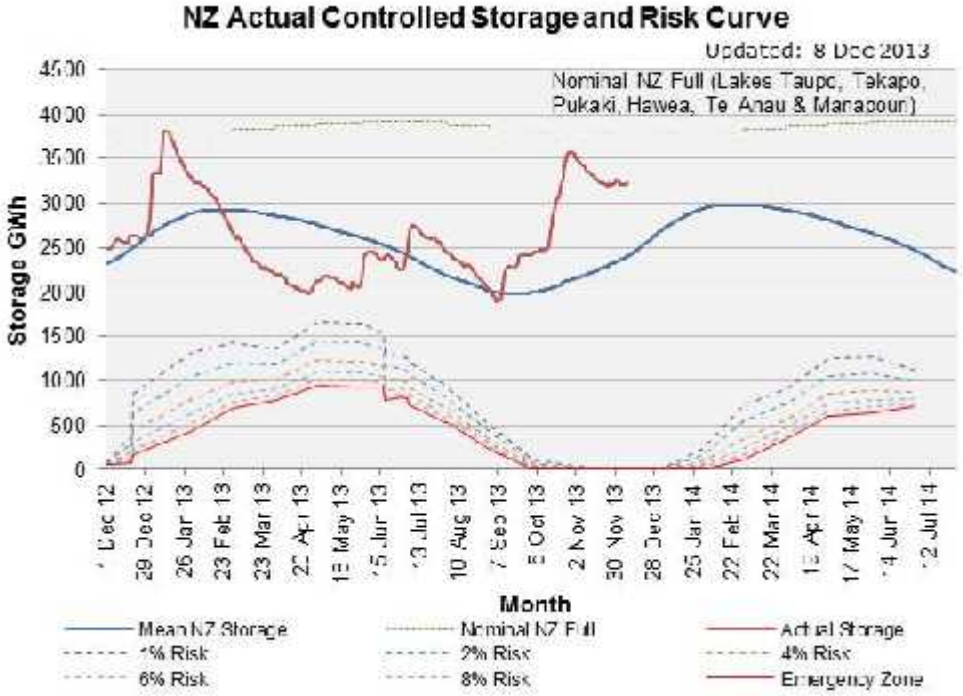

Frequency Keeping (past 4 years)
$12,000,000
$10,000,000
$8,000,000
$6,000,000
$4,000,000
$2,000,000
$-
Dec-09
Feb-10
Apr-10
Jun-10
Aug-10
Oct-10
Dec-10
Feb-11
Apr-11
Jun-11
Aug-11
Oct-11
Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Apr-13
Jun-13
Aug-13
Oct-13
Constrained Off
Constrained On
Market offer
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
$-
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

Appendix B – Security of Supply

New Zealand Hydro Storage and Hydro Risk Curves

Aggregate primary New Zealand storage is 134% 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 100% of average.

South Island Inflows over the last calendar month have been 80% of average.

Measurements are based on daily inflow values.

Over the last 4 weeks hydro generation has met 63% of demand.

System Performance Report

To the Electricity Authority

November 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

Transpower New Zealand Ltd The National Grid

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1. Summary of System Performance

This system performance report covers the month of November 2013.

Principal Performance Obligations

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

System Events

On 7th November at 18:39 a feeder circuit-breaker at Hepburn Road Substation failed catastrophically resulting in a loss of supply to the station. Debris from the explosion and the consequent voltage disturbance resulted in trippings of the 110 kV Henderson – Hepburn Road 4, and Hepburn Road – Mount Roskill 1 & 2 circuits, and of 220 / 110 kV Henderson inter-connecting transformers T1 & T5 and the loss of approximately 100 MW of additional load in the Auckland area. Supply was restored to Hepburn Road after 258 minutes.

On 12th November at 11:05 a control system issue encountered during a planned AC circuit fault test resulted in an HVDC Bipole runback of over 800 MW in north transfer. This resulted in the North Island frequency falling momentarily to 47.79 Hz, triggering the first block of Automatic Under-frequency load shedding (AUFLS). In the South Island the frequency momentarily rose to 53.25 Hz triggering the generators armed on the 53 Hz over-frequency setting to trip. Supply was restored to disconnected North Island parties after 105 minutes.

On 24th November at 04:53 HVDC Pole 3 tripped in north transfer. This resulted in a momentary fall in North Island frequency to 48.95 Hz and a momentary rise in South Island frequency to 52.81 Hz.

Other noteworthy events occurring during the reporting period:

The unsettled weather experienced during spring to date continued into November with electrical storms in particular contributing to a higher than average tripping count for the month.

On 1st November at 18:51 66 kV Hororata – Kimberly – Islington Circuits 1 & 2 tripped resulting in a loss of supply to Kimberly Substation. Supply was restored after 15 minutes.

On 6th November at 13:07 110 kV Arapuni – Kinleith Circuits 1 & 2 tripped resulting in a loss of connection to the Arapuni Power Station 110 kV “South” bus. Supply was restored after 19 minutes.

On 23rd November at 14:19 220 kV Bunnythorpe – Haywards Circuit 2 tripped and auto-reclosed. This resulted in commutation failures occurring on HVDC Poles 2 & 3 causing a widespread voltage disturbance in the Lower North Island.

On 28th November at 15:54 220 kV Bunnythorpe – Brunswick Circuits 1 & 2 tripped, with circuit 1 auto-reclosing. The voltage disturbance associated with the fault resulted in the loss of wind generation at Tararua Wind-farm, and the loss of approximately 80 MW of load in the Lower North Island.

2. Principal Performance Obligations

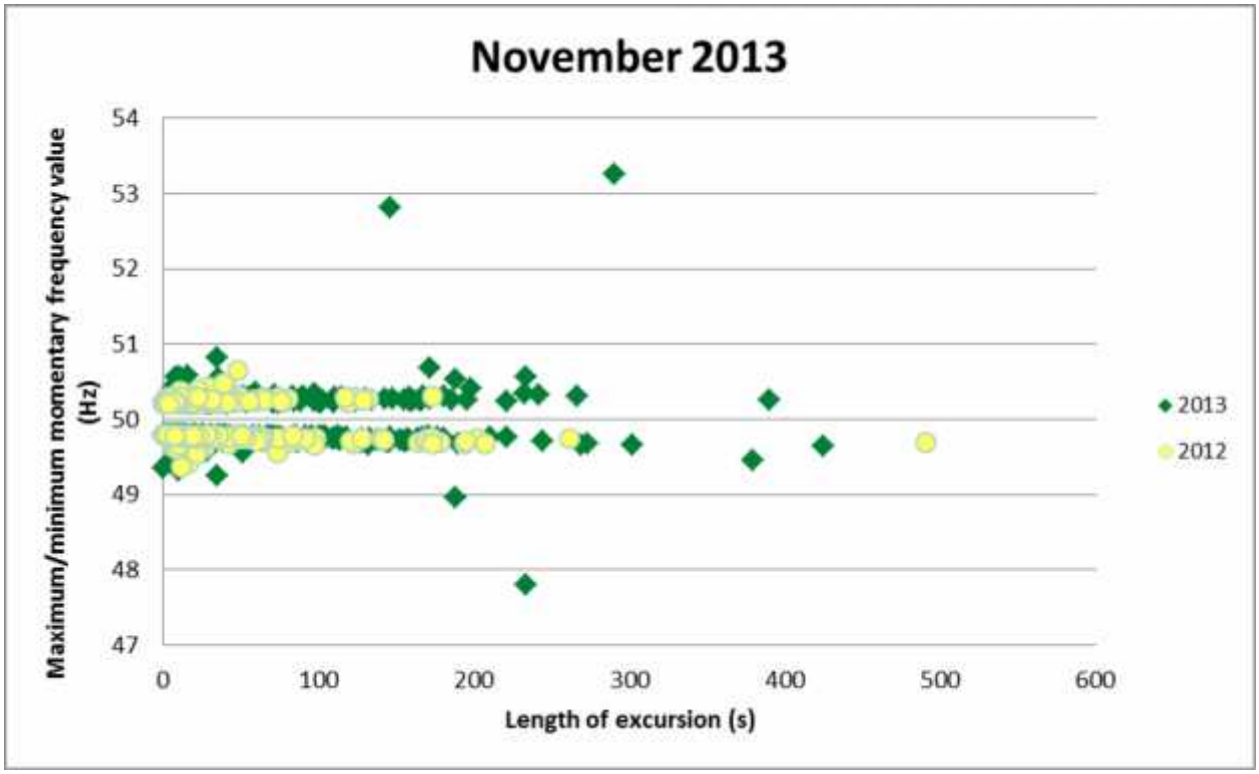
2.1 Avoid Cascade Failure

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	Dec -12	Jan - 13	Feb - 13	Mar - 13	Apr - 13	May - 13	Jun - 13	jul - 13	Aug - 13	Sep - 13	Oct - 13	Nov - 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	**37**	**50**
50.50 > Freq >= 50.20	189	279	445	324	541	419	221	404	656	709	797	582	**5566**	
50.20 > Freq > 49.80														
49.80 >= Freq > 49.50	183	245	367	331	484	401	208	385	652	692	789	605	**5342**	
49.50 >= Freq > 48.75		1	1	2	6	9	4			2	7	7	**39**	**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		Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct -13	Nov-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	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13
Demand Allocation Notice	-	-	-	-	-	-	-	-	-	-	-	-
Grid Emergency Notice	4	6	-	2	6	5	2	4	1	2	1	12
Warning Notice	-	-	-	1	-	3	2	3	1	-	-	2
Customer Advice Notice	24	30	35	39	43	67	41	27	15	31	63	86

3.2 GRID EMERGENCIES

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

Date	Time	Summary Details	Island
01/11/13	23:19	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
03/11/13	00:35		
04/11/13	02:34		
10/11/13	23:59		
06/11/13	13:35	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
	17:52		
19/11/13	16:05		
22/11/13	16:45		
26/11/13	14:47		
28/11/13	16:02		
12/11/13	11:05	A grid emergency was declared to assist with system restoration following the HVDC runback and subsequent AUFLS event.	N
18/11/13	08:53	A grid emergency was declared due to a shortage of North Island generation following the tripping of Huntly U5.	N

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

Island	Region	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Total
North Island	Northland	1	-	-	-	-	-	-	-	-	-	-	-	**1**
	Auckland	-	1	-	-	-	-	1	-	-	-	-	-	**2**
	Zone 1	-	-	-	-	-	-	-	-	-	-	-	4	**4**
	Waikato	1	5	-	1	5	5	-	4	1	2	-	6	**30**
	Bay of Plenty	1	-	-	-	-	-	-	-	-	-	-	-	**1**
	Hawkes Bay	1	-	-	-	-	-	-	-	-	-	-	-	**1**
	Taranaki	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Bunnythorpe	-	-	-	1	-	-	-	-	-	-	1	-	**2**
	Wellington	-	-	-	-	1	-	-	-	-	-	-	-	**1**
	North Island (all)	-	-	-	-	-	-	1	-	-	-	-	2	**3**
South Island & HVDC	Nelson Marlborough	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	West Coast	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Christchurch	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Canterbury	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Zone 3	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Otago	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	Southland	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	South Island (all)	-	-	-	-	-	-	-	-	-	-	-	-	**0**
	HVDC	-	-	-	-	-	-	-	-	-	-	-	-	**0**

3.3 Customer Advice Notices (CANs)

Eighty-six CANs (Customer Advice Notices) were issued in the reporting period:

- Sixty-three related to the HVDC:
  - Twenty-three advised of the planned daily test schedules for the Pole 2 re-commissioning;
  - Eighteen related to revisions to the HVDC offer;
  - Nine related to planned and unplanned HVDC outages;
  - Six related to HVDC frequency keeping capability testing;
  - Five related to additional reserve requirements for testing;
  - Two related to a change in HVDC risk classification;
- Six related to the South Island AC extended contingent risk;
- Four related to circuit risk reclassification during electrical storms;
- Two related to the change to summer ratings on 1st December;
- Three related to the commissioning of Te Mihi Power Station;
- Two related to changes to the Reserve Management Tool;
- Two related to under-frequency events on 12th & 24th November;
- Two advised of the Arapuni Runback scheme being disabled for planned work;
- And one advised that the System Operator would no longer be controlling the amount of AUFLS armed on the system.

3.4 Standby Residual Check (SRC) notices

Two hundred and five 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 8th – 9th, 11th, 13th – 15th, 18th – 22nd, 25th – 26th, 28th – 29th November, and 2nd 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	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Total
North Island	Northland	7	3	5	4	7	5	1	3	3	7	5	7	**57**
	Auckland	8	-	1	1	3	10	11	5	3	5	9	6	**62**
	Waikato	6	6	5	3	7	10	6	8	6	8	11	7	**83**
	Bay of Plenty	10	4	5	3	5	6	2	7	5	4	8	8	**67**
	Hawkes Bay	3	6	4	5	7	4	6	-	1	-	5	7	**48**
	Taranaki	1	2	7	1	6	1	3	-	-	-	3	2	**26**
	Bunnythorpe	1	1	7	7	3	3	4	1	3	3	5	6	**44**
	Wellington	11	12	16	10	13	11	9	4	4	9	8	9	**116**
Total		47	34	50	34	51	50	42	28	25	36	54	52	**503**
South Island	Nelson Marlborough	4	4	8	4	6	7	2	1	4	3	8	11	**62**
	West Coast	3	6	9	3	8	11	8	4	3	3	7	12	**77**
	Christchurch	3	2	5	5	7	3	2	3	2	4	8	7	**51**
	Canterbury	2	2	6	3	3	5	4	1	3	3	4	4	**40**
	Otago	-	-	2	2	4	5	-	2	4	5	2	1	**27**
	Southland	1	2	3	6	9	2	3	8	5	5	3	-	**47**
Total		13	16	33	22	37	33	19	18	21	23	32	35	**302**

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_WKM1.1__TKUWKM1*__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Tokaanu-Whakamaru 1.	2
		RPO_TNG1.1__BPE_TKU1.1__BPE_TKU1__RPO__LN	This is an SFT generated constraint. Its purpose is to protect Rangipo-Tangiwai 1 for a tripping of Bunnythorpe-Tokaanu 1.	3
		RPO_TNG1.1__BPE_TKU2.1__BPE_TKU2__RPO__LN	This is an SFT generated constraint. Its purpose is to protect Rangipo-Tangiwai 1 for a tripping of Bunnythorpe-Tokaanu 2.	5
		BPE_MTR1.1__SFD_TMN1.1__$SFDTMN1__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Stratford-Taumaranui 1.	1
		BPE_HAY2.1__HAY_LTN1.1__HAYLTN1#__HAY__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Haywards 2 for a tripping of Haywards-Linton 1.	1
		BPE_HAY2.1__HAY_LTN1.1__HAYLTN1@__HAY__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Haywards 2 for a tripping of Haywards-Linton 1.	1
		BPE_MTR1.1__TKU_WKM2.1__TKUWKM2*__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Tokaanu-Whakamaru 2.	2
		BPE_WDV1.1__BPE_WDV2.1__#BPEWDV2__WDV__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Woodville 1 for a tripping of Bunnythorpe-Woodville 2.	1
		BPE_WDV2.1__BPE_WDV1.1__#BPEWDV1__WDV__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Woodville 2 for a tripping of Bunnythorpe-Woodville 1.	3
		BPE_MTR1.1__SFD_TMN1.1__HLSFTM11__BPE__LN	This is an SFT generated constraint. Its purpose is to protect Bunnythorpe-Mataroa 1 for a tripping of Stratford-Taumaranui 1.	1
	Edgecumbe	THI_WKM1.1__ATI_WKM.1__$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.	18
		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.	11
		ATI_WKM.1__THI_WKM1.1__THIWKM1*__ATI__LN	This is an SFT generated constraint. Its purpose is to protect Atiamuri-Whakamaru 1 for a tripping of Te Mihi-Whakamaru 1.	2
		ATI_OHK.1__THI_WKM1.1__:S__THIWKM1*__ATI__LN	This is an SFT generated constraint. Its purpose is to protect Atiamuri-Ohakuri 1 for a tripping of Te Mihi-Whakamaru 1.	6

		ATI_OHK.1__THI_WKM1.1__THIWKM1*__ATI__LN	This is an SFT generated constraint. Its purpose is to protect Atiamuri-Ohakuri 1 for a tripping of Te Mihi-Whakamaru 1.	1
	Hamilton	ARI_HAM1.1__ARI_HAM2.1__$ARIHAM2__HAM__LN	This is an SFT generated constraint. Its purpose is to protect Arapuni-Hamilton 1 for a tripping of Arapuni-Hamilton 2	9
		KIN_TRK1.2__KIN_TRK2.2__KIN_TRK2__TRK__LN	This is an SFT generated constraint. Its purpose is to protect Kinleith -Tarukenga 1 for a tripping of Kinleith -Tarukenga 2.	4
		ARI_HAM2.1__ARI_HAM1.1__$ARIHAM1__HAM__LN	This is an SFT generated constraint. Its purpose is to protect Arapuni-Hamilton 2 for a tripping of Arapuni-Hamilton 1	1
	Hawkes Bay	RDF_T3&T4_M_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.	3
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.	29
		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.	142
		HAY_BENmax	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_HAYP3max	The purpose of this constraint is to limit the flow on HVDC from Benmore to Haywards to the Asset Owner offered capability for Pole 3.	39
		BEN_HAYP3min	The purpose of this constraint is to govern the flow on HVDC Pole 3 from Benmore to Haywards for Pole 3 commissioning purposes.	1
		HAY_BENP2min	The purpose of this constraint is to govern the flow on HVDC Pole 2 from Haywards to Benmore for Pole 3 commissioning purposes.	2
		HAY_BENP3min	The purpose of this constraint is to govern the flow on HVDC Pole 3 from Haywards to Benmore for Pole 3 commissioning purposes.	5
		BEN_HAYP2min	The purpose of this constraint is to govern the flow on HVDC Pole 2 from Haywards to Benmore for Pole 3 commissioning purposes.	8
	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.	8
		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.	5
Grand Total				**317**

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	0	0.00%	132	0.75%
		RPO_TNG1.1__BPE_TKU2.1_ _BPE_TKU2__RPO__LN	5	0.35%	0	0.00%
	Edgecumbe	ATI_OHK.1__THI_WKM1.1__: S__THIWKM1*__ATI__LN	6	0.42%	0	0.00%
		THI_WKM1.1__ATI_WKM.1__ $ATIWKM1__WKM__LN	18	1.25%	0	0.00%
		THI_WKM1.1__OHK_WRK.1_ _OHK_WRK__WKM__LN	11	0.76%	0	0.00%
	Hamilton	ARI_HAM1.1__ARI_HAM2.1__ $ARIHAM2__HAM__LN	9	0.63%	5	0.03%
		KIN_TRK1.2__KIN_TRK2.2__ KIN_TRK2__TRK__LN	4	0.28%	6	0.03%
	Hawkes Bay	RDF_TX_ECE_TEMP_1	0	0.00%	56	0.32%
South Island & HVDC	Otago	NSY_ROX.1__CYD_TWZ1.1_ _CYD_TWZ1__ROX__LN	5	0.35%	105	0.60%
		NSY_ROX.1__CYD_TWZ2.1_ _CYD_TWZ2__ROX__LN	8	0.56%	109	0.62%
	HVDC	BEN_HAYP2max	29	2.01%	131	0.75%
		HAY_BENP2max	0	0.00%	50	0.29%
		BEN_HAYmax	142	9.86%	131	0.75%
		BEN_HAYP3max	39	2.71%	216	1.23%
		BEN_HAYP3min	1	0.07%	59	0.34%
		HAY_BENP3min	5	0.35%	13	0.07%
		BEN_HAYP2min	8	0.56%	3	0.02%

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)
05/11/13	11:16	A planned reduction in Tokaanu generation as part of HVDC Pole 2 commissioning resulted in a momentary drop in North Island frequency.	N	49.39
07/11/13	18:39	A loss of load caused by the failure of a feeder circuit-breaker resulted in a momentary rise in the frequency in both the North and South Islands.	N S	50.70 50.56
09/11/13	01:02	Clyde G3 tripped resulting in a momentary drop in South Island frequency.	S	49.32
12/11/13	11:05	A high-power HVDC Bipole Runback resulted in a very large frequency drop in the North Island and corresponding rise in the South Island, with a small over-recovery in the North Island following.	N N S	47.80 50.56 53.25
18/11/13	08:13	Huntly U5 tripped resulting in a momentary drop in frequency in the North Island.	N	49.45
21/11/13	15:11	An HVDC Roundpower commissioning test resulted in a momentary rise in South Island frequency.	S	50.51
24/11/13	04;53	HVDC Pole 3 tripped resulting in a momentary frequency swing in the North island and a momentary frequency rise in the South Island.	N N S	48.95 50.52 52.81
26/11/13	08:10	The South Island frequency rose momentarily when HVDC Pole 2 was shut down as part of routine switching.	S	50.54
26/11/13	08:19	The South Island frequency fell momentarily when HVDC Pole 2 was started as part of routine switching.	S	49.24
26/11/13	17:31	The emergency shutdown of a potline at Tiwai resulted in a momentary rise in South Island frequency.	S	50.58

Connection point events

Date	Time	Summary Details	Generation / Load interrupted (MW)	Restoration time (minutes)
06/11/13	13:26	Arapuni – Kinleith Circuits 1 & 2 tripped resulting in a loss of connection to the Arapuni Power Station ‘South” bus.	57	19
07/11/13	18:39	A loss of supply to Hepburn Road Substation occurred when a feeder circuit-breaker failed.	91	258

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	39	These related to trippings of • Arapuni-Hamilton 1 (auto reclose) • Arapuni-Hamilton 2 (auto reclose) • Arapuni-Hangatiki 1 (auto reclose) • Arapuni-Hangatiki-Ongarue 1 (2 x) • Arapuni-Kinleith 1 (auto reclose) • Atiamuri-Tarukenga 1 (auto reclose) • Atiamuri-Tarukenga 2 (auto reclose) • Benmore-Twizel 1 (2 x planned for HVDC Pole 2 commissioning) • Blenheim-Stoke 1 (auto reclose). • Bunnythorpe-Haywards 1 ((2 x planned for HVDC Pole 2 commissioning) • Bunnythorpe-Tangiwai 1 (2 x auto reclose) • Brunswick-Stratford 1 (auto reclose) • Coleridge-Hororata 3 • Fernhill-Redclyffe 2 (auto reclose) • Huntly-Stratford 1 (3 x auto reclose) • Inangahua-Kikiwa 1 • Kinleith-Tarukenga 2 (2 x auto reclose) • Ohaaki-Wairakei 1 • Ohakune-National Park-Ongarue 1 • Otahuhu-Whakamaru 1 (2 x auto reclose) • Otahuhu-Whakamaru 2 (2 x auto reclose) • Owhata-Te Matai-Tarukenga 1 (auto reclose) • Redclyffe-Wairakei 1 (1 x trip, 1 x auto reclose) • Rangipo-Wairakei 1 • Stratford-Taumaranui 1 • Tokaanu-Whakamaru 1 (auto reclose) • Taumaranui-Te Kowhai 1 • Wanganui-Waverly 1 • Whirinaki-Wairakei 1 (auto reclose)
HVDC	22	These related to • HVDC Pole 2 (8 x planned commutation failure, 8 x planned trip, 1 x unplanned tripping, 1 x start, 1 x stop during commissioning testing) • HVDC Pole 3 (1 x planned trip during commissioning testing, 1 x unplanned trip) • HVDC Bipole Roundpower test
Supply Transformer	3	This related to tripping of • Mount Maunganui T3 • Owhata T1 • Tangiwai T2

Event	Number	Summary
Loss of grid reactive plant	8	These related to trippings of • Albany Static Var Compensator SVC7 • Benmore Filter Bank F7 • Haywards Static Synchronous Compensator STC31 (1 x as part of planned test) • Haywards Synchronous Condensor SC1 • Islington Static Var Compensator SVC3 • Marsden Static Synchronous Compensator STC6 (1 x as part of planned test) • Otahuhu Synchronous Condensor GT2, GT4
Loss of single generation units	10	These related to trippings of • Clyde G3 • Huntly U5 • Mokai generation • Te Mihi G1 (3 x), G2 (3 x) – undergoing commissioning • Tokaanu Generation (planned as part of Pole 2 commissioning)
Total during reporting period	**82**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	1	This related to • HVDC Bipole Runback operation following planned AC staged fault test
Loss of interconnecting transformer	1	This related to • Henderson Interconnecting transformers T1 & T5
Loss of bus bar section	0	
Total during reporting period	**2**	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	4	These related to the tripping of • Hororata-Kimberly-Islington 1 & 2 • Arapuni-Kinleith 1 & 2 • Bunnythorpe-Haywards 2 A/R, commutation failures on HVDC Pole 2 & Pole 3 • Bunnythorpe-Brunswick 1 A/R, Bunnythorpe-Brunswick 2
Demand change	1	This related to • Tiwai Potline Emergency Shutdown
Generation	0	
Loss of supply bus bar section	0	
Total during reporting period	**5**	

Other disturbances

Event	Number	Summary
Feeder trippings	52	Various locations
Total during reporting period	**52**	

4.3 SYSTEM EVENTS – TREND

	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Total	Average Events per month
Contingent Event – transmission	16	22	9	13	23	24	27	19	16	64	24	39	**296**	24.7
Contingent Event – generation	3	8	14	15	12	7	14	17	17	10	12	10	**139**	11.6
Contingent Event – Supply transformer	2	0	3	2	10	3	1	3	3	5	1	3	**36**	3.0
Contingent Event – Reactive plant	3	3	6	2	6	5	6	10	6	7	8	8	**70**	5.8
Contingent Event - HVDC	0	0	2	5	11	9	13	0	0	4	18	22	**84**	7.0
Extended Contingent Event HVDC	0	0	0	0	0	0	0	0	0	1	0	1	**2**	0.2
Extended Contingent Event Inter-connecting Transformers	1	0	0	1	1	0	0	1	0	0	0	1	**5**	0.4
Extended Contingent Event Busbar	1	0	1	0	2	0	1	0	0	3	0	0	**8**	0.7
Other Event – AC transmission	0	3	1	0	1	2	1	2	1	5	3	4	**23**	1.9
Other Event – Demand	0	1	0	0	1	0	2	2	1	1	1	1	**10**	0.8
Other Event – Generation	0	1	4	3	1	1	2	0	0	2	0	0	**14**	1.2