System Performance Report

To the Electricity Commission

May 2010

Purpose

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

SYSTEM OPERATOR

TRANSPOWER

Keeping the energy flowing

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1. Summary of System Performance

This system performance report covers the month of May 2010.

Principal Performance Obligations

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

Operational Management

There were a number of occasions requiring more than usual actions by co-ordination staff to manage voltage. Stratford power station was unavailable for two days resulting in management issues in the lower North Island. An HVDC pole 2 fault on 5 May resulted in high voltages in the lower North Island, leading to declaration of a grid emergency.

In total five Grid Emergencies were declared during May. Please refer to section 3.2 for further details.

The most recent round of Co-ordinator team training concluded during the month. Evaluation scores were very high, supporting the value of the training and the significant resource necessary to maintain the quality levels.

System Events

Karapiro-Te Awamutu 1 circuit tripped on 25 May resulting in a loss of connection at Te Awamutu of approximately 22 MW.

Other noteworthy events occurring during the reporting period include:

- tripping of Wairakei units G1 and G14 on 4 May;
- tripping of Tauhara units G1 and G2 on 10 May;
- tripping of Huntly unit 2 on 11 May;
- trippings of Edgecumbe-Waiotahi 2 circuit on 15 and 24 May, resulting in loss of connection at Te Kaha and Waiotahi;
- tripping of Balclutha-Berwick-Halfway Bush 1 circuit on 15 May, resulting in loss of connection at Berwick;
- tripping of Te Kaha Waiotahi, twice on 15 May and twice on 16 May, resulting in loss of connection at Te Kaha;
- trippings of Kawerau station on 17 and 20 May;
- tripping of Mokai unit G30 on 18 May;
- tripping of Tiwai potline on 18 May;
- tripping of Oamaru-Blackpoint-Waitaki 1 circuit on 21 May, resulting in loss of connection at Blackpoint;
- tripping of Kaikohe-Kaitaia 1 circuit on 24 May, resulting in loss of connection on Kaitaia;
- tripping of Waihou supply transformer T2 during a planned switching on 25 May resulting in loss of connection at Waihou;
- tripping of Patea unit G3 on 27 May;
- trippings of Inangahua-Westport 1 circuit three times on 28 May, resulting in partial loss of connection at Westport; and
- tripping of Tauhara units G1 on 31 May.

2. Principal Performance Obligations

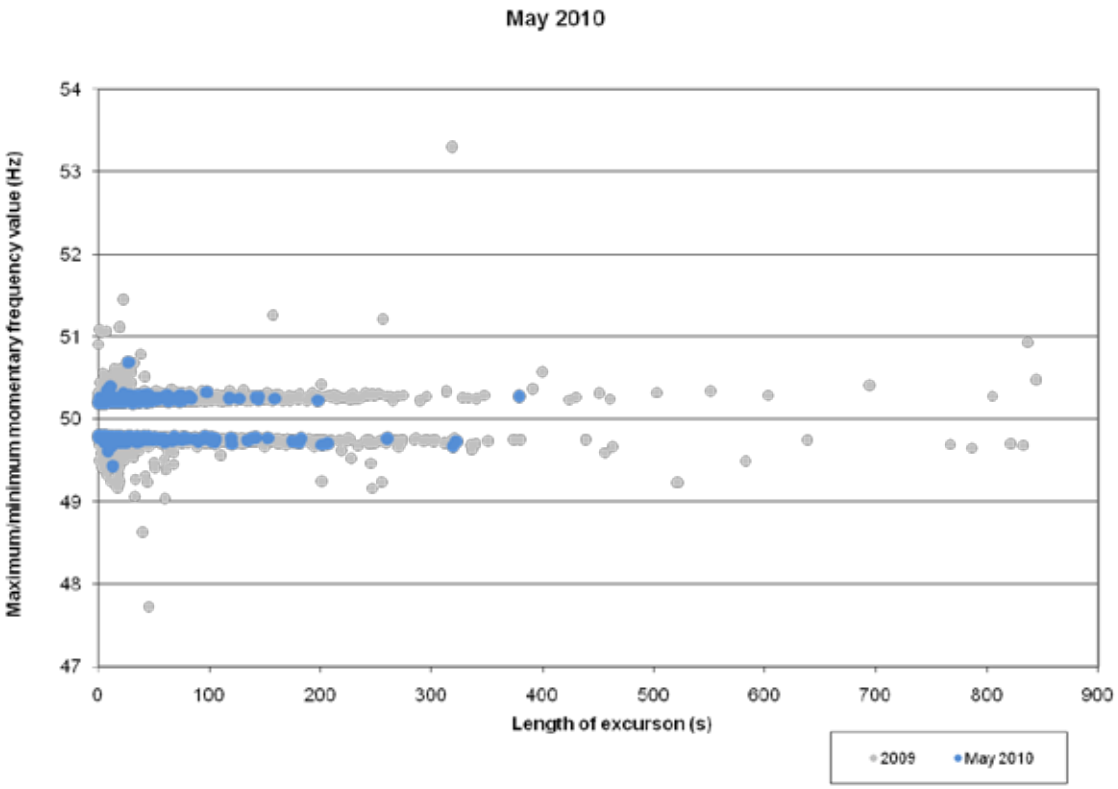
2.1 Avoid Cascade Failure

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.



Manage Frequency and limit rate of 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	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May 10	Annual rate	PPO target
55.00 >= Freq > 52.00													**0**	
52.00 >= Freq > 51.25					1			1					**2**	**7**
51.25 >= Freq > 50.50		2	2	6	4	1	1		2	1	2	1	**22**	**50**
50.50 >= Freq > 50.20	267	416	359	292	228	85	148	140	279	348	351	286	**3199**	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	204	336	257	154	152	98	134	109	278	268	367	253	**2610**	
49.50 >= Freq > 48.75	1	3	1	3	2		2	2	5	5	3	1	**28**	**60**
48.75 >= Freq > 48.00													**0**	**6**
48.00 >= Freq > 47.00			1					1					**2**	**0.2**
47.00 >= Freq > 45.00													**0**	**0.2**

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		Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10
Time Error Management	NI	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	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, Customer Advice Notices and Demand Allocation Notices issued over the last 12 months.

Notices issued	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10
Demand Allocation Notice												
Grid Emergency Notice	4	8		8	6		1	4	3		4	5
Warning Notice	9	9		5	3	1						
Customer Advice Notice	4	11	6	7	41	16	11	18	31	16	12	20

3.2 GRID EMERGENCIES

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

Grid Emergencies			
Date	**Time**	**Summary Details**	**Island**
3 May 2010	18:12	A Grid Emergency was declared for insufficient reserve offers in the South Island following the unplanned loss of some South Island generation. An increase in reserve offers from participants alleviated the situation.	South
6 May 2010	00:39	A Grid Emergency was declared as grid voltages in the lower North Island exceeded or were at risk of exceeding EGR limits as a result of the switching of HVDC Pole 1. To reduce the high voltage, Brunswick-Stratford 1 and Bunnythorpe-Haywards 1 circuits were removed from service.	North
7 May 2010	14:42	A Grid Emergency was declared for independent action taken by the asset owner to remove Bream Bay T2 supply transformer from service due to multiple operations of the low voltage circuit breaker.	North
7 May 2010	15:51	A Grid Emergency was declared for independent action taken by the asset owner to remove Bream Bay T2 supply transformer from service due to multiple operations of the low voltage circuit breaker.	North
30 May 2010	17:30	A Grid Emergency was declared due to insufficient generation offers in the North Island. HVDC Pole 1 was started to alleviate the problem.	North

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

Island	Region	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Total
North Island	Northland												2	**0**
	Auckland					1			2	1				**4**
	Zone 1								1					**1**
	Waikato					1		1						**2**
	Bay of Plenty	1												**1**
	Hawkes Bay													**0**
	Taranaki													**0**
	Bunnythorpe													**0**
	Wellington	2	8		5							1		**16**
	North Island (all)	1			3	4				1			2	**13**
South Island & HVDC	Nelson Marlborough													**0**
	West Coast									1		1		**2**
	Christchurch													**0**
	Canterbury													**0**
	Zone 3													**0**
	Otago													**0**
	Southland											1		**1**
	South Island (all)												1	**1**
	HVDC											1		**1**

3.3 CUSTOMER ADVICE NOTICES (CANS)

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

- three advised of HVDC Pole 2 capability change;
- three advised of HVDC Bipole capability change;
- one advised of the change to winter ratings from 10 May 2010;
- five related to the planned urgent outage of HVDC Pole 2;
- one related to the planned outage of HVDC Pole 1;
- one advised of a change to Standby Residual Check;
- two advised of the revised offer of HVDC Pole 1;
- one related to an issue with the RMT input file which resulted in incorrect reserve requirements in the North Island; and
- three advised of changes in HVDC capability as a result of an unplanned outage Haywards synchronous condenser 4.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of forty seven SRC notices were issued during the reporting period based on the SDS (System Operator's own load forecasting tool). These SRC notices were in respect of trading periods on 3rd-7th, 10th, 13th, 17th-20th, 25th, 27th and 29th-31st. Other SRC notices were issued based on the PDS (based on participants demand bids).

3.5 VOLTAGE MANAGEMENT

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

No contracted voltage support ancillary services were called upon 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	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Total
North Island	Northland	10	1	4	4	8	24	4	1	21	16	19	7	**119**
	Auckland	7	5	3	15	7	13	8	1	2	9	4	4	**78**
	Waikato	7	2	2	3	6	7	5	2	10	12	5	19	**80**
	Bay of Plenty	7	5	3	10	4	5	2	2	11	12	8	12	**81**
	Hawkes Bay	3	5		1	2	3	1	3	6	2	1	6	**33**
	Taranaki	2	3			1	3	1	1	5	1		8	**25**
	Bunnythorpe	5	3			5	3	1	3	5	9	16	5	**55**
	Wellington	3	2	1	7	4	7	6	2	7	11	6	4	**60**
Total		44	26	13	40	37	65	28	15	67	72	59	65	**531**
South Island	Nelson Marlborough	0	2	3	10	5	6	2	1	5	6	6	4	**50**
	West Coast	0	3	4	2	2	4			2	3	3	3	**26**
	Christchurch	0	1	1	4	4	3	4	2	1	2		3	**25**
	Canterbury	1	3	1		3	3			2	6	4		**23**
	Otago	1		3	1	5	2		3		2	4		**21**
	Southland	2		3		10	4	2	2	6	4	2	3	**38**
Total		4	9	15	17	29	22	8	8	16	23	19	13	**183**

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.transpower.co.nz/?id=5979*. This information includes constraint equations and a brief summary of their purpose.

Island	Region	Constraint Name	Description
North Island	Hamilton	ARI_BOB_1_ARI_RUNBACK_ENABLED_M_O_1	The effect of this constraint is to manage flows through Arapuni - Hamilton 1 for a contingency of Arapuni - Hamilton 2 when Arapuni - Bombay 1 is out of service and the Arapuni Runback Scheme is enabled.
		HAM_117_157_110kV_SPLIT_W_O_1	The effect of this constraint is to manage flows through Arapuni - Kinleith 1 for a contingency of Arapuni - Kinleith 2 during Bombay Hamilton, Arapuni Bombay and Arapuni Hamilton 110kV splits when Hamilton 110kV bus is split.
		HAM_OHW_1_or _HAM_WKM_1_110kV_SPLIT_W_O_3	The effect of this constraint is to manage flows through Arapuni - Kinleith 1 for a contingency of Arapuni - Kinleith 2 during Bombay Otahuhu, Arapuni Bombay and Arapuni Hamilton 110kV splits when Hamilton - Ohinewai 1 or Hamilton - Whakamaru 1 are out o
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_W_P_1	The effect of this constraint is to manage flows through Arapuni-Hamilton 1 and 2 for a contingency of Arapuni-Hamilton 2 or 1 during high ARI generation. Arapuni Runback Scheme enabled.
	Hawkes Bay	RDF_T3_M_O_1	The effect of this constraint is to manage flows through Redclyffe-T4 during an outage of Redclyffe_T3 with low Tuai generation.
South Island & HVDC	Nelson	STK_UTK_1_M_P_1	The effect of this constraint is to manage flows through STK_UTK_1 for a contingency of COB_STK_2 during low COB generation.
		MOT_STK_2&MOT_T6_W_O_1	The effect of this constraint is to manage flows through Stoke-Upper Takaka 1 for a contingency of Cobb-Motueka 2 when Motueka-Stoke 2 together with Motueka T6 are out of service, and the Cobb runback scheme is disabled.
	HVDC	DCNPole1Max	The purpose of this constraint is to limit the flow on HVDC Pole 1 to the Asset Owner's offered capability.
		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.
		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.

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	Hamilton	ARI_HAM_1_and_2_ARI_RUNBACK_DISABLED_S_P_1	0	0.00%	56	0.32%
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_S_P_1	0	0.00%	54	0.31%
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_W_P_1	5	0.34%	0	0.00%
	Hawkes Bay	RDF_T3_M_O_1	6	0.40%	0	0.00%
South Island & HVDC	Nelson	MOT_STK_2&MOT_T6_W_O_1	7	0.47%	0	0.00%
	West Coast	WEST_COAST_SPLIT_O_1	0	0.00%	114	0.65%
	Otago	NSY_ROX_1_S_P_z	0	0.00%	337	1.92%
		NSY_ROX_1_W_P_1_z	0	0.00%	59	0.34%
	HVDC	DCNPole1Max	647	43.48%	2577	14.71%
		DCNPole1Min	0	0.00%	2557	14.59%
		BEN_HAYP1max	0	0.00%	542	3.09%
		BEN_HAYP2max	14	0.94%	2	0.01%

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)
11 May 2010	14:44	Huntly unit 2 tripped causing a momentary drop in frequency in the North Island.	North	49.43
18 May 2010	14:29	An emergency Tiwai potline reduction resulted in a momentary rise in frequency in the South Island.	South	50.69

Connection point events

Date	Time	Summary Details	Generation/Load interrupted (MW)	Restoration time (minutes)
25/05/2010	09:30	Karapiro-Te Awamutu 1 circuit tripped causing loss of connection to Te Awamutu.	21.7	106

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	23	These related to trippings of § Gisborne-Tuai 1 (Auto Reclose) § Edendale-Invercargill 1 (Auto Reclose) § New Plymouth-Stratford 1 (Auto Reclose) § Edgecumbe-Kawerau 1 § Edgecumbe-Waiotahi 2 (Auto Reclose) (x2) § Balclutha-Berwick-Halfway Bush 1 § Edgecumbe-Kawerau 2 (Auto Reclose) § Te Kaha-Waiotahi 1 (Auto Reclose) (x4) § Gisborne-Tuai 2 (Auto Reclose) § Invercargill-Roxburgh 1 (Auto Reclose) § Gore-Roxburgh 1 (Auto Reclose) § Oamaru-Blackpoint-Waitaki 1 § Atarau-Inangahua 1 § Gisborne-Tokomaru Bay 1 § Kaikohe-Kaitaia 1 (Auto Reclose) § Karapiro-Te Awamutu 1 § Inangahua-Westport 1 (x3)
Loss of HVDC pole	1	This relate to a tripping of § HVDC Pole 1
Loss of single generation units	8	These related to trippings of § Wairakei G1 & 14 § Tauhara G1 & G2 § Huntly U2 § Kawerau (x2) § Mokai G30 § Patea G3 § Tauhara G1
Total during reporting period	**32**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	0	
Loss of bus bar section	1	This event related to a tripping of § Halfway Bush 33 kV Bus B
Loss of interconnecting transformer	1	This event related to a tripping of § Haywards T2
Loss of grid reactive plant	4	This event related to trippings of § Haywards SC1 § Haywards SC4 (x2) § Haywards Filter F1
Loss of supply transformer	3	This event related to trippings of § Bream Bay T2 (x2) § Waihou T2
Demand change	1	This event related to a tripping of § Tiwai Potline
Loss of multiple generation units	0	
HVDC Start/ Stop	0	
Total during reporting period	**10**	

Other disturbances

Event	Number	Summary
Feeder trippings	39	Various locations
Misc.	0	
Total during reporting period	**39**	

4.3 SYSTEM EVENTS – TREND

	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Total	Average Events per month
Contingent Event – transmission	19	16	24	16	22	4	12	51	20	10	15	23	232	19.3
Contingent Event – generation	8	11	9	11	14	13	15	8	10	13	13	8	133	11.1
Contingent Event - HVDC	0	0	1	0	15	2	1	4	7	0	0	1	31	2.6
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Other Event – AC transmission	2	2	0	1	1	0	1	5	0	1	0	0	13	1.1
Other Event – Busbar	1	0	1	1	0	2	1	2	1	2	1	1	13	1.1
Other Event – Demand	1	5	2	5	4	4	1	0	0	1	0	1	24	2.0
Other Event – Generation	0	0	0	2	0	1		1	0	0	2	0	6	0.5
Other Event – Interconnecting transformer	0	0	0	1	0	0	1	1	1	1	0	1	6	0.5
Other Event – Reactive plant	3	0	1	6	10	2	8	5	6	5	3	4	53	4.4
Other Event – Supply transformer	3	6	4	3	3	4	4	3	2	11	1	3	47	3.9