System Performance Report

To the Electricity Authority

November 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 November 2010.

Principal Performance Obligations

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

Operational Management

A busy month with many grid and generator outages, including some of significant complexity or impact. Weather conditions have been favourable throughout, reducing the instances where planned work could not proceed or required recall.

On the other hand, some outages, notably to re-conductor the BPE_MAR_WGN circuits, were extremely difficult to arrange because of the complexity of industry arrangements (e.g. load management agreements) required to be in place to enable work to proceed. That outage commenced on the 19th, a week later than planned due to the complexity or arrangements required.

(1) A number of generator trippings including an IL event on Thursday 11th when OTC tripped. That generator was then taken out of service for a week. It later came off on the 30th for a planned 3 week maintenance shut down.

(2) The OTA GTs (used for voltage support) were not dispatched from Friday 22nd. This was to trial zone 1 voltage management without reliance upon those synchronous condensers. A new ancillary services contract was being negotiated for ongoing provision of these units, as part of the 2010/2011 Procurement Plan.

(3) The new bus split established at KIN was used for the first time late in the month. This split is designed to enable management of a contingency of the HAM-WKM circuit (that would overload the KIN-TRK circuits) without reducing KIN to 'N' security.

(4) The ATU inter trip was removed from service to increase ATU security while Pike River coal mine rescue efforts continued.

(5) The first of the two SFD peaker plants was synchronised and a first drop load test carried out on the 25th.

(6) A rare instance of independent action by an asset owner occurred on the 29th when the grid owner removed OTA_SWN 1 from service, the action being taken due to faulting equipment and the potential for damage occurring.

(7) Reserves were reduced below 1 on the 3rd when there were insufficient reserves to cover the NI CE risk. This followed trippings at HLY1 and WHI and a failure of a scheduled generator to start up.

(8) The Rowing World Championships were managed without impact on lake levels and surface conditions. This was a challenging period given the high river flows, issues caused by low prices and reduced upper NI generation offers and the need to maintain security in the KIN region in the face of constraints on the HAM-WKM circuits. The champs went off well, with river flows being managed by Mighty River Power without causing organisers evident problems. KIN was on "N' security for some periods to allow MRP to manage flows without spilling in a manner likely to cause lake surface impacts (the KIN bus split being unavailable at the time).

(9) A loss of supply occurred at Opunake on the 8th following a tripping of the OPK_KPI_SFD 2 circuit (while circuit 1 was on planned outage).

System Events

On 11h November at 10:16, Otahuhu B CCGT Power Station tripped, resulting in a momentary drop in North Island frequency to 49.17 Hz and South Island frequency to 49.35 Hz.

On 28th November at 13:14, the tripping of a Tiwai potline resulted in a momentary rise in South Island frequency to 50.74 Hz.

Other noteworthy events occurring during the reporting period:

On 6th November at 14:40, shifts in generation at Benmore Power Station resulted in the South Island frequency momentarily swinging from 49. 61 Hz to 50.25 Hz;

On 8th November at 09:56, and arc-back occurred on HVDC Valve Group 1 at Benmore resulting in a widespread voltage disturbance being experienced;

On 8th November at 10:00, 110 kV Opunake – Kapuni – Stratford Circuit 2 tripped during a planned outage on Opunake – Stratford Circuit 1. This resulted in a loss of supply to both Kapuni Power Station and Opunake Substation. Supply was restored after 22 minutes;

On 11th November at 14:45, Otahuhu B CCGT Power Station tripped resulting in a momentary drop in North Island frequency to 49.69 Hz.

On 15th November at 21:20, Otahuhu B CCGT Power Station tripped resulting in a momentary drop in North Island frequency to 49.63 Hz.

2. PRINCIPAL PERFORMANCE OBLIGATIONS

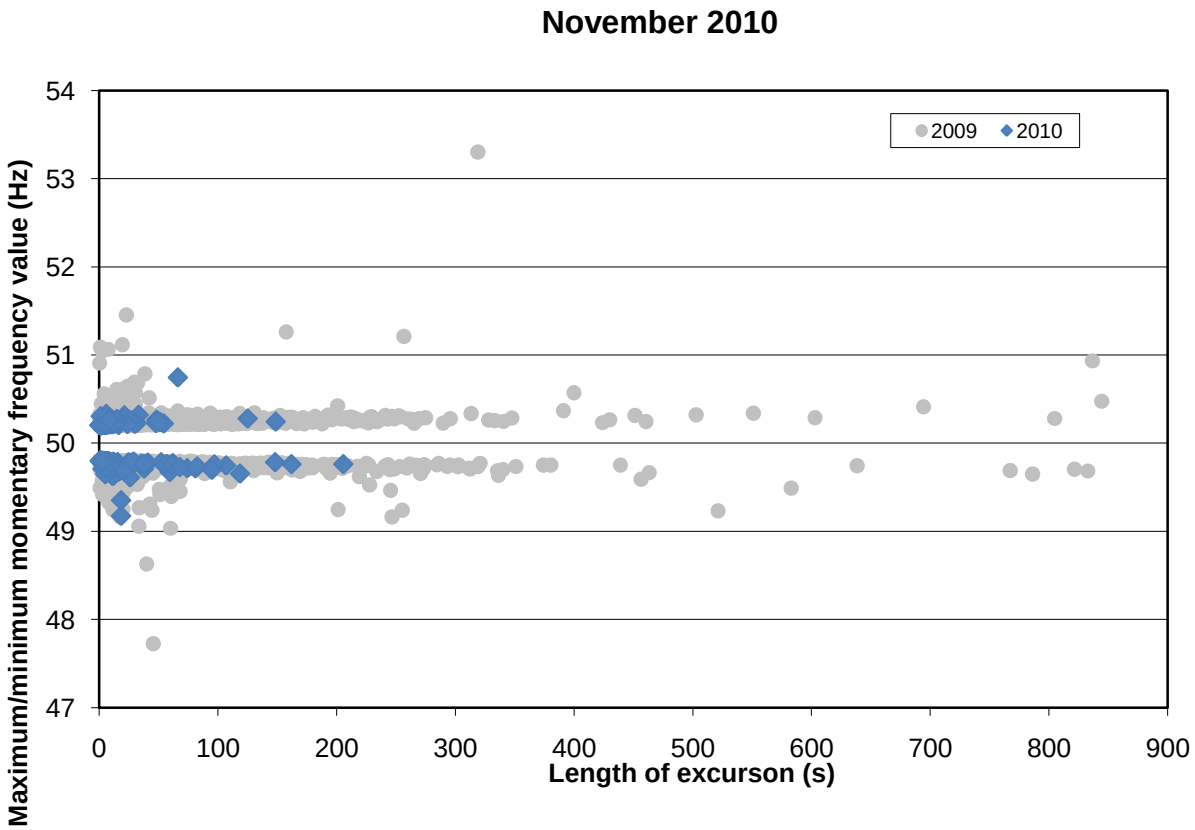
2.1 AVOID CASCADE FAILURE

No instances of cascade failure occurred during the reporting period.

2.2 FREQUENCY

Maintain frequency in normal band and recover quickly from a fluctuation

The chart below shows the maximum or minimum frequency reached and length of each frequency excursion outside the normal band (49.8 to 50.2 Hz) during the reporting period. The majority of excursions are within 0.4 Hz of the normal band and frequency typically returns to within the normal band within 2 minutes.



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	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-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	1		2	1	2	1	1	1		1	1	1	**12**	**50**
50.50 >= Freq > 50.20	148	140	279	348	351	286	376	382	337	71	273	116	**3107**	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	134	109	278	268	367	253	281	368	291	68	252	113	**2782**	
49.50 >= Freq > 48.75	2	2	5	5	3	1	6	4	1	1		2	**32**	**60**
48.75 >= Freq > 48.00													**0**	**6**
48.00 >= Freq > 47.00													**0**	**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.
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Time Error Compliance Table		Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10
Time Error Management	NI	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	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

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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	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10
Demand Allocation Notice												
Grid Emergency Notice	1	4	3		4	5	5	2		16	6	5
Warning Notice								1		8	5	2
Customer Advice Notice	11	18	31	16	12	20	10	17	9	9	7	13

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**
02/11/10	07:39	Grid Emergencies were declared for insufficient generation offers in the Upper North Island and insufficient transmission capacity in the Waikato region. The grid was re-configured at KIN to alleviate the situation.	N
02/11/10	12:41		
03/11/10	07:17		
04/11/10	09:00		
03/11/10	08:16	A Grid Emergency was declared to allow reduced reserves being dispatched to cover the North Island contingent event risk due to insufficient generation and reserve offers in the North Island.	N

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

Island	Region	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Total
North Island	Northland						2				1			**3**
	Auckland		2	1										**3**
	Zone 1		1					1						**2**
	Waikato	1									13	6	4	**24**
	Bay of Plenty							2						**2**
	Hawkes Bay													**0**
	Taranaki							1						**1**
	Bunnythorpe													**0**
	Wellington					1				5				**6**
	North Island (all)			1			2	1	1	3			1	**14**
South Island & HVDC	Nelson Marlborough													**0**
	West Coast			1		1			1		1			**4**
	Christchurch													**0**
	Canterbury										1			**1**
	Zone 3													**0**
	Otago													**0**
	Southland					1								**1**
	South Island (all)						1							**1**
	HVDC					1								**1**

CUSTOMER ADVICE NOTICES (CANS)

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

Nine related to a planned outage of HVDC Pole 1;

Two related to planned testing of the new Stratford Power Station;

One related to a complex outage in the Waikato region being rescheduled;

One related to potential new permanent constraints under investigation;

One related to the change from Shoulder to Summer Ratings on 1st December.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of eighty-nine 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 – 5th, 8th, 9th, 11th, 12th, 15th, and 16th of November.

3.5 VOLTAGE MANAGEMENT

On 19th November between 10:03 and 10:07 unexpected high voltages were recorded in the Waitaki Valley during planned switching of the 220 kV Islington – Livingston

Circuit. Voltages of 245 kV were observed on the 220 kV system and 125 kV on the 110 kV system. We are currently reviewing this event.

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	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Total
North Island	Northland	4	1	21	16	19	7	7	2	1	1	19	5	**103**
	Auckland	8	1	2	9	4	4	1	5	3	10	9	7	**63**
	Waikato	5	2	10	12	5	19	9	3	1	3	7	4	**80**
	Bay of Plenty	2	2	11	12	8	12	6	1	10	5	5	2	**76**
	Hawkes Bay	1	3	6	2	1	6	7		2	2	5		**35**
	Taranaki	1	1	5	1		8	4	1			2		**23**
	Bunnythorpe	1	3	5	9	16	5	5	2	2	3	5	5	**61**
	Wellington	6	2	7	11	6	4	9	5	11			1	**62**
Total		28	15	67	72	59	65	48	19	30	24	52		**479**
South Island	Nelson Marlborough	2	1	5	6	6	4	4					2	**30**
	West Coast			2	3	3	3	3	7	9	5	1		**36**
	Christchurch	4	2	1	2		3				1	1		**14**
	Canterbury			2	6	4		5	3			4	1	**25**
	Otago		3		2	4		4	6	7		4	4	**34**
	Southland	2	2	6	4	2	3		3	3	1		3	**29**
Total		8	8	16	23	19	13	16	19	19	7	10		**158**

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	Edgecumbe	KAW_T13_M_P_2	The effect of this constraint is to manage flows through Kawerau-T13 for a contingency of Edgecumbe-Owhata during low Kawerau 110kV load and high Matahina and Kawerau generation and when Edgecumbe T4 & T5 are out of service.
	Hamilton	ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_M_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.
		KIN_TRK_1_M_P_2	The effect of this constraint is to manage flows through Kinleith - Tarukenga 1 for a contingency of Kinleith - Tarukenga 2 during low generation at Auckland, Huntly and Arapuni with all circuits in service.
		HAM_OHW_1_or_HAM_WKM_1_110kV_SPLIT_M_O_3	The effect of this constraint is to manage flows through Arapuni-Kinleith-1 for a contingency of Arapuni-Kinleith-2 during Bombay and Arapuni 110kV splits when Hamilton-Whakamaru-1 or Hamilton-Ohinewai 1is out of service.
#N/A	#N/A	ATU_RFN_IGH_1_W_O_1	#N/A
		ATI_OHK_1_M_O_5	#N/A
South Island & HVDC	HVDC	DCNPole1Max	The purpose of this constraint is to limit the flow on HVDC Pole 1 to the Asset Owner's offered capability.
	Otago	NSY_ROX_1_M_P_1	The effect of this constraint is to manage flows through Naseby-Roxburgh-1 for a contingency of Clyde-Twizel-1 or 2 during high Southland generation and with all circuits in service
	Southland	HWB_T4_W_O_1_z	The effect of this constraint is to manage flows through Roxburgh interconnecting transformer T10 for a contingency of Edendale-Invercargill 1 during low Southland 110 kV generation when Halfway Bush interconnecting transformer T4 is out of service whether by itself or concurrent with either a Halfway Bush - Three Mile Hill or Halfway Bush - South Dunedin circuit.
		ROX_T10_P_1_temp	The effect of this constraint is to manage flows through Roxburgh T10 for a contingency of Gore-Roxburgh 1 during north transfer or high ROX 110kV generation.
		HWB_T4_M_O_2	The effect of this constraint is to manage flows through Roxburgh interconnecting transformer T10 for a contingency of Edendale-Invercargill 1 during low Southland 110 kV generation when Halfway Bush interconnecting transformer T4 is out of service.
		ROX_T10_M_P_1	The effect of this constraint is to manage flows through Roxburgh T10 for a contingency of Gore-Roxburgh 1 during north transfer or high ROX 110kV generation.

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	Edgecumbe	KAW_T13_M_P_2	4	0.28%	0	0.00%
	Hamilton	ARI_HAM_1_and_2_ARI_RUN BACK_DISABLED_S_P_1	0	0.00%	56	0.32%
		ARI_HAM_1_and_2_ARI_RUN BACK_ENABLED_S_P_1	0	0.00%	54	0.31%
#N/A	#N/A	ATI_OHK_1_M_O_5	15	1.04%	0	0.00%
South Island	West Coast	WEST_COAST_SPLIT_O_1	0	0.00%	98	0.56%
	Otago	NSY_ROX_1_S_P_z	0	0.00%	337	1.92%
	Southland	ROX_T10_P_1_temp	6	0.42%	5	0.03%
		HWB_T4_M_O_2	22	1.53%	0	0.00%
		ROX_T10_M_P_1	8	0.56%	0	0.00%
	HVDC	DCNPole1Max	88	6.11%	2642	15.08%
		DCNPole1Min	0	0.00%	1643	9.38%

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)
11/11/10	10:16	OTC tripped causing a momentary drop in frequency in both the North and South Islands.	N S	49.17 Hz 49.35 Hz
28/11/10	13:14	A Tiwai potline tripping resulted in a momentary rise in frequency in the South Island.	S	50.74 Hz

Connection point events

Date	Time	Summary Details	Generation/Load interrupted (MW)	Restoration time (minutes)
None				

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	5	These related to trippings of - Halfway Bush-Roxbourgh 1 (Auto Reclose) - Opunake-Kapuni-Stratford 2 - Bombay-Hamilton 2 (Auto Reclose) - Islington-Livingstone 1 (Auto Reclose) x 2
Loss of HVDC pole	1	Arcback on HVDC Valve Group VG1 on startup (Auto-restart). No loss of transfer.
Loss of single generation units	11	These related to trippings of - Huntly U1 - Whirinaki G3 - Tuai G5 - Benmore G1 - OTC x 3 - Kinleith G1 x 3 - Ohau A G4
Total during reporting period	**17**	

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	0	
Loss of interconnecting transformer	0	
Loss of grid reactive plant	4	These events related to trippings of - Otahuhu GT6 - Kikiwa STC2A - Haywards SC9 - Haywards F2
Loss of supply transformer	1	These events related to trippings of - Whirinaki T2
Demand change	4	These events related to trippings of - Tiwai Potline #4 x 2 - Tiwai Potline #3 - Approx 13 MW of load tripped in Northpower's network

Event	Number	Summary
Loss of multiple generation units	0	
HVDC Start/ Stop	0	
Other	**1**	**This event related to:** - High grid voltages following the planned switching of Islington-Livingstone 1.
Total during reporting period	**10**	

Other disturbances

Event	Number	Summary
Feeder trippings	41	Various locations
Total during reporting period	**41**	

4.3 System Events – Trend

	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Total	Average Events per month
Contingent Event – transmission	12	51	20	10	15	23	17	11	13	31	17	8	**228**	17.8
Contingent Event – generation	15	8	10	13	13	8	14	13	20	15	9	11	**149**	13
Contingent Event - HVDC	1	4	7	0	0	1	1	2	1	0	1	1	**19**	2.8
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0	0	0		0.0
Other Event – AC transmission	1	5	0	1	0	0	2	0	2	5	0	1	**17**	1.1
Other Event – Busbar	1	2	1	2	1	1	1	0	1	0	0	0	**10**	1.1
Other Event – Demand	1	0	0	1	0	1	1	1	0	2	3	4	**14**	1.25
Other Event – Generation	0	1	0	0	2	0	2	2	0	2	2	0	**11**	0.8
Other Event – Interconnecting transformer	1	1	1	1	0	1	2	0	1	1	0	0	**9**	0.8
Other Event – Reactive plant	8	5	6	5	3	4	2	3	1	1	1	4	**43**	4.6
Other Event – Supply transformer	4	3	2	11	1	3	7	3	3	5	5	1	**48**	3.9