

System Performance Report

To the Electricity Authority Board

October 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

Keeping the energy flowing

TRANSPower



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1. SUMMARY OF SYSTEM PERFORMANCE

This system performance report covers the month of October 2010.

Principal Performance Obligations

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

Operational Management

(1) Continuing system management issues at Kinleith dominated the month. Regular issuance of Warning and Grid Emergency Notices (regarding potential for HAM_WKA contingency overloads and use of KIN_TKA splits) continued to be common. High Waikato water flows and lack of generation north of Hamilton has prevailed and meant this ongoing operational situation did not materially reduce during the month.

(2) On 27th a tripping of ARI_KIN 1 ct resulted (ultimately) in operation of the KIN overload scheme and resultant loss of supply to the Kinleith paper mill and Tokoroa area (86MW). The LOS was of approximately 2 hours duration before all supply was restored.

(3) A bi-pole outage was accommodated during the month with relative ease (from a system management perspective).

(4) A significant Christchurch earthquake occurred on 19th with Orion feeder trippings but no loss of service from Transpower assets.

(5) Low overnight prices again forced off or constrained back wind generation, this on two occasions (16th and 17th).

(6) In addition to the usual slew of asset trippings and problems (both Transpower and industry) the month ended with a bang (literally) on the 30th when a CB at Hineura 'exploded' (at least, as described by a member of the public) causing a loss of supply in the Putaruru area (32MW) for just under 2 hours.

System Events

On 4th October at 11:45am an emergency Tiwai potline off-loading resulted in a momentary rise in frequency in the South Island to 50.63 Hz.

110 kV Arapuni – Kinleith Circuits 1 & 2 tripped on 27th October at 11:28am. This resulted in a loss of supply to Kinleith as a system split had been implemented by opening the 110 kV Kinleith – Tarukenga Circuits 1 & 2 earlier that morning. Supply was restored after 29 minutes.

Hinuera 110 / 33 kV supply transformers T1 and T2 tripped on 30th October at 09:38am resulting in a loss of supply to Hinuera. Supply was restored after 115 minutes.

Other noteworthy events occurring during the reporting period:

- On 5th October at 06:24, 110 kV Gisborne – Tuai Circuit 1 tripped;
- On 13th October at 16:03, 110 kV Karapiro – Te Awamutu Circuit 1 tripped resulting in a loss of supply to Te Awamutu. Supply was restored after 4 minutes;
- Aftershocks in the Canterbury Region continued to cause problems with distribution feeders and load tripping as a result on 13th, 15th, 18th, 19th, and 24th of October;
- On 26th October at 01:28am, 110 kV Takapu Road – Wilton Circuit 1 tripped and auto-reclosed. The resultant voltage disturbance caused a commutation failure on HVDC Pole 2 increasing the impact of the voltage disturbance;



- On 27th October at 06:31am, an arc-back occurred on HVDC Valve Group 1 at Benmore resulting in a widespread voltage disturbance being experienced;
- On 27th October at 13:10pm, Tekapo B Generators G2 and G3 tripped resulting in a momentary drop in South Island frequency to 49.54 Hz.

2. PRINCIPAL PERFORMANCE OBLIGATIONS

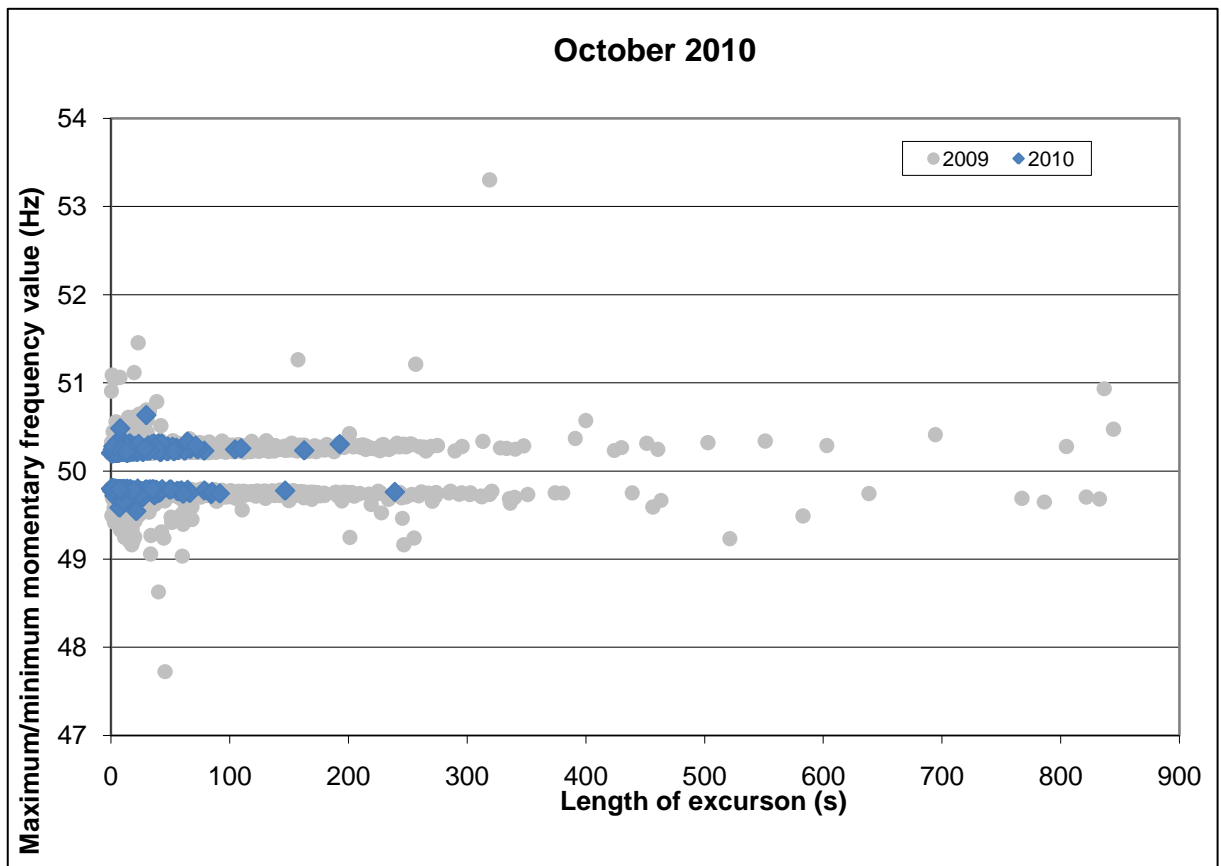
2.1 AVOID CASCADE FAILURE

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	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct 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	1		2	1	2	1	1	1		1	1	12	50
50.50 >= Freq > 50.20	85	148	140	279	348	351	286	376	382	337	71	273	3076	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	98	134	109	278	268	367	253	281	368	291	61	252	2767	
49.50 >= Freq > 48.75		2	2	5	5	3	1	6	4	1	1		30	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.

Time Error Compliance Table		Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct -10
Time Error Management	NI	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	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	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10
Demand Allocation Notice												
Grid Emergency Notice		1	4	3		4	5	5	2		18	6
Warning Notice	1								1		8	5
Customer Advice Notice	16	11	18	31	16	12	20	10	17	11	9	14

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
05/10/10	17:32	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
08/10/10	09:20		
26/10/10	07:04	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
27/10/10	07:15		
29/10/10	07:37		
27/10/10	11:34	A Grid Emergency was declared to allow for grid re-configuration around Kinleith Substation to assist with restoration of supply following a loss of connection.	N



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

Island	Region	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Total
North Island	Northland							2				1		3
	Auckland			2	1									3
	Zone 1			1					1					2
	Waikato		1									13	6	20
	Bay of Plenty								2					2
	Hawkes Bay													0
	Taranaki								1					1
	Bunneythorpe													0
	Wellington						1			5				1
	North Island (all)				1			2	1	3				7
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	

3.3 CUSTOMER ADVICE NOTICES (CANs)

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

- six related to changes in HVDC capability;
- three related to planned HVDC testing;
- three related to permanent constraints (two for new constraints and one revising existing constraints);
- one related to the change from Winter to Shoulder ratings;
- one advised of an industry phone conference.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of 224 SRC notices were issued during the reporting period.

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	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Total
North Island	Northland	24	4	1	21	16	19	7	7	2	1	1	19	122
	Auckland	13	8	1	2	9	4	4	1	5	3	10	9	69
	Waikato	7	5	2	10	12	5	19	9	3	1	3	7	83
	Bay of Plenty	5	2	2	11	12	8	12	6	1	10	5	5	79
	Hawkes Bay	3	1	3	6	2	1	6	7		2	2	5	38
	Taranaki	3	1	1	5	1		8	4	1			2	26
	Bunnythorpe	3	1	3	5	9	16	5	5	2	2	3	5	59
	Wellington	7	6	2	7	11	6	4	9	5	11			68
Total		65	28	15	67	72	59	65	48	19	30	24	544	
South Island	Nelson Marlborough	6	2	1	5	6	6	4	4					34
	West Coast	4			2	3	3	3	3	7	9	5	1	40
	Christchurch	3	4	2	1	2		3				1	1	17
	Canterbury	3			2	6	4		5	3			4	27
	Otago	2		3		2	4		4	6	7		4	32
	Southland	4	2	2	6	4	2	3		3	3	1		30
Total		22	8	8	16	23	19	13	16	19	19	7	180	

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/scheduling-and-dispatch#cs-622459> This information includes constraint equations and a brief summary of their purpose.

Island	Region	Constraint Name	Description
North Island	Edgecumbe	OHK_WRK_1_KIN_TR K_SPLIT_W_O_2	The effect of this constraint is to manage flows through Rangipo-Tangiwai 1 for a contingency of Whakamaru-Poihipi-Wairakei when Ohakuri-Wairakei 1 is out of service and system splits in place between Kinleith and Tarukenga.
		ATI_OHK_1_M_P_1	The effect of this constraint is to manage flows through the Atiamuri-Ohakuri 1 circuit for a contingency of the Whakamaru-Poihipi-Wairakei 1 circuit during periods of low generation in the Auckland area.
	Hamilton	KIN_TRK_1_W_P_2A	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.



Island	Region	Constraint Name	Description
		HAM_KPO_2_W_O_1	The effect of this constraint is to manage flows through Hamilton Karapiro 1 for a contingency of Hinuera Karapiro 1 when Hamilton Karapiro 2 is out of service and Te Awamutu Run-back scheme is disabled.
		KIN_TRK_1&2_ARI_RUNBACK_ENABLED_W_O_1	The effect of this constraint is to manage flows through Arapuni - Hamilton 1 for a contingency of Arapuni - Hamilton 2 when Kinleith - Tarukenga 1 and 2 are out of service and the Arapuni Runback Scheme is enabled.
		KIN_TRK_1_M_P_1A_t emp	The effect of this constraint is to manage flows through Kinleith Tarukenga1 for a contingency of Hamilton-Whakamaru 1 when Auckland generation is low.
		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.
#N/A	#N/A	HWB_ROX_1_O_temp	#N/A
		OHW_WKM_1&KIN_TRK_SPLIT_O_W_2A_t emp	#N/A
		OHW_WKM_1_W_O_3_temp	#N/A
South Island & HVDC	Hamilton	BEN_HAY_Transfer_Limit	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, or Pole 2 plus Pole 1 when Pole 1 is connected for testing. When Pole 1 is connected in Grid Emergency or Extended Capability mode, the RHS of this equation will (normally) be set to ≤ 900 .
	HVDC	DCNPole1Max	The purpose of this constraint is to limit the flow on HVDC Pole 1 to the Asset Owner's offered capability.
	Southland	HWB_ROX_2_W_O_z	The effect of this constraint is to manage flows through Roxburgh_T10 for a contingency of Gore-Roxburgh when Halfway Bush-Roxburgh-2 is out of service.



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	OHK_WRK_1_KIN_TRK_SPLIT_W_O_2	7	0.47%	0	0.00%
	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%
		KIN_TRK_1_W_P_2A	7	0.47%	4	0.02%
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_M_P_1	4	0.27%	0	0.00%
		HAM_KPO_2_W_O_1	8	0.54%	0	0.00%
#N/A	#N/A	HWB_ROX_1_O_temp	15	1.01%	0	0.00%
		OHW_WKM_1&KIN_TRK_SPLIT_O_W_2A_temp	19	1.28%	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	HWB_ROX_2_W_O_z	9	0.60%	12	0.07%
	HVDC	DCNPole1Max	32	2.15%	2889	16.49%
		DCNPole1Min	0	0.00%	1920	10.96%
		INV_MAN_2_W_O_1	9	0.63%	0	0.00%



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)
04/10/10	11:45	An emergency Tiwai potline off-loading resulted in a momentary rise in frequency in the South Island.	S	50.63 Hz

Connection point events

Date	Time	Summary Details	Generation /Load interrupted (MW)	Restoration time (minutes)
27/10/10	11:28	110 kV Arapuni-Kinleith Circuits 1 & 2 tripped causing a loss of connection to Kinleith as a system split had been previously put in place on the Kinleith – Tarukenga Circuits.	86	29
30/10/10	09:58	Hinuera 110 / 33 kV supply transformers T1 & T2 tripped resulting in a loss of connection to Hinuera.	33	115



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	17	<p>These related to trippings of</p> <ul style="list-style-type: none"> - Fernhill-Waipawa 2 (Auto Reclose) - Gisborne-Tuai 1 - Haywards-Takapu Road 1 - Islington-Livingstone 1 (Auto Reclose) - Dargaville-Maungatapere 2 (Auto Reclose) - Brunswick-Stratford 2 x 2 - Karapiro-Te Awamutu 1 - Coleridge-Otira 2 - Arapuni-Hamilton 2 (Auto Reclose) - Kaikohe-Maungatapere 1 (Auto Reclose) - Dargaville-Maungatapere 2 x 2 - Hokitika-Otira 2 - Kinleith-Lichfield-Tarukenga 1 (Auto Reclose) - Tarukenga-Wilton 1 (Auto Reclose) - Islington- Kikiwa 3
Loss of HVDC pole	1	Arcback on HVDC Valve Group VG1 on startup. No loss of transfer.
Loss of single generation units	9	<p>These related to trippings of</p> <ul style="list-style-type: none"> - Tekapo A G1 - OTC - Cobb G6 - Mokai G31 - Kinleith G1 - Tuai G1 & G5 - Te Apiti - Tauranga
Total during reporting period	27	



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	1	These events related to trippings of <ul style="list-style-type: none"> - Otahuhu GT2
Loss of supply transformer	5	These events related to trippings of <ul style="list-style-type: none"> - Kaiwharawhara T3 - Tangiwai T2 x 2 - Tuai T15 - Mt Maunganui T3
Demand change	3	These events related to trippings of <ul style="list-style-type: none"> - Tiwai Potline #1 - Arapuni-Kinleith 1 & 2 - Hinuera T1 & T2
Loss of multiple generation units	2	<ul style="list-style-type: none"> - Atiamuri G1, G2 & G4 - Tekapo B G2 & G3
HVDC Start/ Stop	0	
Total during reporting period	11	

Other disturbances

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



4.3 SYSTEM EVENTS – TREND

	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Total	Average Events per month
Contingent Event – transmission	4	12	51	20	10	15	23	17	11	13	31	17	224	17.8
Contingent Event – generation	13	15	8	10	13	13	8	14	13	20	15	9	151	13
Contingent Event - HVDC	2	1	4	7	0	0	1	1	2	1	0	1	20	2.8
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0	0			0.0
Other Event – AC transmission	0	1	5	0	1	0	0	2	0	2	5	0	16	1.1
Other Event – Busbar	2	1	2	1	2	1	1	1	0	1	0	0	12	1.1
Other Event – Demand	4	1	0	0	1	0	1	1	1	0	2	3	14	1.25
Other Event – Generation	1		1	0	0	2	0	2	2	0	2	2	12	0.8
Other Event – Interconnecting transformer	0	1	1	1	1	0	1	2	0	1	1	0	9	0.8
Other Event – Reactive plant	2	8	5	6	5	3	4	2	3	1	1	1	41	4.6
Other Event – Supply transformer	4	4	3	2	11	1	3	7	3	3	5	5	51	3.9

