

System Performance Report

To the Electricity Authority

January 2011

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 January 2011.

Principal Performance Obligations

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

Operational Management

A busy month for the National Coordination Centre with normal daily business rather than significant one-off events. Two co-ordinators are in training, both nearing the end of their training. Other notable issues during the month included:

(1) Over frequency ancillary service in the North Island was armed for an 8 January outage on OTA_SWN.

(2) Grid emergencies were declared on most days to activate the KIN splits (used to manage contingencies on HAM_WKA circuits). High water flows in the Waikato have continued through most of the month resulting in the regular application of these splits, especially given continued outages of Auckland area generation (OTC) and the apparent reluctance of generators to offer HLY and SWN generation during the month in the face of generally low prices (a consequence of continued abundant water flows in the Waikato).

(3) The system management issues caused by the combination of high water, low prices and reduced generation offers in the upper North Island became especially difficult to manage later in the month (24th - 28th). On the 24th and 25th co-ordination staff exercised discretion for long periods of the day to bring on HLY and SWN generation to avoid load management in the face of constraints arising from the use of the KIN splits and some coincident circuit outages. Some very high prices for constrained on generation resulted. This in turn resulted in industry and regulator concern. Considerable effort went into the development and testing of a constraint targeting the bringing on of generation north of Hamilton to avoid the use of co-ordinator discretion and to have SPD dispatch needed generation. Development of the constraint was difficult given the potential for operation of the constraint to affect prices in the Waikato and other areas. The constraint has operated satisfactorily since commencing use from the 28th.

(4) Commissioning of one of the two Contact peaker plants at Stratford resumed in mid January, with a successful ride through test on the 14th.

(5) Low prices during the last two days of the month resulted in several occasions when generation was constrained off. Operational procedure calls for wind to be the first option when constraining off generation is required. All NI wind was constrained off on the 30th, together with some Waikato hydro. The same situation occurred again on the 31st. These situations also make resource consent limitations affecting generators very evident, and these became apparent at HLY5 and WKA. On two occasions generators claimed an inability to comply with dispatch instructions (to reduce generation) as to do so would result in breaches of applicable resource consent limitations (on NOX emissions, for example at HLY5, or water flows, for example at WKA).

System Events

On 22nd January at 22:24, the Maraetai 220 kV bus tripped resulting in a loss of connection to Maraetai and Waipapa Power Stations. Connection was restored to Maraetai Power Station after 142 minutes and to Waipapa Power Station after 148 minutes.

On 26th January at 16:37, Otahuhu B Power Station tripped, resulting in a momentary drop in North Island frequency to 49.42 Hz and South Island frequency to 49.62 Hz.

On 26th January at 00:55, the tripping of a Tiwai potline resulted in a momentary rise in South Island frequency to 50.85 Hz and North Island frequency to 50.42 Hz.

On 31st January at 20:00, Hangatiki 110 / 33 kV supply transformers T1 and T2 tripped resulting in a loss of supply to Hangatiki. Supply was restored after 44 minutes.



Other noteworthy events occurring during the reporting period:

- On 19th, 23rd, 24th, 26th, and 29th January, the 50 kV Te Kaha – Waiotahi circuit tripped resulting in a loss of supply to Te Kaha. Momentary losses of supply also occurred on 18th, 23rd, 24th, and 29th of January when the circuit tripped and auto-reclosed;
- On 31st January at 21:18 and again at 21:54, 110 kV Masterton – Upper Hutt Circuit 2 tripped and auto-reclosed. The circuit tripping caused a commutation failure on HVDC Pole 2 resulting in a widespread voltage disturbances in the lower North Island.

2. PRINCIPAL PERFORMANCE OBLIGATIONS

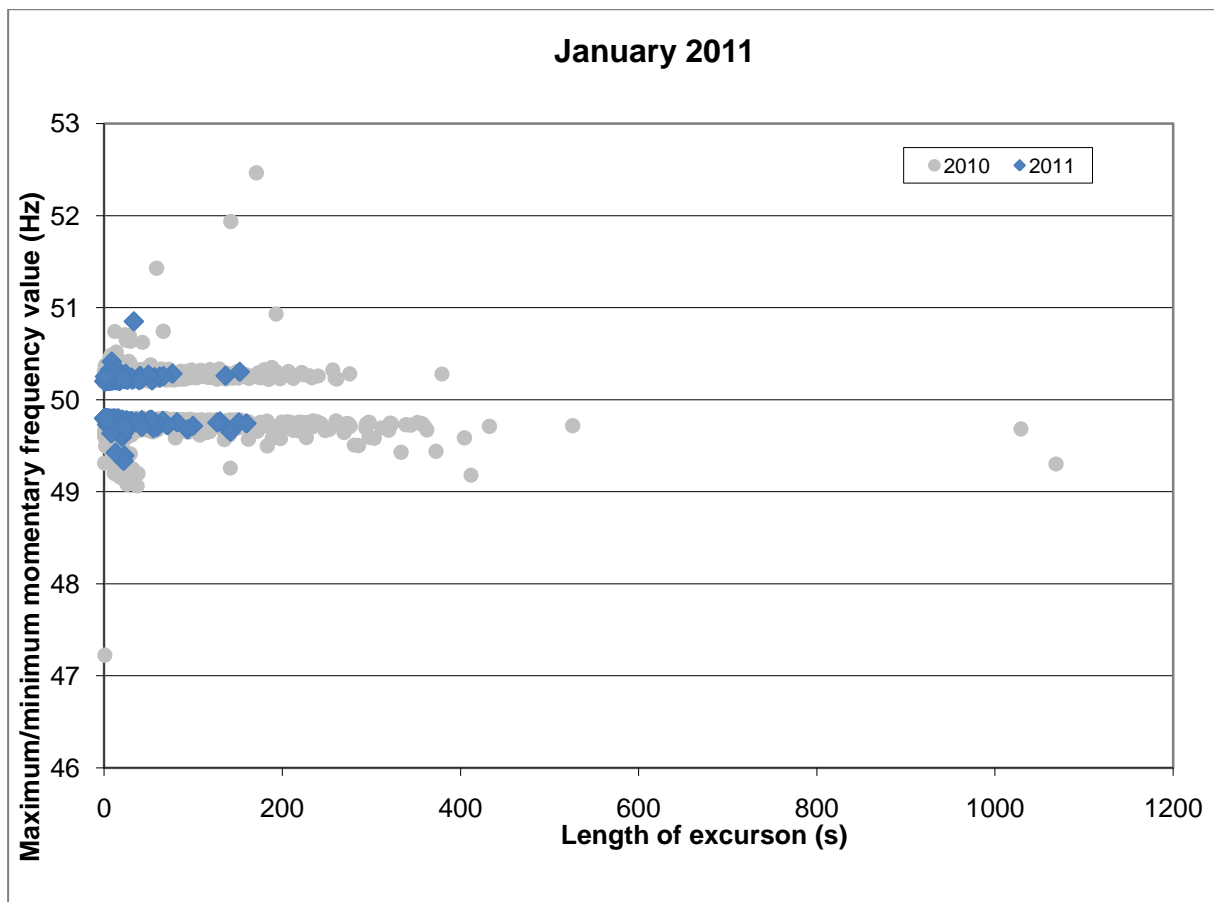
2.1 AVOID CASCADE FAILURE

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	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Annual rate	PPO target
55.00 >= Freq > 52.00													0	
52.00 >= Freq > 51.25						1							1	7
51.25 >= Freq > 50.50	2	1	2	1	1	1		1	1	1		1	12	50
50.50 >= Freq > 50.20	279	348	351	286	376	382	337	71	273	116	217	149	3185	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	109	278	268	367	253	281	368	291	68	252	239	149	2923	
49.50 >= Freq > 48.75	2	5	5	3	1	6	4	1	1		2	3	33	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		Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11
Time Error Management	NI	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	No	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	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11
Demand Allocation Notice												
Grid Emergency Notice	3		4	5	5	2		16	6	5	11	28
Warning Notice						1		8	5	2	4	15
Customer Advice Notice	31	16	12	20	10	17	9	9	7	13	10	23

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
04-Jan-11	09:44	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
05-Jan-11	08:21		
06-Jan-11	08:11		
07-Jan-11	09:24		
08-Jan-11	19:26		
11-Jan-11	15:00		
12-Jan-11	08:55		
13-Jan-11	08:11		
14-Jan-11	08:59		
17-Jan-11	08:44		
18-Jan-11	09:53		
21-Jan-11	09:29		
23-Jan-11	07:39		
24-Jan-11	07:02		
25-Jan-11	06:30		
26-Jan-11	06:35		
27-Jan-11	06:42		
28-Jan-11	06:45		
29-Jan-11	07:00		
30-Jan-11	07:00		
31-Jan-11	08:00		

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



Island	Region	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Total
North Island	Northland				2				1					3
	Auckland	1												1
	Zone 1					1								1
	Waikato								13	6	4	10	21	54
	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			9
South Island & HVDC	Nelson Marlborough											1		1
	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)

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

- Five related to outages of HVDC Pole 1;
- Five related to generator commissioning at Stratford;
- Two related to a new constraint associated with the Kinleith 110 kV system split;
- Two related to the implementation of the SFT software;
- One related to the removal of a number of permanent constraints that are now redundant;
- One related to a telephone conference to discuss the Maui gas shutdown.
-

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of Seventy-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 6th, 10-11th, 13th, 17-19th, 24-25th, and 27th of January.



3.5 VOLTAGE MANAGEMENT

Grid voltages did not exceed the Code 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	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Total
North Island	Northland	21	16	19	7	7	2	1	1	19	5	1	4	103
	Auckland	2	9	4	4	1	5	3	10	9	7	3	2	59
	Waikato	10	12	5	19	9	3	1	3	7	4	3	2	78
	Bay of Plenty	11	12	8	12	6	1	10	5	5	2		3	75
	Hawkes Bay	6	2	1	6	7		2	2	5		3	1	35
	Taranaki	5	1		8	4	1			2			1	22
	Bunnythorpe	5	9	16	5	5	2	2	3	5	5	2	3	62
	Wellington	7	11	6	4	9	5	11			1	5	4	63
Total		67	72	59	65	48	19	30	24	52	24	17	15	497
South Island	Nelson Marlborough	5	6	6	4	4					2	1	1	29
	West Coast	2	3	3	3	3	7	9	5	1			1	37
	Christchurch	1	2		3				1	1		2		10
	Canterbury	2	6	4		5	3			4	1		2	27
	Otago		2	4		4	6	7		4	4	3	2	36
	Southland	6	4	2	3		3	3	1		3	3		28
Total		16	23	19	13	16	19	19	7	10	10	9	8	167

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	MTI_WKM_1&2_Runback_Enabled_S_P	The effect of this constraint is to manage flows through MTI_WKM_1or2 for a contingency of MTI_WKM_1or2 when the MTI runback scheme is enabled and both MTI_WKM circuits are in service.	
		ATI_OHK_1_S_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_S_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.	
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_S_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.	
		ARI_BOB_1_ARI_RUNBACK_ENABLED_S_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.	
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_W_P_1A	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_S_P_1A_tem p	The effect of this constraint is to manage flows through Kinleith Tarukenga1 for a contingency of Hamilton-Whakamaru 1 when Auckland generation is low.	
	Hawkes Bay	FHL_RDF_1&RDF_TUI_1_S_O_2	The effect of this constraint is to manage flows through Fernhill-Redclyffe-2 for a contingency of Redclyffe-Tuai-2 during low Tuai generation when Fernhill-Redclyffe-1 and Redclyffe-Tuai-1 are out of service.	
		RDF_57_77_S_O_2	The effect of this constraint is to manage flows through Fernhill-Redclyffe 2 for a contingency of Redclyffe-Tuai 2 when Redclyffe bus section 57_77 is out of service.	
		KAW_67_177_S_O_1	#N/A	
		BOB_HAM_2_S_O_2B_T emp	#N/A	
		BOB_HAM_1_S_O_2A_T emp	#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_S_P_z	The effect of this constraint is to manage flows through Naseby-Roxburgh-1 for a contingency of Clyde-Twizel-1 during high Southland generation when all circuits are in service
		West Coast	West_Coast_Split_S_O_1	The effect of this constraint is to manage flows through COL_HOR_2 and 3 for a contingency of COL_HOR_3 or 2 during high generation at COL for a west coast split

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	ATI_OHK_1_S_P_1	9	0.60%	0	0.00%
	Hamilton	ARI_BOB_1_ARI_RUNBACK_ENABLED_S_O_1	4	0.27%	0	0.00%
		ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_S_P_1	48	3.23%	25	0.14%
		KIN_TRK_1_S_P_1A_temp	5	0.34%	3	0.02%
North Island		BOB_HAM_1_S_O_2A_Temp	14	0.94%	0	0.00%
		BOB_HAM_2_S_O_2B_Temp	14	0.94%	0	0.00%
		OHW_WKM_1&KIN_TRK_SPLIT_S_O_2_temp	12	0.81%	0	0.00%
South Island	West Coast	WEST_COAST_SPLIT_O_1	0	0.00%	98	0.56%
		West_Coast_Split_S_O_1	18	1.21%	0	0.00%
	Otago	NSY_ROX_1_S_P_z	25	1.68%	3	0.02%
	HVDC	DCNPole1Max	470	31.59%	1744	9.95%
		DCNPole1Min	0	0.00%	547	3.12%

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)
22/01/11	22:24	Maraetai 220 kV bus tripped resulting in a loss of connection to Maraetai and Waipapa Power Stations.	N	49.34 Hz
26/01/11	00:55	A Tiwai potline tripping resulted in a momentary rise in frequency in the South Island.	S	50.85 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	34	These related to trippings of <ul style="list-style-type: none"> • Huapai-Marsden 1 (Auto Reclose) • Atarau-Inangahua 1 (Auto Reclose) • Islington-Livingstone 1 (Auto Reclose) • Balclutha-Gore 1 (Auto Reclose) • Balclutha-Berwick-Halfway Bush 1 • Otahuhu-Southdown 1 • Paraparaumu-Pauatahanui-Takapu Road 1 • Islington-Kikiwa 1 (Auto Reclose) • Greymouth-Kumara 1 • Te Kaha-Waiotahi 1 (5 trippings, 15 x Auto Reclose) • Coleridge-Otira 2 • Halfway Bush-Roxburgh 1 (Auto Reclose) • Southbrook-Waipara 1 (Auto Reclose) • Masterton-Upper Hutt 2 (Auto Reclose) x 2
Loss of HVDC pole	0	
Loss of single generation units	13	These related to trippings of <ul style="list-style-type: none"> • NGA generation • Huntly U4 • Stratford U22 • Ohaaki G6 • Kapuni GT1 x 2 • Glenbrook Co-gen • Tauhara G1 • West Wind T1 • Otahuhu Combined Cycle Plant tripped x 2 • Ohaaki G1 x 2
Total during reporting period	47	

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	3	These events related to trippings of <ul style="list-style-type: none"> • Maraetai 220 kV Bus • South Dunedin 220 kV Bus A • Hangatiki 33 kV Bus
Loss of interconnecting transformer	0	
Loss of grid reactive plant	2	These events related to trippings of <ul style="list-style-type: none"> • Otahuhu GT2 • Blenheim C4
Loss of supply transformer	5	These events related to trippings of <ul style="list-style-type: none"> • Paraparaumu T4 • BPD T2 • Oamaru T1 • Maungaturoto T2 • Rotorua T2
Demand change	2	These events related to trippings of <ul style="list-style-type: none"> • TWI Potline #2 & #4
Loss of multiple generation units	1	These events related to trippings of <ul style="list-style-type: none"> • Maraetai 2 Station
HVDC Start/ Stop	0	
Total during reporting period	13	

Other disturbances

Event	Number	Summary
Feeder trippings	77	Various locations
Total during reporting period	77	



4.3 SYSTEM EVENTS – TREND

	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Total	Average Events per month
Contingent Event – transmission	20	10	15	23	17	11	13	31	17	8	34	34	233	19.4
Contingent Event – generation	10	13	13	8	14	13	20	15	9	11	16	13	155	12.9
Contingent Event - HVDC	7	0	0	1	1	2	1	0	1	1	0	0	14	1.2
Extended Contingent Event														0.0
Other Event – AC transmission	0	1	0	0	2	0	2	5	0	1	0	0	11	0.9
Other Event – Busbar	1	2	1	1	1	0	1	0	0	0	5	3	15	1.3
Other Event – Demand	0	1	0	1	1	1	0	2	3	4	0	2	15	1.3
Other Event – Generation	0	0	2	0	2	2	0	2	2	0	1	1	12	1.0
Other Event – Interconnecting transformer	1	1	0	1	2	0	1	1	0	0	0	0	7	0.6
Other Event – Reactive plant	6	5	3	4	2	3	1	1	1	4	4	2	36	3.0
Other Event – Supply transformer	2	11	1	3	7	3	3	5	5	1	4	5	50	4.2

