

# System Performance Report

## To the Electricity Commission

### April 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



# Table of Contents

- 1. SUMMARY OF SYSTEM PERFORMANCE..... 2
  
- 2. PRINCIPAL PERFORMANCE OBLIGATIONS ..... 3
  - 2.1 Avoid Cascade Failure .....3
  - 2.2 Frequency.....3
  
- 3. OPERATIONAL MANAGEMENT ..... 5
  - 3.1 Security Notices .....5
  - 3.2 Grid Emergencies .....5
  - 3.3 Customer Advice Notices (CANs) .....5
  - 3.4 Standby Residual Check (SRC) notices.....6
  - 3.5 Voltage Management .....6
  - 3.6 Outage Management .....6
  - 3.7 Constraints.....7
  
- 4. SYSTEM EVENTS ..... 8
  - 4.1 Significant System Events.....9
  - 4.2 System Events during reporting period .....9
  - 4.3 System Events – Trend.....11

## 1. SUMMARY OF SYSTEM PERFORMANCE

This system performance report covers the month of April 2010.

### Principal Performance Obligations

The target for the time error principal performance obligation was not met during the reporting period.

On 17 April 2010, two time error excursions exceeding the PPO target were recorded. The event is currently under investigation and will be detailed in the May performance report.

### Operational Management

Industry meetings for the Upper North Island and Upper South Island were held on 8 April and 15 April respectively to review the situation over the summer period and initiate work on the coming winter. Information on demand forecast was sought from network companies to allow reviews of credible scenarios and transfer limits to be carried out.

On 22 April a fault on the Wilton 110 kV bus caused disruptions to the Wellington area (please refer to the System Events section for further information).

A sequence of high inflows in the South Island towards the end of April has resulted in all South Island major catchments reaching maximum level. This has seen HVDC sending energy north in excess of 500MW for most part of the day. From 26 April Grid Owner has made HVDC Pole 1 available during business days to allow for greater transfer northwards.

Four Grid Emergencies were declared during April. Please refer to section 3.2 for further details.

### System Events

Balclutha-Berwick-Halfway Bush 1 circuit tripped on 21 April resulting in a loss of connection at Berwick of approximately 32 MW.

On 22 April, a bus fault on the Wilton 110 kV bus caused all 110 kV circuits connected to the bus to trip. This resulted in loss of connection at Central Park (109 MW), Kaiwharawhara (26 MW) and West Wind (93 MW).

Other noteworthy events occurring during the reporting period include:

- tripping of Kumara unit G1 on 6 April;
- tripping of Southdown unit G105 on 6 April;
- tripping of Benmore unit G3 on 12 April;
- tripping of Huntly unit 5 on 13 April;
- tripping of Ohaaki units G1 and G2 on 14 April and again on 29 April;
- tripping of Tekapo A unit G1 on 19 April;
- tripping of Tararua windfarm North on 24 April;
- tripping of Matahina unit G1 on 26 April;
- tripping of Kawerau unit on 26 April;
- tripping of Southdown unit G102 on 29 April and 30 April; and
- tripping of Tauhara unit on 30 April.



## 2. PRINCIPAL PERFORMANCE OBLIGATIONS

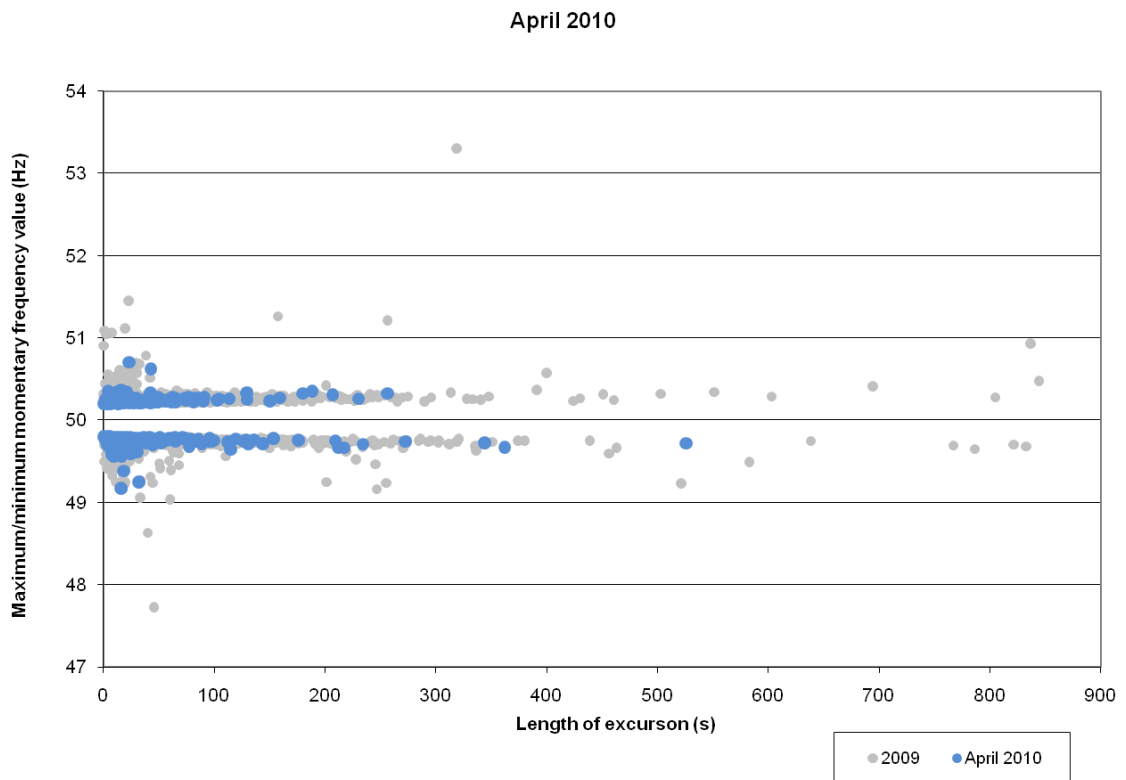
### 2.1 AVOID CASCADE FAILURE

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	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-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	2	6	4	1	1		2	1	2	23	50
50.50 >= Freq > 50.20	231	267	416	359	292	228	85	148	140	279	348	351	3144	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	181	204	336	257	154	152	98	134	109	278	268	367	2538	
49.50 >= Freq > 48.75	2	1	3	1	3	2		2	2	5	5	3	29	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		May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10
Time Error Management	NI	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	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

On 17 April 2010, two time error excursions exceeding the PPO target were recorded. The worst error value was recorded at 5.16 seconds.



### 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	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10
Demand Allocation Notice												
Grid Emergency Notice	4	4	8		8	6		1	4	3		4
Warning Notice	3	9	9		5	3	1					
Customer Advice Notice	23	4	11	6	7	41	16	11	18	31	16	12

#### 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
20 April 2010	16:00	A Grid Emergency was declared for insufficient generation offers in the North Island.. HVDC Pole 1 was started to alleviate the issue.	North
21 April 2010	08:19	A Grid Emergency was declared for load management at Balclutha following a unplanned outage of Balclutha-Halfway Bush 1 circuit. A tripping of Gore-Roxburgh 1 circuit would overload Edendale-Invercargill 1 circuit.	South
22 April 2010	15:21	A Grid Emergency was declared for the restoration of Wilton 110 kV bus and associated circuits connected to it following an earlier bus fault. The fault resulted in loss of connections to Central Park, Kaiwharawhara and West Wind.	North
24 April 2010	12:51	A Grid Emergency was declared for grid reconfiguration at Brydone-Gore 1 circuit following a unplanned outage of Balclutha-Halfway Bush 1 circuit. A tripping of Gore-Roxburgh 1 circuit would overload Edendale-Invercargill 1 circuit.	South

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

Island	Region	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	Total
North Island	Northland													0
	Auckland						1			2	1			4
	Zone 1									1				1
	Waikato						1		1					2
	Bay of Plenty		1											1
	Hawkes Bay													0
	Taranaki													0
	Bunynthorpe													0



	Wellington		2	8		5						1	16
	North Island (all)	4	1			3	4				1		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)												0
	HVDC											1	1

### 3.3 CUSTOMER ADVICE NOTICES (CANs)

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

- two advised of changes to the publication of the Special Winter Schedule (SWS);
- one related to issue with Real Time Pricing;
- four related to a market system outage;
- two advised of a planned test operation of HVDC Pole 1;
- two related to a failure in the PSCADA Oracle database which resulted in a loss of live data being published; and
- one advised of changes in HVDC Pole 1 offer from 26 April 2010 due to the high inflows in the South Island to allow greater transfer north.

### 3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of sixty 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 7<sup>th</sup>-8<sup>th</sup>, 14<sup>th</sup>, 19<sup>th</sup>-20<sup>th</sup>, 22<sup>nd</sup>, 24<sup>th</sup>, 26<sup>th</sup> and 28<sup>th</sup>-29<sup>th</sup>. 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.

Generation at Berwick was constrained on to meet voltage quality targets.

Generation at Otahuhu B was constrained on to maintain system security heading into system peak.

### 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	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	Total
North Island	Northland	10	10	1	4	4	8	24	4	1	21	16	19	122
	Auckland	5	7	5	3	15	7	13	8	1	2	9	4	79
	Waikato	5	7	2	2	3	6	7	5	2	10	12	5	66
	Bay of Plenty	3	7	5	3	10	4	5	2	2	11	12	8	72
	Hawkes Bay	2	3	5		1	2	3	1	3	6	2	1	29
	Taranaki	2	2	3			1	3	1	1	5	1		19
	Bunnythorpe	6	5	3			5	3	1	3	5	9	16	56
	Wellington	12	3	2	1	7	4	7	6	2	7	11	6	68
Total		45	44	26	13	40	37	65	28	15	67	72	59	511
South Island	Nelson Marlborough	1	0	2	3	10	5	6	2	1	5	6	6	47
	West Coast	7	0	3	4	2	2	4			2	3	3	30
	Christchurch	3	0	1	1	4	4	3	4	2	1	2		25
	Canterbury	2	1	3	1		3	3			2	6	4	25
	Otago	3	1		3	1	5	2		3		2	4	24
	Southland	4	2		3		10	4	2	2	6	4	2	39
Total		20	4	9	15	17	29	22	8	8	16	23	19	190

### 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	HAM_OHW_1_or_HAM_WKM_1_110kV_SPLIT_W_O_2A	The effect of this constraint is to manage flows through Kinleith - Tarukenga 1 for a contingency of Kinleith - Tarukenga 2 during Bombay-Otahuhu, Bombay-Arapuni and Arapuni-Hamilton 110kV splits when Hamilton - Ohinewai 1 or Hamilton - Whakamaru 1 are out of service.
	Hawkes Bay	FHL_RDF_1&2_M_P_1	The effect of this constraint is to manage flows through Fernhill-Redclyffe 2 for a contingency of Fernhill-Redclyffe 1 during low Tuai generation and high Hawkes Bay load.
South Island & HVDC	Christchurch	ISL_KIK_1_TOP_SOUTH_ISLAND_STABILITY_O_1A	The effect of this constraint is to manage flows through the Islington-Kikiwa-2 and 3 circuits for a contingency of either of the two circuits. This is to ensure that voltage stability limits are not exceeded during periods when the load at the Top of the South Island is high and Islington-Kikiwa-1 is out of service.
	HVDC	DCNPole1Max	The purpose of this constraint is to limit the flow on HVDC Pole 1 to the Asset Owner's offered capability.
		DCNPole1Min	The purpose of this constraint is to limit the flow on HVDC Pole 1 to the Asset Owner's offered capability.



Island	Region	Constraint Name	Description
	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.
	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.
	West Coast	WEST_COAST_SPLIT_O_1	The effect of this constraint is manage voltage stability on the West Coast during low West Coast generation and high West Coast load when one of the following is out of service: Greymouth-Kumara, Dobson-Greymouth, Atarau-Dobson or Atarau-Reefton-Inangahua.

### 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_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%
		HAM_OHW_1_or _HAM_WKM_1_110kV_SPLIT_ W_O_2A	15	1.04%	7	0.04%
South Island & HVDC	Christchurch	ISL_KIK_1_TOP_SOUTH_ISLA ND_STABILITY_O_1A	9	0.63%	34	0.19%
	Nelson	STK_UTK_1_M_P_1	34	2.36%	0	0.00%
	West Coast	WEST_COAST_SPLIT_O_1	19	1.32%	100	0.57%
	Otago	NSY_ROX_1_S_P_z	0	0.00%	341	1.95%
		NSY_ROX_1_W_P_1_z	0	0.00%	91	0.52%
	HVDC	BEN_HAY2.1	0	0.00%	49	0.28%
		DCNPole1Max	116	8.06%	2468	14.09%
DCNPole1Min		69	4.79%	2493	14.23%	

## 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)
3 April 2010	19:27	An HVDC Pole 2 operation caused momentary fluctuations in frequency in the South Island.	South	49.3 50.7
6 April 2010	00:36	An HVDC Pole 2 operation causes momentary rise in frequency in the South Island.	South	50.6
12 April 2010	13:15	Benmore generation tripped causing a momentary drop in frequency in the South Island.	South	49.25
13 April 2010	17:34	Huntly unit 5 tripped causing a momentary drop in frequency in both the North and South Islands.	North South	49.17 49.38

### Connection point events

Date	Time	Summary Details	Generation/Load interrupted (MW)	Restoration time (minutes)
21 April 2010	07:59	Balclutha-Berwick-Halfway Bush 1 circuit tripped resulting in a partial loss of connection at Berwick.	32	42
22 April 2010	15:21	A fault on the Wilton 110 kV bus caused all 110 kV circuits connected to the bus to trip, resulting in partial loss of connections at Central Park, Kaiwharawhara and West Wind.	CPK - 109 KWA - 26 WWD - 93	66 71 239

## 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	15	<p>These related to trippings of</p> <ul style="list-style-type: none"> <li>▪ Fernhill-Waipawa 2</li> <li>▪ Tokaanu-Whakamaru 2 (Auto Reclose)</li> <li>▪ Arapuni-Hangatiki-Ongarue 1 (Auto Reclose) (x3)</li> <li>▪ Taumarunui-Te Kowhai 1 (x2)</li> <li>▪ Huntly-Stratford 1 (Auto Reclose)</li> <li>▪ Arapuni-Hangatiki 1 (Auto Reclose)</li> <li>▪ Brydone-Edendale 1 (Auto Reclose)</li> <li>▪ Islington-Springston 1 (Auto Reclose)</li> <li>▪ Balclutha-Berwick-Halfway Bush 1 (x2)</li> <li>▪ Ashburton-Timaru-Twizel 2</li> <li>▪ Lake Coleridge-Otira 2</li> </ul>
Loss of HVDC pole	0	



Event	Number	Summary
Loss of single generation units	13	These related to trippings of <ul style="list-style-type: none"> <li>▪ Kumara G1</li> <li>▪ Southdown GE105</li> <li>▪ Southdown GE102 (x2)</li> <li>▪ Benmore G3</li> <li>▪ Huntly U5</li> <li>▪ Tekapo A G1</li> <li>▪ Tararua windfarm North</li> <li>▪ Matahina G1</li> <li>▪ Kawerau</li> <li>▪ Ohaaki G1</li> <li>▪ Ohaaki G2</li> <li>▪ Tauhara</li> </ul>
<b>Total during reporting period</b>	<b>28</b>	

### 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 <ul style="list-style-type: none"> <li>▪ Wilton 110 kV bus</li> </ul>
Loss of interconnecting transformer	0	
Loss of grid reactive plant	3	This event related to trippings of <ul style="list-style-type: none"> <li>▪ Kikiwa Statcon STC2B (x2)</li> <li>▪ Henderson C1</li> </ul>
Loss of supply transformer	1	This event related to a tripping of <ul style="list-style-type: none"> <li>▪ Tangiwai T2</li> </ul>
Demand change	0	
Loss of multiple generation units	1	This event related to a tripping of <ul style="list-style-type: none"> <li>▪ Ohaaki G1 and G2</li> </ul>
HVDC Start/ Stop	1	This event related to <ul style="list-style-type: none"> <li>▪ HVDC Pole 2 shut down</li> </ul>
<b>Total during reporting period</b>	<b>7</b>	



## Other disturbances

Event	Number	Summary
Feeder trippings	38	Various locations
Misc.	0	
<b>Total during reporting period</b>	<b>38</b>	

## 4.3 SYSTEM EVENTS – TREND

	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	Total	Average Events per month
Contingent Event – transmission	42	19	16	24	16	22	4	12	51	20	10	15	251	20.9
Contingent Event – generation	15	8	11	9	11	14	13	15	8	10	13	13	140	11.7
Contingent Event - HVDC	0	0	0	1	0	15	2	1	4	7	0	0	30	2.5
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Other Event – AC transmission	5	2	2	0	1	1	0	1	5	0	1	0	18	1.5
Other Event – Busbar	2	1	0	1	1	0	2	1	2	1	2	1	14	1.2
Other Event – Demand	1	1	5	2	5	4	4	1	0	0	1	0	24	2.0
Other Event – Generation	0	0	0	0	2	0	1		1	0	0	2	6	0.5
Other Event – Interconnecting transformer	0	0	0	0	1	0	0	1	1	1	1	0	5	0.4
Other Event – Reactive plant	3	3	0	1	6	10	2	8	5	6	5	3	52	4.3
Other Event – Supply transformer	3	3	6	4	3	3	4	4	3	2	11	1	47	3.9

