

# System Performance Report

## To the Electricity Commission

### June 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 June 2010.

### Principal Performance Obligations

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

### Operational Management

Operationally it has been a very busy month. A number of material events occurred on the system. These resulted, variously, in load shedding, interruptible load (IL) tripping and the use of discretion by co-ordination staff (the importance of which lies in the fact that, often, out of merit order generation is constrained on). Understandably, this results in queries from industry.

- (1) On 9<sup>th</sup> June Stratford unit bona fide'd down 180MW over the evening peak. This resulted in Whirinaki being constrained on but also required a declaration of a grid emergency and a reduction of reserves to ensure full energy dispatch.
- (2) Circuit and transformer outages in Taranaki have continued to present voltage management issues, require load management agreements with customers and present issues managing generation at Patea. This has been in addition to accommodating planned generation outages.
- (3) On the 15<sup>th</sup> June a number of bona fide's down and plant availability uncertainties resulted in both Whirinaki and Huntly unit 6 being constrained on (under discretion, as a System Security Situation). Industry interest in the circumstances meant a full review of events was undertaken (and is continuing) and reports have been or are being made available on the System Operator's website. No Grid Emergency was declared.
- (4) On 16<sup>th</sup> June a loss of supply at Mount Maunganui occurred when Kaitimako-Mount Maunganui 1 circuit tripped while Kaitimako-Mount Maunganui-Tauranga 1 circuit was on a planned outage.
- (5) A Grid Emergency was declared on the 18<sup>th</sup> June when voltages in Taranaki fell following the scheduling-off of Patea generation. Load management (affecting approximately 3000 customers) was required while Patea was being returned.
- (6) A Grid Emergency was declared on the 26<sup>th</sup> June following a tripping of Huntly unit 5. This was an IL event. On the same day, after the unit was returned to service, the generator tripped again resulting in a further IL event. The unit was removed from service until the 29<sup>th</sup>.
- (7) On the 11<sup>th</sup> June a transformer tripping caused a loss of supply at Oamaru. The same day saw a number of trippings and near grid emergency declarations in respect of the BAL\_HWB circuit.

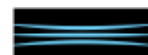
Please refer to section 3.2 for further details on Grid Emergencies declared during the month.

### System Events

Balclutha-Berwick-Halfway Bush 1 circuit tripped on 11 June resulting in a loss of connection at Berwick of approximately 44MW.

Oamaru T1 supply transformer tripped six times on 11 June while Oamaru T2 supply transformer was out of service, resulting in a loss of connection at Oamaru of approximately 20MW.

Kaitimako-Mount Maunganui 1 circuit tripped on 16 June while Kaitimako-Mount Maunganui-Tauranga 1 circuit was out of service, resulting in a loss of connection at Mount Maunganui of approximately 44MW.



Other noteworthy events occurring during the reporting period include:

- auto-reclose of Te Kaha-Waiotahi 1 circuit on 7 and 11 June, resulting in momentary loss of connection to Te Kaha;
- tripping of Mokai units on 9 June;
- trippings of Tauhara unit G2 on 14 and 28 June;
- tripping of Kumara unit G1 on 14 June;
- tripping of Wairakei-Poihipi Road-Whakamaru 1 circuit on 17 June, resulting in loss of connection to Poihipi Road;
- tripping of Mokai unit G10 twice on 18 June;
- tripping of Clyde unit G4 on 21 June;
- tripping of Ohaaki unit G6 on 22 June;
- trippings of Kinleith unit G1 on 22 and 28 June;
- tripping of Huntly unit 4 on 23 June;
- tripping of a Tiwai potline on 24 June;
- tripping of Oamaru-Blackpoint-Waitaki 1 circuit on 26 June, resulting in loss of connection to Blackpoint;
- tripping of Huntly unit 5 twice on 26 June;
- tripping of Tauhara unit G1 on 28 June; and
- tripping of Benmore T2 interconnecting transformer, resulting in islanding and partial loss of connection to Benmore.

## 2. PRINCIPAL PERFORMANCE OBLIGATIONS

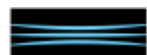
### 2.1 AVOID CASCADE FAILURE

No instances of cascade failure occurred during the reporting period.

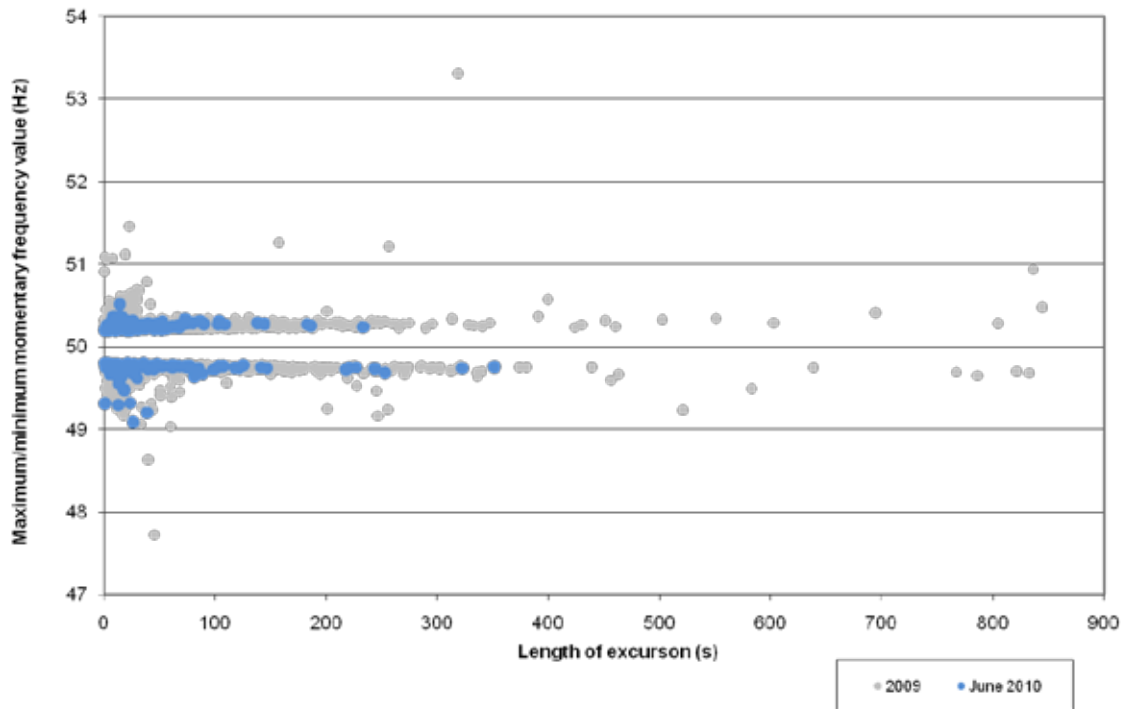
### 2.2 FREQUENCY

#### 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.



June 2010



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	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-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	1	23	50
50.50 >= Freq > 50.20	416	359	292	228	85	148	140	279	348	351	286	376	3308	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	336	257	154	152	98	134	109	278	268	367	253	281	2687	
49.50 >= Freq > 48.75	3	1	3	2		2	2	5	5	3	1	6	33	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.

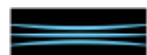
Time Error Compliance Table		Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10
Time Error Management	NI	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
	SI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Error Elimination	NI	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10
Demand Allocation Notice												
Grid Emergency Notice	8		8	6		1	4	3		4	5	5
Warning Notice	9		5	3	1							
Customer Advice Notice	11	6	7	41	16	11	18	31	16	12	20	10



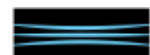
### 3.2 GRID EMERGENCIES

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

Grid Emergencies			
Date	Time	Summary Details	Island
9 June 2010	17:50	A Grid Emergency was declared due to insufficient generation offers in the North Island. North Island Contingent event risk adjustment factors were reduced to 0.6 until 18:52.	North
14 June 2010	13:45	A Grid Emergency was declared due to an unplanned outage of Atiamuri-Whakamaru 1 circuit, where a system split was required at Kinleith-Tarukenga 1 and 2 circuits for system security.	North
16 June 2010	12:18	A Grid Emergency was declared for switching instructions to restore supply at Mount Maunganui following an unplanned outage of Kaitimako-Mount Maunganui 1 circuit while Kaitimako-Mount-Maunganui-Tauranga 1 circuit was out of service.	North
18 June 2010	14:48	A Grid Emergency was declared due to voltage limit at Hawera exceeding the EGR limit, which required the local network company reducing load to alleviate the issue.	North
26 June 2010	10:33	A Grid Emergency was declared due to insufficient generation offers in Zone 1. The grid was reconfigured by creating an operational split on Kinleith-Tarukenga 1 and 2 circuits to avoid circuit overloading for a Hamilton-Whakamaru 1 circuit tripping.	North

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

Island	Region	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Total
North Island	Northland											2		2
	Auckland				1			2	1					4
	Zone 1							1					1	2
	Waikato				1		1							2
	Bay of Plenty												2	2
	Hawkes Bay													0
	Taranaki												1	1
	Bunnythorpe													0
	Wellington	8		5							1			14
	North Island (all)			3	4				1				2	1
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)

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

- one advised of a revision to the permanent constraints involving the Hawera auto-bus splitting scheme (ABSS);
- five advised of a planned outage of Haywards T9 interconnecting transformer;
- one related to the unavailability of HVDC Pole 1 due to a control issue with Haywards valve group 3;
- one related to the implementation of full variable reserves solution in the market system; and
- two advised of an issue with publishing market schedules to COMIT.

### 3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of ninety 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 1<sup>st</sup>-3<sup>rd</sup>, 6<sup>th</sup>, 8<sup>th</sup>-12<sup>th</sup>, 14<sup>th</sup>-17<sup>th</sup> and 20<sup>th</sup>-24<sup>th</sup>. Other SRC notices were issued based on the PDS (based on participants demand bids).

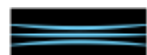
### 3.5 VOLTAGE MANAGEMENT

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

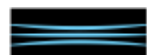
No contracted voltage support ancillary services were called upon during the reporting period.

### 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	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Total
North Island	Northland	1	4	4	8	24	4	1	21	16	19	7	7	<b>116</b>
	Auckland	5	3	15	7	13	8	1	2	9	4	4	1	<b>72</b>
	Waikato	2	2	3	6	7	5	2	10	12	5	19	9	<b>82</b>
	Bay of Plenty	5	3	10	4	5	2	2	11	12	8	12	6	<b>80</b>
	Hawkes Bay	5		1	2	3	1	3	6	2	1	6	7	<b>37</b>
	Taranaki	3			1	3	1	1	5	1		8	4	<b>27</b>
	Bunynthorpe	3			5	3	1	3	5	9	16	5	5	<b>55</b>
	Wellington	2	1	7	4	7	6	2	7	11	6	4	9	<b>66</b>
<b>Total</b>		<b>26</b>	<b>13</b>	<b>40</b>	<b>37</b>	<b>65</b>	<b>28</b>	<b>15</b>	<b>67</b>	<b>72</b>	<b>59</b>	<b>65</b>	<b>48</b>	<b>535</b>
South Island	Nelson Marlborough	2	3	10	5	6	2	1	5	6	6	4	4	<b>54</b>
	West Coast	3	4	2	2	4			2	3	3	3	3	<b>29</b>
	Christchurch	1	1	4	4	3	4	2	1	2		3		<b>25</b>
	Canterbury	3	1		3	3			2	6	4		5	<b>27</b>
	Otago		3	1	5	2		3		2	4		4	<b>24</b>
	Southland		3		10	4	2	2	6	4	2	3		<b>36</b>
<b>Total</b>		<b>9</b>	<b>15</b>	<b>17</b>	<b>29</b>	<b>22</b>	<b>8</b>	<b>8</b>	<b>16</b>	<b>23</b>	<b>19</b>	<b>13</b>	<b>16</b>	<b>195</b>



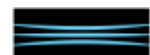
### 3.7 CONSTRAINTS

#### 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.

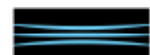
Island	Region	Constraint Name	Description
North Island	Hamilton	ARI_HAM_1_and_2_ARI_RUNBACK_ENABLED_W_P_1	The effect of this constraint is to manage flows through Arapuni-Hamilton 1 and 2 for a contingency of Arapuni-Hamilton 2 or 1 during high ARI generation. Arapuni Runback Scheme enabled.
		ARI_HAM_1_and_2_ARI_RUNBACK_DISABLED_W_P_1	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 disabled.
		KIN_TRK_1_W_P_1A_temp	The effect of this constraint is to manage flows through Kinleith Tarukenga 1 for a contingency of Hamilton-Whakamaru 1 when Auckland generation is low with high Auckland and Northland loads.
		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.
	Edgecumbe	KAW_T13_W_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.
	Taranaki	HWA_SFD_1_O_1	The effect of this constraint is to manage flows through Hawera_Waverly during Low Patea generation and/or no Whareroa generation when Hawera_Stratford is out of service. This constraint assists with precontingent voltage management at Hawera and covers for a loss of Bunnythorpe Wanganui 1 or 2.
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.
	Otago	LIV_NSY_1_or_NSY_ROX_1_W_O_1	The effect of this constraint is to manage flows through the Clyde-Roxburgh circuits for a contingency of one of the Clyde-Roxburgh circuits when Livingstone-Naseby 1 or Naseby-Roxburgh 1 is out of service during low Southland 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	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	11	0.76%	5	0.03%
		ARI_HAM_1_and_2_ARI_RUNBACK_DISABLED_W_P_1	7	0.49%	0	0.00%
	Edgecumbe	KAW_T13_W_P_2	13	0.90%	8	0.05%
	Taranaki	HWA_SFD_1_O_1	8	0.56%	0	0.00%
South Island & HVDC	Christchurch	ISL_KIK_1_TOP_SOUTH_ISLAND_STABILITY_O_1A	7	0.49%	32	0.18%
	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%
		LIV_NSY_1_or_NSY_ROX_1_W_O_1	4	0.28%	0	0.00%
	HVDC	DCNPole1Max	220	15.28%	3208	18.31%
		DCNPole1Min	0	0.00%	2549	14.55%
		BEN_HAYP1max	0	0.00%	542	3.09%



## 4. SYSTEM EVENTS

### 4.1 SIGNIFICANT SYSTEM EVENTS

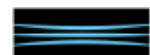
The following table shows significant events (frequency excursions and connection point events) which occurred during the reporting period.

#### Significant frequency excursions

Date	Time	Summary Details	Island	Freq (Hz)
24 June 2010	15:41	Tiwai potline trip resulted in a momentary rise in frequency in the South Island.	South	50.52
26 June 2010	08:41	Huntly unit 5 trip resulted in a momentary drop in frequency in the north Island.	North South	49.08 49.32
26 June 2010	16:41	Huntly unit 5 trip resulted in a momentary drop in frequency in the north Island.	North South	49.2 49.47

#### Connection point events

Date	Time	Summary Details	Generation /Load interrupted (MW)	Restoration time (minutes)
11/06/2010	14:21	Balclutha-Berwick-Halfway Bush 1 circuit tripped causing loss of connection to Berwick.	44	16
11/06/2010	17:53	Oamaru T1 supply transformer tripped six times during recommissioning. Oamaru T2 supply transformer was out of service, loss of connection at Oamaru resulted.	19.5	Total of 60
16/06/2010	12:18	Kaitimako-Mount Maunganui 1 circuit tripped while Kaitimako-Mount-Maunganui-Tauranga 1 circuit was out of service, causing loss of connection at Mount Maunganui.	43.9	28
17/06/2010	13:02	Whakamaru-Poihipi Road-Wairakei 1 circuit tripped causing loss of connection at Poihipi Road.	40	41



## 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	These related to trippings of § Cromwell-Frankton 2 § Arapuni-Hangatiki-Ongarue 1 § Kinleith-Lichfield-Tarukenga 1 (Auto Reclose) § Fernhill-Waipawa 2 (x 2) § Te Kaha-Waiotahi 1 (Auto Reclose) (x 2) § Halfway Bush-Three Mill Hill 1 (x 3) § Kumara-Otira 1 § Wairakei-Poihipi Rd-Whakamaru 1 (Auto Reclose) § Woodville-Dannevirke-Waipawa 2 § Edgecumbe-Kawerau 2 (Auto Reclose) § Oamaru-Blackpoint-Waitaki 1 § Otahuhu-Whakamaru 2 (Auto Reclose) § Islington-Kikiwa 1
Loss of HVDC pole	1	This related to a tripping of § Arcback on HVDC Valve Group VG1 on startup
Loss of single generation units	14	These related to trippings of § Mokai (x 3) § Tauhara (x 3) § Kumara § Clyde § Ohaaki § Kinleith (x 2) § Huntly U4 (x 1) & U5 x 2 & U4 x 1
<b>Total during reporting period</b>	<b>32</b>	

### Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	

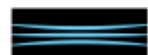


## Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	2	These events related to trippings of § Balclutha-Berwick-Halfway Bush 1 & Halfway Bush-Three Mill Hill 1 § Atiamuri-Whakamaru 1 & Maraetai-Whakamaru 1
Loss of bus bar section	1	This event related to a tripping of § Kaitimako 110 kV
Loss of interconnecting transformer	2	These events related to trippings of § Maungatapere T1 § Benmore T2
Loss of grid reactive plant	2	These events related to trippings of § Haywards Filter F1 § Otahuhu GT5
Loss of supply transformer	7	These events related to trippings of § Oamaru T1 (x 6) § Waihou T2
Demand change	1	This event related to a tripping of § Tiwai Potline
Loss of multiple generation units	2	These events related to § Arapuni generation runback
HVDC Start/ Stop	0	
<b>Total during reporting period</b>	<b>17</b>	

## Other disturbances

Event	Number	Summary
Feeder trippings	37	Various locations
Misc.	0	
<b>Total during reporting period</b>	<b>37</b>	



### 4.3 SYSTEM EVENTS – TREND

	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Total	Average Events per month
Contingent Event – transmission	16	24	16	22	4	12	51	20	10	15	23	17	230	19.2
Contingent Event – generation	11	9	11	14	13	15	8	10	13	13	8	14	139	11.6
Contingent Event - HVDC	0	1	0	15	2	1	4	7	0	0	1	1	32	2.7
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0	0		0	0.0
Other Event – AC transmission	2	0	1	1	0	1	5	0	1	0	0	2	13	1.1
Other Event – Busbar	0	1	1	0	2	1	2	1	2	1	1	1	13	1.1
Other Event – Demand	5	2	5	4	4	1	0	0	1	0	1	1	24	2.0
Other Event – Generation	0	0	2	0	1		1	0	0	2	0	2	8	0.7
Other Event – Interconnecting transformer	0	0	1	0	0	1	1	1	1	0	1	2	8	0.7
Other Event – Reactive plant	0	1	6	10	2	8	5	6	5	3	4	2	52	4.3
Other Event – Supply transformer	6	4	3	3	4	4	3	2	11	1	3	7	51	4.3

