System Performance Report

To the Electricity Commission

March 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 March 2010.

Principal Performance Obligations

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

Operational Management

No significant operational issue encountered during the reporting period.

System Events

Central Park-West Wind-Wilton 3 circuit and Central Park T3 supply transformer tripped on 6 March. This resulted in a loss of connection at West Wind of approximately 56 MW.

Cromwell-Frankton 2 circuit tripped while Cromwell-Frankton 1 was out of service for a planned outage on 16 March. This resulted in a loss of connection at Frankton of approximately 21 MW.

Benmore T2 interconnecting transformer tripped on 20 March, resulting in a loss of connection at Benmore of approximately 80 MW.

Whirinaki T1 supply transformer tripped on 31 March resulting in a partial loss of connection at Whirinaki of approximately 43 MW.

Other noteworthy events occurring during the reporting period include:

- tripping of Atiamuri unit G4 on 2 March;
- trippings of Otahuhu B station on 8 and 12 March;
- tripping of Huntly unit 5 on 9 March;
- a fault in the Kawerau 11 kV network on 11 March caused the tripping of T11 supply transformer, resulting in a partial loss of connection at Kawerau;
- trippings of Kinleith unit G1 (six times) on 16 March;
- tripping of Opunake T4 and T5 supply transformers on 17 March, resulting in loss of connection at Opunake;
- trippings of Rotokawa geothermal station on 22 and 30 March; and
- tripping of Kawerau geothermal station on 29 March.

2. PRINCIPAL PERFORMANCE OBLIGATIONS

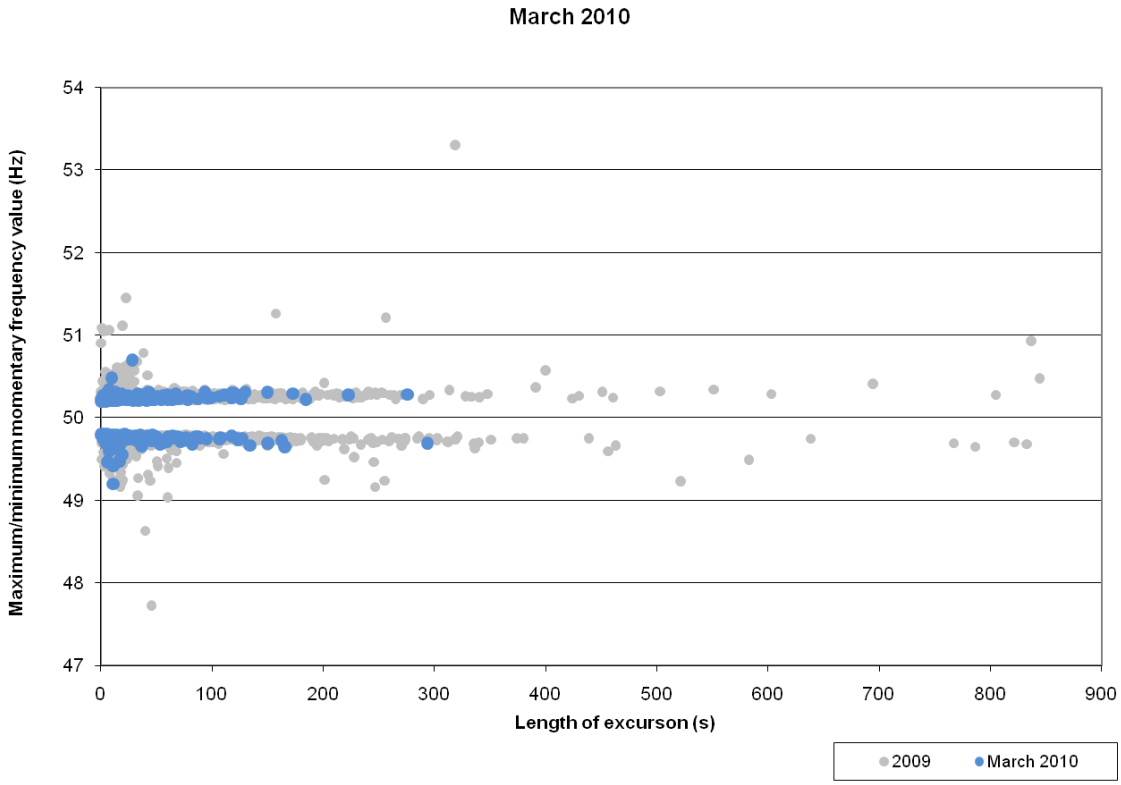
2.1 AVOID CASCADE FAILURE

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	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Annual rate	PPO target
55.00 >= Freq > 52.00	1												**1**	
52.00 >= Freq > 51.25	1						1			1			**3**	**7**
51.25 >= Freq > 50.50	2	2		2	2	6	4	1	1		2	1	**23**	**50**
50.50 >= Freq > 50.20	380	231	267	416	359	292	228	85	148	140	279	348	**3173**	
50.20 >= Freq > 49.80														
49.80 >= Freq > 49.50	221	181	204	336	257	154	152	98	134	109	278	268	**2392**	
49.50 >= Freq > 48.75	9	2	1	3	1	3	2		2	2	5	5	**35**	**60**
48.75 >= Freq > 48.00	1												**1**	**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		Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10
Time Error Management	NI	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	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	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10
Demand Allocation Notice												
Grid Emergency Notice	8	4	4	8		8	6		1	4	3	
Warning Notice	4	3	9	9		5	3	1				
Customer Advice Notice	19	23	4	11	6	7	41	16	11	18	31	16

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
None			

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

Island	Region	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-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**
	Bunnythorpe	1												**1**
	Wellington	1		2	8		5							**16**
	North Island (all)		4	1			3	4				1		**13**
South Island & HVDC	Nelson Marlborough	3												**3**
	West Coast	1										1		**2**
	Christchurch													**0**
	Canterbury													**0**
	Zone 3													**0**
	Otago													**0**
	Southland	2												**2**
	South Island (all)													**0**
	HVDC													**0**

3.3 CUSTOMER ADVICE NOTICES (CANS)

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

- one advised of planned changes of HVDC Pole 1 offer;
- one advised of successful upgrade to the Market Systems Release 18;
- one announced the early re-rating of Otahuhu-Whakamaru 1 and 2 circuits to shoulder rating from 07:00 on 10 March 2010;
- two advised of an outage of the Market Systems;
- one announced the change to shoulder rating from 15 March 2010 until 10 May 2010;
- six advised of a planned outage of HVDC Pole 1;
- three announced the revision of the Arapuni runback scheme shoulder permanent constraint; and
- one advised of an under frequency test being carried out in the South Island.

3.4 STANDBY RESIDUAL CHECK (SRC) NOTICES

A total of thirteen 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, 3rd, 4th and 30th of March 2010. 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.

Transmission outages required the dispatch of generation at Lake Coleridge, Kumara and Berwick to manage post contingency steady state voltages.

Generation at Lake Coleridge and Kumara was constrained on to meet voltage quality targets this week

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	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Total
North Island	Northland	11	10	10	1	4	4	8	24	4	1	21	16	**114**
	Auckland	3	5	7	5	3	15	7	13	8	1	2	9	**78**
	Waikato	3	5	7	2	2	3	6	7	5	2	10	12	**64**
	Bay of Plenty	5	3	7	5	3	10	4	5	2	2	11	12	**69**
	Hawkes Bay	5	2	3	5		1	2	3	1	3	6	2	**33**
	Taranaki	2	2	2	3			1	3	1	1	5	1	**21**
	Bunnythorpe	10	6	5	3			5	3	1	3	5	9	**50**
	Wellington	2	12	3	2	1	7	4	7	6	2	7	11	**64**
Total		41	45	44	26	13	40	37	65	28	15	67	72	**493**
South Island	Nelson Marlborough	4	1	0	2	3	10	5	6	2	1	5	6	**45**
	West Coast	2	7	0	3	4	2	2	4			2	3	**29**
	Christchurch	5	3	0	1	1	4	4	3	4	2	1	2	**30**
	Canterbury	4	2	1	3	1		3	3			2	6	**25**
	Otago	2	3	1		3	1	5	2		3		2	**22**
	Southland	5	4	2		3		10	4	2	2	6	4	**42**
Total		22	20	4	9	15	17	29	22	8	8	16	23	**193**

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	Bunnythorpe	BPE_MTN_WGN_1_S_O_1A	The effect of this constraint is to manage flows through Hawera-Stratford 1 for a contingency of Bunnythorpe-Marton-Wanganui 2 when Bunnythorpe-Marton-Wanganui 1 and Marton T1 out of servce during low Patea and Whareroa generation.
	Edgecumbe	KAW_T13_M_P_1	The effect of this constraint is to manage flows through Kawerau T13 for a contingency of Edgecumbe-Kawerau 3 during low Kawerau 110kV load and high Matahina and Kawerau generation when the Edgecumbe-Kawerau 1&2 overload schemes are active.
	Hamilton	ARI_HAM_1_and_2_ARI_RUNBACK_DISABLED_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 disabled.
		HAM_KPO_2_S_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 when Te Awamutu Run-back scheme is disabled.
		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.

Island	Region	Constraint Name	Description
South Island & HVDC	Canterbury	ASB_BRY_1_or_ASB_ISL_STABILITY_O_1A	The effect of this constraint is to manage flows through Islington-Tekapo B, Islington -Livingstone, Ashburton-Timaru-Twizel 1 and Ashburton-Timaru-Twizel 2 for a contingency of Ashburton - Islington 1 or Ashburton - Bromley 1. This is when Ashburton - Bromley 1 or Ashburton - Islington 1 is out of service and to ensure the Voltage Stability limit is not exceeded during periods when load in the Upper South Island load is high.
		ASB_ISL_1_S_O_2	The effect of this constraint is to manage flows through Aviemore-Waitaki for a contingency of Ashburton-Bromley when Ashburton-Islington 1 is out of service.
		ASB_ISL_1_S_O_1	The effect of this constraint is to manage flows through Livingstone-Waitaki for a contingency of Ashburton-Bromley when Ashburton-Islington 1 is out of service.
	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.
	Nelson	STK_UTK_1_S_P	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	CYD_TWZ_1_W_O_2	The effect of this constraint is to manage flows through Aviemore-Waitaki 1 for a contingency of a Clyde Cromwell Twizel 2 circuit during low Southland generation when Clyde Cromwell Twizel 1 is out of service and HVDCS
		CYD_TWZ_1_M_O_2	The effect of this constraint is to manage flows through Aviemore Waitaki 1 for a contingency of a Clyde Cromwell Twizel 2 circuit during low Southland generation when Clyde Cromwell Twizel 1 is out of service and HVDCS
		CYD_TWZ_2_M_O_1	The effect of this constraint is to manage flows through Naseby-Roxburgh-1 for a contingency of Clyde-Twizel-1 during high Southland and Clutha generation resulting in northwards power flow when Clyde-Twizel-2 is out of service.
		CYD_TWZ_1_M_O_3	The effect of this constraint is to manage flows through Livingstone-Waitaki 1 for a contingency of a Clyde Cromwell Twizel 2 circuit during low Southland generation when Clyde Cromwell Twizel 1 is out of service and HVDCS
		ROX_TMH_2_M_O_2	The effect of this constraint is to manage flows through Roxburgh T10 for a contingency of Roxburgh-Three Mile Hill 1 when Roxburgh-Three Mile Hill 2 is out of service.
	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.
	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.

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	8	0.54%	48	0.27%
		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	7	0.47%	0	0.00%
South Island & HVDC	Canterbury	ASB_BRY_1_or_ASB_ISL_STA BILITY_O_1A	23	1.55%	0	0.00%
		ASB_ISL_1_S_O_1	5	0.34%	0	0.00%
		ASB_ISL_1_S_O_2	6	0.40%	0	0.00%
	Christchurch	ISL_KIK_1_TOP_SOUTH_ISLA ND_STABILITY_O_1A	13	0.87%	21	0.12%
	Nelson	STK_UTK_1_S_P	10	0.67%	137	0.78%
	West Coast	WEST_COAST_SPLIT_O_1	61	4.10%	57	0.33%
	Otago	NSY_ROX_1_S_P_z	0	0.00%	380	2.17%
		NSY_ROX_1_W_P_1_z	0	0.00%	91	0.52%
	Southland	CYD_TWZ_1_M_O_2	16	1.08%	0	0.00%
		CYD_TWZ_1_W_O_2	5	0.34%	0	0.00%
		CYD_TWZ_2_M_O_1	13	0.87%	0	0.00%
		ROX_TMH_2_M_O_2	13	0.87%	0	0.00%
	HVDC	BEN_HAY1.1	0	0.00%	63	0.36%
		BEN_HAY2.1	0	0.00%	49	0.28%
		DCNPole1Max	26	1.75%	2488	14.20%
		DCNPole1Min	26	1.75%	2481	14.16%
		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)
9 March 2010	15:45	Huntly unit tripped causing a momentary drop in frequency in the North Island.	North South	49.2 49.47
12 March 2010	07:31	An HVDC Pole 2 operation caused momentary drop in frequency in the South Island.	South	49.45
12 March 2010	19:43	A planned shutdown of Otahuhu station resulted in a momentary drop in frequency in the North Island.	North	49.48
14 March 2010	10:43	A Manapouri unit tripped caused a momentary drop in frequency in the South Island.	South	49.42
22 March 2010	15:17	An emergency Tiwai potline reduction resulted in a momentary rise in frequency in the South Island.	South	50.7

Connection point events

Date	Time	Summary Details	Generation/Load interrupted (MW)	Restoration time (minutes)
6 March 2010	11:54	Central Park-Westwind-Wilton 3 circuit and Central Park T3 supply transformer tripped resulted in a loss of connection at Westwind.	56	140
16 March 2010	08:39	Cromwell-Frankton 2 circuit tripped while Cromwell-Frankton 1 was out of service for a planned outage, resulted in a loss of connection at Frankton.	21	70
20 March 2010	21:36	Benmore T2 interconnecting transformer tripped resulting in a partial loss of connection at Benmore.	80	1304
31 March 2010	05:53	Whirinaki T1 supply transformer tripped resulting in a partial loss of connection at Whirinaki.	43	37

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	10	These related to trippings of ▪ Hamilton-Karapiro 2 (x2) ▪ Wairakei -Poihipi-Whakamaru 1 ▪ Gisborne-Tuai 1 (Auto Reclose) ▪ Central Park-West Wind-Wilton 3 ▪ Bunnythorpe-Wilton 1 ▪ Bunnythorpe-Mangahao 2 ▪ Cromwell-Frankton 2 ▪ New Plymouth-Stratford 1 ▪ Islington-Livingstone 1 (Auto Reclose)
Loss of HVDC pole	0	
Loss of single generation units	13	These related to trippings of ▪ Atiamuri G4 ▪ OTC (x2) ▪ Huntly U5 ▪ Kinleith G1(x6) ▪ Rotokawa (x2) ▪ Kawerau
Total during reporting period	**23**	

Extended contingent events

Event	Number	Summary
Loss of both HVDC poles	0	

Other events

Event	Number	Summary
Loss of multiple AC transmission circuits	1	This event related to the tripping of ▪ Blenheim-Stoke 1 & 2 (Auto Reclose)
Loss of bus bar section	2	This event related to trippings of ▪ T11 & Kawerau CB28 ▪ Opunake T4 & T5
Loss of interconnecting transformer	1	This event related to the tripping of ▪ Benmore T2
Loss of grid reactive plant	5	This event related to trippings of ▪ Benmore 692B ▪ Benmore F3 (x2) ▪ Greymouth C1 & C2 ▪ Kikiwa STC2B
Loss of supply	11	This event related to trippings of

Event	Number	Summary
transformer		▪ Dobson T2 (x3) ▪ Dobson T1 ▪ Waihou T1 (x2) ▪ PapanuiT4 ▪ Motueka T6 ▪ Marton T3 ▪ Linton T2 ▪ Whirinaki T1
Demand change	1	This event related to the tripping of • Tiwai potline
Loss of multiple generation units	0	
HVDC Start/ Stop	0	
Total during reporting period	**21**	

Other disturbances

Event	Number	Summary
Feeder trippings	49	Various locations
Misc.	0	
Total during reporting period	**49**	

4.3 System Events – Trend

	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Total	Average Events per month
Contingent Event – transmission	23	42	19	16	24	16	22	4	12	51	20	10	259	21.6
Contingent Event – generation	8	15	8	11	9	11	14	13	15	8	10	13	135	11.3
Contingent Event - HVDC	1	0	0	0	1	0	15	2	1	4	7	0	31	2.6
Extended Contingent Event	0	0	0	0	0	0	0	0	0	0		0	0	0.0
Other Event – AC transmission	2	5	2	2	0	1	1	0	1	5	0	1	20	1.7
Other Event – Busbar	2	2	1	0	1	1	0	2	1	2	1	2	15	1.3
Other Event – Demand	4	1	1	5	2	5	4	4	1	0	0	1	28	2.3
Other Event – Generation	0	0	0	0	0	2	0	1		1	0	0	4	0.3
Other Event – Interconnecting transformer	0	0	0	0	0	1	0	0	1	1	1	1	5	0.4
Other Event – Reactive plant	9	3	3	0	1	6	10	2	8	5	6	5	58	4.8
Other Event – Supply transformer	3	3	3	6	4	3	3	4	4	3	2	11	49	4.1