



Annual Reliability & Power Quality Report

Financial Year Ending June 2009

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safe reliable efficient

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1 Introduction

This report presents information required as part of Schedule 1 of the *Electricity Industry (Network Quality and Reliability of Supply) Code 2005* ("the Code") – for the financial year ending 30 June 2009.

Western Power's commitment is to work with the Office of Energy and the Economic Regulation Authority to ensure that the data presented in the Annual Reliability and Power Quality Report is clear and understandable and interprets the code requirements correctly.

The figures stated in this report should not be compared to other publications by Western Power of reliability performance. Western Power is required to report on industry standard definitions of reliability to the Economic Regulatory Authority, which is different from the measures defined in the Code.

2 Overview

Outages due to inclement weather, bushfires and other environmental issues are typically outside the control of an energy network business. There were a number of these events that occurred during the 2008/09 financial year that had a negative impact on reliability, resulting in an average increase in the total minutes without power for each customer.

In comparison to the previous year, there has been an increase in significant storm related outages. For the 12 months to June 2009, customers experienced five days (compared to two days for the 12 months to June 2008) where there were widespread outages due to storm activity affecting customers in the Perth Metropolitan area and coastal regions from Geraldton to Bremer Bay for extended periods.

There was a bushfire causing widespread damage to equipment that spread through the Bridgetown region in mid January, with some premises in the Shires of Bridgetown-Greenbushes and Nannup without power for over 2 days.

While the above environmental factors had an adverse affect on reliability, there were a number of activities during the year that were focused on improving reliability to customers:

- The deployment of 3-phase telemetered reclosers and load break switches. This strategy aims to provide switching flexibility to reduce the number of customers affected by a supply interruption;
- The reinforcement of the protection sections of distribution feeders that contribute the most to SAIDI (measure of average interruption duration) on the South West Interconnected System (SWIS). This strategy aims to improve the reliability of the targeted protection section by reducing faults due to equipment failure and wildlife;
- The State Underground Power Program, which is a partnership between Western Power, the State Government and local government authorities, with funding shared 25%, 25% and 50% respectively, to target areas of the distribution network for undergrounding; and
- Directing maintenance work to the worst performing feeders in the network.

As a result of these activities, there were a number of improvements in the 2008/09 financial year which included:

- Customers having experienced a reduction in the number of outages resulting from equipment failures; and
- A reduction in the number of customers affected in the event of an unplanned interruption.

3 Definitions

All terminology used in this report is in accordance with definitions presented in Item 1 to Item 3 of Schedule 1 of the Code.

For the purposes of this report, “all other areas of the State” as defined in Items 2 and 3 of Schedule 1 are referred to as “Rural” areas of the SWIS and will be referred to as such in Sections 6, 7 and 9 of the Report.

4 Response to Item 4 of Schedule 1

4.1 Overview

Permanent power quality (PQ) meters have been deployed in different parts of the low voltage (LV) distribution network to monitor the quality of customers’ supply.

In responding to item 4, the program of installing permanent PQ meters (known as Electronic Design and Manufacturing International or “EDMI” meters) continues with an additional 28 devices deployed in the 2008/09 financial year, bringing the total number operating to 56, with plans to increase this number in subsequent years. As a result of the small sample size of the deployment of PQ meters, data from PQ measurements in response to customer complaints was used in conjunction with EDM I measurements.

4.2 Harmonics Compliance

Harmonics are certain characteristics of voltage and current on a power system that arise from particular types of equipment that are connected to the system. Harmonics can result in extra strain on the network, and devices connected to the network such as electric motors. Where reasonably practicable the voltage distortion levels arising from harmonics in the network are to be contained within the compatibility levels given in Part 2 Section 7 of the Code.

Guidelines have been defined to prevent high levels of voltage disturbances from entering the system. Residential customers are not the main contributors to harmonic voltage distortion, so harmonic limits are generally negotiated with commercial and industrial customers. Rigorous procedures are in place for the management of contracted harmonic limits for customers with potential distorting power loads.

Harmonic limits are assigned in accordance with Western Power’s Technical Rules for distribution planning. The total harmonic voltage distortion (THD) limit is 6.5% for each customer, to help ensure that the compatibility level of 8% THD specified in the Code is not exceeded.

Figures 1 and 2 illustrate the THD representation of the EDM I meter sites. Western Power is achieving 100% compliance with the technical rules and regulatory requirements based on the Electricity Industry Code 2005. The median THD is approximately 2.5% at the customer sites and 2.25% at the transformer sites.

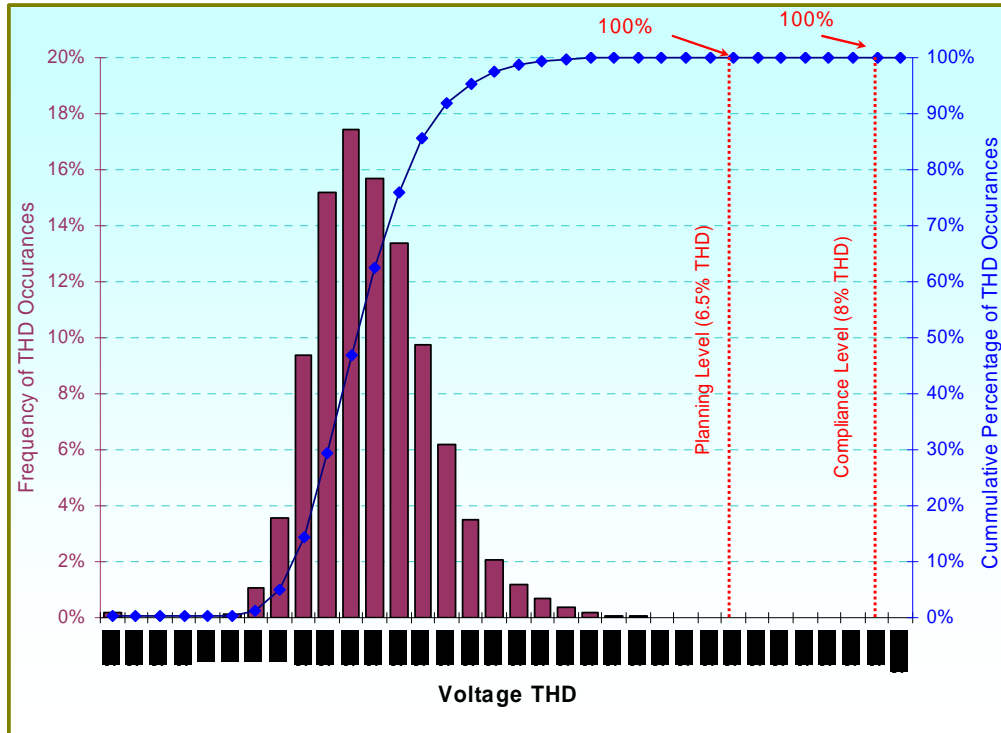


Figure 1 – THD % for EDM I customer sites in the 2008/09 financial year

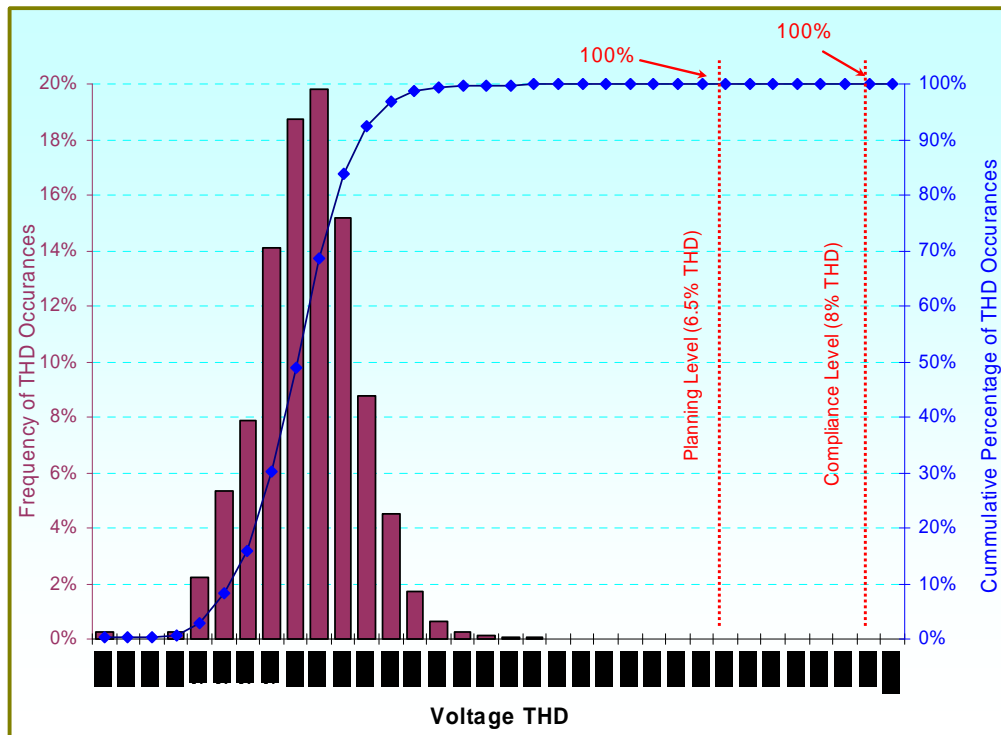


Figure 2 - THD % for EDM I transformer sites in the 2008/09 financial year

4.3 Voltage Variation Compliance

To prevent issues that can occur with customers' equipment that is connected to the network, voltages must be maintained within $\pm 6\%$ of the supply voltage according to the Electricity Act 1945 Section 25(1)(d). According to the Technical Rules, the steady state voltage must be within the following limits:

- $\pm 6\%$ of the nominal voltage during normal conditions;
- $\pm 8\%$ of the nominal voltage during maintenance conditions; and
- $\pm 10\%$ of the nominal voltage during emergency conditions.

Figures 3 and 4 represent the frequency of variations in voltage levels for customer and transformer sites surveyed for the purposes of reactively investigating PQ complaints.

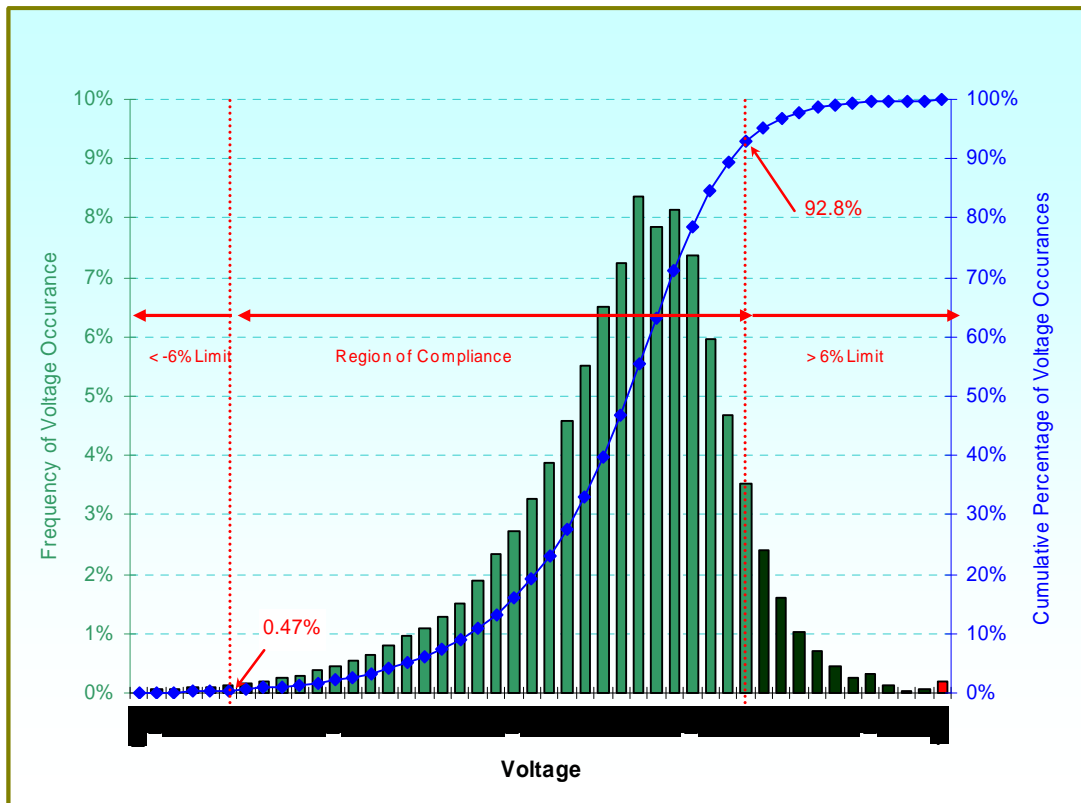


Figure 3 – Voltage distribution for recorded customer sites in the 2008/09 financial year

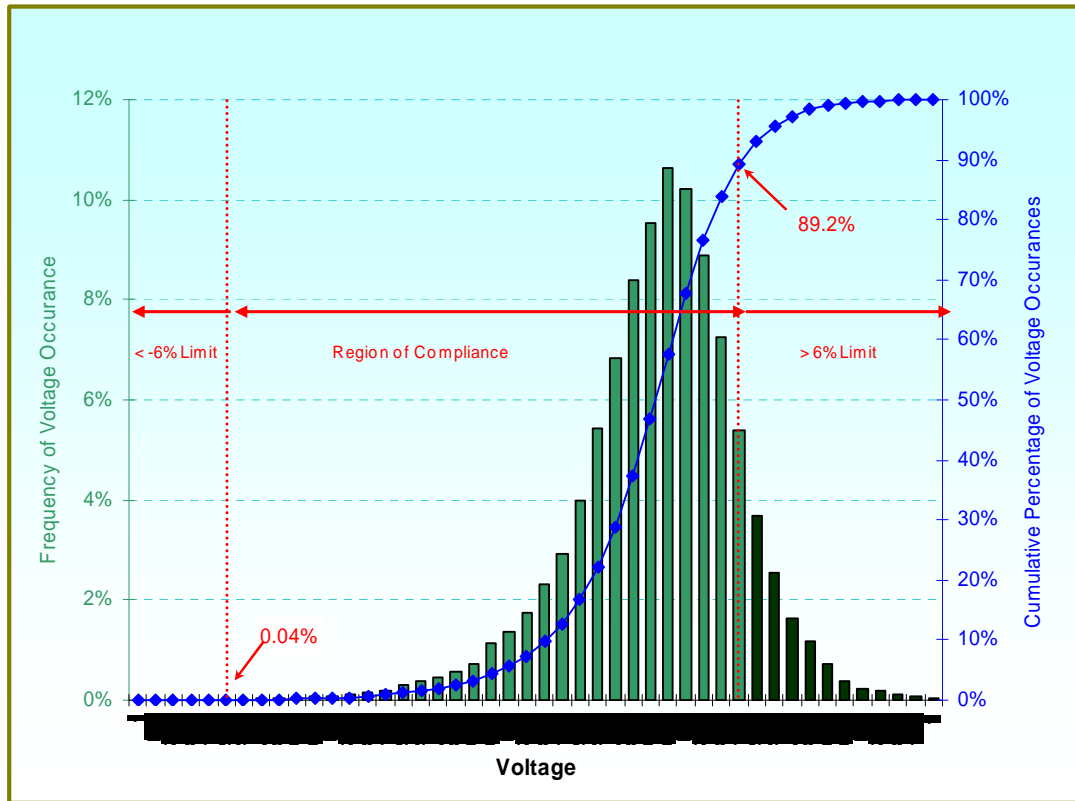


Figure 4 - Voltage distribution for recorded transformer sites for the 2008/09 financial year

Figure 3 shows the percentage of voltage level variations for customer sites that occur below 225.6V and above 254.4V is 0.47% and 7.2% of the time respectively. In addition, Figure 4 shows the proportion of voltage level variations for transformer sites that occur below 225.6V and above 254.4V is 0.04% and 10.8% of the time respectively. Figures 3 and 4 further show that the frequency voltage levels exceeding the “+10% of the emergency limits” (greater than 264V) outlined in the Technical Rules is negligible.

Deviations exceeding the voltage limits are likely to be higher from the data results in Figures 3 and 4 in comparison to the whole SWIS as these measurements were conducted in response to customer complaints. Any non-compliance in voltage levels identified by these measurements was subsequently rectified.

Figures 5 and 6 show the results of measurements undertaken on the distribution network by way of EDMI meters, for both customer and transformer sites. In comparison to sites recorded as a result of customer complaints, the voltage regulation from these sites recorded by EDMI meters is more compliant with the statutory limits. Table 1 provides a summary of the findings from Figures 3 to 6.

Table 1- Non compliance summary of voltage level measurements over the 2008/09 financial year

Data Source		Sample Size	<-6% Non-Compliance	>+6% Non-Compliance
Measurements arising from PQ complaints	Customer sites	520	0.47%	7.2%
	Transformer sites	437	0.04%	10.8%
Measurements arising from EDMI meters	Customer sites	24	0.29%	3.1%
	Transformer sites	32	0.47%	6.0%

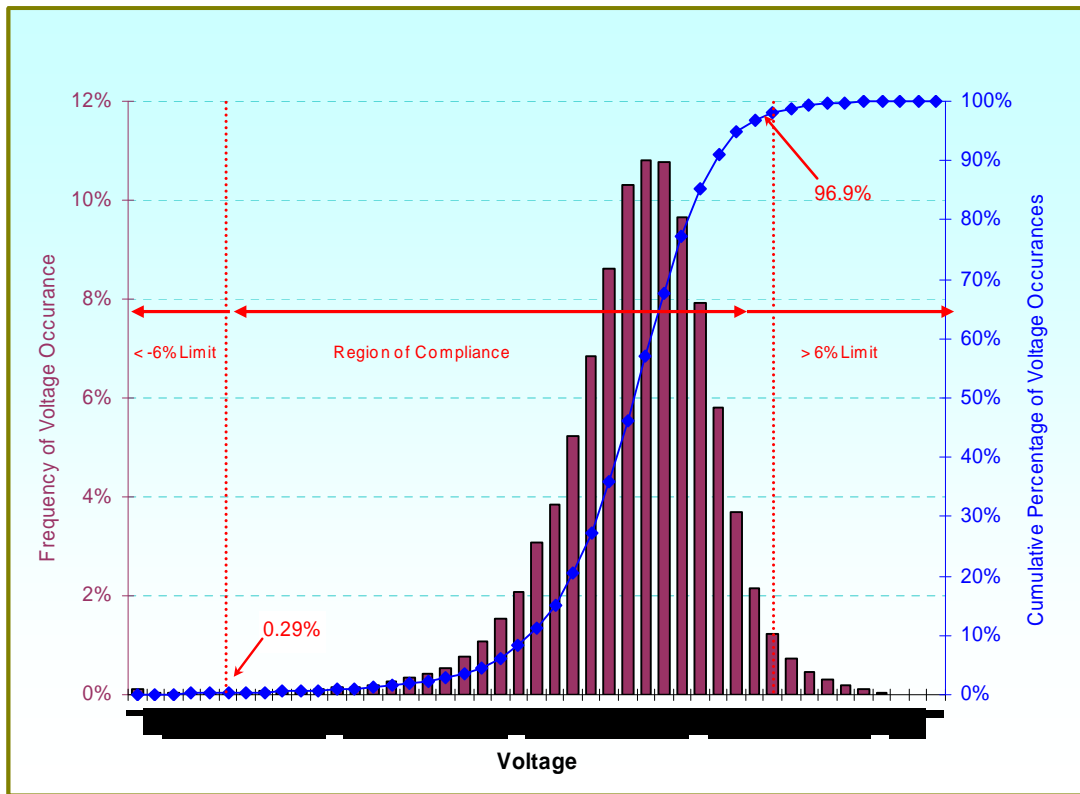


Figure 5- Voltage distribution for EDMI customer sites in the 2008/09 financial year

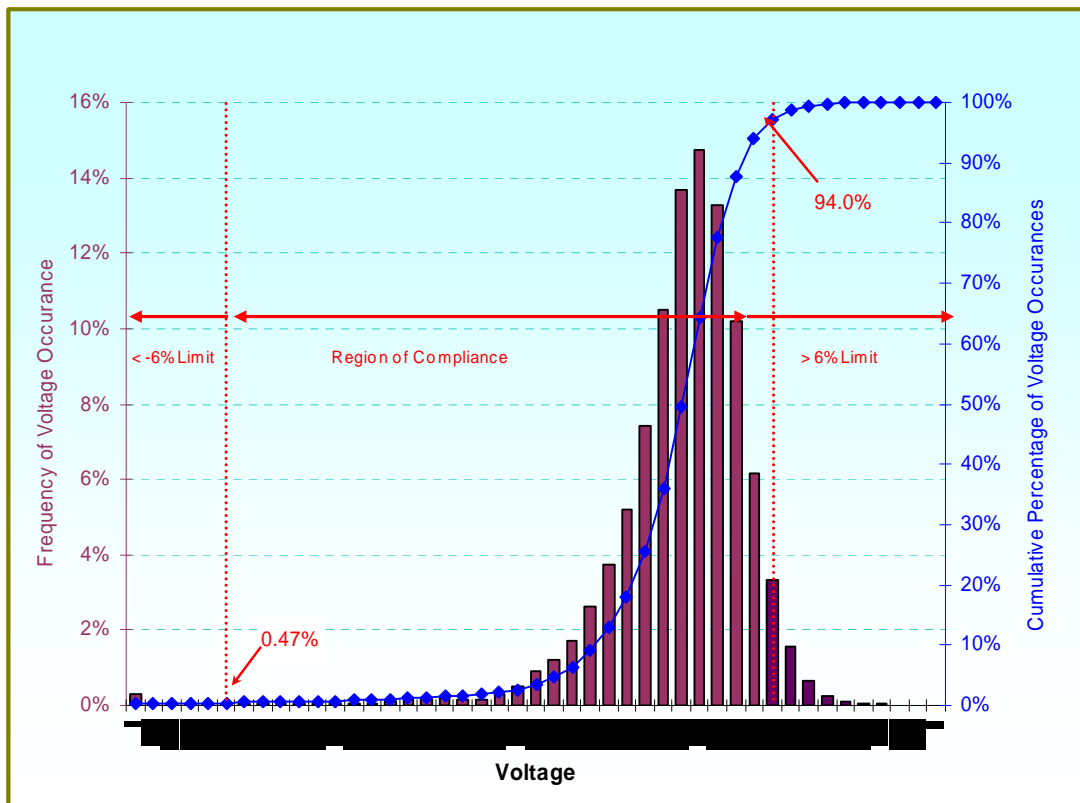


Figure 6- Voltage distribution for EDMI transformer sites in the 2008/09 financial year

4.4 Voltage Unbalance Compliance

Power is distributed to customers by way of 3 phase electricity, in which each phase is initially transmitted at 120° before and after the proceeding and preceding phase and this is known as a balanced supply. However, differing loads on each of the phases causes imbalances between phases and amplitudes and can cause problems similar to that of Harmonics (see section 4.2).

According to the Western Power Technical Rules, the voltage unbalance on the distribution system for the ratio of negative and positive phase sequence components must be less than 2%.

Instrumentation for measuring sequence components is not readily available. The measurements for voltage unbalance are based on an approximation method that compares the voltage differences between each phase. The approximation method requires voltage measurements to be either:

- Phase to phase; or
- If phase to neutral measurements are taken, then phase displacement angles also need to be considered.

As all measurements for investigating customer complaints were taken as phase to neutral, a phase angle displacement of 120° between phases was assumed.

Figures 7 to 10 depict the occurrences of voltage unbalance between 0% and 4.4 % for customer and transformer sites respectively. Although reporting voltage unbalance is not a requirement by the Code, Western Power endeavours to maintain the network voltage unbalance below 2%.

Based on PQ customer complaints, Figures 7 and 8 show that voltage unbalance is maintained at 96.2% of the time for customer sites and 99.5% for transformer sites respectively.

Based on recordings from the permanent EDMI sites, Figures 9 and 10 show that voltage balance is maintained at 98.9% of the time for customer sites and 96.4% for transformer sites.

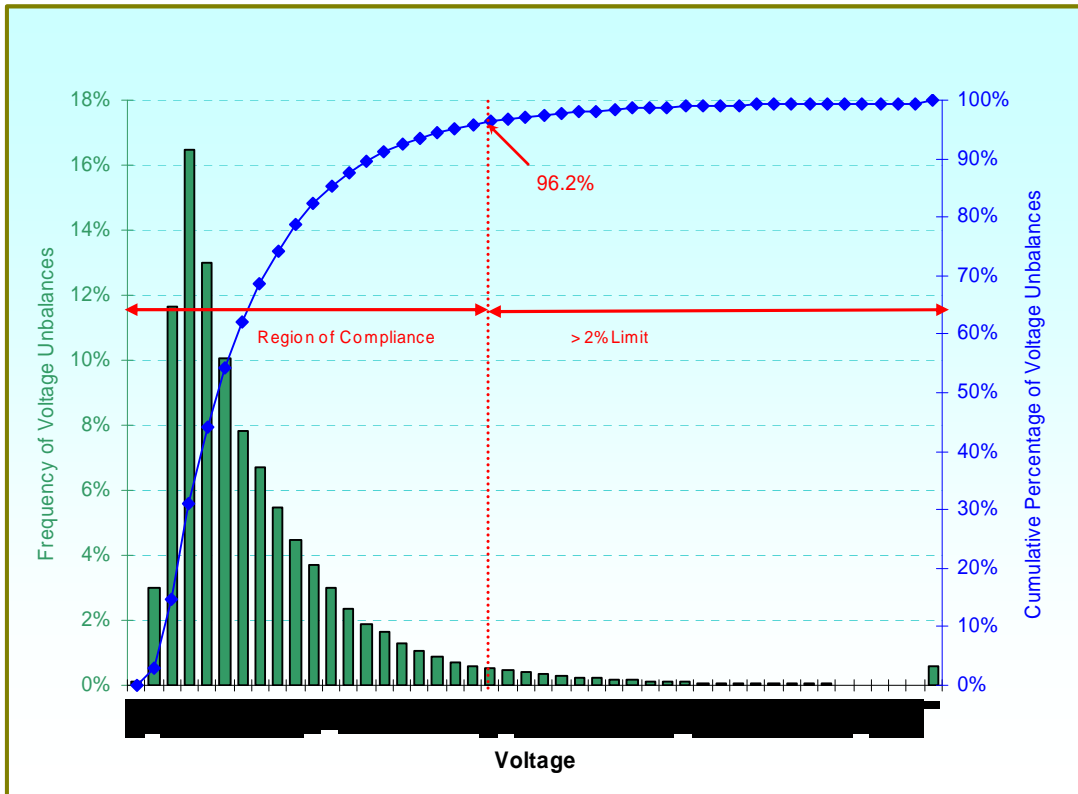


Figure 7 - Voltage unbalance for recorded customer sites for the 2008/09 Financial Year

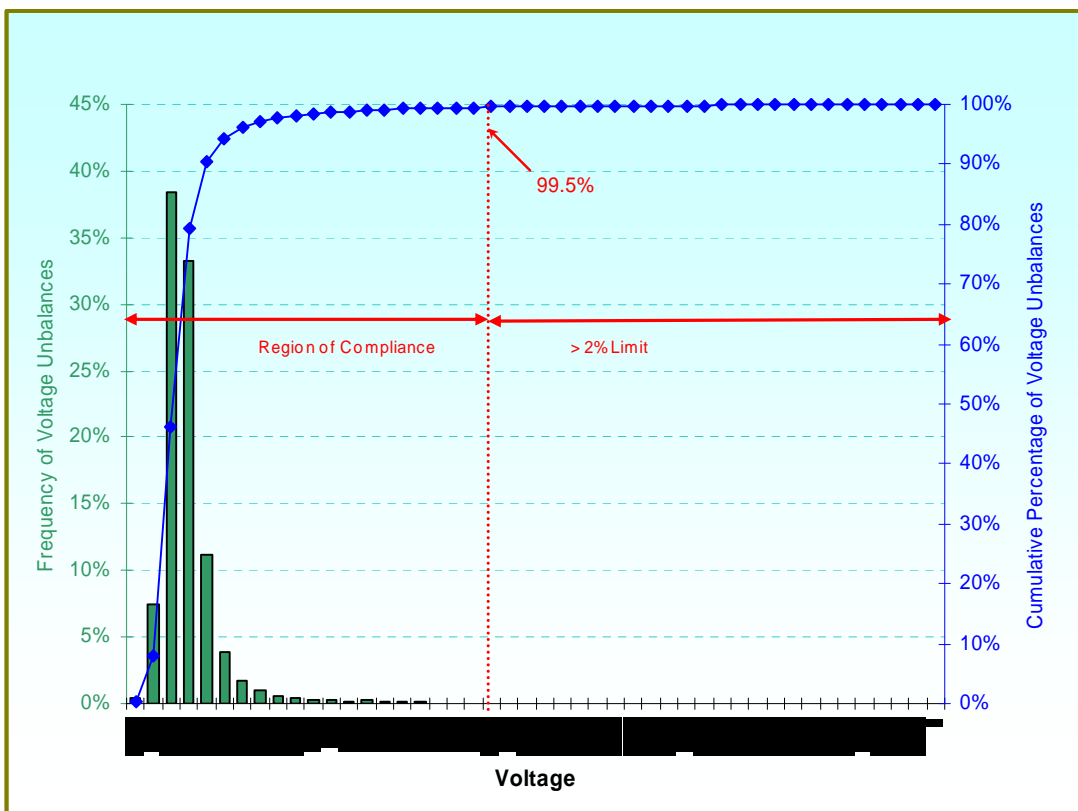


Figure 8 - Voltage unbalance for recorded distribution transformer sites for the 2008/09 financial year

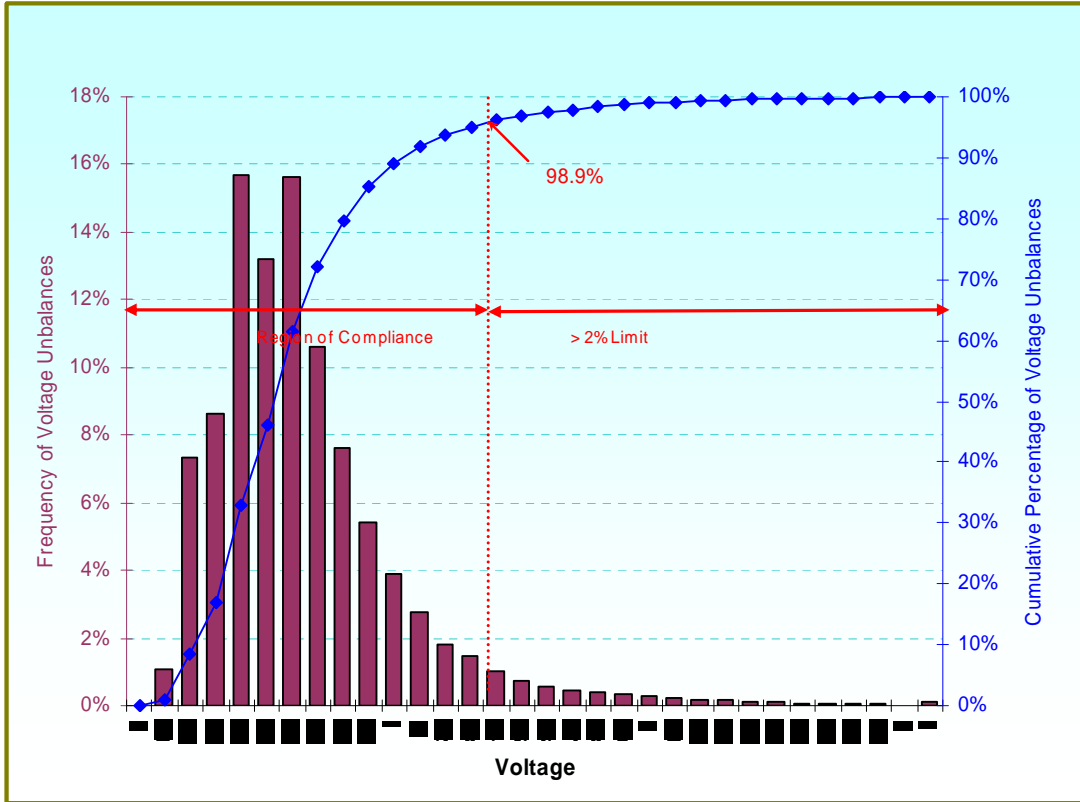


Figure 9 - Voltage unbalance for EDM I customer sites for the 2008/09 financial year

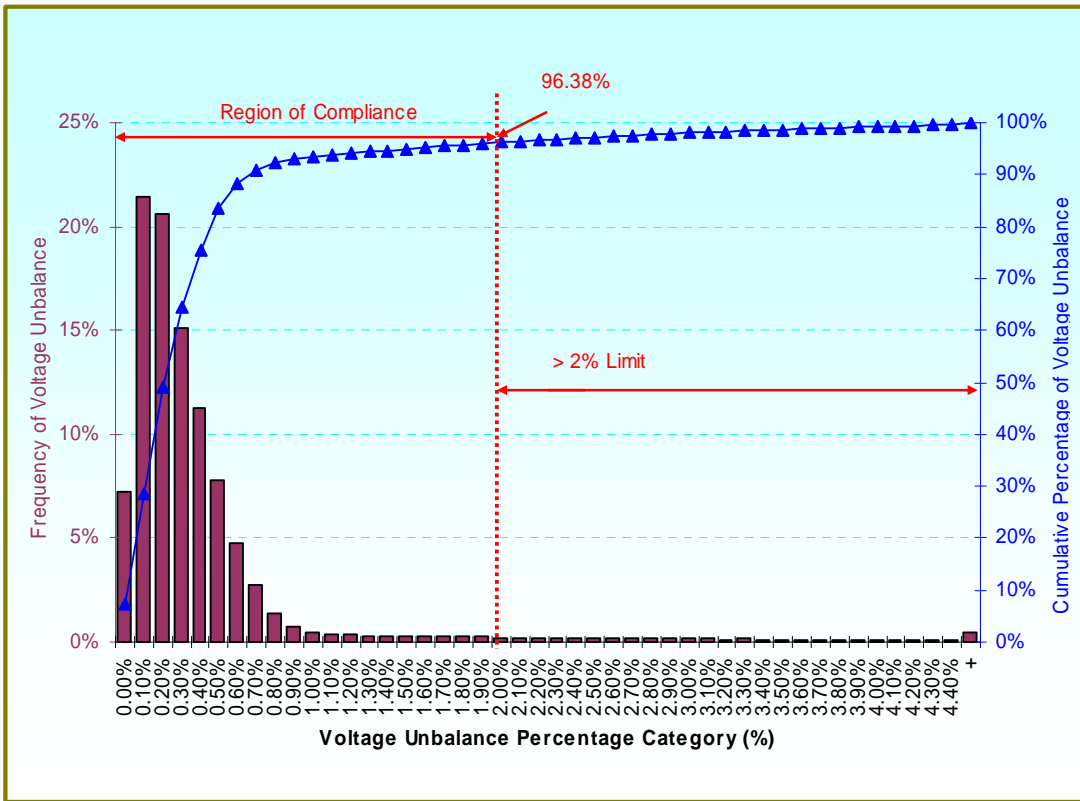


Figure 10 - Voltage unbalance for EDM I transformer sites for the 2008/09 financial year

5 Response to Item 5 of Schedule 1

5.1 Terminology applicable to this Section

Source data is the Trouble Call Management System (TCMS) and Trouble Call System (TCS).

Outages separated by 3 or more hours are treated as different outages.

5.2 Response

Out of a customer base of approximately 934,000, customers that have been interrupted for more than 12 hours:

- Customer premises are only counted once - 45,456; and
- Customer premises are counted each time an outage exceeds 12 hours - 48,680.

These outages were predominantly due to events beyond Western Power’s control such as storm activity (wind and lightning). Equipment failure on the distribution network also contributed to the extended outages, although the overall net contribution from equipment failures in 2008/09 was less than 2007/08.

There were 666 incidents where customers experienced outages exceeding 12 hours. Refer to Appendix A for a complete list of these outages. Figure 11 shows the customer interruptions lasting greater than 12 hours by fault cause.

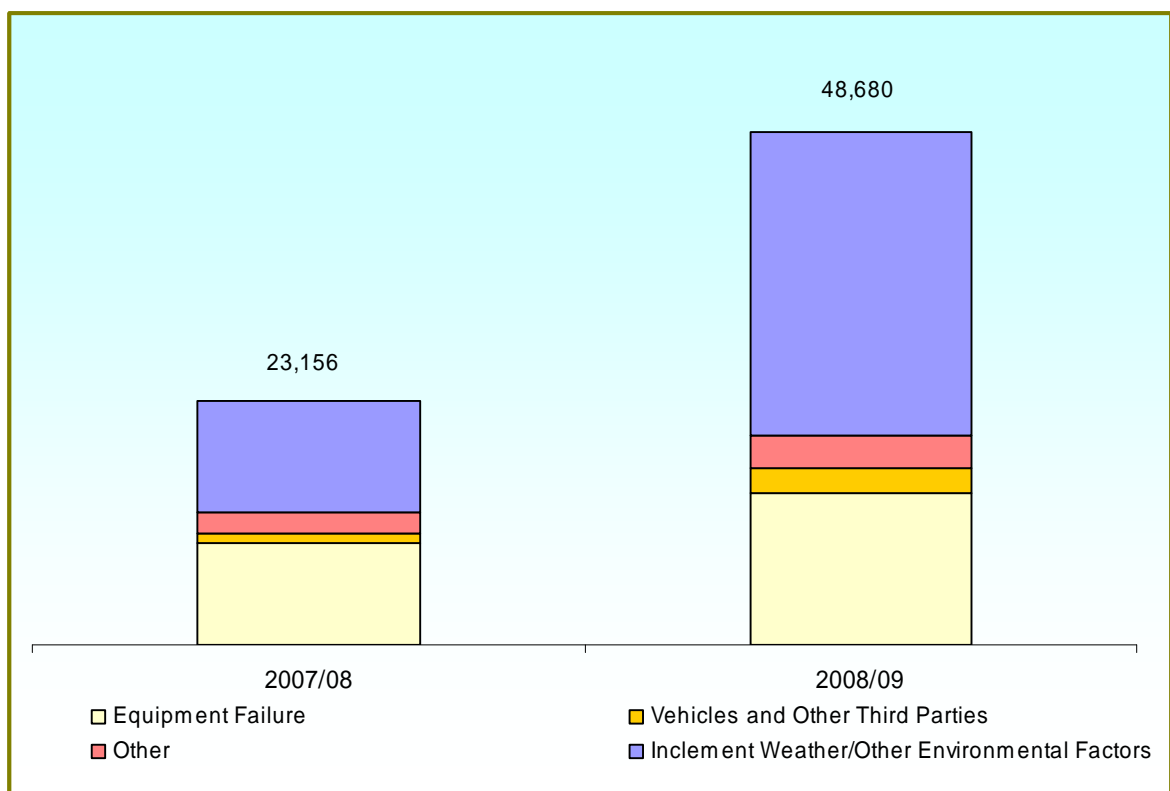


Figure 11 – Customer Interruptions lasting greater than 12 hours by Fault Cause

Table 2 - Customers that have been interrupted more than the number of times expressed in section 12(1) of the Code

	2007/08	2008/09
Urban area (including Perth CBD) customers that have been interrupted more than 9 times	27,006	16,733
Rural area customers that have been interrupted more than 16 times	1,168	739

Urban area customers experiencing more than 9 interruptions in 2008/09 were predominantly within the outer suburbs of the South East and Eastern parts of the Perth Metropolitan region and the Bunbury region. Rural area customers experiencing more than 16 interruptions in 2008/09 were predominantly within the Great Southern and Wheatbelt regions.

6 Response to Items 11, 12 and 13 of Schedule 1

6.1 Terminology applicable to these Sections

Source data is TCMS and TCS.

This data is inclusive of all protection device trips on the network greater than or equal to one minute that resulted in loss of power to customers.

In reference to Item 11 of Schedule 1 of the Code:

'SAIDI' (System Average Interruption Duration Index) refers to 11(d);

'SAIFI' (System Average Frequency Interruption Duration Index) refers to 11(b);

'CAIDI' (Customer Average Interruption Duration Index) refers to 11(a);

'ASAI' (Average Service Availability Index) refers to 11(c).

6.2 Response - Perth CBD

There was an increase in the number of customers interrupted due to customer equipment and underground distribution hardware. SAIDI and CAIDI decreased in the Perth CBD during the 2008/09 financial year due to the reduction in the fault restoration time to customers in the event of an outage.

Table 3 – Perth CBD area reliability

KPI	Units	Financial Year Ending 30 June				4 Year Average
		2005/06	2006/07	2007/08	2008/09	
SAIDI	Minutes	11	33	57	46	37
SAIFI		0.05	0.26	0.25	0.30	0.22
CAIDI	Minutes	218	128	223	152	170
ASAI	%	99.998	99.994	99.989	99.991	99.993

6.3 Response - urban areas other than Perth CBD

SAIDI and CAIDI increased in urban areas during 2008/09. This is in part due to outages from:

- planned interruptions which are conducted to expand and upgrade the network to mitigate unplanned interruptions (accounted for 17 per cent of interruption minutes);
- factors beyond Western Power's control such as storm damage (18 per cent of interruption minutes); and
- equipment failure of underground assets (7 per cent of interruption minutes). Western Power's siliconing program contributed to reductions in pole top fires.

Targeted maintenance work and line reinforcements have contributed to a reduction in the frequency of unplanned interruptions from equipment failure from overhead assets. Automated switchgear has reduced customer impact due to interruptions such as storms and other environmental events.

Table 4 – Urban areas other than the Perth CBD reliability

KPI	Units	Financial Year Ending 30 June				4 Year Average
		2005/06	2006/07	2007/08	2008/09	
SAIDI	Minutes	218	264	269	329	270
SAIFI		2.7	3	2.9	2.7	2.8
CAIDI	Minutes	81	87	92	122	95
ASAI	%	99.96	99.95	99.95	99.94	99.95

6.4 Response – isolated networks

There were no isolated networks in 2008/09.

6.5 Response – rural areas

SAIDI, CAIDI and SAIFI increased for rural areas during 2008/09. This is in part due to factors beyond Western Power's control such as:

- storm damage (23 per cent of interruption minutes);
- planned interruptions (12 per cent of interruption minutes), which are conducted to expand and upgrade the network to mitigate unplanned interruptions; and
- damage from bushfires (3 per cent of interruption minutes). Western Power's siliconing program contributed to reductions in pole top fires. There were also reductions in outages due to vegetation.

Targeted maintenance work and line reinforcements have contributed to a reduction in the frequency of unplanned interruptions from equipment failure from overhead assets. Automated switchgear has reduced customer impact due to interruptions such as storms and other environmental events.

Table 5 – Rural areas reliability

KPI	Units	Financial Year Ending 30 June				4 Year Average
		2005/06	2006/07	2007/08	2008/09	
SAIDI	Minutes	462	563	599	735	590
SAIFI		3.9	4.3	4.7	5.1	4.5
CAIDI	Minutes	119	131	128	145	132
ASAI	%	99.91	99.89	99.89	99.86	99.89

7 Response to Items 6, 7 and 8 of Schedule 1

7.1 Terminology applicable in this Section

Source data for complaints (Table 6) is based on records from TCMS that have been defined as power quality complaints and that have been subsequently directed for corrective action in the Distribution Quotation Management 2 Operational Data Storage (DQM2ODS) database.

7.2 Response

Table 6 - Complaints received in 2007/08 and 2008/09 - total and by discrete area as per Items 6 and 7 of Schedule 1 of the Code

Discrete Area	# Complaints	
	2007/08	2008/09
Perth CBD	12	39
Urban areas other than the Perth CBD	1,370	1,249
Rural areas	492	358
Isolated systems	0	0
Total	1,874	1,646

Complaints fell by 12 per cent in the 2008/09 financial year in comparison to the previous year. The total amount spent during 2008/09 addressing complaints (including materials and labour on the network) was \$6.21 million compared to \$9.2 million in 2007/08. This figure included the complaints received in Table 6 as well as complaints received prior to this time period.

8 Response to Item 9 of Schedule 1

Source data for failure to give notice of planned interruption (Table 7) is from the Cusrems and for the supply interruption payments is from the Extended Outage Payment Scheme (EOPS) databases.

Table 7 - Payments in 2007/08 and 2008/09 as per Items 8 of Schedule 1 of the Code

	2007/08		2008/09	
	Number	Value	Number	Value
Payments for failure to give required notice of a planned Interruption	241	\$4,820	364	\$18,200
Payments for supply interruptions exceeding 12 Hours	3,099	\$247,920	5,589	\$447,120

9 Response to Items 14 and 15 of Schedule 1

9.1 Terminology applicable to these Sections

Source data is TCMS and is inclusive of all protection device trips on the network greater than or equal to one minute that resulted in loss of power to customers.

Percentiles are selected over the customer premise count for each discrete area. For example, Table 9 and Figure 13 show that in 2008/09, 50 per cent of customers in urban areas had no more than 2 interruptions.

9.2 Average length of interruption

The 100th percentile figure for Rural is due to a cable failure at a substation resulting in loss of supply to a major customer. As there was no supply redundancy in the substation, the customer sourced alternate supply arrangements while repairs to the cable were carried out. The 100th percentile figure for Urban is predominantly due to extended outages attributed to significant storm events during the 2008/09 financial year (see Section 2).

Table 8 – Average length of interruption (minutes) percentile figures as per Item 14(a) of Schedule 1 of the Code

	25 th	50 th	75 th	90 th	95 th	98 th	100 th
Perth CBD	0	0	0	450	450	462	462
Urban (ex Perth CBD)	20	72	133	229	330	477	3,105
Rural	53	107	174	301	402	668	3,666

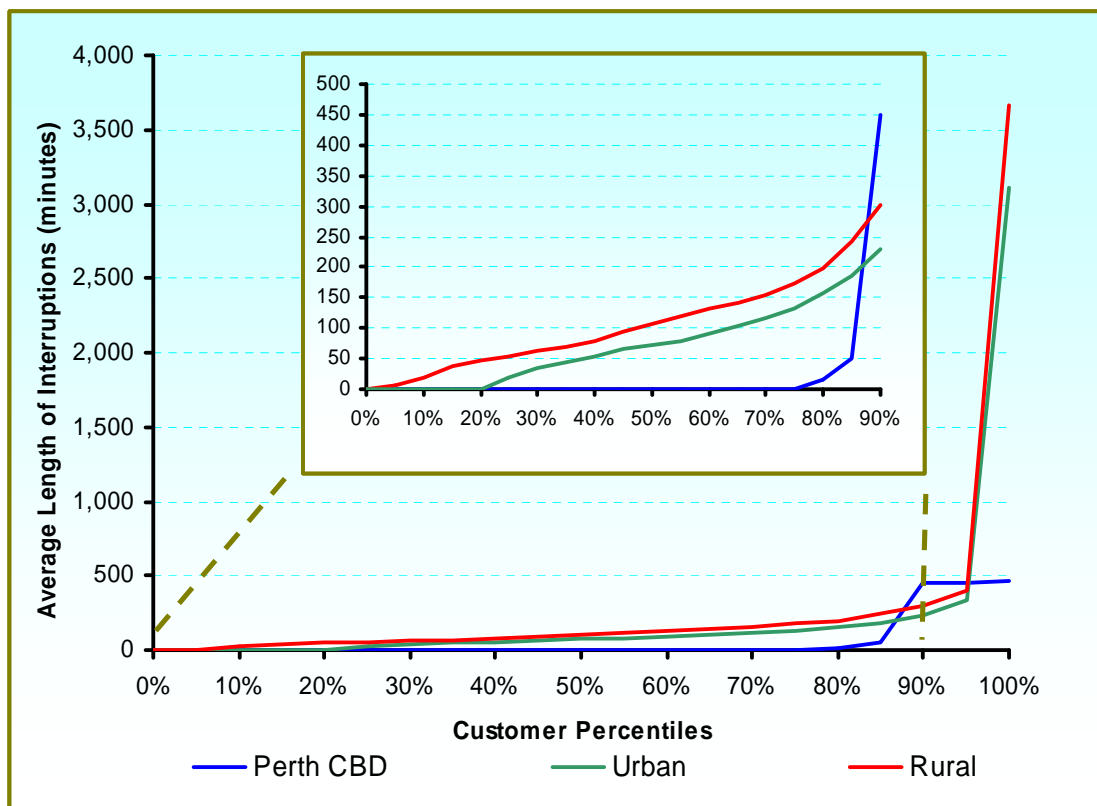


Figure 12 – Average length of interruption percentile distribution as per Item 15 of Schedule 1 of the Code

9.3 Number of interruptions

For 2008/09:

- Approximately 77% of CBD customers experienced no outages;
- Approximately 98% of urban area customers experienced 9 or less outages; and
- Approximately 99% of rural area customers experienced 16 or less outages.

Targeted remedial work for the worst served customers continues to be implemented to mitigate the current interruption frequency.

Table 9- Number of interruptions percentile figures as per Item 14(b) of Schedule 1 of the Code

	25th	50th	75th	90th	95th	98th	100th
Perth CBD	0	0	0	1	1	2	3
Urban (ex Perth CBD)	1	2	3	5	7	9	18
Rural	2	3	6	8	10	12	29

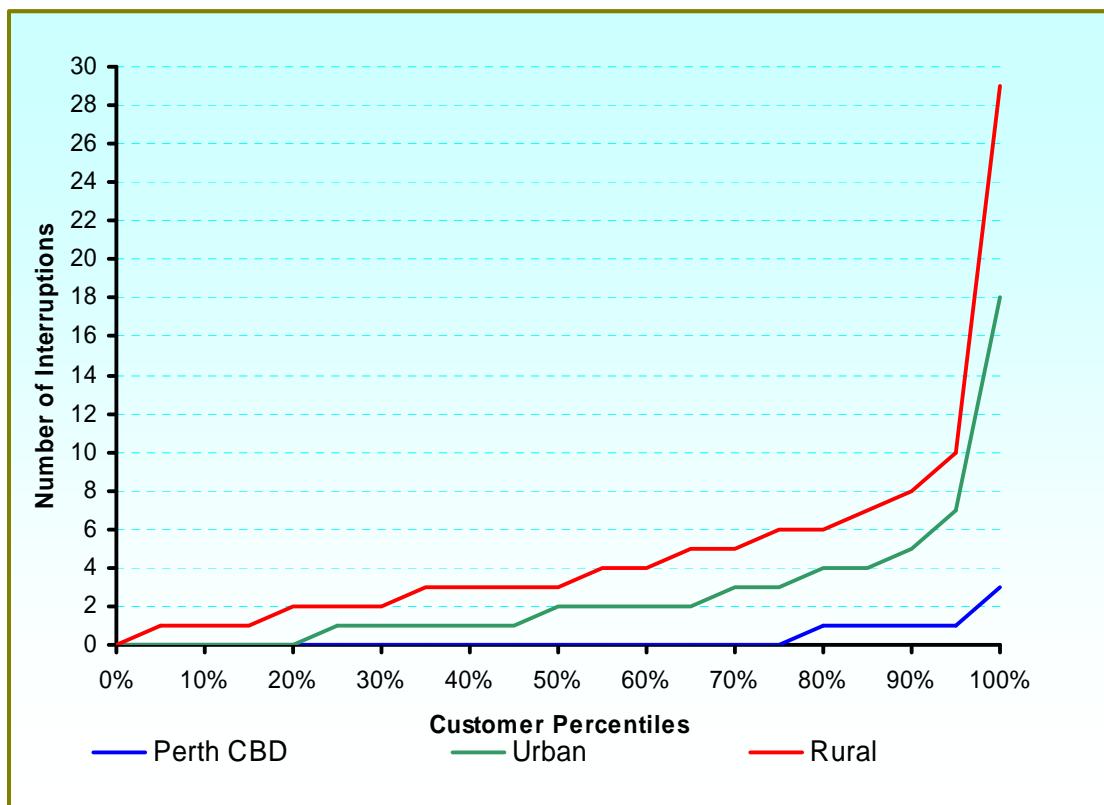


Figure 13 – Number of interruptions percentile distribution as per Item 15 of Schedule 1 of the Code

9.4 Total length of all interruptions

For 2008/09:

- Approximately 87% of Perth CBD customers experienced total outage minutes of less than 30 minutes;
- Approximately 52% of urban area customers experienced total outage minutes of less than 160 minutes;
- Approximately 47% of rural area customers experienced total outage minutes of less than 290 minutes;

The 100th percentile figures for Urban and Rural is predominantly due to extended outages attributed to significant storm events during the 2008/09 financial year (see Section 2).

Table 10 - Total length of interruptions (minutes) percentile figures as per Item 14(c) of Schedule 1 of the Code

	25th	50th	75th	90th	95th	98th	100th
Perth CBD	0	0	0	450	450	925	925
Urban (ex Perth CBD)	22	142	395	790	1,203	1,750	6,443
Rural	131	396	853	1,629	2,224	3,538	9,007

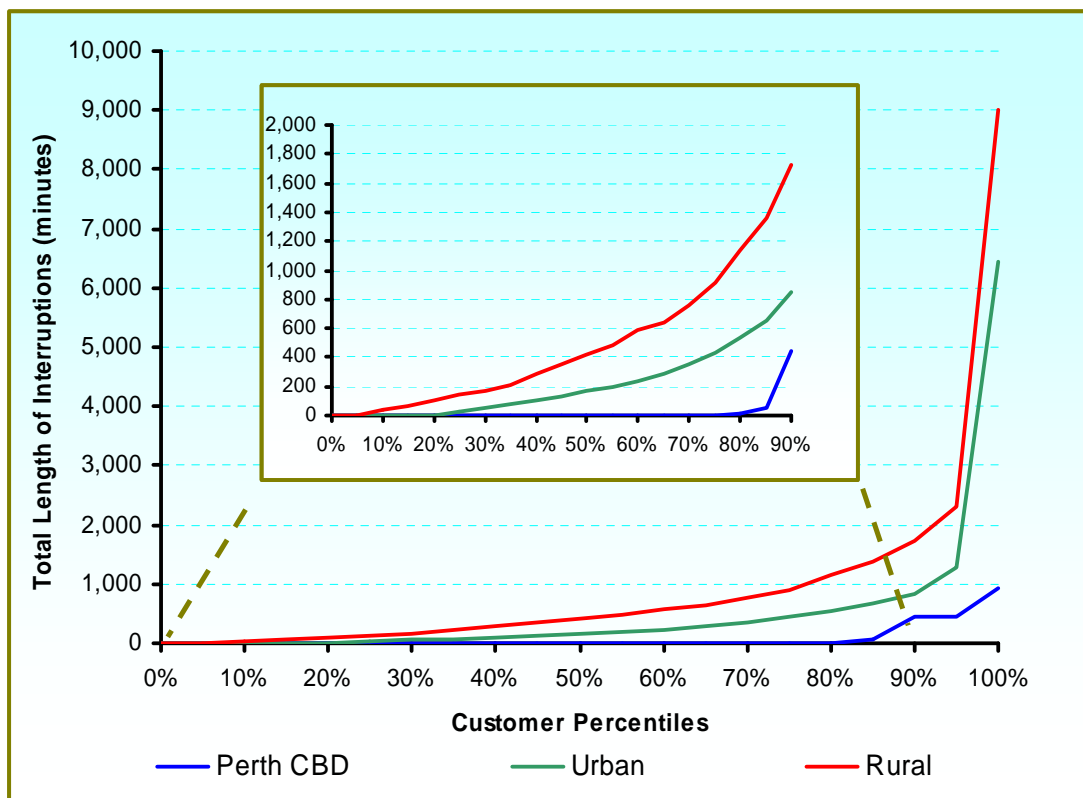


Figure 14 – Total length of interruptions percentile distribution as per Item 15 of Schedule 1 of the Code

Appendix A - List of Customer Outages Greater than 12 Hours

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
1	26.32	26.32	22
2	14.03	14.03	73
3	28.21	28.21	34
4	21.33	21.33	16
5	31.87	31.87	45
6	13.7	13.7	232
7	21.29	21.29	473
8	14.37	14.37	4
9	12.18	12.18	7
10	18.89	18.89	115
11	16.31	16.31	62
12	22.46	22.46	96
13	13.15	13.15	114
14	28.17	28.17	38
15	29.11	29.11	7
16	57.85	57.85	11
17	24.88	24.88	150
18	31.95	31.95	28
19	14.93	14.93	29
20	12.26	12.26	198
21	21.94	21.94	8
22	33.4	33.4	105
23	13.94	13.94	120
24	15.76	15.76	102
25	24.91	24.91	14
26	35.77	35.77	4
27	32.82	32.82	6
28	51.65	51.65	98
29	12.38	19.32	605
30	13.66	13.66	63
31	20.55	20.58	33
32	25.98	25.98	6
33	16.53	16.53	29
34	36.54	36.54	15
35	21.28	21.28	160
36	12.2	12.2	26
37	30.34	30.34	77
38	49.44	49.44	19
39	13.05	13.05	35
40	17.18	17.18	27
41	57.34	57.34	15
42	17.86	17.86	8
43	18.46	18.46	78
44	29.3	29.3	115
45	16.21	16.21	10
46	16.66	16.66	102
47	15.7	15.7	5

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
48	19.5	20.57	546
49	23.01	23.01	3
50	47.58	47.58	22
51	13.04	13.04	5
52	28.88	28.88	49
53	31.37	31.37	26
54	34.78	34.78	45
55	81.01	81.01	4
56	17.22	17.22	11
57	15.91	15.91	28
58	34.71	34.71	3
59	33.91	33.91	216
60	22.19	22.19	14
61	18.23	18.23	14
62	18.75	18.75	107
63	16.47	16.47	11
64	14.7	14.7	11
65	51.67	51.67	4
66	14.38	14.38	20
67	34.79	34.79	24
68	56.7	56.7	16
69	31.98	31.98	17
70	12.19	12.19	8
71	27.4	27.4	11
72	19.33	19.33	6
73	25.49	25.49	65
74	58.96	59.06	869
75	13.86	13.86	78
76	12.87	12.87	11
77	29.96	29.96	4
78	17.66	17.66	5
79	26.02	26.02	10
80	26.25	26.25	68
81	21.05	21.05	11
82	28.51	28.51	8
83	14.48	14.48	1272
84	12.17	12.17	1
85	20.85	20.85	7
86	18.85	19.91	25
87	23.23	23.23	50
88	15.88	36.26	145
89	14.84	14.84	32
90	20.07	20.07	59
91	14.78	14.78	105
92	42.7	42.7	3
93	12.58	15.23	269
94	21.76	21.76	137
95	19.82	19.82	10
96	28.9	28.9	89
97	13.93	13.93	78

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
98	64.41	64.41	1
99	27.94	27.94	52
100	28.2	28.2	24
101	26.36	26.36	54
102	15.19	15.37	636
103	12.95	12.95	60
104	19.37	19.37	1
105	50.26	50.26	10
106	13.64	13.64	7
107	16.1	16.1	4
108	13.45	13.45	11
109	17.18	17.18	61
110	57.05	57.05	4
111	18.33	18.33	61
112	21.48	21.48	8
113	12.73	13.3	56
114	22.88	22.88	11
115	26.66	26.66	1
116	18.54	18.54	128
117	52.18	52.18	3
118	22.5	22.5	44
119	15.85	15.85	35
120	14.01	14.01	22
121	16.61	16.61	20
122	13.79	13.79	21
123	14.45	14.45	11
124	13.56	13.56	115
125	25.15	25.15	18
126	18.48	18.48	129
127	59.05	59.05	367
128	15.37	15.37	14
129	60.03	60.03	13
130	22.06	22.06	20
131	13.42	13.42	58
132	15.17	15.17	68
133	24.95	24.95	5
134	54.61	54.61	14
135	23.38	23.38	30
136	14.49	16.22	67
137	13	30.26	317
138	72.86	72.86	3
139	25.44	29.71	118
140	32.11	36.64	476
141	15.89	18.26	23
142	14.86	14.86	73
143	40.23	41.35	151
144	12.73	12.73	1
145	14.18	14.18	250
146	14.27	14.27	65
147	16.65	16.65	1

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
148	21.42	21.42	11
149	18.15	18.15	11
150	12.68	12.68	65
151	19.38	19.38	3
152	16.52	16.52	8
153	15.72	15.72	14
154	16.35	17.63	49
155	14.42	14.42	414
156	12.33	12.33	18
157	12.08	12.08	5
158	14.2	14.2	56
159	19.05	19.13	2
160	13.93	13.93	10
161	12.13	12.13	18
162	13.53	13.53	6
163	16.28	16.28	58
164	27.17	27.17	12
165	26.98	26.98	124
166	14.12	14.12	21
167	17.28	17.28	4
168	15.7	15.7	7
169	12.8	15.1	13
170	19.12	19.12	5
171	17.28	17.28	2
172	19.2	19.2	18
173	18.22	18.22	4
174	12.58	13.55	50
175	14.93	14.93	8
176	16.07	16.07	13
177	13.67	13.67	56
178	17.45	17.45	16
179	12.18	12.18	180
180	16.55	16.55	24
181	26.68	26.68	2
182	20.5	20.5	8
183	24.58	24.58	18
184	22.92	24.18	16
185	44.05	44.05	8
186	18.33	18.33	7
187	17.3	17.3	16
188	19.47	19.47	31
189	12.03	12.03	13
190	19.93	19.93	18
191	14.6	14.6	7
192	12.78	12.78	28
193	36.78	36.78	7
194	14.33	14.33	1
195	15.98	15.98	2
196	12.08	12.08	15
197	14.82	14.82	49

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
198	12.23	12.23	25
199	16.87	16.87	24
200	12.27	12.27	93
201	33.4	33.4	38
202	23.03	23.03	1035
203	15.85	15.85	134
204	18.03	18.03	69
205	15.85	15.85	121
206	15.78	15.78	11
207	14.67	14.67	40
208	49.4	49.4	22
209	12.32	12.32	52
210	28.33	28.33	23
211	21.52	21.52	16
212	14.05	14.05	2
213	19.28	19.28	10
214	22.17	22.17	19
215	13.37	13.37	68
216	15.97	15.97	60
217	14.08	14.08	59
218	21.68	21.68	8
219	24.62	24.62	6
220	19.92	19.92	6
221	24.32	24.32	2
222	15.12	15.12	14
223	13.1	13.1	26
224	18.08	18.08	4
225	15.58	15.58	32
226	13.95	13.95	71
227	16.08	16.08	49
228	17.52	17.52	188
229	18.53	18.53	15
230	12.53	12.53	63
231	21.87	21.87	8
232	14.53	14.53	22
233	17.13	17.13	28
234	16.03	16.03	16
235	14.78	14.78	19
236	34.62	34.62	62
237	12.13	12.13	104
238	24.78	24.78	3
239	29.28	29.28	120
240	18.78	18.78	63
241	14.57	14.63	16
242	27.15	27.15	87
243	27.9	27.9	63
244	26.35	26.65	102
245	25.62	25.62	11
246	25.72	25.72	52
247	21.97	21.97	1

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
248	16.78	16.78	129
249	15.25	15.25	22
250	17.6	17.6	5
251	37.27	37.27	49
252	12.87	12.87	26
253	13.2	13.2	573
254	28.08	28.08	11
255	26.7	26.7	39
256	25.35	25.35	17
257	17.97	17.97	24
258	19.77	19.77	95
259	15.93	15.93	93
260	20.72	20.72	22
261	14.5	14.5	47
262	13.73	14.2	258
263	13.73	13.73	6
264	23.27	23.27	39
265	12.63	12.63	5
266	40.93	40.93	1
267	12.65	12.65	26
268	118.83	118.83	2
269	25.08	25.08	15
270	18.5	18.5	14
271	12.32	12.32	42
272	18.68	18.68	12
273	13.4	13.4	36
274	19.07	19.07	3
275	17.62	17.62	32
276	12.22	12.22	128
277	14.62	14.62	4
278	14.8	14.8	40
279	50.4	52.32	8
280	12.73	12.73	31
281	14.73	14.73	7
282	17.03	39.68	829
283	27.37	27.37	4
284	28.92	28.92	24
285	12.17	12.17	86
286	29.52	29.52	13
287	23	23	2
288	15.45	15.45	10
289	16.65	16.65	29
290	12.52	12.52	29
291	12.92	12.92	9
292	31.02	31.02	59
293	15.42	15.42	16
294	24.2	24.2	2
295	14	14	14
296	14.15	14.15	14
297	14.43	14.43	17

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
298	31.08	31.08	4
299	19.98	19.98	51
300	14.75	28.93	17
301	31	31	47
302	17.65	17.65	83
303	61.35	61.35	13
304	18.1	18.1	4
305	16.65	16.65	24
306	13.82	13.82	13
307	15.2	15.2	7
308	13.05	13.05	3
309	16.65	16.65	25
310	13.65	13.65	1
311	13.8	13.8	172
312	17.25	17.25	72
313	19.23	19.23	139
314	12.88	12.88	24
315	20.85	20.85	53
316	19	19	10
317	19.37	19.37	5
318	17.33	17.33	4
319	62.83	62.83	79
320	16.32	16.32	4
321	27.22	27.22	7
322	12.52	12.52	2
323	12.07	12.07	17
324	14.3	14.3	6
325	15.27	15.27	12
326	20.03	20.03	94
327	15.97	15.97	171
328	34.97	34.97	180
329	15.78	15.78	839
330	17.38	17.38	6
331	15.52	15.52	7
332	12.43	12.43	16
333	23.18	24.88	40
334	51.02	51.02	26
335	73.5	73.5	2
336	29.05	29.05	38
337	13.77	13.77	8
338	13.82	13.82	8
339	19.17	30.32	402
340	22.6	22.6	28
341	28.97	28.97	212
342	20.82	20.82	34
343	19.83	19.83	73
344	18.38	18.38	74
345	17.57	17.57	74
346	29.2	29.2	31
347	18.12	18.12	40

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
348	14.22	14.22	73
349	13.35	13.35	156
350	13.38	13.38	38
351	12.38	12.38	24
352	67.68	67.68	2
353	23.8	23.8	7
354	21.87	21.87	5
355	14.73	14.73	4
356	28.6	28.6	28
357	16.95	22.8	13
358	60.58	60.58	23
359	12.53	12.53	12
360	23.62	23.62	51
361	12.4	12.4	27
362	17.72	17.72	28
363	17.65	17.65	10
364	17.97	17.97	4
365	21.42	21.42	3
366	17.33	17.33	12
367	18.2	18.2	9
368	14.83	19	19
369	16.32	16.32	9
370	22.55	22.55	13
371	16.03	16.03	6
372	16.3	16.3	13
373	15	15	9
374	36.93	36.93	12
375	18.53	18.53	4
376	21.45	21.45	2
377	24.4	24.4	28
378	16.13	16.13	15
379	15.53	15.53	13
380	15.8	20.4	91
381	15.52	15.52	36
382	13.12	13.12	3
383	17.87	17.87	10
384	12.55	12.55	7
385	19.32	19.32	3
386	27.43	27.43	106
387	19.03	19.03	5
388	14.67	14.9	42
389	13.65	13.65	52
390	12.43	12.43	14
391	25.63	25.63	2
392	15.1	15.1	93
393	24.35	24.35	24
394	24.07	24.07	9
395	17.85	20.5	132
396	17.4	17.4	3
397	19.67	19.67	11

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
398	15.82	15.82	4
399	13.68	13.68	22
400	20.18	20.18	99
401	18.07	18.07	32
402	17.02	17.02	1154
403	16.35	16.35	3
404	16.13	16.13	22
405	19.75	19.75	3
406	16.23	16.23	1
407	14.92	14.92	19
408	25.92	25.92	5
409	35.7	35.7	50
410	20.77	20.77	22
411	12.22	12.22	6
412	13.62	13.62	85
413	15.92	15.92	30
414	13.22	13.22	9
415	12.62	12.62	30
416	16.28	16.28	4
417	14.78	14.78	35
418	16.15	16.15	71
419	20.9	20.9	1
420	18.73	18.73	12
421	25.7	25.7	9
422	16.58	16.58	6
423	19.58	19.58	28
424	22.7	22.7	6
425	14.58	106.97	4
426	16.6	19.85	177
427	16.78	16.78	18
428	32.38	32.38	22
429	17.83	17.83	22
430	14.67	14.67	71
431	24.72	24.72	98
432	26.82	26.82	4
433	22.37	22.37	41
434	33.77	33.77	1
435	18.3	18.3	10
436	22.67	22.67	13
437	19.75	19.75	9
438	13.45	13.45	2
439	19.2	19.2	23
440	13.43	13.43	15
441	12.63	12.63	69
442	28.73	28.73	2
443	18.23	18.23	88
444	18.8	18.8	5
445	17.35	18.37	468
446	23.03	23.03	42
447	13.42	13.42	17

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
448	18.97	18.97	873
449	18.08	18.08	7
450	20.4	20.4	10
451	23.1	23.1	5
452	18.67	18.67	7
453	12.23	12.23	8
454	15.85	15.85	9
455	22.12	22.12	12
456	13.5	13.5	7
457	13.17	13.17	15
458	21.38	21.38	150
459	26.77	26.77	41
460	28.1	28.1	88
461	27.9	27.9	66
462	29.3	29.3	162
463	30.73	30.73	59
464	50.43	50.43	32
465	22.7	22.7	231
466	35.95	35.95	70
467	13.3	13.3	3070
468	26.78	26.78	65
469	43.88	43.88	24
470	20.72	20.72	312
471	25.43	25.43	118
472	47.93	47.93	56
473	22.25	26.48	276
474	39.47	39.47	74
475	30.22	30.22	129
476	34.68	34.68	84
477	23	23	51
478	24.07	24.07	9
479	18.37	41.93	206
480	26.25	26.25	66
481	14.98	14.98	1164
482	22.33	22.33	30
483	20.93	20.93	1
484	113.35	113.35	1
485	25.52	25.52	13
486	18.6	18.6	73
487	20.57	20.57	8
488	21.7	21.7	22
489	24.17	24.17	177
490	20.77	20.77	55
491	14.32	19.7	209
492	25.2	25.2	26
493	24.85	24.85	3
494	20.57	20.57	21
495	32.72	32.72	65
496	18.6	18.6	120
497	18.32	19.05	24

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
498	32.38	32.38	148
499	31.02	31.02	32
500	13.27	13.27	15
501	43.57	43.57	127
502	18.45	18.45	105
503	14.08	14.08	37
504	17.92	17.92	88
505	16.05	16.05	131
506	19.62	19.62	17
507	17.92	17.92	80
508	18.65	18.65	3
509	37.98	37.98	25
510	19.05	19.05	86
511	20.18	20.18	69
512	22.03	22.03	53
513	17.12	17.12	23
514	13.78	13.78	59
515	13.47	13.47	9
516	28.32	28.32	85
517	16.68	16.68	12
518	16.97	16.97	14
519	18.38	18.38	39
520	23.02	23.02	35
521	15.27	15.27	13
522	15.2	15.2	27
523	15.6	15.6	97
524	37.93	37.93	9
525	20.77	20.77	88
526	29.28	29.28	109
527	19.95	19.95	21
528	16.25	16.25	104
529	63.5	63.5	66
530	15.65	15.65	22
531	16.55	16.55	26
532	16.68	16.68	42
533	25.53	25.53	13
534	15.65	15.65	64
535	23.03	23.03	75
536	42.07	42.07	96
537	16.78	16.78	110
538	24.05	24.05	4
539	29.05	29.05	272
540	17.85	17.85	6
541	15.3	15.3	52
542	19.5	19.5	49
543	39.38	39.38	58
544	18.68	18.88	128
545	23.67	23.67	62
546	24.23	24.23	50

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
547	51.73	51.73	51
548	30.2	30.2	36
549	19.72	19.72	144
550	22.47	22.47	7
551	21.8	21.8	106
552	18.82	18.82	25
553	20.17	20.17	133
554	14.97	14.97	57
555	12.03	12.03	66
556	23.77	23.77	20
557	27.18	27.18	13
558	18.28	18.28	193
559	25.88	25.88	66
560	18.82	18.82	1
561	20.2	20.22	20
562	18.05	18.05	48
563	22.4	22.4	23
564	16.23	16.23	7
565	12.53	12.53	120
566	21.12	21.12	11
567	16.67	16.67	13
568	15.25	15.25	1
569	16.97	16.97	117
570	13.48	13.48	26
571	14.8	14.8	9
572	18.18	18.18	5
573	13.73	13.73	10
574	13.75	13.75	23
575	14.75	14.75	65
576	15.45	15.45	15
577	15.55	15.55	31
578	12.82	12.82	30
579	13.03	13.03	10
580	16.95	16.95	4
581	18.55	18.55	6
582	16.05	16.05	29
583	20.53	20.53	82
584	20.53	20.53	103
585	20.27	20.27	4
586	28.17	28.17	9
587	16.12	16.12	17
588	13.5	13.5	2
589	21.07	21.07	20
590	21.02	21.02	66
591	17.92	17.92	25
592	21.4	21.4	224
593	14.57	14.57	49
594	16.95	16.95	54
595	12.18	12.95	147
596	20.65	20.65	110

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
597	61.38	61.38	1
598	15.15	15.15	40
599	18.8	18.8	81
600	18.93	18.93	87
601	26.07	26.07	71
602	13.15	13.15	29
603	58.1	58.1	4
604	18.45	18.45	15
605	30.1	30.12	33
606	15.68	15.68	19
607	13.77	13.77	11
608	19.83	19.83	53
609	14.75	14.75	64
610	17.97	17.97	15
611	29.18	29.18	34
612	13.62	13.62	157
613	15.63	18.27	85
614	18.32	18.32	1
615	17.02	17.02	28
616	12.45	12.45	56
617	12.05	12.05	17
618	18.48	18.48	74
619	13.07	13.07	46
620	31.18	31.18	56
621	25.42	25.42	171
622	20.42	20.42	72
623	50.83	50.83	153
624	13	13	17
625	12.03	12.03	36
626	29.4	29.4	146
627	28.77	28.77	45
628	13.97	13.97	125
629	33.35	33.35	75
630	13.82	13.82	10
631	29.75	29.75	15
632	28.3	28.3	16
633	26.98	26.98	70
634	28.3	28.3	4
635	26.87	26.87	5
636	21.92	21.92	15
637	25.8	25.8	19
638	19.05	19.05	24
639	40.98	40.98	58
640	21.58	21.58	76
641	24.62	24.62	9
642	24.53	24.53	40
643	22.88	22.88	57
644	23.23	23.23	71
645	17.05	17.05	7
646	12.65	12.65	110

Outage	First Restoration (hours) after 12 hours	Final Restoration (hours)	Customers Affected
647	19.87	19.87	130
648	20.63	20.63	17
649	13.62	13.62	62
650	13.43	13.43	105
651	15.58	15.58	107
652	13.58	13.58	28
653	16.8	16.8	35
654	35.47	35.47	83
655	19.07	19.07	8
656	19.53	19.53	10
657	25.45	25.45	16
658	14.03	14.03	9
659	14.57	14.57	37
660	15.27	15.27	22
661	12.6	12.6	9
662	14.08	14.08	1126
663	14.03	14.03	29
664	12.97	12.97	70
665	16.43	16.43	24
666	18	18	54