



Network Quality and Reliability of Supply

Annual Report

2006/07

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Audited by: Logica CMG

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INTRODUCTION

This report has been produced to meet the requirements of the Electricity Industry (Network Quality and Reliability of Supply) Code 2005.

It is acknowledged that there is room for improvement in the quality & reliability of supply performance on some power systems. Horizon Power is striving to improve the performance of these systems by implementing targeted asset management plans.

AUDIT BY INDEPENDENT EXPERT

Division 3 of the Electricity Industry (Network Quality and Reliability of Supply) Code 2005 requires that Horizon Power arrange for an independent expert to audit, and report on the operation of the systems that Horizon Power has in place for monitoring its compliance with the code.

Horizon Power has appointed Logica CMG Pty. Ltd. to perform the audit of its systems for compliance with the code. Logica CMG is an international company that provides management and IT consultancy, systems integration and outsourcing services to clients across diverse markets including telecoms, financial services, energy and utilities, industry, distribution and transport and the public sector. Among its core global competencies Logica CMG lists knowledge management and regulatory reporting.

HORIZON POWER

Horizon Power is the Network Operator for the North West Interconnected System and thirty isolated systems.



REPORTS - Code Schedule 1 – Information to be published

Clause 4 and 10

Clause 4(a) Number of breaches of each provision of the Code:

Quality of Supply	2005/06	2006/07
Voltage fluctuations	UD	0
Harmonics	UD	0

UD = Under development. Although there is a process in place to investigate and correct voltage and harmonics complaints, it did not include the recording of out of limits events.

Clause 4(b) Remedial action taken for each provision:

Voltage Fluctuations

Location	Action Taken
	N/A

Harmonics

Location	Action Taken
	N/A

N/A = Not Applicable.

Continuous monitoring of voltage and harmonic distortion is done at the substation busbar. Temporary power quality monitoring equipment is installed on the network for specific problem monitoring in response to a customer power quality complaint.

Clause 5 – Significant interruptions to small use customers.

*Clause 5(a) Number of premises that experienced interruptions greater than 12 hours continuous: **8,882.***

*Clause 5(b) Number of premises that experienced more than 16 interruptions: **2,872.***

Detailed analysis of interruptions where duration is greater than 12 hours.

SUBSTATION	DATE	DURATION [MINS]	CUSTOMERS AFFECTED	CAUSE
LAKE ARGYLE	27-Aug-06	842	19	Ord Hydro Generation Failure
ESPERANCE	04-Nov-06	1,563	2	Blown fuse – Cause unknown.
ESPERANCE	04-Nov-06	942	7	Lightning Storm
ESPERANCE	16-Nov-06	1,191	7	Lightning Storm
ESPERANCE	16-Nov-06	1,139	21	Lightning Storm
ESPERANCE	16-Nov-06	1,232	10	Lightning Storm
ESPERANCE	16-Nov-06	1,431	22	Lightning Storm
ESPERANCE	18-Nov-06	738	9	Transformer failure
ESPERANCE	18-Nov-06	735	22	Transformer failure
DERBY	27-Nov-06	2,112	2	Equipment failure
ESPERANCE	29-Dec-06	743	529	Pole down.
ESPERANCE	04-Jan-07	2,880	563	Severe Storm (med)
ESPERANCE	05-Jan-07	3,153	708	Severe Storm (med)
ESPERANCE	05-Jan-07	2,926	33	Severe Storm (med)
ESPERANCE	05-Jan-07	1,692	102	Severe Storm (med)
ESPERANCE	05-Jan-07	1,126	154	Severe Storm (med)
ESPERANCE	06-Jan-07	1,509	359	Repairs after storm
ESPERANCE	08-Jan-07	908	68	Repairs after storm
WEDGEFIELD	08-Mar-07	3,135	191	Cyclone George (med)
WEDGEFIELD	08-Mar-07	2,644	430	Cyclone George (med)
MURDOCK DRIVE	08-Mar-07	1,150	671	Cyclone George (med)
ANDERSON ST	08-Mar-07	841	1691	Cyclone George (med)
MURDOCK DRIVE	08-Mar-07	791	326	Cyclone George (med)
MURDOCK DRIVE	08-Mar-07	2,173	1071	Cyclone George (med)
MURDOCK DRIVE	08-Mar-07	803	536	Cyclone George (med)
ANDERSON ST	08-Mar-07	2,064	162	Cyclone George (med)
MURDOCK DRIVE	08-Mar-07	3,986	16	Cyclone George (med)
ANDERSON ST	08-Mar-07	1,927	127	Cyclone George (med)
WEDGEFIELD	08-Mar-07	2,574	162	Cyclone George (med)
WEDGEFIELD	08-Mar-07	1,886	22	Cyclone George (med)
MURDOCK DRIVE	09-Mar-07	6,763	38	Cyclone George (med)
ANDERSON ST	09-Mar-07	5,460	42	Cyclone George (med)
MURDOCK DRIVE	09-Mar-07	6,864	35	Cyclone George (med)
ANDERSON ST	09-Mar-07	5,321	63	Cyclone George (med)
MURDOCK DRIVE	10-Mar-07	6,281	29	Cyclone George (med)
ANDERSON ST	10-Mar-07	4,620	71	Cyclone George (med)
ANDERSON ST	10-Mar-07	5,834	58	Cyclone George (med)
MURDOCK DRIVE	10-Mar-07	6,168	37	Cyclone George (med)
ANDERSON ST	10-Mar-07	4,563	73	Cyclone George (med)
ANDERSON ST	10-Mar-07	4,385	60	Cyclone George (med)
ANDERSON ST	10-Mar-07	5,388	54	Cyclone George (med)
WEDGEFIELD	12-Mar-07	1,467	22	Repairs after cyclone
WEDGEFIELD	12-Mar-07	3,404	38	Repairs after cyclone
ANDERSON ST	12-Mar-07	1,677	41	Repairs after cyclone
ANDERSON ST	13-Mar-07	1,621	47	Repairs after cyclone
ANDERSON ST	13-Mar-07	1,481	58	Repairs after cyclone
WEDGEFIELD	13-Mar-07	1,465	17	Repairs after cyclone
MURDOCK DRIVE	13-Mar-07	1,455	11	Repairs after cyclone
WEDGEFIELD	13-Mar-07	3,150	22	Repairs after cyclone
ESPERANCE	16-Apr-07	792	7	Lightning Storm
ESPERANCE	23-Apr-07	1,204	21	Equipment failure
NULLAGINE	21-May-07	886	10	Damaged pillar

Note: med = major event day.

Clause 6 and 10- Total number of complaints received

2005/06	2006/07
160	185

Clause 7 and 10- Number of customer complaints in each discrete area:

DISCRETE AREA	2005/06	2006/07
NWIS	35	32
Ardayaloon	N/A	0
Bidyadanga	N/A	0
Broome	25	12
Camballin	0	0
Carnarvon	8	3
Cue	1	1
Denham	0	0
Derby	5	8
Esperance	38	93
Exmouth	9	14
Fitzroy Crossing	1	1
Gascoyne Junction	0	0
Halls Creek	3	2
Hopetoun	7	12
Kununurra	13	3
Lake Argyle	0	0
Laverton	1	0
Leonora	1	1
Marble Bar	0	0
Meekatharra	1	2
Menzies	0	0
Mount Magnet	0	0
Norseman	4	1
Nullagine	0	0
Onslow	5	1
Sandstone	0	0
Warmun	0	0
Wiluna	1	0
Wyndham	2	0
Yalgoo	0	0
Horizon Power	160	185

Clause 8 and 10- Total amount spent addressing complaints.

2005/06	2006/07
\$240,692	\$261,292

Clause 9 and 10 - Payments to customers for failure to meet certain standards

The number and total payments made to customers for failure to give required notice of planned interruption.

2005/06		2006/07	
Number	Cost	Number	Cost
0	\$0	0	\$0

The number and total payments made to customers for supply interruptions exceeding 12 hours.

2005/06		2006/07	
Number	Cost	Number	Cost
124	\$9,920	323	\$25,840

Clause 11, 12 and 13(a) - Average Length of Interruption of Supply to Customer Premises in Minutes (CAIDI)

DISCRETE AREA	2003/04	2004/05	2005/06	2006/07	AVERAGE
NWIS	93.48	82.61	163.26	402.49	185.46
Ardyaloon	N/A	N/A	N/A	0	0
Bidyadanga	N/A	N/A	N/A	0	0
Broome	43.48	39.33	48.04	52.12	45.74
Camballin	45.00	61.54	211.43	38.04	89.00
Carnarvon	28.50	36.59	36.28	29.44	32.70
Cue	28.00	256.92	178.67	52.74	129.08
Denham	38.48	114.00	20.29	190.60	90.84
Derby	9.09	75.00	41.08	91.90	54.27
Esperance	53.68	26.00	32.24	123.12	58.76
Exmouth	60.32	31.79	47.41	55.25	48.69
Fitzroy Crossing	25.50	32.00	44.36	15.61	29.37
Gascoyne Junction	8.33	40.00	10.80	0	14.79
Halls Creek	23.03	59.38	52.17	43.92	44.63
Hopetoun	99.30	67.10	95.69	142.70	101.20
Kununurra	20.49	37.73	38.15	37.09	33.36
Lake Argyle	3.00	38.50	16.35	222.14	70.00
Laverton	19.52	68.52	31.53	54.48	43.51
Leonora	20.80	33.21	51.67	47.68	38.34
Marble Bar	15.00	-	-	9.78	6.19
Meekatharra	27.39	26.90	41.99	36.99	33.32
Menzies	12.50	76.67	26.37	85.44	50.24
Mount Magnet	32.71	39.29	40.36	24.48	34.21
Norseman	96.76	-	48.44	44.49	47.42
Nullagine	167.20	15.56	48.65	78.95	77.59
Onslow	123.13	33.68	213.13	48.48	104.60
Sandstone	233.46	27.00	-	11.22	67.92
Warmun	N/A	N/A	N/A	3.54	3.54
Wiluna	10.29	84.62	23.85	168.19	71.74
Wyndham	17.97	32.54	42.29	44.69	34.37
Yalgoo	36.61	30.00	42.72	32.76	35.52
Horizon Power	-	36.27	71.91	126.70	58.72

Clause 11, 12 and 13(b) - Average Number of Interruptions of Supply to Customer Premises (SAIFI)

DISCRETE AREA	2003/04	2004/05	2005/06	2006/07	AVERAGE
NWIS	0.46	1.15	3.45	2.53	1.90
Ardyaloon	N/A	N/A	N/A	0	0
Bidyadanga	N/A	N/A	N/A	0	0
Broome	2.3	1.5	2.45	3.30	2.39
Camballin	3.2	2.6	0.42	3.68	2.48
Carnarvon	8	9.1	3.67	7.40	7.04
Cue	2.5	1.3	0.98	5.33	2.53
Denham	3.3	0.5	0.99	0.25	1.26
Derby	4.4	1.8	5.02	4.10	3.83
Esperance	11.7	15	8.96	11.26	11.73
Exmouth	3.1	2.8	5.18	10.79	5.47
Fitzroy Crossing	8	14.5	4.55	4.73	7.95
Gascoyne Junction	8.4	6.3	2.58	0	4.32
Halls Creek	3.3	9.7	6.92	11.55	7.87
Hopetoun	4.3	14.5	9.38	14.93	10.78
Kununurra	8.2	14.1	8.86	12.20	10.84
Lake Argyle	1	8	3.14	5.95	4.52
Laverton	12.4	5.4	1.53	3.70	5.76
Leonora	2.5	5.6	2.25	7.99	4.59
Marble Bar	1	0	0	0.59	0.40
Meekatharra	2.3	8.7	0.99	2.14	3.53
Menzies	2	4.5	2.58	4.21	3.32
Mount Magnet	5.9	7	4.45	5.49	5.71
Norseman	7.1	0	13.33	10.29	7.68
Nullagine	13.2	9.9	4.76	5.46	8.33
Onslow	1.6	3.8	9.70	3.60	4.68
Sandstone	2.6	1	0	0.96	1.14
Warmun	N/A	N/A	N/A	2.07	2.07
Wiluna	6.8	3.9	3.43	3.07	4.30
Wyndham	7.9	13.8	9.37	15.44	11.63
Yalgoo	6.2	0.4	1.97	1.64	2.55
Horizon Power		6.12	5.09	6.11	5.77

**Clause 11, 12 and 13(c) - Average Percentage Of Time That Electricity Has
Been Supplied To Customer Premises.**

DISCRETE AREA	2003/04	2004/05	2005/06	2006/07	AVERAGE
NWIS	99.992%	99.982%	99.893%	99.806%	99.918%
Ardyaloon	N/A	N/A	N/A	0	0
Bidyadanga	N/A	N/A	N/A	0	0
Broome	99.981%	99.989%	99.978%	99.967%	99.979%
Camballin	99.973%	99.970%	99.983%	99.973%	99.975%
Carnarvon	99.957%	99.937%	99.975%	99.959%	99.957%
Cue	99.987%	99.936%	99.967%	99.947%	99.959%
Denham	99.976%	99.989%	99.996%	99.991%	99.988%
Derby	99.992%	99.974%	99.961%	99.928%	99.964%
Esperance	99.881%	99.926%	99.945%	99.736%	99.872%
Exmouth	99.965%	99.983%	99.953%	99.887%	99.947%
Fitzroy Crossing	99.961%	99.912%	99.962%	99.986%	99.955%
Gascoyne Junction	99.987%	99.952%	99.995%	100%	99.983%
Halls Creek	99.986%	99.890%	99.931%	99.903%	99.928%
Hopetoun	99.919%	99.815%	99.829%	99.595%	99.789%
Kununurra	99.968%	99.899%	99.936%	99.914%	99.929%
Lake Argyle	99.999%	99.941%	99.990%	99.749%	99.920%
Laverton	99.954%	99.930%	99.991%	99.962%	99.959%
Leonora	99.990%	99.965%	99.978%	99.928%	99.965%
Marble Bar	99.997%	100.000%	100.000%	99.999%	99.999%
Meekatharra	99.988%	99.955%	99.992%	99.985%	99.980%
Menzies	99.995%	99.934%	99.987%	99.932%	99.962%
Mount Magnet	99.963%	99.948%	99.966%	99.974%	99.963%
Norseman	99.870%	100.000%	99.877%	99.913%	99.915%
Nullagine	99.581%	99.971%	99.956%	99.918%	99.856%
Onslow	99.963%	99.976%	99.607%	99.967%	99.878%
Sandstone	99.885%	99.995%	100.000%	99.998%	99.969%
Warmun	N/A	N/A	N/A	99.999%	99.999%
Wiluna	99.987%	99.937%	99.984%	99.902%	99.953%
Wyndham	99.973%	99.915%	99.925%	99.869%	99.920%
Yalgoo	99.957%	99.998%	99.984%	99.990%	99.982%
Horizon Power	--	99.958%	99.930%	99.849%	99.890%

Clause 11, 12 and 13(d) - Average Total Length of All Interruptions of Supply to Customer Premises in Minutes (SAIDI)

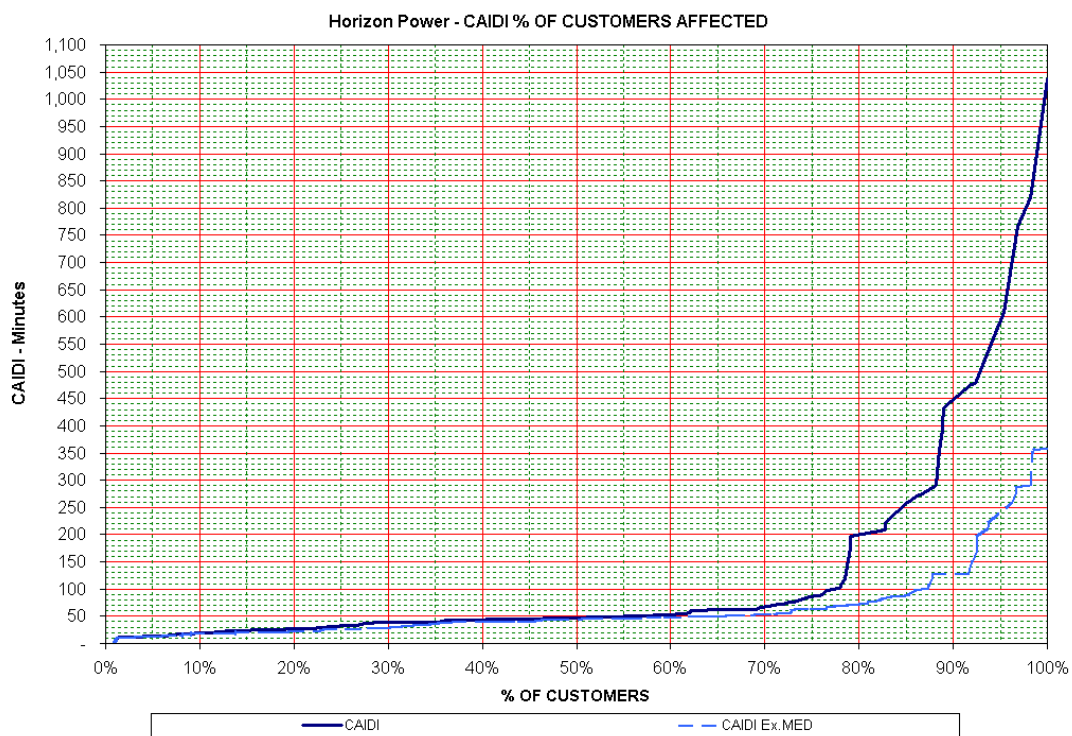
DISCRETE AREA	2003/04	2004/05	2005/06	2006/07	AVERAGE
NWIS	43	95	563	1,018	430
Ardyaloon	N/A	N/A	N/A	0	0
Bidyadanga	N/A	N/A	N/A	0	0
Broome	100	59	118	172	112
Camballin	144	160	89	140	133
Carnarvon	228	333	133	218	228
Cue	70	334	175	281	215
Denham	127	57	20	48	63
Derby	40	135	206	377	190
Esperance	628	390	289	1,386	673
Exmouth	187	89	246	596	279
Fitzroy Crossing	204	464	202	74	236
Gascoyne Junction	70	252	28	0	87
Halls Creek	76	576	361	507	380
Hopetoun	427	973	898	2,130	1,107
Kununurra	168	532	338	452	373
Lake Argyle	3	308	51	1,322	421
Laverton	242	370	48	202	215
Leonora	52	186	116	381	184
Marble Bar	15	0	0	6	5
Meekatharra	63	234	42	79	104
Menzies	25	345	68	360	199
Mount Magnet	193	275	180	134	195
Norseman	687	0	646	458	448
Nullagine	2207	154	232	431	756
Onslow	197	128	2,067	175	642
Sandstone	607	27	0	11	161
Warmun	N/A	N/A	N/A	7	7
Wiluna	70	330	82	516	250
Wyndham	142	449	396	690	419
Yalgoo	227	12	84	54	94
Horizon Power		222	366	774	454

Note: Figures in red indicate where SAIDI is greater than 290 minutes.

Clause 14(a) - Horizon Power - Average Length of Interruption – Frequency Distribution

Percentile	Minutes
25 th	31.83
50 th	47.71
75 th	86.52
90 th	448.39
95 th	590.05
98 th	809.38
100 th	1,038.04

Clause 15(a) – CAIDI Frequency Graph.

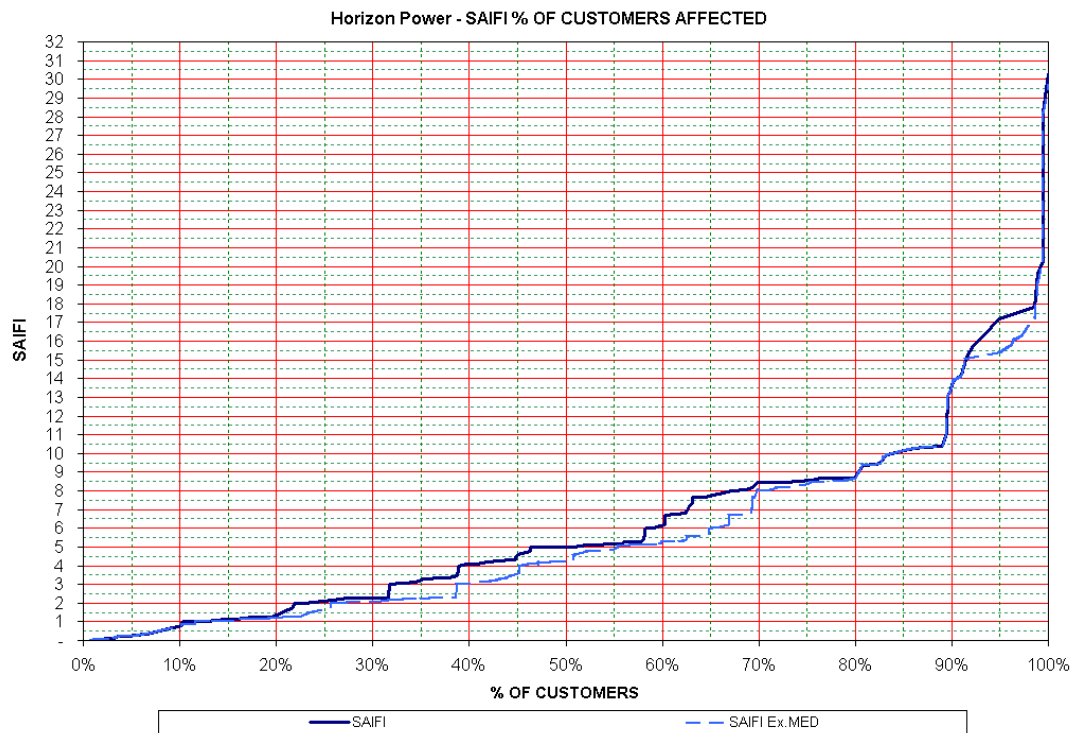


During the period 01/07/2006 to 30/06/2007 of those customers who experienced an interruption, approximately 60% had an interruption of less than 60 minutes.

Clause 14(b) - Horizon Power - Number of Interruptions – Frequency Distribution

Percentile	Interruptions
25 th	2.11
50 th	5.00
75 th	8.57
90 th	13.61
95 th	17.23
98 th	17.72
100 th	30.32

Clause 15(b) – SAIFI Frequency Graph.

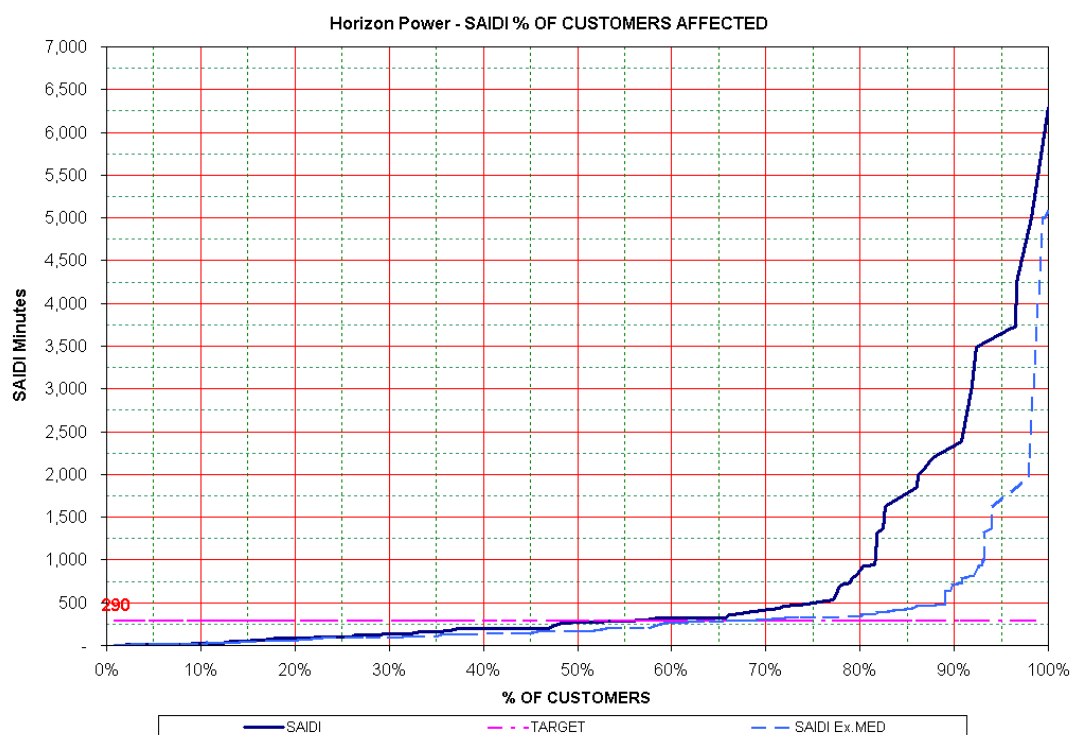


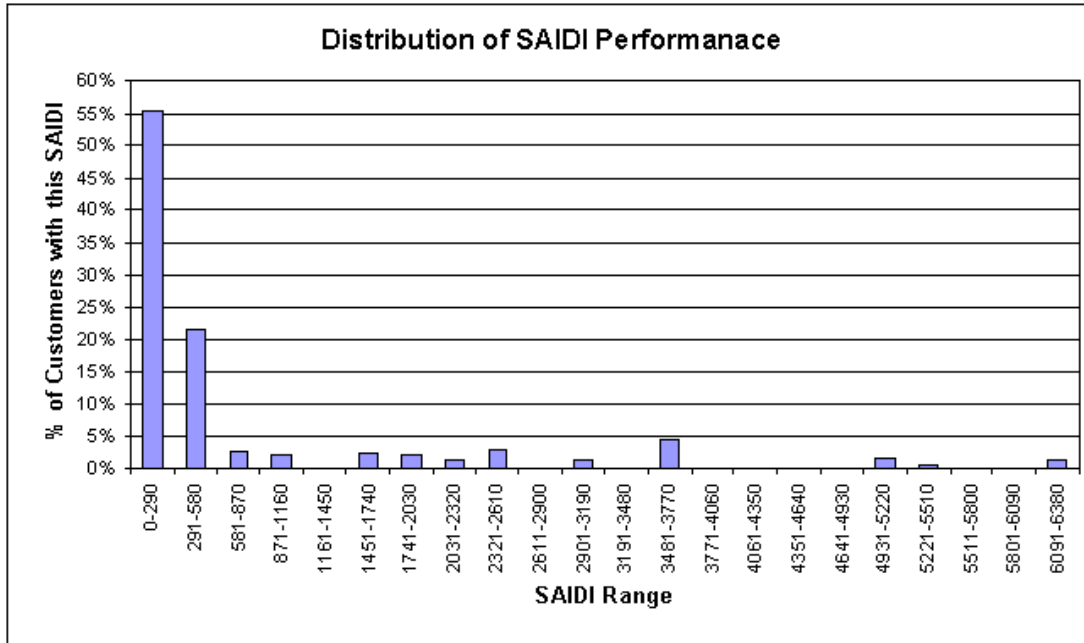
During the period 01/07/2006 to 30/06/2007 approximately 92% of customers experienced less than 16 outages.

Clause 14(d) - Horizon Power – Total Length of all Interruptions – Frequency Distribution

Percentile	Minutes
25 th	102
50 th	275
75 th	498
90 th	2,337
95 th	3,644
98 th	4,933
100 th	6,289

Clause 15(d) – SAIDI Frequency Graph





During the period 01/07/2005 to 30/06/2006 approximately 56% of customers experienced outages with a duration of less than 290 minutes. If major event days are excluded, this is increased to approximately 68%.

EFFECT OF MAJOR EVENT DAYS

Major event days occurred on the 4/1/07 and 5/1/07 due to the major storm, which affected Esperance and 8/3/07, 9/3/07 and 10/3/07 due to Cyclone George, which affected Port Hedland. The SAIDI for Horizon Power with these outages excluded was 383.

APPENDIX A

Major Event Days

Major event days are days on which the impact of system faults is statistically greater than normal. These faults are due to unusually severe events that are outside the control of Horizon Power, for example a very severe cyclone or widespread flooding. This report makes reference to the impact of major event days where they have had a significant impact on the statistics.

Major Event Days are identified using the IEEE 1366 2.5 Beta Method. Horizon Power has only three years of accurate daily data available. Therefore for this report daily historic data for 2003/04, 2005/06 and 2006/07 was used. The 2007/08 report will use four years data with each subsequent year adding another year until five years data is available.

IEEE 1366-2003 Section 4.5 Major Event Day Classification

The following process (“Beta Method”) is used to identify MEDs. Its purpose is to allow major events to be studied separately from daily operation, and in the process, to better reveal trends in daily operation that would be hidden by the large statistical effect of major events.

A major event day is a day in which the daily system SAIDI exceeds a threshold value T_{MED} . The SAIDI index is used as the basis of this definition since it leads to consistent results regardless of utility size and because SAIDI is a good indicator of operational and design stress. Even though SAIDI is used to determine the major event days, all indices should be calculated based on removal of the identified days.

In calculating daily system SAIDI, any interruptions that span multiple days is accrued to the day on which the interruption begins.

The major event day identification threshold value T_{MED} , is calculated at the end of each period (typically one year) for use during the next reporting period s follows:

- a) Collect values of daily SAIDI for five sequential years ending on the last day of the last complete reporting period. If fewer than five years of historic data are available, use all available historical data until five years of historical data are available.
- b) Only those days that have a SAIDI/Day value will be used to calculate the T_{MED} (do not include days that did not have any interruptions).
- c) Take the natural log (ln) of each daily SAIDI value in the data set.
- d) Find α (Alpha), the average of the logarithms (also known as the log-average) of the data set.
- e) Find β (Beta), the standard deviation of the logarithms (also known as the log-standard deviation) of the data set.
- f) Compute the major event day threshold T_{MED} , using equation 25.

$$T_{MED} = e^{(\alpha+2.5\beta)} \quad (25)$$

- g) Any day with daily SAID greater than the threshold value T_{MED} that occurs during the subsequent reporting period is classified as a major event day.