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MEC



Sharon M. Suzuki
President

May 20, 2013

The Honorable Chair and Members of the
Hawaii Public Utilities Commission
Kekuanaoa Building
465 South King Street, First Floor
Honolulu, Hawaii 96813

PUBLIC UTILITIES
COMMISSION

MAY 20 P 3:48

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Dear Commissioners:

Subject: MECO Annual Service Reliability Report for 2012

Maui Electric Company, Limited respectfully submits a copy of its Annual Service Reliability Report for the year 2012.

Sincerely,

Sharon M. Suzuki

Attachment

c: Division of Consumer Advocacy (with Attachment)

MAUI ELECTRIC COMPANY, LIMITED
ANNUAL SERVICE RELIABILITY REPORT
2012

Prepared by
Transmission and Distribution Department

March 25, 2013

INTRODUCTION

This is the 2012 annual service reliability report for Maui Electric Company, Limited (MECO). The year-end average number of electric customers increased from 68,010 in 2011 to 68,575 in 2012 (a 0.83% increase). The 2012 peak demand for the system was 199.1 MW (evening peak), 5 MW higher than the peak demand in 2011; the highest system peak demand remains at 210.9 MW set on the evening of October 11, 2004.

The system interruption summaries (Attachments A and B) for the past year and the system reliability indices for the five prior years are presented to depict the quality of service provided to the electrical energy consumer.

Attachment C, contains the definition of terms and the reliability indices explanations and equations.

Indices measure reliability in terms of the overall availability of electrical service (ASAI), the frequency or number of times MECO's customers experience an outage during the year (SAIFI), the average length of time an interrupted customer is out of power (CAIDI), and the average length of time MECO's customers are out of power during the year (SAIDI). SAIDI is an indication of overall system reliability because it is the product of SAIFI and CAIDI and incorporates the impact of frequency and duration of outages on MECO's total customer base (in this case 68,575 customers).

ANALYSIS

This analysis of the annual system reliability for MECO is for the year 2012. To determine the relative level of reliability, the statistics for five prior years, 2007 through 2011, are used for comparison.

The reliability indices are calculated using the data from all sustained¹ system outages except customer maintenance outages. If data normalization is required, it is done using the guidelines specified in the report on reliability that was prepared for the Public Utilities Commission, titled "Methodology for Determining Reliability Indices for HECO Utilities," dated December 1990. The guidelines indicate that normalization is allowed for "abnormal" situations such as hurricanes, tsunamis, earthquakes, floods, catastrophic equipment failures, and single outages that cascade into a loss of load greater than 10% of the system peak load. These normalizations are made in calculating the reliability indices because good engineering design takes into account safety, reliability, utility industry standards, and economics, and cannot always plan for catastrophic events.

¹An electrical service interruption of more than one minute. (The majority of peer companies in the Edison Electric Institute association use a threshold of five minutes to identify sustained interruptions.)

2012 RESULTS

Annual Service Reliability Indices

The annual service reliability for 2012 was ranked third for the best CAIDI and ranked fifth for the best SAIFI, SAIDI and ASA in the past 6 years in terms of the indices for all events. The reliability results for all events in 2012 and five prior years are shown below in Table 1 through Table 4. The normalized reliability results for all events in 2012 and five prior years are shown below in Table 5 through Table 8. The reliability results comparing T&D and generation related outages with all events in 2012 and five prior years are shown below in Table 8 through Table 16. The normalized reliability results comparing T&D and generation related outages in 2012 and five prior years are shown below in Table 16 through Table 24.

Table 1: Annual Service Reliability Indices – All Islands with All Events

	2007	2008	2009	2010	2011	2012
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	240028.0	163120.0	124864.0	131294.0	170379.0	195618.0
Customer-Hours Interrupted	576110.1	224208.8	195853.4	103416.1	210185.7	248500.5
SAIDI (Minutes)	525.90	201.35	175.06	92.05	185.43	217.43
CAIDI (Minutes)	144.01	82.47	94.11	47.26	74.02	76.22
SAIFI (Occurrence)	3.652	2.442	1.860	1.948	2.505	2.853
ASA (Percent)	99.8997	99.9617	99.9667	99.9824	99.9646	99.9586

Table 2: Annual Service Reliability Indices – Maui with All Events

	2007	2008	2009	2010	2011	2012
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	230080.0	146230.0	118205.0	110350.0	156145.0	181244.0
Customer-Hours Interrupted	559458.6	197033.8	189744.8	70072.9	194603.0	199620.7
SAIDI (Minutes)	550.87	190.74	182.66	67.12	184.68	187.89
CAIDI (Minutes)	145.89	80.85	96.31	38.10	74.78	66.08
SAIFI (Occurrence)	3.776	2.359	1.896	1.762	2.470	2.843
ASA (Percent)	99.8949%	99.9637%	99.9652%	99.9872%	99.9648%	99.9643%

Table 3: Annual Service Reliability Indices – Molokai with All Events

	2007	2008	2009	2010	2011	2012
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	8491.0	11902.0	4452.0	18473.0	8018.0	12171.0
Customer-Hours Interrupted	15595.5	24045.4	4989.6	31258.9	7022.2	47466.7
SAIDI (Minutes)	299.15	458.15	95.01	596.35	133.29	893.63
CAIDI (Minutes)	110.20	121.22	67.25	101.53	52.55	234.00
SAIFI (Occurrence)	2.715	3.780	1.413	5.874	2.537	3.819
ASA (Percent)	99.9429%	99.9128%	99.9819%	99.8862%	99.9746%	99.8300%

Table 4: Annual Service Reliability Indices – Lanai with All Events

	2007	2008	2009	2010	2011	2012
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	1457.0	4988.0	2207.0	2471.0	6216.0	2203.0
Customer-Hours Interrupted	1056.1	3129.7	1119.1	2084.3	8560.4	1413.1
SAIDI (Minutes)	38.06	111.77	40.74	77.15	316.27	51.60
CAIDI (Minutes)	43.49	37.65	30.42	50.61	82.63	38.49
SAIFI (Occurrence)	0.875	2.969	1.339	1.524	3.828	1.341
ASA (Percent)	99.9927%	99.9787%	99.9922%	99.9853%	99.9397%	99.9902%

Table 5: Annual Service Reliability Indices - All Islands with Normalization

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	170,445.0	75,764.0	108,368.0	67,481.0	101,268.0	81,428.0
Customer-Hours Interrupted	177,607.7	114,000.7	173,602.0	60,006.6	145,710.8	125,836.1
SAIDI (Minutes)	162.13	102.39	155.18	53.41	128.55	110.10
CAIDI (Minutes)	62.53	90.29	96.09	53.35	86.33	92.72
SAIFI (Occurrence)	2.593	1.134	1.615	1.001	1.489	1.187
ASA (Percent)	99.9692	99.9805	99.9705	99.9898	99.9755	99.9791

Table 6: Annual Service Reliability Indices - Maui with Normalization

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	161215.0	73414.0	106498.0	65654.0	99,729.0	77,968.0
Customer-Hours Interrupted	162066.0	109806.9	169242.7	55954.1	144,404.5	119,045.4
SAIDI (Minutes)	159.58	106.30	162.92	53.60	137.04	112.05
CAIDI (Minutes)	60.32	89.74	95.35	51.14	86.88	91.61
SAIFI (Occurrence)	2.646	1.184	1.709	1.048	1.577	1.223
ASA (Percent)	99.9696	99.9798	99.9689	99.9898	99.9739	99.9787

Table 7: Annual Service Reliability Indices - Molokai with Normalization

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	7,773.0	1,393.0	1,284.0	1,498.0	1,252.0	3,229.0
Customer-Hours Interrupted	14,485.7	3,746.5	3,748.6	3,800.1	1,218.5	6,338.9
SAIDI (Minutes)	277.86	71.38	71.38	72.50	23.13	119.34
CAIDI (Minutes)	111.82	161.37	175.17	152.21	58.39	117.79
SAIFI (Occurrence)	2.485	0.442	0.407	0.476	0.396	1.013
ASA (Percent)	99.9470	99.9864	99.9864	99.9862	99.9956	99.9773

Table 8: Annual Service Reliability Indices - Lanai with Normalization

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	1457.0	957.0	586.0	329.0	287.0	231.0
Customer-Hours Interrupted	1056.1	447.4	610.8	252.4	87.8	451.7
SAIDI (Minutes)	38.06	15.98	22.24	9.34	3.24	16.50
CAIDI (Minutes)	43.49	28.05	62.54	46.04	18.36	117.33
SAIFI (Occurrence)	0.875	0.570	0.356	0.203	0.177	0.141
ASA (Percent)	99.9927	99.9970	99.9958	99.9982	99.9994	99.9969

NOTE:

- 2007*
 - Data normalized to exclude the 01/29/07 Kona Storm
 - Data normalized to exclude the 12/05/07 Kona Storm
- 2008*
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai
 - Data normalized to exclude the 03/15/08 Flashover
 - Data normalized to exclude the 04/02/08 Equipment Failure
 - Data normalized to exclude the 08/05/08 Equipment Failure
 - Data normalized to exclude the 08/07/08 Deterioration, Corrosion
 - Data normalized to exclude the 12/17/08 Equipment Failure
- 2009*
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai
 - Data normalized to exclude the 01/16/09 High Winds
 - Data normalized to exclude the 06/19/09 High Winds
- 2010*
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai
 - Data normalized to exclude the 03/28/10 – 04/01/2010 High Winds
 - Data normalized to exclude the 06/07/10 Flashover
 - Data normalized to exclude the 12/09/10 – 12/10/10 Kona Storm
- 2011*
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai
 - Data normalized to exclude the 01/10/11 High Winds
 - Data normalized to exclude the 01/12/11 – 01/14/11 High Winds and Lightning Storm
 - Data normalized to exclude the 12/24/11 High Winds
- 2012*
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai
 - Data normalized to exclude the 02/07/12 – 02/08/12 High Winds
 - Data normalized to exclude the 09/05/12 Operator Error
 - Data normalized to exclude the 11/06/12 Flashover
 - Data normalized to exclude the 12/04/12 Substation Fire
 - Data normalized to exclude various equipment failures and faults on Lanai and Molokai

T&D vs. Generation – All Events

Table 9: Annual Service Reliability Indices for All Islands – T&D

	2007	2008	2009	2010	2011	2012
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	190877.0	83683.0	109218.0	89347.0	129554.0	120420.0
Customer-Hours Interrupted	537490.1	118731.8	184174.3	82311.0	188364.0	182315.6
SAIDI (Minutes)	490.65	106.63	164.62	73.27	166.18	159.52
CAIDI (Minutes)	168.95	85.13	101.18	55.28	87.24	90.84
SAIFI (Occurrence)	2.904	1.253	1.627	1.326	1.905	1.756
ASA (Percent)	99.9064	99.9797	99.9686	99.9860	99.9683	99.9697

Table 10: Annual Service Reliability Indices for All Islands - Generation

	2007	2008	2009	2010	2011	2012
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	49151.0	79437.0	15646.0	41947.0	40825.0	75198.0
Customer-Hours Interrupted	38620.1	105477.0	11679.1	21105.1	21821.7	66185.0
SAIDI (Minutes)	35.25	94.73	10.44	18.79	19.25	57.91
CAIDI (Minutes)	47.14	79.67	44.79	30.19	32.07	52.81
SAIFI (Occurrence)	0.748	1.189	0.233	0.622	0.600	1.097
ASA (Percent)	99.9933	99.9820	99.9980	99.9964	99.9963	99.9890

Table 11: Annual Service Reliability Indices for Maui – T&D

	2007	2008	2009	2010	2011	2012
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	182779.0	79431.0	106913.0	80270.0	121962.0	109200.0
Customer-Hours Interrupted	521846.7	111233.9	179116.6	62462.0	179049.6	134348.7
SAIDI (Minutes)	513.84	107.68	172.43	59.83	169.92	126.46
CAIDI (Minutes)	171.30	84.02	100.52	46.69	88.08	73.82
SAIFI (Occurrence)	3.000	1.282	1.715	1.281	1.929	1.713
ASA (Percent)	99.9020	99.9795	99.9671	99.9886	99.9676	99.9759

Table 12: Annual Service Reliability Indices for Maui - Generation

	2007	2008	2009	2010	2011	2012
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	47301.0	66799.0	11292.0	30080.0	34183.0	72044.0
Customer-Hours Interrupted	37611.9	85799.9	10628.2	7610.9	15553.4	65272.0
SAIDI (Minutes)	37.03	83.06	10.23	7.29	14.76	61.44
CAIDI (Minutes)	47.71	77.07	56.47	15.18	27.30	54.36
SAIFI (Occurrence)	0.776	1.078	0.181	0.48	0.541	1.130
ASA (Percent)	99.9929	99.9842	99.9980	99.9986	99.9972	99.9883

Table 13: Annual Service Reliability Indices for Molokai – T&D

	2007	2008	2009	2010	2011	2012
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	7877.0	3892.0	1668.0	7914.0	3261.0	10338.0
Customer-Hours Interrupted	15365.3	7272.6	4433.4	19294.9	2753.4	47081.8
SAIDI (Minutes)	294.73	138.57	84.42	368.11	52.26	886.38
CAIDI (Minutes)	117.04	112.12	159.47	146.28	50.66	273.25
SAIFI (Occurrence)	2.518	1.236	0.529	2.516	1.032	3.244
ASA (Percent)	99.9438	99.9736	99.9839	99.9298	99.9900	99.8314

Table 14: Annual Service Reliability Indices for Molokai - Generation

	2007	2008	2009	2010	2011	2012
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	614.0	8010.0	2784.0	10559.0	4757.0	1833.0
Customer-Hours Interrupted	230.2	16772.7	556.2	11964.0	4268.9	385.0
SAIDI (Minutes)	4.42	319.58	10.59	228.25	81.03	7.25
CAIDI (Minutes)	22.50	125.64	11.99	67.98	53.84	12.60
SAIFI (Occurrence)	0.196	2.544	0.884	3.357	1.505	0.575
ASA (Percent)	99.9992	99.9392	99.9980	99.9565	99.9845	99.9986

Table 15: Annual Service Reliability Indices for Lanai – T&D

	2007	2008	2009	2010	2011	2012
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	221.0	360.0	637.0	1163.0	4331.0	882.0
Customer-Hours Interrupted	278.2	225.3	624.4	554.1	6561.0	885.1
SAIDI (Minutes)	10.02	8.05	22.73	20.51	242.40	32.32
CAIDI (Minutes)	75.52	37.55	58.81	28.59	90.89	60.21
SAIFI (Occurrence)	0.133	0.214	0.387	0.717	2.667	0.537
ASA (Percent)	99.9981	99.9985	99.9957	99.9961	99.9538	99.9939

Table 16: Annual Service Reliability Indices for Lanai - Generation

	2007	2008	2009	2010	2011	2012
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	1236.0	4628.0	1570.0	1308.0	1885.0	1321.0
Customer-Hours Interrupted	777.9	2904.4	494.7	1530.1	1999.5	528.0
SAIDI (Minutes)	28.03	103.73	18.01	56.64	73.87	19.28
CAIDI (Minutes)	37.76	37.65	18.91	70.19	63.64	23.98
SAIFI (Occurrence)	0.742	2.755	0.953	0.807	1.161	0.804
ASA (Percent)	99.9947	99.9803	99.9966	99.9892	99.9859	99.9963

T&D vs. Generation – With Normalization**Table 17: Normalized Annual Service Reliability Indices for All Islands – T&D**

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	124,179.0	69,556.0	96,773.0	44,699.0	92,997.0	53,218.0
Customer-Hours Interrupted	146,602.2	111,656.4	162,889.6	53,754.4	139,223.9	111,142.1
SAIDI (Minutes)	133.83	100.28	145.60	47.85	122.83	97.24
CAIDI (Minutes)	70.83	96.32	100.99	72.16	89.82	125.31
SAIFI (Occurrence)	1.889	1.041	1.442	0.663	1.367	0.776
ASA (Percent)	99.9745	99.9809	99.9722	99.9909	99.9766	99.9815

Table 18: Normalized Annual Service Reliability Indices for All Islands – Generation

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	65,728	66,810	67,126	67,405	68,010	68,575
Customer Interruptions	46,266.0	6,208.0	11,595.0	22,782.0	8,271.0	28,210.0
Customer-Hours Interrupted	31,005.5	2,344.3	10,712.4	6,252.2	6,486.9	14,694.0
SAIDI (Minutes)	28.30	2.11	9.58	5.57	5.72	12.86
CAIDI (Minutes)	40.21	22.66	55.43	16.47	47.06	31.25
SAIFI (Occurrence)	0.704	0.093	0.173	0.338	0.012	0.411
ASA (Percent)	99.9946	99.9996	99.9982	99.9989	99.9989	99.9976

Table 19: Normalized Annual Service Reliability Indices for Maui – T&D

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	116,799.0	68,001.0	95,206.0	42,938.0	91,828.0	50,306.0
Customer-Hours Interrupted	132,068.6	107,798.7	158,614.5	49,743.3	137,980.4	104,638.8
SAIDI (Minutes)	130.04	104.35	152.69	47.65	130.94	98.49
CAIDI (Minutes)	67.84	95.12	99.96	69.51	90.16	124.80
SAIFI (Occurrence)	1.917	1.097	1.527	0.685	1.452	0.789
ASA (Percent)	99.9752	99.9801	99.9709	99.9909	99.98	99.9813

Table 20: Normalized Annual Service Reliability Indices for Maui – Generation

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	60,935	61,981	62,328	62,640	63,225	63,745
Customer Interruptions	44,416.0	5,413.0	11,292.0	22,716.0	7,901.0	27,662.0
Customer-Hours Interrupted	29,997.4	2,008.2	10,628.2	6,210.7	6,424.1	14,406.7
SAIDI (Minutes)	29.54	1.94	10.23	5.95	6.10	13.56
CAIDI (Minutes)	40.52	22.26	56.47	16.40	48.78	31.25
SAIFI (Occurrence)	0.729	0.087	0.181	0.363	0.125	0.434
ASA (Percent)	99.9944	99.9996	99.9980	99.9989	99.9988	99.9974

Table 21: Normalized Annual Service Reliability Indices for Molokai – T&D

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	7,159.0	1,393.0	1,284.0	1,498.0	1,102.0	2,752.0
Customer-Hours Interrupted	14,255.5	3,746.5	3,748.6	3,800.1	1,163.5	6,067.0
SAIDI (Minutes)	273.44	71.38	71.38	72.50	22.08	114.22
CAIDI (Minutes)	119.48	161.37	175.17	152.21	63.35	132.27
SAIFI (Occurrence)	2.289	0.442	0.407	0.476	0.349	0.864
ASA (Percent)	99.9478	99.9864	99.9864	99.9862	99.9958	99.9783

Table 22: Normalized Annual Service Reliability Indices for Molokai – Generation

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	3,128	3,149	3,151	3,145	3,161	3,187
Customer Interruptions	614.0	0.0	0.0	0.0	150.0	477.0
Customer-Hours Interrupted	230.2	0.0	0.0	0.0	55.0	272.0
SAIDI (Minutes)	4.42	0.00	0.00	0.00	1.04	5.12
CAIDI (Minutes)	22.50	0.00	0.00	0.00	22.00	34.21
SAIFI (Occurrence)	0.196	0.000	0.000	0	0.047	0.150
ASA (Percent)	99.9992	100	100	100	99.9998	99.9990

Table 23: Normalized Annual Service Reliability Indices for Lanai – T&D

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	221.0	162.0	283.0	263.0	67.0	160.0
Customer-Hours Interrupted	278.2	111.2	526.5	211.0	80.0	436.3
SAIDI (Minutes)	10.02	3.97	19.17	7.81	2.96	15.93
CAIDI (Minutes)	75.52	41.19	111.62	48.13	71.66	163.61
SAIFI (Occurrence)	0.133	0.096	0.172	0.162	0.041	0.097
ASA (Percent)	99.9981	99.9992	99.9963	99.9985	99.9994	99.9970

Table 24: Normalized Annual Service Reliability Indices for Lanai – Generation

	2007*	2008*	2009*	2010*	2011*	2012*
Number of Customers	1,665	1,680	1,648	1,621	1,624	1,643
Customer Interruptions	1236.0	795.0	303.0	66.0	220.0	71.0
Customer-Hours Interrupted	777.9	336.2	84.3	41.5	7.8	15.4
SAIDI (Minutes)	28.03	12.01	3.07	1.53	0.29	0.56
CAIDI (Minutes)	37.76	25.37	16.69	37.70	2.13	13.03
SAIFI (Occurrence)	0.742	0.473	0.184	0.041	0.135	0.043
ASA (Percent)	99.9947	99.9977	99.9994	99.9997	99.9999	99.9999

Figure 1: System Average Interruption Duration Index (SAIDI)

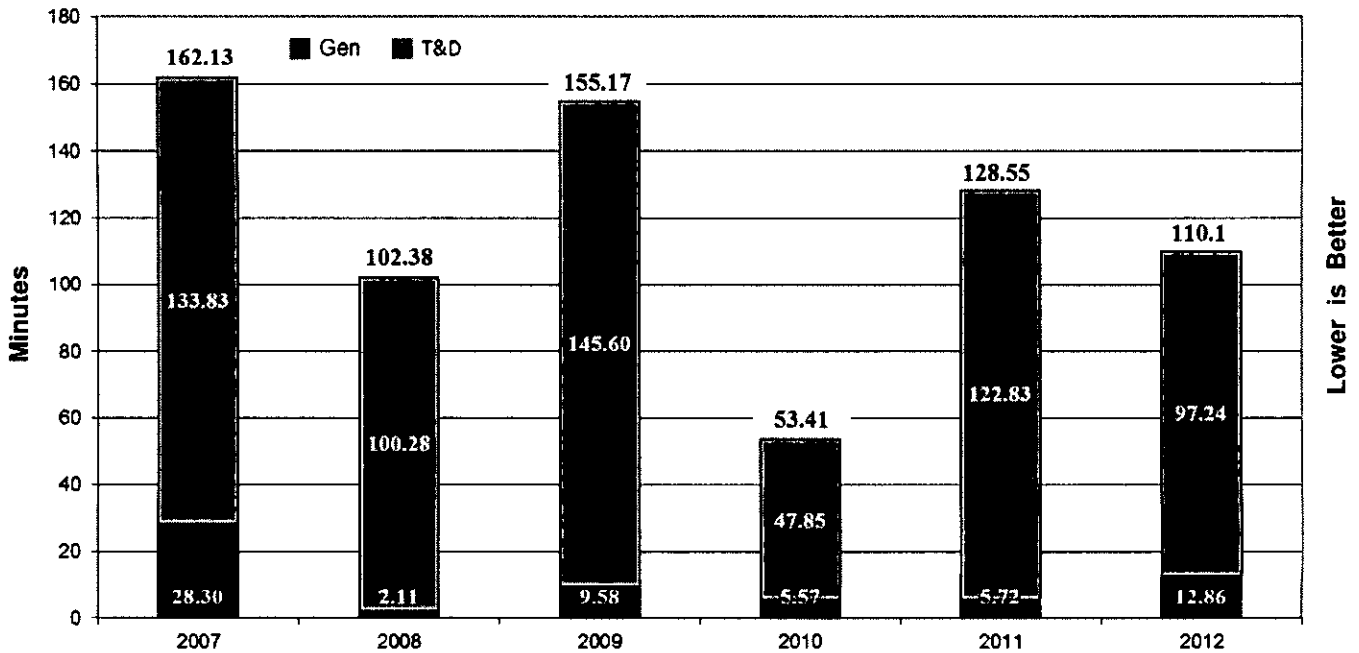


Figure 1 shows the System Average Interruption Duration Indices (SAIDI) for 2012 and the past five years. It shows that the 2012 SAIDI is 110.1 minutes, a 14.35% decrease compared to the 2011 SAIDI result of 128.55 minutes. The SAIDI is the composite of both the SAIFI and CAIDI indices and produces a broader benchmark of system reliability by combining both the duration and the number of customer interruptions during a given period of time. The lower SAIDI result was due to a decrease in the SAIFI statistics.

Figure 2: Customer Average Interruption Duration Index (CAIDI)

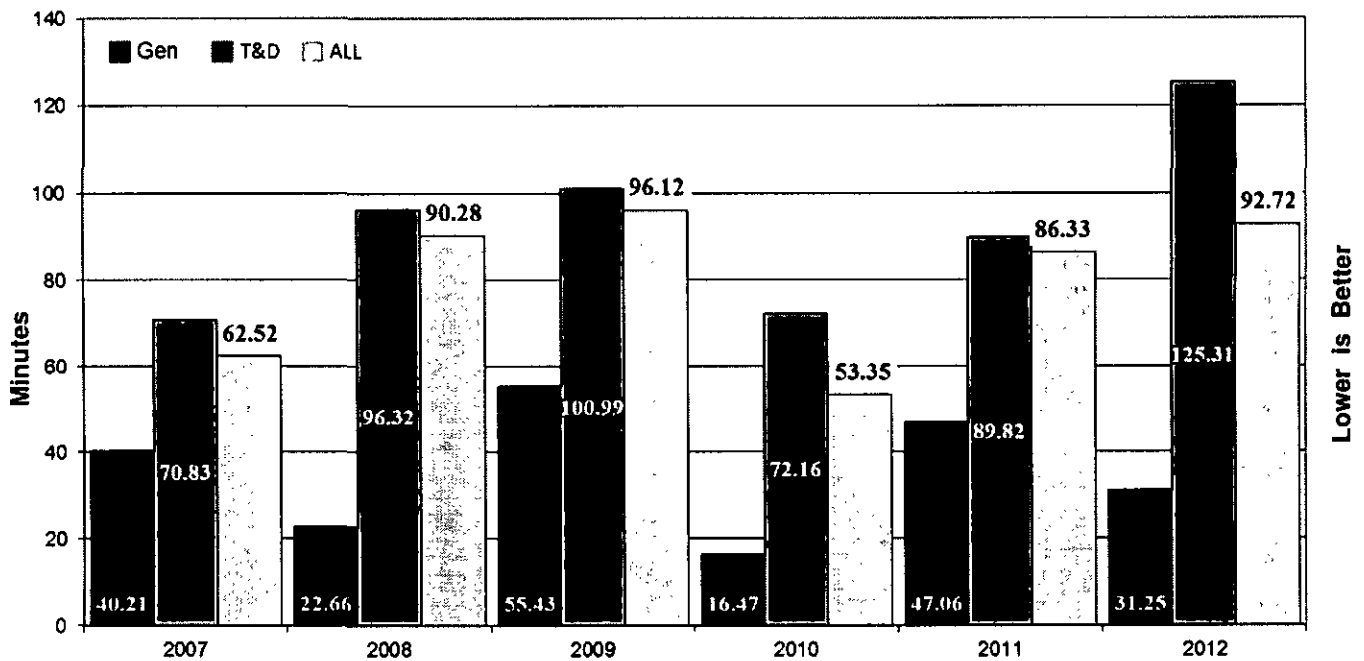


Figure 2 shows the Customer Average Interruption Duration Indices (CAIDI) for 2012 and the past five years. It shows that the average duration of a customer's outage (CAIDI) for 2012 is 92.72 minutes, a 7.4% increase compared to the 2011 CAIDI result of 86.33 minutes.

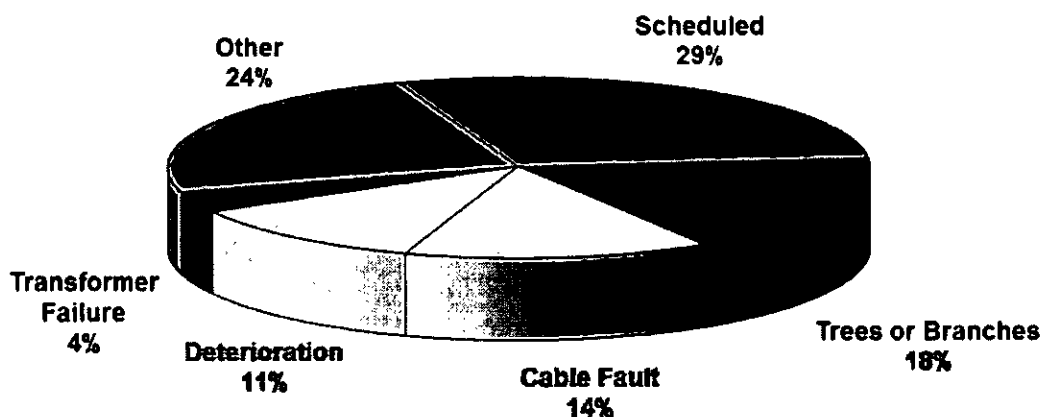
The contributing factors to the increase of the CAIDI index from 2011 were longer outage durations related to deterioration or corrosion, scheduled maintenance and high winds. Outage durations due to deterioration or corrosion increased in 2012, which incurred 23,657.0 customer interruption hours, as compared to 19,229.7 customer interruption hours in 2011. Outages due to deterioration or corrosion accounted for 18.8% of all customer interruption hours in 2012. Outages durations due to scheduled maintenance increased in 2012, which incurred 14,004.1 customer interruption hours, as compared to 9,914.0 customer interruption hours in 2011. Outages due to scheduled maintenance accounted for 11.1% of all customer interruption hours in 2012. Outages durations due to high winds also increased in 2012, which incurred 5,009.9 customer interruption hours, as compared to 3,886.3 customer interruption hours in 2011. Outages due to high winds accounted for 4.0% of all customer interruption hours in 2012.

The three major events affecting the 2012 CAIDI results were:

1. January 31, 2012 – A prearranged outage to perform maintenance work on the Hana 23kV line caused outages affecting 644 customers from 10 hours 47 minutes to 11 hours and 30 minutes.
2. August 13, 2012– A pole fell due to a corroded anchor rod in Pukalani affecting 2,702 customers from 1 hour 10 minutes to 14 hours 24 minutes.
3. December 2012 – High winds in areas across Maui and Molokai caused outages affecting 17,548 customers from 5 minutes to 21 hours and 32 minutes.

These three events increased the 2012 CAIDI by over 20 minutes.

Figure 3: Outage Categories



The Top 5 Outage Categories, by number of Customer Interruptions, as illustrated in Figure 3, equates to about 76% of the total Customer Interruptions in 2012; these causes are:

<u>Outage Category</u>	<u>Sample Causes</u>
1. Scheduled Maintenance	Replacement of equipment still in service
2. Trees or Branches	Trees falling or contacting overhead lines
3. Cable Faults	Underground equipment failures
4. Deterioration	Failed, broken, corroded equipment
5. Transformer Failure	Transformers failing not related to overloading

The major cause factors for 2011 were similar to the 2012 major causes.

The total number of customer interruptions in 2012 was 81,428 compared with 101,268 interruptions in 2011. In the six year period, 2012 was the third best performing year for the number of interruptions. The number of customer interruptions due to flashovers decreased from 10,975 in 2011 to 2,477 in 2012, a 77.4% decrease. Also, the number of customer interruptions due to man or animals in equipment decreased from 9,033 in 2011 to 2,777 in 2012, a 69.3% decrease. However, the number of customer interruptions due to interruption to balance load increased from 0 in 2011 to 6,356. Also, the number of customer interruptions due to other company personnel errors increased from 242 in 2011 to 4,695.

In 2012, there were six events that resulted in the loss of more than 10,000 customers.

- On January 26, 2012, Maui experienced a load shedding event due to the loss of a generating unit. This event caused outages to 11,844 customers or 17% of our customers with outage durations ranging from 9 minutes to 30 minutes.
- On March 1, 2012, Maui experienced a load shedding event due to the loss of a generating unit. This event caused outages to 26,295 customers or 38% of our customers with outage durations ranging from 8 minutes to 3 hours 25 minutes.
- On September 5, 2012, Maui experienced a major outage due to an operator error while testing relays. This event caused outages to 13,093 customers or 19% of our customers with outage durations ranging from 14 minutes to 51 minutes.
- On November 6, 2012, Maui experienced a load shedding event due to the loss of two generating units. This event caused outages to 16,280 customers or 24% of our customers with outage durations ranging from 7 minutes to 51 minutes.
- On November 24, 2012, Maui experienced a major outage due to incorrect relay settings while energizing Auwahi wind farm substation. This event caused outages to 10,453 customers or 16% of our customers with outage durations ranging from 9 minutes to 1 hour 46 minutes.
- On December 13, 2012, Maui experienced a major outage due to the loss of the Kanaha to Kula transmission line. This event caused outages to 16,260 customers or 24% of our customers with outage durations ranging from 5 minutes to 20 minutes.

Figure 4: System Average Interruption Frequency Index (SAIFI)

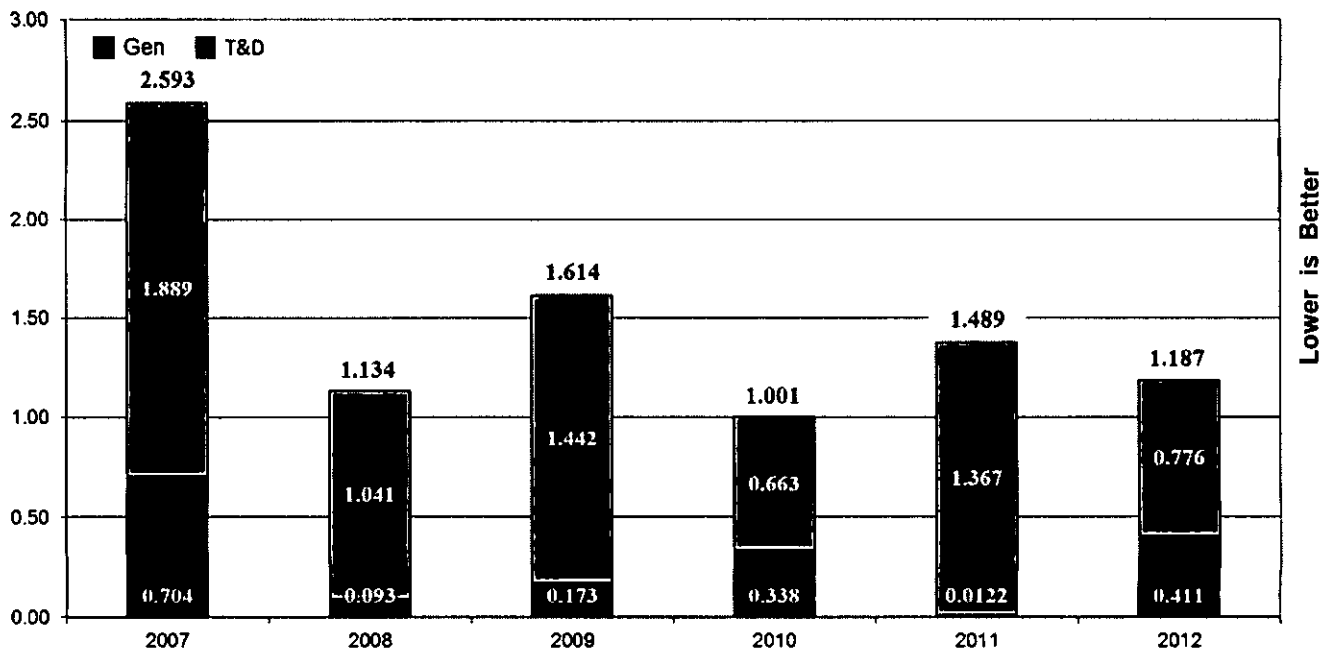


Figure 4 shows the System Average Interruption Frequency Index (SAIFI) for 2012 and the past five years. It shows that the 2012 SAIFI of 1.187 was the third best performance in the past six years, decreasing from 1.489 in 2011.

The contributing factors to the decrease of the SAIFI index from 2011 were fewer outage interruptions related to flashovers, man or animals in lines or equipment and transformer overload. Outage durations due to flashovers decreased in 2012, which incurred 2,477 customer interruptions, as compared to 10,975 customer interruptions in 2011. Outages due to flashovers accounted for .3% of all customer interruptions in 2012. Outages durations due to man or animals in lines or equipment decreased in 2012, which incurred 2,777 customer interruptions, as compared to 9,033 customer interruptions in 2011. Outages due to man or animals in lines or equipment accounted for 1.6% of all customer interruption hours in 2012. Outages durations due to transformer overload also decreased in 2012, which incurred 8 customer interruptions, as compared to 4,705 customer interruptions in 2011. Outages due to transformer overload accounted for 0.01% of all customer interruption hours in 2012.

Figure 5: Average Service Availability Index (ASAI)

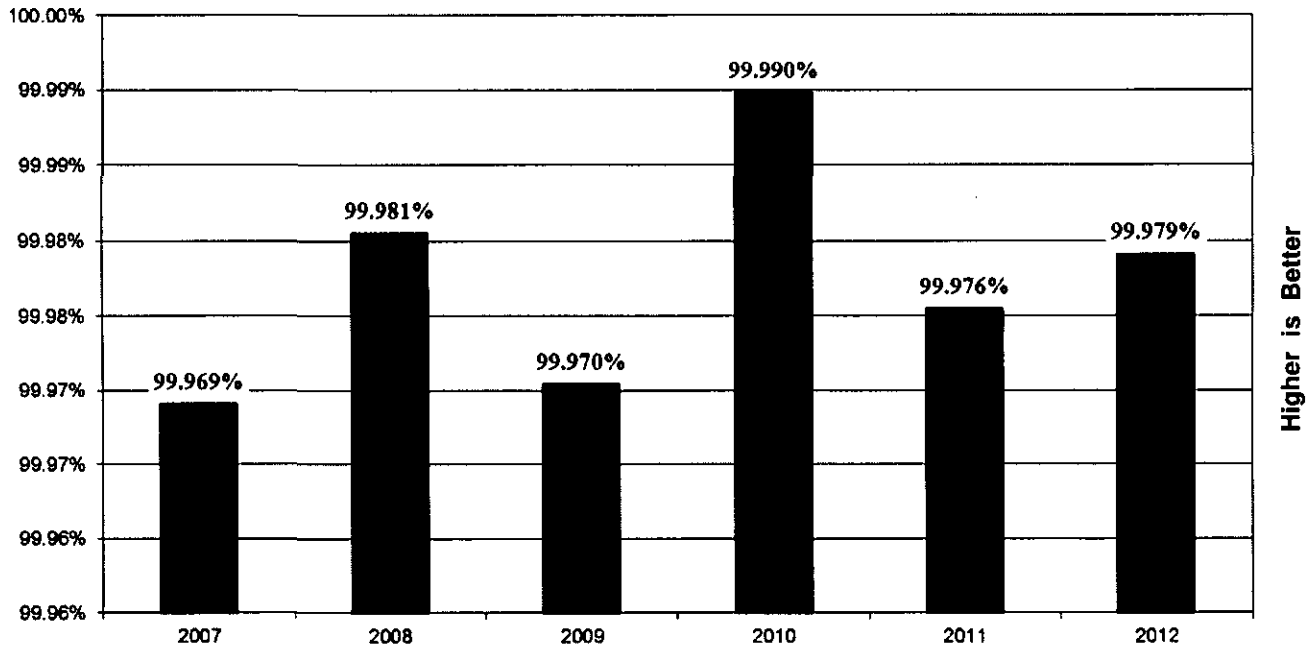


Figure 5 shows that the 2012 Average Service Availability Index increased as compared to the 2011 results after a decline (higher is better) from 2010 to 2011. Approximately 14% fewer hours of outage were sustained during 2012 compared to the previous year, thus causing a .003% increase to the ASAI, raising this statistic from 99.976% to 99.979%.

The contributing factors to the increase of the ASA index from 2011 was a reduction of customer hour interruptions related to equipment failure, transformer overload and automobile accident. Outages due to equipment failure in lines decreased in 2012, which incurred 7,945.8 customer interruption hours, as compared to 17,761.1 customer interruption hours in 2011. Outages due to equipment failure accounted for 6.3% of all customer interruption hours in 2012. Outages due to transformer overload decreased in 2012, which incurred 37.1 customer interruption hours, as compared to 5,307.7 customer interruption hours in 2011. Outages due to transformer overload accounted for 0.01% of all customer interruption hours in 2012. Outages due to automobile accidents also decreased in 2012, which incurred 8,939.4 customer interruption hours, as compared to 13,548.5 customer interruption hours in 2011. Outages due to automobile accidents accounted for 7.1% of all customer interruption hours in 2012.

Maui Electric Company
Normalized Sustained Interruption Summary – System Total

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Customer Hours	Customer Interruptions	SAIFI	SAIDI	CAIDI
TREES OR BRANCHES IN LINES	33146.2	18203	0.265	29	109.26
EQUIPMENT FAILURE	7945.8	13768	0.201	6.95	34.63
DETERIORATION, CORROSION, TERMITES	23657	10945	0.16	20.7	129.69
INT. TO BALANCE LOAD OR SYSTEM CONV.	2409.3	6356	0.093	2.11	22.74
CABLE FAULT	6562.3	5107	0.074	5.74	77.1
OTHER COMPANY PERSONNEL ERROR	2509.4	4695	0.068	2.2	32.07
MAINTENANCE - FORCED	5716.2	4604	0.067	5	74.49
AUTOMOBILE ACCIDENT	8939.4	3714	0.054	7.82	144.42
MAINTENANCE - SCHEDULED	14004.1	2784	0.041	12.25	301.81
MAN OR ANIMALS IN LINES OR EQUIPMENT	5570.9	2777	0.04	4.87	120.36
FLASHOVER	1838.5	2477	0.036	1.61	44.53
OPERATOR OR SWITCHING ERROR	114.2	1362	0.02	0.1	5.03
HIGH WIND	5009.9	1296	0.019	4.38	231.94
TRANSFORMER FAILURE	646.2	624	0.009	0.57	62.13
LIGHTNING	3890	615	0.009	3.4	379.51
SYSTEM ADDITIONS OR REMOVALS	1456.8	506	0.007	1.27	172.74
EXCAVATION AND CONSTRUCTION	396.2	403	0.006	0.35	58.98
UNKNOWN FAILURE	869.2	398	0.006	0.76	131.03
FAULTY OPERATION OF EQUIPMENT	222.1	344	0.005	0.19	38.73
FOREIGN OBJECTS IN LINES OR EQUIPMENT	376.7	242	0.004	0.33	93.39
EQUIPMENT OVERLOAD	70.9	83	0.001	0.06	51.24
FIRE	370.6	67	0.001	0.32	331.88
FAILURE OF CUSTOMER'S ELECTRICAL EQUIP	22.5	32	0	0.02	42.25
CONTACT BY MOVING EQUIPMENT	48.6	11	0	0.04	265.27
TRANSFORMER OVERLOAD	37.1	8	0	0.03	278
LOOSE CONNECTION	6.2	7	0	0.01	53
MYLAR BALLOON	0	0	0	0	0
INT. TO TRANSFER LOAD (OUT OF PHASE)	0	0	0	0	0
TSUNAMI, EARTHQUAKE, OR FLOODING	0	0	0	0	0
VANDALISM	0	0	0	0	0
TOTAL	125836.1	81428	1.187	110.1	92.72

AVERAGE SYSTEM AVAILABILITY = 99.9791%
NUMBER OF CUSTOMERS FOR THE PERIOD = 68,575
24 MONTH ANNUALIZED SAIDI AVERAGE FOR THE PERIOD 1/1/2011 - 12/31/2012 = 119.67
24 MONTH AVERAGE NUMBER OF CUSTOMERS FOR THE PERIOD 1/1/2011 - 12/31/2012 = 68,293

SAIFI = SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX
SAIDI = SYSTEM AVERAGE INTERRUPTION DURATION INDEX (MINUTES)
CAIDI = CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (MINUTES)

NOTES: OUTAGE CAUSES ARE LISTED IN ORDER OF SAIFI.
OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company Normalized Sustained Interruption Summary – Maui

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Customer Hours	Customer Interruptions	SAIFI	SAIDI	CAIDI
TREES OR BRANCHES IN LINES	31627.3	17297	0.271	29.77	109.71
EQUIPMENT FAILURE	7286	13059	0.205	6.86	33.48
DETERIORATION, CORROSION, TERMITES	20726	10268	0.161	19.51	121.11
INT. TO BALANCE LOAD OR SYSTEM CONV.	2409.3	6356	0.1	2.27	22.74
CABLE FAULT	6553.1	5106	0.08	6.17	77
OTHER COMPANY PERSONNEL ERROR	2509.4	4695	0.074	2.36	32.07
MAINTENANCE - FORCED	5716.2	4604	0.072	5.38	74.49
AUTOMOBILE ACCIDENT	8939.4	3714	0.058	8.41	144.42
MAN OR ANIMALS IN LINES OR EQUIPMENT	5551.3	2757	0.043	5.23	120.81
MAINTENANCE - SCHEDULED	13843.4	2748	0.043	13.03	302.26
FLASHOVER	1838.5	2477	0.039	1.73	44.53
OPERATOR OR SWITCHING ERROR	114.2	1362	0.021	0.11	5.03
HIGH WIND	4352	829	0.013	4.1	314.98
TRANSFORMER FAILURE	559	618	0.01	0.53	54.27
LIGHTNING	3849.7	611	0.01	3.62	378.04
SYSTEM ADDITIONS OR REMOVALS	1456.8	506	0.008	1.37	172.74
EXCAVATION AND CONSTRUCTION	370.4	402	0.006	0.35	55.28
UNKNOWN FAILURE	775.2	320	0.005	0.73	145.34
EQUIPMENT OVERLOAD	70.9	83	0.001	0.07	51.24
FIRE	370.6	67	0.001	0.35	331.88
FAULTY OPERATION OF EQUIPMENT	10.7	32	0.001	0.01	20
FAILURE OF CUSTOMER'S ELECTRICAL EQUIP	18.3	16	0	0.02	68.5
FOREIGN OBJECTS IN LINES OR EQUIPMENT	5.9	15	0	0.01	23.67
CONTACT BY MOVING EQUIPMENT	48.6	11	0	0.05	265.27
TRANSFORMER OVERLOAD	37.1	8	0	0.03	278
LOOSE CONNECTION	6.2	7	0	0.01	53
MYLAR BALLOON	0	0	0	0	0
INT. TO TRANSFER LOAD (OUT OF PHASE)	0	0	0	0	0
TSUNAMI, EARTHQUAKE, OR FLOODING	0	0	0	0	0
VANDALISM	0	0	0	0	0
TOTAL	119045.4	77968.0	1.223	112.05	91.61

AVERAGE SYSTEM AVAILABILITY = 99.9787%
NUMBER OF CUSTOMERS FOR THE PERIOD = 63,745
24 MONTH ANNUALIZED SAIDI AVERAGE FOR THE PERIOD 1/1/2011 - 12/31/2012 = 124.65
24 MONTH AVERAGE NUMBER OF CUSTOMERS FOR THE PERIOD 1/1/2011 - 12/31/2012 = 63,485

SAIFI = SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX
SAIDI = SYSTEM AVERAGE INTERRUPTION DURATION INDEX (MINUTES)
CAIDI = CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (MINUTES)

NOTES: OUTAGE CAUSES ARE LISTED IN ORDER OF SAIFI.
OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company
Normalized Sustained Interruption Summary – Molokai

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Customer Hours	Customer Interruptions	SAIFI	SAIDI	CAIDI
TREES OR BRANCHES IN LINES	1494.8	904	0.284	28.14	99.21
DETERIORATION, CORROSION, TERMITES	2895.9	662	0.208	54.52	262.47
EQUIPMENT FAILURE	646	657	0.206	12.16	58.99
HIGH WIND	657.9	467	0.147	12.39	84.52
FAULTY OPERATION OF EQUIPMENT	210	300	0.094	3.95	42
FOREIGN OBJECTS IN LINES OR EQUIPMENT	370.8	227	0.071	6.98	98
UNKNOWN FAILURE	14.1	7	0.002	0.27	121
LIGHTNING	40.3	4	0.001	0.76	605
CABLE FAULT	9.2	1	0	0.17	554
MYLAR BALLOON	0	0	0	0	0
OTHER COMPANY PERSONNEL ERROR	0	0	0	0	0
SYSTEM ADDITIONS OR REMOVALS	0	0	0	0	0
MAINTENANCE - FORCED	0	0	0	0	0
MAINTENANCE - SCHEDULED	0	0	0	0	0
INT. TO BALANCE LOAD OR SYSTEM CONV.	0	0	0	0	0
INT. TO TRANSFER LOAD (OUT OF PHASE)	0	0	0	0	0
TSUNAMI, EARTHQUAKE, OR FLOODING	0	0	0	0	0
FAILURE OF CUSTOMER'S ELECTRICAL EQUIP	0	0	0	0	0
OPERATOR OR SWITCHING ERROR	0	0	0	0	0
VANDALISM	0	0	0	0	0
EQUIPMENT OVERLOAD	0	0	0	0	0
TRANSFORMER OVERLOAD	0	0	0	0	0
TRANSFORMER FAILURE	0	0	0	0	0
FLASHOVER	0	0	0	0	0
LOOSE CONNECTION	0	0	0	0	0
EXCAVATION AND CONSTRUCTION	0	0	0	0	0
CONTACT BY MOVING EQUIPMENT	0	0	0	0	0
FIRE	0	0	0	0	0
MAN OR ANIMALS IN LINES OR EQUIPMENT	0	0	0	0	0
AUTOMOBILE ACCIDENT	0	0	0	0	0
TOTAL	6338.9	3229	1.013	119.34	117.79

AVERAGE SYSTEM AVAILABILITY = 99.9773%
NUMBER OF CUSTOMERS FOR THE PERIOD = 3,187
24 MONTH ANNUALIZED SAIDI AVERAGE FOR THE PERIOD 1/1/2011 - 12/31/2012 = 70.84
24 MONTH AVERAGE NUMBER OF CUSTOMERS FOR THE PERIOD 1/1/2011 - 12/31/2012 = 3,174
SAIFI = SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX
SAIDI = SYSTEM AVERAGE INTERRUPTION DURATION INDEX (MINUTES)
CAIDI = CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (MINUTES)

NOTES: OUTAGE CAUSES ARE LISTED IN ORDER OF SAIFI.
OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company Normalized Sustained Interruption Summary – Lanai

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Customer Hours	Customer Interruptions	SAIFI	SAIDI	CAIDI
UNKNOWN FAILURE	79.9	71	0.043	2.92	67.51
EQUIPMENT FAILURE	13.8	52	0.032	0.5	15.92
MAINTENANCE - SCHEDULED	160.7	36	0.022	5.87	267.83
MAN OR ANIMALS IN LINES OR EQUIPMENT	19.6	20	0.012	0.71	58.65
FAILURE OF CUSTOMER'S ELECTRICAL EQUIP	4.3	16	0.01	0.16	16
DETERIORATION, CORROSION, TERMITES	35.2	15	0.009	1.28	140.67
FAULTY OPERATION OF EQUIPMENT	1.4	12	0.007	0.05	7
TRANSFORMER FAILURE	87.2	6	0.004	3.18	871.67
TREES OR BRANCHES IN LINES	24	2	0.001	0.88	721
EXCAVATION AND CONSTRUCTION	25.8	1	0.001	0.94	1545
MYLAR BALLOON	0	0	0	0	0
OTHER COMPANY PERSONNEL ERROR	0	0	0	0	0
SYSTEM ADDITIONS OR REMOVALS	0	0	0	0	0
MAINTENANCE - FORCED	0	0	0	0	0
INT. TO BALANCE LOAD OR SYSTEM CONV.	0	0	0	0	0
INT. TO TRANSFER LOAD (OUT OF PHASE)	0	0	0	0	0
TSUNAMI, EARTHQUAKE, OR FLOODING	0	0	0	0	0
OPERATOR OR SWITCHING ERROR	0	0	0	0	0
VANDALISM	0	0	0	0	0
EQUIPMENT OVERLOAD	0	0	0	0	0
TRANSFORMER OVERLOAD	0	0	0	0	0
CABLE FAULT	0	0	0	0	0
FLASHOVER	0	0	0	0	0
LOOSE CONNECTION	0	0	0	0	0
HIGH WIND	0	0	0	0	0
LIGHTNING	0	0	0	0	0
CONTACT BY MOVING EQUIPMENT	0	0	0	0	0
FIRE	0	0	0	0	0
FOREIGN OBJECTS IN LINES OR EQUIPMENT	0	0	0	0	0
AUTOMOBILE ACCIDENT	0	0	0	0	0
TOTAL	451.7	231	0.141	16.5	117.33

AVERAGE SYSTEM AVAILABILITY = 99.9969%
 NUMBER OF CUSTOMERS FOR THE PERIOD = 1,643
 24 MONTH ANNUALIZED SAIDI AVERAGE FOR THE PERIOD 1/1/2011 - 12/31/2012 = 9.90
 24 MONTH AVERAGE NUMBER OF CUSTOMERS FOR THE PERIOD 1/1/2011 - 12/31/2012 = 1,633
 SAIFI = SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX
 SAIDI = SYSTEM AVERAGE INTERRUPTION DURATION INDEX (MINUTES)
 CAIDI = CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (MINUTES)

NOTES: OUTAGE CAUSES ARE LISTED IN ORDER OF SAIFI.
 OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company
Normalized Sustained Interruption Summary – System Total

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	<u>Interruptions</u>		<u>Customer Hours</u>	
	Number	% of Total	Number	% of Total
<u>NON-CONNECTED SYSTEM EMERGENCY</u>	174	23.71%	48871.0	38.8%
FOREIGN OBJECT IN LINES	3	0.41%	376.7	0.3%
CONTACT BY MOVING EQUIPMENT	2	0.27%	48.6	0.0%
EXCAVATION AND CONSTRUCTION	4	0.54%	396.2	0.3%
FIRE	6	0.82%	370.6	0.3%
AUTO ACCIDENT	12	1.63%	8939.4	7.1%
MAN OR ANIMAL IN LINES	12	1.63%	5570.9	4.4%
TREES OR BRANCHES IN LINES	130	17.71%	33146.2	26.3%
VANDALISM	0	0.00%	0.0	0.0%
CUSTOMER EQUIP. FAILURE	5	0.68%	22.5	0.0%
MYLAR BALLOON	0	0.00%	0.0	0.0%
<u>ERROR</u>	20	2.72%	2623.6	2.1%
OPERATOR OR SWITCHING ERROR	8	1.09%	114.2	0.1%
OTHER COMPANY PERSONNEL ERROR	12	1.63%	2509.4	2.0%
<u>WEATHER</u>	29	3.95%	8899.9	7.1%
LIGHTNING	4	0.54%	3890.0	3.1%
HIGH WIND	25	3.41%	5009.9	4.0%
TSUNAMI, EARTHQUAKE OR FLOODING	0	0.00%	0.0	0.0%
<u>NON-TRANSFORMER EQUIPMENT</u>	217	29.56%	40302.7	32.0%
LOOSE CONNECTION	1	0.14%	6.2	0.0%
FLASHOVER	2	0.27%	1838.5	1.5%
EQUIPMENT FAILURE	18	2.45%	7945.8	6.3%
CABLE FAULT	103	14.03%	6562.3	5.2%
EQUIPMENT OVERLOAD	5	0.68%	70.9	0.1%
DETERIORATION, CORROSION OR TERMITES	85	11.58%	23657.0	18.8%
FAULTY OPERATION OF EQUIPMENT	3	0.41%	222.1	0.2%
<u>TRANSFORMER</u>	28	3.81%	683.3	0.5%
TRANSFORMER OVERLOAD	1	0.14%	37.1	0.0%
TRANSFORMER FAILURE	27	3.68%	646.2	0.5%
<u>SWITCHING</u>	2	0.27%	2409.3	1.9%
INT TO TRANSFER LOAD (OUT OF PHASE)	0	0.00%	0.0	0.0%
INT TO BALANCE LOAD OR CONVERSION	2	0.27%	2409.3	1.9%
<u>UNKNOWN</u>	22	3.00%	869.2	0.7%
<u>MAINTENANCE</u>	238	32.43%	19720.4	15.7%
SCHEDULED	213	29.02%	14004.1	11.1%
FORCED	25	3.41%	5716.2	4.5%
<u>SYSTEM ADDITIONS OR REMOVALS</u>	4	0.54%	1456.8	1.2%
<u>TOTALS</u>	734		125836.1	

NOTES: OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company Normalized Sustained Interruption Summary – Maui

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Interruptions		Customer Hours	
	Number	% of Total	Number	% of Total
<u>NON-CONNECTED SYSTEM EMERGENCY</u>	161	23.61%	46931.9	39.4%
FOREIGN OBJECTS IN LINES	2	0.29%	5.9	0.0%
CONTACT BY MOVING EQUIPMENT	2	0.29%	48.6	0.0%
EXCAVATION AND CONSTRUCTION	3	0.44%	370.4	0.3%
FIRE	6	0.88%	370.6	0.3%
AUTO ACCIDENT	12	1.76%	8939.4	7.5%
MAN OR ANIMAL IN LINES	7	1.03%	5551.3	4.7%
TREES OR BRANCHES IN LINES	126	18.48%	31627.3	26.6%
VANDALISM	0	0.00%	0.0	0.0%
CUSTOMER EQUIP. FAILURE	3	0.44%	18.3	0.0%
MYLAR BALLOON	0	0.00%	0.0	0.0%
<u>ERROR</u>	20	2.93%	2623.6	2.2%
OPERATOR OR SWITCHING ERROR	8	1.17%	114.2	0.1%
OTHER COMPANY PERSONNEL ERROR	12	1.76%	2509.4	2.1%
<u>WEATHER</u>	23	3.37%	8201.7	6.9%
LIGHTNING	3	0.44%	3849.7	3.2%
HIGH WIND	20	2.93%	4352.0	3.7%
TSUNAMI, EARTHQUAKE OR FLOODING	0	0.00%	0.0	0.0%
<u>NON-TRANSFORMER EQUIPMENT</u>	200	29.33%	36491.3	30.7%
LOOSE CONNECTION	1	0.15%	6.2	0.0%
FLASHOVER	2	0.29%	1838.5	1.5%
EQUIPMENT FAILURE	10	1.47%	7286.0	6.1%
CABLE FAULT	102	14.96%	6553.1	5.5%
EQUIPMENT OVERLOAD	5	0.73%	70.9	0.1%
DETERIORATION, CORROSION OR TERMITES	79	11.58%	20726.0	17.4%
FAULTY OPERATION OF EQUIPMENT	1	0.15%	10.7	0.0%
<u>TRANSFORMER</u>	26	3.81%	596.1	0.5%
TRANSFORMER OVERLOAD	1	0.15%	37.1	0.0%
TRANSFORMER FAILURE	25	3.67%	559.0	0.5%
<u>SWITCHING</u>	2	0.29%	2409.3	2.0%
INT TO TRANSFER LOAD (OUT OF PHASE)	0	0.00%	0.0	0.0%
INT TO BALANCE LOAD OR CONVERSION	2	0.29%	2409.3	2.0%
<u>UNKNOWN</u>	17	2.49%	775.2	0.7%
<u>MAINTENANCE</u>	229	33.58%	19559.7	16.4%
SCHEDULED	204	29.91%	13843.4	11.6%
FORCED	25	3.67%	5716.2	4.8%
<u>SYSTEM ADDITIONS OR REMOVALS</u>	4	0.59%	1456.8	1.2%
<u>TOTALS</u>	682		119045.4	

NOTES: OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company
Normalized Sustained Interruption Summary – Molokai

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

<u>Outage Cause</u>	<u>Interruptions</u>		<u>Customer Hours</u>	
	<u>Number</u>	<u>% of Total</u>	<u>Number</u>	<u>% of Total</u>
<u>NON-CONNECTED SYSTEM EMERGENCY</u>	4	21.05%	1865.6	29.4%
FOREIGN OBJECT IN LINES	1	5.26%	370.8	5.8%
CONTACT BY MOVING EQUIPMENT	0	0.00%	0.0	0.0%
EXCAVATION AND CONSTRUCTION	0	0.00%	0.0	0.0%
FIRE	0	0.00%	0.0	0.0%
AUTO ACCIDENT	0	0.00%	0.0	0.0%
MAN OR ANIMAL IN LINES	0	0.00%	0.0	0.0%
TREES OR BRANCHES IN LINES	3	15.79%	1494.8	23.6%
VANDALISM	0	0.00%	0.0	0.0%
CUSTOMER EQUIP. FAILURE	0	0.00%	0.0	0.0%
MYLAR BALLOON	0	0.00%	0.0	0.0%
<u>ERROR</u>	0	0.00%	0.0	0.0%
OPERATOR OR SWITCHING ERROR	0	0.00%	0.0	0.0%
OTHER COMPANY PERSONNEL ERROR	0	0.00%	0.0	0.0%
<u>WEATHER</u>	6	31.58%	698.2	11.0%
LIGHTNING	1	5.26%	40.3	0.6%
HIGH WIND	5	26.32%	657.9	10.4%
TSUNAMI, EARTHQUAKE OR FLOODING	0	0.00%	0.0	0.0%
<u>NON-TRANSFORMER EQUIPMENT</u>	8	42.11%	3761.1	59.3%
LOOSE CONNECTION	0	0.00%	0.0	0.0%
FLASHOVER	0	0.00%	0.0	0.0%
EQUIPMENT FAILURE	2	10.53%	646.0	10.2%
CABLE FAULT	1	5.26%	9.2	0.1%
EQUIPMENT OVERLOAD	0	0.00%	0.0	0.0%
DETERIORATION, CORROSION OR TERMITES	4	21.05%	2895.9	45.7%
FAULTY OPERATION OF EQUIPMENT	1	5.26%	210.0	3.3%
<u>TRANSFORMER</u>	0	0.00%	0.0	0.0%
TRANSFORMER OVERLOAD	0	0.00%	0.0	0.0%
TRANSFORMER FAILURE	0	0.00%	0.0	0.0%
<u>SWITCHING</u>	0	0.00%	0.0	0.0%
INT TO TRANSFER LOAD (OUT OF PHASE)	0	0.00%	0.0	0.0%
INT TO BALANCE LOAD OR CONVERSION	0	0.00%	0.0	0.0%
<u>UNKNOWN</u>	1	5.26%	14.1	0.2%
<u>MAINTENANCE</u>	0	0.00%	0.0	0.0%
SCHEDULED	0	0.00%	0.0	0.0%
FORCED	0	0.00%	0.0	0.0%
<u>SYSTEM ADDITIONS OR REMOVALS</u>	0	0.00%	0.0	0.0%
<u>TOTALS</u>	19		6338.9	

NOTES: OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

Maui Electric Company
Normalized Sustained Interruption Summary – Lanai

FROM: JANUARY 1, 2012

TO: DECEMBER 31, 2012

Outage Cause	Interruptions		Customer Hours	
	Number	% of Total	Number	% of Total
<u>NON-CONNECTED SYSTEM EMERGENCY</u>	9	27.27%	73.6	16.3%
FOREIGN OBJECTS IN LINES	0	0.00%	0.0	0.0%
CONTACT BY MOVING EQUIPMENT	0	0.00%	0.0	0.0%
EXCAVATION AND CONSTRUCTION	1	3.03%	25.8	5.7%
FIRE	0	0.00%	0.0	0.0%
AUTO ACCIDENT	0	0.00%	0.0	0.0%
MAN OR ANIMAL IN LINES	5	15.15%	19.6	4.3%
TREES OR BRANCHES IN LINES	1	3.03%	24.0	5.3%
VANDALISM	0	0.00%	0.0	0.0%
CUSTOMER EQUIP. FAILURE	2	6.06%	4.3	0.9%
MYLAR BALLOON	0	0.00%	0.0	0.0%
<u>ERROR</u>	0	0.00%	0.0	0.0%
OPERATOR OR SWITCHING ERROR	0	0.00%	0.0	0.0%
OTHER COMPANY PERSONNEL ERROR	0	0.00%	0.0	0.0%
<u>WEATHER</u>	0	0.00%	0.0	0.0%
LIGHTNING	0	0.00%	0.0	0.0%
HIGH WIND	0	0.00%	0.0	0.0%
TSUNAMI, EARTHQUAKE OR FLOODING	0	0.00%	0.0	0.0%
<u>NON-TRANSFORMER EQUIPMENT</u>	9	27.27%	50.4	11.2%
LOOSE CONNECTION	0	0.00%	0.0	0.0%
FLASHOVER	0	0.00%	0.0	0.0%
EQUIPMENT FAILURE	6	18.18%	13.8	3.1%
CABLE FAULT	0	0.00%	0.0	0.0%
EQUIPMENT OVERLOAD	0	0.00%	0.0	0.0%
DETERIORATION, CORROSION OR TERMITES	2	6.06%	35.2	7.8%
FAULTY OPERATION OF EQUIPMENT	1	3.03%	1.4	0.3%
<u>TRANSFORMER</u>	2	6.06%	87.2	19.3%
TRANSFORMER OVERLOAD	0	0.00%	0.0	0.0%
TRANSFORMER FAILURE	2	6.06%	87.2	19.3%
<u>SWITCHING</u>	0	0.00%	0.0	0.0%
INT TO TRANSFER LOAD (OUT OF PHASE)	0	0.00%	0.0	0.0%
INT TO BALANCE LOAD OR CONVERSION	0	0.00%	0.0	0.0%
<u>UNKNOWN</u>	4	12.12%	79.9	17.7%
<u>MAINTENANCE</u>	9	27.27%	160.7	35.6%
SCHEDULED	9	27.27%	160.7	35.6%
FORCED	0	0.00%	0.0	0.0%
<u>SYSTEM ADDITIONS OR REMOVALS</u>	0	0.00%	0.0	0.0%
<u>TOTALS</u>	33		451.7	

NOTES: OUTAGES WITH ZERO CUSTOMER HOURS OR DUE TO CUSTOMER MAINTENANCE ARE NOT INCLUDED IN THE REPORT.

DEFINITION OF TERMS

OUTAGE

The state of a component when it is not available to perform its intended function due to some event directly associated with that component. An outage may or may not cause an interruption of service to consumers depending on the system configuration.

INTERRUPTION

The loss of service to one or more consumers and is a result of one or more component outages.

INTERRUPTION DURATION

The period from the initiation of an interruption to a consumer until service has been restored to that consumer.

MOMENTARY INTERRUPTION

An interruption that has a duration limited to the period required to restore service by automatic or supervisory-controlled switching operations or by manual switching at locations where an operator is immediately available. Such switching operations must be completed in a specific time not to exceed one minute. Previous issues of this report indicated that a momentary interruption has a duration not to exceed five minutes. A December 1990 report, "Methodology for Determining Reliability Indices for HECO Utilities" indicated that momentary interruptions will have duration of less than one minute.

SUSTAINED INTERRUPTION

Any interruption not classified as a momentary interruption. Only this type of interruption is included in the reliability indices within this report. In conformance with the guidelines established in the report, "Methodology for Determining Reliability Indices for HECO Utilities," dated December 1990, a sustained interruption has duration of one minute or longer.

CUSTOMER INTERRUPTION

One interruption of one customer.

NOTE: Interruptions to customers at their request (e.g., customer maintenance) are not considered.

Reliability indices used in this report conform to standards proposed by both the Edison Electric Institute (EEI) and the Institute of Electrical and Electronics Engineers (IEEE) unless otherwise indicated in the above definitions. Four reliability indices that convey a meaningful representation of the level of reliability were selected and are presented in this report. These reliability indices are as follows:

RELIABILITY INDICES

AVERAGE SERVICE AVAILABILITY INDEX (ASA)

Total customer hours actually served as a percentage of total customer hours possible during the year. This indicates the extent to which electrical service was available to all customers. This index has been commonly referred to as the "Index of Reliability." A customer-hour is calculated by multiplying the number of customers by the number of hours in the period being analyzed.

$$ASA = \frac{\sum \text{No. of Customer Hours Actually Served during the year}}{\sum \text{No. of Customer Hours Possible during the year}} \times 100\%$$

SYSTEM AVERAGE INTERRUPTION FREQUENCY INDEX (SAIFI)

The number of customer interruptions per customer served during the year. This index indicates the average number of sustained interruptions experienced by all customers serviced on the system.

$$SAIF = \frac{\sum \text{No. of Customer Interruptions Experienced during the year}}{\text{Average No. of Customers served during the year}}$$

CUSTOMER AVERAGE INTERRUPTION DURATION INDEX (CAIDI)

The interruption duration per customer interrupted during the year. This index indicates the average duration of an interruption for those customers affected by a sustained interruption.

$$CAID = \frac{\sum \text{Duration of Interruption} \times \text{No. of Customers affected}}{\sum \text{No. of Customer Interruptions Experienced for the year}}$$

SYSTEM AVERAGE INTERRUPTION DURATION INDEX (SAIDI)

The interruption duration per customer served during the year. This index indicates the average interruption time experienced by all customers serviced on the system.

$$SAID = \frac{\sum \text{Duration of Interruption} \times \text{No. of Customers Affected}}{\text{Average No. of Customers Served during the year}}$$