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President

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PUBLIC UTILITIES
COMMISSION

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

Dear Commissioners:

Subject: MECO Annual Service Reliability Report for 2009

Maui Electric Company, Limited respectfully submits a copy of its Annual Service Reliability Report for the year 2009.

Sincerely,

Attachment

c: Division of Consumer Advocacy (with Attachment)



MAUI ELECTRIC COMPANY, LIMITED

ANNUAL SERVICE RELIABILITY REPORT

2009

Prepared By

Transmission and Distribution Department
Operations Division

Introduction

This is the 2009 service reliability report for Maui Electric Company, Limited (MECO). The average number of electric customers increased from 66,810 in 2008 to 67,126 in 2009 (an increase of 0.47%). The peak 2009 demand for the system was 204.3 MW (gross) that occurred on October 21, 2009. The peak 2008 demand was higher than the 2008 peak demand of 199.0 MW (gross) on January 9, 2008 (an increase of 2.66%).

The system interruption summary for the past year and the system reliability indices for the five prior years are presented to depict the quality of service to the electrical energy consumer.

The definitions of terms, the explanation and equations of reliability indices are contained on Attachments B-1 through B-3.

The Average Service Availability Index (ASA), the System Average Interruption Frequency Index (SAIFI), the Customer Average Interruption Duration Index (CAIDI), and the System Average Interruption Duration Index (SAIDI) are indicators of service reliability. These indices measure reliability in terms of the overall availability of electrical service (ASA), the frequency or number of times MECO's customers experience an outage during the year (SAIFI), and the average length of time an interrupted customer is out of power (CAIDI). 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, 67,126 customers).

Analysis

This analysis of the system reliability for MECO is for the year 2009. To determine the relative level of reliability, the statistics for five prior years, 2004 through 2008, are used for comparison.

The reliability indices are calculated using the data from all sustained¹ system outages, except customer maintenance outages. The data used for the 2005 reliability indices was not normalized due to the lack of system events that would qualify certain data to be normalized. The data used for calculating the reliability indices for 2004, 2006, 2007 and 2008 was normalized.

The data used for the 2004 reliability indices for MECO was normalized to exclude the following event:

- January 14 - Kona Storm

¹ An Interruption of electrical service of 1 minute or longer

The data used for the 2006 reliability indices for MECO was normalized to exclude the following event:

- October 15 - Earthquake

The data used for the 2007 reliability indices for MECO was normalized to exclude the following events:

- January 29 – Kona Storm
- December 5 - Kona Storm

The data used for the 2008 reliability indices for MECO was normalized to exclude the following events:

- January 16 – Outage due to high winds on Molokai
- March 4 – Load shed due to unknown cause on Lanai
- March 25 – Load shed due to loss of generator on Molokai
- April 2 - Load shed due to loss of generator on Lanai
- April 3 - Load shed due to loss of generator on Lanai
- April 4 - Load shed due to loss of generator on Lanai
- June 19 - Outage due to high winds on Maui
- July 6 - Load shed due to loss of generator on Lanai
- November 17 - Load shed due to unknown cause on Lanai
- November 26 - Load shed due to unknown cause on Lanai (Ckt. 1226)
- November 26 - Load shed due to unknown cause on Lanai (Ckt. 1227)
- December 13 – Load shed due to animal in lines on Lanai
- December 19 – Load shed due to loss of generator on Molokai
- December 21 – Load shed due to loss of generator on Molokai

The data used in calculating the reliability indices was normalized in accordance with 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. That report indicates that normalization is allowed for "abnormal" situations such as hurricanes, tsunamis, earthquakes, floods, catastrophic equipment failures, and a single outage that cascades into a loss of load that is 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.

Graphs of the ASA (Figure 1), SAIFI (Figure 2), CAIDI (Figure 3), and SAIDI (Figure 4) for the six years are included.

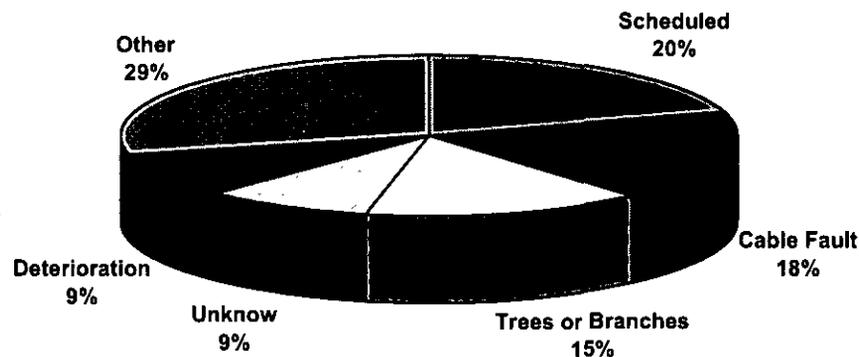
2009 Normalized Results

The 2009 service reliability results were normalized to exclude the effects of various catastrophic equipment failures and large storms on Maui, Molokai and Lanai. There were 14 outages in 2009 that were classified as "abnormal" situations (i.e. catastrophic equipment failures and major storms) that cascaded into a loss of load greater than 10% of the system peak load.

The 2009 service reliability results (normalized) indicate that MECO did not make any improvement in the ASA, SAIFI, CAIDI and SAIDI indices compared to 2008.

- The ASA index of 99.9705% is a decrease from 2008 and is ranked the fourth best ASA index of the last six years. (Higher is better.)
- The SAIFI index of 1.614 is an increase from 2008 and is ranked the third best SAIFI index of the last six years. (Lower is better.)
- The CAIDI index of 96.12 minutes is an increase from 2008 and is ranked the worst CAIDI index of the last six years. (Lower is better.)
- The 2009 SAIDI index of 155.17 minutes is an increase from 2008 and is ranked the fourth best SAIDI index of the last six years. (Lower is better.)

2009 Outage Causes



Scheduled outages were the leading cause of outages in 2009, with 155 outages, which accounted for 20.18% of all outages. This was an increase of 138.46% from 2008. Outages caused by cable faults were the second leading cause of outages in 2009, with 142 outages and accounted for 18.49% of all outages. This was an increased of 31.48% from 2008.

MECO experienced 27 load shed events in 2009. Maui experienced 2 load shed events, Molokai experienced 5 load shed events and Lanai experienced 20 load shed events in 2009.

Annual Service Reliability Indices

The normalized results for 2009, the previous un-normalized indices for 2005 and the normalized indices for 2004, 2006, 2007 and 2008 are shown in the table "Annual Service Reliability Indices". Figures 1 through 4 contain the same data shown in graphical form as well as the 2009 outages listed by cause and associated reliability indices shown on Attachments A1 and A2, (normalized results).

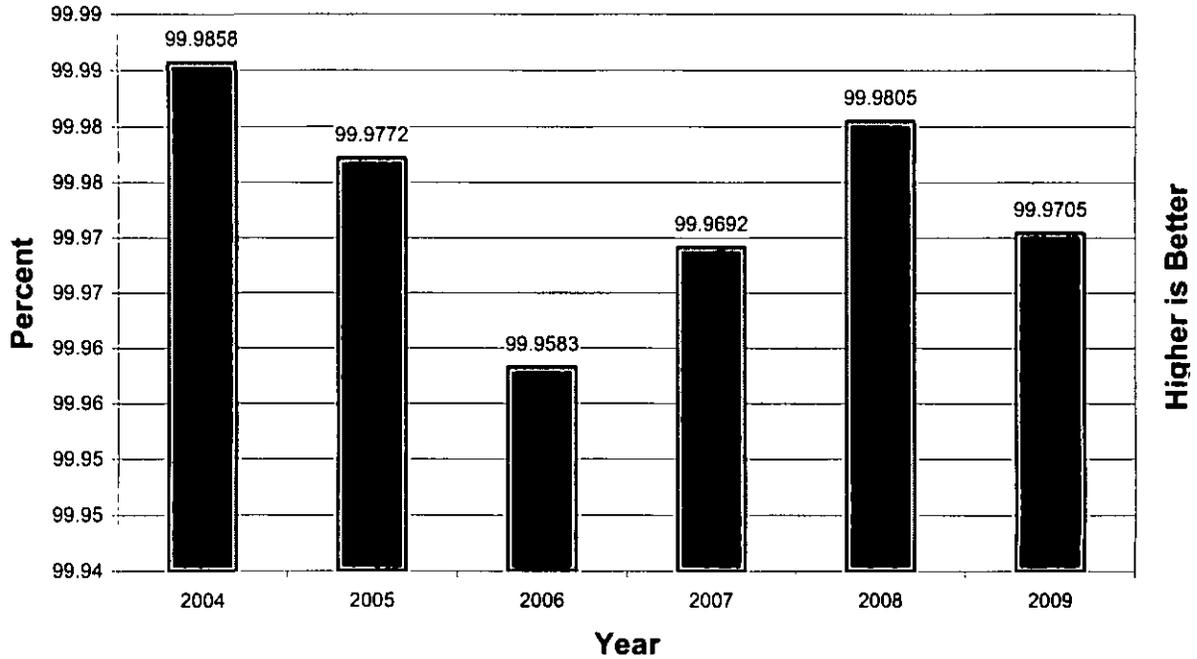
MECO Table of Annual Service Reliability Indices

SYSTEM TOTALS	<u>2004</u>*	<u>2005</u>	<u>2006</u>*	<u>2007</u>*	<u>2008</u>*	<u>2009</u>*
Number of Customers	61,846	63,103	64,405	65,728	66,810	67,126
Customer Hrs. Interrupted	77,122	126,010	235,186	186,022	114,001	173,602
Customer-Interruptions	99,424	162,827	249,485	170,299	75,764	108,368
ASA (Percent)	99.9858	99.9772	99.9583	99.9692	99.9805	99.9705
SAIFI (Occurrence)	1.608	2.580	3.874	2.593	1.134	1.614
CAIDI (Minutes)	46.54	46.43	56.56	62.52	90.28	96.12
SAIDI (Minutes)	74.82	119.81	219.10	162.13	102.38	155.17

* Data normalized per 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

Figure 1

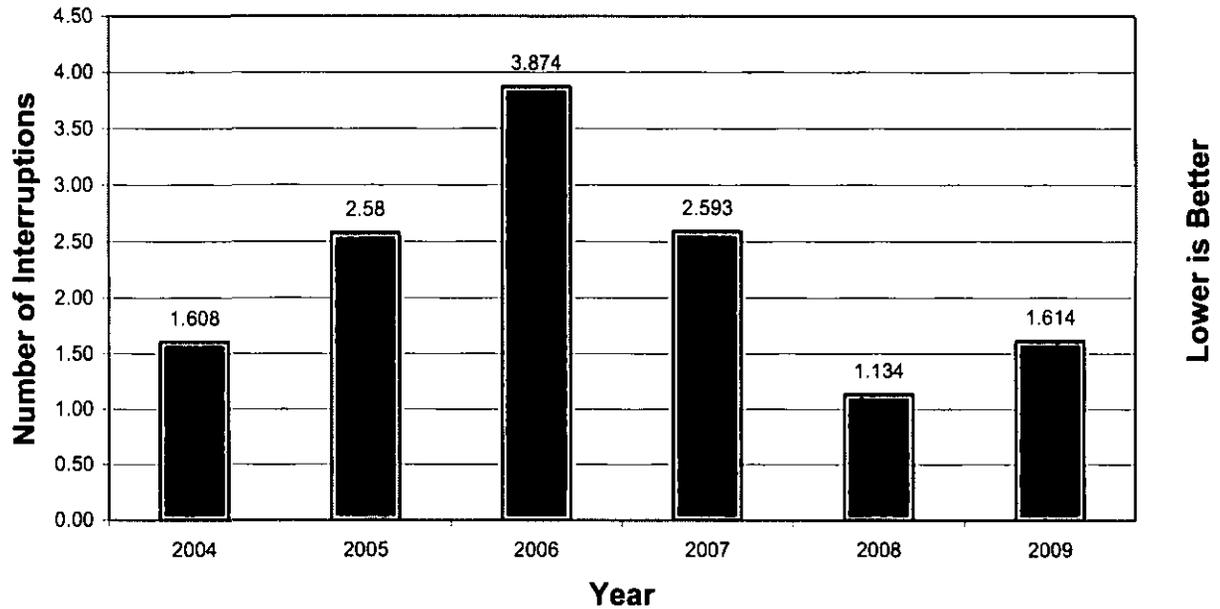
**MECO AVERAGE SERVICE AVAILABILITY
(ASA)**



Data normalized for 2004, 2006, 2007, 2008 & 2009

Figure 1 shows that the 2009 Average Service Availability (ASA) index has decreased from the 2008 results of 99.9805% to 99.9705% during 2009. This was a decrease of approximately 0.0100% in the 2009 Average Service Availability compared to the previous year. The 2009 service reliability results (normalized) showed that MECO did not make improvements in the SAIFI, CAIDI or SAIDI indices compared to 2008.

Figure 2
MECO SYSTEM AVERAGE INTERRUPTION
FREQUENCY
(SAIFI)



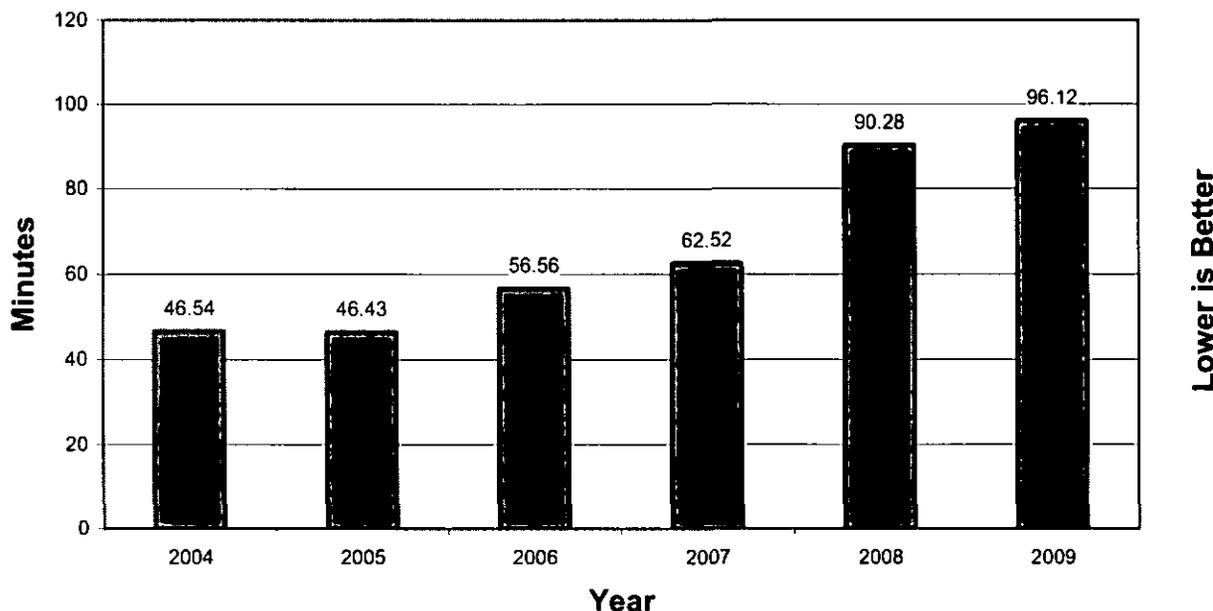
Data normalized for 2004, 2006, 2007, 2008 & 2009

Figure 2 shows the System Average Interruption Frequency Index (SAIFI) for the past six years. It shows that in 2009, the recorded SAIFI index was 1.614 and it had increased from 2008 by 42.3%.

An increase in interruptions due to scheduled maintenance, cable faults and trees or branches in lines contributed to a higher SAIFI for 2009.

Figure 3

**MECO CUSTOMER AVERAGE INTERRUPTION
DURATION
(CAIDI)**



Data normalized for 2004, 2006, 2007, 2008 & 2009

Figure 3 shows the Customer Average Interruption Duration index (CAIDI) for the past six years.

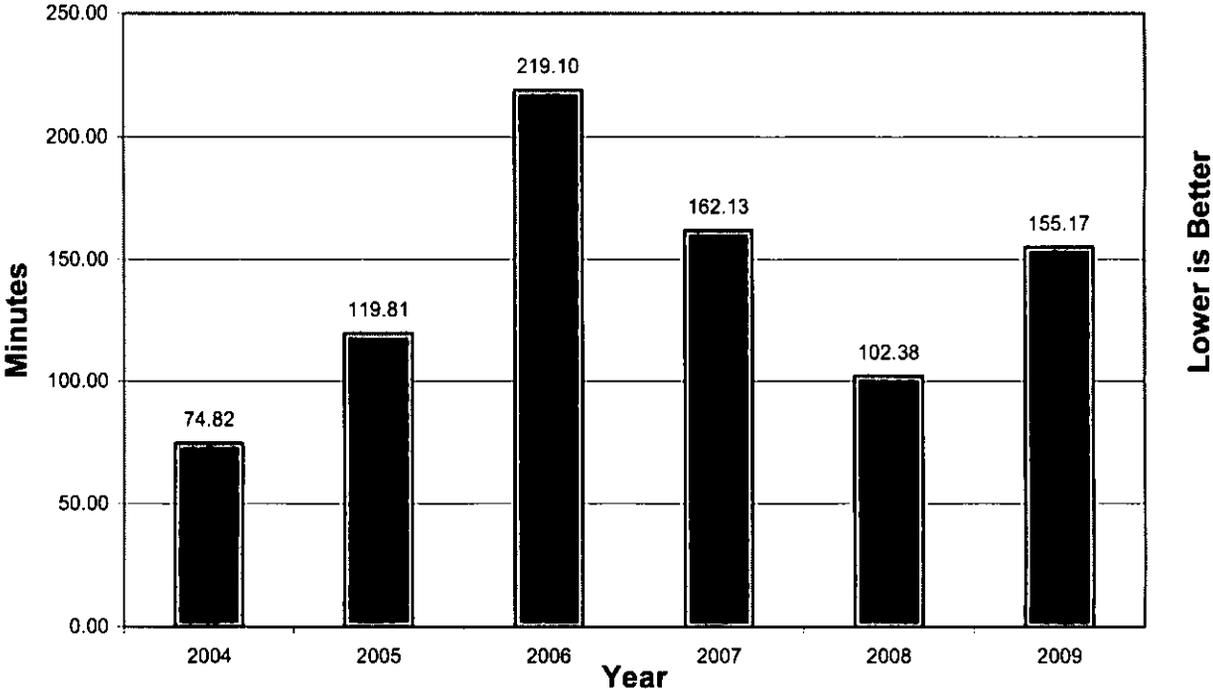
The average electrical outage duration of 96.12 minutes per customer for 2009 is an increase of 6.5% from the previous year.

The contributing factors to the increase of the CAIDI index are outages related to trees or branches in lines, equipment failure and high winds. Outages due to trees or branches in lines increased in 2009, which incurred 38,834.8 customer interruption hours and accounted for 22.4% of all customer interruption hours in 2009. Outages due to equipment failure increased in 2009, which incurred 27,364.7 customer interruption hours and accounted for 15.8% of all customer interruption hours in 2009. Outages due to high winds also increased in 2009, which incurred 20,393.8 customer interruption hours and accounted for 11.7% of all customer interruption hours in 2009.

Outages related to trees or branches in lines and high winds for 2009 caused extensive damage to MECO property and required time consuming work (i.e. the replacement of poles and conductors), which increases the duration of the outage. Also, a majority of the outages caused by trees or branches in lines occurred in rural areas, which increased the duration of the outage due to the additional travel time required to reach the various outage sites.

Figure 4

**MECO SYSTEM AVERAGE INTERRUPTION DURATION
(SAIDI)**



Data normalized for 2004, 2006, 2007, 2008 & 2009

Figure 4 shows the System Average Interruption Duration Index (SAIDI) for the past six years. It shows that in 2009, the recorded SAIDI index was 155.17 and it had increased from 2008 by 51.7%.

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 higher SAIDI result was due to an increase in the SAIFI and CAIDI statistics as noted previously.

***Maui Electric Company System Interruption
Service Reliability - System Total
From: January 1, 2009 To: December 31, 2009***

<u>Cause</u>	<u>Cust-Hr</u>	<u>Cust-Int</u>	<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>	<u>SAIDI Rank</u>
07. Trees or branches in lines	38834.8	22106.0	0.329	34.71	105.41	1
17. Equipment failure	27364.7	16423.0	0.245	24.46	99.97	2
08. Deterioration, rot, corrosion, termites	14880.2	14868.0	0.221	13.30	60.05	5
10. High wind	20393.8	10469.0	0.156	18.23	116.88	3
13. Cable fault	10164.3	7688.0	0.115	9.09	79.33	7
26. Maintenance - forced	18688.9	7056.0	0.105	16.70	158.92	4
05. Contact by moving equipment	2266.2	5562.0	0.083	2.03	24.45	12
29. Unknown failure	6862.0	5110.0	0.076	6.13	80.57	8
20. Operator or switching error	334.5	3923.0	0.058	0.30	5.12	17
09. Lightning	10970.6	3863.0	0.058	9.81	170.39	6
11. Loose connection	5298.4	3605.0	0.054	4.74	88.18	11
25. Maintenance - scheduled	6427.6	2127.0	0.032	5.75	181.31	10
01. Automobile Accident	6553.7	1632.0	0.024	5.86	240.94	9
12. Flashover	1206.3	1485.0	0.022	1.08	48.74	13
02. Man or animals in lines or equipment	997.3	993.0	0.015	0.89	60.26	14
16. Equipment overload	851.8	435.0	0.006	0.76	117.49	15
14. Transformer failure other than overload	791.8	282.0	0.004	0.71	168.46	16
03. Foreign objects in lines or equipment	46.9	190.0	0.003	0.04	14.79	22
19. Faulty operation of equipment	33.2	161.0	0.002	0.03	12.37	23
24. Nec. Int. to balance load or system conv.	93.5	92.0	0.001	0.08	60.99	21
30. Other company personnel error	125.2	90.0	0.001	0.11	83.47	20
27. System additions or removals	159.7	54.0	0.001	0.14	177.43	19
04. Fire	180.0	50.0	0.001	0.16	216.00	18
23. Nec. Int. to transfer load (out of phase)	1.7	50.0	0.001	0.00	2.00	28
06. Excavation and construction	25.4	15.0	0.000	0.02	101.60	25
21. Failure of customer's electrical equipment	16.2	15.0	0.000	0.01	64.87	26
31. Mylar Balloon	28.2	14.0	0.000	0.03	121.00	24
15. Transformer overload	5.2	10.0	0.000	0.00	31.00	27
22. Tsunami, earthquake, or flooding	0.0	0.0	0.000	0.00	0.00	30
18. Vandalism	0.0	0.0	0.000	0.00	0.00	29
Total	173602.0	108368	1.614	155.17	96.12	

Average System Availability Index (ASA) = 99.9705%
Number of Customers for the Period = 67126
SAIFI = System Average Interruption Frequency Index
SAIDI = System Average Interruption Duration Index (Minutes)
CAIDI = Customer Average Interruption Duration Index (Minutes)
The Outage Causes are Listed in Order of its SAIFI Index

**Maui Electric Company System Interruption
System Total**

From: January 1, 2009 To: December 31, 2009

<u>Cause</u>	<u>Interruptions</u>		<u>Customer Hours</u>	
	<u>Number</u>	<u>% of Total</u>	<u>Hours</u>	<u>% of Total</u>
<u>Non-Connected System Emergency</u>	159	20.70%	48948.7	28.2%
Foreign Objects	4	0.52%	46.9	0.0%
Contact by Moving Equipment	5	0.65%	2266.2	1.3%
Excavation and Construction	2	0.26%	25.4	0.0%
Fire	4	0.52%	180.0	0.1%
Auto Accident	16	2.08%	6553.7	3.8%
Man or Animal in Lines or Equipment	10	1.30%	997.3	0.6%
Trees or Branches	113	14.71%	38834.8	22.4%
Vandalism	0	0.00%	0.0	0.0%
Customer Equip. Failure Affecting Company	4	0.52%	16.2	0.0%
Mylar Balloons	1	0.13%	28.2	0.0%
<u>Error</u>	10	1.30%	459.7	0.3%
Operator or Switching	5	0.65%	334.5	0.2%
Other Company Personnel	5	0.65%	125.2	0.1%
<u>Weather</u>	31	4.04%	31364.4	18.1%
Lightning	14	1.82%	10970.6	6.3%
High Wind	17	2.21%	20393.8	11.7%
Tsunami, Earthquake or Flooding	0	0.00%	0.0	0.0%
<u>Non-Transformer Equipment</u>	260	33.85%	59798.9	34.4%
Loose connection	7	0.91%	5298.4	3.1%
Flashover	9	1.17%	1206.3	0.7%
Equipment	29	3.78%	27364.7	15.8%
Cable Fault	142	18.49%	10164.3	5.9%
Equipment Overload	3	0.39%	851.8	0.5%
Deterioration, Rot, Corrosion or Termites	67	8.72%	14880.2	8.6%
Faulty Operation of Equipment	3	0.39%	33.2	0.0%
<u>Transformer</u>	38	4.95%	796.9	0.5%
Transformer	1	0.13%	5.2	0.0%
Transformer Failure Other Than Overload	37	4.82%	791.8	0.5%
<u>Switching</u>	4	0.52%	95.2	0.1%
NEC Int to Transfer Load (Out of Phase)	1	0.13%	1.7	0.0%
NEC Int to Balance Load or Conversion	3	0.39%	93.5	0.1%
<u>Unknown After Tests and Inspections</u>	69	8.98%	6862.0	4.0%
<u>Maintenance</u>	192	25.00%	25116.4	14.5%
Scheduled	155	20.18%	6427.6	3.7%
Forced	37	4.82%	18688.9	10.8%
<u>System Additions or Removals</u>	5	0.65%	159.7	0.1%
<u>TOTALS</u>	768		173602.0	

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 system configuration.

INTERRUPTION

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

INTERRUPTION DURATION

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

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 a duration 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 which follow: In conformance with the guidelines established in the report, "Methodology for Determining Reliability Indices for HECO Utilities," dated December 1990, a sustained interruption has a duration of one minute or longer.

CUSTOMER INTERRUPTION

One interruption of one customer.

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

RELIABILITY INDICES

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:

AVERAGE SERVICE AVAILABILITY (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.

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

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.

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

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.

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