

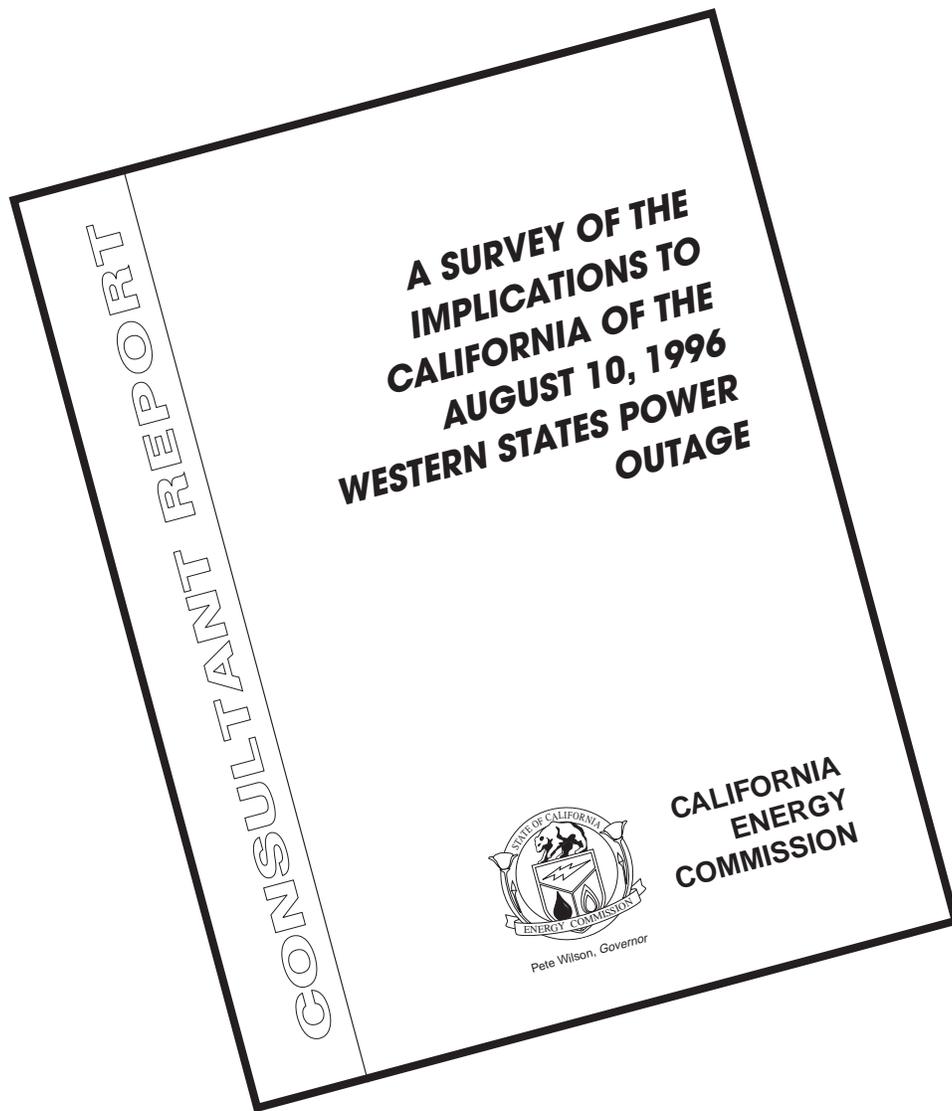
**A SURVEY OF THE
IMPLICATIONS TO
CALIFORNIA OF THE
AUGUST 10, 1996
WESTERN STATES POWER
OUTAGE**



Pete Wilson, *Governor*

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California Energy Commission

A Survey of the Implications to California of the August 10, 1996, Western States Power Outage

Contract Number 700-96-004

ABSTRACT

On December 13, 1996, the California Energy Commission contracted for a telephone survey of a sample of California's residential, commercial and industrial electricity consumers to assess the effects of the Saturday, August 10, 1996, western states power outage. Results include information on experiences with interruptions and outages, financial losses, use of back-up power supplies, satisfaction with electric power service, and the importance of reliable service.

Findings show that most consumers experience very few outages. Outages are more disruptive for residential consumers on weekends, and more disruptive for most commercial and industrial consumers on weekdays.

Approximately 44 percent of California consumers experienced the August 10, 1996, outage, and most did not incur financial losses. However, a few commercial and industrial consumers experienced losses of \$50,000 to \$5,000,000. More in-depth research regarding losses from outages is needed. Some commercial and industrial consumers have back-up power supplies and used them during the August 10, 1996, outage.

Most consumers are either very or somewhat satisfied with their present electric service. A total of 85.5% of residential, 89.5 percent of commercial, and 95.0 percent of industrial consumers said reliable, uninterrupted service is important. Some would be willing to pay higher rates for greater reliability. However, more research is needed to determine amounts and levels of reliability expected.

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Purpose

On December 13, 1996, the California State Energy Resources Conservation and Development Commission (California Energy Commission) contracted with the Survey Research Center, California State University, Chico Foundation, to conduct a telephone survey to a representative sample of California's residential, commercial and industrial electricity consumers to assess the effects of the August 10, 1996, western states power outage.

Questionnaire Development

The questionnaires for the residential, commercial and industrial surveys were developed as a collaborative effort between staff of the Survey Research Center and staff of the California Energy Commission. Each questionnaire was pretested two times on small samples of the study population. A copy of the residential questionnaire is included in Appendix A, and a copy of the questionnaire used for both the commercial and industrial sectors is included in Appendix B.

Major themes in the questionnaires for residential, commercial and industrial customers included:

- Experiences with, and number of, power interruptions of less than five minutes and power outages of five minutes or more.
- Experiences with the Saturday, August 10th, 1996, power outage, including lengths of the outage, levels of disruption caused by the outage, contact with utility companies during the outage, economic losses, and insurance claims filed.
- Availability and use of back-up power supplies during the Saturday, August 10th, 1996, outage.
- Contacts regarding the purchase of back-up power supplies.
- Possible effects of a hypothetical Thursday afternoon power outage, including levels of disruption and estimated economic losses that might be caused by this outage.
- Possible effects of a worst case power outage, including the length of such an outage; the season of the year, day of the week and time of day that it would occur; and, why it would be most disruptive.
- Satisfaction with electric power service.
- Importance of reliable electric power service, and willingness to pay more for reliability.
- Demographics and descriptive information.

Likert-type scales of standardized response categories were used in the questionnaires to measure attitudes and perceptions regarding levels of disruptions caused by interruptions or outages, satisfaction with electric power service, helpfulness of utility companies during the August 10th, 1996, outage, and the importance of reliable electric power service.

Sampling Methodology

The original contract specified completed interviews with samples of 300 residential, 200 commercial, and 100 industrial electric power customers. An amendment to the contract changed the samples to 200 each for the three categories of customers. A sample size of 200 has a sampling error of +/-6.9% with 95% confidence. Therefore, one can say with 95% confidence that the findings from a sample of 200 represents the population from which the sample was drawn within +/- 6.9%. A limitation of the data collected from a sample of 200 is the inability to generalize findings from a small sub-sample to the population for that sub-sample. For example, if 15 members of the industrial sample own back-up power supplies, the sampling error for the opinions of this sub-sample is so high that the results cannot be generalized to the sub-population of industrial customers with back-up power supplies. One can only conclude that 7.5% (15 out of 200) of the sample and somewhere between 0.6% and 14.4% of the population of industrial customers (the sample percentage +/-6.9%) own back-up power supplies.

The sample of residential customers was selected through random digit dial (RDD) sampling which better assures that all residences, including new listings and unlisted numbers, have equal chances of selection. The commercial and industrial samples were randomly selected from the *1997 California Business Register*, a database of approximately 60,000 manufacturers, wholesalers, high tech, and service businesses. The information contained in the database was provided through the cooperation of the companies in 1996 either by mailed questionnaires or telephone interviews. Every listing in the directory was contacted; however, in some instances it can only be determined that the company continues to operate at the same address. A company is dropped from the directory if contact with a company representative is not made for two consecutive years.

Residential Customers

Telephone calling for the residential survey was conducted between April 6th and May 2nd, 1997. An initial sample of 600 randomly selected telephone numbers was used for the residential survey. Of these, 223 were non-working numbers and 48 were numbers for which there was no legitimate respondent (language barrier, no-one over 18, etc.). These 271 numbers were removed from the sample. The remaining 329 numbers were assumed to be legitimate household numbers.

Telephone numbers in the sample were called up to 14 times during the study period. Contact times were varied by time of day and day of week to increase the chances of reaching someone. Refusal conversion attempts were made on all initial refusals except those cases where the respondent specifically requested they not be called back. Interviews were completed with a total of 200 residential customers.

When residences were reached, interviewers asked to speak to the person who most commonly pays the electric bill. The 200 interviews were completed out of the remaining 329 numbers which yielded a completion rate of 60.8%. Completion rate was calculated by dividing the number of completed interviews (200) by the total number of potentially eligible respondents (329). The cooperation rate for the survey was 83.3%. Cooperation rate is the ratio of the number of eligible respondents who completed interviews (200) to the total number of eligible respondents who were contacted for interviews (240).

Commercial Customers

Telephone calling for the commercial survey was conducted between May 7th and June 2nd, 1997. The sample of commercial customers was randomly selected from a commercial and industrial data base entitled *1997 California Business Register* furnished by the California Energy Commission. An initial sample of 313 companies was randomly selected. A total of eight companies had non-working numbers and one had a number for which there was no legitimate respondent available during the study period. These nine numbers were removed from the sample.

All companies included in the sample received an initial call for the purpose of identifying the person responsible for managing energy costs. Once the respondent for a company was identified, he or she was mailed or faxed a letter and a set of factual questions which were asked during the telephone interview (Appendix C).

Prospective companies were called up to 11 times during the study period. Calling times were varied by day of week and time of day to increase the chances of making contact. Refusal conversion attempts were made on all initial refusals except those cases where there was a corporate policy against participating in surveys or the respondent specifically requested us not to call back.

Of the 304 numbers in the commercial sample, a total of 203 interviews with commercial customers were completed which yielded a completion rate of 66.8%. Completion rate was calculated by dividing the number of completed interviews (203) by the total number of potentially eligible respondents (304). The cooperation rate for the study was 82.5%. Cooperation rate is the ratio of the number of eligible respondents (203) who completed interviews to the total number of eligible respondents who were contacted for interviews (246).

Industrial Customers

Telephone calling for the industrial survey was conducted between May 7th and June 2nd, 1997. The sample of industrial customers was randomly selected from a commercial and industrial data base entitled *1997 California Business Register* furnished by the California Energy Commission. An initial sample of 308 companies was randomly selected. A total of 12 companies had non-working numbers and two had numbers for which there was no legitimate respondent available during the study period. These 14 numbers were removed from the sample.

All companies included in the sample received an initial call for the purpose of identifying the person responsible for managing energy costs. Once the respondent for a company was identified, he or she was mailed or faxed a letter and a set of factual questions which were asked during the telephone interview (Appendix C).

Prospective companies were called up to 11 times during the study period. Calling times were varied by day of week and time of day to increase the chances of making contacting. Refusal conversion attempts were made on all initial refusals except those cases where there was a corporate policy against participating in surveys or the respondent specifically requested us not to call back.

Of the 294 numbers in the industrial sample, a total of 201 interviews with industrial customers were completed which yielded a completion rate of 68.4%. Completion rate was calculated by dividing the number of completed interviews (201) by the total number of potentially eligible respondents (294). The cooperation rate for the study was 82.0%. Cooperation rate is the ratio of the number of eligible respondents who completed interviews (201) to the total number of eligible respondents who were contacted for interviews (245).

Survey Results

Demographics of the Residential Sample

The demographics of the 200 residential respondents are presented in Table 1. As shown, 40.5% were male and 59.5% were female. A total of 70.1% were employed either full- or part-time, and about two-thirds were White/Anglo. The largest age groups were 40-49 and 30-39 respectively. The income groups with the largest numbers of respondents were \$35,000-\$49,999 and \$20,000-\$34,999. A comparison of household incomes of survey respondents with 1995 California Department of Finance estimates shows that the survey sample represents household incomes within sampling tolerances for three of the four income categories. Only households with incomes of less than \$20,000 per year are under-represented in the sample based on the 1995 California Department of Finance Estimates (Table 2). This under-representation is probably due to several factors:

1. Though approximately 95% of California households have telephones, lower income households account for most of the households without phones and would therefore be less likely to be selected in the sample.
2. The estimates from the California Department of Finance are approximately two years old and household incomes have most likely changed during this period.
3. Respondents often tend to overstate their household incomes during telephone surveys.
4. A total of 13.0% (26) of respondents refused to provide their household incomes for the survey.

Given the above limitation, the sample should be sufficient to satisfy the purpose of the survey.

Profile of the Commercial and Industrial Organizations

Commercial and industrial respondents were asked the approximate square footage of the facility at their location, the number of full-time employees at the location, the number of part-time or seasonal employees at the location, normal days and hours of operation, amount spent on electricity per year, and the percentage of annual operating expenses spent on electricity. These characteristics are presented in Table 3. The SIC (Standard Industrial Codes) for the commercial and industrial respondents are presented in Table 4.

Table 1. Demographic characteristics of the residential electric power customers surveyed for the 1997 California Energy Commission Telephone Survey.

Characteristic	Number	Percentage	Cumulative Percentage
Gender			
Male	81	40.5%	40.5%
Female	119	59.5%	100.0%
Age Group			
18 to 29	31	15.5%	15.5%
30 to 39	46	23.0%	38.5%
40 to 49	49	24.5%	63.0%
50 to 59	26	13.0%	76.0%
60 to 69	21	10.5%	86.5%
70 or over	27	13.5%	100.0%
Ethnicity			
White/Anglo	130	67.0%	67.0%
Latino/Hispanic	28	14.4%	81.4%
Black/African American	19	9.8%	91.2%
Asian/Pacific Islander	14	7.2%	98.5%
Native American	3	1.5%	100.0%
Refused to answer	6		
Employment Status			
Full-Time	112	56.9%	56.9%

Part-Time	26	13.2%	70.1%
Temp. Unemployed	8	4.1%	74.1%
Homemaker	12	6.1%	80.2%
Retired	36	18.3%	98.5%
Disabled	3	1.5%	100.0%
Refused to answer	3		
Annual Household Income			
Less than \$20,000	32	18.4%	18.4%
\$20,000-\$34,999	35	20.1%	38.5%
\$35,000-\$49,999	38	21.8%	60.3%
\$50,000-\$64,999	15	8.6%	69.0%
\$65,000-\$84,999	20	11.5%	80.5%
\$85,000-\$99,999	16	9.2%	89.7%
\$100,000 or more	18	10.3%	100.0%
Refused to answer	26		

Table 2. Comparison of household incomes of the residential electric power customers surveyed for the 1997 California Energy Commission Telephone Survey with 1995 statewide household income estimates prepared by the California Department of Finance.

Annual Household Income	1997 Energy Sample	1995 Statewide Estimates
Less than \$20,000	18.4% (32)	28.6% (3,212,600)
\$20,000-\$34,999	20.1% (35)	19.1% (2,138,300)
\$35,000-\$49,999	21.8% (38)	15.6% (1,754,400)
\$50,000 or more	39.6% (69)	36.6% (4,108,700)
Totals	99.9% (200)	99.9% (11,214,000)

Table 3. Characteristics of California commercial and industrial organizations surveyed for the 1997 California Energy Commission Telephone Survey.

Characteristic	Commercial	Industrial
Square Footage		
Less than 1,000	9.8% (18)	3.2% (6)
1,000 - 1,999	11.4% (21)	5.3% (10)
2,000 - 3,999	18.5% (34)	14.2% (27)
4,000 - 5,999	6.5% (12)	9.5% (18)
6,000 - 7,999	6.0% (11)	6.3% (12)
8,000 - 9,999	4.9% (9)	5.8% (11)
10,000 - 19,999	17.4% (32)	18.45 (35)
20,000 - 39,999	8.2% (15)	15.8% (30)

40,000 - 99,999	8.2% (15)	12.1% (23)
100,000 - 199,999	3.8% (7)	3.7% (7)
200,000 - 499,999	2.7% (5)	3.7% (7)
500,000 or more	2.7% (5)	2.1% (4)
Full-Time Employees		
10 or fewer	50.8% (101)	39.55 (79)
11-20	17.1% (34)	18.0% (36)
21-30	8.5% (17)	8.5% (17)
31-40	5.5% (11)	7.5% (15)
41-60	7.0% (14)	9.5% (19)
61-100	2.0% (4)	7.0% (14)
101-200	2.0% (4)	5.0% (10)
201-400	4.0% (8)	2.5% (5)
401-1,000	2.0% (4)	2.5% (5)
1,001 or more	1.0% (2)	0 (0.0%)

Table 3. (cont'd.)

Characteristic	Commercial	Industrial
Part-Time Employees		
10 or fewer	91.9% (181)	89.3% (176)
11-20	3.6% (7)	4.1% (8)
21-40	1.5% (3)	2.0% (4)
41-100	2.0% (4)	3.0% (6)
101 or more	1.0% (2)	1.5% (3)
Annual Expenditures for Electricity		
Less than \$1,000	9.7% (10)	2.0% (3)
\$1,000 - \$1,999	11.7% (12)	6.0% (9)
\$2,000 - \$3,999	14.5% (15)	14.1% (21)
\$4,000 - \$9,999	27.2% (28)	18.8% (28)
\$10,000 - \$19,999	8.7% (9)	15.4% (23)
\$20,000 - \$39,999	6.8% (7)	16.1% (24)
\$40,000 - \$99,999	11.7% (12)	12.1% (18)
\$100,000 - \$499,999	8.7% (9)	11.4% (17)
\$500,000 or more	1.0% (1)	4.0% (6)
Percent of Annual Operating Expenses Spent for Electricity		
1% or less	40.0% (36)	42.0% (42)
2% - 10%	46.7% (42)	46.0% (46)
11% - 20%	6.7% (6)	6.0% (6)
21% - 30%	2.2% (2)	4.0% (4)
31% - 40%	1.1% (1)	1.0% (1)
41% - 70%	1.1% (1)	0.0% (0)
71% or more	2.2% (2)	1.0% (1)
Normal Days of Operation		
Monday - Friday	70.9% (144)	70.1% (141)

Monday - Saturday	17.2% (35)	15.4% (31)
7 Days a Week	10.8% (22)	11.9% (24)
Other	1.0% (2)	2.5% (5)
Times That Work Normally Begins		
3 AM	0.5% (1)	1.5% (3)
4 AM	0.5% (1)	1.0% (2)
5 AM	1.0% (2)	2.5% (5)
6 AM	5.4% (11)	10.9% (22)
7 AM	16.3% (33)	10.9% (22)
8 AM	50.2% (102)	35.8% (72)
9 AM	15.8% (32)	5.0% (10)
10 AM	1.5% (3)	0.5% (1)
5 PM	0.5% (1)	0.0% (0)
Operate 24 hours a day	8.4% (17)	11.9% (24)

Table 3. (cont'd.)

Characteristic	Commercial	Industrial
Times That Work Normally Ends		
2 AM	0.5% (1)	0.0% (0)
3 AM	0.5% (1)	0.0% (0)
1 PM	0.5% (1)	0.5% (1)
2 PM	0.0% (0)	0.5% (1)
3 PM	1.5% (3)	4.0% (8)
4 PM	8.4% (17)	12.9% (26)
5 PM	55.2% (112)	43.8% (88)
6 PM	15.8% (32)	15.4% (31)
7 PM	3.9% (8)	3.5% (7)
8 PM	1.5% (3)	1.0% (2)
9 PM	2.0% (4)	0.5% (1)
10 PM	1.0% (2)	1.5% (3)
11 PM	1.0% (2)	2.0% (4)
12 midnight	1.5% (3)	2.0% (4)
Operate 24 hours a day	8.4% (17)	11.9% (24)

Table 4. SIC (Standard Industrial Codes) for California commercial and industrial organizations surveyed for the 1997 California Energy Commission Telephone Survey.

SIC Codes	Percentage (Number)
Commercial Respondents	
15 Building Contractors - General Contractors & Building Operators	0.5% (1)
17 Construction - Special Trade Contractors	0.5% (1)
27 Printing, Publishing & Allied Industries	0.5% (1)
34 Fabricated Metal Products	0.5% (1)
35 Industrial Machinery & Equipment	0.5% (1)
36 Electronic & Other Electric Equipment	1.0% (2)
38 Instruments or Related Products	1.0% (2)

39 Misc. Manufacturing Industries	0.5% (1)
50 Wholesale Trade - Durable Goods	24.3% (49)
51 Wholesale Trade - Non-Durable Goods	7.4% (15)
53 General Merchandise Stores	0.5% (1)
55 Automotive Dealers & Service Stations	1.5% (3)
57 Furniture & Home Furnishings Store	1.5% (3)
60 Depository Institutions	3.0% (6)
62 Security & Commodity Brokers	0.5% (1)
63 Insurance Carriers	0.5% (1)
64 Insurance Agents, Brokers & Service	1.5% (3)
65 Real Estate	2.0% (4)

Table 4. (Cont'd.)

SIC Codes	Percentage (Number)
Commercial Respondents (cont'd.)	
67 Holding & Other Investment Offices	1.5% (3)
70 Hotels & Other Lodging Places	1.5% (3)
72 Personnel Services	1.5% (3)
73 Business Services	13.4% (27)
75 Auto Repair, Services & Parking	2.0% (4)
76 Misc. Repair Services	2.0% (4)
78 Motion Pictures	3.0% (6)
79 Amusement & Recreation Services	1.0% (2)
80 Health Services	1.5% (3)
81 Legal Services	1.5% (3)
82 Educational Services	2.0% (4)
83 Social Services	0.5% (1)
86 Membership Organizations	3.5% (7)
87 Engineering & Management Services	17.3% (35)
96 Administration of Economic Programs	0.5% (1)
SIC Code Missing	1
TOTAL	100% (203)
Industrial Respondents	
14 Mining & Quarrying - Non-Metallic	1.0% (2)
15 Building Contractors - General Contractors & Building Operators	1.0% (2)
17 Construction - Special Trade Contractor	4.0% (8)
20 Food & Kindred Products	8.0% (16)
23 Apparel & Other Finished Fabric Products	3.5% (7)
24 Lumber & Wood Products (Excludes Furniture)	3.5% (7)
25 Furniture & Fixtures	2.0% (4)
26 Paper & Allied Products	1.0% (2)
27 Printing, Publishing & Allied Industries	10.9% (22)
28 Chemicals & Allied Products	2.5% (5)
30 Rubber & Misc. Plastic Products	4.0% (8)
32 Stone, Clay & Glass Products	2.0% (4)
33 Primary Metal Industries	1.0% (2)
34 Fabricated Metal Products	6.5% (13)
35 Industrial Machinery & Equipment	18.9% (38)
36 Electronic & Other Electric Equipment	5.5% (11)
37 Transportation Equipment	4.0% (8)

38 Instruments or Related Products	6.0% (12)
39 Misc. Manufacturing Industries	2.0% (4)
41 Local & Interurban Passenger Transit	1.0% (2)
42 Trucking & Warehousing	1.5% (3)
44 Water Transportation	0.5% (1)
45 Transportation by Air	2.0% (4)

Table 4. (Cont'd.)

SIC Codes	Percentage (Number)
Industrial Respondents (cont'd.)	
47 Transportation Services	3.0% (6)
48 Communications	2.5% (5)
49 Electric, Gas & Sanitary Services	1.0% (2)
75 Auto Repair, Services & Parking	0.5% (1)
76 Misc. Repair Services	0.5% (1)
78 Motion Pictures	0.5% (1)
TOTAL	100% (201)

Short-Duration Power Interruptions

Residential respondents were asked if their households had experienced any power interruptions of less than five minutes within the last 12 months (Appendix A, q1st). A total of 53% said they had experienced one or more interruptions, and 47.0% said they had not. The number of interruptions (Appendix A, q1a) varied from one (1) to eighty (80) with one (1) to five (5) interruptions being most frequent (Table 5).

Commercial and industrial respondents were also asked if their organizations had experienced any power interruptions of less than five minutes during the past 12 months (Appendix B, q1st). A total of 99 (48.8%) commercial and 105 (52.2%) industrial respondents said they had experienced at least one interruption. The number of interruptions (q1a) varied from one (1) to thirty (30) for commercial and one (1) to fifty (50) for industrial customers (Table 5).

When asked how disruptive power interruptions were to their households (Appendix A, q1b), about two-thirds of residential respondents said they were either somewhat disruptive (33.0%) or not very disruptive (38.7%), and 12.3% said they were very disruptive. A total of 21.2% of commercial and 29.5% of industrial respondents said the power interruptions were very disruptive. An additional 46.5% of commercial and 34.3% of industrial customers indicated the interruptions were somewhat disruptive (Table 6).

Table 5. Number of short-duration power interruptions experienced by California electric power customers during the past 12 months.

Number of Interruptions	Residential	Commercial	Industrial
1	22 (20.8%)	28 (28.3%)	25 (24.5%)
2	33 (31.1%)	24 (24.2%)	33 (32.4%)
3	19 (17.9%)	20 (19.6%)	14 (14.1%)
4	7 (6.6%)	11 (11.1%)	4 (3.9%)
5	10 (9.4%)	10 (10.1%)	8 (7.8%)
6	1 (0.9%)	2 (2.0%)	4 (3.9%)
7	0 (0.0%)	1 (1.0%)	0 (0.0%)
8	2 (2.9%)	1 (1.0%)	1 (1.0%)
10	3 (2.8%)	5 (5.1%)	1 (1.0%)
12	1 (0.9%)	2 (2.0%)	1 (1.0%)
15	1 (0.9%)	0 (0.0%)	1 (1.0%)
20	1 (0.9%)	0 (0.0%)	1 (1.0%)
30	0 (0.0%)	1 (1.0%)	2 (2.0%)
40	1 (0.9%)	0 (0.0%)	0 (0.0%)
50	0 (0.0%)	0 (0.0%)	1 (1.0%)
80	1 (0.9%)	0 (0.0%)	0 (0.0%)
TOTAL	102 (99.9%)	102 (100.5%)	102 (100.6%)

Table 6. Level of disruption caused by short-duration power interruptions experienced by California electric power customers during the past 12 months.

Level of Disruption	Residential	Commercial	Industrial
Very Disruptive	13 (12.3%)	21 (21.2%)	31 (29.5%)
Somewhat Disruptive	35 (33.0%)	46 (46.5%)	36 (34.3%)
Not Very Disruptive	41 (38.7%)	24 (24.2%)	29 (27.6%)
Not At All Disruptive	17 (16.0%)	8 (8.1%)	9 (8.6%)
TOTAL	106 (100.0%)	99 (100.0%)	105 (100.0%)

Longer-Duration Power Outages

Residential respondents were asked if their households had experienced any prolonged power outages of five minutes or more during the past 12 months (Appendix A, q2). A total of 57.5% (115) said “yes” and 42.0% (84) said “no”. The number of outages (Appendix A, q2a) varied from one to 15 with one outage being the most frequent and two being the second most frequent (Table 7).

Commercial and industrial respondents were also asked if they had experienced any longer-duration power outages during the past twelve months. A total of 92 (45.8%) of commercial and 95 (47.5%) of industrial respondents said “yes”. The number of outages varied from one to 10 for commercial and one to 20 for industrial respondents (Table 7).

Table 7. Number of longer-duration power outages experienced by California electric power customers during the past 12 months.

Number of Outages	Residential	Commercial	Industrial
1	59 (51.3%)	52 (55.9%)	49 (51.6%)
2	29 (25.2%)	24 (25.8%)	24 (25.3%)
3	16 (13.9%)	12 (12.9%)	11 (11.6%)
4	4 (3.5%)	0 (0.0%)	3 (3.2%)
5	2 (1.7%)	3 (3.2%)	3 (3.2%)
6	3 (2.6%)	1 (1.1%)	1 (1.1%)
8	0 (0.0%)	0 (0.0%)	1 (1.1%)
10	1 (0.9%)	1 (1.1%)	1 (1.1%)
14	0 (0.0%)	0 (0.0%)	1 (1.1%)
15	1 (0.9%)	0 (0.0%)	0 (0.0%)
20	0 (0.0%)	0 (0.0%)	1 (1.1%)
TOTAL	115 (100.0%)	93 (100.0%)	95 (100.4%)

When residential respondents were asked how disruptive the longer-duration outages were for their households (Appendix A, q2b), 41.7% said they were very disruptive and 33.9% said they were somewhat disruptive (Table 8). Therefore, approximately three-fourths of residential respondents said that power outages were very or somewhat disruptive to their households.

In the opinions of commercial and industrial respondents, longer-duration power outages were more disruptive to their organizations than these outages were to residential respondents. A total of 58.7% of commercial and 65.3% of industrial respondents said these outages were very disruptive to their organizations. Another 19.6% of commercial and 13.7% of industrial respondents indicated these outages were somewhat disruptive (Table 8).

Commercial and industrial respondents were asked how long their organizations can be without power before they have to shut down operations and send people home (Appendix B, q2c). Approximately three-fourths of both commercial and industrial respondents said two hours or less, and more than half said one hour or less (Table 9).

Table 8. Levels of disruption caused by longer-duration power outages experienced by California electric power customers during the past 12 months.

Levels of Disruption	Residential	Commercial	Industrial
Very Disruptive	48 (41.7%)	54 (58.7%)	62 (65.3%)
Somewhat Disruptive	39 (33.9%)	18 (19.6%)	13 (13.7%)
Not Very Disruptive	22 (19.1%)	16 (17.4%)	11 (11.6%)

Not At All Disruptive	6 (5.2%)	4 (4.3%)	9 (9.5%)
TOTAL	115 (99.9%)	92 (100.0%)	95 (100.1%)

Table 9. Length of time California commercial and industrial organizations can be without electric power before they have to shut down operations and send people home.

Length of Time	Commercial	Industrial
1 to 20 minutes	10 (11.9%)	17 (18.7%)
20 minutes to 1 hour	34 (40.5%)	34 (37.4%)
1 to 2 hours	20 (23.8%)	18 (19.8%)
2 to 4 hours	13 (15.5%)	13 (14.3%)
4 to 6 hours	1 (1.2%)	2 (2.2%)
6 hours to 1 day	5 (6.0%)	5 (5.5%)
More than 1 day	1 (1.2%)	2 (2.2%)
TOTAL	84 (100.1%)	91 (100.1%)

Power Outage on Saturday, August 10, 1996

The Saturday, August 10, 1996, western states power outage, which began affecting California at 3:48 PM, affected 5,030,705 (43.6%) of the 11,546,968 customers of California's five largest utility companies. Table 10 summarizes the verified outages of these five companies and describes the total number of electricity customers affected as well as the time-frames for restoration of electric power. These five utilities serve more than 90% of California. This information is abstracted from the October 18, 1996, *Western Systems Coordinating Council Disturbance Report* and the California Energy Commission, *Quarterly Fuel and Energy Report*, August 1996.

When residential respondents were asked if their households experienced the August 10, 1996, power outage (Appendix A, q3), 45.5% said "yes", 48.0% said "no", and 6.5% did not know (Table 11). For those who experienced the outage, the length of the outage varied from less than 20 minutes to more than one day (Appendix A, q3a). The most common outage durations were 1-2 hours, 2-4 hours, and 4-6 hours (Table 12).

Table 10. California electric power customers interrupted by the August 10, 1996, power outage.

Utility Company	Total Customers	Customers Interrupted	Restoration Time
Pacific Gas & Electric (PG&E)	4,438,871	2,000,000 (45.1%)	13 minutes*
Sacramento Municipal Utility District (SMUD)	490,700	193,267 (39.4%)	5 hours
Southern California Edison (SCE)	4,200,234	1,800,000 (42.9%)	3 hours
Los Angeles Dept. of Water & Power	1,279,998	575,000 (44.9%)	2 hours

(LADWP)			
San Diego Gas & Electric (SDG&E)	1,137,165	462,438 (40.7%)	3 hours
TOTAL	11,546,968	5,030,705 (43.6%)	

Note: This information is abstracted from the *Western Systems Coordinating Council Disturbance Report* and the California Energy Commission, *Quarterly Fuel and Energy Report*, August 1996.

*The PG&E restoration time appears to reflect the time to stabilize the system at the bulk level; actual time to restore power to individual customers was considerably longer. PG&E restored power to more than 90% of its customers by 10 PM, more than six hours into the outage (Source: "Oregon Voltage Glitches Trigger Outages in Western States," SMUD Electronic Bulletin Board article, August 14, 1996).

Table 11. California electric power customers who experienced the August 10, 1996, power outage.

Experienced the Outage	Residential	Commercial	Industrial
Yes	91 (45.5%)	40 (19.7%)	51 (25.4%)
No	96 (48.0%)	156 (76.8%)	143 (71.1%)
Don't Know	13 (6.5%)	7 (3.4%)	7 (3.5%)
TOTAL	200 (100.0%)	203 (99.9%)	201 (100.0%)

Table 12. Length of the August 10, 1996, power outage experienced by California electric power customers.

Length of Outage	Residential	Commercial	Industrial
Did not experience the outage	96 (48.0%)	156 (76.8%)	143 (71.1%)
Did not know if they experienced the outage	13 (6.5%)	7 (3.4%)	7 (3.5%)
1 to 20 minutes	7 (3.5%)	1 (0.5%)	5 (2.5%)
20 minutes to 1 hour	8 (4.0%)	6 (3.0%)	5 (2.5%)
1 to 2 hours	21 (10.5%)	10 (4.9%)	10 (5.0%)
2 to 4 hours	23 (11.5%)	7 (3.4%)	10 (5.0%)
4 to 6 hours	15 (7.5%)	1 (0.5%)	2 (1.0%)
6 hours to 1 day	10 (5.0%)	3 (1.5%)	10 (5.0%)
More than 1 day	2 (1.0%)	5 (2.5%)	0 (0.0%)
Don't Know	5	7	9
TOTAL	200 (100.0%)	203 (100.0%)	201 (100.0%)

Commercial and industrial respondents were also asked if their organizations experienced the August 10, 1996, power outage (Appendix B, q3). A total of 19.7% of commercial and 25.4% of industrial respondents said "yes", 76.8% of commercial and 71.1% of industrial said "no", and 3.4% of commercial and 3.5% of industrial respondents did not know (Table 11). A total of 28.0% of commercial and 27.3% of industrial respondents operate on Saturdays (Table 3). The most frequently reported outage lengths for commercial respondents were 1-2 hours, 2-4 hours, and 20 minutes to 1 hour. The most common lengths for industrial respondents were 1-2 hours, 2-4 hours and 6 hours to 1 day (Table 12).

Back-up Power Supplies

Residential respondents who experienced the Saturday, August 10, 1996, power outage (n=91) were asked if they had back-up power supplies (Appendix A, q3b). Only two respondents said “yes.” One of these customers had a generator and one had batteries (Appendix A, q3d) (Table 13). When asked if their back-up power supply worked during the outage, both said “yes” (Appendix A, q3e), and both were very satisfied with their back-up supplies (Appendix A, q3f).

Fifteen of the 40 commercial and ten of the 51 industrial respondents who experienced the Saturday, August 10, 1996, outage had back-up power supplies. Like residential customers, most of these back-up supplies were either batteries or generators (Table 13). Of those with back-up power supplies, a total of 12 commercial and six industrial respondents used their back-up supplies during the August 10th outage. These respondents were asked if their back-up supplies were large enough to allow operations to proceed normally, or if they handled only critical emergency functions (Appendix B, q3e). A total of 10 of the commercial and five of the industrial organizations stated their back-up power supplies handled only critical functions (Table 14).

When commercial and industrial respondents with back-up power supplies who experienced the August 10, 1996, outage were asked if their back-up supplies worked as expected during the August 10th outage, all 11 of commercial and five of the six industrial respondents who knew the capacity of their back-up system said “yes”. Respondents whose back-up supplies worked as expected were also asked if they were satisfied with the performance of their back-up supplies during the August 10th power outage (Appendix B, q3g). As shown in Table 14, five of the 11 commercial and three industrial customers very satisfied with their back-up supplies.

Table 13. Types of back-up power supplies available to California electric power customers when the August 10, 1996, power outage occurred.

Type of Back-up Supply	Residential	Commercial	Industrial
Did not experience the outage	96 (48.0%)	156 (76.8%)	143 (71.1%)
Did not know if they experienced the outage	13 (6.5%)	7 (3.4%)	7 (3.5%)
Stated they had no back-up supply	89 (44.5%)	25 (12.3%)	41 (20.4%)
Generator	1 (0.5%)	5 (2.5%)	4 (2.0%)
Batteries	1 (0.5%)	8 (3.9%)	5 (2.5%)
Other	0 (0.0%)	2 (1.0%)	1 (0.5%)
TOTAL	200 (100.0%)	203 (99.9%)	201 (100.0%)

Table 14. Capacities of back-up power supplies available to California commercial and industrial organizations during the August 10, 1996, power outage.

Capacities of Back-up Supplies	Commercial	Industrial
Stated they had no back-up supply	188 (92.6%)	191 (95.0%)
Did not know capacity	4 (2.0%)	4 (2.0%)
Handled normal operations	1 (0.5%)	1 (0.5%)
Handles critical functions	10 (4.9%)	5 (2.5%)
TOTAL	203 (100.0%)	201 (100.0%)

Table 15. Satisfaction of California commercial and industrial organizations with the performance of their back-up power supplies during the August 10, 1996, power outage.

Satisfaction with Back-up Supplies	Commercial	Industrial
Very Satisfied	5 (45.5%)	3 (60.0%)
Somewhat Satisfied	5 (45.5%)	2 (40.0%)
Somewhat Dissatisfied	0 (0.0%)	0 (0.0%)
Very Dissatisfied	1 (9.1%)	0 (0.0%)
TOTAL	11 (100.1%)	5 (100.0%)

Contact Regarding the Purchase of Back-up Supplies

Commercial and industrial respondents were asked if they had ever been contacted about purchasing a back-up power supply (Appendix B, q4). A total of 19.7% of commercial and 11.5% of industrial said “yes” (Table 16). They were also asked if they had ever been contacted about other methods for increasing the reliability of their electricity service (Appendix B, q4a). A total of 6.5% (13) of commercial and 7.5% (15) of industrial respondents said “yes” (Table 17). Organizations making the contacts included utility companies and independent power providers (Table 18).

Table 16. California commercial and industrial organizations who have been contacted about purchasing a back-up power supply.

Contacted About a Back-up Supply	Commercial	Industrial
Yes	40 (19.7%)	23 (11.5%)
No	161 (79.3%)	177 (88.1%)
Don't Know	2 (1.0%)	1 (0.5%)
TOTAL	203 (100.0%)	201 (100.1%)

Table 17. California commercial and industrial organizations who have been contacted about increasing the reliability of their electric service.

Contacted About Other Methods for Increasing Reliability	Commercial	Industrial
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Yes	13 (6.4%)	15 (7.5%)
No	187 (92.1%)	186 (92.5%)
Don't Know	3 (1.5%)	0 (0.0%)
TOTAL	203 (100.0%)	201 (100.0%)

Table 18. Types of organizations who contacted California commercial and industrial organizations about increasing the reliability of their electric service.

Types of Organizations Making Contact	Commercial	Industrial
Utilities	3 (23.1%)	8 (53.3%)
Independent Power Provider	2 (15.4%)	2 (13.3%)
Other	3 (23.1%)	1 (6.7%)
Don't Know	5 (38.5%)	4 (26.7%)
TOTAL	13 (100.1%)	15 (100.0%)

Contact With Their Utility Company

When residential respondents who remembered experiencing the Saturday, August 10, 1996, power outage (n=91) were asked if they attempted to contact their utility company during the outage (Appendix A, q4), 18.7% (17) said “yes”. Of the seventeen, nine (9) or 52.9% said they were able to get the information they needed about the outage from their electric utility (Appendix A, q4a). Of these nine, six (66.7%) said their electric utility was very helpful, two said they were somewhat helpful, and one said they were not very helpful (Appendix A, q4b) (Table 19).

Only 12 of the commercial and 21 of the industrial respondents who experienced the Saturday, August 10, 1996, power outage attempted to call their utility companies (Appendix B, q5). Of these, 83.3% (10) of the commercial and 38.1% (8) of the industrial respondents said they were able to get the information they needed from their utility companies (Appendix B, q5a). Of those who made contact, 40.0% (4) commercial and 25.0% (2) of industrial respondents said the utility companies were very helpful (Table 19).

Table 19. Opinions of California electric power customers regarding the helpfulness of their utility companies when contacted during the August 10, 1996, power outage.

Opinions Regarding Helpfulness	Residential	Commercial	Industrial
Very Helpful	6 (66.7%)	4 (40.0%)	2 (25.0%)
Somewhat Helpful	2 (22.2%)	6 (60.0%)	5 (62.5%)
Not Very Helpful	1 (11.1%)	0 (0.0%)	1 (12.5%)
Not At All Helpful	0 (0.0%)	0 (0.0%)	0 (0.0%)
TOTAL	9 (100.0%)	10 (100.0%)	8 (100.0%)

Disruption Caused by the August 10, 1996, Outage

Of the 91 residential respondents who remembered experiencing the Saturday, August 10, 1996, outage, 38.5% said it was very disruptive and 35.2% said it was somewhat disruptive to their households (Appendix A, q5). Only about one-fourth (26.4%) said the outage was not very disruptive or not at all disruptive (Table 20).

Commercial and industrial respondents who experienced the Saturday, August 10, 1996, outage were asked how disruptive the outage was to their organizations (Appendix B, q6). Of the 40 commercial and 51 industrial respondents who were affected by the outage, a total of 40% (16) of commercial and 31.4% (16) of industrial respondents said the outage was very disruptive. Another 32.5% (13) of commercial and 41.2% (21) of industrial respondents stated that the outage was somewhat disruptive (Table 20).

Table 20. Levels of disruption experienced by California electric power customers as a result of the August 10, 1996, power outage.

Levels of Disruption	Residential	Commercial	Industrial
Very Disruptive	35 (38.5%)	16 (40.0%)	16 (31.4%)
Somewhat Disruptive	32 (35.2%)	13 (32.5%)	21 (41.2%)
Not Very Disruptive	15 (16.5%)	8 (20.0%)	10 (19.6%)
Not At All Disruptive	9 (9.9%)	2 (5.0%)	3 (5.9%)
Don't Know	0 (0.0%)	1 (2.5%)	1 (1.9%)
TOTAL	91 (100.1%)	40 (100.0%)	51 (100.0%)

Losses from the August 10, 1996, Outage

When residential respondents who experienced the Saturday, August 10, 1996, outage (n=91) were asked if their households had suffered any financial losses caused by the power outage (which might include food spoilage, damage to appliances, computers and/or air conditioning units) (Appendix A, q6), only eight people (8.8%) said “yes”. Only seven of the eight reported losses which ranged from \$49 to \$5,500 (Table 21).

Table 21. Amounts of financial losses suffered by California households which resulted from the August 10, 1996, power outage.

Amounts of Losses	Percentage (Number)
\$49.00	1 (14.3%)

\$50.00	2 (28.6%)
\$100.00	1 (14.3%)
\$200.00	1 (14.3%)
\$900.00	1 (14.3%)
\$5,500.00	1 (14.3%)
TOTAL	7 (100.1%)

About one-third (33.3%) of commercial and half (49.0%) of industrial respondents who experienced the Saturday, August 10, 1996, outage incurred losses due to the outage. Losses included labor costs (Table 22), costs of raw materials (Table 23), costs of products lost (Table 24), costs of damage to equipment (Table 25), and losses from canceled contracts (Table 26). Total estimated losses are shown in Table 27, and range from a low of \$40.00 to a high of \$5,000,000. More than 80% of loss estimates from commercial and industrial respondents came from estimates made by the respondents (Table 28).

Table 22. Amounts of labor costs suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
\$10.00	0 (0.0%)	2 (10.5%)
\$40.00	0 (0.0%)	1 (5.3%)
\$50.00	0 (0.0%)	1 (5.3%)
\$150.00	0 (0.0%)	1 (5.3%)
\$200.00	0 (0.0%)	1 (5.3%)
\$300.00	1 (11.1%)	1 (5.3%)
\$400.00	0 (0.0%)	1 (5.3%)
\$500.00	0 (0.0%)	1 (5.3%)
\$600.00	0 (0.0%)	1 (5.3%)
\$750.00	0 (0.0%)	1 (5.3%)
\$1,000.00	0 (0.0%)	3 (15.8%)
\$1,500.00	0 (0.0%)	1 (5.3%)
\$2,000.00	2 (22.2%)	2 (8.3%)
\$2,500.00	0 (0.0%)	1 (5.3%)
\$3,000.00	3 (33.3%)	1 (4.2%)
\$5,000.00	1 (11.1%)	7 (29.2%)
\$9,000.00	0 (0.0%)	1 (5.3%)
\$10,000.00	1 (11.1%)	0 (0.0%)
\$12,000.00	1 (11.1%)	0 (0.0%)
\$14,500.00	0 (0.0%)	1 (5.3%)
\$18,000.00	0 (0.0%)	1 (5.3%)
Don't Know	4	5
TOTAL	13 (99.9%)	24 (100.0%)

Table 23. Amounts of losses related to raw materials costs suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
None	7 (87.5%)	19 (86.4%)
\$400.00	1 (12.5%)	0 (0.0%)
\$750.00	0 (0.0%)	1 (4.5%)
\$3,500.00	0 (0.0%)	1 (4.5%)
\$5,000,000.00	0 (0.0%)	1 (4.5%)
Don't Know	5	2
TOTAL	13 (100.0%)	24 (99.9%)

Table 24. Amounts of losses related to product costs suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
None	6 (75.0%)	14 (70.0%)
\$100.00	0 (0.0%)	1 (5.0%)
\$400.00	1 (12.5%)	0 (0.0%)
\$750.00	0 (0.0%)	1 (5.0%)
\$7,000.00	0 (0.0%)	1 (5.0%)
\$3,500.00	1 (12.5%)	1 (5.0%)
\$7,000.00	0 (0.0%)	1 (5.0%)
\$2,000,000.00	0 (0.0%)	1 (5.0%)
Don't Know	5	4
TOTAL	13 (100.0%)	24 (100.0%)

Table 25. Amounts of losses related to equipment damage suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
None	5 (45.5%)	16 (72.7%)
\$100.00	0 (0.0%)	1 (4.5%)
\$400.00	1 (9.1%)	0 (0.0%)
\$500.00	1 (9.1%)	0 (0.0%)
\$1,000.00	0 (0.0%)	2 (9.1%)
\$2,000.00	3 (27.3%)	0 (0.0%)
\$5,000.00	1 (9.1%)	0 (0.0%)
\$7,000.00	0 (0.0%)	1 (4.5%)
\$10,000.00	0 (0.0%)	1 (4.5%)
\$4,000,000.00	0 (0.0%)	1 (4.5%)
Don't Know	2	2
TOTAL	13 (100.1%)	24 (99.8%)

Table 26. Amounts of losses related to canceled contracts suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
None	7 (87.5%)	19 (95.0%)
\$1,500.00	0 (0.0%)	1 (5.0%)
\$2,000.00	1 (12.5%)	0 (0.0%)
Don't Know	5	4
TOTAL	13 (100.0%)	24 (100.0%)

Table 27. Total amounts of losses suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Amounts of Losses	Commercial	Industrial
None	0 (0.0%)	1 (4.8%)
\$40.00	0 (0.0%)	1 (4.8%)
\$50.00	0 (0.0%)	2 (9.5%)
\$150.00	0 (0.0%)	1 (4.8%)
\$200.00	0 (0.0%)	1 (4.8%)
\$400.00	0 (0.0%)	1 (4.8%)
\$500.00	0 (0.0%)	1 (4.8%)
\$1,000.00	0 (0.0%)	1 (4.8%)
\$1,500.00	0 (0.0%)	2 (9.5%)
\$1,700.00	1 (11.1%)	0 (0.0%)
\$2,000.00	1 (11.1%)	3 (14.3%)
\$2,500.00	1 (11.1%)	1 (4.8%)
\$3,000.00	1 (11.1%)	0 (0.0%)
\$3,500.00	0 (0.0%)	1 (4.8%)
\$5,000.00	1 (11.1%)	0 (0.0%)
\$8,500.00	0 (0.0%)	1 (4.8%)
\$9,000.00	1 (11.1%)	0 (0.0%)
\$10,000.00	2 (22.2%)	0 (0.0%)
\$11,000.00	0 (0.0%)	1 (4.8%)
\$12,000.00	1 (11.1%)	0 (0.0%)
\$60,000.00	0 (0.0%)	1 (4.8%)
\$90,000.00	0 (0.0%)	1 (4.8%)
\$5,000,000.00	0 (0.0%)	1 (4.8%)
Don't Know	4	3
TOTAL	13 (99.9%)	24 (100.5%)

Table 28. Sources of estimates for losses suffered by California commercial and industrial organizations which resulted from the August 10, 1996, power outage.

Sources of Loss Estimates	Commercial	Industrial
Respondent's estimates	9 (81.8%)	19 (86.4%)
Company records	0 (0.0%)	1 (4.5%)

Both	2 (18.2%)	2 (9.1%)
Don't Know/Refused	2	2
TOTAL	13 (100.0%)	24 (100.0%)

Insurance Claims for Losses Due to the August 10, 1996, Outage

Only one (1) residential respondent filed a claim for losses due to the August 10, 1996, power outage. The claim for \$49.00 was filed with the utility company and was denied.

Commercial and industrial respondents whose organizations incurred financial losses due to the August 10, 1996, power outage were asked if their organizations filed claims for their losses (Appendix B, q8). Only one of the commercial and two of the industrial respondents said “yes”.

Insurance Claims for Losses from Other Outages

Commercial and industrial respondents were also asked, “Other than for the August 10th, 1996, outage, have you ever filed a liability claim for economic losses incurred due to a power outage?” (Appendix B, q13). Only 3% (6) of commercial and 5.6% (11) industrial respondents answered “yes”. All of the commercial claims and most (70%) of the industrial claims were filed with their utility companies (Table 29). Only one (1) commercial and four (4) industrial respondents said they were reimbursed for all of the claimed losses (Table 30).

Table 29. Organizations with which claims were filed for losses suffered by California commercial and industrial organizations which resulted from power outages other than the August 10, 1996, power outage.

Organizations	Commercial	Industrial
Insurance Company	0 (0.0%)	2 (20.0%)
Utility Company	6 (100.0%)	7 (70.0%)
Other	0 (0.0%)	1 (10.0%)
Don't Know	0	1
TOTAL	6 (100.0%)	11 (100.0%)

Table 30. Reimbursement for claims that were filed for losses suffered by California commercial and industrial organizations which resulted from power outages other than the August 10, 1996, power outage.

Level of Reimbursement	Commercial	Industrial
None	3 (60.0%)	2 (20.0%)

A Portion of Claims	1 (20.0%)	4 (40.0%)
All of Claims	1 (20.0%)	4 (40.0%)
Don't Know	1	1
TOTAL	6 (100.0%)	11 (100.0%)

Thursday Afternoon Outage Scenario

Residential respondents who experienced the August 10, 1996, outage (n=91) were asked, “What if the power outage last summer had occurred on a Thursday afternoon at 1:00 PM and had lasted for eight hours until 9:00 PM. In your opinion, would this outage be very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?” (Appendix A, q5a). Of those who experienced the August 10th outage, 56.0% (51) said a hypothetical Thursday afternoon outage would be very disruptive, and 33.0% said it would be somewhat disruptive. The remaining 11.0% said it would not be very disruptive or not at all disruptive (Table 31).

Table 31. Levels of disruption that would likely be experienced by California residential electric power customers as a result of a Thursday afternoon power outage.

Levels of Disruption	Residential Customers
Very Disruptive	51 (56.0%)
Somewhat Disruptive	30 (33.0%)
Not Very Disruptive	8 (8.8%)
Not At All Disruptive	2 (2.2%)
TOTAL	91 (100.0%)

All commercial and industrial respondents were also presented the scenario for a hypothetical Thursday afternoon power outage (Appendix B, q9). A total of 93.6% of commercial and 91.5% of industrial respondents said their organizations would be disrupted by such an outage. Both commercial and industrial respondents indicated their organizations would be disrupted from one (1) to seventy-two (72) hours as a result of this outage, considering both the length of the outage plus any hours required to return to full operation. About 80% of both commercial and industrial respondents would be disrupted nine (9) or fewer hours (Table 32).

When commercial and industrial respondents were asked if they would experience any economic losses at their location as a result of the Thursday afternoon power outage (Appendix B, q9b), 66.5% (135) of the commercial and 74.1% (149) of the industrial respondents said “yes”, and 26.1% of commercial and 15.4% (31) industrial respondents said “no”. The remaining 7.4% (15) of commercial and 10.4% (21) of industrial respondents did not know. Loss estimates ranged from a low of \$100 for commercial and \$200 for industrial, to highs of more than \$1,000,000 (Table 33).

Slightly less than two-thirds of commercial and industrial respondents said a Thursday afternoon outage would be very disruptive and another one-fourth said it would be somewhat disruptive to their organizations' operations (Table 34).

Table 32. Estimated number of hours that operations would likely be disrupted for California commercial and industrial electric power customers as a result of a Thursday afternoon power outage.

Number of Hours	Commercial	Industrial
1	5 (2.5%)	3 (1.5%)
2	6 (3.0%)	2 (1.0%)
3	6 (3.0%)	12 (6.0%)
4	45 (22.2%)	39 (19.4%)
5	42 (20.7%)	21 (10.4%)
6	14 (6.9%)	8 (4.0%)
7	4 (2.0%)	1 (0.5%)
8	31 (15.3%)	54 (26.9%)
9	4 (2.0%)	4 (2.0%)
10	7 (3.4%)	8 (4.0%)
11	1 (0.5%)	4 (2.0%)
12	6 (3.0%)	11 (5.5%)
13	0 (0.0%)	1 (0.5%)
14	2 (1.0%)	0 (0.0%)
15	0 (0.0%)	1 (0.5%)
16	2 (1.0%)	4 (2.0%)
18	1 (0.5%)	0 (0.0%)
20	0 (0.0%)	1 (0.5%)
24	7 (3.4%)	3 (1.5%)
30	0 (0.0%)	1 (0.5%)
32	1 (0.5%)	1 (0.5%)
35	1 (0.5%)	0 (0.0%)
48	1 (0.5%)	1 (0.5%)
72	1 (0.5%)	1 (0.5%)
Don't Know	16 (7.9%)	21 (10.4%)
TOTAL	203 (100.3%)	201 (100.6%)

Table 33. Estimated total financial losses that would be suffered by California commercial and industrial organizations as a result of a Thursday afternoon power outage.

Amounts of Losses	Commercial	Industrial
Under \$1,000	16 (17.2%)	12 (10.5%)
\$1,000 - \$4,999	34 (36.6%)	39 (34.2%)
\$5,000 - \$9,999	8 (8.6%)	20 (17.5%)
\$10,000 - \$49,999	19 (20.4%)	27 (23.7%)
\$50,000 - \$99,999	2 (2.2%)	6 (5.3%)
\$100,000 - \$499,999	11 (11.8%)	5 (4.4%)
\$500,000 - \$999,999	2 (2.2%)	2 (1.8%)
\$1 Million or more	1 (1.1%)	3 (2.6%)
Don't Know	110	87
TOTAL	135 (100.1%)	149 (100.0%)

Table 34. Levels of disruption that would likely be experienced by California commercial and industrial electric power customers as a result of a Thursday afternoon power outage.

Levels of Disruption	Commercial	Industrial
Don't Know	15 (7.4%)	19 (9.5%)
Very Disruptive	127 (62.6%)	124 (61.7%)
Somewhat Disruptive	50 (24.6%)	50 (24.9%)
Not Very Disruptive	11 (5.4%)	6 (3.0%)
Not At All Disruptive	0 (0.0%)	2 (1.0%)
TOTAL	203 (100.0%)	201 (100.1%)

Worst Case Electrical Outage

Residential respondents were asked to “think about what the worst electrical outage would be for you and your household,” then asked, “what would be the worst season of the year for this electrical power outage to occur?” (Appendix A, q9). Almost two-thirds (63.7%) said winter would be the worst season, and just over one-third (34.7%) indicated that summer would be the worst. In contrast, 41.4% of commercial and 43.7% of industrial respondents said any season would be bad for an outage (Appendix B, q10a) (Table 35).

When asked, “on which day of the week would this power outage cause the most disruption for your household” (Appendix A, q9a), almost one-fourth (24.0%) of residential respondents who expressed an opinion said any weekday and another 27.0% said any weekend. Another 17.0% said any Saturday would be the worst day.

Table 35. Opinions of California electric power consumers regarding the worst season of the year for a worst case electrical outage to occur.

Season of the Year	Residential	Commercial	Industrial
Spring	3 (1.6%)	15 (7.5%)	20 (10.1%)
Summer	67 (34.7%)	56 (27.9%)	65 (32.7%)
Winter	123 (63.7%)	37 (18.4%)	18 (9.0%)
Fall	0 (0.0%)	9 (4.5%)	9 (4.5%)
Any Season	NA	84 (41.8%)	87 (43.7%)
TOTAL	193 (100.0%)	201 (100.1%)	199 (100.0%)

When asked, “on which day of the week would this power outage cause the most disruption to your organization’s operations” (Appendix B, q10b), 36.9% of commercial and 42.3% of industrial respondents said any weekday would be the worst day for an outage. In addition, 26.6% of commercial and 17.9% of industrial respondents indicated that Monday would be the worst day (Table 36). The times of day this power outage would be most disruptive for residential respondents (q9b) were evening (29.4%), afternoon (18.0%), and dinner time (16.5%) (Table 37).

Table 36. Opinions of California electric power consumers regarding the worst day of the week for a worst case electrical outage to occur.

Day of the Week	Residential	Commercial	Industrial
Monday	14 (7.0%)	54 (26.6%)	36 (17.9%)
Tuesday	0 (0.0%)	3 (1.5%)	3 (1.5%)
Wednesday	2 (1.0%)	9 (4.4%)	7 (3.5%)
Thursday	5 (2.5%)	7 (3.4%)	12 (6.0%)
Friday	6 (3.0%)	19 (9.4%)	30 (14.9%)
Saturday	34 (17.0%)	6 (3.0%)	0 (0.0%)
Sunday	18 (9.0%)	1 (0.5%)	1 (0.5%)
Any Weekday	48 (24.0%)	75 (36.9%)	85 (42.3%)
Any Weekend	54 (27.0%)	3 (1.5%)	2 (1.0%)
Any Day	NA	25 (12.3%)	24 (11.9%)
Don’t Know	19 (9.5%)	1 (0.5%)	1(0.5%)
TOTAL	200 (100.0%)	203 (100.0%)	201 (100.0%)

Table 37. Opinions of California residential electric power consumers regarding the worst time of the day for a worst case electrical outage to occur.

Time of Day	Number of Residential Customers
Early Morning (6 - 9 AM)	14 (7.2%)
Morning (9 - 11 AM)	25 (12.9%)
Lunch Hour (11 AM - 1 PM)	8 (4.1%)
Afternoon (1 - 4 PM)	35 (18.0%)
Dinner Time (4 - 7 PM)	32 (16.5%)
Evening (7 - 10 PM)	57 (29.4%)

Late Night (10 PM - 6 AM)	6 (3.1%)
Other	9 (4.6%)
Don't Know	8 (4.1%)
TOTAL	194 (99.9%)

Residential respondents were asked how long the worst case power outage would last (Appendix A, q9c). Lengths of time varied from less than 20 minutes to more than one week. However, 71.3% said the outage would last 6 or fewer hours (Table 38). Of the nine reasons given for this outage being disruptive (Appendix A, q9d), the three most frequently mentioned were (1) the loss of heating/cooling, (2) interference with cooking/meals/dinner, and (3) other appliance problems (Table 39).

Table 38. Opinions of California residential electric power customers regarding the length of time a worst case power outage would last.

Estimated Length of Time	Number of Residential Customers
1 to 20 minutes	15 (8.3%)
20 minutes to 1 hour	36 (19.9%)
1 to 2 hours	24 (13.3%)
2 to 4 hours	32 (17.7%)
4 to 6 hours	22 (12.2%)
6 hours to 1 day	38 (21.0%)
1 to 2 days	9 (5.0%)
2 days to 1 week	4 (2.2%)
More than 1 week	1 (0.6%)
TOTAL	181 (100.2%)

Table 39. Reasons why a worst case electrical outage would be disruptive to California residential electric power customers.

Reasons Why Outage Would be Disruptive	Number of Residential Customers
Interferes with cooking/meals/dinner	41 (22.7%)
Couldn't watch TV; listen to radio	13 (7.2%)
Medical equipment would not work	1 (0.6%)
No heat/cooling	41 (22.7%)
General household disruption	10 (5.5%)
Computer	11 (6.1%)
Not having lights	25 (13.8%)
Other appliance problems	37 (20.4%)
Other	2 (1.1%)

TOTAL	181 (100.1%)
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When commercial and industrial respondents were asked about the worst case situation for an electrical outage for their organizations, the length of time between the beginning of the outage and the point at which the outage would be significant to the organization ranged from less than 20 minutes to more than one day (Appendix B, q10). The distribution of responses by commercial and industrial respondents were very similar (Table 40).

Table 40. Estimated length time between the beginning of a worst case power outage and the point at which the outage would be significant to California commercial and industrial electric power customers.

Estimated Length of Time	Commercial	Industrial
1 to 20 minutes	28 (14.1%)	29 (14.7%)
20 minutes to 1 hour	34 (17.1%)	32 (16.2%)
1 to 2 hours	14 (7.0%)	18 (9.1%)
2 to 4 hours	28 (14.1%)	24 (12.2%)
4 to 6 hours	7 (3.5%)	9 (4.6%)
6 hours to 1 day	61 (30.7%)	57 (28.9%)
More than 1 day	27 (13.6%)	28 (14.2%)
TOTAL	199 (100.1%)	197 (99.9%)

Commercial and industrial respondents were asked, “What time of day would be the worst for your organization to experience an outage?” (Appendix B, q10c). As shown in Table 41, the worst beginning and ending times for a worst case outage vary greatly among both commercial and industrial customers.

Table 41. Opinions of California commercial and industrial electric power consumers regarding the worst times of the day for a worst case electrical outage to begin and end.

Worst Times for an Outage	Commercial	Industrial
<u>Beginning Times</u>		
1 AM	4 (2.0%)	5 (2.5%)
2 AM	2 (1.0%)	2 (1.0%)
3 AM	1 (0.5%)	0 (0.0%)
4 AM	3 (1.5%)	4 (2.0%)
5 AM	2 (1.0%)	3 (1.5%)
6 AM	8 (4.0%)	11 (5.5%)
7 AM	6 (3.0%)	23 (11.4%)
8 AM	33 (16.3%)	37 (18.4%)
9 AM	24 (11.9%)	13 (6.5%)

10 AM	21 (10.4%)	10 (5.0%)
11 AM	5 (2.5%)	1 (0.5%)
12 Noon	20 (9.9%)	12 (6.0%)
1 PM	7 (3.5%)	6 (3.0%)
2 PM	0 (0.0%)	1 (0.5%)
3 PM	4 (2.0%)	2 (1.0%)
4 PM	1 (0.5%)	0 (0.0%)
7 PM	0 (0.0%)	1 (0.5%)
12 Midnight	1 (0.5%)	0 (0.0%)
Any Work Hours	60 (29.7%)	70 (34.8%)
TOTALS	202 (100.2%)	201 (100.1%)
<u>Ending Times</u>		
2 AM	3 (1.5%)	1 (0.5%)
3 AM	0 (0.0%)	2 (1.0%)
4 AM	2 (1.0%)	2 (1.0%)
5 AM	4 (2.0%)	4 (2.0%)
6 AM	1 (0.5%)	0 (0.0%)
7 AM	2 (1.0%)	1 (0.5%)
8 AM	3 (1.5%)	3 (1.5%)
9 AM	2 (1.0%)	2 (1.0%)
10 AM	9 (4.4%)	9 (4.5%)
11 AM	3 (1.5%)	7 (3.5%)
12 Noon	23 (11.3%)	29 (14.4%)
1 PM	12 (5.9%)	6 (3.0%)

Table 41. (Cont'd.)

Worst Times for an Outage	Commercial	Industrial
<u>Ending Times</u>		
2 PM	12 (5.9%)	6 (3.0%)
3 PM	9 (4.4%)	12 (6.0%)
4 PM	11 (5.4%)	14 (7.0%)
5 PM	29 (14.3%)	19 (9.5%)
6 PM	10 (4.9%)	4 (2.0%)
7 PM	2 (1.0%)	4 (2.0%)
8 PM	3 (1.5%)	1 (0.5%)
9 PM	1 (0.5%)	1 (0.5%)
10 PM	0 (0.0%)	1 (0.5%)
11 PM	1 (0.5%)	0 (0.0%)
12 Midnight	1 (0.5%)	3 (1.5%)
Any Work Hours	60 (29.6%)	70 (34.8%)
TOTALS	203 (100.1%)	201 (100.2%)

Commercial and industrial respondents were asked what would be most disruptive about a worst case outage (Appendix B, q10d). A total of 43.3% of commercial respondents said their computers would shut down, and another 19.9% stated that telephones and communications equipment would shut down. In contrast, a total of 36.2% of industrial respondents stated that manufacturing equipment would shut down, and another 23.1% said their computers would shut down (Table 42). When asked about the next most disruptive thing about an outage, the shutting down of telephones and communications equipment, and computer shut downs were the two most frequently mentioned by commercial respondents. Computers shutting down and loss of product were the two most frequently mentioned by industrial respondents (Table 43).

When asked if a worst case power outage would cause a complete shutdown, partial shutdown, or general slow down in operations (Appendix B, q11), more than 40% of commercial and over 50% of industrial respondents said their operations would experience a complete shutdown (Table 44). A partial shutdown was defined as a situation where some parts of the organization would be completely operational and some parts would be completely shut down. A general slow down was defined as a situation where the outage affects the entire operation, but does not shut everything down. Economic losses due to this outage (Appendix B, q11b) were estimated to be less than \$10,000 by 43.4% of commercial and 44.7% of industrial respondents (Table 45). However, four of the commercial and six of the industrial respondents estimated their losses would be more than \$500,000. This worst case outage would be very disruptive to 60.4% of commercial and 73.5% of industrial respondents (Appendix B, q11c) (Table 46).

Table 42. Primary reason a worst case electrical outage would be disruptive to California commercial and industrial electric power customers.

Reasons Why Outage Would Be Disruptive	Commercial	Industrial
Computers would shut down	87 (43.3%)	46 (23.1%)
Manufacturing equipment would shut down	22 (10.9%)	72 (36.2%)
Product would be lost	8 (4.0%)	23 (11.6%)
Damage to equipment	7 (3.5%)	6 (3.0%)
Telephones/ communications equip. shut down	40 (19.9%)	26 (13.1%)
Environmental control shut down	6 (3.0%)	0 (0.0%)
Lack of lighting	4 (2.0%)	4 (2.0%)
Other office equipment	3 (1.5%)	0 (0.0%)
Labor cost/loss of productivity	3 (1.5%)	2 (1.0%)
Loss of customers/inconvenience to customers	8 (4.0%)	1 (0.5%)
Refrigeration systems/freezers	1 (0.5%)	0 (0.0%)
Other	12 (6.0%)	19 (9.5%)
TOTAL	201 (100.1%)	199 (100.0%)

Table 43. Secondary reason why a worst case electrical outage would be disruptive to California commercial and industrial electric power customers.

Reasons Why Outage Would Be Disruptive	Commercial	Industrial
Computers would shut down	41 (20.7%)	36 (18.1%)
Manufacturing equipment would shut down	16 (8.1%)	21 (10.6%)
Product would be lost	7 (3.5%)	23 (11.6%)
Damage to equipment	13 (6.6%)	10 (5.0%)
Telephones/ communications equip. shut down	45 (22.7%)	15 (7.5%)
Environmental control shut down	3 (1.5%)	3 (1.5%)
Lack of lighting	12 (6.1%)	6 (3.0%)
Other office equipment	4 (2.0%)	4 (2.0%)
Labor cost/loss of productivity	5 (2.5%)	10 (5.0%)
Loss of customers/inconvenience to customers	1 (0.5%)	1 (0.5%)
Refrigeration systems/freezers	0 (0.0%)	3 (1.5%)
Other	21 (10.6%)	15 (7.5%)
No other reason given	30 (15.2%)	52 (26.1%)
TOTAL	198 (100.0%)	199 (99.9%)

Table 44. Operational impacts that would likely be experienced by California commercial and industrial electric power customers as a result of a worst case power outage.

Operational Impacts	Commercial	Industrial
Complete shutdown	86 (42.6%)	112 (56.0%)
Partial shutdown	52 (25.7%)	42 (21.0%)
General slowdown	64 (31.7%)	46 (23.0%)
TOTAL	202 (100.0%)	200 (100.0%)

Table 45. Estimated total financial losses that would be suffered by California commercial and industrial electric power customers as a result of a worst case power outage.

Amounts of Losses	Commercial	Industrial
Under \$1,000	29 (14.3%)	27 (13.4%)
\$1,000 - \$4,999	53 (26.1%)	41 (20.4%)
\$5,000 - \$9,999	6 (3.0%)	22 (10.9%)
\$10,000 - \$49,999	34 (16.7%)	41 (20.4%)
\$50,000 - \$99,999	3 (1.5%)	8 (4.0%)
\$100,000 - \$499,999	8 (3.9%)	7 (3.5%)
\$500,000 - \$999,999	2 (1.0%)	3 (1.5%)
\$1 Million or more	2 (1.0%)	3 (1.5%)
Don't Know	68 (33.5%)	49 (24.4%)
TOTAL	203 (101.0%)	201 (100.0%)

Table 46. Levels of disruption that would likely be experienced by commercial and industrial California electric power customers as a result of a worst case power outage.

Levels of Disruption	Commercial	Industrial
Very Disruptive	122 (60.4%)	147 (73.5%)
Somewhat Disruptive	65 (32.2%)	46 (23.0%)
Not Very Disruptive	12 (5.9%)	7 (3.5%)
Not At All Disruptive	3 (1.5%)	0 (0.0%)
TOTAL	202 (100.0%)	200 (100.0%)

Satisfaction with Electric Power Service

Residential respondents were asked about their satisfaction with the current electric power service to their homes (Appendix A, q10). More than half (55.8%) are very satisfied and 38.2% are somewhat satisfied. The remaining 6.0% are somewhat dissatisfied or very dissatisfied with their present service (Table 47).

When asked about satisfaction with their electric utility company restoring service after an outage (Appendix B, q12), 54.5% of commercial and 59.4% of industrial respondents said they were very satisfied. More than 90% of both were very satisfied or somewhat satisfied (Table 48).

Table 47. Satisfaction of California residential electric power customers with their electric power service.

Levels of Satisfaction	Residential
Very Satisfied	111 (55.8%)
Somewhat Satisfied	76 (38.2%)
Somewhat Dissatisfied	9 (4.5%)
Very Dissatisfied	3 (1.5%)
TOTAL	199 (100.0%)

Table 48. Satisfaction of California commercial and industrial electric power customers with their electric utility company restoring service after an outage.

Levels of Satisfaction	Commercial	Industrial
Very Satisfied	103 (54.5%)	114 (59.4%)
Somewhat Satisfied	71 (37.6%)	68 (35.4%)
Somewhat Dissatisfied	10 (5.3%)	7 (3.6%)
Very Dissatisfied	5 (2.6%)	3 (1.6%)
TOTAL	189 (100.0%)	192 (100.0%)

Importance of Reliable Electric Power Service

When residential respondents were asked, “in your opinion, how important is reliable, uninterrupted electric service to your household” (Appendix A, q11), 85.5% said it was very important and 12.0% said it was somewhat important (Table 49). Residential respondents were then asked, “would your household be willing to pay higher electric rates for reliable, uninterrupted electric service” (Appendix A, q11a). A total of 21.7% said “yes” and 73.7% said “no”. Another 4.5% stated that “it depends” (Table 50).

A total of 89.5% of commercial and 95.0% of industrial respondents said reliable, uninterrupted electric power service is very important to their organizations (Table 49). When asked if their organizations would be willing to pay higher electric rates for reliable, uninterrupted electric service, 32.4% of commercial and 28.1% of industrial respondents said “yes” (Table 50). All other respondents answered “no”.

Analysis of the Effects of Outages

Commercial and industrial respondents were asked, “Before receiving the letter about this study, had anyone in your organization ever analyzed the impacts of power outages on your organization?” (Appendix B, q14b). A total of 10.9% (21) of commercial and 13.6% (27) of industrial respondents answered “yes”.

Table 49. Importance of reliable electric power service to California electric power customers.

Levels of Importance	Residential	Commercial	Industrial
Very Important	171 (85.5%)	181 (89.5%)	191 (95.0%)
Somewhat Important	24 (12.0%)	18 (9.0%)	8 (4.0%)
Not Very Important	5 (2.5%)	3 (1.5%)	2 (1.0%)
TOTAL	200 (100.0%)	202 (100.0%)	201 (100.0%)

Table 50. Willingness of California electric power customers to pay higher rates for reliable, uninterrupted service.

Willing to Pay	Residential	Commercial	Industrial
Yes	43 (21.7%)	61 (32.4%)	52 (28.1%)
No	146 (73.7%)	127 (67.6%)	133 (71.9%)
It Depends	9 (4.5%)	0 (0.0%)	0 (0.0%)
TOTAL	198 (99.9%)	188 (100.0%)	185 (100.0%)

Damage by Winter Flooding

Residential respondents were asked if their households suffered any damage and/or financial losses due to the recent winter flooding (Appendix A, q12). A total of 2.5% (5) said “yes”.

Commercial and industrial respondents were asked if their organizations suffered any damage and/or financial losses due to the recent winter flooding (Appendix B, q15). A total of 6.4% (13) of commercial and 5 (2.5%) of industrial respondents answered “yes”. The purpose of these questions was to assess the extent of flood damage among respondents, since the survey was conducted shortly after the winter floods. If a large percentage of respondents had experienced flood damage, the results of this survey might have been biased because of the recent flood experience.

Conclusions and Recommendations

The Saturday, August 10, 1996, electricity outage affected slightly less than one-half of California's population. Since many residential customers do not work on Saturdays and are at home, and based on responses to questions regarding a hypothetical Thursday afternoon outage and a worst case outage, the August 10th outage was more disruptive for households than it would have been had it occurred on a weekday. Though it was disruptive to many households, few residential respondents reported having experienced financial losses as a result of the outage. Conversely, for the commercial and industrial sectors, the Saturday outage was costly in some instances, but would have been much more disruptive and costly if it had occurred on a weekday.

Only two (about 2%) of the 91 residential respondents affected by the August 10, 1996, outage reported having back-up power supplies. Because of this, residential customers were and will continue to be dependent upon the restoration of electric power by their utility company when future outages occur. Future research should track investment in back-up systems by residential customers if longer duration outages should occur more frequently due to changes in the electric power industry.

Approximately 20% of commercial and 25% of industrial customers experienced the August 10, 1996, outage. Of those who experienced the outage, 41% of commercial and 31% of industrial respondents said the outage was very disruptive to their operations. In addition, about one-third of commercial and one-half of industrial customers who experienced this outage reported having incurred financial losses as a result of the outage. Losses ranged from \$40.00 to \$5,000,000.

Different types of commercial and industrial customers are likely affected quite differently by outages as implied by the data on reported financial losses and levels of disruption to operations. However, sub-samples of various types of commercial and industrial customers in this study are too small to generalize the magnitudes of losses to the populations of those sub-samples. In addition, this survey did not probe into why outages are disruptive and the specific types of losses that occur. Future research using a combination of focus groups of various types of commercial and industrial customers, followed by targeted surveys to collect quantitative data from these targeted groups, could gather more detailed information on disruptions and losses. In larger, more complex commercial and industrial organizations, it is very unlikely that one person can reasonably address all important aspects of disruptions and financial losses. Therefore, personnel from each major functional area of an organization should be included in focus group discussions, and possibly interviewed when quantitative data are collected. Initial telephone calls should be made to identify personnel to be interviewed, and pre-letters explaining the survey and providing factual questions to be asked should be sent to respondents included in samples in future surveys. This procedure was utilized in this survey and improved the accuracy of responses by (1) better assuring the most knowledgeable

respondents were interviewed, and (2) providing them questions requiring factual data as well as the time needed to compile and prepare responses.

A total of 37.5% of the commercial and 19.6% of the industrial customers affected by the August 10, 1996, outage reported having back-up power supplies. However, these sub-samples are small with a high sampling error. If accurate data on the availability and use of back-up power supplies is needed, larger samples of commercial and industrial customers should be surveyed. In addition, the number of commercial and industrial customers with back-up supplies may change in the future if the number and length of power outages should change. Though only 19.7% of commercial and 11.5% of industrial respondents had been contacted regarding the purchase of back-up supplies, this may change if electric power reliability changes in the future.

Some residential, commercial and industrial respondents said they would be willing to pay higher electric rates for more reliable electric service. However, this survey did not measure the level of reliability expected, why the reliability is desired, nor how much customers are willing to pay. A CVM (contingent valuation methodology) study could be conducted to collect this data.

One limitation of this survey is the length of time between the August 10, 1996, outage and the collection of data on that outage. Some respondents, particularly residential customers, have difficulty recalling the event. In the future, data collection should occur as soon after the outage as possible. To facilitate the data collection process, a questionnaire which includes questions on important aspects of the outage should be developed and available for use.

Almost all Californians have historically received highly reliable electric power service in a stable, regulated market. As a result, most are very or somewhat satisfied with their service. More than half (55.8%) of residential customers are very satisfied and 38.2% are somewhat satisfied with their electric power service. Likewise, more than 90% of commercial and industrial customers are very satisfied or somewhat satisfied with their electric utility company restoring service after an outage. However, levels of satisfaction are likely to change if the reliability and/or cost of service change in the future.

APPENDIX A
Residential Questionnaire

CALIFORNIA ENERGY COMMISSION
SURVEY OF RESIDENTIAL CONSUMERS

RESIDENTIAL SURVEY QUESTIONNAIRE
4/1/97

>dial<

Hello, my name is _____ and I'm calling from the Survey Research Center at California State University, Chico for the California Energy Commission. The Energy Commission wants to know your experiences with electric power disruptions. May I speak with the person in your household who usually pays the energy bill?

- <1> Yes, that's me [goto q1st]
- <3> Yes, someone else comes to the phone [goto e100]
- <5> Person not here or unavailable or [goto e000]
it's me, but call me back later
- <14> Refused
- <16> All others - NA, MAD, BZY, NIS, etc.
- <39> Some other problem

===>

>e100<

Hello, my name is _____ and I'm calling from the Survey Research Center at California State University, Chico for the California Energy Commission. The Energy Commission wants to know your experiences with electric power disruptions. Are you the person in your household who usually pays the energy bill?

- <1> That's me [goto e700]
- <5> That person is not here right now [goto e200]
- <12> Callback
- <14> Refused
- <39> Some other problem

===>

>q1st<

I'd like to begin by asking about your household's experiences with electric power interruptions and outages. An electrical power interruption occurs when accidents, equipment failure, bad weather, or other problems result in a temporary loss of electricity lasting less than 5 minutes. Has your household experienced any power interruptions lasting less than 5 minutes during the past 12 months?

<1> Yes [goto q1a]

<2> No [goto q2]

<d> Don't Know

<r> Refused

====>

>q1a<

About how many power interruptions of less than five minutes has your household experienced during the past 12 months?

<1-80>

<d> Don't Know

<r> Refused

====>

>q1b<

How disruptive would you say the [fill q1a] power interruptions of less than five minutes were to your household: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

<1> Very disruptive

<3> Somewhat disruptive

<5> Not very disruptive

<7> Not at all disruptive

<d> Don't know.

<r> Refused.

====>

>q2<

Now I would like to ask about your household's experience with prolonged power outages. Prolonged outages occur when accidents, equipment failure, weather, or other problems result in a complete loss of electricity to your household for 5 minutes or more. Has your household experienced any prolonged power outages lasting 5 minutes or more during the past 12 months?

<1> Yes [goto q2a]

<2> No [goto q3]

<d> Don't Know

<r> Refused

====>

>q2a<

About how many power outages of five minutes or more has your household experienced during the past 12 months?

<1-80>

<d> Don't Know

<r> Refused

====>

>q2b<

How disruptive would you say the [fill q2a] power outages of five minutes or more were to your household: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

<1> Very disruptive

<3> Somewhat disruptive

<5> Not very disruptive

<7> Not at all disruptive

<d> Don't know.

<r> Refused.

====>

>q3<

We'd like to learn how power outages of five minutes or more affect your household. Last year, a prolonged power outage occurred on Saturday, August 10th, affecting much of the Western United States. This widespread outage received national news coverage. It occurred at 3:48 in the afternoon, and lasted anywhere from a few minutes in some areas to several hours in others. Was your household affected by this outage?

<1> Yes

<3> No [goto q8]

<d> Don't Know [goto q8]

<r> Refused [goto q8]

===>

>q3a<

To the best of your recollection, how long was your household without electric power as a result of the August 10th outage?

<1-80>

<d> Don't Know [goto q3]

<r> Refused [goto q3]

===>

>q3tm< (ENTER THE CORRECT RESPONSE)

<1> Minutes

<2> Hours

<3> Days

===>

>q3b<

Did your household have a back-up power supply when the August 10th outage occurred?

<1> Yes [goto q3d]

<3> No [goto q3g]

<d> Don't Know [goto q3g]

<r> Refused [goto q3g]

====>

>q3d<

What type of back-up power supply did you have?

<1> Generator

<3> Batteries

<5> Other [specify]

<d> Don't Know

<r> Refused

====>

>q3e<

Did your back-up power supply work as expected during the August 10th outage?

<1> Yes

<3> No

<5> Didn't use the back-up power supply (VOLUNTEERED ONLY)

<d> Don't Know

<r> Refused

====>

>q3f<

How satisfied were you with the performance of your back-up power supply during the August 10th outage: would you say that you were very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied with its performance?

- <1> Very satisfied
- <3> Somewhat satisfied
- <5> Somewhat dissatisfied
- <7> Very dissatisfied

- <d> Don't Know
- <r> Refused

====>

>q3g<

Have you considered buying [another][a] back-up power supply?

- <1> Yes
- <3> No
- <5> I live in an apartment (VOLUNTEERED ONLY)

- <d> Don't Know
- <r> Refused

====>

>q4<

When the August 10th outage occurred, did you try to call your electric utility to get information about the outage?

- <1> Yes
- <3> No [goto q5]

- <d> Don't Know [goto q5]
- <r> Refused [goto q5]

====>

>q4a<

Were you able to get the information you needed from your electric utility?

<1> Yes [goto q4b]

<3> No [goto q5]

<d> Don't Know [goto q5]

<r> Refused [goto q5]

====>

>q4b<

Would you say that your utility company was very helpful, somewhat helpful, not very helpful, or not at all helpful in providing you information you needed when you contacted them?

<1> very helpful

<2> somewhat helpful

<3> not very helpful

<4> not at all helpful

<d> Don't Know

<r> Refused

====>

>q5<

Overall, how disruptive was the August 10th power outage to your household: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

<1> Very disruptive

<3> Somewhat disruptive

<5> Not very disruptive

<7> Not at all disruptive

<d> Don't know.

<r> Refused.

====>

>q5a<

What if the power outage last summer had occurred on a Thursday afternoon at 1:00pm and had lasted for eight hours until 9:00pm. In your opinion, would this outage have been:

- <1> Very disruptive,
- <3> Somewhat disruptive,
- <5> Not very disruptive, or
- <7> Not at all disruptive?

- <d> Don't know.
- <r> Refused.

====>

>q6<

Some households suffered financial losses during the August 10th power outage. Did your household suffer any financial losses caused by the power outage? (These might include food spoilage, damage to appliances, computers and/or air conditioning units.)

- <1> Yes
- <3> No [goto q8]

- <d> Don't Know [goto q8]
- <r> Refused [goto q8]

====>

>q6a<

What was the approximate dollar amount of your losses?

<1-87000>

- <88888> Don't Know [goto q8]
- <99999> Refused [goto q8]

====>

>q7<

Did your household file a claim or claims for financial losses caused by the August 10th power outage?

<1> Yes

<3> No [goto q8]

<d> Don't know [goto q8]

<r> Refused [goto q8]

====>

>q7a<

Was your claim filed with:

<1> your insurance company,

<2> your local electric utility,

<3> the California Public Utilities Commission,

<0> or some other? [specify]

<d> Don't know [goto q8]

<r> Refused [goto q8]

====>

>q7b<

What was the total dollar amount of the claims filed?

<1-80000>

<88888> Don't Know [goto q8]

<99999> Refused [goto q8]

====>

>q7c<

Was your household reimbursed for any claimed losses?

- <1> Yes, all of the claimed losses.
- <3> Yes, a portion of the claimed losses.
- <5> No.

- <d> Don't Know
- <r> Refused

===>

>q9<

Now I'm going to ask some questions about how a power outage might affect your household. I'd like you to think about what the worst electrical outage would be for you and your household. What would be the worst season of the year for this electrical power outage to occur?

- <1> Spring
- <3> Summer
- <5> Winter
- <7> Fall

- <d> Don't know [goto q10]
- <r> Refused [goto q10]

===>

>q9a<

On which day of the week would this power outage cause the most disruption for your household?

- <1> Monday
- <2> Tuesday
- <3> Wednesday
- <4> Thursday
- <5> Friday
- <6> Saturday
- <7> Sunday
- <8> Any weekday
- <9> Any weekend

- <d> Don't know
- <r> Refused

===>

>q9b<

What time of day would it be most disruptive for your household?

- <1> Early morning, breakfast (6-9 am)
- <2> Morning (9-11 am)
- <3> Lunch hour (11am -1 pm)
- <4> Afternoon (1-4 pm)
- <5> Dinner time (4-7 pm)
- <6> Evening (7-10 pm)
- <7> Late night (10 pm -6 am)

- <d> Don't know [goto q10]
- <r> Refused [goto q10]

>q9c<

How long would this worst case power outage last?

- <1-99>
- <d> Don't know
- <r> Refused

====>

>q9tm< (ENTER THE CORRECT RESPONSE)

- <1> Minutes
- <3> Hours
- <5> Days

- <d> Don't know
- <r> Refused

====>

>q9d<

What would make a power outage for this amount of time most disruptive for you?

- <1> Interferes with cooking, meals, dinner
- <2> Couldn't watch TV, listen to radio
- <3> Medical equipment not work
- <4> No heat/cooling, temperature control
- <5> General household disruption [specify]

<0> Other [specify]

- <d> Don't know
- <r> Refused

===>

>q10<

In general, how satisfied are you with the current electric power service to your home:
Would you say that you are:

- <1> Very satisfied,
- <3> Somewhat satisfied,
- <5> Somewhat dissatisfied, or
- <7> Very dissatisfied?

- <d> Don't Know
- <r> Refused

===>

>q11<

In your opinion, how important is reliable, uninterrupted electric service to your household: very important, somewhat important, or not very important?

- <1> Very important
- <3> Somewhat important
- <5> Not very important

- <8> Don't Know
- <9> Refused

===>

>q11a<

Would your household be willing to pay higher electric rates for reliable, uninterrupted electric service?

- <1> Yes
- <3> No
- <5> It depends [AFTER ASKING: "In general ...?"]

- <8> Don't Know
- <9> Refused

===>

>q12<

Did your household suffer any damage and/or financial losses due to the recent winter flooding?

<1> Yes

<3> No

<d> Don't Know

<r> Refused

===>

>age<

Now I'd like to finish with a few questions for classification purposes. What is your age?
(IF HESITANT ASK: "In what year were you born?")
CALCULATE AND CODE AGE IN YEARS)

<1> under age 18 [goto agck]

<18-97>

<d> Don't Know

<r> Refused

===> [goto work]

>agck< YOU ENTERED AGE OF RESPONDENT AS <1> under age 18. IF THIS IS CORRECT ENTER 1.

IF THIS IS WRONG, ENTER THE CORRECT AGE:

<18-97>

===>

>AGCK< [store agck in age][if age eq <1> goto sex]

>work<

Are you currently working:

<1> full time,

<2> part time,

<3> temporarily unemployed but going back to a job,

<4> a homemaker not working outside the home,

<5> retired, or

<6> disabled and unable to work?

<d> Don't Know

<r> Refused

====> [goto ethn]

>ethn<

Which of the following best describes your ethnic background:

<1> Latino/Hispanic

<2> White/Anglo,

<3> Black/African American,

<4> Asian/Pacific Islander,

<5> Native American, or

<0> some other? [specify]

<d> Don't Know

<r> Refused

====>

>zip<

What is your zip code?

<00000-99999>

====>

>inc<

Finally, I'd like an approximate idea of the total amount of annual income in your household. Stop me when I read the category for your household. Is it (READ ALTERNATIVES):

- <1> Less than \$20,000
- <2> \$20,000-35,000 (34,999)
- <3> \$35,000-50,000 (49,999)
- <4> \$50,000-65,000 (64,999)
- <5> \$65,000-80,000 (79,999)
- <6> \$80,000-100,000
- <7> More than \$100,000

<d> Don't Know

<r> Refused

==>

THANK YOU FOR COMPLETING THE SURVEY.

INTERVIEWER: Code gender of respondent.

<1> Male

<2> Female

APPENDIX B

Commercial and Industrial Questionnaire

CALIFORNIA ENERGY COMMISSION
SURVEY OF COMMERCIAL/INDUSTRIAL CONSUMERS

COMMERCIAL & INDUSTRIAL SURVEY QUESTIONNAIRE
4/1/97

>dil1<

Hello, may I please speak with [fill gen] [fill ctac]?

- <1> Yes, that's me
- <3> Yes, I'll get him/her
- <5> Person not here or unavailable or
it's me, but call me back later

- <14> Refusal
- <16> All others - NA, AM, BZY, NIS, etc.
- <39> This is a way too weird problem

====>

>e100<

(Person comes to the phone) Hello, my name is [fill inam] and I'm calling from the Survey
Research Center at California State University, Chico for the California Energy Commission.
Did you receive the letter we recently sent to you?

- <1> Yes [goto e160]
- <3> No

- <12> Callback
- <14> Refusal
- <39> This is a way too weird problem

====>

>e160<

As we explained in our recent letter to your organization, the Energy Commission is interested in the experiences California energy consumers have had with electric power disruptions in the past year. I'd like to speak with the individual in the organization responsible for managing or accounting for energy costs. Is that you?

- <1> That's me
- <5> That person is not here right now
- <12> Callback
- <14> Refusal
- <39> This is a way too weird problem

====>

>q1st<

I'd like to begin by asking about your organization's experiences with electric power interruptions and outages. An electrical power interruption occurs when accidents, equipment failure, bad weather, or other problems result in a temporary loss of electricity lasting less than 5 minutes. Has your organization experienced any power interruptions lasting less than 5 minutes during the past 12 months?

- <1> Yes
- <2> No [goto q2]
- <d> Don't Know
- <r> Refused

====>

>q1a<

About how many power interruptions of less than five minutes has your organization experienced during the past 12 months?

<1-80>

- <d> Don't Know
- <r> Refused

====>

>q1b<

How disruptive would you say these power interruptions of less than five minutes have been to your organization: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

- <1> Very disruptive
- <3> Somewhat disruptive
- <5> Not very disruptive
- <7> Not at all disruptive

- <d> Don't know
- <r> Refused

====>

>q2<

Now I would like to ask about your organization's experience with prolonged power outages. Prolonged outages occur when accidents, equipment failure, weather, or other problems result in a complete loss of electricity to your organization for 5 minutes or more. Has your organization experienced any prolonged power outages at this location during the past 12 months?

- <1> Yes [goto q2a]
- <3> No

- <d> Don't Know
- <r> Refused

====> [goto q3]

>q2a<

About how many power outages of 5 minutes or more has your organization experienced during the past 12 months?

<0-80>

- <d> Don't Know
- <r> Refused

====>

>q2b<

How disruptive would you say these power outages of five minutes or more have been to your organization: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

<1> Very disruptive
<3> Somewhat disruptive
<5> Not very disruptive
<7> Not at all disruptive

<d> Don't Know
<r> Refused

====>

>q2c<

How long can your organization be without power before you have to shut down operations and send people home?

<1-99>

<d> Don't Know [goto q3]
<r> Refused [goto q3]

====>

>q2tm< (ENTER THE CORRECT RESPONSE) [no erase]

<1> Minutes
<3> Hours
<5> Days

<d> Don't know
<r> Refused

====>

>q3<

Last year, a prolonged power outage occurred on Saturday, August 10th, affecting much of the Western United States. This widespread outage received national news coverage. It occurred at 3:48 in the afternoon, and lasted anywhere from a few minutes in some areas to several hours in others. Were any of your organization's operations or services disrupted at this location as a result of the August 10th power outage?

<1> Yes [goto q3a]

<3> No

<d> Don't Know

<r> Refused

====>[goto q4]

>q3a<

To the best of your recollection, how long was your operation disrupted as a result of the August 10th power outage?

<1-99>

<d> Don't Know [goto q3b]

<r> Refused [goto q3b]

====>

>q3tm< (ENTER THE CORRECT RESPONSE) [no erase]

<1> Minutes

<3> Hours

<5> Days

<d> Don't know

<r> Refused

====>

>q3b<

Did your organization have a back-up power supply at the time of the August 10th outage?

- <1> Yes
- <3> No [goto q4]

- <d> Don't Know [goto q4]
- <r> Refused [goto q4]

====>

>q3c<

What type of back-up power supply did you have?

- <1> Generator
- <2> Co-generation
- <3> Batteries
- <0> Other [specify]

- <d> Don't Know [goto q4]
- <r> Refused [goto q4]

====>

>q3d<

Did your organization use your back-up power supply during the August 10th outage?

- <1> Yes
- <3> No [goto q4]

- <d> Don't Know [goto q4]
- <r> Refused [goto q4]

====>

>q3e<

Was your back-up power supply large enough to allow operations to proceed normally, or did it only handle critical or emergency functions?

- <1> handles normal operations
- <3> handles only critical or emergency functions

- <d> Don't Know [goto q4]
- <r> Refused [goto q4]

====>

>q3f<

Did your back-up power supply work as expected during the August 10th outage?

<1> Yes
<3> No [goto q4]

<d> Don't Know [goto q4]
<r> Refused [goto q4]

====>

>q3g<

How satisfied were you with the performance of your back-up power supply during the August 10th outage: Would you say that you were very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied with its performance?

<1> Very satisfied
<3> Somewhat satisfied
<5> Somewhat dissatisfied
<7> Very dissatisfied

<d> Don't Know
<r> Refused

====>

>q4<

Have you ever been contacted about purchasing a back-up power supply?

<1> Yes
<3> No

<d> Don't Know
<r> Refused

====>

>q4a<

Have you ever been contacted about other methods for increasing the reliability of your electricity service?

<1> Yes [goto q4b]
<3> No [goto ck5]

<d> Don't Know [goto ck5]
<r> Refused [goto ck5]

====>

>q4b<

Who contacted you about these other methods?

<0> [specify]

<d> Don't Know

<r> Refused

====>

>q5<

When the August 10th outage occurred, did you try to call your utility company to get information about the outage?

<1> Yes

<3> No [goto q6]

<d> Don't Know [goto q6]

<r> Refused [goto q6]

====>

>q5a<

Were you able to get the information you needed from your utility company?

<1> Yes [goto q5b]

<3> No [goto q6]

<d> Don't Know [goto q6]

<r> Refused [goto q6]

====>

>q5b<

Would you say that your utility company was very helpful, somewhat helpful, not very helpful, or not at all helpful in providing you information you needed when you contacted them?

<1> very helpful

<2> somewhat helpful

<3> not very helpful

<4> not at all helpful

<d> Don't Know

<r> Refused

===>

>q6<

Overall, how disruptive was the August 10th power outage to your organization: very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive?

- <1> Very disruptive
- <3> Somewhat disruptive
- <5> Not very disruptive
- <7> Not at all disruptive

- <d> Don't Know
- <r> Refused

===>

>q7<

Some companies experienced losses during the August 10th power outage. Did your organization experience any economic losses at this location as a result of the August 10th outage?

(These would include labor costs, loss of materials and/or products, and damage to equipment which occurred during the outage as well as restart costs and slowdowns following the outage.)

- <1> Yes [goto q7a]
- <3> No [goto q9]
- <d> Don't Know [goto q9]
- <r> Refused [goto q9]

===>

>q7a<

What was the approximate dollar amount of your organization's losses due to labor costs?

<1-8888000>

<d> Don't Know

<r> Refused

====>

>q7b<

What was the approximate dollar amount of your organization's losses due to loss of raw materials?

<0-88880000>

<d> Don't Know

<r> Refused

====>

>q7c<

What was the approximate dollar amount of your organization's losses due to the loss of product, finished or in process?

<0-88880000>

<d> Don't Know

<r> Refused

====>

>q7d<

What was the approximate dollar amount of your organization's losses due to damage to equipment?

<0-88880000>

<d> Don't Know

<r> Refused

====>

>q7e<

What was the approximate dollar amount of your organization's losses due to canceled contracts?

<0-88880000>

<d> Don't Know

<r> Refused

====>

>q7f<

What was the approximate dollar amount of your organization's total losses due to the August 10th outage?

<0-888880000>

<d> Don't Know

<r> Refusal

====>

>q7g<

Are these amounts based on your estimates, actual totals from organizational accounting records, a combination of both, or some other source?

<1> your estimates

<2> organizational accounting records

<3> combination of both

<0> some other [specify]

<d> Don't know

<r> Refused

====>

>q8<

Did your organization file a claim or claims for these economic losses caused by the August 10th power outage?

<1> Yes

<2> No [goto q9]

<d> Don't know

<r> Refused

===>

>q8a<

Was your claim or claims filed with:

<1> your insurance company, [goto q8c]

<2> your local electric utility, [goto q8b]

<3> the California Public Utilities Commission, [goto q8c]

<0> or some other? [specify][goto q8c]

<d> Don't know

<r> Refused

===>

>q8b<

How responsive was your electric utility in processing your claim? Would you say they were:

<1> very responsive

<2> somewhat responsive

<3> not very responsive

<4> not at all responsive

<d> Don't Know

<r> Refused

===>

>q8c<

What was the total dollar amount of the claims filed?

<1-8888000>

<d> Don't Know

<r> Refused

===>

>q8d<

Was your organization reimbursed for your claimed losses?

- <1> Yes, all of the claimed losses
- <3> Yes, a portion of the claimed losses
- <5> No

- <d> Don't Know
- <r> Refused

====>

>q9<

Now I'm going to ask some questions about a possible power outage situation. What if a total electrical outage occurred during the summer on a Thursday afternoon at 1:00pm and lasted for eight hours until 9:00 pm. Would any of your organization's operations be disrupted as a result of this power outage?

- <1> Yes
- <3> No [goto q10]

- <d> Don't Know [goto q10]
- <r> Refused [goto q10]

>q9a<

For about how many hours would your operations at this location be disrupted as a result of this power outage, considering both the length of the outage plus any hours required to return to full operation?

<1-100>

- <d> Don't Know
- <r> Refused

====>

>q9b<

In your opinion, would your organization experience any economic losses at this location as a result of this Thursday afternoon power outage?

- <1> Yes
- <3> No [goto q9d]

- <d> Don't Know [goto q9d]
- <r> Refused [goto q9d]

====>

>q9c<

What is your best estimate of the economic losses that your organization would incur at this location as a result of this power outage?

<1-8880000>

<d> Don't Know

<r> Refused

====>

>q9d<

Would this Thursday afternoon outage be very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive to your organization's operations?

<1> Very disruptive

<3> Somewhat disruptive

<5> Not very disruptive

<7> Not at all disruptive

<d> Don't Know

<r> Refused

====>

>q10<

Now I'd like you to think of the worst case situation for an electrical outage for your organization. Thinking about possible economic losses and inconvenience to you and your customers, how long could a power outage last before the disruption would be significant to your organization?

<1-99>

<d> Don't know

<r> Refused

====>

>10tm< (ENTER THE CORRECT RESPONSE) [no erase]

<1> Minutes

<3> Hours

<5> Days

<d> Don't know

<r> Refused

====>

>q10a<

What season of the year would be the worst for your organization to experience a power outage?

- <1> Spring
- <3> Summer
- <5> Winter
- <6> Fall
- <7> Any Season

- <d> Don't know
- <r> Refused

====>

>q10b<

What day of the week would be worst for your organization to experience a power outage?

- <1> Monday
- <2> Tuesday
- <3> Wednesday
- <4> Thursday
- <5> Friday
- <6> Saturday
- <7> Sunday
- <8> Any weekday
- <9> Any weekend

<99> Any day

- <d> Don't know
- <r> Refused

====>

>q10c<

What time of day would be the worst for your organization to experience an outage?

ENTER BEGINNING HOUR

<1-24>

<66> Any Work Hours [goto q10d]

<d> Don't know [goto q10d]

<r> Refused [goto q10d]

===>

>10et<

ENTER ENDING HOUR

<1-24>

<d> Don't know

<r> Refused

===>

>q10d<

What is most disruptive about an outage of [fill q10] [fill tmcd]?

<1> Computers would shut down.

<2> Manufacturing equipment would shut down.

<3> Product would be lost.

<4> Computers or other equipment would be damaged.

<5> Telephones/Communication System/Telesis shut down.

<6> Air Conditioning/Environmental Control shut down.

<7> Lack of lighting.

<8> Other office equipment.

<9> Labor Costs/Loss of Productivity.

<10> Loss of Customers/Inconvenience to Customers.

<11> Refrigeration Systems/Freezers

<0> Other [specify]

<d> Don't Know [goto q11]

<r> Refused [goto q11]

====>

>q10e<

What is the second most disruptive thing about an outage [fill q10] [fill tmcd]?

<1> Computers would shut down.

<2> Manufacturing equipment would shut down.

<3> Product would be lost.

<4> Computers or other equipment would be damaged.

<5> Telephone/Communication System/Telesis shut down.

<6> Air Conditioning/Environmental control shut down.

<7> Lack of lighting.

<8> Other office equipment.

<9> Labor Costs/Loss of Productivity.

<10>Loss of Customers/Inconvenience to Customers.

<11>Refrigeration Systems/Freezers

<0> Other [specify]

<n> No others

<d> Don't Know

<r> Refused

====>

>q11<

As a result of this outage, would your operations at this location stop completely, partially shut down in certain areas, or would you experience a general slow down in all areas of your operation?

<1> Complete Shutdown

<3> Partial Shutdown

<5> General Slow Down

<d> Don't Know [goto q12]

<r> Refused [goto q12]

====>

>q11a<

How many hours would your operations be disrupted as a result of this power outage considering both the duration of the outage plus any hours required to return to full operation?

<1-99>

<n> No additional startup time

<d> Don't Know

<r> Refused

===>

>q11b<

What is your best estimate of the economic losses that your organization might incur at this location as a result of this worst case power outage?

<0-9999999>

<d> Don't Know

<r> Refused

===>

>q11c<

Would this worst case outage be very disruptive, somewhat disruptive, not very disruptive, or not at all disruptive to your organization's operations?

<1> Very disruptive

<3> Somewhat disruptive

<5> Not very disruptive

<7> Not at all disruptive

<d> Don't Know

<r> Refused

===>

>q12<

Now I'd like to ask you a few general questions about your electric utility service. How satisfied are you with the responsiveness of your utility company in restoring service after an outage:

- <1> Very satisfied,
- <3> Somewhat satisfied,
- <5> Somewhat dissatisfied, or
- <7> Very dissatisfied?

- <d> Don't Know
- <r> Refused

====>

>q13<

Other than for the August 10th, 1996, outage, have you ever filed a liability claim for economic losses incurred due to a power outage?

- <1> Yes
- <3> No [goto q14]

- <d> Don't Know [goto q14]
- <r> Refused [goto q14]

====>

>q13a<

Was your claim or claims filed with:

- <1> an Insurance Company,
- <2> an Electric Utility,
- <3> the California Public Utilities Commission,
- <0> or some other? [specify]

- <d> Don't Know
- <r> Refused

====>

>q13b<

Were you reimbursed for any of your claimed losses?

- <1> Yes, all of the claimed losses
- <3> Yes, a portion of the claimed losses
- <5> No

- <d> Don't Know
- <r> Refused

====>

>q14<

In your opinion, how important is reliable, uninterrupted electric service to your organization

- <1> Very important
- <3> Somewhat important
- <5> Not very important?

- <8> Don't Know
- <9> Refused

====>

>q14a<

In your opinion, would your organization be willing to pay higher electric rates for reliable, uninterrupted electric service?

- <1> Yes
- <3> No

- <d> Don't Know
- <r> Refused

====>

>q14b<

Before receiving the letter about this study, had anyone in your organization ever analyzed the impacts of power outages on your organization?

- <1> Yes
- <3> No

- <d> Don't Know
- <r> Refused

===>

>q15<

Did your organization suffer any damage and/or financial losses due to the recent winter flooding?

<1> Yes

<3> No

<d> Don't Know

<r> Refused

===>

>feet<

Now I'd like to finish by asking a few questions for classification purposes. What is the approximate square footage of your facility at this location?

(Buildings at or adjacent to the location we are calling)

<100-88800000>

<d> Don't Know

<r> Refused

===>

>emps<

How many full time employees are employed by your organization at this location?

<0-888000>

<d> Don't Know

<r> Refused

===>

>part<

How many part time or seasonal employees are employed by your organization at this location?

<0-888000>

<d> Don't Know

<r> Refused

===>

>days<

What days of the week do you usually operate?

- <1> Monday - Friday
- <2> Tuesday - Sunday
- <3> Monday - Saturday

<9> 7 Days a Week

<0> Other [specify]

<d> Don't Know

<r> Refused

===>

>hram<

What are your normal hours of operation?

ENTER AM HOUR

<1-12>

<24> 24 Hours a Day [goto expn]

===>

>hrpm<

ENTER PM HOUR

<1-12>

===>

>expn<

How much does your organization usually spend on electricity per year?

<1-8888800000>

<n> Included in rent [goto rslt]

<d> Don't Know

<r> Refused

====>

>nrgy<

Approximately what percentage of your organization's annual operating expenses is spent on electricity?

<1-100>

<d> Don't Know

<r> Refused

====>

>rslt<

Do you want to receive the results of this study?

<1> Yes

<3> No

====>

>sex<

Thank-you for participating in this survey. Good-bye.
CODE GENDER OF RESPONDENT.

<1> Male

<3> Female

====>

APPENDIX C

Pre-Letter and Questions Mailed to Commercial and Industrial Customers

May 27, 1997

Name, Title
Company Name
Company Address
City, CA ZIP

Dear Gender Last Name,

The California Energy Commission, a public agency of the State of California, is interested in the opinions of California electric energy consumers about electric power outages and how they affect commercial and industrial operations. The Energy Commission has contracted with the Survey Research Center (SRC) to complete a telephone survey of commercial and industrial customers as approved by the California Legislature and signed by the Governor in 1996. Your organization has been randomly selected to participate in the survey. Survey results will be used to improve electric power service and reliability for you, the consumer.

The SRC will be phoning you within the next few days to schedule a time to ask you about:

- * your organization's experiences with electric power interruptions and outages during the past twelve months including the August 10th, 1996, outage
- * economic losses resulting from these power interruptions and outages
- * claims which have been filed for economic losses caused by these interruptions and outages
- * disruptions to your operations during and after interruptions and outages
- * your organization's use of backup power supplies

We have enclosed a copy of the factual questions which will be asked in the survey.

All information you provide will remain confidential and will be aggregated with responses of other commercial and industrial customers to be reported as averages for each sector of business. If you need additional information about the survey prior to the SRC's call, or if we should contact another person to complete the survey, please phone Allen Lunde or me at 916-898-4332, or e-mail us at: SRC@CAMPUSPO.CSUCHICO.EDU. All commercial and industrial customers who participate in the survey will be mailed a summary of the survey findings by the California Energy Commission. Your assistance with the survey will be greatly appreciated.

Sincerely,

Jim Fletcher, Ph.D.
Professor and Director

Enclosure

CALIFORNIA ENERGY COMMISSION
Questions Regarding Electrical Power Outages

(Note: Please use this list as a reference. There is no need to fill it out and send it back. We will call you to collect the data.)

- 1. About how many power interruptions of less than five minutes has your organization experienced during the past 12 months?**
- 2. About how many power outages of 5 minutes or more has your organization experienced during the past 12 months?**
- 2b. How long can your organization be without power before the outage causes economic losses?**
- 3. Last year, a prolonged power outage occurred on Saturday, August 10th, affecting much of the Western United States. It occurred at 3:48 in the afternoon, and its length varied by area. Were any of your organization's operations or services disrupted at this location as a result of the August 10th power outage?**
- 3a. To the best of your recollection, how long was your operation disrupted as a result of the August 10th power outage?**
- 3b. Did your organization have a back-up power supply at the time of the August 10th outage?**
- 3c. (If YES to 3b) What type of back-up supply did you have?**
- 3d. (If YES to 3b) Did your organization use your back-up power supply during the August 10th outage?**
- 3e. (If YES to 3b) Was your back-up power supply large enough to allow operations to proceed normally, or did it only handle critical or emergency functions?**
- 4. When the August 10th outage occurred, did you try to call your utility company to get information about the outage?**
- 5. Some companies experienced losses during the August 10th power outage. Did your organization experience any economic losses at this location as a result of the August 10th outage? (These would include labor costs, loss of materials and/or products, and damage to equipment which occurred during the outage as well as restart costs and slowdowns following the outage.)**
- 5a. (If YES to 5) What was the approximate dollar amount of your organization's losses?**
- 5b. (If YES to 5) What was the approximate dollar amount of losses due to labor costs?**

- 5c. (If YES to 5) What was the approximate dollar amount of losses due to loss of raw materials?
- 5d. (If YES to 5) What was the approximate dollar amount of losses due to loss of product, finished or in process?
- 5e. (If YES to 5) What was the approximate dollar amount of losses due to damage to equipment?
- 5f. (If YES to 5) What was the approximate dollar amount of losses due to canceled contracts?
- 6. Did your organization file a claim or claims for these economic losses caused by the August 10th power outage?
 - 6a. (If YES to 6) With whom was your claim filed?
 - 6b. (If YES to 6) What was the total dollar amount of the claims filed?
 - 6c. (If YES to 6) Was your organization reimbursed for your claimed losses?
- 7. What is the approximate square footage of your facility at this location? (Buildings at or adjacent to the location we are calling?)
- 8. How many full time employees are employed by your organization at this location?
- 9. How many part time or seasonal employees are employed by your organization at this location?
- 10. What is the approximate total for your organization's expenditures on electricity?
- 11. Approximately what percentage of your organization's annual operating expenses is spent on electricity?