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Final Report

Southern California Edison 2004-2005 IDEEA Constituent Program Evaluations: Appendices

Vol. 2

Prepared for:
Southern California Edison

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1. AC Energy Hog Roundup Program

Appendix A: Remaining Useful Life Analyses

Edison's Survival Function Analysis and Estimated Remaining Useful Life

January 20, 2007

TO: Shahana Samiullah, M&E/Southern California Edison International

Ben Bronfman, QUANTEC

FROM: John Peterson, Athens Research

RE: CAC remaining useful life table.

This is a redraft of an informal memo to you (November 5, 2006), concerning the estimation of remaining useful life by current age of HVAC appliance. As I understood the purpose of the task, a table relating appliance age to remaining useful life (and proportion of appliances still functioning in place) was needed to estimate savings expected in an early replacement program. In general, tables like this may be useful in early replacement programs where some defensible estimate of the life expectancy for the replaced equipment is needed; in some cases they can be generated through ad hoc use of retention studies that have provided survival model parameters.

In this case, I used ADM's 9th year retention study of the Southern California Edison Residential Appliance Efficiency Incentive Program (RAEI):

> Southern California Edison 1994 Residential Appliance Efficiency Incentive Program: Ninth Year Retention Study. CPUC Study ID #546A. ADM Associates, Inc., July 2004.

To summarize ADM's approach, grouped data were assembled from RASS 2002, linking stock counts and estimated hazards by age-of-appliance ranges. ADM developed from this RASS data a Weibull specification for the survival function. The study EUL, based on the evaluation of the study's estimate of the Weibull model, was 26.2 years. It was determined, however, that this result was not significantly different at the 80% confidence level from the ex-ante value of 18 years, so that the 18 year EUL remained in force. To honor both the approach, and the still-accepted ex-ante value based on CPUC Protocols of that time, I made use of ADM's "lower 80% confidence limit" for the survivor function, which produced an estimated EUL of 18.08 years, which was judged by ADM and project management to be essentially 18 years. The following are scale and shape parameters representing the obtained Weibull solution and the lower limit function (provided by ADM in spreadsheets supporting its final report):

	Final obtained	Lower limit
Scale	0.0032	0.004082
Shape	1.6517	1.773733
Implied EUL	26.2 yrs.	18.08 yrs.

The Weibull implies that …

Propn surviving to age t= Exp(-scale parameter x t**shape parameter).

I made use of this, adopting the lower limit solution that passes through (or very near) the retained default EUL of 18.0 years. In this way, we respect the retained ex-ante, and the method followed in a CPUC-approved study, using general population HVAC data.

Using the scale and shape parameters from the lower limit solution, I evaluated the model from age 0 to 200 years, reproducing exactly the survival-at-year y results that ADM shows in the spreadsheet documenting the RAEI study. At 18 years, the survival is .5027 or 50.27 percent of the appliances installed (according to the model implications). I then committed the very minor sin of normalizing this distribution as follows:

a. calculate proportion of deaths in year y
b. for deaths in years through 18, normalize downward (by 0.5/0.5027), to assure that 0.5 of the deaths occur exactly at year 18.
c. For deaths in years after 18, normalize upward (by 0.5/(1-0.5027) to balance the modest adjustment in b.

With this very slightly different survival distribution in hand, which honors ADM's modeling approach and the ex-ante of 18 years, I simply passed through years 0-200, in each case calculating the surviving appliances at year Y, and then looking forward through succeeding years to determine the (interpolated) year Y2 in which half of the survivors at Y would have died. The estimated RUL at any year Y is then Y2-Y. I did not calculate standard errors for these RUL's; in other modeling circumstances (more information about model results or using raw data) that would not be difficult.

The appendix to this memo contains a SAS listing which provides, for each year, the survivor proportion per ADM's lower limit model (that has an EUL of 18.08), the survivor proportion after the moderate normalization, and using the moderately normalized distribution, the RUL at each year (the expected useful remaining life given that the appliance is now Y years old). I provide the first 100 years (at which point, the implication is that any survivors will be halved in 2.7 years; but note also that the model reasonably suggests that fewer than 2% would last 50 years).

I've also provided this data in a spreadsheet as part of the email transmission.

APPENDIX: SAS LISTING FOR FUNCTION EVALUATION (SV_YR is survivor proportion), slightly normalized distribution (SV_YR2), and age-specific remaining useful life.

1DEVELOP EXPECTED RULS, ADM CAC STUDY, LOWER LIMIT SURV FN
23:57 Monday, November 6, 2006 13

==

---- slightly modified survivor distribution and RUL's ----

YR	SV_YR	SV_YR2	RUL	
0	1.000000	1.000000	18.000	NOTE THAT RUL AT 0 IS EX-ANTE EUL
1	0.995926	0.995904	17.061	
2	0.986140	0.986063	16.208	
3	0.971755	0.971599	15.425	
4	0.953395	0.953138	14.701	
5	0.931555	0.931177	14.030	
6	0.906677	0.906161	13.415	
7	0.879171	0.878503	12.842	
8	0.849428	0.848596	12.313	
9	0.817824	0.816817	11.820	
10	0.784717	0.783526	11.365	
11	0.750448	0.749068	10.937	
12	0.715342	0.713768	10.547	
13	0.679705	0.677934	10.176	
14	0.643821	0.641852	9.833	
15	0.607954	0.605786	9.516	
16	0.572344	0.569980	9.214	
17	0.537211	0.534653	8.931	
18	0.502749	0.500000	8.673	HALF GONE AT YEAR 18, 75% TO BE
19	0.469129	0.466564	8.420	GONE AT 18+8.673 YEARS (26.673)
20	0.436499	0.434113	8.177	
21	0.404986	0.402771	7.948	
22	0.374692	0.372643	7.739	

23	0.345700	0.343810	7.539
24	0.318074	0.316335	7.347
25	0.291858	0.290262	7.162
26	0.267079	0.265619	6.985
27	0.243750	0.242417	6.826 RIGHT
28	0.221868	0.220655	6.674
29	0.201419	0.200318	6.527
30	0.182378	0.181380	6.385
31	0.164708	0.163807	6.247
32	0.148368	0.147556	6.114
33	0.133307	0.132578	5.986
34	0.119472	0.118818	5.873
35	0.106802	0.106218	5.763
36	0.095237	0.094717	5.657
37	0.084714	0.084250	5.554
38	0.075167	0.074756	5.454
39	0.066532	0.066168	5.357
40	0.058745	0.058423	5.262
41	0.051743	0.051460	5.170
42	0.045466	0.045218	5.080
43	0.039855	0.039637	4.993
44	0.034852	0.034662	4.917
45	0.030405	0.030239	4.844
46	0.026463	0.026318	4.772
47	0.022978	0.022852	4.703
48	0.019905	0.019796	4.635

49	0.017203	0.017108	4.568
50	0.014833	0.014752	4.504
51	0.012760	0.012690	4.440
52	0.010951	0.010891	4.378
53	0.009378	0.009326	4.318

==

---- slightly modified survivor distribution and RUL's ----

YR	SV_YR	SV_YR2	RUL
54	0.008012	0.007968	4.258
55	0.006829	0.006792	4.200
56	0.005808	0.005777	4.143
57	0.004929	0.004902	4.086
58	0.004173	0.004150	4.031
59	0.003525	0.003506	3.981
60	0.002972	0.002955	3.936
61	0.002499	0.002486	3.892
62	0.002097	0.002086	3.849
63	0.001756	0.001747	3.807
64	0.001467	0.001459	3.765
65	0.001223	0.001217	3.725
66	0.001018	0.001012	3.685
67	0.000845	0.000840	3.646
68	0.000700	0.000696	3.607
69	0.000578	0.000575	3.570

70	0.000477	0.000474	3.533
71	0.000392	0.000390	3.496
72	0.000322	0.000320	3.460
73	0.000264	0.000263	3.425
74	0.000216	0.000215	3.390
75	0.000176	0.000175	3.356
76	0.000143	0.000143	3.323
77	0.000117	0.000116	3.289
78	0.000095	0.000094	3.257
79	0.000076	0.000076	3.224
80	0.000062	0.000061	3.193
81	0.000050	0.000049	3.161
82	0.000040	0.000040	3.130
83	0.000032	0.000032	3.100
84	0.000026	0.000026	3.070
85	0.000021	0.000020	3.040
86	0.000016	0.000016	3.010
87	0.000013	0.000013	2.985
88	0.000010	0.000010	2.962
89	0.000008	0.000008	2.940
90	0.000006	0.000006	2.918
91	0.000005	0.000005	2.896
92	0.000004	0.000004	2.874
93	0.000003	0.000003	2.853
94	0.000002	0.000002	2.832
95	0.000002	0.000002	2.812

96	0.000002	0.000002	2.791
97	0.000001	0.000001	2.771
98	0.000001	0.000001	2.752
99	0.000001	0.000001	2.732
100	0.000001	0.000001	2.713

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Quantec's Survival Function Analysis and Estimated Remaining Useful Life

We estimated a survival function for HVAC units using program data from the units replaced. Note that units that were not operational and could not be repaired did not qualify for replacement, and were excluded from the program (those unit characteristics were not collected). If a unit could be made functional, it was, and if it tested at a EER of 7.0 or less it was eligible for replacement. Because no independent (outside the program) was observed, we do not have "death" parameter for the analysis. However, we can created a "censored" dataset, where end of life assumed by a proxy. For this analysis we created a dataset where any unit with an operating EER under 7.0 was deemed at the end of life.

Using the Kaplan-Meier survival function (this is a nonparametric method), two estimates were obtained, as shown in Table A–1 below. We also calculated a survival function using a Weibull distribution. The expected lifetime were of all units exactly the same in both analyses, but the median of age of units over 18 years was slightly higher (26 vs. 25) using the Weibull distribution, and the confidence intervals were larger.

Table A–1. Expected Lifetime Estimates

Emperical Results

	Median	Expected Lifetime	Standard Error	Number Failed	Number Surviving (Censored)	90% Confidence Interval		80% Confidence Interval	
						LCL	UCL	LCL	UCL
All units	22.00	21.65	0.33	360	272	21.11	22.19	21.23	22.07
Units over 18	25.00	25.45	0.31	199	60	24.94	25.96	25.06	25.85

For all units, the mean expected lifetime was 22 years. For units currently over 18 years, the total expected lifetime was 25 years. For units over 18 years, we calculated annual survival rates for units

Table A–2 shows the survival rate, remaining life and average age of remaining units by year, for those units over 18 years and older.

Table A–2. Survival Rates for Units 18 Years and Older.

Age	SURVIVAL	MRL (Mean Residual Life at Current Age)	Age of MRL
0	1		
19	0.92	7.01	26.01
20	0.83	6.65	26.65
21	0.77	6.09	27.09
22	0.68	5.74	27.74
23	0.62	5.21	28.21
24	0.56	4.68	28.68
25	0.45	4.52	29.52
26	0.43	3.74	29.74
27	0.33	3.58	30.58
28	0.26	3.18	31.18
29	0.18	3.24	32.24
30	0.12	3.36	33.36
31	0.09	2.99	33.99
32	0.06	2.98	34.98
33	0.04	2.83	35.83
35	0.04	2.20	37.20
36	0.02	2.00	38.00
37	0.01	1.50	38.50
38	0.01	1.00	39.00

Figure A–1. Survival Function Distribution, All Units

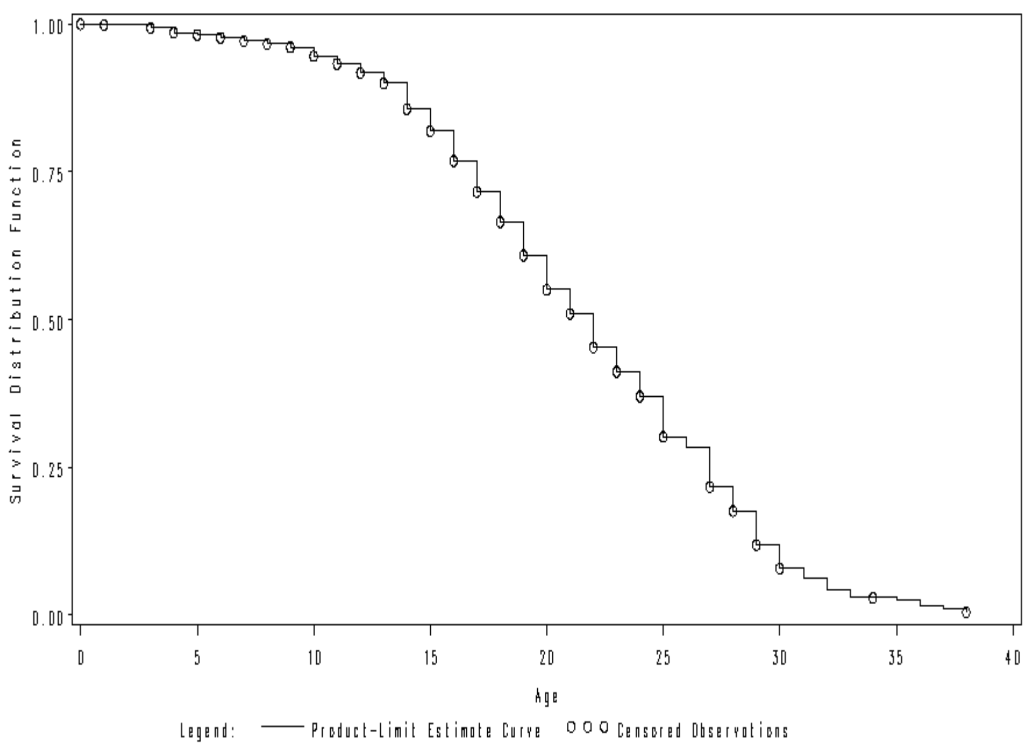
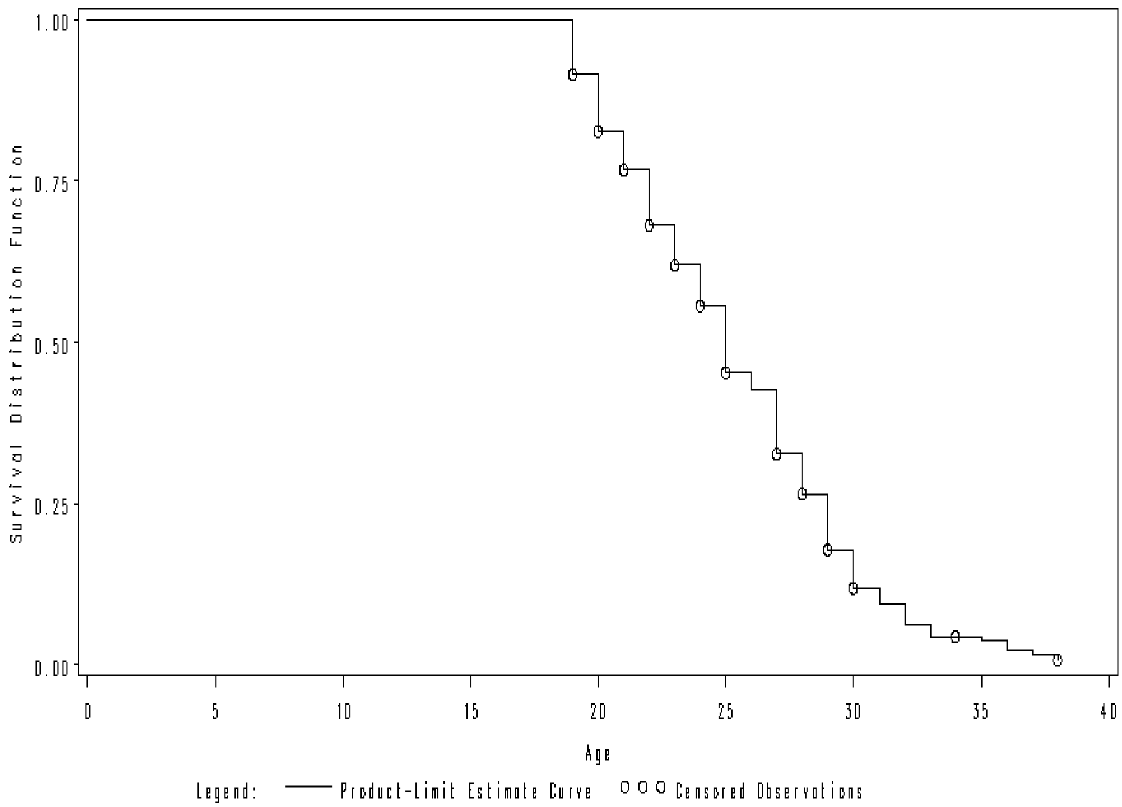


Figure A–2. Survival Function Distribution, Units Older Than 18 Years



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Appendix B: Surveys

The following surveys are included in this Appendix:

- Edison
- CSG
- PEG
- Participating Contractors
- Non-Participating Contractors
- Participating Residents
- Non-Participating Residents

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AC Energy Hog Program

Edison Program Manager

Date ____
Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
3. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?
4. How was the program marketed? How were participants contacted?

Program Administration

5. Were there any issues related to interaction with CSG, PEG, billing, incentives program tracking, or processing contractor rebates.
6. What QC procedures were employed by contractors CSG and PEG?
7. Were there any issues with the ‘chain of command’ or the structure of the program implementation?
8. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration?

Overall Lessons Learned

9. Are there barriers to the widespread adoption of HVAC enhanced tune-up or early retirement services into normal maintenance activities that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them? If yes, What were they? How were they addressed or what suggestions do you have?
10. What is the potential for mainstreaming the program?
11. Any other issues?

Thank you for your time.

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A/C Energy Hog Roundup

Program/Implementer Staff - CSG

Respondent ____
Date ____
Interviewer ____

Program Design

1. What were the innovative aspects of AC Energy Hog Program?
2. Was the program implemented as designed?
3. Did you meet your program goals and targets?
4. [If targets were not met] Why were targets not met?

Marketing and Outreach

5. What was your strategy to identify HVAC contractors?
6. What were the qualifying criteria for HVAC contractors?
7. How did you verify that contractors met the qualifying criteria?

Delivery and Implementation -- Contractors

8. Was any special training needed to provide this service?

Delivery and Implementation -- Consumers

9. Were there common characteristics of consumers who received the AC inspection but refused to follow the recommendations?

Free Ridership

10. Would the contractors have instituted a similar program without incentives?

Overall Lessons Learned

11. What characteristics would an ideal contractor have?

What characteristics make a good end-user of this program?

12. What barriers to technology diffusion have you identified?
13. How should those barriers be addressed?
14. Would you change the way consumers are identified and recruited?
15. Would you change the model of the program delivery? (i.e., CSG >PEG>contractors>end-users)
16. f the program were mainstreamed, what changes would improve it? [probe for products marketing, delivery, warranty service, training]

Thank you for your time and assistance in evaluating this program.

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A/C Energy Hog Roundup

Program/Implementer Staff - PEG

Respondent ______________________________
Date ______________________________
Interviewer ______________________________

Program Design

1. What were the innovative aspects of AC Energy Hog Program?
2. Was the program implemented as designed?

Marketing and Outreach

3. What was your strategy to identify HVAC contractors?
4. How long did it take?
5. What were the qualifying criteria for HVAC contractors?
6. How did you verify that contractors met the qualifying criteria?
7. How was the program marketed to contractors?
8. What as the most effecting marketing method?
9. What portion of targeted contractors participated?
10. What were the contractors' reason(s) for not participating?

Delivery and Implementation -- Contractors

11. Was any special training needed to provide this service?
12. How was this training administered?
13. What was involved in the training?
14. Did the tune up services help the contractors get more business? If yes, how?
15. Did the contractor's approach to the prescribed program tune-up differ from a 'typical' tune up?

Delivery and Implementation -- Consumers

16. Were there common characteristics of consumers who received the AC inspection but refused to follow the recommendations?
17. For this program, did the contractors document anything differently or collect different information than they would for a 'typical' tune up?
18. How did you ensure contractors followed the AC inspection guidelines outlined in the proposal? What quality control procedures did you employ?
19. What corrective actions were taken when tune ups or installations did not meet standards?

Free Ridership

20. Would the contractors have instituted a similar program without incentives?

Response to Program

21. Was Edison's sponsorship of this program important to the contractors in their decision to participate?
22. Would contractors have participated without the program being part of the Edison IDEEA umbrella?

Overall Lessons Learned

23. What characteristics make a good end-user of this program?
24. What barriers to technology diffusion have you identified?
25. How should those barriers be addressed?
26. Would you make changes in the way you would recruit and train contractors?
27. If the program were mainstreamed, what changes would improve it? [probe for products marketing, delivery, warranty service, training]

Thank you for your time and assistance in evaluating this program.

A/C Energy Hog Roundup

Participating Contractors

Respondent ____

Business Name ____

Date ____

Interviewer ____

Hello, my name is ___________________________ from _______________. I am calling on behalf of Southern California Edison. We are evaluating the AC tune-up and early retirement program, administered by Conservation Services Group and Procter Engineering Group. This program was offered in Conchilla Valley and targets inefficient AC units for tune-up or early replacement to increase energy efficiency.

I'd like to speak to _____________ or someone familiar with your participation in this program.

- ❑ Respondent interested ....Continue
- ❑ Refused ....Determine Time to Call Back

Screening Question:

First, Does your company provide tune-up and maintenance services for residential central air conditioning systems?

- ❑ No...[Thank and Terminate]
- ❑ Yes ....[Continue]

Marketing and Outreach

1. Do you remember when you were contacted about the AC Roundup & Early Retirement Program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes When were you contacted? ______________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Program implementer – CSG (Conservation Services Group)
   - ❑ Southern California Edison
   - ❑ Proctor Engineering Group
   - ❑ Customer
   - ❑ Other, specify ____
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify ____

4. Could you tell me the benefits of program participation, as you understood them? [Do not read. Check all that apply. Capture comments verbatim.]
    - ❑ Tune-ups and replacements of inefficient A/C units will save energy
    - ❑ Southern California Edison will pay for inspections and incentives
    - ❑ This was an experiment
    - ❑ Develop good customer relations
    - ❑ It was never explained to me
    - ❑ Useful for marketing
    - ❑ Other, specify ____
5. Why did you decide to participate? What factors were key to your decision? [Do not read list. Check all that apply. Probe if needed]
    - ❑ A good way to increase product sales
    - ❑ To use program as marketing tool
    - ❑ Customers save on their electricity bill
    - ❑ Reduce peak demand loads
    - ❑ There is a market for energy efficient products and services that save home owners energy and money
    - ❑ Program will help contractors get more business and enhance their value to customers
    - ❑ Develop good customer relations
    - ❑ Already using Check-me in maintenance practice
    - ❑ Other, specify ____
6. Did you have any initial concerns about folding the Early Retirement Program diagnostic protocols into your normal business practices?
7. How important was Edison's sponsorship of this program to your decision to participate? Would you say… [Read and check one]
    - ❑ Not at all important
    - ❑ Somewhat unimportant
    - ❑ Neutral
    - ❑ Somewhat important
    - ❑ Very important

Explain response ______________________________________

8. Outside of the AC Early Retirement Program, what do you do to tune-up an air conditioner as part of a routine service contract? [Do not read list, Mark all that apply, capture additional verbatim]
    - ❑ Basic inspection
    - ❑ Measure air flow and refrigerant charge
    - ❑ Adjust air flow
    - ❑ Adjust refrigerant charge
    - ❑ Check & clean or change filters
    - ❑ Check and clean condenser coil
    - ❑ Check & adjust fan speed
    - ❑ Check & open registers
    - ❑ Duct inspection & repair
    - ❑ Visual inspection of other parts and controls
    - ❑ Install new AC

- ❑ Other, specify ____

9. (If not answered in #8) Do your technicians inspect the ductwork as part of your practice?
   - ❑ No...[Skip to Q11]
   - ❑ Yes
   - ❑ It depends Ask for clarification _______________________
   - ❑ Uncertain...[Skip to Q11]
10. (If Yes to Q9) What do you do (your technicians do) when they find ducts in need of sealing? (Do they ignore it? Do they repair and seal the ducts? What do they use to seal it?).
11. The AC Early Retirement Program uses Check-Me software and diagnostic protocols. When the Check-Me protocol is not used, do you record site measurements and estimate energy and demand savings? (Capture comments verbatim)
   - ❑ No
   - ❑ Yes
      1. IF YES, what analysis tool is used? [record verbatim]

Delivery and Implementation

12. Who is your typical customer? Who buys tune-up services or maintenance contracts? Why do they buy your services or maintenance contracts?
13. How did the customers in the Early Retirement Program differ from your typical customer? Could you sell the program's diagnostic services to your typical customers without the Program? Why/why not?
14. What percentage of your customers participating in the Program already had a tune-up or maintenance contract in place with your firm when you implemented the Check-Me diagnostic protocols within this Program?
15. How did you present the Early Retirement Program to your customers? (Capture verbatim)
16. (If not answered in Q15) What special features of the Program did you present to a customer who already had a maintenance plan?
17. What are the common AC maintenance issues that can be addressed by the Early Retirement program?
18. How would these be addressed without the Program practices?
19. What is the average age of the units you tuned-up in this program? __________
20. What is the average age of the units you tuned-up outside of this program? _____
21. What percent of the units you inspected qualified for replacement? ________%
22. What criteria did you use to determine to replace the units?
23. What is the average age of the units you replaced? __________

Training

24. Was any special training received to learn how to provide the Program services?
   - ❑ No, none offered [Skip to ***Market/Contractor Response***]
   - ❑ No, already familiar [Skip to ***Market/Contractor Response***]
   - ❑ Yes
   - ❑ Uncertain [Skip to ***Market/Contractor Response***]

25. How was training administered?
26. How much contractor time is required to become proficient with Check-me and Program procedures?
27. Did you have to pay anything for the training?
    - ❑ No
    - ❑ Yes: specify amount ___________
    - ❑ Unknown
28. Did CSG use any kind of test to certify successful completion of training?

Market/Contractor Response

29. Did the services that you offered through this Program help generate more business?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
30. About what percentage of your overall costs to provide the program related services was contributed by Edison through incentives? (i.e., did incentives cover the incremental cost of providing services) ___________________%

Comments (record verbatim):

31. Did the customer contribute to the cost of the tune-up? (Capture verbatim)
    - ❑ No
    - ❑ Yes
        - If yes, approximately, how much on average?
    - ❑ Uncertain
32. Did the customer contribute to the cost of replacing an air conditioner? (Capture verbatim)
    - ❑ No
    - ❑ Yes
        - If yes, approximately, how much on average?
    - ❑ Uncertain
33. How does AC Early Retirement Program Check-Me diagnostics service model fit into your current business model? Are there administrative issues with this service model?
34. What level of effort was needed to integrate Early Retirement Program's service model into your business objectives? (e.g. was it an easy fit? Were services very different from prior & required stretch to change?)
35. The AC Early Retirement Program's Check-me software allows infield service technicians to test and adjust the air conditioner's air flow and refrigerant charge. Refrigerant can be added or removed to optimize performance. Were you already familiar with these practices before being contacted about the program?
    - Familiar with and using Check-me or Early Retirement program practices [Ask 35a] .
        - Q35a. When did you start using these practices?
    - ❑ Familiar with and not using Check-me or Early Retirement program practices
    - ❑ Not familiar with Check-me or Early Retirement program practices

- ❑ Uncertain
    1. 35a

36. Have you used diagnostic tools, but <u>not</u> Check-Me, to test and adjust the airflow and refrigerant levels to optimize the air conditioner performance?
    - ❑ No
    - ❑ Yes
        - Did this procedure or protocol have a trade-name?
        - How do they compare to Check-Me?
        - Do you use them now?
            - ❑ No
            - ❑ Yes
37. Outside of the Early Retirement program, do your customers specifically ask for the Check-Me type of diagnostic services?
    - ❑ No
    - ❑ Yes

Spillover

38. Will you use the Early Retirement program practices in the future, either at your own expense, or with incentives? (Record comments verbatim)
    - ❑ Not at own expense or with incentives
    - ❑ Yes, at own expense
    - ❑ Yes, with incentives
    - ❑ Uncertain
39. Since hearing about the program, have you added any other energy efficient equipment or services to your customer offerings?
    - ❑ Yes
    - ❑ No [Skip to *Program Improvement*]
40. Please describe the type of the equipment or services.
41. Overall, how influential would you say the Early Retirement program was in your decision to add energy efficient equipment or services to your customer offerings?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Program Improvement

We have a few questions to improve future programs.

42. First, can you tell me if there is a technical reason that amp readings are not recorded after the new AC is installed?
43. We understand that power measurements are not taken on these units and the airflow is not measured. For future programs, could you tell me the technical difficulties in taking and recording these measurements? (Capture verbatim)
44. In the database, amps were recorded as whole numbers. Could you tell me how difficult it would be to record amps as actual measured numbers with the decimal. (Capture verbatim) (*Note to interviewer: perhaps the actual number was not taken but a proxy input into the data sheet?)*
45. Did CSG/PEG provide customer contact information to you?
46. Do you keep records of customers who refused the AC Early Retirement Program?
    - ❑ No
    - ❑ Yes
    - If yes, We would like to contact some of the people who refused to find out why they refused. Could you tell me who we could talk with about getting contact information for customers who refused? ______________________________
47. Do you have any suggestions for program changes and improvements? (for example, the selection of services, marketing, delivery, training, etc.)?

Satisfaction

48. How satisfied are you with the program overall? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat dissatisfied
    - ❑ Very dissatisfied
49. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When? What program was it? ______________________
    - ❑ Uncertain

Firmagraphics

Lastly, I have a couple of questions about your company.

50. Please tell me how many people your firm employs. __________________
51. How many are AC technicians? ___________________
52. Are all of these technicians using the Check-me diagnostics?
    - ❑ No ....How many? __________
    - ❑ Yes
53. Do you now offer AC Early Retirement program services in addition to standard maintenance services?
    - ❑ No
    - ❑ Yes

- If yes: what percentage of customers buy standard service?
- What percentage of customers buys AC Early Retirement - Check-Me service?

54. What percentage of your overall business revenue is generated through the EnergyHog preventive maintenance services for air conditioning units? __________________%
55. What percentage of your overall business revenue is generated through air conditioner on-call services, that is, services to troubleshoot or repair problems? __________________%

Thank you for your time.

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A/C Energy Hog Roundup

Partial Participants: Non-participating Contractors

(chose not to participate)

Respondent ____
Company ____
Date ____
Interviewer ____

Hello, my name is ____________________________ from ________________. I am calling on behalf of Southern California Edison. We are evaluating the Air Conditioning Roundup and Early Retirement Program which was administered by Conservation Services Group and Procter Engineering Group. This program targets inefficient A/C units for tune-up or replacement, reducing peak electric demand. Your responses will help Edison to improve their future programs and better serve customers and contractors. May I have about ______ minutes of your time.
I'd like to speak to ______________ or someone familiar with your AC services.

- ❑ Respondent interested ....Continue
- ❑ Refused ....Determine Time to Call Back

Screening Question:
First, Does your company provide tune-up and maintenance services for residential central air conditioning systems?

- ❑ No...[Thank and Terminate]
- ❑ Yes ....[Continue]

Marketing and Outreach

1. Do you remember when you were contacted about the AC Roundup and Early Retirement Program sponsored by Southern California Edison? Someone from Edison or CSG would have provided information.[Do not read responses]
   - ❑ Yes When were you contacted? ________________________________
   - ❑ No [Is there someone else with your company who would have been contacted about participating in that program?]
     [INTERVIEWER; PLEASE TRY TO TALK WITH SOMEONE WHO REMEMBERS BEING CONTACTED ABOUT ENERGYHOG AND/OR CHECK-ME]
     - No (there is not someone who would have been contacted): I'd like to ask a few questions about HVAC services that you offer. Who would be a good person to speak with?
       ____________________________________ [Skip to Q7]
     - Yes (there is someone who would have been contacted): could I speak with that person?
       ____________________________________ [Continue]
   - ❑ Uncertain (as above for "No" answers)

2. Do you remember who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Program implementer – CSG (Conservation Services Group)
   - ❑ Southern California Edison
   - ❑ Proctor Engineering Group
   - ❑ Customer
   - ❑ Don't remember
   - ❑ Other, specify ____
3. Do you remember how the information was delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Don't remember
   - ❑ Other, specify ____
4. Could you tell me the benefits of program participation, as you understood them? [Do not read. Check all that apply. Record comments verbatim]
   - ❑ Tune-ups and replacements of inefficient A/C units will save energy
   - ❑ Southern California Edison will pay for inspections and incentives
   - ❑ This was an experiment
   - ❑ Develop good customer relations
   - ❑ It was never explained to me
   - ❑ Useful for marketing
   - ❑ Don't remember
   - ❑ Other, specify ____
5. Why did you decide not to participate? What factors were key to your decision? [Do not read list. Probe if needed]
   - ❑ Have good business already
   - ❑ Too much hassle
   - ❑ Poor experience with similar programs previously
   - ❑ Wouldn't work
   - ❑ Don't remember
   - ❑ Other, specify ____
6. Did you have concerns about folding the Early Retirement Program diagnostic protocols into your normal business practices?

Delivery & Implementation

7. Could you please tell me what your standard Air Conditioner inspection, tune-up and maintenance practices include? [Do not read list, Mark all that apply, capture comments verbatim]
   - ❑ Basic inspection
   - ❑ Measure air flow and refrigerant charge
   - ❑ Adjust air flow
   - ❑ Adjust refrigerant charge

- ❑ Check & clean or change filters
- ❑ Check and clean condenser coil
- ❑ Check & adjust fan speed
- ❑ Check & open registers
- ❑ Adjust refrigerant charge
- ❑ Duct inspection & repair
- ❑ Visual inspection of other parts and controls
- ❑ Install new AC
- ❑ Other, specify ____

8. Do your technicians inspect the ductwork as part of your practice?
   - ❑ No...[Skip to Q11]
   - ❑ Yes
   - ❑ It depends   Ask for clarification ______________________
   - ❑ Uncertain...[Skip to Q11]
9. (If Yes to Q8) What do you do (your technicians do) when they find ducts in need of sealing? (Do they ignore it? Do they repair and/or seal the ducts? What do they use to seal the ducts?).
10. As part of your maintenance practice, do you record site measurements and estimate energy and demand savings? (Capture comments verbatim)
    - ❑ No
    - ❑ Yes

      2. IF YES, what analysis tool is used? [record verbatim]
11. Could you please tell me who your typical customer is, that is, who buys tune-up services or maintenance contracts? (Capture verbatim)
12. Why do they buy your services or maintenance contracts? (Capture verbatim)
13. What is the average age of the units you service but don't replace? __________
14. What percent of the units you inspect qualify for replacement? ________%
15. What criteria do you use to determine whether to replace the units? (Capture verbatim)
16. What is the average age of the units you replaced? __________

Technology Familiarity

17. The AC Early Retirement Program's Check-me software allows infield service technicians to test and adjust the air conditioner's air flow and refrigerant charge. Refrigerant charge can be added or removed to optimize performance. Were you already familiar with these practices before being contacted about the program?
    - ❑ Familiar with and using Check-me or the Early Retirement Program's practices [Ask 18a]

      18a. When did you start using these practices?
    - ❑ Familiar with and not using Check-me or Early Retirement program practices
    - ❑ Not familiar with Check-me or Early Retirement program practices
    - ❑ Uncertain
18. Have you used diagnostic tools, but <u>not</u> Check-Me, to test and adjust the airflow and refrigerant levels to optimize the air conditioner performance?
    - ❑ No

- ❑ Yes
    - Did this procedure or protocol have a trade-name?
    - How do they compare to Check-Me?
    - Do you use them now?
        - ❑ No
        - ❑ Yes

19. Do your customers specifically ask for the Check-Me type of diagnostic services?
    - ❑ No
    - ❑ Yes

Spillover

20. Will you use the Early Retirement program practices in the future, either at your own expense, or with incentives? (Record comments verbatim)
    - ❑ Not at own expense or with incentives
    - ❑ Yes, at own expense
    - ❑ Yes, with incentives
    - ❑ Uncertain
21. Since hearing about the program, have you added any other energy efficient equipment or services to your customer offerings?
    - ❑ Yes
    - ❑ No [Skip to Q25]
22. Please describe the type of the equipment or services.
23. Overall, how influential would you say the Early Retirement program was in your decision to add energy efficient equipment or services to your customer offerings?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Somewhat not influential
    - ❑ Not at all influential
24. What do you think are the major reasons businesses like this (HVAC maintenance services) don't offer programs like Check-Me, that is, preventive maintenance protocols using diagnostic tools and testing? [Capture comments verbatim.]
25. Have you participated in any Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When, what program was it? ______________________
    - ❑ Uncertain

Firmographics

Lastly, I have a couple of questions about your company.

26. Please tell me how many people your firm employs. __________________
27. How many are AC technicians? __________________
28. Are any of these technicians using the Early Retirement program's Check-me or similar diagnostics?
    - ❑ No
    - ❑ Yes ....How many? __________

29. Do you now offer services like Check-Me (that is, preventive maintenance protocols using diagnostic tools and testing) in addition to standard maintenance services?
    - ❑ No
    - ❑ Yes
    - If yes: what percentage of customers buy standard service?
    - What percentage buys the Early Retirement Program's Check-Me type of service?
30. What percentage of your overall business revenue is generated through the preventive maintenance services of air conditioning units? ___________________%
31. What percentage of your overall business revenue is generated through air conditioner on-call services, that is, services to troubleshoot or repair air conditioner problems? ___________________%

Thank you for your time.

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A/C Energy Hog Roundup

Program Participants (Residents)

Respondent ______________________________
Date ______________________________
Interviewer ______________________________

Hello, my name is ___________________________ from _______________.
I am calling on behalf of Southern California Edison. I'd like to speak to
or another adult in your home.
[When respondent comes on line] According to our records, an Edison contractor tuned-up or replaced your air conditioner. The contractors would also have provided you with some fluorescent light bulbs. We are evaluating the Central Air Conditioner Roundup Program to learn about your experience of participation. . Your responses will help Edison to improve their future programs and better serve customers. May I have about 5-10 minutes of your time.

- ❑ Respondent interested ....Continue
- ❑ Refused ....Determine Time to Call Back

Marketing and Outreach

1. Please tell me how did you first heard about the program? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ In person
   - ❑ Don't know
   - ❑ Other, specify ________________________________
2. You probably received information from Southern California Edison, CSG, Proctor Engineering or an air conditioner contractor. Do you remember who contacted you and explained what the Central Air Conditioner Roundup Program was about? [Do not read. Check all that apply]
   - ❑ Contractor
   - ❑ Program implementer – CSG (Conservation Services Group)
   - ❑ Southern California Edison
   - ❑ Friend/family
   - ❑ Landlord
   - ❑ Don't remember
   - ❑ Other, specify ________________________________
3. Could you tell me the benefits of program participation, as you understood them? [Do not read. Check all that apply. Capture comments verbatim.]
   - ❑ Tune-ups and replacements of inefficient AC units will save **energy**
   - ❑ Tune-ups and replacements of inefficient AC units will save **money**
   - ❑ This was an experiment

- ❑ Help environment
- ❑ It was never explained to me
- ❑ Necessary for AC service
- ❑ Other, specify ____

4. Why did you decide to participate? What factors were key to your decision? [Do not read list. Probe if needed]
   - ❑ To use less electricity/less environmental problems
   - ❑ To save money
   - ❑ For incentives
   - ❑ It was free, or little cost to me
   - ❑ Worried AC unit might break down
   - ❑ Free service
   - ❑ Other, specify ____
5. How important was Southern California Edison's sponsorship of this program to your decision to participate?
   - ❑ Not at all important
   - ❑ Somewhat unimportant
   - ❑ Neutral
   - ❑ Somewhat important
   - ❑ Very important

   Please explain your answer.
6. People who participated in the program received six compact fluorescent bulbs. How significant were these bulbs in your decision to participate in the program?
   - ❑ Very significant
   - ❑ Somewhat significant
   - ❑ Neutral
   - ❑ Somewhat insignificant
   - ❑ Very insignificant
7. Did you have any CFLs in your house before you were given a 6-pack?
   - ❑ No
   - ❑ Yes
     - If yes: How many?_____________
8. Have you installed CFLs from the six-pack?
   - ❑ No
   - ❑ Yes
     - If yes, how many? ______
9. Did the contractor talk with you about your air conditioner(s)?
   - ❑ No
   - ❑ Yes
     - Do you remember what he told you about it? Explain.
10. Do you know if the contractors had any difficulties collecting information about your AC unit?
    - ❑ No, they did not have difficulty
    - ❑ Yes, they had difficulty
      - Do you know what were they? Explain.
    - ❑ Don't know

11. Do you know what was done to your AC after the contractor's inspection? For example, did the contractor do a tune-up, make repairs or suggest you replace the air conditioner? (Check all that apply)
    - ❑ Repairs
    - ❑ Tune up
    - ❑ Replaced AC ....[Skip to Q14]
    - ❑ Suggested replacement.................................[Ask Q12b]
    - ❑ Uncertain
    - ❑ Other specify: _______________________________
12. [If Q11 does **not** state 'replaced AC' or 'suggested replacement'] Did the contractor suggest you replace the AC?
    - ❑ No
    - ❑ Yes ....[Ask Q12b]
        - Q12b. Did you replace the AC?
            - ❑ No..[Ask 13, then skip to 15]
            - ❑ Yes ....[Ask Q14]
13. [Ask if Q12b = NO, then skip to 15] Why didn't you replace the air conditioner? [Do not read. Check all that apply. Record comments verbatim.]
    - ❑ Didn't think I needed it
    - ❑ Was unsure about rebate
    - ❑ Couldn't afford it
    - ❑ Shopped but didn't find suitable unit
    - ❑ Planning to replace it ....When?_____________________
    - ❑ Don't know
    - ❑ Other specify ____
14. Did any problems come up during the delivery or installation of your new air conditioner?
    - ❑ No
    - ❑ Yes
        - If yes, what were the problems?

Free-Ridership

15. How old was your air conditioner at the time the contractors inspected it?
    - Unit 1 -- Years old____________
    - Unit 2 -- Years old____________
    - If don't know, was it there when you moved in? When did you move in? _________________
16. Before being contacted for the program did anyone do some maintenance or tune-ups on your air conditioner?
    - ❑ No...[skip to Q18]
    - ❑ Yes,
        - If YES, Who did the work?
            - ❑ Did it myself (Skip to Q18)
            - ❑ Contractor
                1. About how much did you pay the contractor for service? ………………$

17. Was the maintenance done by a contractor part of a service contract that you have, or was this a special service call?
    - ❑ Regular service maintenance contract
    - ❑ Special service call (skip to Q21)
    - ❑ Don't know (skip to Q21)
18. How often do you usually do maintenance on your air conditioner?
    - ❑ At least once every 6 months
    - ❑ At least once every year
    - ❑ At least once every two years
    - ❑ Once in the last five years
    - ❑ Once longer than five years
    - ❑ Never, or when it breaks
    - ❑ Uncertain
19. Were you already planning to have your air conditioner inspected or serviced when the contractors contacted you about this program?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
20. [If Q11 includes "replaced the AC" or Q12=Yes] Did you have plans to replace the AC before you participated in this program?
    - ❑ No, did not have plans to replace the AC
    - ❑ Yes, had plans to replace the AC
        - IF YES, When would you have replaced the AC if you did not participate in the program? Would you say …
            - ❑ This year
            - ❑ 1-2 years
            - ❑ 3-5 years
            - ❑ Don't know

Maintenance Services

21. What services were included in the maintenance or tune up you did before participating in this program? [Do not read list, Mark all that apply, capture comments and 'other' verbatim]
    - ❑ Basic inspection
    - ❑ Measure air flow and refrigerant charge
    - ❑ Adjust air flow
    - ❑ Adjust refrigerant charge
    - ❑ Check & clean or change filters
    - ❑ Check and clean condenser coil
    - ❑ Check & adjust fan speed
    - ❑ Check & open registers
    - ❑ Duct inspection & repair
    - ❑ Visual inspection of other parts and controls
    - ❑ Install new AC
    - ❑ Inspect the ducts
    - ❑ Seal or repair ducts

- ❑ Repairs, specify ____
- ❑ Other, specify ____
- ❑ Don't know

22. Do you know if the AC Roundup Program services that you just received were different from the service or tune-up that you got before the program?
    - ❑ No, they were not different
    - ❑ Yes, they were different
        - If YES, what was different?
    - ❑ Don't know if they were different
23. When you had maintenance service before this program, do you know if the contractor provided an estimate of energy savings that could result from the maintenance? (Capture comments verbatim)
    - ❑ No, they did not provide an estimate
    - ❑ Yes, they provided an estimate
        - What was the estimate?
    - ❑ Don't know if energy estimate provided

Comments: ____

24. (If not answered in #22 or 23) In the maintenance service before this program, do you know if the contractors inspected the ducts?
    - ❑ No, they did not inspect the ducts
    - ❑ Yes, they did inspect the ducts
    - ❑ Don't know if they inspected the ducts
25. (If YES to Q24) Do you know if the ducts needed repair or sealing?
    - ❑ No, the ducts did not need repair or sealing
    - ❑ Yes, the ducts did need repair or sealing
        - If YES, did you repair or seal the ducts?
            - ❑ No
            - ❑ Yes

              If YES, did you have to pay something for this work?
                1. About how much?
    - ❑ Don't know if ducts needed repair or sealing
26. What about during the services you just received with this Program? Do you know if the contractors inspected the ducts?
    - ❑ No, they did not inspect the ducts
    - ❑ Yes, they did inspect the ducts
    - ❑ Don't know if they inspected the ducts
27. (If YES to Q26) Do you know if the ducts needed repair or sealing?
    - ❑ No, the ducts did not need repair or sealing
    - ❑ Yes, the ducts did need repair or sealing
        - If YES, did you repair or seal the ducts?
            - ❑
            - ❑ Yes

              If YES, did you have to pay something for this work?
                1. About how much?

- ❑ Don't know if ducts needed repair or sealing

Market/Customer Response

28. This summer (2006) when you cooled your home, what percent of the time did you use your AC? For example, did you use it 50% of the cooling season? Or 80%? ________________%

Comments: (If don't know %, please record all comments) ______________________

29. Last summer (2005) when you cooled your home, what percent of the time did you use your AC? ________________%

Comments: (If don't know %, please record all comments) ______________________

30. Do you have a swamp cooler?
    - ❑ No
    - ❑ Yes
        - This summer (2006), what percent of the time did you use your swamp cooler? _______________%

Comments: (If don't know %, please record all comments) ______________________

- Last summer (2005), what percent of the time did you use your swamp cooler? ________________%

Comments: (If don't know %, please record all comments) ______________________

Spillover

31. Have you installed any other energy efficiency measures since the air conditioner service was completed?
    - ❑ No
    - ❑ Yes ....Describe ______________________________________

Satisfaction

32. Were you satisfied with the air conditioner services the contractor provided in this program?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat dissatisfied
    - ❑ Very dissatisfied

Comments (record verbatim) ____

33. Can you think of any improvements that could be made to this AC program?
34. Have you ever participated in any other energy efficiency programs offered by Southern California Edison?
    - ❑ No
    - ❑ Yes, When? What program was it? _______________________
    - ❑ Uncertain

Demographics

Last, I have a few of questions about your household for statistical purposes. This information will only be reported in the aggregate and your name will not be disclosed.

35. How many AC units do you have? _______________
36. What is the total size or capacity of your air conditioners? [Record information as reported. Note that they may reference the total size or each unit separately. Please note whether answers are for each separately or total capacity.]
    - ❑ 2-4 tons
    - ❑ 5-8 tons
    - ❑ 8-10 tons
    - ❑ 11-15 tons
    - ❑ SEER level ___________________
    - ❑ Don't know
    - ❑ Other comment, capture verbatim _______________________________

Total Capacity _______ Each unit ________________

37. Do you know the approximate square footage of your home? _____ Square ft
38. Do you know the approximate age of your home? ____Years old
39. Please tell me the number of people in your household. _______

Thank you for your time and assistance in evaluating this program.

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A/C Energy Hog Roundup

Non-Participants (Residents)

Respondent ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________.
I am calling on behalf of Southern California Edison. We are evaluating the Air Conditioner Roundup Program. We'd like to ask you some questions about air conditioning in your home. Your responses will help Edison improve their programs and better serve customers. May I have about 5 minutes of your time?
I'd like to speak to or another adult in your home.

- ❑ Respondent interested ....Continue
- ❑ Refused ....Determine Time to Call Back

Screen

Do you have central air conditioning?

- ❑ No...Thank and Terminate
- ❑ Yes ....Continue

Marketing and Outreach

If using "Edison Call List" start with Q5 [These people were not contacted about the program]

If using "Contractor Call List" Ask Q1 to Q4 [These people were contacted and refused participation]

1. Please tell me how did you first heard about the program? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ In person
   - ❑ Don't know
   - ❑ Other, specify ____
2. You probably received information from Southern California Edison, CSG, Proctor Engineering or an air conditioner contractor. Do you remember who contacted you and explained what the Central Air Conditioner Roundup Program was about? [Do not read. Check all that apply]
   - ❑ Contractor
   - ❑ Program implementer – CSG (Conservation Services Group)
   - ❑ Southern California Edison
   - ❑ Friend/family
   - ❑ Landlord
   - ❑ Don't remember
   - ❑ Other, specify ____

3. Could you tell me the benefits of program participation, as you understood them? [Do not read. Check all that apply. Capture comments verbatim.]
   - ❑ Tune-ups and replacements of inefficient AC units will save **energy**
   - ❑ Tune-ups and replacements of inefficient AC units will save **money**
   - ❑ This was an experiment
   - ❑ Help environment
   - ❑ It was never explained to me
   - ❑ Necessary for AC service
   - ❑ Don't remember
   - ❑ Other, specify ____
4. Why did you decide NOT to participate? What factors were key to your decision? [Do not read list. Probe if needed]
   - ❑ Do not have central AC
   - ❑ Did not think I was eligible
   - ❑ Did not think it would use less electricity
   - ❑ Did not think it would save money
   - ❑ Did not believe it was Southern California Edison program
   - ❑ Did not think it was free, or little cost to me
   - ❑ Worried AC unit might break down
   - ❑ Don't remember
   - ❑ Other, specify ____

If using "Edison Call List" Start here [These people were not contacted about the program]

AC Maintenance

5. Do you have a regular service maintenance contract or do you only make special service calls when there is a problem?
   - ❑ Regular service maintenance contract
   - ❑ Special service calls
   - ❑ Both
   - ❑ Don't know
6. How often do you usually do maintenance or a tune-up on your air conditioner?
   - ❑ At least once every 6 months
   - ❑ At least once every year
   - ❑ At least once every two years
   - ❑ Once in the last five years
   - ❑ Once longer than five years
   - ❑ Never, or just when it breaks down (skip to Q14)
   - ❑ Uncertain
7. Has anyone done some maintenance or tune-ups on your air conditioner in the past three years?
   - ❑ No...[skip to Q8]
   - ❑ Yes
     - If YES, Who did the work?
       - ❑ Did it myself ....[Ask 8 & 9, then skip to Q14]
       - ❑ Contractor

- About how much did you pay the contractor for service? ……….$

8. When was the last maintenance or tune-up done?
   - Year ________________________
9. How old was your air conditioner at the time it was serviced?
   - Unit 1 --Years old_____________
   - Unit 2 --Years old_____________
   - [If don't know], When did you move in? __________________
10. What services were included in the maintenance or tune up? [Check all that apply. Capture comments verbatim. Probe if needed.]
    - ❑ Basic inspection
    - ❑ Measure air flow and refrigerant charge
    - ❑ Adjust air flow
    - ❑ Adjust refrigerant charge
    - ❑ Check & clean or change filters
    - ❑ Check and clean condenser coil
    - ❑ Check & adjust fan speed
    - ❑ Check & open registers
    - ❑ Duct inspection & repair
    - ❑ Visual inspection of other parts and controls
    - ❑ Install new AC
    - ❑ Inspect the ducts
    - ❑ Seal or repair ducts
    - ❑ Repairs, specify ____
    - ❑ Other, specify ____
    - ❑ Don't know
11. Do you know if the contractor provided an estimate of energy savings that could result from the maintenance? (Capture comments verbatim)
    - ❑ No, they did not provide an estimate
    - ❑ Yes, they provided an estimate
      - What was the estimate?
    - ❑ Don't know if energy estimate provided

Comments: ____

12. (If not answered in Q10 or Q11) Do you know if the contractors inspected the ducts?
    - ❑ No, they did not inspect the ducts
    - ❑ Yes, they did inspect the ducts
    - ❑ Don't know if they inspected the ducts
13. (If Yes to Q12) Do you know if the ducts needed repair or sealing?
    - ❑ No, the ducts did not need repair or sealing
    - ❑ Yes, the ducts did need repair or sealing
      - If YES, did you repair or seal the ducts?
        - ❑ No
        - ❑ Yes

          If YES, did you have to pay something for this work?

1. About how much?
- ❑ Don't know if ducts needed repair or sealing

14. Do you have plans to replace the AC in the near future?
    - ❑ No, do not have plans to replace the AC
    - ❑ Yes, have plans to replace the AC
        - IF YES, When do you think you'll replace the AC? Would you say …
            - ❑ This year
            - ❑ 1-2 years
            - ❑ 3-5 years
            - ❑ Don't know
15. This summer (2006) when you cooled your home, what percent of the time did you use your AC? For example, did you use it 50% of the cooling season? Or 80%? _______________%

Comments: (If don't know %, please record all comments) ____________________

16. Do you have a swamp cooler?
    - ❑ No
    - ❑ Yes
        - This summer (2006) when you cooled your home, what percent of the time did you use your swamp cooler? _______________%

Comments: (If don't know %, please record all comments) ____________________

17. Have you participated in any energy efficiency programs offered by Southern California Edison?
    - ❑ No
    - ❑ Yes, When? What program was it? _____________________
    - ❑ Uncertain

Demographics

Last, I have a few questions about your household for statistical purposes. This information will only be reported in the aggregate and your name will not be disclosed.

18. How many AC units do you have? _______________
19. What is the total size or capacity of your air conditioners? [Record information as reported. Note that they may reference the total size or each unit separately. Please note whether answers are for each separately or total capacity.]
    - ❑ 2-4 tons
    - ❑ 5-8 tons
    - ❑ 8-10 tons
    - ❑ 11-15 tons
    - ❑ SEER level ___________________
    - ❑ Don't know
    - ❑ Other comment, capture verbatim _______________________________

Total Capacity _______ Each unit ________________

20. Do you know the approximate square footage of your home? _____ Square ft
21. Do you know the approximate age of your home? ____Years old
22. Please tell me the number of people in your household. _______

Thank you for your time.

2. Agricultural Ventilation Efficiency Program

Appendix A: Minimum Efficiency Ratings & Incentives

EnSave's proposal noted that there are no known efficiency guidelines or energy saving assumptions for agricultural ventilation and HVLS fans. Guidelines are not listed in the Energy Efficiency Policy Manual, or the California Energy Commission DEER database. However, the HVLS fans are inherently more energy efficient than standard fans. EnSave developed tables for energy saving assumptions using data from Bioenvironmental and Structural Systems Laboratory, Dept. of Agricultural Engineering, University of Illinois, Urbana-Champaign and MacroAir Technologes, LLC, Sherborn, MA as well as from Delta T Corporation, d.b.a. Big Ass Fans, Lexington, KY.[1] This information was used to develop savings goals and incentive levels. Table A–1 shows the efficiency guidelines and associated incentives for energy-efficient fans established for this program.

Table A–1. Fan Size, Minimum Efficiency Ratings, Incentives[2]

Fan Size	Circulation Fan Min. Efficiency at 0" Static Pressure in H20 (CFM/Watt)	Exhaust Fan Min. Efficiency at .10" Static Pressure in H20 (CFM/Watt)	Rebate Offered per Fan	Average Installed Cost
12 - 15"	8.0	7.0	$125	$475
16" – 18"	9.8	8.5	$150	$500
20"- 22"	10.0	9.0	$175	
24" – 26"	14.0	11.9	$175	$550
27" - 30"	16.4	13.8	$200	$650
36"	20.4	16.2	$225	$750
48"	21.9	17.6	$250	$800
50" – 54"	22.5	18.0	$250	$850
54" – 56"	23.0	18.0	$250	$850
HVLS 8' -24'	125.0	N/A	$1,000	$4000

Source: EnSave documents

[1] EnSave proposal, page 13.
[2] Data reported in EnSave proposal and final report documents.

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Appendix B: HVLS Fan Technology

The HVLS fans offered a new design and applications to increase comfort and air circulation, and reduce the total amount of required ventilation. HVLS fans range in size from eight feet to twenty-four feet in diameter and move a large volume of air at low speeds. The fans, more commonly used in the industrial and commercial sector, are well suited to situations that require movement of a large volume of air at low speeds. Animal houses and open sheds requiring air circulation, for example, are appropriate locations for the HVLS fans. The HVLS fans were anticipated to replace several smaller fans. Through this program, the energy-efficient and HVLS fans gained exposure to a larger market.

In 1995 Walt Boyd (MacroAir Technologies) invented the High-Volume, Low-Speed (HVLS) fans to create an efficient means to cool dairy cows. The problem the HVLS fans were originally designed to address is that when cows get hot, they suffer from heat stress, stop eating, and produce less milk. MacroAir reports "studies have shown that HVLS fans lower the temperatures in dairy barns by 6-8 degrees, resulting in significant increases in milk production." [3] The slow moving air circulates over the cows and they don't bunch up around smaller "alley" fans that move lesser volumes of air at high speeds; cows stay cooler when they don't bunch up.

The HVLS fans, designed with 10 airfoil blades, are manufactured using an aluminum extrusion technology to produce the large and lightweight hollow foil shape. The inventor notes that the blade's light weight and precision balance enable the fans to be powered with a motor the same size and energy consumption as a single high-speed fan, typically a one-horsepower motor or smaller. The larger blades (from 8 ft. to 24 ft. in overall diameter), can move up to 12 times the amount of air. Since the motor is running at a lower RPM, it requires less maintenance and yields a longer life.[4]

Figure B–1. HVLS Fan

Source: Photo courtesy of MacroAir Technologies LLC

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[3] http://www.macro-air.com

[4] ibid

The HVLS fans are appropriate for any animal house requiring air circulation. Likewise, they are suited for greenhouses where low-speed air circulation reduces stagnant air, which in turn reduces mildew, fungus and the use of fungicides.

The fans also destratify air and can reduce heating costs. The large fans push heated air down from the ceiling. They also draw moisture up from the ground, drying surfaces without drying the air. The fans are more effective in establishing and sustaining circulating air currents than smaller high speed fans. The HVLS fans are able to keep much more air in motion than smaller traditional fans.[5]

Figure B–2. HVLS Fans in Dairy Barn

Source: Photo courtesy of MacroAir Technologies LLC

[5] ibid

Appendix C: Newsletter Announcement Sample

The Sunkist NewsLINK - March 24, 2005

Ag Energy Rebate

In a program funded by California ratepayers under the auspices of the California Public Utilities Commission, $466,000 in cash incentives is being made available to Southern California Edison (Edison) agricultural producers to encourage energy efficient ventilation upgrades. Any agricultural customer of Edison is eligible for these rebates.

According to *Capitol Weekly*, the newsletter of the Agricultural Council of California, the 2005 Agricultural Ventilation Fan Efficiency Program offers an easy, practical way to lower electrical costs. Administered by EnSave, a nationally known agricultural energy conservation firm, cash incentives ranging from $125 to many thousands of dollars will be provided depending on the size and number of fans installed and the energy saved. Cash is offered when producers install or upgrade to any one of seven different sized, energy efficient, conventional fans or the new High Volume Low Speed fan systems. To learn more about the program, call 1-800-732-1399 or visit the EnSave web site at www.ensave.com.

<http://www.sunkist.com/growers/sunkist_report/report.asp?report_id=73#845>

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Appendix D: Field Plan and Impact Instruments

Memorandum

To: **Ben Bronfman**

From: **Floyd Keneipp**

Copy: **Shahana Samiullah, Kevin Cooney, Gary Suzuki**

Date: **June 28, 2006**

RE: **Sample design and field data collection plan for EnSave's Agricultural Ventilation Efficiency Program.**

The objective of EnSave's Agricultural Ventilation Efficiency Program is to promote the installation of energy-efficient fans and high-volume, low-speed (HVLS) fans through cash incentives so as to aid agricultural market sectors in achieving a reduction in energy consumption. The HVLS fans are a relatively new technology that has not yet been promoted to a wide market and EnSave intends to help create a market for this energy-efficient measure through the program. As such, it should be noted that approximately 80% of the participants did not have ventilation at the participating facilities prior to their involvement in the Program.

The intent of the following sample design and field data collection plan is to:

- Specify data collection objectives.
- Define the sample of sites that will undergo verification activities.
- Define customer contact protocol and site activities.
- Provide the data collection and communication instruments used during field activities (See Appendix A).

Data Collection Objectives:

Field activities will provide verification of program records with respect to overall project goals. This process will confirm several key components needed to accurately analyze Program impacts, gross energy savings and net energy savings achieved. The Program components to be confirmed include:

1. Complete measure installation verifications
2. Verify energy savings assumptions

The approach to each of these activities is discussed further below. It should be noted that the aforementioned data will be collected through both on-site verification activities utilizing power loggers and supporting participant surveys to be administered on-site and through the telephone (See Appendix A).

1. Complete Measure Installation Verifications:

The onsite verification process will entail observations of installed measures and the collection of key energy performance variables including, but not limited to:

a) Measure presence.
b) Appropriate installation verification.
c) Key facility performance data, such as daily schedules, seasonal variations in schedules and control strategies.

Furthermore, in the event that recorded measures are not present, Summit Blue will make an extensive effort to determine the cause of removal (if previously installed) along with future plans. These inquiries will be conducted through on-site interviews and the telephone should a representative not be available during the verification process.

2. Verify Energy Savings Assumptions:

Summit Blue will employ three methodologies to confirm energy saving assumptions attributed to the newly installed fans

a) Power logging
b) A detailed review of secondary literature
c) A detailed review and discussion of energy saving estimates calculated by EnSave's proprietary software.

Power loggers will be utilized at 4 sites to confirm estimated kWh savings by verifying run hours. The collected data will be used to provide the necessary information required to calculate ex-post savings values and yield the kW and kWh reduction values resulting from the installation of energy efficient fans. The loggers will be in place for between 21 to 28 calendar days and the sample of sites subject to this verification process will be selected based on rationale discussed further in the subsequent "Sample Design" section of this document.

Summit Blue will also analyze relevant literature pertaining to this Program in order to confirm the legitimacy of the data collected. This will entail a thorough review of vendor literature and applicable reports for similar Programs (where available). Moreover, Summit Blue will review and discuss the Savings Calculator Work Paper with Program representatives in order to determine whether or not the assumptions and calculations made in the document are representative of the measures installed and field operating conditions.

Sample Design:

The Agricultural Ventilation Efficiency Program implemented a variety of energy efficiency measures commensurate with the needs of each participating site. Table 1 provides the number and type of installations that have been installed according to the most recent program participation records provided to Summit Blue by EnSave's representatives[6].

Table 1: Measure Records

Sector	Fans	kWh Savings (Net)	kW (Net)
Dairy	1,359	1,175,926	559
Poultry	152	154,077	26
Greenhouse	730	977,583	136
Total	**2,241**	**2,307,586**	**721**

Sampling Methodology for Installation Verifications

Due to the large variety of fans installed, it was deemed most feasible to aggregate measures across market sectors involved and verify sites according to their impact on energy savings attributable to the Program. A total of 8 (23% of total participants) sites are expected to receive verification activities and provide representative information. Accordingly, a weighted methodology was employed when developing the field verification sample:

$$\text{\# of Verification Visits to Market Sector Sites} = T*c*[(P+E)/2]$$

Where:

T = Total Number Site Verification Visits Planned

c = Constant

P = Specific Sector's Percentage of Total Fans Installed

E = Specific Sector's Percentage of Total Energy Savings Attributable to the Program

It should be noted that 'c' is a constant developed to ensure that the verification activities were commensurate with the available budget while maintaining statistical accuracy. Moreover, some sites installed more than one measure which reduced the total number of sites that needed to be visited. The selection of dairy installations to be verified was stratified to ensure that a representative sample of fan control systems was verified.

[6] File: Edison Vent IDEEA Final installation Report 06 23 06.xls

Table 2 provides the sample of sites that will be verified based on the sampling methodology discussed. Due to the relatively small impact that the poultry sector had on the Program's energy savings, it was deemed acceptable to forego verification activities at those sites. However, interviews will still be conducted with facility staff.

Table 2: Sites Receiving Verification Activities:

Strata	Site #	Measures Verified
1	Site 1	20"
1	Site 2	50"
1	Site 3	50"
1	Site 4	51"
1	Site 5	50"
1	Site 6	50"
1	Site 7	51"
1	Site 8	51"
Alt	Site 9	20"
Alt	Site 10	51"
Alt	Site 11	51"

Sampling Methodology for Sites Receiving Power Data Logging

The Agricultural Ventilation Efficiency Program was adopted by three market segments: Dairy, Poultry and Greenhouse. However, after conversations with facility managers, it was concluded that within each respective market segment, the layouts and operational characteristics were relatively similar. Among the three participating markets, dairy producers represent the largest installed base and also have the greatest uncertainty in estimating fan operating hours because fan operation may vary depending on outdoor temperature. It is assumed that changes in occupancy are relatively predictable because of required milking schedules. Poultry and greenhouse facilities are generally more predictable and can be verified through a review of historic facility operating data because these facilities are fully occupied at all times and are not likely to be as sensitive to heat as dairy operations (greenhouses primarily).

Thus, Summit Blue will conduct power logging on circuits that operate at least 34 fans total distributed among 3 Dairy sites and 1 Greenhouse site. Metering will occur within the Edison peak summer period definition of 6/2/2006 – 10/6/206, for approximately 3 weeks in duration. Table 3 provides a summary of planed field activity, including the number of sites receiving verification visits, and the number of sites receiving power logging. In summary, the sites with the greatest impact on Program savings were chosen to receive power logging as this would maximize the quality of the data collected.

The data loggers used will record amperage on the circuits used to supply fans, and spot measurements of voltage and power factor will be used to calculate resulting demand and energy consumption values. A review of installation data indicates that the fans are installed o dedicated circuits and so logging activity will capture only the measure impacts.

Table 3: Distribution of Verification Activities:

Sector	Fans	Sites Installed	Fans Verified	Sites Verified	Sites Receiving Power Logging
Dairy	1,359	27	68	7	3
Poultry	152	2	0	0	0
Greenhouse	730	5	68	1	1
Total	**2,241**	**34**	**156**	**8**	**4**

No billing analysis will be conducted on this Program because, as noted earlier, an estimated 80% of fan installations represent new application to existing facilities or new facilities. For existing facilities, ventilation generally did not exist prior to the fan installation supported by the Program.

Potential Adjustments to Verification Sample Based on Ongoing Installations:

According to conversations with EnSave staff, all installations are required to be completed by the end of June. Given that the field verification activities will take place in early July, no additional measures are expected to be installed following the site visitations. If, however, additional measures are installed, records for each new measure installation will be reviewed and gross savings will be adjusted according to this data along with a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with EnSave representatives.

Sampling and Uncertainty

No diEdisonrnable preference was shown when developing the field sample set from qualifying sites. As a result, the sample set is assumed to have little or no bias. However, the sample may be adjusted during the course of the evaluation if discrepancies are realized, and the updated sample will be random as well in order to minimize overall impact analysis bias.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

Summit Blue will endeavor to utilize IPMVP Option B to conduct the Measurement and Verification Process. This specific method stipulates the use of engineering calculations and short-term or continuous measurement of system operation. Energy impacts will be calculated on a per site basis based on the number of fans retrofit, the base fan and retrofit fan unit demand, site operating parameters (hours per year) and a billing analysis where possible. Adjusted program gross energy savings will be based on this analysis and the installation rates based on verification data.

In the event that the existing energy calculations are deemed non-representative, Summit Blue will collaborate with Program representatives to derive more accurate estimators. Furthermore, Summit Blue will try and account for any operating factors that may influence the energy consumption of the fans.

Calculation of Gross and Adjusted Gross Demand Impacts

This evaluation will use the Energy Efficiency Policy Manual[7] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated based on fan kW draw, by reviewing relevant data on the frequency of participant operation characteristics, and also from metered data provided by power logging. Adjusted program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this program will be reported in the format provided in Appendix B. Future savings will be based on manufacturer statement of expected system life, and on estimates from customers on the likelihood that they will replace failed retrofit fans with the same technology. There are no therm savings estimated for this program.

Customer Contact Protocol and Site Activities

Field activities will typically involve 5 components:

a) Summit Blue will coordinate with the implementation contractor and primary customer contact to establish field activity dates and identify site level contacts. Moreover, field staff will collaborate with site managers to address the issue of bio-security.

b) The customer contact at each site will be provided with a letter of introduction on Edison or Summit Blue Consulting (SBC) letterhead that provides a description if the activities to be undertaken at their site.

c) SBC staff will conduct a room-by-room, fan-by-fan audit noting fixture count, type, operating conditions, etc.

d) A detailed description will be provided where data logging equipment has been installed. Correspondingly, a data logger installation worksheet is provided as a separate document in Appendix A1.

e) Where data loggers have been installed, a pick-up date will be provided to each site. SBC staff will call each site in advance to returning to retrieve loggers.

Data Logger Data Collection Protocol

The Fluke 43B power analyzer and HOBO 4 channel loggers will be used to collect relevant information pertinent to project objectives. The process for collecting the data acquired by the HOBO data loggers is as follows:

[7] Version 2, August 2003

1. All inspections and data logging are planned to take place between July 7th and July 14th.
2. Initialize each logger as close as possible to the date it is deployed
3. Power loggers with clamp-on current transducers will be connected at the facility power panel for power circuits being monitored.
4. SBC staff will randomly verify that the data loggers are recording operation.
5. SBC will inform facility representatives of the energy study being conducted on the building and ask them not to move, remove or tamper with the logger. Also, participants will be asked to operate the equipment as usual; that is – not change their normal behavior during the study.

1. After 21 to 28 days, data loggers will be retrieved. Data loggers will be downloaded directly to a computer on the day they are retrieved.

Appendix A1 – Measure Installation Verification Worksheet:

SITE INFORMATION **Date:_________**

Customer Name: ____

Contact Name: ____________________ Phone: _______________

Street Address: ____

City / Town: __________________ State: _____ Zip: ________

Market Sector ____________________

PRIMARY OPERATING HOURS

Day Type	**Season / Business Hours**			
Season definition / Months	1	2	3	4
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

DATA COLLECTION

Measure Type	Database Qty	Verified Qty	Replacing Existing Fans?	Location	% Operating	Season / Business Hour code			
						1	2	3	4
						1	2	3	4
						1	2	3	4
						1	2	3	4
						1	2	3	4
						1	2	3	4

Fixture Data				
Measure Type - Reference Floor Sketch	# ___	# ___	# ___	# ___
Space Type: **B =** Barn **E** = Enclosed Office **H**= Hallway **W** = Warehouse/Storage **R** = Restroom **O** = Other	B E H W R O	B E H W R O	B E H W R O	B E H W R O
Number of Fans				
Fan Type / Size				
Logger Data				
kW				
KVAPF				
KVAR				
PF				
DPF				
VOLTS				
CF				
AMPS				
Location:				
Floor				
Tenant/Suite Number				
Fixture Location – reference floor plan sketch				
Logger ID Number:				
Deploy Date:				
Data Retrieval Date:				
Logger Removal Date:				
Field Notes				

FURTHER QUESTIONS

1. Is the equipment in working condition? (Y / N). If no, describe;

2. Does the equipment appear to be properly installed? (Y / N) If no, describe;

3. Has any of the equipment been removed or replaced since installation? (Y / N) If yes, describe;

    a. Why were they removed or replaced?

    b. When were they removed or replaced?

4. How likely will new measures that fail during their lifetime be replaced by the same technology? Please give us a % estimate of likelihood where 100% means that you are certain that failed measure will be replaced by the same technology and 0% means that you will use a different system.

_________%

5. Do you or your maintenance company maintain, or know where to obtain, retrofit equipment in the event of failure? (Y / N / DK)

6. Do you use a thermostat to or timer to control the fan operation? If yes, what temperature is it set to and at what time is the fan scheduled to turn off?

LOCATION OF INSTALLATIONS:

(map locations)

____

Comments:

____

____

____

Appendix E: Field Activity Sample Details

Table E–1. Fan Installation Details Used to Derive Sample Set

Market Segment	Size	Count	kW Savings	kWh Savings
Dairy	20"	6	9,449	5.74
Dairy	36"	12	6,615	4.0
Duck	15"	98	50,031	11.45
Egg Layers	48"	54	104,046	14.83
Greenhouse	20"	334	453,957	62.61
Dairy	51"	39	40,357	10.27
Dairy	48"	26	15,198	8.43
Dairy	50"	58	56,531	28.60
Dairy	50"	30	33,773	12.50
Dairy	36"	6	3,006	1.40
Dairy	51"	220	150,196	82.90
Dairy	51"	4	3,380	1.05
Dairy	50"	18	16,142	7.00
Dairy	51"	4	2,704	1.05
Dairy	51"	110	95,658	28.95
Greenhouse	12"	60	58,173	8.02
Dairy	51"	6	7,403	2.26
Dairy	51"	21	22,862	7.90
Dairy	51"	4	3,042	1.05
Dairy	51"	9	6,144	3.39
Dairy	20'	2	29,964	17.50
Dairy	51"	8	6,489	2.11
Dairy	50"	28	17,561	10.63
Dairy	51"	14	8,517	3.69
Dairy	50"	77	67,020	29.23
Dairy	50"	234	204,951	88.68
Dairy	51"	29	17,602	7.63
Dairy	51"	52	29,210	19.71
Dairy	51"	108	189,689	88.59
Greenhouse	20"	156	201,810	29.24
Greenhouse	20"	60	77,374	11.25
Greenhouse	20"	120	186,269	24.40
Dairy	51"	9	8,418	3.39
Dairy	50"	225	130,660	85.40

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Appendix F: Ex-post Gross Demand and Energy Savings Verification and Calculations

Table F–1. Verified Installations and Recorded Savings from Final Flat File

Segment	Size	Count	Recorded Savings (kWh)	Recorded Savings (kW)
Greenhouse	12"	60	58,173	8.0
Duck	15"	98	50,031	11.5
Greenhouse	20"	334	453,957	62.6
Greenhouse	20"	156	201,810	29.2
Greenhouse	20"	60	77,374	11.3
Greenhouse	20"	130	186,269	24.4
Dairy	20'	2	29,964	17.5
Dairy	20"	6	2,834	1.7
Dairy	36"	12	6,615	4.0
Dairy	36"	6	3,006	1.4
Dairy	48"	26	15,198	8.4
Dairy	50"	58	56,531	28.6
Dairy	50"	33	33,773	12.5
Dairy	50"	18	16,142	7.0
Dairy	50"	28	17,561	10.6
Dairy	50"	80	69,631	30.4
Dairy	50"	234	204,951	88.7
Dairy	50"	225	130,660	85.4
Dairy	51"	27	20,437	7.1
Dairy	51"	220	150,196	82.9
Dairy	51"	110	95,658	29.0
Dairy	51"	6	7,403	2.3
Dairy	51"	21	22,862	7.9
Dairy	51"	4	3,042	1.1
Dairy	51"	9	6,144	3.4
Dairy	51"	8	6,489	2.1
Dairy	51"	14	8,517	3.7
Dairy	51"	52	29,210	19.7
Dairy	51"	108	189,689	88.6
Dairy	51"	9	8,418	3.4

Table F–2. Installations by Market Segment

Market Segment	Fan Size	Count
Dairy		
	20"	6
	36"	18
	48"	26
	50"	676
	51"	588
	20'	2
Total		1316
Poultry		
	15"	98
Total		98
Greenhouse		
	12"	60
	20"	680
Total		740

Table F–3. Dairy Segment Verifications

Participant	Fan Type	Name Plate Information	Fan Count	Fan Size
1	Existing	Amps: 3/1.5	33	36"
		Serial: 17F80562A		
		HP: 1/2		
		Part: HM4W002K		
		V: 230/460		
	Retrofit	Part: FM1029T	108	51"
		Hz: 60		
		HP: 1		
		RPM: 1725		
		V: 200-230/460		
		Type: BQE56T17T5587D P		
2	Existing	Cust No: VR12C	53	NA
		Part: HM4W015K		
		RPM: 825/715		
		HP: 1/2 - 1/3		
		V: 230/460 190/380		
		Hz: 60/50		
	Retrofit	Mod: 5K49NN4523X	36	50"
		HP: 1		
		V: 208-230/460		
		RPM: 1725		
		A: 3.1-2.8/1.4		
		Bar Code: TW5070025		
3	Existing	Part: HF4U006N	11	NA

		HP: 1/2		
		V: 115/230		
		Amps: 6.8/3.5		
		RPM: 825		
	Retrofit	Mod: SK49NN4523X	50	48"
		V: 208-230/460		
		HP: 1		
		A: 3.1-2.8/1.4		
		Hz: 60		
4	Existing	V: 460	314	NA
		HP: 1/2		
		Amp: 1.2		
		RPM: 825		
		Hz: 60		
		No: 7138-0013		
		Type: 38B1		
	Retrofit	Cat No: AX511G3-03	216	51"
		Volts: 460/200-230		
		Amps: 2.0/4.2-4.0		
		RPM: 550		
		HP: 1		
		Code: 050503		
5	Existing	NA	0	
	Retrofit	Mod: 5K49NN4523X	251	50"
		HP: 1		
		V: 208-230/460		
		A: 3.1-2.8/1.4		
		Hz: 60		
		RPM: 1725		
		Bar Code: TWJO30249		

Table F–4. Greenhouse Segment Verifications

Participant	Fan Type	Name Plate Information	Fan Count	Fan Size
1	Existing	Model: LCS102	70	24"
		LR34571		
		E58977		
		E42359		
		E37704		
		RPM: 1725		
		V: 115/230		
		HP: ½		
		Type: 024B_1		
		Cage Diameter: 24.5”		
		AMB No: 7124_2050		
	Retrofit	HP: 1/3	60	20"
		RPM: 1725		
		Part: HF2J7031N		
		Type: XC		
		SF 1.00 SER3788		
		HF2J031N		
		CS103		
		V: 115/230		
		Amps: 3.8/1.9		
2	Existing	NA	0	NA
	Retrofit	HP: 1/3	120	20"
		V: 115/230		
		Part HF2J7031W		
		SF1.00SER42T8		
		HF2J031N		
		CS103		
		Type XC		
		Amps: 3.8/1.9		
		Hz: 60		
		AMB 40		
		RPM: 1725		

Table F–5. Detailed Logger Activity Information

Participant	Loger ID	Operating Schedule	Fluke Data			Meter #
			Amps	Volts	Power Factor	
1	988626	Half of the freestall fans turn on at 75 degrees. Other half of freestall fans turn on at 85 degrees. Milk barn fans turn on at 60 degrees.All fans are turned off during winter (Mid-October to Mid-May).	0.8	265	0.54	EdisonV349N-003104
			0.11	264	0.5	
2	988625	75/85 degree thermostat fans in free stalls. 70 degree setback in the milking barn. All fans turned off during Winter (Mid-October to Mid-May)	25.8	278	-0.74	N/A
			24.24	277.9	-0.71	
3	988617	Milk barn fans are turned on and off manually. Free stall fans are thermostat controlled and turned on at 80 degrees	13.8	-0.84	270	N/A
			13.8	270	-0.83	
	988622		N/A	271	0.78	
			N/A	268	0.76	
4	988618	Thermostat setpoints for free stalls: 50% at 80 degrees, 50% at 94 degrees.	N/A	273	0.99	N/A
			N/A	275	1	

Table F–6. Participant Interviewed Fan Operating Schedule

Participant	Days/Year	Hours/Day	Yearly Operating Hours
1	170	17	2890
2	184	11	2024
3	215	12	2580
4	365	18	6570
5	365	23	8395
6	168	12	2016
7	184	14	2576
8	216	17	3672
9	215	15	3225
10	184	12	2208
11	215	8	1720
12	215	13	2795
13	154	7	1078
14	122	12	1464
15	123	13.5	1660.5
16	154	13	2002
17	365	24	8760
18	365	20	7300
19	198	10	1980
20	168	10	1680
21	184	12	2208
22	365	14	5110
23	184	15	2760
24	214	9	1926
25	184	12	2208
26	122	7	854
27	184	14	2576

Table F–7. Average Daily Temperatures for Participant Demographic Region (Fresno)

Date	Average Daily Temperature (Fahrenheit)	Average Setback Temperature
January-1	45.3	75
January-2	47.0	75
January-3	53.2	75
January-4	50.8	75
January-5	49.0	75
January-6	44.3	75
January-7	45.5	75
January-8	43.0	75
January-9	39.8	75
January-10	40.2	75
January-11	38.2	75
January-12	37.5	75
January-13	40.4	75
January-14	41.4	75
January-15	38.6	75
January-16	33.7	75
January-17	38.2	75
January-18	40.2	75
January-19	39.7	75
January-20	44.0	75
January-21	43.5	75
January-22	44.7	75
January-23	49.4	75
January-24	48.9	75
January-25	51.5	75
January-26	53.3	75
January-27	58.3	75
January-28	52.2	75
January-29	49.6	75
January-30	52.0	75
January-31	44.8	75
February-1	52.3	75
February-2	51.3	75
February-3	51.2	75
February-4	44.1	75
February-5	40.5	75
February-6	42.5	75
February-7	45.8	75
February-8	48.0	75
February-9	48.5	75
February-10	51.1	75
February-11	51.8	75
February-12	50.3	75
February-13	50.8	75

February-14	53.9	75
February-15	48.0	75
February-16	45.5	75
February-17	48.6	75
February-18	48.5	75
February-19	47.1	75
February-20	44.0	75
February-21	48.0	75
February-22	51.4	75
February-23	52.5	75
February-24	49.0	75
February-25	50.4	75
February-26	51.6	75
February-27	53.3	75
February-28	54.9	75
March-1	60.0	75
March-2	57.3	75
March-3	58.9	75
March-4	61.3	75
March-5	55.0	75
March-6	52.8	75
March-7	51.9	75
March-8	52.7	75
March-9	51.2	75
March-10	49.9	75
March-11	54.8	75
March-12	54.6	75
March-13	52.4	75
March-14	50.6	75
March-15	52.4	75
March-16	51.4	75
March-17	49.1	75
March-18	48.8	75
March-19	50.3	75
March-20	53.7	75
March-21	55.0	75
March-22	57.6	75
March-23	56.3	75
March-24	55.0	75
March-25	56.7	75
March-26	52.0	75
March-27	58.4	75
March-28	61.9	75
March-29	64.2	75
March-30	66.6	75
March-31	63.5	75
April-1	58.9	75
April-2	59.6	75

April-3	60.6	75
April-4	65.2	75
April-5	68.7	75
April-6	58.9	75
April-7	55.5	75
April-8	54.8	75
April-9	60.6	75
April-10	60.1	75
April-11	57.8	75
April-12	60.7	75
April-13	59.8	75
April-14	59.9	75
April-15	63.9	75
April-16	61.5	75
April-17	50.3	75
April-18	52.0	75
April-19	56.5	75
April-20	52.9	75
April-21	51.0	75
April-22	53.5	75
April-23	56.9	75
April-24	51.0	75
April-25	54.4	75
April-26	59.0	75
April-27	60.9	75
April-28	62.8	75
April-29	61.5	75
April-30	65.0	75
May-1	70.1	75
May-2	70.4	75
May-3	70.7	75
May-4	65.0	75
May-5	62.1	75
May-6	60.0	75
May-7	64.8	75
May-8	67.4	75
May-9	65.7	75
May-10	65.0	75
May-11	58.7	75
May-12	56.9	75
May-13	55.2	75
May-14	57.8	75
May-15	64.0	75
May-16	68.8	75
May-17	72.9	75
May-18	74.9	75
May-19	73.8	75
May-20	73.3	75

May-21	65.8	75
May-22	63.7	75
May-23	63.3	75
May-24	65.5	75
May-25	72.1	75
May-26	73.3	75
May-27	78.5	75
May-28	80.9	75
May-29	79.6	75
May-30	74.6	75
May-31	75.5	75
June-1	67.1	75
June-2	65.0	75
June-3	66.7	75
June-4	70.1	75
June-5	73.4	75
June-6	71.3	75
June-7	68.1	75
June-8	72.4	75
June-9	73.8	75
June-10	75.2	75
June-11	74.6	75
June-12	77.8	75
June-13	84.3	75
June-14	88.8	75
June-15	89.9	75
June-16	82.9	75
June-17	79.8	75
June-18	82.0	75
June-19	84.5	75
June-20	80.4	75
June-21	72.8	75
June-22	71.5	75
June-23	70.7	75
June-24	71.9	75
June-25	80.7	75
June-26	82.4	75
June-27	83.5	75
June-28	87.1	75
June-29	82.9	75
June-30	77.5	75
July-1	81.5	75
July-2	79.6	75
July-3	77.5	75
July-4	80.5	75
July-5	81.2	75
July-6	81.7	75
July-7	80.0	75

July-8	77.7	75
July-9	78.2	75
July-10	75.1	75
July-11	75.4	75
July-12	80.8	75
July-13	84.7	75
July-14	87.0	75
July-15	87.5	75
July-16	87.1	75
July-17	78.8	75
July-18	84.5	75
July-19	86.8	75
July-20	88.0	75
July-21	87.5	75
July-22	88.1	75
July-23	86.3	75
July-24	82.0	75
July-25	79.8	75
July-26	80.9	75
July-27	83.9	75
July-28	83.8	75
July-29	81.9	75
July-30	83.4	75
July-31	83.2	75
August-1	76.7	75
August-2	79.0	75
August-3	84.0	75
August-4	85.8	75
August-5	85.0	75
August-6	82.8	75
August-7	83.9	75
August-8	80.9	75
August-9	81.5	75
August-10	82.8	75
August-11	77.5	75
August-12	78.6	75
August-13	76.1	75
August-14	77.9	75
August-15	80.0	75
August-16	79.3	75
August-17	72.6	75
August-18	74.3	75
August-19	75.8	75
August-20	78.1	75
August-21	79.4	75
August-22	80.3	75
August-23	82.2	75
August-24	85.1	75

August-25	85.8	75
August-26	85.8	75
August-27	84.3	75
August-28	83.3	75
August-29	82.0	75
August-30	81.9	75
August-31	83.0	75
September-1	79.2	75
September-2	80.0	75
September-3	80.5	75
September-4	81.4	75
September-5	81.9	75
September-6	78.6	75
September-7	69.2	75
September-8	74.6	75
September-9	75.9	75
September-10	74.2	75
September-11	72.9	75
September-12	75.8	75
September-13	80.5	75
September-14	82.4	75
September-15	83.6	75
September-16	70.8	75
September-17	66.4	75
September-18	60.7	75
September-19	61.6	75
September-20	68.6	75
September-21	71.8	75
September-22	75.9	75
September-23	79.7	75
September-24	72.5	75
September-25	72.3	75
September-26	72.6	75
September-27	70.7	75
September-28	68.3	75
September-29	68.6	75
September-30	66.6	75
October-1	69.5	75
October-2	72.3	75
October-3	76.9	75
October-4	76.1	75
October-5	78.0	75
October-6	74.5	75
October-7	68.8	75
October-8	61.6	75
October-9	58.2	75
October-10	60.8	75
October-11	64.2	75

October-12	62.6	75
October-13	62.5	75
October-14	64.0	75
October-15	65.7	75
October-16	66.0	75
October-17	65.0	75
October-18	64.5	75
October-19	63.0	75
October-20	63.6	75
October-21	56.6	75
October-22	54.4	75
October-23	58.5	75
October-24	62.3	75
October-25	63.3	75
October-26	63.9	75
October-27	65.0	75
October-28	63.3	75
October-29	61.8	75
October-30	58.2	75
October-31	55.3	75
November-1	58.7	75
November-2	60.6	75
November-3	60.8	75
November-4	61.4	75
November-5	65.2	75
November-6	60.8	75
November-7	55.5	75
November-8	54.9	75
November-9	57.6	75
November-10	55.7	75
November-11	55.5	75
November-12	57.0	75
November-13	51.6	75
November-14	55.0	75
November-15	53.9	75
November-16	51.6	75
November-17	50.4	75
November-18	49.3	75
November-19	50.3	75
November-20	50.3	75
November-21	52.6	75
November-22	48.5	75
November-23	47.9	75
November-24	49.0	75
November-25	54.0	75
November-26	51.0	75
November-27	47.3	75
November-28	60.3	75

November-29	52.0	75
November-30	50.2	75
December-1	46.7	75
December-2	40.2	75
December-3	41.2	75
December-4	37.0	75
December-5	36.9	75
December-6	38.6	75
December-7	43.4	75
December-8	45.7	75
December-9	47.5	75
December-10	49.3	75
December-11	45.3	75
December-12	39.3	75
December-13	43.0	75
December-14	50.8	75
December-15	54.2	75
December-16	43.7	75
December-17	36.2	75
December-18	37.6	75
December-19	39.7	75
December-20	34.4	75
December-21	33.4	75
December-22	37.3	75
December-23	45.3	75
December-24	48.5	75
December-25	48.5	75
December-26	40.7	75
December-27	38.6	75
December-28	45.8	75
December-29	43.9	75
December-30	42.8	75
December-31	43.9	75

Table F–8. Energy Savings by Market Segment

	Recorded Gross Savings (kWh)	Recorded Net Savings (kWh)	Evaluated Gross Savings (kWh)	Evaluated Net Savings (kWh)
Dairy	1,513,241	1,134,931	1,488,602	1,280,197
Greenhouse	1,303,444	977,583	1,306,891	1,123,926
Poultry	66,708	50,031	66,708	57,369
Total	2,883,393	2,162,545	2,862,201	2,461,493

Table F–9. Demand Savings by Market Segment

	Recorded Gross Savings (kW)	Recorded Net Savings (kW)	Evaluated Gross Savings (kW)	Evaluated Net Savings (kW)
Dairy	729.6	547.2	729.7	627.5
Greenhouse	180.7	135.5	181.2	155.8
Poultry	15.3	11.5	15.3	13.2
Total	925.6	694.2	926.2	796.5

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Appendix G: Surveys

Following are the surveys for the Agricultural Ventilation Efficiency Program. Included surveys are:

- Edison Program Manager
- Program Implementer—EnSave
- Participating Facilities (Short)
- Participating Facilities (Long)
- Partial-Participant Facilities
- Participating Fan Dealers
- Partial-Participant Fan Dealers

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Agricultural Ventilation Efficiency Program

Edison Program Manager

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
3. What was the reason for adding fans in facilities? Was this part of the original program design? (explore load building concept; new buildings vs. existing buildings, new fans vs. replacement fans)

Program Administration

4. Were there any issues related to interaction with EnSave, billing, incentives and tracking?

Overall Lessons Learned

5. Are there barriers to the widespread installation of these fans that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
6. What do you now know about the industry? What characteristics make a good candidate for this program?

Thank you for your time.

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Agricultural Ventilation Efficiency Program

Program Implementer—EnSave

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Program Design

1. What was/were the innovative aspect(s) of this program?
2. What changes did you make in program design, approach or outreach from the plan originally submitted?
3. Were the targets met? If not, why not?
4. What was the reason for adding fans in facilities? Was this part of the original program design?

Program Administration

5. Were there any issues related to interaction with Edison, billing, incentives and tracking? Are there changes you suggest if the program were offered to a larger market?

Marketing and Outreach

6. What was your strategy for identifying the target market? What characteristics or criteria were used to identify potential participants? Issues related to identifying and recruiting participants? How long did it take? What did it involve?
7. How was the program marketed to manufacturers, dealers and facilities?
8. Was response disposition tracked? What is known about the interested/non-interested contacts?
9. What was the most effective marketing method?
10. How were other market actors in the agricultural community involved and how was the technology received by these actors?
11. Which actors were the most supportive of the program? How?
12. What would the facility owners have installed without the program?
13. What was the incentive offered to participants? What did participants have to pay? Was the incentive the right amount?

Overall Lessons Learned

14. Have there been any issues with fan installations, failure, early replacement, etc.
15. Have there been any issues/barriers with program operations? In what areas?
16. Is there a viable market niche for this technology? Explain.
17. Are there barriers to the widespread installation of these fans that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?

18. If the program were expanded to other agricultural facilities, is there anything that you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, etc?

Thank you for your time and assistance in evaluating this program.

Agricultural Ventilation Efficiency Program

Participating Facilities (Short Survey)

Facility Name ____
Facility Type ____
Date ____
Interviewer ____
Number of new fans installed : ________________________________

Hello, my name is ___________________________ from _______________. We are evaluating the Agricultural Ventilation Efficiency Program for Southern California Edison. I have just a couple of questions I'd like to ask. I'd like to speak with __________________________. Is _______________available? If not, could I schedule a time to call back to reach Mr./Ms. _______________________?

If someone other than original contact is respondent, repeat introduction.

1. The program records show that you installed __________ new fans at your facility. [*Confirm number of new & retrofit]*
2. Can you tell me if the fans were installed in new construction, that is, new buildings, renovations or additions?
   - ❑ No..
     - Confirm they are existing building; record comments
   - ❑ Yes
     - Confirm new buildings, retrofit, additions; record comments
   - ❑ Uncertain..
3. Could you please tell me why you decided to install the new ventilation fans at your facility? [*instead of leaving the buildings as they were without ventilation]*
4. [If not answered in #3] Could you please tell me why you decided to participate in the Program? What factors were key to your decision?
5. Did you consider installing fans before hearing about Edison's Ag Vent Program?
   - ❑ No..
   - ❑ Yes
   - ❑ Uncertain..
6. Would you have installed fans without the program incentive?
   - ❑ No Skip to #11
   - ❑ Yes Continue
7. If YES to #6, Would the fans have been the same efficiency levels as those installed under the program?
   - ❑ No..
   - ❑ Yes
   - ❑ Uncertain..
8. If YES to #6, When do you think you would have installed the fan(s)
   - ❑ In the same year
   - ❑ In one to two years
   - ❑ In three to five years

- ❑ More than five years out

9. If YES to #6, Did you have funding for the fans in your capital plans or budget?
   - ❑ No
   - ❑ Yes
10. If YES to #6, Were they already ordered?
    - ❑ No
    - ❑ Yes (how many fans/type/size)
11. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Satisfied
    - ❑ Not satisfied

Record comments:

12. Do you have any suggestions to improve the program, for example, in terms of the selection of products, marketing, delivery, warranty service, training, etc?
13. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ______________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

Agricultural Ventilation Efficiency Program

Participating Facilities (Long Survey)

Delivered during site visits by Summit Blue and by phone by Quantec

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

Marketing and Outreach

1. Do you remember being contacted about the Agricultural Ventilation program sponsored by Southern California Edison?
2. Who contacted you and explained what the program was about?
   - ❑ Manufacturer
   - ❑ Dealer/distributor
   - ❑ Installer
   - ❑ Extension service or other agricultural community organization
   - ❑ Other, specify ____
3. How was the information delivered?
4. How was the program explained to you? What are the program's benefits?
5. Why did you decide to participate? What factors were key to your decision?
6. Were you aware of energy efficient fans and HVLS (high volume low speed) fans before being contacted about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Not Sure
7. How important was Edison's sponsorship of this program to your decision to participate? Please explain your answer.
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important
8. Have you participated in any other Southern California Edison energy efficiency programs?
   - ❑ No
   - ❑ Yes When, what was it? ___________________________________
   - ❑ Uncertain

Baseline ventilation

9. What were the existing ventilation conditions before participation? (Did you have a ventilation system in place prior to learning about the program?)
10. How were your fans controlled before participating?
    - ❑ There were no fans
    - ❑ Manual Number or Percent of manual____

- Describe the operation schedule (days, hours on/off)

- ❑ All days/all hours Number of 24/7 ______
- ❑ Thermostatically controlled Number or Percent of therm. controlled ___
  - What are the on/off temperature settings?

- ❑ Timer controlled Number or percent of timer controlled ___
  - Describe the operation schedule (days, hours on/off)

Delivery and Implementation

11. How many fans did you replace under the program? (number and size)
12. How many fans did you add under the program? (number and size)
13. Did you have to pay anything to participate in this program (install fans)?
    - ❑ No
    - ❑ Yes How much? ____________________________
    - ❑ Uncertain
14. How are your fans controlled now, since participating?
    - ❑ Manual Number or Percent of manual____
      - Describe the operation schedule (days, hours on/off)

    - ❑ All days/all hours Number of 24/7 ______
    - ❑ Thermostatically controlled Number or Percent of therm. controlled ___
      - What are the on/off temperature settings?

    - ❑ Timer controlled Number or percent of timer controlled ___
      - Describe the operation schedule (days, hours on/off)

Free Ridership

15. Before the project, had you previously installed high efficiency or HVLS fans without an incentive?
    - ❑ No..
    - ❑ Yes
    - ❑ Uncertain..
16. To the same level of efficiency?
    - ❑ No
    - ❑ Yes

RECORD THE ANSWERS TO QUESTIONS 17-21 IN TABLE 1

17. Would you have installed the high efficiency or HVLS (high volume low speed) fans that replaced your original fans without the program incentive?
    - ❑ No..
    - ❑ Yes
    - ❑ Uncertain..
18. Would you have installed the additional fans without the program?
    - ❑ No
    - ❑ Yes

- ❑ Uncertain

19. Would you have installed the fan(s)
    - ❑ In the same year
    - ❑ In one to two years
    - ❑ In three to five years
    - ❑ More than five years out
20. Did you have funding for these measures in your short or long-term capital improvements plan/budget?
    - ❑ No
    - ❑ Short Term (0-1 years)
    - ❑ Long Term 1-5 years)
21. Was it already ordered?
    - ❑ No
    - ❑ Yes (how many fans/type/size)

Table 1. Free-Ridership Grid: Enter For each installed program measure

Measure	Number of fans	Installed w/o incentive	Same level of Efficiency	Time Frame -- # years	Budgeted
Replacement High efficiency fans					
Replacement HVLS fans					
Additional High efficiency fans					
Additional HVLS fans					

22. If energy efficient/HVLS fans were considered and not installed before this program, why were they not installed?
    - ❑ High first cost
    - ❑ In capital budget for future installation
    - ❑ Unable to obtain financing
    - ❑ Didn't know a contractor
    - ❑ Other, specify ____
23. Has the installation of the fans resulted in any other benefits (non-energy) to your operations? (If they didn't have ventilation before and now do, what are the non-energy benefits that were significant in their decision?)

Spillover

24. Have you installed energy efficient and HVLS fans in other facilities since the program ? Because of the program?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
25. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ No (IF BOTH 24 AND 25 ARE NO; GO TO Q28)

- ❑ Yes
- ❑ Uncertain

26. Please describe the type and quantity of the equipment or measures.
27. Overall, how influential would you say the program was in your decision to install additional measures/install fans at additional facilities?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Moderately influential
    - ❑ Not at all influential

Market/Customer Response

28. Did any operational issues emerge during or since the installation of the fans that required the attention of you or your staff?
29. Did you see energy savings or any other effects after installation?
30. Have you changed any behavior or taken any actions that would impact energy use since the equipment was installed?
    - ❑ No
    - ❑ Yes Describe____
    - ❑ Uncertain
31. How satisfied are you with the efficiency improvements?
    - ❑ Very satisfied
    - ❑ Satisfied
    - ❑ Not satisfied
32. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Satisfied
    - ❑ Not satisfied

Overall Lessons Learned

33. What characteristics of your facilities make them good candidates for the installation of energy efficient and HVLS fans?
34. Are there barriers to the widespread installation of these fans that you are aware of? What are they?
35. If the program were expanded to other agricultural facilities, do you have any suggestions in terms of the selection of products, marketing, delivery, warranty service, training, etc? Are there aspects of the program that could be improved?
36. Is the equipment in working condition?
    - ❑ No, Describe____
    - ❑ Yes
    - ❑ Uncertain
37. Does the equipment appear to be properly installed?
    - ❑ No, Describe____
    - ❑ Yes
    - ❑ Uncertain
38. Has any of the equipment been removed or replaced since installation?
    - ❑ No

- ❑ Yes Describe____
  a. Why were they removed or replaced?
  b. When were they removed or replaced?

39. How likely will retrofit measures that fail during their lifetime be replaced by the same technology? Please give us a % estimate of likelihood where 100% means that you are certain that failed retrofits will be replaced by the same technology and 0% means that you will use a different system.
    __________%
40. Do you or your maintenance company maintain, or know where to obtain, retrofit equipment in the event of failure?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
41. Did you have ventilation measures installed prior to the Program?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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Agricultural Ventilation Efficiency Program

Partial-Participant Facilities

(Were contacted about participating and chose not to)

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________. I am calling on behalf of Southern California Edison. We are evaluating the Agricultural Ventilation Efficiency Program. This program provided information about high efficiency fans and high-volume low speed fans, and promoted installation of these fans. I'd like to speak with the owner or facility manager, or someone who would be knowledgeable about your ventilation systems. Who would that be? _______________________ Is that person available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach

1. Do you remember being contacted about the Agricultural Ventilation program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No Is there someone else who would have received information about this program with whom we could speak?
     - No, thank and terminate
     - Yes, start interview again
   - ❑ Yes When were you contacted? _______________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Dealer/distributor
   - ❑ Installer
   - ❑ Extension service or other agricultural community organization (Dept of Agriculture, California Farm Bureau, National Farmers Organization, etc.)
   - ❑ Other, specify ____
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify ____

4. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
    - ❑ Energy efficient and HVLS (high volume low speed) fans will save energy and/or money
    - ❑ Southern California Edison would pay for the fans
    - ❑ This was an experiment
    - ❑ New fans would give ventilation where I didn't have any before
    - ❑ No one has ever talked to us about Edison programs before
    - ❑ Other, record comments verbatim ________________________________
5. Why did you decide not to follow-through with your original decision to participate? (What were the factors in your decision to drop out from the program?) [Do not read list. Probe if needed]
    - ❑ Don't need any fans now
    - ❑ Don't have funding for fans/not in the capital budget
    - ❑ Don't think the energy efficient fans and HVLS (high volume low speed) fans will save any energy or money
    - ❑ Payback is too long
    - ❑ Just not interested right now/too busy right now
    - ❑ Didn't look into it
    - ❑ Didn't think I qualified
    - ❑ Didn't understand what it was about
    - ❑ Decision maker is someone else and they weren't interested
    - ❑ Might do it in the future
    - ❑ Other, specify ____
6. How important was Edison's sponsorship of this program to your original decision to participate? [Read answer options and check one]
    - ❑ Not at all important
    - ❑ Somewhat unimportant
    - ❑ Not important and not unimportant
    - ❑ Somewhat important
    - ❑ Very important

Explain response _______________________________________

Market Barriers to Adoption

7. Are there barriers to the widespread installation of these fans that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Fans not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____

8. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc. so that you would be interested in participating in a program such as this, or to expand it to other agricultural facilities?

Free Ridership

9. Were you aware of energy efficient fans and HVLS (high volume low speed) fans before being contacted about this program?
   - ❑ No
   - ❑ Yes
10. Have you installed energy efficient fans and HVLS (high volume low speed) fans at any of your facilities?
    - ❑ No
    - ❑ Yes, When
      - This year
      - In one to two years
      - In three to five years
      - More than five years out
11. Do you have any plans to install energy efficient fans and HVLS (high volume low speed) fans at any of your facilities?
    - ❑ No
    - ❑ Yes, When
      - This year
      - In one to two years
      - In three to five years
      - More than five years out
    - ❑ Uncertain

Spillover

12. Since hearing about the program, have you added any other energy efficient equipment to your facilities?
    - ❑ Yes
    - ❑ No..(Skip to 15)
13. Please describe the type of energy efficient equipment you added.
14. Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment to your facilities?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential
15. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ______________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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Agricultural Ventilation Efficiency Program

Participating Fan Dealers

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

I am calling on behalf of Southern California Edison. We are evaluating the Agricultural Ventilation Efficiency Program. This program provided information about high efficiency fans and high-volume low speed fans, and promoted installation of these fans. I'd like to speak with the owner or facility manager, or someone who would be knowledgeable about your ventilation systems. Who would that be? ______________________ *Is that person available?*
If not, could I schedule a time to call back to reach Mr./Ms. ______________________*?*
If someone other than original contact is respondent, repeat introduction *(italics above).*

Marketing and Outreach

1. Do you remember being contacted about the Agricultural Ventilation program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes   When were you contacted? ______________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Program implementer/EnSave
   - ❑ Extension service or other agricultural community organization (Dept of Agriculture, California Farm Bureau, National Farmers Organization, etc.)
   - ❑ Other, specify ______________________________________
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify ______________________________________
4. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
   - ❑ Energy efficient and HVLS (high volume low speed) fans will save energy and/or money
   - ❑ Southern California Edison would pay for the fans
   - ❑ This was an experiment
   - ❑ New fans would give ventilation where there wasn't any before
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim ______________________________

5. Why did you decide to participate? What factors were key to your decision? [Do not read list. Probe if needed]
    - ❑ I saw a need in the agricultural community I serve
    - ❑ A good way to increase product sales
    - ❑ There is a market for energy efficient fans and HVLS (high volume low speed) fans that save energy and customer's money
    - ❑ Payback was reasonable
    - ❑ Other, specify ____
6. Were you aware of energy efficient fans and HVLS (high volume low speed) fans before being contacted about this program?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
7. How important was Edison's sponsorship of this program to your decision (not) to participate? Would you say… [Read and check one]
    - ❑ Not at all important
    - ❑ Somewhat important
    - ❑ Not important and not unimportant
    - ❑ Somewhat important
    - ❑ Very important

Explain response _______________________________________

Delivery and Implementation

8. Was any special training needed to promote or install the fans?
    - ❑ No
    - ❑ Yes How was the training administered? What did it involve?
    - ❑ Uncertain
9. Who are your typical customers?
    - ❑ Dairies
    - ❑ Poultry Farms
    - ❑ Greenhouses
    - ❑ Other, specify ____
10. If the program did not exist, what would facility operators typically install for ventilation systems?
    - ❑ They would not have mechanical ventilation
    - ❑ Fans of __________ efficiency
    - ❑ Other, specify ____

Free Ridership

11. Would you have sold and/or installed the high efficiency or HVLS (high volume low speed) fans without the program?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
12. Before the project, had you previously sold and/or installed the same type of fans?
    - ❑ No.. [Skip to Q14]

- ❑ Yes
  - How long have you been installing these fans? ____________
  - Do your customers ask for them? ________________________
- ❑ Uncertain

13. Are the fans the same level of efficiency as those in the program?
    - ❑ No, What efficiency? __________________________________
    - ❑ Yes

Spillover

14. Since participating in the program, have you added any additional energy efficient equipment to your product line?
    - ❑ No..(Skip to Q17)
    - ❑ Yes
15. Please describe the type and quantity of the equipment or measures.
16. Overall, how influential would you say the program was in your decision to add energy efficient equipment to your product line? [Read list, check one]
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Not very influence
    - ❑ No influence at all

Market Characteristics & Barriers

17. Did any operational issues emerge during or since the installation of the fans that required the attention of you or your staff?
    - ❑ No
    - ❑ Yes, specify ____
18. What characteristics of the participating facilities make them good candidates for the installation of energy efficient and HVLS fans?
19. Are there barriers to the widespread installation of these fans that you are aware of? What are they?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Fans not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____
20. If the program were expanded to other agricultural facilities, do you have any suggestions in terms of the selection of products, marketing, delivery, warranty service, training, etc?
21. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Satisfied
    - ❑ Not satisfied
22. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No

❑ Yes When, what program was it? ______________________________
❑ Uncertain

Thank you for your time and assistance in evaluating this program.

Agricultural Ventilation Efficiency Program

Partial-Participant Fan Dealers

(Were contacted about participating and chose not to)

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________.

I am calling on behalf of Southern California Edison. We are evaluating the Agricultural Ventilation Efficiency Program. This program provided information about high efficiency fans and high-volume low speed fans, and promoted installation of these fans. I'd like to speak with the owner or facility manager, or someone who would be knowledgeable about your ventilation systems. Who would that be? _______________________ Is that person available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?

If someone other than original contact is respondent, repeat introduction.

Screening

Does your company install ventilation fans for agricultural producers?

- ❑ No...Thank and Terminate
- ❑ Yes ....Continue

Marketing and Outreach

1. Do you remember being contacted about the Agricultural Ventilation program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes When were you contacted? ______________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Dealer/distributor
   - ❑ Installer
   - ❑ Extension service or other agricultural community organization (Dept of Agriculture, California Farm Bureau, National Farmers Organization, etc.)
   - ❑ Other, specify _______________________________________
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show

- ❑ Other, specify ____

4. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
   - ❑ Energy efficient and HVLS (high volume low speed) fans will save energy and/or money
   - ❑ Southern California Edison would pay for the fans
   - ❑ This was an experiment
   - ❑ New fans would give ventilation where I didn't have any before
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim __________________________________
5. Were you aware of energy efficient fans and HVLS (high volume low speed) fans before being contacted about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
6. Why did you decide not to participate? (What factors were key to your decision?) [Do not read list. Probe if needed]
   - ❑ I did not see a need in the agricultural community I serve
   - ❑ This was not a good way to increase product sales
   - ❑ There is no market for energy efficient fans and HVLS (high volume low speed) fans
   - ❑ Payback was not reasonable
   - ❑ Other, specify ____
7. How important was Edison's sponsorship of this program to your decision not to participate? [Read answer options and check one]
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important

Explain response ____

8. Who are your typical customers?
   - ❑ Dairies
   - ❑ Poultry Farms
   - ❑ Greenhouses
   - ❑ Other, specify ____
9. What kind of fans do you typically install in these facilities?

Market Barriers to Adoption

10. Are there barriers to the widespread installation of these fans that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Fans not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money

- ❑ Other, specify ____

11. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc. so that you would be interested in participating in a program such as this, or to expand it to other agricultural facilities?

Free Ridership

12. Have you sold and/or installed the high efficiency or HVLS (high volume low speed) fans?
    - ❑ No
    - ❑ Yes
        - How long have you been installing these fans? ____________
        - Are they the same level of efficiency as those offered in the program?
            1. Yes
            2. No What efficiency __________________
        - Do your customers ask for them?
            1. Yes
            2. No
    - ❑ Uncertain

Spillover

13. Since hearing about the program, have you added any energy efficient equipment to your product line?
    - ❑ Yes
    - ❑ No..(Skip to 15)
14. Please describe the type of energy efficient equipment you added.
15. Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment to your product line?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Moderately influential
    - ❑ Not at all influential
    - ❑ Not at all influential
16. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ________________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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3. AirCare PlusSM Program

Appendix A: Program Measure Descriptions

AirCare Plus offers a variety of measure bundles.

1. AirCare Basic Package – The AirCare Basic package includes a screening audit and implements basic energy saving retrofits. The audit includes a general analysis of potential energy savings. If areas of concern are identified, additional diagnostics are necessary to determine the appropriate retrofits. Standard retrofits include retrofitting the Schrader valve cap with a cap that has a machined brass seat instead of an O ring. This creates a mechanical seal between the flange of the Schrader valve and the cap, thus eliminating the possibility of refrigerant leakage at the system's most vulnerable point of failure. In addition, the technician permanently adjusts economizer setpoints to reflect rooftop conditions enabling the economizer to use cool outside air instead of creating it through the compressor system.

2. AirCare Refrigerant Modifications – Two bundles focus on increasing the capacity and efficiency of RTUs through adjustments to the refrigeration cycle.[8] AirCare Plus provides immediate measurement results so that the technician can add refrigerant relatively quickly and ensure that the RTU has the proper charge. The brass cap on the Schrader valve ensures the persistence of this modification. The prevailing problem with the vapor compression cycles appears to be undercharged circuits, with a frequency of occurrence of 71%. Overcharged circuits account for 22% of problems in RTUs needing adjustment, and the remainder fall to high side heat transfer problem and liquid line restriction. The program addresses these problems with several operational changes, such as cleaning the condenser coils, and permanently modifying the thermostat setpoint on the rooftop.

3. Economizer Retrofits – Economizers allow facilities to use cooler outside air for conditioning in certain climates. The program includes four packages that relate to economizer energy efficiency. The most prevalent opportunity optimizes the changeover strategy used by the rooftop unit. Restructuring the standard factory setting and setup allows more use of the economizer and reduces energy usage. Another way to optimize the economizer is to retrofit the building space thermostat. Some thermostats only send a single cooling signal to the rooftop unit and therefore do not allow the rooftop unit to take full advantage of the economizer before the compressor is energized.

4. AirCare Air Flow Modifications – The refrigeration tool used in AirCare Plus analyzes refrigeration cycle data and provides recommendations for optimization, such as a permanent change to the sheave setting increasing the supply fan rotation and air flow delivered.

5. Electronically commutated motors (ECMs) – The largest application of ECM motors is in smaller HVAC systems. A significant retrofit opportunity exists for indoor blowers for RTUs

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[8] Tune-ups are provided for one compressor units (Refrigerant I) and two compressor units (Refrigerant II).

less than 5 tons. ECMs use significantly less energy to do the same work as standard factory supplied motors in these smaller units. In commercial environments, supply fan motors must operate continuously while the space is occupied making this motor a good candidate for retrofitting with ECM motors.

6. HVAC Upgrade – In some situations, the HVAC unit should be replaced. The program offers the standard HVAC retrofit for this situation.

Measures	Description and Impact
Basic Package	Including on-site screening audit. Retrofit standard cap for Schrader valve with specialty brass cap. Change economizer setpoint. Functional testing of economizer & refrigeration cycle
Refrigerant Tune-up on 1 compressor RTU (Refrigerant I)	Add refrigerant and retrofit standard cap for Schrader valve with specialty brass cap. Increases capacity and efficiency of RTU and prevents future leakage
Refrigerant Tune-up on 2 compressor RTU (Refrigerant II)	Add refrigerant and retrofit standard cap for Schrader valve with specialty brass cap Increases capacity and efficiency of RTU and prevents future leakage
Economizer Control Package	Retrofit the electronic sensor with an outside air thermostat with a deadband of 3F, and make appropriate adjustments. Improved economizer changeover algorithm provides more energy savings from economizer.
Economizer Adjustments	Permanent modification of cooling stage 1 and 2 jumper. Damper linkage adjustments. Relocation of electronic sensor in some RTUs. Allows more economizer hours of operation reducing compressor run time. Maximizes outside air intake during economizing. Poor sensor location causes economizer failure.
Programmable Thermostat modification (T-Stat Modification)	Modify thermostat setup and operational attributes. Eliminates additional supply fan and compressor run time not needed.
Programmable Thermostat modification plus economizer adjustment	Retrofit 2-stage cooling thermostat plus economizer adjustments Maximizes capacity and efficiency of refrigeration cycle.
Air Flow	Permanent modification of air flow rate with adjustment to sheave on evaporator fan. Maximizes capacity and efficiency of refrigeration cycle.
Electrically Commutated Motors (ECMs)	Retrofit standard motor with ECM for evaporator and make appropriate adjustments. Reduces power consumption of RTU.
HVAC replacement	Full replacement of unit. Experience shows that 5% of units will need to be replaced

Source: AirCare Plus Proposal

Appendix B: Billing Analysis Measure Bundles

The Program implemented measures independently and as a package of measures. Therefore, the measure combinations were tabulated to assess the possibility of estimating ex-post gross savings for a measure for a comparison with the Program ex-ante assumptions.

Table B-1 shows the Air Care measure combinations in order of installation frequency by participants (per customer). The most common measure installation combinations are:

Basic Inspection (BI) Only (41%), Thermostat Adjustment (TA) Only (12%), Thermostat Replacement (TR) Only (8%), Air Flow Service (AFS) (6%), Refrigeration 1 (REF1) Retrofit Only (4%), Thermostat Adjustment (TA) + Economizer Adjustment (EA) (4%), Economizer Controls (ER) (4%). These measure combinations account for 80% of the measures installed by the Air Care program.

Table B-1. Population Measure Installation Frequency

Measure Bundle	Number of Customers	% of Customers	Reported Savings
TOTAL	994		6,179,315
0: BI	410	41.3%	476,000
1: TA	123	12.4%	484,560
1: TR	77	7.8%	670,400
1: AFS	64	6.4%	156,610
1: REF1	41	4.1%	474,150
2: TA+EA	38	3.8%	227,665
1: EP	36	3.6%	120,300
2: REF1+AFS	30	3.0%	802,080
1: EA	17	1.7%	55,275
2: TA+AFS	16	1.6%	116,160
2: TA+TR	14	1.4%	153,280
2: TA+EP	11	1.1%	79,140
2: REF1+REF2	9	0.9%	180,550
2: TR+AFS	9	0.9%	66,040
3: REF1+REF2+AFS	8	0.8%	320,270
3: TA+EA+AFS	8	0.8%	66,805
2: EA+TR	6	0.6%	46,350
2: TR+EP	6	0.6%	65,900
3: REF1+TA+AFS	6	0.6%	211,540
3: TA+AFS+EP	6	0.6%	74,090
2: REF1+TR	5	0.5%	50,900
3: TA+TR+AFS	5	0.5%	288,170
1: REF2	4	0.4%	10,000
3: TA+EA+EP	4	0.4%	181,430
2: REF1+EP	3	0.3%	46,050

Measure Bundle	Number of Customers	% of Customers	Reported Savings
2: REF1+TA	3	0.3%	40,920
4: REF1+TA+TR+AFS	3	0.3%	85,830
2: AFS+EP	2	0.2%	6,160
2: REF2+TA	2	0.2%	14,520
2: REF2+TR	2	0.2%	17,200
3: EA+TP+AFS	2	0.2%	29,180
3: TA+EA+TR	2	0.2%	20,660
3: TA+TR+EP	2	0.2%	45,590
2: REF1+EA	1	0.1%	5,200
2: REF2+EP	1	0.1%	6,150
3: EA+AFS+EP	1	0.1%	9,545
3: REF1+AFS+EP	1	0.1%	50,130
3: REF1+EA+TR	1	0.1%	11,600
3: REF1+REF2+EP	1	0.1%	23,650
3: REF1+TA+EA	1	0.1%	36,110
3: REF2+TA+EA	1	0.1%	10,380
3: REF2+TA+TR	1	0.1%	11,800
3: REF2+TR+AFS	1	0.1%	22,570
4: REF1+REF2+EA+EP	1	0.1%	15,325
4: REF1+REF2+EA+TA	1	0.1%	9,275
4: REF1+REF2+TA+AFS	1	0.1%	32,150
4: REF1+REF2+TA+EP	1	0.1%	69,560
4: REF1+TA+EA+AFS	1	0.1%	13,150
4: REF1+TA+EA+EP	1	0.1%	23,980
4: TA+EA+TR+AFS	1	0.1%	10,940
4: TA+EA+TR+EP	1	0.1%	11,415
5: REF1+REF2+TA+AFS+EP	1	0.1%	71,170
5: REF1+TA+EA+AFS+EP	1	0.1%	51,440

Table B-2 shows the energy savings expected per participant from the measure bundle implemented at the participating sites that showed reasonable cooling usage. The billing analysis savings estimates are heavily skewed by some large commercial and industrial accounts with high annual usage.

Table B-2. Measure Bundle Savings

Measure Bundle9	Number of Sites Installing Measure Bundle	Weather Normalized Pre Usage in kWh	Weather Normalized Pre Cooling Usage in kWh	Weather Normalized Post Cooling Usage in kWh	Weather Normalized Cooling Savings	Average Savings per Participant using Ex-ante Measure Saving Estimate	Realization Rate
0: BI	200	348,735	39,267	40,051	-784	1,358	-58%
1: TA	73	1,977,788	188,887	55,228	133,659	4,192	3189%
1: TR	40	233,909	32,930	30,230	2,701	8,770	31%
1: AFS	19	378,241	74,435	64,471	9,964	2,594	384%
2: TA+EA	17	344,789	56,940	45,813	11,126	4,863	229%
2: TA+TR	9	196,137	30,203	28,480	1,723	10,267	17%
1: EP	8	375,201	38,742	26,314	12,428	1,694	734%
2: TA+AFS	8	359,002	65,060	51,765	13,295	4,775	278%
2: TA+EP	6	252,228	23,373	20,859	2,514	9,457	27%
3: TA+EA+AFS	6	613,544	89,688	52,527	37,162	9,334	398%
1: REF1	4	276,613	52,178	39,623	12,555	2,050	612%
3: TA+AFS+EP	4	306,603	38,853	236,121	-197,268	6,795	-2903%
1: EA	3	305,207	44,737	29,661	15,076	5,217	289%
2: EA+TR	3	276,848	43,065	28,128	14,937	9,058	165%
3: TA+TR+AFS	3	229,684	30,127	17,317	12,811	80,343	16%
2: AFS+EP	2	301,261	50,366	48,923	1,444	3,080	47%
2: REF1+TR	2	142,330	20,496	16,338	4,158	8,825	47%
2: REF2+TA	2	297,519	107,415	63,847	43,568	7,260	600%
2: REF2+TR	2	262,518	15,406	30,930	-15,524	8,600	-181%
2: TR+AFS	2	190,012	26,618	28,460	-1,842	8,370	-22%
2: TR+EP	2	176,291	22,358	25,884	-3,526	9,725	-36%
3: EA+TP+AFS	2	240,551	26,544	19,473	7,071	14,590	48%
3: TA+TR+EP	2	477,387	47,480	37,190	10,290	22,795	45%
2: REF1+AFS	1	271,281	43,620	42,574	1,046	2,920	36%
2: REF1+EA	1	465,719	36,005	78,315	-42,310	5,200	-814%
2: REF1+REF2	1	765,085	215,691	162,438	53,253	9,350	570%
2: REF1+TA	1	11,844	1,972	2,080	-108	3,270	-3%
3: REF1+EA+TR	1	114,501	31,179	30,423	756	11,600	7%
3: REF2+TA+TR	1	176,604	48,006	67,551	-19,545	11,800	-166%
3: REF2+TR+AFS	1	464,745	100,772	55,425	45,347	22,570	201%
3: TA+EA+EP	1	658,046	75,903	70,691	5,212	7,160	73%
4:REF1+REF2+EA+TA	1	205,912	35,371	34,920	451	9,275	5%
4: REF1+TA+TR+AFS	1	119,947	14,892	10,379	4,513	7,240	62%
OVERALL	429	609,699	67,778	44,292	23,486	4,413	532%

[9] BI: Basic Inspection; TA: Thermostat Adjustment; TR: Thermostat Replacement; AFS: Air Flow Service; EA: Economizer Adjustment; REF1; Refrigeration I retrofit for single compressor; REF II: Refrigeration II retrofit for two-stage compressor; EP; Economizer Package

Measure Bundle9	Number of Sites Installing Measure Bundle	Weather Normalized Pre Usage in kWh	Weather Normalized Pre Cooling Usage in kWh	Weather Normalized Post Cooling Usage in kWh	Weather Normalized Cooling Savings	Average Savings per Participant using Ex-ante Measure Saving Estimate	Realization Rate
OVERALL - NO BI	229	837,615	92,679	47,996	44,683	7,082	631%
OVERALL - NO BI, NO TA	156	304,073	47,659	44,611	3,047	8,434	36%

The results for each of the three screening methods are summarized in Table B-3, Table B-4, and Table B-5.

Table B-3. Bundle Level Savings with ±200% Realization Rate Screen

Measure Bundle	Number of Sites Installing Measure Bundle	Weather Normalized Pre Usage in kWh	Weather Normalized Pre Cooling Usage in kWh	Weather Normalized Post Cooling Usage in kWh	Weather Normalized Cooling Savings	Average Savings per Participant using Ex-ante Measure Saving Estimate	Realization Rate
0: BI	48	73,790	6,352	6,077	276	1,283	21%
1: TR	32	216,784	30,046	26,655	3,391	9,450	36%
1: TA	24	529,333	49,929	51,113	-1,184	4,400	-27%
2: TA+EA	9	314,458	38,445	40,282	-1,837	4,806	-38%
1: AFS	7	51,003	4,635	4,320	314	1,337	23%
2: TA+TR	6	185,840	32,197	31,167	1,030	12,707	8%
2: TA+AFS	3	126,228	37,622	37,582	40	3,727	1%
2: TA+EP	3	174,265	14,127	16,397	-2,271	10,973	-21%
3: TA+TR+AFS	3	229,684	30,127	17,317	12,811	80,343	16%
2: EA+TR	2	266,943	30,525	28,405	2,120	9,125	23%
2: REF1+TR	2	142,330	20,496	16,338	4,158	8,825	47%
2: REF2+TR	2	262,518	15,406	30,930	-15,524	8,600	-181%
2: TR+AFS	2	190,012	26,618	28,460	-1,842	8,370	-22%
2: TR+EP	2	176,291	22,358	25,884	-3,526	9,725	-36%
3: EA+TP+AFS	2	240,551	26,544	19,473	7,071	14,590	48%
3: TA+AFS+EP	2	364,388	53,150	49,507	3,643	8,295	44%
3: TA+TR+EP	2	477,387	47,480	37,190	10,290	22,795	45%
1: EA	1	270,514	29,935	24,688	5,246	2,650	198%
1: EP	1	46,957	11,697	10,661	1,036	1,150	90%
1: REF1	1	14,880	3,232	1,708	1,524	1,750	87%
2: REF1+AFS	1	271,281	43,620	42,574	1,046	2,920	36%
2: REF1+TA	1	11,844	1,972	2,080	-108	3,270	-3%
2: REF2+TA	1	92,505	26,186	14,517	11,669	7,440	157%
3: REF1+EA+TR	1	114,501	31,179	30,423	756	11,600	7%
3: REF2+TA+TR	1	176,604	48,006	67,551	-19,545	11,800	-166%
3: TA+EA+AFS	1	551,470	111,227	104,484	6,742	9,115	74%
3: TA+EA+EP	1	658,046	75,903	70,691	5,212	7,160	73%
4: REF1+REF2+EA+TA	1	205,912	35,371	34,920	451	9,275	5%
4: REF1+TA+TR+AFS	1	119,947	14,892	10,379	4,513	7,240	62%
OVERALL	163	219,945	25,769	24,859	909	6,991	13%
OVERALL - NO BI	115	280,948	33,873	32,699	1,174	9,374	13%
OVERALL - NO BI, NO TA	91	215,441	29,639	27,843	1,796	10,686	17%

Table B-4. Bundle Level Savings with ±150% Realization Rate Screen

Measure Bundle	Number of Sites Installing Measure Bundle	Weather Normalized Pre Usage in kWh	Weather Normalized Pre Cooling Usage in kWh	Weather Normalized Post Cooling Usage in kWh	Weather Normalized Cooling Savings	Average Savings per Participant using Ex-ante Measure Saving Estimate	Realization Rate
0: BI	37	67,564	6,770	6,798	-28	1,265	-2%
1: TR	27	201,810	26,726	22,628	4,098	8,667	47%
1: TA	16	175,785	28,779	28,281	498	3,485	14%
1: AFS	7	51,003	4,635	4,320	314	1,337	23%
2: TA+EA	6	280,713	33,396	33,913	-517	4,810	-11%
2: TA+TR	5	198,086	35,734	32,490	3,244	14,224	23%
2: EA+TR	2	266,943	30,525	28,405	2,120	9,125	23%
2: REF1+TR	2	142,330	20,496	16,338	4,158	8,825	47%
2: TA+EP	2	220,581	15,919	17,095	-1,176	15,325	-8%
2: TR+AFS	2	190,012	26,618	28,460	-1,842	8,370	-22%
2: TR+EP	2	176,291	22,358	25,884	-3,526	9,725	-36%
3: EA+TP+AFS	2	240,551	26,544	19,473	7,071	14,590	48%
3: TA+TR+AFS	2	219,265	22,072	7,626	14,447	117,570	12%
3: TA+TR+EP	2	477,387	47,480	37,190	10,290	22,795	45%
1: EP	1	46,957	11,697	10,661	1,036	1,150	90%
1: REF1	1	14,880	3,232	1,708	1,524	1,750	87%
2: REF1+AFS	1	271,281	43,620	42,574	1,046	2,920	36%
2: REF1+TA	1	11,844	1,972	2,080	-108	3,270	-3%
2: TA+AFS	1	127,667	29,766	32,873	-3,107	2,610	-119%
3: REF1+EA+TR	1	114,501	31,179	30,423	756	11,600	7%
3: TA+AFS+EP	1	312,699	43,980	50,924	-6,944	8,320	-83%
3: TA+EA+AFS	1	551,470	111,227	104,484	6,742	9,115	74%
3: TA+EA+EP	1	658,046	75,903	70,691	5,212	7,160	73%
4: REF1+REF2+EA+TA	1	205,912	35,371	34,920	451	9,275	5%
4: REF1+TA+TR+AFS	1	119,947	14,892	10,379	4,513	7,240	62%
OVERALL	125	160,760	21,367	19,710	1,657	7,384	22%
OVERALL - NO BI	88	199,944	27,505	25,140	2,365	9,956	24%
OVERALL - NO BI, NO TA	72	205,313	27,222	24,442	2,780	11,394	24%

Table B-5. Bundle Level Savings with ±100% Realization Rate Screen

Measure Bundle	Number of Sites Installing Measure Bundle	Weather Normalized Pre Usage in kWh	Weather Normalized Pre Cooling Usage in kWh	Weather Normalized Post Cooling Usage in kWh	Weather Normalized Cooling Savings	Average Savings per Participant using Ex-ante Measure Saving Estimate	Realization Rate
0: BI	29	67,789	7,487	7,331	156	1,283	12%
1: TR	22	197,082	23,747	21,580	2,166	8,255	26%
1: TA	13	180,941	26,650	26,206	445	3,631	12%
1: AFS	4	74,178	6,064	5,793	271	1,663	16%
2: TA+EA	4	208,776	28,978	29,842	-864	4,148	-21%
2: TA+TR	4	182,096	39,965	34,620	5,345	16,500	32%
2: EA+TR	2	266,943	30,525	28,405	2,120	9,125	23%
2: REF1+TR	2	142,330	20,496	16,338	4,158	8,825	47%
2: TA+EP	2	220,581	15,919	17,095	-1,176	15,325	-8%
2: TR+AFS	2	190,012	26,618	28,460	-1,842	8,370	-22%
2: TR+EP	2	176,291	22,358	25,884	-3,526	9,725	-36%
3: EA+TP+AFS	2	240,551	26,544	19,473	7,071	14,590	48%
3: TA+TR+AFS	2	219,265	22,072	7,626	14,447	117,570	12%
3: TA+TR+EP	2	477,387	47,480	37,190	10,290	22,795	45%
1: EP	1	46,957	11,697	10,661	1,036	1,150	90%
1: REF1	1	14,880	3,232	1,708	1,524	1,750	87%
2: REF1+AFS	1	271,281	43,620	42,574	1,046	2,920	36%
2: REF1+TA	1	11,844	1,972	2,080	-108	3,270	-3%
3: REF1+EA+TR	1	114,501	31,179	30,423	756	11,600	7%
3: TA+AFS+EP	1	312,699	43,980	50,924	-6,944	8,320	-83%
3: TA+EA+AFS	1	551,470	111,227	104,484	6,742	9,115	74%
3: TA+EA+EP	1	658,046	75,903	70,691	5,212	7,160	73%
4: REF1+REF2+EA+TA	1	205,912	35,371	34,920	451	9,275	5%
4: REF1+TA+TR+AFS	1	119,947	14,892	10,379	4,513	7,240	62%
OVERALL	102	163,612	21,403	19,890	1,513	8,134	19%
OVERALL - NO BI	73	201,678	26,932	24,880	2,052	10,856	19%
OVERALL - NO BI, NO TA	60	206,171	26,992	24,593	2,400	12,422	19%

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Appendix C: Surveys

The following are Program surveys, including:

- Program Manager Edison
- PECI Staff
- Participating HVAC Contractors
- Partial Non-Participant HVAC Contractors

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AirCare Plus^SM Program

Edison Program Manager

Date ____
Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
   - ☐ No, Why
   - ☐ Yes
   - ☐ Unknown
3. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with PECI, billing, incentives program tracking, or processing contractor rebates.
   - ☐ No
   - ☐ Yes, explain
   - ☐ Unknown
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Overall Lessons Learned

6. Are there barriers to the widespread adoption of AirCare services into normal maintenance activities that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
   - ☐ No
   - ☐ Yes,
     1. What are they
     2. How were they addressed or what suggestions do you have?
   - ☐ Unknown
7. What do you now know about the light commercial HVAC industry? What characteristics make a good candidate for this program?

Thank you for your time.

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AirCare Plus^{SM} Program

Program Implementer - PECI

Interview Guide

Date ____
Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
   - ❑ No, Why
   - ❑ Yes
   - ❑ Unknown
3. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with Edison billing, incentives program tracking, or processing contractor rebates.
   - ❑ No
   - ❑ Yes, explain ____________________
   - ❑ Unknown
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Marketing and Outreach

6. I understand PECI compiled a list of potential contractors, using references, local contractor's association websites (what are the URLs?), the yellow pages, and trade allies participating in other Edison programs, etc….

   How did you use the list?

   Did you expand the list? If so, how?
   - ❑ No
   - ❑ Yes, How? __________
   - ❑ Unknown
7. What was your strategy for identifying the target market of HVAC contractors? What characteristics or criteria were used to identify potential participating contractors? Issues related to identifying and recruiting contractors? How long did it take? What did it involve?
8. Were the target market HVAC units identified first, before identifying and approaching potential participating contractors, or were the contractors approached first, then target HVAC units identified?
   - ❑ HVAC units identified first
   - ❑ Contractors identified first

- ❑ Unknown

9. How did PECI oversee or coordinate program marketing with HVAC contractors?
10. How was the program marketed? Were contacts and refusals tracked in a spreadsheet? What is known about the disposition of interested/non-interested contacts?
11. How was the program marketed? What methods of contact were employed for contractors? What was the relative success of the different methods if different methods were attempted?
    - ❑ Mail
    - ❑ Email
    - ❑ Phone call
    - ❑ Presentation at industry meetings
    - ❑ Other, specify ______________________________________
12. What type of contractor is best fit to administer this technology and why? ('Typical' where HVAC contractors fit service into business, or 'ESCO' which specialize in this type of work, or other)?
    - ❑ Typical
    - ❑ ESCO
    - ❑ Other, specify ____

Delivery and Implementation

13. What type of training did participating contractors receive to understand how to utilize the diagnostics technology?
14. Did the specialized training for technicians occur, if so how many were trained?
    - ❑ No
    - ❑ Yes, How many were trained?
    - ❑ Unknown
15. What does the training involve? Does the manufacturer regularly train technicians about how to use the AirCare Plus℠ diagnostic computer?
16. How much time is required for contractors to become an AirCare Plus℠ technician? Was more than the initial training required?
17. What does it cost PECI to train the technicians? Do the contractors or technicians have to pay anything?
18. What QC procedures were employed by PECI to ensure the training was adequate?
19. Did any issues emerge with either the HVAC managers or technician training?
    - ❑ No
    - ❑ Yes, Explain
    - ❑ Unknown
20. Did any issues emerge since project completions/installations?
21. Any central or recurring or unaddressed issues emerge with HVAC system owners, contractors or the measures installed at any time during the process?
22. Have any of the equipment/measures been removed since they were installed with this program? If so, what, when, how many?
    - ❑ No
    - ❑ Yes, Explain
    - ❑ Unknown

Overall Lessons Learned

23. What is the size of the existing market of small retail, office and grocery sector with roof top units? What portion are existing, new and replacement units?
24. Were there unique issues at particular sites that would be encountered in technology diffusion? Have barriers to technology administration or diffusion been identified?
    - ❑ No
    - ❑ Yes, Explain
    - ❑ Unknown
25. What are the differences between the California and the Northwest markets that you are aware of?
26. What do you now know about the small commercial HVAC industry? What characteristics make a good candidate for this program?
27. Do you believe contractors are missing opportunities with their clients when implementing the AirPlus program? Is the program being marketed to the right market actors?
    - ❑ No
    - ❑ Yes, Explain
    - ❑ Unknown
28. Are there barriers to the widespread installation of the AirCare program measures that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____
29. Is the program scalable into a larger program? What aspects of the program will have to change if it were expanded?
    - ❑ No
    - ❑ Yes, Explain
    - ❑ Unknown
30. If the program were expanded to other facility types than those reached so far, is there anything that you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, etc?

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AirCare Plus^{SM} Program

Participating HVAC Contractors

Contact person ____
Business Name ____
Date ____
Interviewer ____

Hello my name is ______________ from ____________. I am calling on behalf of Southern California Edison. We are evaluating the AirCarePlus Program implemented by PECI. This program introduced a hand-held diagnostic technology to service small rooftop HVAC units. I'd like to speak with ____________ or someone knowledgeable about your participation in this program. Is ______________ available?
If not, could I schedule a time to call back to reach Mr./Ms. _____________________?
If someone other than original contact is respondent, repeat introduction.

Introduction

I'd like to talk about your experience with the AirCare Plus^{SM} program in California. Do you know how many commercial systems your company serviced under the AirCare Plus^{SM} program sponsored by Southern California Edison and PECI? _________________

Marketing and Outreach

1. Do you remember when you were contacted about the AirCare Plus^{SM} program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes When were you contacted? ___________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Edison
   - ❑ Program implementer/PECI
   - ❑ Other, specify ___________________________________
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify ___________________________________
4. Could you tell me the benefits of program participation, as you understand them? [Do not read. Check all that apply. Record comments verbatim]
   - ❑ Screening tool to identify customer energy savings & equipment issues
   - ❑ Program will help customers save energy and/or money
   - ❑ Edison would help pay for the energy efficiency measures
   - ❑ This was an experiment
   - ❑ It was never explained to me

- ❑ Other, specify ________________________________

5. Why did you decide to participate? What factors were key to your decision? [Do not read list. Probe if needed]
   - ❑ A good way to increase sales
   - ❑ There is a market for energy efficient products and services that save small commercial HVAC customers energy and money
   - ❑ AirCarePlus will help contractors get more business and enhance their value to customers
   - ❑ Other, specify ____
6. Did you have any initial concerns about folding the AirCare practice into your normal business practices?
7. What maintenance services do you typically provide as part of a service contract when AirCarePlus is not used? (How does AirCarePlus differ from your standard practice before AirCarePlus?) [Do not read. Mark all that apply]
   - ❑ Initial assessment
   - ❑ Clean or change filters
   - ❑ Measure and adjust air flow
   - ❑ Clean Condenser coil
   - ❑ Visual inspection of AC components
   - ❑ Refrigerant charge adjustment
   - ❑ Thermostat replacement
   - ❑ Thermostat adjustment
   - ❑ Economizer retrofit
   - ❑ Economizer adjustment
   - ❑ Economizer adjustment to work with programmable thermostat
   - ❑ Other, specify ____
8. How important was Edison's sponsorship of this program to your decision to participate? Would you say… [Read and check one]
   - ❑ Not at all important
   - ❑ Somewhat unimportant
   - ❑ Neutral
   - ❑ Somewhat important
   - ❑ Very important

Explain response _______________________________________

Delivery and Implementation

9. Could you please tell me who your typical customer is, that is, who buys tune-up services or maintenance contracts? (Capture verbatim)
10. What percentage of your commercial customers buy maintenance contracts?
11. What was your method or strategy for selecting customers to participate in AirCarePlus?
12. How did you present the AirCarePlus program to your customers? (Capture verbatim)
13. (If not answered in Q12) What special features of AirCarePlus did you present to a customer who already had a maintenance plan?
14. Does the AirCarePlus technology address HVAC maintenance issues that are not addressed by common maintenance practices? Which are those issues?
15. Could these be addressed without AirCarePlus?
    - ❑ No

- ❑ Yes,   How?

16. What is the average age of the units you service? __________
17. Was any special training received in using the AirCarePlus technology? (for example, how to use the AirCare Plus[SM] diagnostic computer?)
    - ❑ No [Skip to *Market/Contractor Response*]
    - ❑ Yes
    - ❑ Uncertain [Skip to *Market/Contractor Response*]
18. How was training administered? (Explain: Classroom session, field demonstration or both)
19. How many technicians from your firm were trained?
20. How much contractor time is required to become an AirCarePlus technician?
21. Was more than the initial training required?
22. Did you have to pay anything for the training?
    - ❑ No
    - ❑ Yes, specify amount ___________
    - ❑ Unknown
23. Did PECI use any kind of test to certify successful completion of training?
24. Did any issues come up with training HVAC managers or technicians? (If needed: "For example, were there technical issues using Air Care? Were there logistics issues providing services?")
    - ❑ No
    - ❑ Yes,
        1. Explain
        2. How were these dealt with?
    - ❑ Unknown
25. Do you have any suggestions to improve training?

Market/Contractor Response

26. When your technicians find an overridden, non-functional, or improperly adjusted programmable thermostat, what do they do? (Capture comments verbatim)
    - ❑ Nothing
    - ❑ Inform customer
    - ❑ Adjust thermostat
    - ❑ Don't know

Comments ____

27. When your technicians find a nonprogrammable thermostat, what do they do? (Capture comments verbatim)
    - ❑ Nothing
    - ❑ Inform customer
    - ❑ Install programmable thermostat
    - ❑ Don't know

Comments ____

28. When AirCarePlus is not used do you record site measurements and estimate energy and demand savings? (Capture comments verbatim)
    - ❑ No
    - ❑ Yes

3. IF YES, what analysis tool is used? [record verbatim]

29. Do you think that AirCarePlus service is appropriate for your customers?
    - ❑ No
        1. Why is it not appropriate for your business or customers
    - ❑ Yes
        1. For what type of customers?
        2. How will it help?
30. What level of effort was needed to integrate AirCarePlus diagnostics into your regular business objectives?
31. Do you charge your customers a fee for the AirCarePlus services you provided under this program?
    - ❑ No
        1. Do you provide the service for free to all customers, or just those participating in this program? (Capture comments verbatim)
    - ❑ Yes
        1. On average, what did your customers pay for the AirCarePlus services? (Capture comments verbatim)
32. About what percentage of your overall costs to provide the program related services was contributed by Edison through incentives? (i.e., did incentives cover the incremental cost of providing services) ___________________%

Comments (record verbatim): ____

33. Did you share some or all of the incentives from PECI and Edison with your customers?
    - ❑ No
    - ❑ Yes
    - ❑ Sometimes

Free Ridership

34. In the AirCarePlus program, a hand-held computer is used to inspect, diagnose and make adjustments to refrigerant charge, airflow and economizer functions. The intent of the preventive maintenance is to lower energy bills, reduce downtime, increase comfort and service life. Were you already familiar with the AirCare protocol before being contacted about the program? [Record answer for each practice in Table 1]
    - ❑ Familiar with and using AirCarePlus protocol (Table 1 Column A) [Ask 34a]
        - 34a. Familiar with and using AirCarePlus diagnostic protocol:
            2. When did you start using this protocol? (Table 1 Column B)
            3. About how many units have you serviced with AirCare diagnostics in the past year? (Table 1 Column C)
    - ❑ Familiar with and not using AirCarePlus protocol (Table 1 Column D)
    - ❑ Not familiar with AirCarePlus protocol (Table 1 Column E)
    - ❑ Uncertain (Table 1 Column F)

Table 1. AirCarePlus Practices

	Col A	Col B	Col C	Col D	Col E	Col F
	Familiar with and using	Started using practice	Number units serviced	Familiar with and not using	Not familiar with	Uncertain
Computerized diagnostics to optimize economizer adjustments						
Economizer control package						
Automated tools to analyze refrigerant charge and adjustments						
Thermostat schedule review and modifications						
Thermostat replacement to programmable stat						

35. Have you used diagnostic tools, but <u>not</u> AirCarePlus, for preventive maintenance, to adjust the economizer and refrigerant charge, and to optimize the rooftop HVAC for energy savings?
    - ❑ No
    - ❑ Yes
        1. What were those procedures or protocol?
        2. Did this procedure or protocol have a trade-name?
        3. How do they compare to AirCarePlus?
        4. Do you use them now?
            - ❑ No
            - ❑ Yes
36. Do your customers specifically ask for the AirCare type of diagnostic services?
    - ❑ No
    - ❑ Yes
37. Before participating in this Program, did you consider offering any of the AirCarePlus type of diagnostic protocol without the program incentive, but decide not to offer them? [ask each item on list of offered services] (Table 2 Col A)
    - ❑ Yes ....[Ask for each item Table 2]
    - ❑ No [If NO to all, Skip to *Spillover*]
    - ❑ Uncertain ....[Skip to *Spillover*]
38. Why did you decide not to offer them? (record verbatim) [Table 2 Col B]
39. Would you have offered the *services…* [Table 2 Col C]
    - ❑ In this year
    - ❑ In one to two years
    - ❑ In three to five years
    - ❑ More than five years out
    - ❑ Never; decided not to offer this type of service [Skip to *Spillover*]

40. Are plans for offering services using this type of diagnostic services actively 'in the works' now? [Table 2 Col D]
    - ❑ No
    - ❑ Yes

Table 2. Free-Ridership Grid: Enter For each installed program measure

	Col A	Col B	Col C	Col C
Measure*	Considered	Why not?	Time Frame	In the works?
Computerized diagnostics to optimize economizer adjustments				
Economizer control package				
Automated tools to analyze refrigerant charge and adjustments				
Thermostat schedule review and modifications				
Thermostat replacement to programmable stat				

Spillover

41. Will you use the AirCarePlus diagnostics protocol in the future, either at your own expense, or with incentives? (Record comments verbatim)
    - ❑ Not at own expense or with incentives
    - ❑ Yes, at own expense
    - ❑ Yes, with incentives
    - ❑ Uncertain
42. Comments: ____
43. Since hearing about the program, have you added any other energy efficient equipment or services to your customer offerings?
    - ❑ Yes
    - ❑ No [Skip to *Satisfaction*]
44. Please describe the type of the equipment or services added.
45. Overall, how influential would you say the program was in your decision to add energy efficient equipment or services to your customer offerings?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Satisfaction

46. How satisfied are you with the program overall? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat dissatisfied
    - ❑ Very dissatisfied

47. Do you have any suggestions for program changes and improvements? (for example, the selection of services, marketing, delivery, training, etc.)?
48. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When? What program was it? ______________________
    - ❑ Uncertain

Firmagraphics

Lastly, I have a couple of questions about your company.

49. Please tell me how many people your firm employs. _________________
50. How many are AC technicians? __________________
51. Are all of these technicians using the AirCarePlus diagnostics?
    - ❑ No ....How many? __________
    - ❑ Yes
52. Do you currently offer AirCare Plus[SM] service in addition to standard maintenance services?
    - ❑ No
    - ❑ Yes
        1. If yes: what percentage of customers buy standard service?
        2. What percentage buys Air Care service?
53. What percentage of your overall business revenue is generated through the preventive maintenance services for rooftop HVAC units? __________________%
54. What percentage of your overall business revenue is generated through rooftop HVAC on-call services, that is, services to troubleshoot or repair rooftop HVAC problems? __________________%

Thank you for your time.

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AirCare Plus^{SM} Program

Partial Nonparticipant HVAC Contractors

(Received information and chose not to participate)

Contact Person____
Facility Name ____
Date ____
Interviewer ____

Hello, my name is __________ from ____________. I am calling on behalf of Southern California Edison. We are evaluating the AirCarePlus Program implemented by PECI. This program introduced a hand-held diagnostic technology for rooftop HVAC units. I'd like to speak with ____________ or someone knowledgeable about your HVAC maintenance services. Is ______________ available? Your answers will help Edison improve their programs. If not, could I schedule a time to call back to reach Mr./Ms. _______________________?

If someone other than original contact is respondent, repeat introduction.
Screening Question:
First, Does your company provide tune-up and maintenance services for commercial rooftop HVAC systems?

- ❑ No...[Thank and Terminate]
- ❑ Yes ....[Continue]

Marketing and Outreach

1. Do you remember when you were contacted about the AirCarePlus Program sponsored by Southern California Edison and implemented by PECI? [Do not read responses]
   - ❑ Yes When were you contacted? ______________________________
   - ❑ No [Is there someone else with your company who would have been contacted about participating in that program?]
     - No (there is not someone who would have been contacted): I'd like to ask a few questions about HVAC services that you offer. Who would be a good person to speak with? ___________________________________ [Skip to Q8]
     - Yes (there is someone who would have been contacted): could I speak with that person? ___________________________________ [Continue]
   - ❑ Uncertain (as above for "No" answers)
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Edison
   - ❑ Program implementer/PECI
   - ❑ Other, specify ____

3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify ____
4. Could you tell me the benefits of program participation, as you understand them? [Do not read. Check all that apply. Record comments verbatim]
   - ❑ Screening tool to identify customer energy savings & equipment issues
   - ❑ Program will help customers save energy and/or money
   - ❑ Edison would help pay for the energy efficiency measures
   - ❑ This was an experiment
   - ❑ It was not explained to me
   - ❑ Other, specify ________________________________
5. Why did you decide not to participate? What factors were key to your decision? [Do not read list. Check all that apply. Probe if needed. Record comments verbatim]
   - ❑ Already offer AirCarePlus or similar services
   - ❑ Not a good way to increase sales
   - ❑ There is no market for energy efficient products and services that save small commercial HVAC customers energy and money
   - ❑ AirCarePlus will not help contractors get more business and enhance their value to customers
   - ❑ Other, specify ____
6. Did you have concerns about folding the AirCare practice into your normal business practices?
   - ❑ No
   - ❑ Yes, If yes, what were they? (capture verbatim)
7. Please tell me what maintenance services do you typically provide as part of a service contract? (Do not read. Check all that apply. Capture 'other' verbatim.)
   - ❑ Initial assessment
   - ❑ Clean filters
   - ❑ Measure and adjust air flow
   - ❑ Clean Condenser coil
   - ❑ Visual inspection of AC components
   - ❑ Refrigerant charge adjustment
   - ❑ Thermostat replacement
   - ❑ Thermostat adjustment
   - ❑ Economizer retrofit
   - ❑ Economizer adjustment
   - ❑ Economizer adjustment to work with programmable thermostat
   - ❑ Other, specify ____
8. When your technicians find an overridden, non-functional, or improperly adjusted programmable thermostat, what do they do? (Do not read. Mark all that apply. Capture comments verbatim)
   - ❑ Nothing

- ❑ Inform customer
- ❑ Adjust thermostat
- ❑ Don’t know

Comments ____

9. When your technicians find a nonprogrammable thermostat, what do they do? (Do not read. Mark all that apply. Capture comments verbatim)
   - ❑ Nothing
   - ❑ Inform customer
   - ❑ Install programmable thermostat
   - ❑ Don’t know

Comments ____

10. Could you please tell me what percentage of your service calls includes an evaluation and/or adjustment of the economizer? _____________%
11. What percentage of your service calls includes an evaluation and/or adjustment of the refrigerant charge? ________________%
12. In the AirCarePlus program, an infield hand-held computer is used to analyze refrigerant charge, airflow and economizer functions. Have you used infield computerized diagnostics and protocol as part of your practice?
    - ❑ No...[Ask Q13]
    - ❑ Yes ....[Ask Q14]
13. [Ask if Q12 = No] Have you considered using the AirCarePlus or similar practices, but decided not to use them?
    - ❑ No, did not consider using them
    - ❑ Yes, considered but decided not to use them
      1. Why did you decide not to offer them? [record verbatim]
    - ❑ Uncertain
14. [Ask if Q12 = Yes] Do you currently offer AirCare Plus℠ service in addition to standard maintenance services?
    - ❑ No
      - What is the trade-name of the procedure or protocol that you use?
    - ❑ Yes
15. [Ask if Q12 = Yes] Do your customers specifically ask for these types of services?
    - ❑ No
    - ❑ Yes
16. [Ask if Q12 = Yes] What percentage of customers buys standard service?
17. [Ask if Q12 = Yes] What percentage buys Air Care or similar services?
18. As part of your maintenance practices do you record site measurements and estimate energy and demand savings?
    - ❑ No, do not estimate energy savings
    - ❑ Yes, estimate energy savings
      - IF YES, what analysis tool is used? [record verbatim]

19. What do you think are the major reasons businesses like this (HVAC maintenance services) don't offer programs like AirCarePlus, that is, preventive maintenance protocols using diagnostic tools and testing? [Capture comments verbatim.]

Customer Base

20. Could you please tell me who your typical customer is, that is, who buys tune-up services or maintenance contracts? [Capture verbatim]
21. What percentage of your commercial customers buys maintenance contracts?
22. Why do they buy your services or maintenance contracts? [Capture verbatim]
23. hat is the average age of the units you service? __________

Firmagraphics

Lastly, I have some questions about your company.

24. Have you participated in any Edison's energy efficiency programs?
    - ❑ No
    - ❑ Yes, When? What program was it? ____________________
    - ❑ Uncertain
25. Please tell me how many people your firm employs. ________________
26. How many are HVAC technicians? ________________
27. What percentage of your overall business revenue is generated through the preventive maintenance services for rooftop HVAC units? ________________%
28. What percentage of your overall business revenue is generated through rooftop HVAC on-call services, that is, services to troubleshoot or repair rooftop HVAC problems? ________________%

Thank you for your time.

4. Community College District Retrofit Program

Appendix A: Impact Evaluation Field Plan

Program Overview

The Community Colleges in California program is designed to leverage off of an educated and sophisticated customer base that understands the benefits of implementing energy efficiency projects. California has the highest number of Community Colleges in the country. Significant energy-efficiency opportunities exist in these campuses. The facility managers at the Community campuses are aware of the value of conserving energy and dedicated to fulfilling the objectives of this and other similar programs. However, due to recent budget cuts in the Community College budgets, many of these projects have not been implemented. The Los Angeles Community College District Program (LACCDP) and the San Bernardino Community College District Program (SBCCDP) are two unique and innovative programs that accomplish immediate long-term peak energy and demand savings, and establish a permanent framework for a comprehensive, long-term, energy management program at the Community Colleges in California.

The Community College District Retrofit Program consists of two distinct program categories: 1) Standard performance contracts (SPC), implemented by Siemens and Chevron, and 2) Deemed measure programs, implemented by Intergy including vending machine and personal computer energy efficiently controls. The impact evaluation will address each category.

Standard Performance Contracts

The SPC activities include comprehensive interior and exterior lighting measures, chiller plant upgrades, economizer damper repair, skylight installation, HVAC upgrades, central plant upgrades and others. A detailed list of performance activities is shown below in Exhibit CC.3 Program activity detail. The impact evaluation will make extensive use of contractual performance measures conducted by the implementation contractors.

Vending Machine Energy Efficiency Controls

The vending machine energy efficiency project utilizes the VendingMiser (VM) and SnackMiser (SM) controls, by Bayview Technologies Group, Inc. The project provides a simple and cost-effective way to reduce electrical loads using an occupancy sensor to power down the vending machine when the area surrounding the machine is vacant.

The project installs controls on three types of vending machines: 1) Refrigerated cold beverage vending machines, 2) Refrigerated glass front vending machines, and 2) Nonrefrigerated snack vending machines. The impact evaluation will address each type independently. Further segmentation may be required to address location or traffic pattern differences.

Significant literature exists documenting the performance of VendingMiser technology.[10] In addition to other impact evaluation methods, Summit Blue Consulting will compare baseline and expected energy savings results derived from these studies with the community college project expected performance in evaluating the impact of the VindingMeisr technology. The details of the evaluation approach are summarized below.

Personal Computer Energy Efficiently Controls

The personal computer energy efficiency controls utilize the Verdiem software product, the Surveyor Network Energy Manager (Surveyor). The product is a network software tool that enables network administrators to remotely control the power management function of personal computers (PC's) linked to the central network.

Summit Blue Consulting has recent evaluation experience with the Verdiem Surveyor software.[11] This research as well as information derived from recent case studies will be drawn upon to accurately establish the baseline and expected savings associated with Community Colleges PC controls program.

The energy savings impact of the Surveyor initiative will be based on three fundamental inputs: total number of Surveyor licenses achieving savings at the community colleges; an estimation of per-unit energy savings for each license; and an estimate of the baseline. Specifically, energy savings for a given calendar year can be calculated as follows:

$$\textbf{Annual Energy Savings (kWh/year)} = \quad N \times E \times P \qquad (1)$$

where:

N = Number of Surveyor licenses achieving savings. This is defined as the total number of workstations at the community colleges at which Surveyor is deployed and achieving energy savings.

E = Estimated per-unit savings. This is the annual electric (kWh) savings attained per Surveyor license achieving savings.

P = Percentage of units NOT included in the baseline. This term accounts for those units that would be achieving savings anyway in the absence of the IDEEA initiative and is typically assumed to be 10% of all units sold.

Program Goals and Achievements

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[10] A couple of relevant documents are: Speiser, T., and K. Cabanas-Holmen, "Scaling Back Vending Machine Energy Use with the VendingMiser", Esource ER-00-14, September 2000; and "Vending Machine Service Call Reduction Using the VendingMiser", Report BAY-01197, Report prepared by Foster-Miller, Inc., February 2002.

[11] Summit Blue Consulting, LLC, NW Alliance Surveyor Network Energy Manager Draft M&T Findings, November 2005.

Exhibits CC.1 and CC.2 below provide an overview of Program goals and achievements. Exhibit CC.1 shows that 16 separate projects will be spread over 18 campuses when installations are complete in June of 2006. The Program Ex-ante savings of 1,305 kW and 6.0 MWh are equal to original Program planned savings, as shown inn Exhibit CC.2.

Exhibit CC.1 Summary of Program Participation

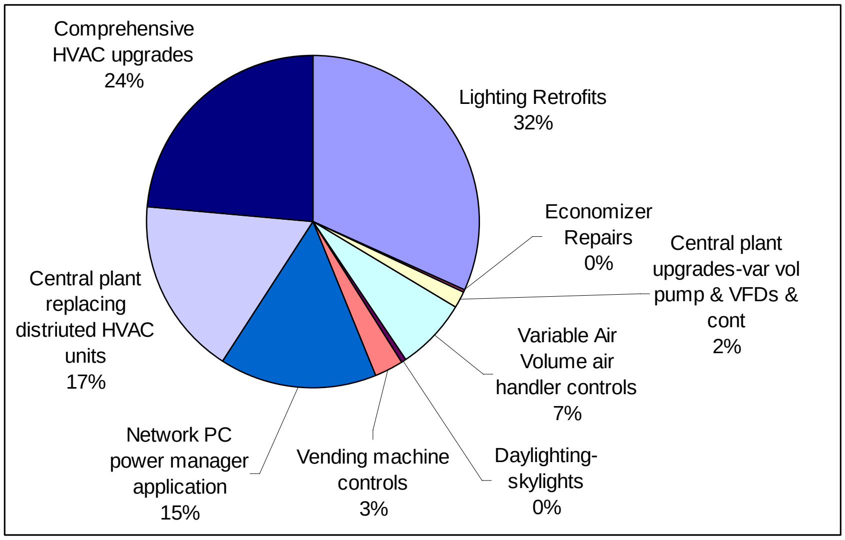
Installed Customers	Seven projects at two campuses; all contracts are performance contracts.
Committed Customers	Nine projects at six campuses, blend of performance contracts and deemed savings.
Total Customers	Eighteen Campuses
Committed / Installed Measure Description	Sixteen separate projects
Final installation date	June 2006

Exhibit CC.2 Program Savings Goals and Achievements

Metric	Program Goals	Current Workbook Installed Savings	Committed Savings	Likely Ex-ante Installations
Demand (kW)	1,305	229	1,077	1,305
Energy (MWh)	6.0	1.7	4.2	6.0

The Community College Program activities include both comprehensive performance contract projects (SPC) and the vending machine and PC control measures. Exhibit CC.3 charts the percentage each activity contributes to the overall community college goals. The SPC activities account for approximately 82% of the total Program committed kWh savings. Deemed measures account for the remaining 18% of committed kWh. Of the programs goals as a whole, lighting retrofits contribute the majority of savings.

Exhibit CC.3 Activity Percentage of Total Program Goals (Committed kWh)



Evaluation Approach

Because of the broad scope of energy efficient technologies, the evaluation approach will be comprised of several activities, detailed below to verify installation and performance, collect pre and post energy consumption data, validate deemed energy savings and evaluate changes in billing records. The diverse nature of the programs presents unique research issues and data requirements to be addressed in the evaluation approach.

Research Issues

- Significant % of installations are performance contracts with Chevron and Siemens, while portion of projects are small measure installations by implementation contractor, accounting for about 4% of kWh savings.
- Performance contracts are likely well documented both for baseline and post installation measure performance.
- Implementer installations are primarily vending machine and PC controls
  - Vending miser now in current express program, used deemed savings for refrigeration machine. Unclear how savings are estimated for non-refrigerated machines
  - PC control software (Verdiem Corp.) savings estimates are based on vendor literature and 1 secondary data source

Data Required

- Program database, in Excel or Access, for SPC projects.
- Engineering documents used to calculate SPC savings, including algorithms, baseline assumptions, etc. Any software used that can be shared.
- Contact list for facility operators who did not participate.

- Updated projects records as commitments are installed and timeline for completing.

As previously mentioned, a billing analysis will be conducted for this program and post installation inspections will establish the presence and operation of recorded installations. The evaluation will conduct pre installation data logging on a sampling of vending machines. The PC controls data will be collected from the Surveyor software. In addition, information will be gathered regarding the following key researchable issues include:

- Can the framework for a comprehensive, long-term, energy management program be extended to community colleges statewide?
- Are deemed savings standards accurately accounting for the unique community college program characteristics?
- Can PC control technology (Verdiem) software be used quantify kW demand reductions in addition to kWh consumption savings?

Review Engineering Calculations and Secondary Literature

Key Program documents will be reviewed to identify Program impact assumptions that present the greatest uncertainty in estimating Program impacts. This review will include the following documents:

- Savings assumptions in Program plans.
- SPC performance evaluation documentation.
- Vendor documentation of expected savings.
- Reports and publications evaluating the VendingMeiser and Verdiem technology.

Conduct Billing Data Analysis

Billing analysis will be conducted to provide an estimate of energy savings achieved by the Program installations. However, 100% of the sites will not be analyzed. SPC implementation contractors are expected to perform billing analysis as a contractual requirement for performance verification. The SPC billing analysis results will be reviewed as part of the impact evaluation process. The impact evaluation will conduct a statistical sampling of billing records with sufficient crossover to verify the SPC results. The secondary billing analysis will be conducted on only the most relevant meters.

Conduct On-site Verification

The community college Program is spread over 18 campuses. Site inspections will verify equipment installation and operation. Because of the availability of SPC data and because Edison has verified a large percentage of installations, the number of on-site visits will be limited to those most relevant sites likely to contribute to the existing knowledge base.

Edison has conducted a visual verification of installation and operation at the majority of the sites. The evaluation team has requested from Edison records for all sites verified.

Complete Impact Interviews with Select Market Actors

Interviews will be conducted at both colleges targeting the Program decision makers most influential in the implementation of the individual projects. It is anticipated that the interviews will not exceed 10 participants. Interviews will include impact topics regarding run hours and customer initiated actions. These interviews will include all or a subset of the process analysis questions.

Conduct On-site End Use Metering

Interval data logging will be conducted on sample of vending machine installations. The vending machine measures are relatively homogeneous across the three types of machines: refrigerated, refrigerated glass, and non-refrigerated. The sample size required for any one of the three machine types will not exceed 20% of the total population of the particular machine type as outlined above. Nor will the total number of data loggers exceed 10 units for any one machine type. The data logging will begin prior to the installation of the efficiency controls to enable pre and post installation comparison of energy consumption measures.

PC Control Data Feeds

The Verdiem PC control software produces data feeds recording the energy reductions attributable to the PC control system. The data will be collected and analyzed to verify PC control energy consumption impacts. As previously noted the data retrieval will be coordinated with the appropriate college administrators and scheduled so as to allow a sufficient amount of data to support the analysis.

Reference to Appropriate IPMVP Option

The proposed impact evaluation plan adheres to Chapter 6 of the California Energy Efficiency Policy Manual (version 2, August 2003). The evaluation plan does not correspond directly to any of the IPMVP options. We are proposing an alternative method that relies on developing Program-specific adjustments to the ex-ante savings values. The approach is similar to Option A: Partially Measured Retrofit Isolation, in that it will use partial short term field measurement of energy use to verify or adjust ex-ante energy and demand savings estimates for measures installed. Some performance parameters will be based on secondary data, or estimates included in the ex-ante calculations. Engineering adjustments made to specific measure savings will be extrapolated to the population of installed measures for the specific program.

Summary of Impact Evaluation Activities

Adjusted gross savings will be estimated based on the verification of unit installations, and adjustments made based on the review of Program engineering documents, secondary reports, billing analysis, survey information, site visits, analysis of logging data, and analysis of PC data. Exhibit CC-4 provides a summary expected impact evaluations activity.

Exhibit CC.4 Impact Evaluation Activities

Community Colleges	Current Plan
Program Records Review	Yes
Engineering Calculations	Yes
Secondary Literature	Yes
Billing Data/Metered Data Analysis	Review SPC results and secondary analysis or relevant meters
Participant Surveys	Targeted interviews not to exceed 10
Site Visits	Review Edison reports and additional visits of most relevant sites
End Use Metering	Vending machines will be pre and post installation metered
PC Control Data Collection	Collect and analyze PC data

Exhibit CC.5 provides a summary schedule of major impact evaluation tasks. Scheduling of the Program verification work will be based on several research design criteria;

1. Data logging must occur pre- and post-installation of vending machine controls.

2. PC data requests must be coordinated with the computer center administrator.

3. Field verification-only activities can occur at any point after installations are completed in March of 2006.

4. The schedule, including the interval end date for billing analysis, reflect that the majority of installation for this Program will not occur until mid to late spring of 2006.

Exhibit CC.5 Schedule of Field Activities

Detailed site visit plan	March 2006
Complete Field verification instruments	March 2006
Data loggers installed	March 2006
Field verification / data logging beginning date	April 2006
Collect PC data from college	June 2006
Field verification / data logging ending date	June 2006
Billing analysis interval ending date	August 2006

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Appendix B: Examples of Documentation Provided for the Impact Analysis

Energy Savings Calculation Documentation Example.

Chaffey College Master Plan
P2S #3731
Operational Savings

Operating hours 0600 to 2200, 5 days per week, 49 weeks per year = 3920
Percentage of operating hours at full load = 0.50

Plant Code	Building	Gross Area sf	Current CHW	Current kW/ton	Current kW	Current DX	Current kW/ton	Current kW	Current Unitary
1	Administration	17,147	80	0.98	78	0			0
0	Aeronautics	22,198	0			0			7
1	Art	4,932	0			20	1.12	22	0
2	Auto Tech Lab	21,028	0			0			39
1	Business Ed	16,278	0			40	0.93	37	0
1	Campus Center East	18,094	0			0			60
1	Campus Center West	30,137	75	0.98	74	22	0.82	18	10
0	Child Care	19,461	0			0			52
2	Gym	47,792	0			0			39
1	Health Science	8,820	40	0.98	39	0			0
1	Fashion/Consumer	3,275	0			15	1.04	16	0
0	Information Services	8,065	0			0			18
1	Language Arts	12,198	0			40	0.93	37	0
1	Library	39,312	77	0.98	76	0			69
1	Life Science East	8,121	20	0.98	20	0			2
2	Life Science West	9,780	20	0.98	20	0			5
0	Maintenance	18,601	0			0			3
1	Museum	3,940	0			0			10
2	Physical Science	28,596	108	0.98	106	0			0
0	Planetarium	3,013	0			0			8
0	Public Safety	1,271	0			0			5
2	Skills Lab	12,316	0			0			60
1	Social Science	14,251	0			40	0.93	37	0
1	Theater	31,469	72	0.98	70	0			20
2	Vocational Ed	26,511	136	1.10	149	0			0
0	Warehouse	3,486	0			0			2
1	Wargin Hall	11,431	40	0.98	39	30			0
1	Education Excellence Center	37,182							
2	Science Building	34,025							
2	Visual & Performance Arts	57,143				(See Note 1)			
1	Instructional Bldg A	47,296				(See Note 1)			
2	Instructional Bldg B	47,143				(See Note 1)			
	Totals	664,302	667		670	207		167	409

Building	2003 CHW	2004 CHW	2004 kW/ton	2004 kW	2004 Unitary	2005 CHW	2005 kW/ton	2005 kW	2005 Unitary	2006 CHW	2007 CHW	2007 kW/ton	2007 kW	2007 Unitary	2008 CHW	2008 kW/ton	2008 kW
Education Excellence Center											93	1.11	103	12			
Science Building						360	1.30	468	5								
Visual & Performance Arts															229	1.30	297
Instructional Bldg A											189	1.30	246				
Instructional Bldg B															189	1.30	245
Totals	874	874		837	0	1,234		1,305	5	1,234	1,516		1,655		1,933		2,197
Annual kWh (1,000s)	1,641			1,641				2,559					3,243				4,306

Building	2009 CHW	2009 kW/ton	2009 kW	2010 CHW	2011 CHW	2011 kW/ton	2011 kW	2012 CHW	2012 kW/ton	2012 kW	Total as of 2012 CHW	Total as of 2012 DX	Total as of 2012 Unitary
Administration											80		
Aeronautics											0		7
Art											0		
Auto Tech Lab											0		
Business Ed											0		
Campus Center East											0		
Campus Center West											75		10
Child Care											0		52
Gym											0		
Health Science											40		
Fashion/Consumer											0		
Information Services											0		18
Language Arts											0		
Library											77		
Life Science East											20		2
Life Science West											20		5
Maintenance											0		3
Museum											0		
Physical Science											108		
Planetarium											0		8
Public Safety											0		5
Skills Lab											0		
Social Science											0		
Theater											72		
Vocational Ed											136		
Warehouse											0		2
Wargin Hall											40		
Education Excellence Center											209		0
Science Building											360		5
Visual & Performance Arts											527		
Instructional Bldg A											436		
Instructional Bldg B											436		
Totals	1,933		2,197	1,933	1,933		2,197	1,933		2,197	2,635	0	117
Annual kWh (1,000s)			4,306				4,306			4,306			

		Current	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Single Plant												
Total CHW		667	874	874	1,234	1,234	1,516	1,933	1,933	1,933	1,933	1,933
Max Diversity	60%	400	524	524	740	740	910	1,160	1,160	1,160	1,160	1,160
Min Diversity	80%	534	699	699	987	987	1,213	1,547	1,547	1,547	1,547	1,547
kW/ton	0.60											
Annual kWh (1,000s)			617	617	871	871	1,070	1,364	1,364	1,364	1,364	1,364
kWh Savings (1,000s)			-1,025	-1,025	-1,688	-1,688	-1,489	-1,195	-2,942	-2,942	-2,942	-2,942
$ Savings (1,000s)	0.1566	per kWh	-160	-160	-264	-264	-233	-187	-461	-461	-461	-461
North Plant												
Total CHW		404	404	404	404	404	686	686	686	686	686	686
Max Diversity	60%	243	243	243	243	243	412	412	412	412	412	412
Min Diversity	80%	323	323	323	323	323	549	549	549	549	549	549
South Plant												
Total CHW		263	263	263	623	623	623	1,040	1,040	1,040	1,040	1,040
Max Diversity	60%	158	158	158	374	374	374	624	624	624	624	624
Min Diversity	80%	210	210	210	498	498	498	832	832	832	832	832

Legend:
CHW = Chilled water
DX = AHU w/ dx coil
Unitary = package or split dx

All capacities listed are in tons of cooling

Plant Codes:

0 = No plant assignment
1 = North Plant
2 = South Plant
No code for Single Plant; Single Plant numbers are for campus total.

Notes:
1. For new bldgs with no data, the following assumption was used: 250 sf/ton

P2S Engineering, Inc.
3731 LCC Analysis_prelim

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Energy Savings Calculation Documentation Provided for Site 6

PROPOSED LIGHTING SYSTEM										*SAVINGS*				
Edison Code	**FIX. QTY**	**NEW kW/ FIX.**	**Verf kW/Fixt**	**TOTAL FIX.(S) kW**	**Verf Total kW**	**ANNUAL KWH**	**Verf Annual kWh**	**ANNUAL COSTS**	**ANNUAL SAVINGS**	**DEMAND SAVINGS kW**	**ANNUAL ENERGY SAVINGS KWH**	**VERF Demand Savings (kW)**	**VERF Energy Savings (kWh)**	**VERF PEAK DEMAND SAVINGS kW**
CF13/2-SQ	15	0.026	0.026	0.390	0.390	912.6	912.6	$137	$363	1.04	2422	1.04	2422	0.96
f46ilp/h	14	0.35	0.35	4.900	4.900	11466	11466	$1,720	$531	1.51	3538	1.51	3538	1.41
f48ilp/h	6	0.46	0.468	2.760	2.808	6458.4	6570.72	$969				-0.06	-140	-0.06
F44WLL(G3) 1/2	10	0.047	0.047	0.470	0.470	1099.8	1099.8	$165	$47	0.13	314	0.13	314	0.12
F44WLL(G3)KIT	3	0.094	0.094	0.282	0.282	2470.32	2470.32	$371	$134	0.10	894	0.10	894	0.09
F42ILL (G3)	1	0.048	0.048	0.048	0.048	112.32	112.32	$17	$4	0.01	29	0.01	29	0.01
F44WLL(G3) 1/2	4	0.047	0.047	0.188	0.188	439.92	439.92	$66	$19	0.05	125	0.05	125	0.05
F42ILL (G3)	1	0.048	0.048	0.048	0.048	112.32	112.32	$17	$4	0.01	29	0.01	29	0.01
CF18/1-SCRW	8	0.018	0.018	0.144	0.144	336.96	336.96	$51				0.00	0	0.00
CF18/1-SCRW	2	0.018	0.018	0.036	0.036	84.24	84.24	$13				0.00	0	0.00
CF18/1-SCRW	11	0.018	0.018	0.198	0.198	463.32	463.32	$69	$278	0.79	1853	0.79	1853	0.74
F42ILL(G3)TG	7	0.051	0.048	0.357	0.336	835.38	786.24	$125	$23	0.07	154	0.09	203	0.08
F42ILL(G3)TG	20	0.051	0.048	1.020	0.960	2386.8	2246.4	$358	$66	0.19	440	0.25	580	0.23
F42ILL(G3)TG	92	0.051	0.048	4.692	4.416	10979.28	10333.44	$1,647	$304	0.86	2024	1.14	2669	1.06
F42ILL(G3)TG	3	0.051	0.048	0.153	0.144	358.02	336.96	$54	$28	0.08	190	0.06	140	0.06
F44WLL(G3) 1/2	6	0.047	0.047	0.282	0.282	659.88	659.88	$99	$28	0.08	188	0.08	188	0.07
F42ILL(G3)TG	3	0.051	0.048	0.153	0.144	358.02	336.96	$54	$10	0.03	66	0.04	87	0.03
F42ILL (G3)	2	0.048	0.048	0.096	0.096	224.64	224.64	$34	$9	0.02	58	0.02	58	0.02
CF18/1-SCRW	3	0.018	0.018	0.054	0.054	126.36	126.36	$19				0.00	0	0.00
F43ILL (G3)	20	0.073	0.072	1.460	1.440	5466.24	5391.36	$820	$221	0.39	1475	0.41	1550	0.39
MH360/1	4	0.408	0.368	1.632	1.472	4455.36	4018.56	$668	$93	0.23	622	0.39	1059	0.36
CF13/2-SQ	1	0.026	0.026	0.026	0.026	70.98	70.98	$11	$28	0.07	188	0.07	188	0.06
CF13/2-SQ	2	0.026	0.026	0.052	0.052	141.96	141.96	$21	$95	0.23	636	0.23	636	0.22
F43ILL (G3)	2	0.073	0.072	0.146	0.144	341.64	336.96	$51	$14	0.04	92	0.04	97	0.04
F43ILL (G3)	2	0.073	0.072	0.146	0.144	341.64	336.96	$51	$14	0.04	92	0.04	97	0.04
F44WLL(G3) 1/2	12	0.047	0.047	0.564	0.564	2052.96	2052.96	$308	$88	0.16	585	0.16	585	0.15
F43ILL (G3)	16	0.073	0.072	1.168	1.152	4251.52	4193.28	$638	$172	0.32	1147	0.33	1206	0.31
F44WLL(G3) 1/2	4	0.047	0.047	0.188	0.188	684.32	684.32	$103	$29	0.05	195	0.05	195	0.05

F44WLL(G3) 1/2	2	0.047	0.047	0.094	0.094	219.96	219.96	$33	$9	0.03	63	0.03	63	0.02
F42ILL (G3)	1	0.048	0.048	0.048	0.048	109.728	109.728	$16	$4	0.01	28	0.01	28	0.01
F42ILL (G3)	3	0.048	0.048	0.144	0.144	329.184	329.184	$49	$13	0.04	85	0.04	85	0.03
F44WLL(G3) 1/2	10	0.047	0.047	0.470	0.470	1222	1222	$183	$52	0.13	348	0.13	348	0.12
F42ILL (G3)	2	0.048	0.048	0.096	0.096	419.328	419.328	$63	$16	0.02	108	0.02	108	0.02
F44WLL(G3) 1/2	2	0.047	0.047	0.094	0.094	410.592	410.592	$62	$18	0.03	117	0.03	117	0.02
F44WLL(G3) 1/2	24	0.047	0.047	1.128	1.128	2639.52	2639.52	$396	$113	0.32	753	0.32	753	0.30
F42ILL (G3)	4	0.048	0.048	0.192	0.192	449.28	449.28	$67	$17	0.05	116	0.05	116	0.05
F42ILL (G3)	2	0.048	0.048	0.096	0.096	224.64	224.64	$34	$9	0.02	58	0.02	58	0.02
F44WLL(G3) 1/2	4	0.047	0.047	0.188	0.188	439.92	439.92	$66	$19	0.05	125	0.05	125	0.05
F44WLL(G3) 1/2	4	0.047	0.047	0.188	0.188	439.92	439.92	$66	$19	0.05	125	0.05	125	0.05
F42ILL (G3)	2	0.048	0.048	0.096	0.096	224.64	224.64	$34	$9	0.02	58	0.02	58	0.02
F44WLL(G3) 1/2	24	0.047	0.047	1.128	1.128	2932.8	2932.8	$440	$125	0.32	836	0.32	836	0.30
F42ILL (G3)	4	0.048	0.048	0.192	0.192	499.2	499.2	$75	$19	0.05	129	0.05	129	0.05
F44WLL(G3) 1/2	2	0.047	0.047	0.094	0.094	219.96	219.96	$33	$9	0.03	63	0.03	63	0.02
	364	NA	NA	**25.90**	**25.37**	**68,472**	**67,127**	**$10,271**	**$3,056**	**7.7**	**20,370**	**8.2**	**21,617**	**7.6**

Appendix C: Vending Machine Control Impact Analysis

Vending Machine Control Data Logging Sample Results

Location	Asset#	Product	Exposure	Metered Hours	Metered kWh	Notes	Vending Miser	Traffic	College
Music	5321449	Sobe	Out	390	120	Outside Covered (Eastern Exposure)	Enabled	Medium	Site 4
Music	5327867	Pepsi	Out	391	171	Outside Covered (Northern Exposure)	Enabled	Medium	Site 4
Art	5313268	Aquafina	Out	885	173	Comparable units next to each other - one enabled and one disabled - Outside Covered (Southeast Exposure)	Enabled	Medium	Site 4
Liberal Arts	5233782	Aquafina	Inside	886	262	Comparable units next to each other - one enabled and one disabled -	Enabled	Medium	Site 4
Science	80764	Pepsi	Inside	363	78	Comparable units next to each other - one enabled and one disabled - Inside Glass Front	Enabled	Heavy	Site 4
Academic Commons	5287418	Gatorade	Out	889	273	Comparable units next to each other - one enabled and one disabled -	Enabled	Medium	Site 4
SAC	5289036	Gatorade	Out	889	130		Enabled	Heavy	Site 4
SAC	5315068	Mountain Dew	Out	721	152		Enabled	Heavy	Site 4
Counseling	80843	Pepsi	Inside	159	18		Enabled	Heavy	Site 4
A6-Pavillion	First Class	Snapple	Inside	480	111		Enabled	High	Site 2
A6-Pavillion	First Class	Snack	Inside	480	11	Inside	Enabled	High	Site 2
Library-Breezeway	RY02018549	Powerade	Outside	480	91	The Coke and Powerade units are comparable units next to each other - one with Vending Miser enabled and one disabled	Enabled	Light	Site 2
Library-Outdoor	RY01002864	Minute Maid	Outside	480	105	The Minute Maid and Powerade units are comparable units next to each other - one with Vending Miser enabled and one disabled	Enabled	High	Site 2

PEC South Bldg 1	RY94086327	Dasani	Inside	480	180	Comparable units next to each other - one with Vending Miser enabled and one disabled	Enabled	High	Site 2
Cox Bldg vending area	Asset: 5442843	Pepsi	Inside	480	116	Inside	Enabled	Heavy	Site 3
Lecture Lab north entry, level 1 & level 2	Unit: 200231BA00334	NA	Outside	480	62	Outside in Covered Walkway	Enabled	Light	Site 3
Student Services Bldg 3rd floor lobby	Unit: SN 1204568	NA	Inside	479	71	12 Button Vendo; Inside	Enabled	Light	Site 3
Tech Bldg north entry	Unit: 200218BA00568	NA	Outside	479	55	Outside in Covered Walkway	Enabled	Light	Site 3
Human Resources	80762	Pepsi	Inside	887	285	Outside Covered (Southern Exposure)	Disabled	Light	Site 4
Art	86971	Pepsi	Out	885	232	Comparable units next to each other - one enabled and one disabled - Outside Covered (Southeast Exposure)	Disabled	Medium	Site 4
Liberal Arts	5231680	Pepsi	Inside	886	321	Comparable units next to each other - one enabled and one disabled -	Disabled	Medium	Site 4
Science	81982	Aquafina	Inside	362	102	Comparable units next to each other - one enabled and one disabled - Inside Glass Front	Disabled	Heavy	Site 4
Academic Commons	5308453	Aquafina	Out	889	232	Comparable units next to each other - one enabled and one disabled -	Disabled	Medium	Site 4
Ticket Office	5288691	Gatorade	Out	889	270	Outside Covered	Disabled	Heavy	Site 4
Library-Outdoor	First Class	Snack	Outside	480	12	Outside Covered	Disabled	Light	Site 2
Library-Breezeway	RY03009487	Coke	Outside	480	117	The Coke and Powerade units are comparable units next to each other - one with Vending Miser enabled and one disabled	Disabled	Light	Site 2
Library-Outdoor	RY01002746	Powerade	Outside	480	145	The Minute Maid and Powerade units are comparable units next to each other - one with Vending Miser enabled and one disabled	Disabled	High	Site 2
PEC South Bldg 1	309622	Coke	Inside	480	214	Comparable units next to each other - one with Vending Miser enabled and one disabled	Disabled	High	Site 2
Cox Bldg vending area	Asset: 6790BA	Gatorade	Inside	480	144	Inside	Disabled	Heavy	Site 3

Average hours logged - all loggers = 589
Average kWh usage - all loggers = 147
Average hours logged - enabled loggers = 550
Average kWh usage - enabled loggers = 121
Average hours logged - disabled loggers = 654
Average kWh usage - disabled loggers = 189

Vending Control Data Logger Matched Pair Data Summary

Campus	Location	Hours	kWh Enabled	kWh Disabled	Annual Savings - kWh	Percent Savings
Site 4	Art Building	885	173	232	584	25.4%
Site 4	Liberal Arts	886	262	321	583	18.4%
Site 4	Science	363	77.79	102	584	23.7%
Site 2	Library-Breezeway	480	90.65	117	481	22.5%
Site 2	Library-Outdoor	480	105	145	730	27.6%
Site 2	PEC South Bldg 1	480	180	214	621	15.9%
Site 3	Cox Bldg vending area	480	116	144	511	19.4%

Average Annual kWh Savings = 585
Average Percent kWh Savings = 22%

Verified Vending Machine Controls by Campus

Vending Machine Controls	AS-BUILT SAVINGS		VERIFIED SAVINGS	
	Demand (kW)	Energy (kWh)	Demand (kW)	Energy (kWh)
Site 3	0.0	20,670	0.0	9,152
Site 2	0.0	52,290	0.0	23,152
Site 4	0.0	85,860	0.0	38,016
TOTAL	0.0	158,820	0.0	70,320

Appendix D: Surveys

The following surveys guides were used in the Community College District Retrofit Program.

- Key Staff (Intergy and Edison Program Managers)
- ESCOs and Contractors
- Nonparticipating Campus Staff

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Edison IDEEA Community College Partnership Interview Guide for

Key Staff (Intergy and Edison)

Date ____
Name ____
Organization ____

These questions cover a range of topics with which you may or may not be familiar. If you are not familiar with a particular area, please feel free to say so, so we can focus on those topics you are most knowledgeable about.

Program Design

1. ***[Intergy]*** How did the program idea come about?
2. **[*Edison and Intergy*]** What were the initial goals for the program?

Marketing and Outreach

[*Issues for Intergy only*]

3. The program originally targeted a select number of campuses, and then expanded. What happened that allowed the number of campuses to be expanded? (What happened to the original target market?)
4. What was your original approach to the market?
5. How did the marketing change to reach the additional campuses?
6. Why did you switch to a performance contract strategy?
7. Did the changes provide lessons for future programs with community colleges?

[*Issues for both Intergy and Edison*]

8. What role did Edison have in informing the campuses of the program opportunity?
9. Was this effective?

Program/Project Administration

10. What has been the frequency of your interactions with (Edison/Intergy)?

[*Issues for Intergy only*]

We would like to understand how program responsibilities were divided between the Intergy, the campuses, contractors, and ESCOs? That is, who was responsible for:

11. Project identification?
12. Project design (if any)?
13. Finalization of project details?
14. Purchasing required project materials and equipment?
15. Project installation or construction?
16. Project documentation?
17. Were any challenges encountered during any of these project steps? ***[Describe]***
18. What lessons were learned from this division of responsibilities?

[*Issues for both Intergy and Edison*]

19. Has project billing worked as expected?
20. How about the Project Reporting System?
21. Have the incentive payments to ESCOs, contractors, and campuses been timely?

Delivery and Implementation

[*Issues for Intergy only*]

22. How were the projects selected?
23. What was the process for implementing the projects?
24. How were the different parties informed of project progress?
25. Did any of the projects change during the course if implementation?

[*Issues for both Intergy and Edison*]

26. What role did Edison have in selecting the projects and keeping track of projects?
27. Was this effective?

Market/Customer Response

[*Issues for Intergy only*]

28. What were the roles of the ESCOs and contractors?
29. How were the ESCOs brought into the program?
30. How were the contractors brought into the program?
31. How was the performance contract developed for each of the ESCOs?
32. What were the benefits and drawbacks of the performance contracting approach?
    a. Benefits
    b. Drawbacks
33. Are you aware of additional energy efficiency opportunities on the campuses? **[*Describe*]**
34. Were any new skills developed or required among the implementers and participants in undertaking the projects?
35. **[*If not addressed*]** The proposal mentioned using campus staff for continuous commissioning. Is this something they were familiar with?
36. ***[If so]*** Did they do any continuous commissioning?
37. ***[If so]*** How is that work going?
38. What was learned from the customer satisfaction surveys?

Overall Lessons Learned

[*Issues for both Intergy and Edison*]

39. How well did the partnership approach work?
40. Are you aware of conversations about campus projects with contacts at other campuses? **[*Both participating and nonparticipating campuses*]**
41. What can you tell us about those conversations?
42. What would you say is the best aspect of the program?
43. What would you say most needs to be changed?
44. Do you have any further comments or observations about the program?

Edison IDEEA Community College Partnership Interview Guide for

ESCOs and Contractors

Date ____
Name ____
Organization ____

My name is ____, and I am conducting an evaluation of the IDEEA Community College Partnership. I understand you participated in the program. Do you have about 10-15 minutes to answer some questions about your involvement in the program?
All responses will be kept confidential.

1. What was your role in the program?
2. How were you brought into the program?

Program Administration and Delivery

Regarding responsibilities for various project stages, who was responsible for:

3. Project identification?
4. Project design (if any)?
5. Finalization of project details?
6. Purchasing required project materials and equipment?
7. Project installation or construction?
8. Project documentation?
9. How did this division of responsibilities work for you?
10. What was the process for implementing the projects?
11. **[*If not addressed*]** Did you encounter any difficulties during any of the project steps in which you were involved?
12. Were incentive payments timely?
13. How were you kept informed of project progress?

Market/Customer Response

14. What were the benefits and drawbacks of the performance contracting approach?
    a. Benefits
    b. Drawbacks
15. Were any new skills developed or required in order to complete the projects?
16. Did you see additional energy efficiency opportunities on the campuses that were not addressed by the projects? ***[Describe]***
17. **[*If not addressed*]** The program proposal mentioned using campus staff for continuous commissioning. Is this something they were familiar with?
18. ***[If so]*** Did they do any continuous commissioning?
19. ***[If so]*** How is that work going?
20. What feedback from the campuses have you received about the program or the campus projects?

Overall Lessons Learned

21. How well did the partnership approach work?
22. Are you aware of conversations about campus projects with contacts at other campuses? **[*Both participating and nonparticipating campuses*]**
23. **[*If so*]** What can you tell us about those conversations?
24. What would you say is the best aspect of the program?
25. What about the program most needs to be changed?
26. Do you have any further comments or observations about the program?

Edison IDEEA Community College Partnership Interview Guide for

Nonparticipating Campus Staff

Date ____
Name ____
Organization ____

My name is ____, and I am conducting an evaluation of Edison's IDEEA Community College Partnership. I understand you participated in the program. Do you have about 10-15 minutes to answer some questions about your involvement in the program?
All responses will be kept confidential.

Marketing and Outreach

1. How did you learn of the program opportunity? When he received the phone call there was a lot energy efficiency activity going on, and he couldn't tell whether this call was legitimate or an ESCO soliciting business. He asked for literature and never received it. Received another call, and again asked for literature, but again never received anything. Chevron is their energy services provider, and later told them it was a legitimate program and that the program opportunity could have been worth about $100,000 to them. They were disappointed, but have moved on.
2. What was your understanding of the opportunity? It came across as really great rebates for energy savings projects. But he doesn't recall anything specific.
3. Was the information on the program options sufficient for you to consider projects to implement?
4. **[*If no*]** what additional information did you need?

Market/Customer Response

5. Are there energy efficiency project opportunities on your campus? ***[Describe]*** They have taken care of all of the "low hanging fruit."
6. **[*If yes*]** What are the reasons your campus did not participate in the program? See above.
7. **[*If not addressed*]** The program proposal mentioned using campus staff for continuous commissioning. Is this something you are familiar with?

Delivery and Implementation

Free Ridership

8. What types of capital equipment projects have been done on your campus during the last two years? ***[Describe]***
9. Do you have plans for additional capital projects? ***[Describe]***
   [*If yes*] When is it likely those projects will occur?

Operations and Maintenance

10. Who is responsible for equipment and facility operations and maintenance on your campus?

11. What is the frequency of normal operations and maintenance activities?
12. Are there any unusual O&M situations or requirements on your campus?

Overall Lessons Learned

13. Would the partnership approach work for your campus?
14. Have you had conversations about this program with contacts at other campuses? **[*Both participating and nonparticipating campuses*]**
15. If yes, what can you tell us about those conversations?
16. What would you say is the best aspect of the program?
17. What would you say most needs to be changed?
18. Do you have anything else to add?

5. Convenience Store Energy Efficiency Delivery Program

Appendix A: Field Plan and Instruments

Memorandum

To: Ben Bronfman, Anne West

From: Floyd Keneipp

Copy: Shahana Samiullah, Kevin Cooney, Ed Flores, Mike Yim

Date: September 25, 2006

RE: Sample design and field data collection plan for Convenience Store Energy Efficiency Delivery Program

The Convenience Store Energy Efficiency Delivery (CSEED) Program provides the direct installation of comprehensive energy efficiency measures to the hard-to-reach convenience store market segment throughout Edison's service territory. The CSEED Program addresses select market barriers through a package of comprehensive measures specific to participating convenience stores and offers customized incentives focused on a one-year payback, 100% financing, and direct installation. Research has revealed that the convenience store market segment is the most difficult to reach and underserved segment in California[12] indicating a strong need for the Program.

CSEED installations consisted of identifying and implementing changes in refrigeration, HVAC, and lighting systems (to reduce energy use while maintaining aesthetics which is a key factor for

[12] California Statewide Nonresidential Customer Hard-To-Reach Study Final Report 2001.

this segment). The Program achieves persistence of long-term energy savings by installing hardware measures with effects of which are clearly exhibited in monthly utility bills.

Consequently, the intent of the following sample design and field data collection plan is to:

- Specify data collection objectives.
- Define the sample of participant sites that will undergo verification activities.
- Define participant contact protocol and site activities.
- Provide the data collection and communication instruments used during field activities (See Appendix A).

Data Collection Objectives:

Field activities will provide verification of Program records with respect to overall project goals. This process will confirm several key components needed to accurately analyze Program impacts, gross energy savings and net energy savings achieved. The Program components to be confirmed include:

1. Proper measure installations
2. Energy savings assumptions
3. Correlate installation reports with participant interviews.

The approach to each of these activities is discussed further below. It should be noted that the aforementioned data will be collected through both on-site verification activities and supporting participant surveys to be administered on-site and through the telephone (Appendix A). Surveys that include a range of process evaluation related topics will also be administered to participants that have obtained retrofits through the Program (Appendix E).

2. Complete Measure Installation Verifications:

The onsite verification process will entail observations of installed measures and the collection of key energy performance variables including, but not limited to:

a) Measure presence.
b) Appropriate installation verification.
c) Key operational characteristics including daily schedules, seasonal variations in schedules, and control strategies.
d) Metering infrastructure (recording meter numbers and determining whether the measures have dedicated meters).
e) Existing logger data.

Furthermore, in the event that recorded measures are not present, Summit Blue will make an extensive effort to determine the cause of removal (if previously installed) along with future plans. These inquiries will be conducted through on-site interviews and the telephone should a representative not be available during the verification process.

3. Verify Energy Savings Assumptions:

Four methodologies will be employed to confirm the energy saving assumptions attributed to the installed measures:

d) Historical billing analysis coupled with on-site observations and interviews.

e) An analysis of existing metering devices, such as the inherent CoolTrol data logging capability, where available.

f) A detailed review of secondary literature where available.

g) A thorough review and discussion of engineering calculations.

The aforementioned data will be used to provide the necessary information required to calculate ex-post savings values and yield the kW and kWh reduction values resulting from the installation of energy efficient measures.

Although the CSEED Program is segmented into refrigeration and lighting measures, the diverse combination of measures used at each store requires a broad evaluation approach to fully validate Program savings. The lighting measure savings are estimated via the deemed or custom savings measures and onsite inspection. Both deemed and custom savings calculations will be reviewed for consistence and applicability to this market. Additionally, measure-specific logging data will be utilized to validate the engineering models and to segment the lighting measures from the refrigeration measures. Billing analysis will provide an overall store efficiency savings measure. However, several precautions are in order to avoid bias. First, care must be taken to account for non-Program related changes in the store energy consumption patterns. For example, installation records will need to be reviewed to correct for novelty cabinet turnover. Second, persistence of energy-efficient measures will be reviewed to control for post-installation modification or replacement of high efficiency equipment. Third, some of the data provided through the CoolTrol system logging capability will reflect primarily 1 month of information recorded during September 2006 and may not reflect higher summer or lower winter ambient temperature effects on system performance.

The CSEED Program conducts metering at a select number of participant stores. Data from these meters will be analyzed, and, as far as statistically possible, extrapolated to benchmark savings for the overall Program. Additionally, NRM Technology, the contractor that designed and installed the refrigeration measures, has installed the CoolTrol data logging system. This system collects the following data:

- Ten-year run time log of each output by month and year in minutes (solenoid, evaporative fans, cooler door heaters and freezer door heaters).
- Fifteen minute run time and temperature log of each input and output. Depending on the number of coolers being controlled, the log could have 60 to 120 days worth of data.

The data collected by these instruments is easily downloaded using the serial port on a laptop with a special cable and connector provided by NRM Technology. The data will be collected during site visits.

Key researchable issues include:

- Can the long-term persistence of energy efficiency measures be estimated?
- Can static and dynamic changes in energy consumption associated with ambient (outside) temperature be identified?

Again, it should be noted that billing analysis will be conducted to provide an estimate of energy savings achieved by the Program installations. Billing data can provide an overall store efficiency savings measure. However, several precautions will be taken in order to identify non-Program related changes in energy consumption patterns, including a review of novelty cabinet turnover and other dynamic changes in consumption patterns, such as run-time hours.

Summit Blue will analyze relevant literature pertaining to this Program and its measures in order to provide benchmarks for comparison with the data collected. This will entail a thorough review of vendor literature and applicable reports for similar Programs (where available). Moreover, Summit Blue will review and discuss Savings Calculations with Program representatives in order to determine whether or not they are representative of the measures installed and operating conditions noted.

Telephone interviews will be conducted at a census of sites included in verification field sample. The focus will be on clarifying data as needed to reduce uncertainty in ex-post estimates. Interviews will include impact topics regarding run hours and customer-initiated actions impacting energy consumption. These interviews will likely include all or a subset of the process analysis questions.[13]

Sample Design

Sampling Methodology for Installation Verifications

Physical site inspections will verify equipment installation and operation onsite and will be conduced in consideration of those sites previously verified by Edison representatives, in order to not duplicate previous efforts. The number of onsite visits will be designed to 'fill-in the gaps' and will be limited to those most relevant sites likely to contribute to the existing knowledge base. Moreover, to the extent that Edison has conducted a visual verification of installation and operation of customer sites, the evaluation will utilize the available Edison data in the overall savings estimate. The evaluation team has requested from Edison records for all sites verified by Edison. In addition, Summit Blue will place more emphasis on verifying measures that have contributed significantly to overall savings attributable to the Program.

A total of 10 participant sites that were retrofitted through the Program will receive verification activities. The sites chosen for verification activities were selected from the sites that have been in operation for at least one year prior to the verification inspections. This sample design provides a 90% confidence and 20% error based on the proportionate sample approach where the sample exceeds 10% of the population and standard error equaling 1.645. The equation used is:

where

[13] See Appendix D, surveys.

Sample size = N x [P x (1-P) x Z^2] / [N x E^2 + P x (1-P) x Z^2]

N = Population size

E = Error

Z = Standard error

P = Proportion of the population

Table 1 lists the most recent demand and energy savings attributed to the CSEED Program by the implementation contractor. The activities include both refrigeration and lighting measures. A total of 32 sites participated in measure installations for this Program.

Table 1: Program Energy Savings:

System Measure	# Stores	kW Savings	kWh Savings
Lighting and Refrigeration	17	38	554,431
Lighting Only	11	15	149,801
Refrigeration Only	4	5	81,564
Total	*32*	*58*	*785,796*

Table 2 highlights the number and type of measure that have been installed throughout the participant sites by the CSEED Program.

Table 2: Measure Types:

Code	Description	Quantity
CFS11	Retrofit Incandescent Lamps to CFL	87
F21T8DX	Retrofit T12 Lamps to T8 Fluorescent Fixtures	468
ELD	Replace Incandescent EXIT signs with LED Fixtures	16
WA2	De-Power Restroom Light and Fan with Motion Sensor	23
EFC	Install Controls on Evaporator Fan Motors	31
HECFM	Replace Inefficient Evaporator Fan Motors	148
LCASH	Install Low Temp ASH Door Controls	8
MCASH	Install Med Temp ASH Door Controls	25
CNC	De-Power Coolers During Off-Hours with Time Controls	13
Total		*819*

Subsequently, Table 3 illustrates the number of sites that will receive verification activities by Summit Blue. It should be noted that the anticipated sites that will receive verification activities may change if there are unforeseen complications, but the overall number of sites verified will remain constant.

Table 3: Sites Receiving Verification Activities:

Customer Name	Strata	Service Account City	Service Account State	kWh Savings to Date
1	1	Temecula	CA	65524
2	1	Blythe	CA	59436
3	1	Riverside	CA	42614
4	1	Riverside	CA	42417
5	1	Arcadia	CA	37527
6	1	Laguna Beach	CA	34534
7	1	Irvine	CA	31024
8	1	Yucaipa	CA	29234
9	1	Blythe	CA	28856
10	1	Fullerton	CA	28345
11	Alt	Barstow	CA	28076
12	Alt	29 Palms	CA	27631
13	Alt	Terra Bella	CA	24202
14	Alt	Upland	CA	23754
15	Alt	Menifee	CA	23237

Potential Adjustments to Verification Sample Based on Ongoing Installations

According to conversations with CSEED representatives, all installations were required to be completed by the end of June. Given that the field verification activities will take place in early September, no additional measures are expected to be installed following the site verification visits. If, however, additional measures are installed, records for each new measure installation will be reviewed and gross savings will be adjusted according to this data along with a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with CSEED representatives.

Sampling and Uncertainty

No discernable preference was shown when developing the field sample set from qualifying sites. As a result, the sample set is assumed to have little or no bias. However, the sample may be adjusted during the course of the evaluation if discrepancies are realized, and the updated sample will be random as well in order to minimize overall impact analysis bias.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

The evaluation methodology does not directly correspond to any of the IPMVP options. Instead, Summit Blue is proposing an alternative method that relies heavily on billing analysis, comprehensive engineering calculations, data logging, and interviews with relevant participants and Program staff. However, the approach correlates closely with Option A: Partially Measured Retrofit Isolation in that it will use partial short term field measurement of energy use to verify or adjust ex-ante energy and demand savings estimates for measures installed. Some performance parameters will be based on secondary data. Engineering adjustments made to specific measure savings will be extrapolated to the population of installed measures for the specific program given that they prove representative.

Calculation of Gross and Adjusted Gross Demand Impacts

This evaluation will use the Energy Efficiency Policy Manual[14] peak demand period definition of noon to 6 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated based on measure kW draw, by reviewing relevant data on the frequency of participant operation characteristics, and also from data provided by logging. Adjusted Program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this Program will be reported in the format provided in Appendix B. Future savings will be based on manufacturer statement of expected system life, and on estimates from participants that they will replace failed measures with the same technology. There are no therm savings estimated for this Program.

Customer Contact Protocol and Site Activities

Field activities will typically involve five components;

1. Summit Blue will coordinate with the implementation contractor and store manager contacts to establish field activity dates and identify issues of concern.
2. The mangers at each participant site will be provided with a letter of introduction[15] on Summit Blue letterhead that provides a description of the activities to be undertaken at their respective site.
3. Summit Blue staff will conduct verification activities at convenience stores that have given their approval noting measure count, type, operating conditions, etc.
4. In order to support billing analysis, Summit Blue staff will confirm meter numbers at each site. In the event that there are non-dedicated meters at the site, Summit Blue will confirm their meter numbers as well assuming the load attributable to the meter is meaningful.

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[14] Version 2, August 2003
[15] Appendix C, sample letter

5. The energy assumptions will be compared with the billing analysis to further validate Program assumptions.

The results of these field activities will be used to calculate installation rates and develop adjusted gross Program savings.

Appendix A – Measure Installation Verification Worksheet:

SITE INFORMATION ***Date:*** ______________________

Customer Name: ______________________ Application Code: ______________________

Contact Name: ______________________ Phone: ______________________

Apartment # Address: ______________________

City / Town: ______________________ State: __________ Zip: ______________

Measure Information

Ref #	Space code	Measure Type	Presence	Logger Information	Retrofit	Operating Schedule
1			Yes / No	Yes / No	Yes / No	
2			Yes / No	Yes / No	Yes / No	
3			Yes / No	Yes / No	Yes / No	
4			Yes / No	Yes / No	Yes / No	
5			Yes / No	Yes / No	Yes / No	
6			Yes / No	Yes / No	Yes / No	

Space Type Codes: SF = Store Front; **S** = Storage; **RS** = Rear Store; **H** = Hallway; **O** = Other

1. What are the operating hours of your convenience store?

2. What are the respective operating hours of the retrofit equipment that has been installed?

Measure ref #	1	2	3	4	5	6
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

FURTHER QUESTIONS

1. Is the equipment in working condition to the best of your knowledge? (Y / N). If no, describe;

2. Does the equipment appear to be properly installed? (Y / N) If no, describe;

3. Has any of the equipment been removed or replaced since installation? (Y / N) If yes, describe;

    a. Why were they removed or replaced?

    b. When were they removed or replaced?

4. Given that measures may fail before their EUL, how probable is it that you will replace the failed measure with the same technology?

5. How likely is it that you would have installed the retrofit measures in absence of the Program?

6. Has the Program influenced you to participate in other energy efficiency measures?

7. To the best of your knowledge, have other convenience stores become more receptive to energy efficient measures?

LOCATION OF INSTALLATIONS:

(map locations)

Comments:

<u>Appendix B – Program Reporting:</u>

CPUC tables

Appendix D – Store Manager Contact Letter:

August 22, 2006

Dear Site Manger,

Southern California Edison is conducting an important study to evaluate the effectiveness of its energy efficiency programs implemented at sites such as those under your management. In 2005, one or more measures were installed at your site to reduce energy consumption while maintaining aesthetic appeal. Part of that installation process included allowing representatives of Southern California Edison the ability to inspect the installations to determine if the systems were properly installed and operating correctly. Summit Blue Consulting, the designated inspection contractor, would like to complete these inspections in September and are requesting your help.

Summit Blue would like to access your site and complete a brief inspection of the system. The activities will include a visual inspection of the measures that were installed and testing the system functions. You will be contacted by a representative shortly to schedule this work at a time that is convenient for you. In addition, we will make the results of our inspection available to you upon completion of our work.

Thank you very much for your participation in the program and help on this important inspection. If you have any questions about scheduling the onsite activities or the nature of this inspection, please call Floyd Keneipp from Summit Blue Consulting at 925-935-0270.

Regards,

[Summit Blue Contact Representative]

Appendix E – Meter Data Collection Sheet;

Site Name ______________________________

Site Facility Description ______________________________

Store Reference #	Store name / Reference #	Meter #
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Appendix B: Verification and Calculation Details

Tables follow.

Table B–1. Distribution of Recorded Savings

Retrofit Measure	Recorded Installations	Recorded kW Savings	Recorded kWh Savings	Weight
Depower Coolers during Off-Hours with Time Controls	13.00	-	11,765.00	0.72%
Depower Restroom Light and Fan with Motion Sensor	23.00	-	16,927.00	1.04%
Install Controls on Evaporator Fan Motors	31.00	-	180,079.00	11.08%
Install Low Temp ASH Door Controls	8.00	1.73	31,016.00	3.35%
Install Med Temp ASH Door Controls	25.00	6.22	142,656.00	13.97%
Replace Inefficient Evaporator Fan Motors	148.00	17.02	101,824.00	20.47%
Replace w/ 1 Lamp EXIT Light Emitting Diode Fixtures Using 3 Watts Ea	16.00	0.56	5,184.00	0.79%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 11 Watts Ea	10.00	0.40	3,505.00	0.55%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 19 Watts Ea	2.00	0.08	701.00	0.11%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 20 Watts Ea	59.00	2.36	20,679.50	3.24%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 27 Watts Ea	2.00	0.08	701.00	0.11%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 36 Watts Ea	1.00	0.04	350.50	0.05%
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 7 Watts Ea	10.00	0.40	3,505.00	0.55%
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 30 Watts Ea	3.00	0.20	1,875.95	0.28%
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 33 Watts Ea	2.00	0.13	1,250.64	0.19%
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 50 Watts Ea	25.00	1.64	15,632.97	2.33%
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 72 Watts Ea	23.00	1.51	14,382.33	2.14%
Retrofit to 2 Lamp Compact Fluorescent Fixtures Using 40 Watts Ea	3.00	0.12	1,051.50	0.16%
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 100 Watts Ea	75.00	5.17	46,898.86	7.20%
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 147 Watts Ea	8.00	0.52	5,002.55	0.74%
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 30 Watts Ea	1.00	0.07	625.32	0.09%
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 48 Watts Ea	87.00	5.69	54,402.68	8.10%
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 55 Watts Ea	29.00	1.90	18,134.23	2.70%
Retrofit to 2 Lamp T8 U-Tube Fluorescent Fixtures Using 48 Watts Ea	10.00	0.65	6,253.18	0.93%
Retrofit to 2 Lamp T8 U-Tube Fluorescent Fixtures Using 55 Watts Ea	4.00	0.26	2,501.27	0.37%
Retrofit to 3 Lamp T8 Fluorescent Fixtures Using 78 Watts Ea	16.00	1.05	10,005.09	1.49%
Retrofit to 3 Lamp T8 Fluorescent Fixtures Using 81 Watts Ea	11.00	0.72	6,878.50	1.02%
Retrofit to 3 Lamp T8 Fluorescent Fixtures Using 83 Watts Ea	10.00	0.65	6,253.18	0.93%
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 108 Watts Ea	81.00	5.30	50,650.77	7.54%
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 200 Watts Ea	25.00	1.64	15,632.95	2.33%
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 55 Watts Ea	4.00	0.26	2,501.27	0.37%
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 96 Watts Ea	54.00	3.53	33,767.18	5.03%
Total	**819.00**	**59.90**	**812,593.43**	**100.01%**

Table B–2. Verified Installations

Retrofit Measure	Recorded Installations	Verified Installations	Measures in Place	Weight
Depower Coolers during Off-Hours with Time Controls	2	2	2	0.01
Depower Restroom Light and Fan with Motion Sensor	6	6	6	0.01
Install Controls on Evaporator Fan Motors	18	18	18	0.11
Install Low Temp ASH Door Controls	5	5	5	0.03
Install Med Temp ASH Door Controls	13	13	13	0.14
Replace Inefficient Evaporator Fan Motors	79	79	79	0.20
Replace w/ 1 Lamp EXIT Light Emitting Diode Fixtures Using 3 Watts Ea	4	4	4	0.01
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 20 Watts Ea	29	29	22	0.03
Retrofit to 1 Lamp Compact Fluorescent Fixtures Using 27 Watts Ea	2	2	2	0.00
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 33 Watts Ea	1	1	1	0.00
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 50 Watts Ea	7	7	7	0.02
Retrofit to 1 Lamp T8 Fluorescent Fixtures Using 72 Watts Ea	14	14	14	0.02
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 100 Watts Ea	16	16	16	0.07
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 30 Watts Ea	1	1	1	0.00
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 48 Watts Ea	12	7	7	0.08
Retrofit to 2 Lamp T8 Fluorescent Fixtures Using 55 Watts Ea	3	3	3	0.03
Retrofit to 2 Lamp T8 U-Tube Fluorescent Fixtures Using 48 Watts Ea	10	10	10	0.01
Retrofit to 3 Lamp T8 Fluorescent Fixtures Using 83 Watts Ea	10	0	0	0.01
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 108 Watts Ea	4	4	4	0.08
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 55 Watts Ea	4	4	4	0.00
Retrofit to 4 Lamp T8 Fluorescent Fixtures Using 96 Watts Ea	24	21	21	0.05

Table B–3. CoolTrol Cooler and Evaporator Fan Control Calculations

Compressor Annual Run Time	45%	
Total Run Hours	3,942	Hrs/Yr
Power Factor	0.85	
Typical Compressor		
Volts	208	
Amps	12.5	
Phase	3	
PF	0.85	
Compr Load	3.828	kW
Annual	15,089	kWh
Evap Fans		
Volts	115	
Amps - 6 Fans	10.8	
Phase	1	
PF	0.85	
Run Time Before	8,760	Hrs/Yr
Fan Load	1.056	kW
Annual	9,248	kWh
BTU/T	12,000	
BTU/kWh	3,415	
kWh/T	0.285	
kW/T for Cooler	1.75	
Additional kWh from Fan Motor Heat	4,606	kWh
Total Fan Usage	**13,854**	**kWh**
Evap Fan Run Time with CoolTrol	5,102	Hrs/Yr
Reduction in Run Time	3,658	Hrs/Yr
Annual kWh Savings	**5,785**	**kWh**

Table B–4. ECM Evaporator Fan Motor Replacement Calculations

Evap Fans		
Volts	115	
Amps - 6 Fans	1.8	
Phase	1	
PF	0.85	
Run Time Before	5,102	Hrs/Yr
Fan Load	0.176	kW
Annual	898	kWh
BTU/T	12,000	
BTU/kWh	3,415	
kWh/T	0.285	
kW/T for Cooler	1.75	
Additional kWh from Fan Motor Heat	447	kWh
Total Fan Usage	**1,345**	**kWh**
Savings for ECM	50%	
kW Load Reduction	**0.088**	**kW**
Annual kWh Savings	**672.38**	**kWh**

Table B–5. CoolTrol Anti-Sweat Controls Calculations

Typical Cooler with 10 Doors - Medium Temp Doors		
Volts	120	
Amps/10 Doors	7.2	
Phase	1	
Load	0.864	
Annual Hours On	8,760	Hrs/Yr
Current Annual Use	7,569	kWh
Annual Hours OFF	5,000	Hrs/Yr
Remaining Hours with Average Power at 50%	1,880	Hrs/Yr
Total Reduced Run Time	6,880	Hrs/Yr
Annual kWh Savings	**5,944**	**kWh**
Typical Freezer with 4 Doors - Low Temp Doors		
Volts	120	
Amps/4 Doors	9.00	
Phase	1	
Load	1.080	
Annual Hours On	8,760	Hrs/Yr
Current Annual Use	9,461	kWh
Annual Hours Operating at 40% Power	4,000	Hrs/Yr
Remaining Hours with Average Power at 75%	4,760	Hrs/Yr
Total Reduced Run Time	3,590	Hrs/Yr
Annual kWh Savings	**3,877**	**kWh**

Table B–6. CoolTrol Novelty Cooler Shut Off Calculations

Typical Novelty Cooler - 11 Amps /Unit		
Volts	120	
Amps	11	
Phase	1	
PF	0.85	
Load	1.071	kW
Annual Compressor Hours On 70%	6,132	Hrs/Yr
Current Annual Use	6,567	kWh
Annual OFF Hours per Day	7	Hrs/Yr
Assume 70% of Normal Load at Night		
Annual Run Time Savings	**1,341**	**Hrs/Yr**

Table B–7. Refrigeration Reduction in Operation Hours Calculations

Measure	Month	500 N Santa Anita Avenue	519 S. Harbor Blvd. F	519 S. Harbor Blvd.	1390 N Coast Highway	1390 N Coast Highway F	4511 Campus Drive	4511 Campus Drive	29115 Old Town Front St.	29115 Old Town Front St.	29115 Old Town Front St.	2955 Haun Rd.	35112 Widlwood Canyon Rd.	17905 Van Buren Blvd. F	17905 Van Buren Blvd.	23290 Avenue 95
Solenoid	1		51.26%	43.50%	21.48%	51.12%							33.33%			
Solenoid	2	49.07%	47.14%	45.01%	22.11%	51.92%			29.76%	30.18%	11.16%	55.21%	37.71%	54.00%	36.03%	39.32%
Solenoid	3	46.85%	43.16%	43.60%	21.94%	48.47%	28.47%	33.11%	26.01%	31.90%	9.70%	57.27%	35.89%	50.21%	36.25%	42.47%
Solenoid	4	53.64%	49.54%	48.56%	22.30%	53.53%	29.45%	40.90%	28.88%	41.19%	26.84%	51.52%	41.46%	56.15%	37.16%	52.64%
Solenoid	5	62.01%	44.07%	55.12%	28.09%	51.94%	29.74%	52.81%	32.72%	57.68%	47.88%	49.40%	48.28%	70.61%	43.12%	77.39%
Solenoid	6	68.79%	47.16%	57.70%	35.07%	57.68%	34.71%	61.84%	36.80%	63.15%	60.03%	48.75%	53.22%	77.95%	48.07%	87.96%
Solenoid	7	75.23%	53.14%	64.36%	47.30%	61.07%	41.69%	67.65%	41.48%	45.67%	21.66%	48.37%	55.97%	97.35%	54.06%	88.33%
Solenoid	8	70.20%	55.20%	60.20%	46.74%	61.27%	34.68%	53.76%	39.16%	40.55%	18.53%	49.73%	53.59%	76.40%	48.44%	55.68%
Solenoid	9	69.67%	46.64%	57.30%	41.05%	57.24%	32.53%	51.25%	35.67%	35.00%	21.63%		50.42%	68.95%	43.82%	52.33%
Solenoid	10	63.06%	42.22%	53.53%	34.57%	52.69%	27.36%	43.76%	32.06%	36.23%	17.30%		45.40%	62.64%	43.49%	47.85%
Solenoid	11		50.80%	44.82%												
Solenoid	12		52.19%	44.09%	24.46%	52.65%										
		62.37%	48.92%	51.57%	31.87%	54.84%	32.86%	51.80%	34.17%	44.20%	28.35%	51.74%	47.39%	67.07%		63.11%
hese fans ran 100%	Weight	Uniform														
Evaporator Fans	1		62.47%	62.33%	35.40%	66.50%							33.33%			
Evaporator Fans	2	67.37%	59.53%	66.15%	36.03%	67.42%			50.61%	46.11%	26.42%	67.98%	59.04%	64.70%	54.23%	69.12%
Evaporator Fans	3	64.18%	56.78%	63.72%	36.49%	64.15%	47.27%	48.79%	44.15%	46.76%	24.18%	69.05%	57.18%	62.92%	55.67%	74.74%
Evaporator Fans	4	69.78%	61.72%	67.91%	36.25%	69.21%	48.35%	55.38%	46.95%	55.55%	43.13%	64.86%	62.42%	66.24%	55.72%	80.45%
Evaporator Fans	5	77.78%	62.67%	73.43%	42.29%	67.56%	52.26%	65.29%	53.37%	71.00%	66.58%	63.26%	66.25%	77.10%	60.74%	97.75%
Evaporator Fans	6	84.52%	63.32%	74.62%	48.79%	73.47%	57.23%	72.85%	57.94%	75.31%	78.96%	62.74%	70.08%	82.77%	64.37%	99.91%
Evaporator Fans	7	90.20%	66.06%	79.70%	60.09%	77.67%	66.94%	80.41%	62.73%	57.81%	35.52%	61.85%	72.60%	97.90%	75.19%	99.68%
Evaporator Fans	8	86.62%	69.28%	74.86%	59.99%	77.30%	58.57%	66.01%	59.20%	53.49%	32.93%	92.24%	70.59%	81.62%	65.64%	95.83%
Evaporator Fans	9	86.42%	63.26%	73.25%	54.15%	73.63%	53.84%	63.93%	53.07%	47.15%	35.50%		67.62%	85.82%	77.38%	94.95%
Evaporator Fans	10	80.76%	61.33%	68.84%	47.72%	69.77%	46.77%	57.58%	49.06%	48.44%	31.44%		62.58%	71.12%	61.47%	91.93%
Evaporator Fans	11		61.97%	63.78%												
	12		63.38%	62.49%	38.85%	68.10%										
		78.77%	62.79%	69.46%	45.57%	70.72%	54.94%	65.05%	53.65%	57.39%	44.04%	75.35%	65.88%	76.10%	62.93%	90.64%
aters were on 100%	Weight	Uniform														
Door Heater	1			11.97%	12.21%											
Door Heater	2	4.87%		13.80%	14.91%				8.25%	9.24%		5.20%	1.85%		6.34%	10.23%
Door Heater	3	10.51%		13.40%	10.94%		28.32%		4.90%	6.55%		9.06%	5.38%		7.84%	26.59%
Door Heater	4	28.76%		24.53%	20.95%		47.21%		21.85%	26.63%		17.46%	20.87%		27.00%	45.82%
Door Heater	5	54.09%		39.39%	36.34%		64.91%		49.04%	49.74%		36.72%	38.77%		40.46%	49.59%
Door Heater	6	62.09%		41.44%	39.52%		75.43%		58.08%	58.24%		42.07%	35.14%		45.87%	53.91%
Door Heater	7	67.45%		40.02%	35.05%		78.79%		62.83%	62.19%		47.71%	29.43%		56.51%	60.23%
Door Heater	8	65.28%		45.11%	34.26%		75.90%		57.20%	57.88%		47.49%	28.19%		39.77%	52.26%
Door Heater	9	55.87%		42.41%	27.92%		71.62%		46.37%	47.20%			21.64%		31.95%	44.65%
Door Heater	10	54.46%		39.96%	10.00%		66.98%		45.14%	47.13%			30.09%		39.62%	51.22%
Door Heater	11			14.62%												
Door Heater	12			20.97%	35.77%											
		45.23%		28.76%	25.51%		64.74%		41.90%	43.08%		32.06%	23.77%		32.49%	45.64%
aters were on 100%	Weight	Uniform														
Freezer Heater	1		45.31%			45.24%										
Freezer Heater	2		45.68%			45.80%								44.38%		
Freezer Heater	3		45.55%			44.67%								44.33%		
Freezer Heater	4		48.67%			47.26%								50.47%		
Freezer Heater	5		55.14%			51.74%								58.75%		
Freezer Heater	6		58.55%			54.16%								63.24%		
Freezer Heater	7		60.99%			53.94%								72.80%		
Freezer Heater	8		65.02%			51.70%								57.39%		
Freezer Heater	9		60.46%			49.90%								54.08%		
Freezer Heater	10		54.81%			45.04%								54.98%		
Freezer Heater	11		46.07%													
Freezer Heater	12		47.69%			50.82%										

Table B–8. Refrigeration Aggregated Reduction in Operating Hours by Month

	Solenoids	Evaporator Fans	Door Heaters	Freezer Heaters
January	59.86%	47.99%	87.91%	54.72%
February	56.89%	40.74%	91.70%	54.57%
March	59.37%	43.08%	87.65%	53.61%
April	54.49%	38.86%	71.89%	47.51%
May	47.20%	31.80%	54.09%	41.68%
June	41.78%	27.53%	48.82%	38.41%
July	40.20%	26.39%	45.98%	34.37%
August	46.48%	28.98%	49.67%	39.46%
September	49.66%	31.90%	56.71%	43.27%
October	53.78%	37.33%	57.27%	44.35%
November	52.19%	37.13%	85.38%	53.93%
December	56.65%	41.79%	71.63%	50.75%
Total	49.10%	33.34%	61.68%	44.55%

Appendix C: Product Specification Sheets

Utility Rebate Programs

We do the paperwork, you get an even faster return on your investment

NRM participates in a variety of state- and utility-sponsored rebate programs around the country. Our turnkey service includes processing your application for the following areas:

Contact us for your free energy audit today!

California
- California SPC
- KEMA-XENERGY's BEST Programs
- SDG&E
- SMUD

Connecticut
- CL&P
- United Illuminating Company

If you don't see your utility listed here, ask. New utility programs are being added monthly.

Maine
- Efficiency Maine

Massachusetts
- Cape Light Compact
- Mass Electric
- NSTAR Electric
- WMECO

New Hampshire
- Granite State Electric
- New Hampshire Electric Co-Op
- PSNH
- Unitil

New Jersey
- Smart Start Program

New York
- NYSERDA
- LIPA

Oregon
- Energy Trust Oregon

Rhode Island
- Narragansett Electric

Vermont
- Efficiency Vermont

Washington
- Puget Sound Energy
- Snohomish County PUD

Wisconsin
- Wisconsin's Focus on Energy

- **www.nrminc.com**
- **800.377.5439**
- **sales@nrminc.com**

About NRM

Privately held, National Resource Management (NRM) was founded in 1991, primarily as a lighting conservation company. Since 1995, NRM has been a leading provider of cost-effective energy management solutions for walk-in coolers and freezers. In addition to high efficiency replacement motors, NRM also offers the CoolTrol® Cooler Control System, primarily designed for use in stores, restaurants, and wholesale distribution centers. NRM's latest offerings include web-enabled remote site and fuel management solutions. NRM can provide complete lighting and refrigeration design services.

For more information, contact NRM at:
www.nrminc.com • 800.377-5439 • sales@nrminc.com

Corporate Headquarters:
61 Endicott St., Building 32
Norwood, MA 02062
- **www.nrminc.com**
- **800.377.5439**
- **sales@nrminc.com**

Ph: 781.255.8811
Fax: 781.440.9133

Regional Offices:
914 1/2 Diamond St.
San Diego, CA 92109
Ph: 858.581.1528
Fax: 858.581.6712

14605 N.E. 49th Circle
Vancouver, WA 98682
Ph: 360.892.9323
Fax: 360.256.1412

Utility Rebate Programs

For an even faster return on your investment

NRM participates in several state- and utility-sponsored rebate programs, including:

California
- KEMA-XENERGY's BEST Programs
- SDG&E
- SMUD

Connecticut
- CL&P
- United Illuminating Company

Maine
- Efficiency Maine

Massachusetts
- Cape Light Compact
- Mass Electric
- NSTAR Electric
- WMECO

New Hampshire
- Granite State Electric
- New Hampshire Electric Co-Op
- PSNH
- Unitil

New Jersey
- Smart Start Program

New York
- NYSERDA
- LIPA

Oregon
- Energy Trust Oregon

Rhode Island
- Narragansett Electric

Vermont
- Efficiency Vermont

Washington
- Puget Sound Energy
- Snohomish County PUD

Wisconsin
- Wisconsin's Focus on Energy

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About NRM

Privately held, National Resource Management (NRM) was founded in 1991, primarily as a lighting conservation company. Since 1995, NRM has been a leading provider of cost-effective energy management solutions for walk-in coolers and freezers. The CoolTrol Cooler Control System enables stores, restaurants, wholesale distributors and other users to maximize the efficiency of their walk-in coolers and freezers, while reducing overall operational costs.

In addition to CoolTrol, NRM offers high-efficiency ECM replacement motors for cooler evaporator fans, remote site and fuel management solutions and complete lighting and refrigeration design services.

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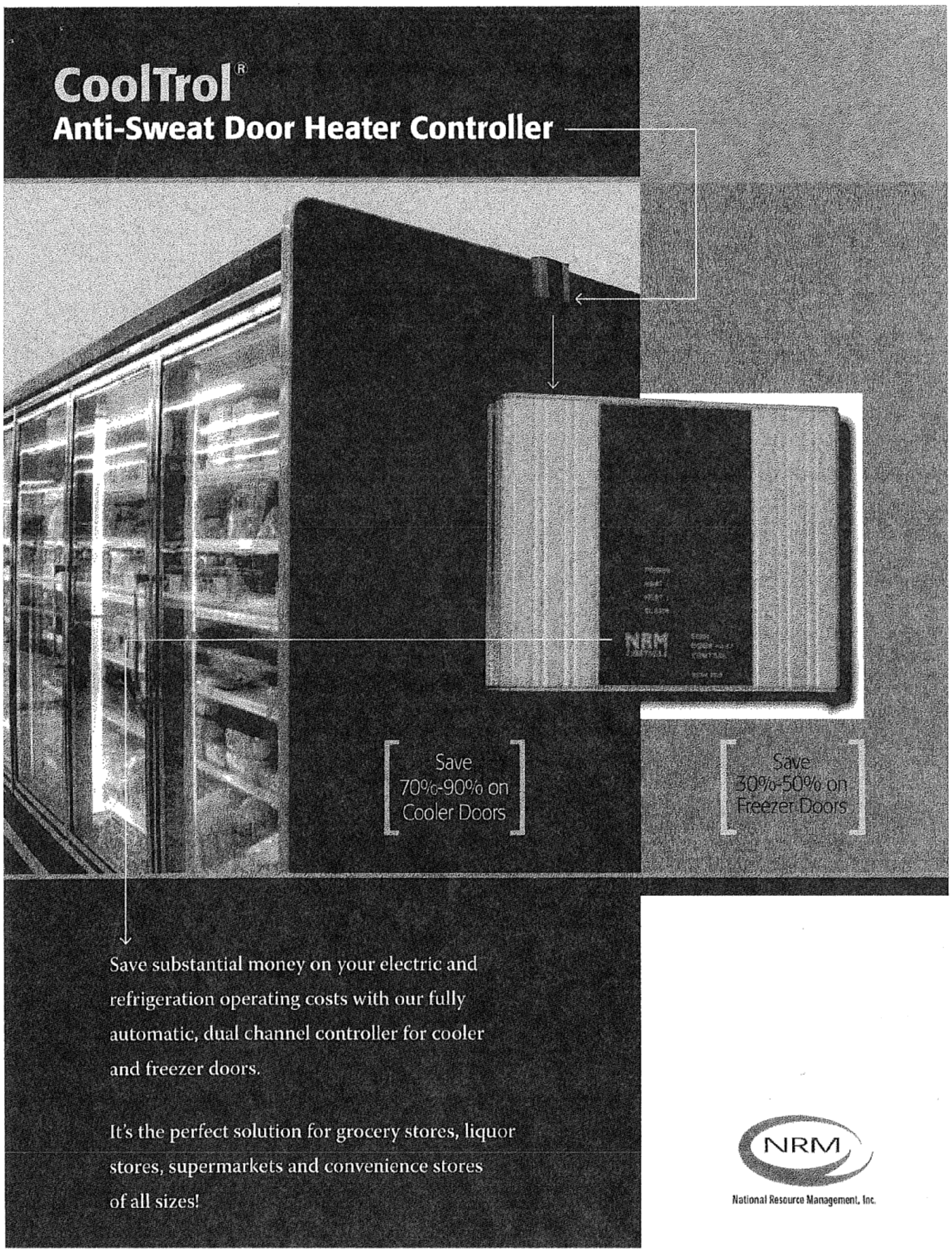
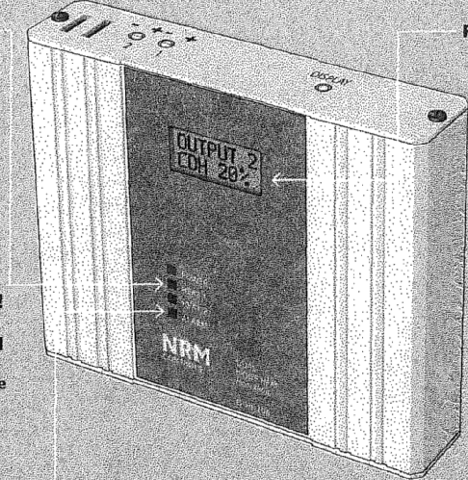
National Resource Management, Inc.


CoolTrol®
Anti-Sweat Door Heater Controller
NRM
Save 70%-90% on Cooler Doors
Save 30%-50% on Freezer Doors
Save substantial money on your electric and refrigeration operating costs with our fully automatic, dual channel controller for cooler and freezer doors.
It's the perfect solution for grocery stores, liquor stores, supermarkets and convenience stores of all sizes!
NRM
National Resource Management, Inc.

NRM's Anti-Sweat Door Heater Controller Optimizes Energy Use & Saves You Up to $50 - $100 per Door Annually*

Our controller **automatically** calculates the dew point in your store and applies just enough heat to your cooler or freezer doors to prevent sweating.



Dual Channel Control

- User configurable to control cooler or freezer doors independently or in combination, resulting in peak demand savings.
- Each controller has 70 selectable automated control strategies.
- LEDs indicate when the heat is "ON" for a particular channel.

Simple & Flexible Installation!

- Each channel can drive up to 10 remote switching modules, ideal for isolating door circuits when lighting or other loads are on the same circuit.
- No unsightly sensor required for frames or doors.
- Features special settings for freezer doors that are used in cooler applications.
- Integrated dew point sensor.

Fail-Safe Operation

- If controller unit loses power, door heaters default to "ON."

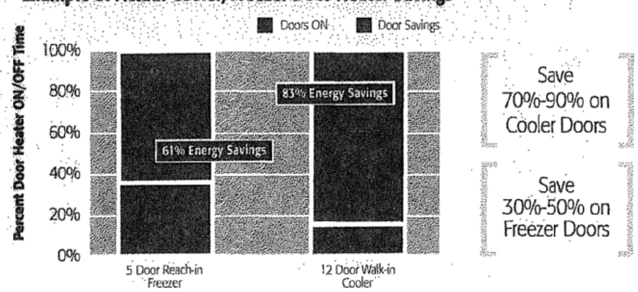
Alarm Indicator

- Red light indicates when there is a problem with a sensor. The front panel displays the nature of the problem.

Front Panel Display

- Scrolls between 4 informational screens every 9 seconds:
  - the first screen shows the current temperature and relative humidity in the store,
  - the second screen shows the dew point – if the temperature or humidity is out of the normal operating range, a "HI" or "LO" readout will be indicated,
  - the third and fourth screen show the percentage of power and operational mode for each output – "FDH" for freezers, "CDH" for coolers.
- Re-settable run time vs. elapsed time log allows you to determine savings easily and quickly.

Example of Actual Cooler/Freezer Door Heater Savings



To learn more about this and other NRM cost-effective energy management solutions for walk-in coolers and freezers, contact NRM at:
www.nrminc.com
800.377.5439
sales@nrminc.com

NRM
National Resource Management, Inc.

National Resource Management's Turnkey Retrofit Solutions Deliver Maximum Energy Savings with Minimal Disruption to Store Operations

Our brushless, DC evaporator fan replacement motors reduce your energy costs up to 70% over conventional motors.

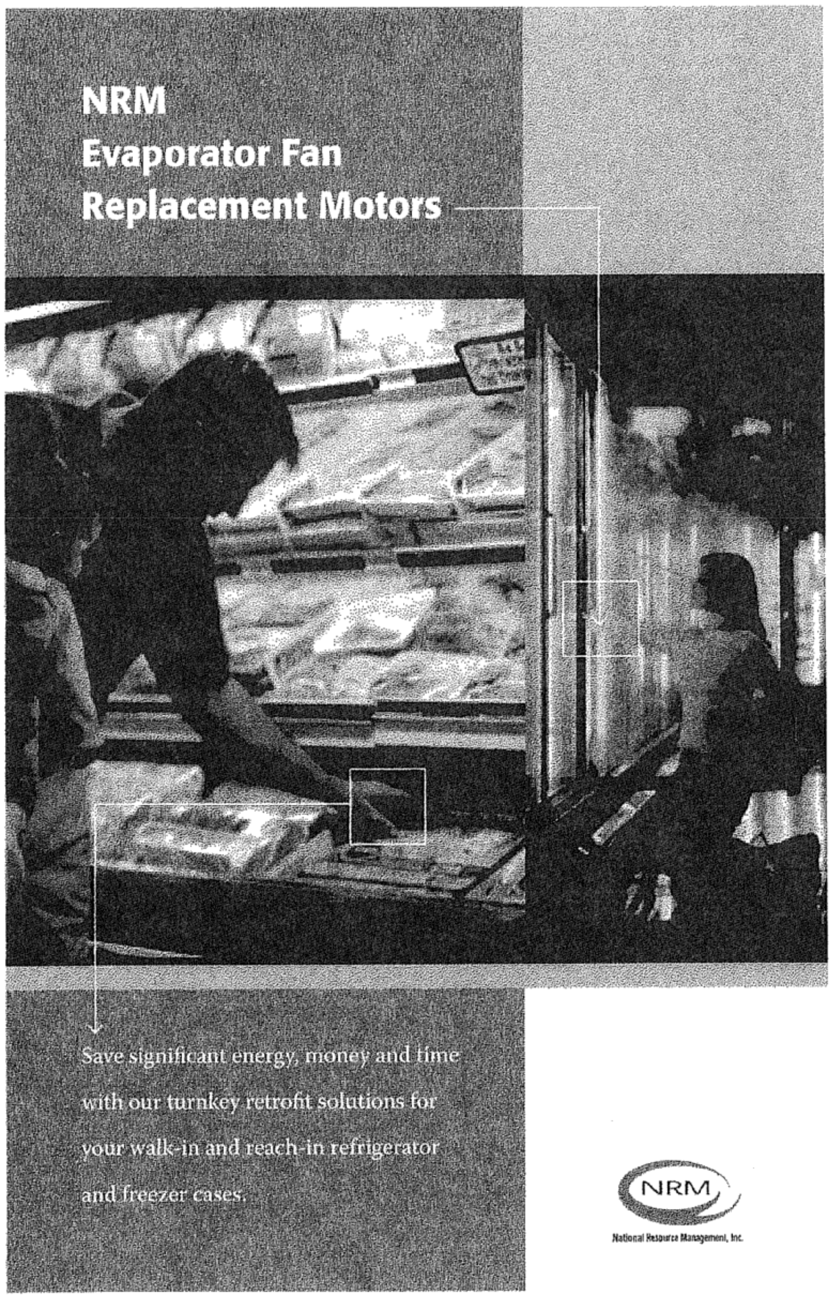
Since 1995, NRM has been at the forefront of energy saving technologies for commercial refrigeration. Our current offering has been expanded to include the highest efficiency replacement fan motor (electronically commutated or EC motor) that can easily be retrofitted into existing walk-in and reach-in coolers and freezers.

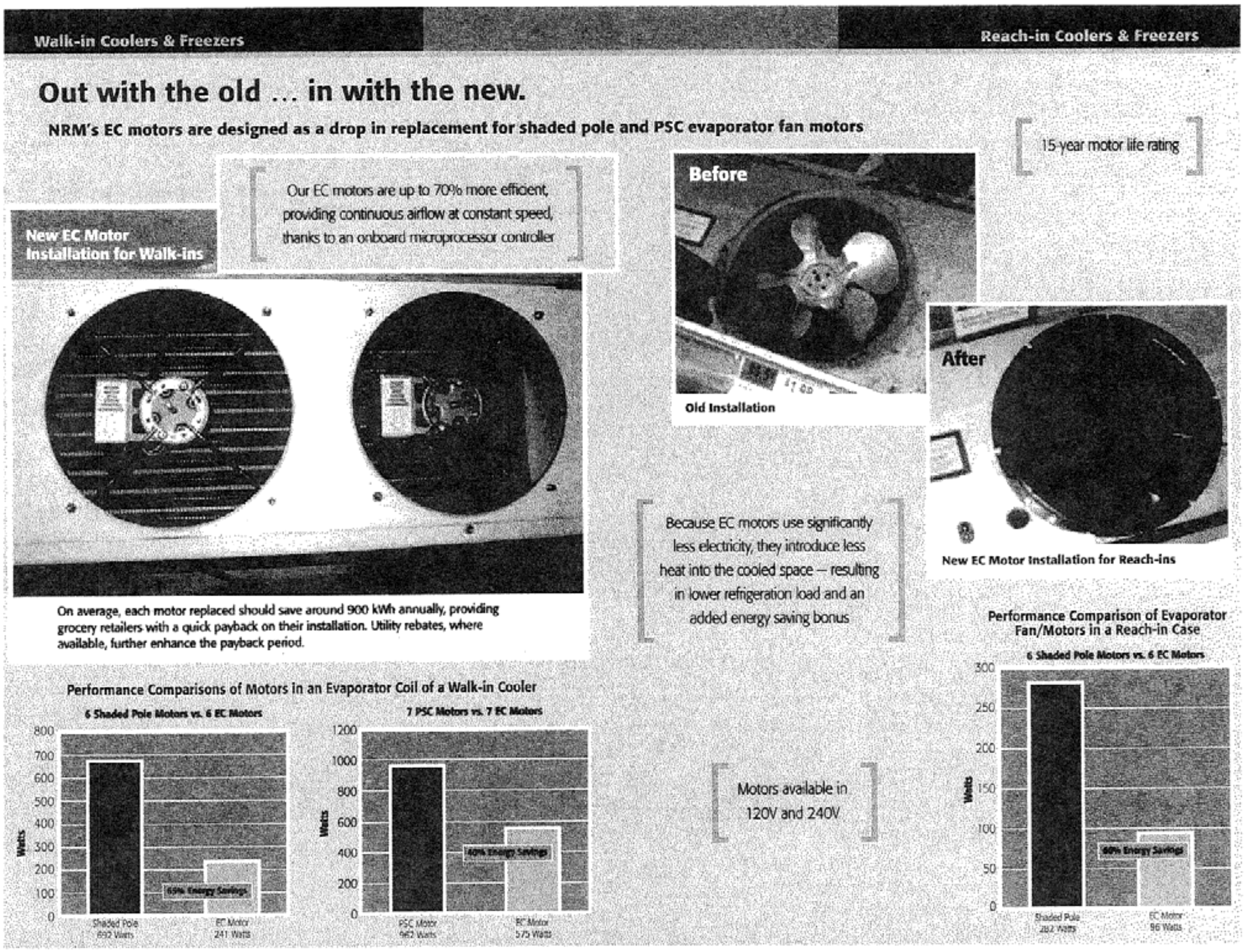
Our engineers, project managers and fully licensed technicians are ready to manage your evaporator fan/motor retrofit project from start to finish. As part of our complete turnkey solution, we will:

- perform an energy audit,
- process all rebate applications (where applicable),
- engineer, specify and supply all EC motors, and
- design and fabricate any custom parts to ensure proper fit and performance of the motors upon installation into your existing walk-in and reach-in coolers and freezers.

In most cases, all of your existing motors can be replaced in 1 - 3 days.

> You'll save significant money, energy and time – so much so that you may even consider expanding your refrigerator/freezer departments – giving your customers more products to choose from and your store increased opportunities for profit.


NRM
Evaporator Fan
Replacement Motors
Save significant energy, money and time with our turnkey retrofit solutions for your walk-in and reach-in refrigerator and freezer cases.
NRM
National Resource Management, Inc.



Walk-in Coolers & Freezers

Reach-in Coolers & Freezers

Out with the old … in with the new.

NRM's EC motors are designed as a drop in replacement for shaded pole and PSC evaporator fan motors

15-year motor life rating

Our EC motors are up to 70% more efficient, providing continuous airflow at constant speed, thanks to an onboard microprocessor controller

New EC Motor Installation for Walk-ins

Before

Old Installation

After

New EC Motor Installation for Reach-ins

Because EC motors use significantly less electricity, they introduce less heat into the cooled space — resulting in lower refrigeration load and an added energy saving bonus

On average, each motor replaced should save around 900 kWh annually, providing grocery retailers with a quick payback on their installation. Utility rebates, where available, further enhance the payback period.

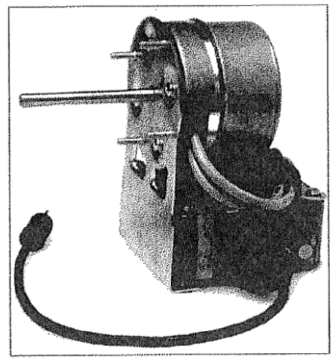
Motors available in 120V and 240V

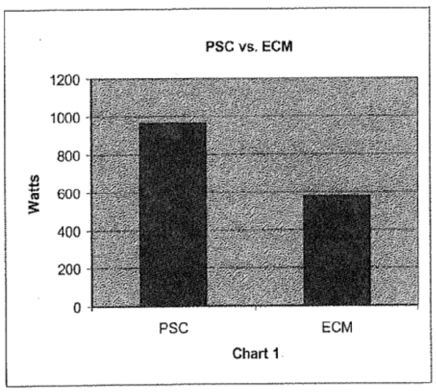
Performance Comparisons of Motors in an Evaporator Coil of a Walk-in Cooler

Performance Comparison of Evaporator Fan/Motors in a Reach-in Case

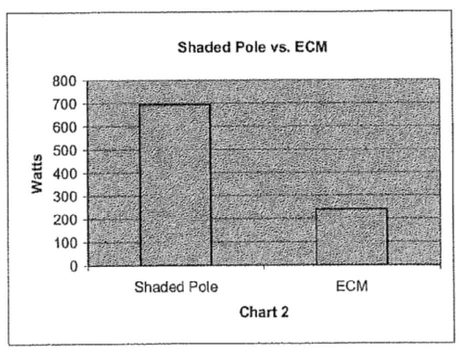
NRM Evaporator Fan Replacement Motor

The NRM Evaporator Fan Replacement Motor uses GE patented ECM™ technology to provide continuous airflow with constant speed. The 90-watt design is available in two voltages, 200–240V and 100–120V, both are single phase. Controls are enclosed in cast aluminum housing with a zinc coated steel cover. The 5/16-inch carbon steel shaft is coated in zinc phosphate, which inhibits rusting, and has permanently lubricated ball bearing construction. A conformal coating and a sealed power cord protect against transient water exposure up to 100% humidity, and the motor is designed to operate between -40° to +40° C. The design life of this motor is 15 years and it meets UL and CSA standards.





The following charts show that the ECM's watts are significantly lower, thus reducing the amount of heat introduced into the cooled space. Chart 1 compares the performance of 7 PSC motors and 7 ECM's in an evaporator coil of a walk-in cooler. Chart 2 compares 6 Shaded Pole motors to 6 ECM's in an evaporator coil of a walk-in cooler. As each graph shows, the ECM's use 43% less energy than a PSC motor and 67% less than a Shaded Pole motor.



The overall savings from the ECM are further amplified since there is less heat from the motor introduced into the refrigerated space. In the application from Chart 1, each ECM saved 630 kWh per year more than a PSC motor. The annual savings for each ECM in Chart 2 is 1,072 kWh compared to a Shaded Pole motor.

Model # information:
5SME84BM0026 – 120 Volt, CCW
5SME84BM0042 – 120 Volt, CW
5SME84BM1027 – 240 Volt, CCW
5SME84BM1043 – 240 Volt, CW

Data Sheet

NRM
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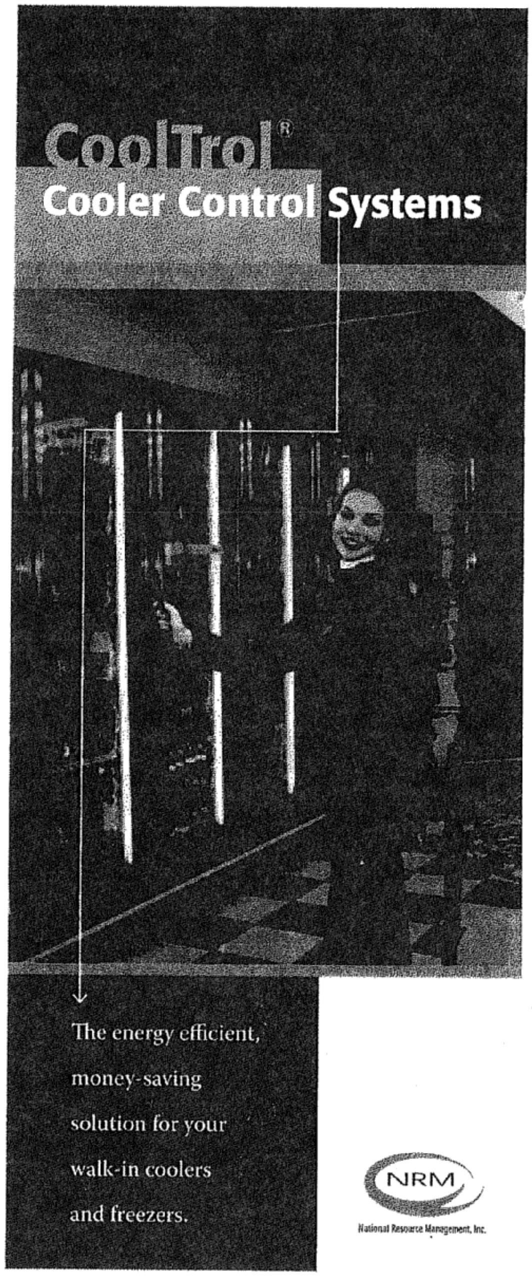
1-800-377-5439


CoolTrol®
Cooler Control Systems
The energy efficient,
money-saving
solution for your
walk-in coolers
and freezers.
NRM
National Resource Management, Inc.

CoolTrol® systems are in more than 4,000 stores, restaurants and wholesale distribution centers throughout the country.

With skyrocketing fuel and energy costs, many owners and managers are turning to National Resource Management's smart and innovative system to help them reduce operational costs and improve their bottom line:

"The NRM System controls our walk-in coolers and freezers in over 20 of our restaurants. We are very pleased with our savings. We estimate we have **reduced our annual electricity and maintenance costs by $15,000** and prevented possible equipment and product loss with the system's alarm features."

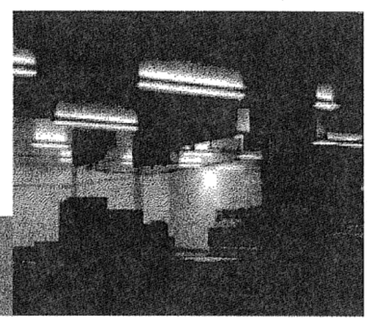
— Phil Gagne, Director HVAC Department
99 Restaurant and Pub

"We have installed the CoolTrol solution in over 170 Cumberland Farms locations. Since installing the first system in 1995, our refrigeration technicians have been most **impressed with its reliability, ease in diagnosing compressor and cooler problems, and seamless integration with the refrigeration equipment.**"

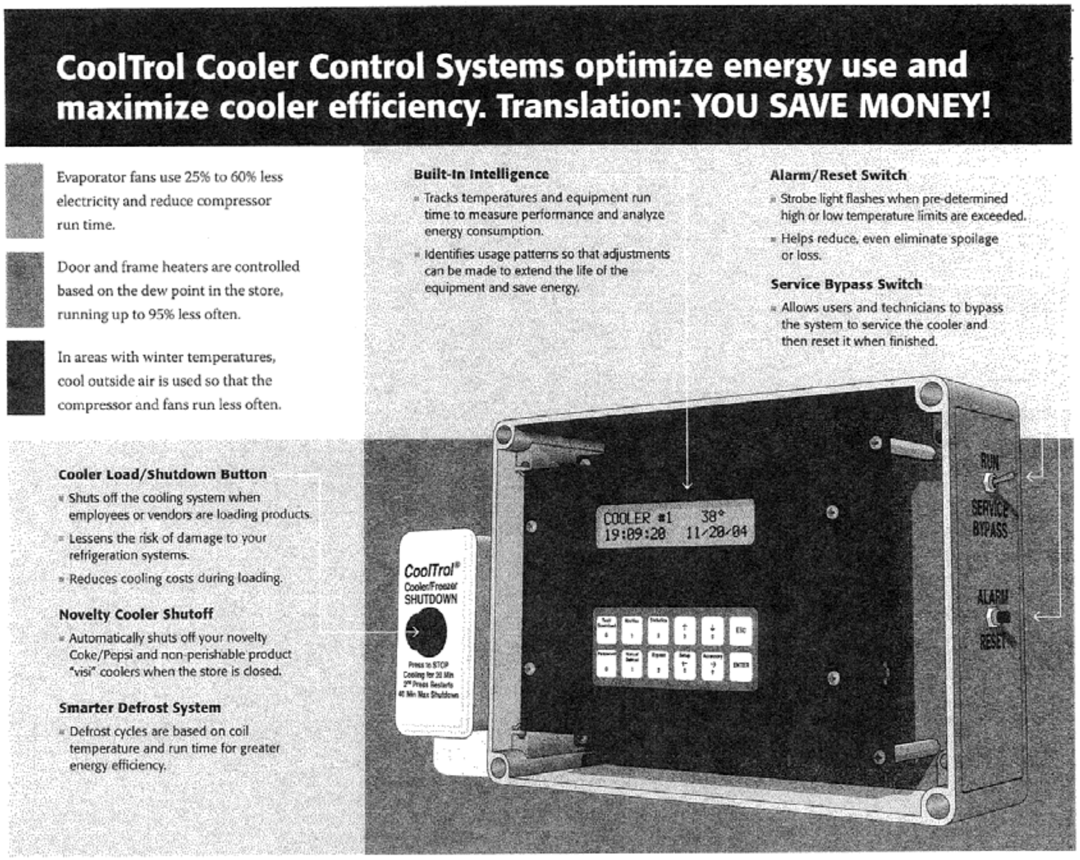
— Scott Amerault, Manager of Maintenance Services
Cumberland Farms

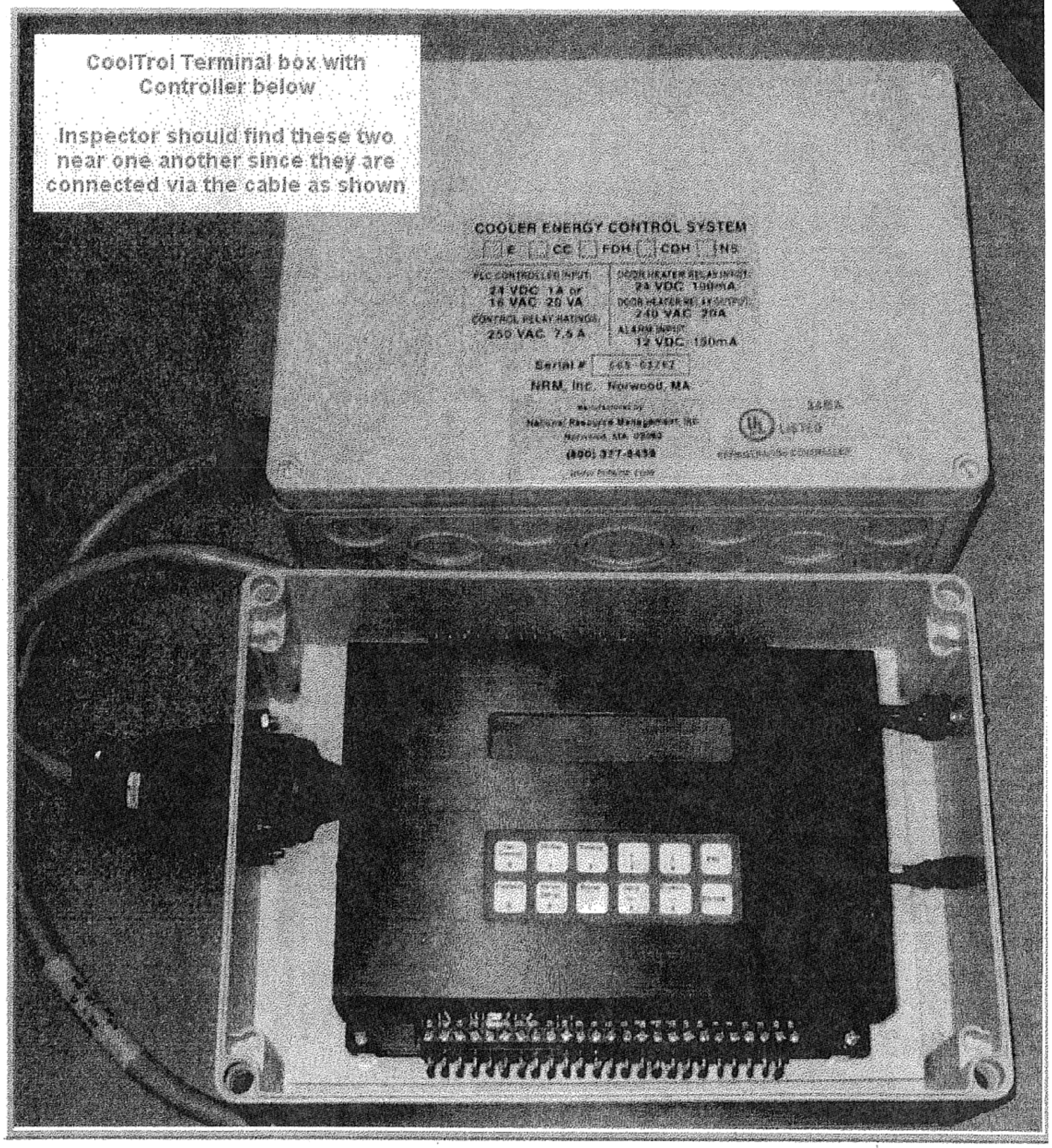
"We have installed CoolTrol in over 75 XtraMart stores since 2002. We estimate that CoolTrol has helped us **reduce our electric bills as much as $2,000 per store per year.** Additionally, the Freezer and Cooler Alarms have saved us thousands of dollars in product loss and spoilage. We are very pleased with our return on investment."

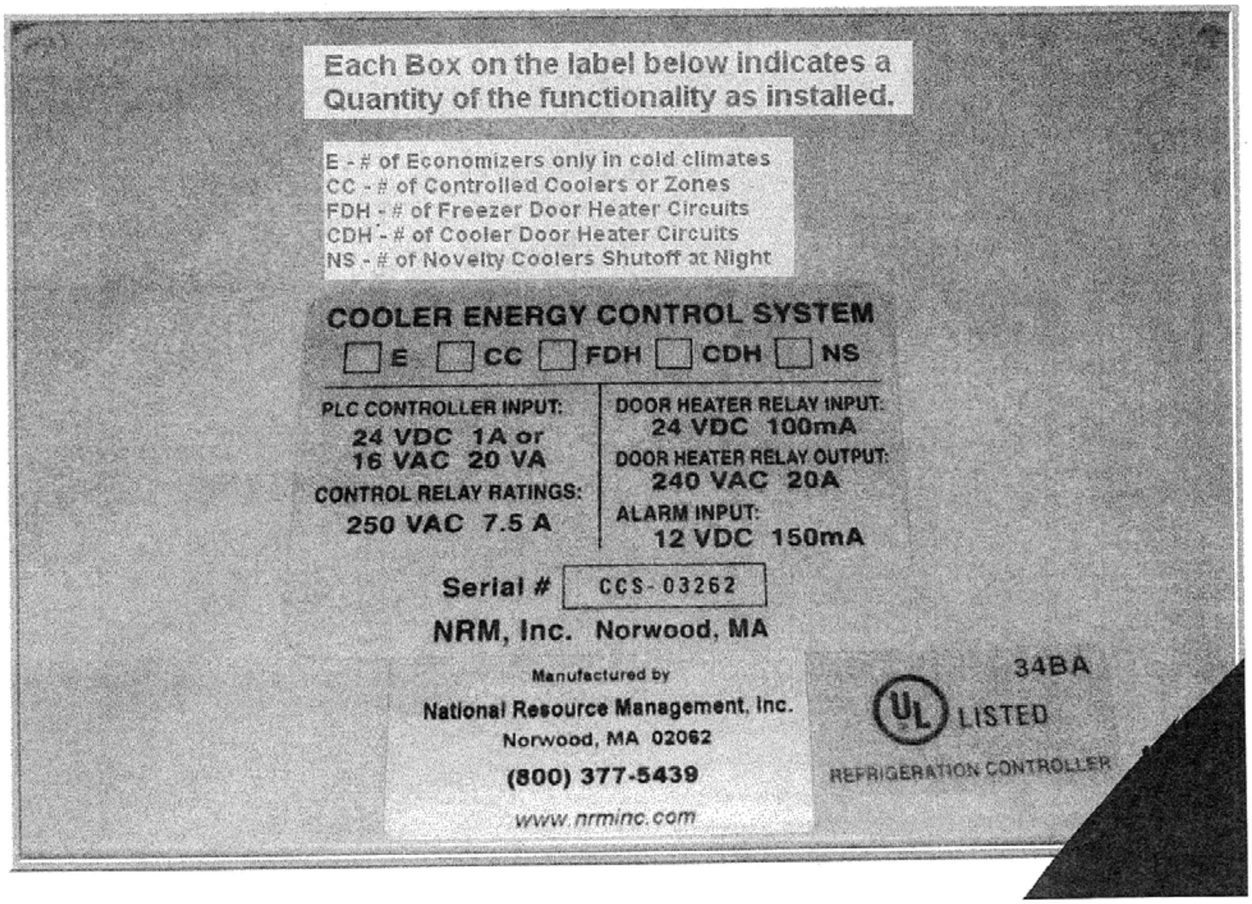
— Tom Sancoucy, Operations Manager
Kenyon Oil



What can CoolTrol do for YOUR business? Read on and find out...


CoolTrol Cooler Control Systems optimize energy use and maximize cooler efficiency. Translation: YOU SAVE MONEY!
Evaporator fans use 25% to 60% less electricity and reduce compressor run time.
Door and frame heaters are controlled based on the dew point in the store, running up to 95% less often.
In areas with winter temperatures, cool outside air is used so that the compressor and fans run less often.
Built-In Intelligence
Tracks temperatures and equipment run time to measure performance and analyze energy consumption.
Identifies usage patterns so that adjustments can be made to extend the life of the equipment and save energy.
Alarm/Reset Switch
Strobe light flashes when pre-determined high or low temperature limits are exceeded.
Helps reduce, even eliminate spoilage or loss.
Service Bypass Switch
Allows users and technicians to bypass the system to service the cooler and then reset it when finished.
Cooler Load/Shutdown Button
Shuts off the cooling system when employees or vendors are loading products.
Lessens the risk of damage to your refrigeration systems.
Reduces cooling costs during loading.
Novelty Cooler Shutoff
Automatically shuts off your novelty Coke/Pepsi and non-perishable product "visi" coolers when the store is closed.
Smarter Defrost System
Defrost cycles are based on coil temperature and run time for greater energy efficiency.
CoolTrol®
Cooler/Freezer
SHUTDOWN
COOLER #1 38°
19:09:20 11/20/04
ENTER
RUN
SERVICE
BYPASS
ALARM
RESET


CoolTrol Terminal box with
Controller below
Inspector should find these two
near one another since they are
connected via the cable as shown
COOLER ENERGY CONTROL SYSTEM
E CC FDH CDH NS
24 VDC 1A or
16 VAC 20 VA
250 VAC 7.5 A
24 VDC 100mA
240 VAC 20A
12 VDC 150mA
Serial #
NRM, Inc. Norwood, MA
LISTED


Each Box on the label below indicates a
Quantity of the functionality as installed.
E - # of Economizers only in cold climates
CC - # of Controlled Coolers or Zones
FDH - # of Freezer Door Heater Circuits
CDH - # of Cooler Door Heater Circuits
NS - # of Novelty Coolers Shutoff at Night
COOLER ENERGY CONTROL SYSTEM
E CC FDH CDH NS
PLC CONTROLLER INPUT:
24 VDC 1A or
16 VAC 20 VA
CONTROL RELAY RATINGS:
250 VAC 7.5 A
DOOR HEATER RELAY INPUT:
24 VDC 100mA
DOOR HEATER RELAY OUTPUT:
240 VAC 20A
ALARM INPUT:
12 VDC 150mA
Serial # CCS-03262
NRM, Inc. Norwood, MA
Manufactured by
National Resource Management, Inc.
Norwood, MA 02062
(800) 377-5439
www.nrminc.com
34BA
UL LISTED
REFRIGERATION CONTROLLER

Alto®

ALTO® PLUS Slimline T8 8-Foot Fluorescent Lamps
Long Life, Environmentally-Responsible Lamps.
Ideal for applications where long life is important.

Alto PLUS Slimline T8 8-Ft. Fluorescent Lamps

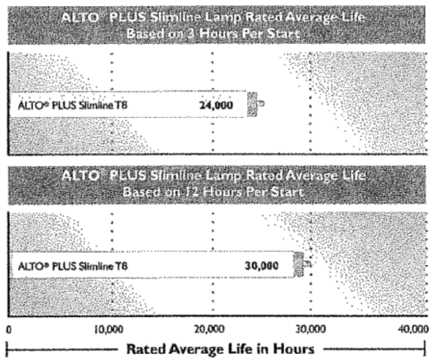
Long Life: Up to 30,000 hours rated average life; 60% more life than standard T8 lamps means reduced maintenance and disposal costs

Environmentally Responsible: Low mercury—TCLP*-compliant; energy efficient; long life

Sustainable Lighting Solution: Less mercury and fewer lamps in landfills, combined with energy efficiency, reduces the impact on the environment

Outstanding Lumen Maintenance: HI-VISION® Phosphor combined with Philips exclusive cathode guard delivers 90% lumen maintenance and reduced lamp-end blackening

Enhanced CRI: 86 CRI for TL80 lamps; 78 CRI for TL70 lamps



ALTO PLUS Slimline T8 Warranty: 24 months

Nom. Lamp Watts	Product Number	Symbols, Footnotes	Ordering Code	Pkg. Qty.*	Description	Nom. Length (In.)	Rated Avg. Life Hrs. 3-Hr. Start (202)	Rated Avg. Life Hrs. 12-Hr. Start (241)	Approx. Initial Lumens (203, 204)	Design Lumens (208)	CRI
ALTO® PLUS Slimline T8 8-Foot Fluorescent Lamps T8 Single Pin; Featuring ALTO® Lamp Technology; Instant Start											
59	38800-9	Ⓔ☐$	**F96T8/TL830/PLUS/ALTO**	24	TL 830, 3000K	96	24,000	30,000	5900	5490	86
	38801-7	Ⓔ☐$	**F96T8/TL835/PLUS/ALTO**	24	TL 835, 3500K	96	24,000	30,000	5900	5490	86
	38802-5	Ⓔ☐$	**F96T8/TL841/PLUS/ALTO**	24	TL 841, 4100K	96	24,000	30,000	5900	5490	86
	38803-3	Ⓔ☐$	**F96T8/TL850/PLUS/ALTO**	24	TL 850, 5000K	96	24,000	30,000	5780	5375	86
	38805-8	Ⓔ☐$	**F96T8/TL735/PLUS/ALTO**	24	TL 735, 3500K	96	24,000	30,000	5700	5190	78
	38806-6	Ⓔ☐$	**F96T8/TL741/PLUS/ALTO**	24	TL 741, 4100K	96	24,000	30,000	5700	5190	78

ALTO PLUS Slimline T8 8-Foot Cost of Ownership Savings

ALTO PLUS Slimline 8-foot T8 Fluorescent Lamps vs. Standard 8-foot T8 Lamps

General Overview

ALTO PLUS Slimline 8-foot T8 fluorescent lamps provide up to 60% longer life than standard 8-foot T8 products. With an incremental cost as little as $1.00 per lamp, benefits and financial impact can be significant.

Benefits

By using ALTO PLUS Slimline 8-foot T8 lamps the lamp replacement and labor costs are extended by an extra 2 years on a facility that operates an average of 4000 hours per year. For example, a standard 8-foot T8 product, with a rated average life expectancy of 15,000 hours, will last nearly 4 years (15,000 hours rated average life/4000 hours per year = 3 3/4 years). Conversely, ALTO PLUS Slimline 8-foot T8 lamps will operate for 6 years due to their rated average life expectancy of 24,000 hours (24,000 hours rated average life/4000 hours per year = 6 years).

Financial Impact

With the extended life expectancy of 2 years and the benefits of Philips' exclusive ALTO TCLP-compliant low mercury technology, the positive financial impact of installing ALTO PLUS Slimline 8-foot T8 lamps will provide cost of ownership savings per lamp as follows:

Incremental Cost	$ (1.00)
Material Cost Avoidance[A]	$ 4.00
Labor Cost Avoidance[B]	$ 3.72
Disposal Cost Avoidance[C]	$ 0.72
Cost of Ownership Savings	**$ 7.44**

A Material Cost Avoidance is the annualized acquisition cost per lamp (average cost per lamp of $7.50 for standard 8-Foot T8 product / 3 3/4 years = $2.00 per year). By installing ALTO PLUS Slimline 8-Foot T8 lamps, a material cost per lamp of $4.00 is avoided due to the extra 2 years of life expectancy. Note that the average cost per lamp may vary.

B Labor Cost Avoidance is the annualized labor replacement cost per lamp (labor replacement cost per lamp of $7.00 / 3 years = $1.86 per year). By installing ALTO PLUS Slimline 8-Foot T8 lamps, a labor replacement cost per lamp of $3.72 is avoided due to the extra 2 years life expectancy. Note that the labor replacement cost per lamp may vary.

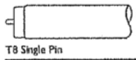
C Disposal Cost Avoidance is based on an average of $.09 per foot for lamp recycling or $.72 per 8-foot lamp. Philips Lighting Company encourages the recycling of all fluorescent lamps.

For the most current product information, go to www.nam.lighting.philips.com/us/ecatalog/

Fluorescent symbols and footnotes located on page 77

☐ This product utilizes ALTO® Lamp Technology

* The TCLP is the US EPA's Toxicity Characteristic Leaching Procedure.



T8 Single Pin

FLUORESCENT

ALTO® Universal T8: Full Rated Average Life on All T8 Ballast Types, Environmentally-Responsible Lamps. Ideal for any lighting application requiring maximum quality of light and maintained light output.

Alto Universal T8 Fluorescent Lamps

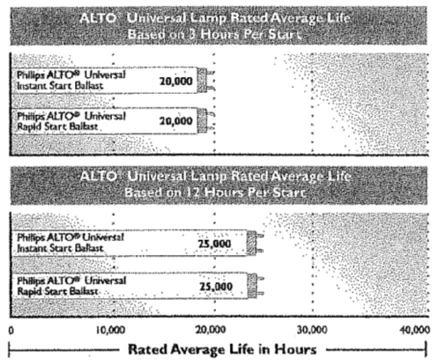
Philips Exclusive Universal Design: The only T8 lamp to deliver full rated average life on all T8 ballast types (Instant Start, Rapid Start, Programmed Start and Hybrid ballasts)

Environmentally Responsible: Low mercury—TCLP*-compliant; energy efficient; long life

Sustainable Lighting Solution: Less mercury and fewer lamps in landfills, combined with energy efficiency, reduces the impact on the environment

Outstanding Lumen Maintenance: HI-VISION® Phosphor combined with Philips exclusive cathode guard delivers 95% lumen maintenance and reduced lamp-end blackening

Enhanced CRI: 86 CRI for TL80 lamps; 78 CRI for TL70 lamps



ALTO Universal T8 Warranty: 24 months

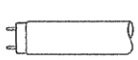
Nom. Lamp Watts	Product Number	Symbols, Footnotes	Ordering Code	Pkg. Qty.*	Description	Nom. Length (In.)	Rated Avg. Life, Hrs. 3-Hr. Start (202)	Rated Avg. Life, Hrs. 12-Hr. Start (241)	Approx. Initial Lumens (203, 204)	Design Lumens (208)	CRI
ALTO Universal T8 Fluorescent Lamps T8 Medium Bipin											
17	36787-0	$	**F17T8/TL830/ALTO**	25	TL 830, 3000K	24	20,000	25,000	1400	1300	86
	36791-2	$	**F17T8/TL835/ALTO**	25	TL 835, 3500K	24	20,000	25,000	1400	1300	86
	36793-8	$	**F17T8/TL841/ALTO**	25	TL 841, 4100K	24	20,000	25,000	1400	1300	86
	36807-6	$	**F17T8/TL730/ALTO**	25	TL 730, 3000K	24	20,000	25,000	1325	1200	78
	36808-4	$	**F17T8/TL735/ALTO**	25	TL 735, 3500K	24	20,000	25,000	1325	1200	78
	36812-6	$	**F17T8/TL741/ALTO**	25	TL 741, 4100K	24	20,000	25,000	1325	1200	78
25	36813-4	$	**F25T8/TL830/ALTO**	25	TL 830, 3000K	36	20,000	25,000	2225	2050	86
	36814-2	$	**F25T8/TL835/ALTO**	25	TL 835, 3500K	36	20,000	25,000	2225	2050	86
	36825-8	$	**F25T8/TL841/ALTO**	25	TL 841, 4100K	36	20,000	25,000	2225	2050	86
	36826-6	$	**F25T8/TL730/ALTO**	25	TL 730, 3000K	36	20,000	25,000	2125	1925	78
	36828-2	$	**F25T8/TL735/ALTO**	25	TL 735, 3500K	36	20,000	25,000	2125	1925	78
	36829-0	$	**F25T8/TL741/ALTO**	25	TL 741, 4100K	36	20,000	25,000	2125	1925	78
32	24667-8	Ⓔ $	**F32T8/TL830/ALTO**	25	TL 830, 3000K	48	20,000	25,000	2950	2800	86
	27236-9	Ⓔ $	**F32T8/TL830/ALTO PLZ**	1350	TL 830, 3000K	48	20,000	25,000	2950	2800	86
	24670-2	Ⓔ $	**F32T8/TL835/ALTO**	25	TL 835, 3500K	48	20,000	25,000	2950	2800	86
	27233-6	Ⓔ $	**F32T8/TL835/ALTO PLZ**	1350	TL 835, 3500K	48	20,000	25,000	2950	2800	86
	24671-0	Ⓔ $	**F32T8/TL841/ALTO**	25	TL 841, 4100K	48	20,000	25,000	2950	2800	86
	27235-1	Ⓔ $	**F32T8/TL841/ALTO PLZ**	1350	TL 841, 4100K	48	20,000	25,000	2950	2800	86
	27229-4	Ⓔ $	**F32T8/TL850/ALTO**	25	TL 850, 5000K	48	20,000	25,000	2950	2800	86
	27252-6	Ⓔ $	**F32T8/TL730 ALTO**	25	TL 730, 3000K	48	20,000	25,000	2800	2660	78
	27282-3	Ⓔ $	**F32T8/TL730/ALTO PLZ**	1350	TL 730, 3000K	48	20,000	25,000	2800	2660	78
	27249-2	Ⓔ $	**F32T8/TL735/ALTO**	25	TL 735, 3500K	48	20,000	25,000	2800	2660	78
	27259-1	Ⓔ $	**F32T8/TL735/ALTO PLZ**	1350	TL 735, 3500K	48	20,000	25,000	2800	2660	78
	27248-4	Ⓔ $	**F32T8/TL741/ALTO**	25	TL 741, 4100K	48	20,000	25,000	2800	2660	78
	38351-3	Ⓔ $	**F32T8/TL741/ALTO**	10	TL 741, 4100K, 10 Pk.	48	20,000	25,000	2800	2660	78
	27255-9	Ⓔ $	**F32T8/TL741/ALTO PLZ**	1350	TL 741, 4100K	48	20,000	25,000	2800	2660	78
	27268-2	Ⓔ $	**F32T8/TL750/ALTO**	25	TL 750, 5000K	48	20,000	25,000	2700	2550	78

For the most current product information, go to www.nam.lighting.philips.com/us/ecatalog/

Fluorescent symbols and footnotes located on page 77

☐ This product utilizes ALTO® Lamp Technology

* *The TCLP is the US EPA's Toxicity Characteristic Leaching Procedure.*



T8 Medium Bipin

FLUORESCENT

Alto PLUS T8 Fluorescent Lamps

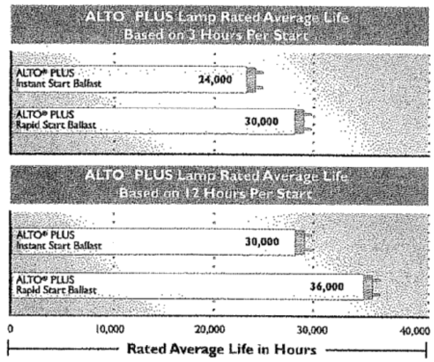
Long Life: Up to 36,000 hours rated average life; 50% more life than standard T8 lamps means reduced maintenance and disposal costs

Environmentally Responsible: Low mercury—TCLP*-compliant; energy efficient; long life

Sustainable Lighting Solution: Less mercury and fewer lamps in landfills, combined with energy efficiency, reduces the impact on the environment

Outstanding Lumen Maintenance: HI-VISION® Phosphor combined with Philips exclusive cathode guard delivers 95% lumen maintenance and reduced lamp-end blackening

Enhanced CRI: 86 CRI for TL80 lamps; 78 CRI for TL70 lamps



ALTO PLUS T8 Warranty: 30 months

Nom. Lamp Watts	Product Number	Symbols, Footnotes	Ordering Code	Pkg. Qty.*	Description	Nom. Length (In.)	Rated Avg. Life, Hrs. 3-Hr. Start (202)	Rated Avg. Life, Hrs. 12-Hr. Start (241)	Approx. Initial Lumens (203, 204)	Design Lumens (208, 239)	CRI
ALTO PLUS T8 Fluorescent Lamps T8 Medium Bipin Featuring HI-VISION® Phosphor											
15	38419-8	Ⓔ◇▢$	**F15T8/TL865/PLUS/ALTO**	24	TL 865, 6500K	18	24,000	30,000	975	925	86
17	38215-0	Ⓔ$	**F17T8/TL865/PLUS/ALTO**	25	TL 865, 6500K	24	24,000	30,000	1300	1235	86
25	38258-0	Ⓔ$	**F25T8/TL865/PLUS/ALTO**	25	TL 865, 6500K	36	24,000	30,000	2150	2040	86
32	36000-8	Ⓔ$	**F32T8/TL830/PLUS/ALTO**	25	TL 830, 3000K	48	30,000	36,000	2950	2800	86
	36001-6	Ⓔ$	**F32T8/TL835/PLUS/ALTO**	25	TL 835, 3500K	48	30,000	36,000	2950	2800	86
	36002-4	Ⓔ$	**F32T8/TL841/PLUS/ALTO**	25	TL 841, 4100K	48	30,000	36,000	2950	2800	86
	13686-1	Ⓔ$	**F32T8/TL841/PLUS/ALTO PLZ**	1350	TL 841, 4100K	48	30,000	36,000	2950	2800	86
	36003-2	Ⓔ$	**F32T8/TL850/PLUS/ALTO**	25	TL 850, 5000K	48	30,000	36,000	2950	2800	86
	38261-4	Ⓔ$	**F32T8/TL865/PLUS/ALTO**	25	TL 865, 6500K	48	30,000	36,000	2800	2660	86
	36004-0	Ⓔ$	**F32T8/TL730/PLUS/ALTO**	25	TL 730, 3000K	48	30,000	36,000	2800	2660	78
	36005-7	Ⓔ$	**F32T8/TL735/PLUS/ALTO**	25	TL 735, 3500K	48	30,000	36,000	2800	2660	78
	38383-6	Ⓔ$	**F32T8/TL735/PLUS/ALTO PLZ**	1350	TL 735, 3500K	48	30,000	36,000	2800	2660	78
	36013-1	Ⓔ$	**F32T8/TL741/PLUS/ALTO**	25	TL 741, 4100K	48	30,000	36,000	2800	2660	78
	38384-4	Ⓔ$	**F32T8/TL741/PLUS/ALTO PLZ**	1350	TL 741, 4100K	48	30,000	36,000	2800	2660	78
	36014-9	Ⓔ$	**F32T8/TL750/PLUS/ALTO**	25	TL 750, 5000K	48	30,000	36,000	2700	2550	78

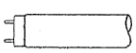
For the most current product information, go to **www.nam.lighting.philips.com/us/ecatalog/**

Fluorescent symbols and footnotes located on page 77

▢ This product utilizes ALTO® Lamp Technology

** The TCLP is the US EPA's Toxicity Characteristic Leaching Procedure.*

FLUORESCENT



T8 Medium Bipin

Universal Lighting Technologies

TRIAD®

B432IUNVEL-A

ULTim8 A Triad® Brand

APPLICATION and PERFORMANCE SPECIFICATION

Description: High frequency electronic ballast for (4 or 3) F32T8, (4 or 3) F32T8ES, (4 or 3) F28T8, (3) F40T8, (4) F25T8, and (4) F17T8. Also equivalent U-shaped lamps.

- Line Voltage: 108vac - 305vac, 50/60Hz
- Parallel Lamp Operation
- Instant Start

Lamp Type	Lamp #	Volts	Input Watts	Nominal Line Amps	Power Factor	Ballast Factor	Ballast Efficacy Factor	Harmonic Total	Crest Factor
F32T8	**4**	**120**	**97**	**0.80**	**> .99**	**.77**	**0.79**	**< 10%**	**< 1.7**
F32T8	**4**	**277**	**96**	**0.34**	**> .98**	**.77**	**0.80**	**< 10%**	**< 1.7**
F32T8ES	4	120	91	0.75	> .99	.77	0.85	< 10%	< 1.7
F32T8ES	4	277	90	0.32	> .98	.77	0.86	< 10%	< 1.7
F28T8	4	120	85	0.70	> .99	.77	0.91	< 10%	< 1.7
F28T8	4	277	84	0.31	> .98	.77	0.92	< 10%	< 1.7
F32T8	3	120	80	0.67	> .99	.86	1.08	< 10%	< 1.7
F32T8	3	277	78	0.29	> .98	.86	1.10	< 10%	< 1.7
F32T8ES	3	120	75	0.62	> .99	.86	1.15	< 10%	< 1.7
F32T8ES	3	277	73	0.27	> .98	.86	1.18	< 10%	< 1.7
F28T8	3	120	69	0.57	> .99	.86	1.25	< 10%	< 1.7
F28T8	3	277	68	0.26	> .95	.86	1.26	< 10%	< 1.7
F40T8	3	120	97	0.81	> .99	.86	0.89	< 10%	< 1.7
F40T8	3	277	94	0.35	> .98	.86	0.91	< 10%	< 1.7
F25T8	4	120	78	0.65	> .98	.78	1.00	< 10%	< 1.7
F25T8	4	277	76	0.28	> .98	.78	1.03	< 10%	< 1.7
F17T8	4	120	53	0.44	> .98	.79	1.49	< 10%	< 1.7
F17T8	4	277	52	0.20	> .95	.79	1.52	< 10%	< 1.7

Application and Performance Specification Information Subject to Change without Notification.

Performance:
- Meets ANSI Standard C82.11-1993
- Meets ANSI Standard C62.41-1991
- Meets FCC Part 18 (Class A) for EMI and RFI Non-Consumer Limits

Safety:
- No PCB's
- UL listed
  (Class P, Type 1 Outdoor, Type HL)
- CSA Certified

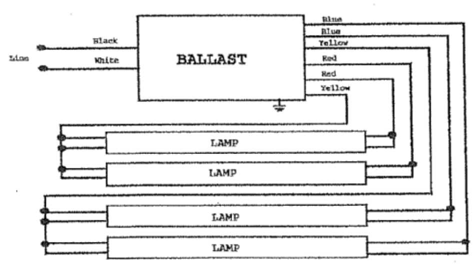
Application:
- Minimum Starting Temperature: 0°F, -18° C
  For ES & 28W Lamps: 60° F, 16° C
- Maximum Ambient Temperature: 105° F, 40° C
- Sound Rated: A
- Remote Mounting: 20 ft. max. lead length, 18 AWG

Physical Parameters:

Length:	9.50"	
Width:	1.70"	
Height:	1.18"	
Weight:	1.7 lbs.	
Lead Length:	White, Black	25" (± 1")
	Red & Blue	31" (± 1")
	Yellow	45" (± 1")

Warranty:
Universal Lighting Technologies warrants to the purchaser that each electronic ballast will be free from defects in material or workmanship for a period of 5 years from date of manufacture when properly installed and under normal conditions of use. Call **1-800-BALLASTx800** for technical assistance.

Manufactured in North America



Note: For three lamp operation, cap any blue lead.

Ballast Must be Grounded

1-800-BALLAST www.universalballast.com November 2003

Universal Lighting Technologies

TRIAD®

ULTim8 A Triad® Brand

B332IUNVEL-A

APPLICATION and PERFORMANCE SPECIFICATION

Description: High frequency electronic ballast for (3 or 2) F32T8, (3 or 2) F32T8ES, (3 or 2) F28T8, (2) F40T8, (3) F25T8, and (3) F17T8. Also equivalent U-shaped lamps.

- Line Voltage: 108vac - 305vac, 50/60Hz
- Parallel Lamp Operation
- Instant Start
- Active Power Factor Correction

*60 Hz data

Lamp Type	#	Volts	Input Watts	Nominal Line Amps	Power Factor	Ballast Factor	Ballast Efficacy Factor	Harmonic Total	Crest Factor
F32T8	**3**	**120**	**74**	**0.61**	**>99%**	**.77**	**1.04**	**< 10%**	**< 1.7**
F32T8	**3**	**277**	**73**	**0.26**	**>98%**	**.77**	**1.05**	**< 10%**	**< 1.7**
F32T8ES	3	120	70	0.58	>99%	.77	1.10	< 10%	< 1.7
F32T8ES	3	277	69	0.25	>98%	.77	1.12	< 10%	< 1.7
F28T8	3	120	66	0.53	>99%	.77	1.17	< 10%	< 1.7
F28T8	3	277	65	0.23	>97%	.77	1.18	< 10%	< 1.7
F32T8	2	120	57	0.48	>99%	.89	1.56	< 10%	< 1.7
F32T8	2	277	56	0.21	>97%	.89	1.59	< 10%	< 1.7
F32T8ES	2	120	54	0.46	>99%	.89	1.65	< 10%	< 1.7
F32T8ES	2	277	53	0.2	>98%	.89	1.68	< 10%	< 1.7
F28T8	2	120	49	0.41	>99%	.89	1.82	< 10%	< 1.7
F28T8	2	277	48	0.18	>95%	.89	1.85	< 10%	< 1.7
F40T8	2	120	68	0.57	>99%	.89	1.31	< 10%	< 1.7
F40T8	2	277	66	0.25	>98%	.89	1.35	< 10%	< 1.7
F25T8	3	120	59	0.49	>99%	.80	1.36	< 10%	< 1.7
F25T8	3	277	58	0.22	>97%	.80	1.38	< 10%	< 1.7
F17T8	3	120	42	0.35	>99%	.82	1.95	< 10%	< 1.7
F17T8	3	277	41	0.15	>95%	.82	2.00	< 10%	< 1.7

Application and Performance Specification Information Subject to Change without Notification.

Performance:
- Meets ANSI Standard C82.11-1993
- Meets ANSI Standard C62.41-1991
- Meets FCC Part 18 (Class A) for EMI and RFI Non-Consumer Limits

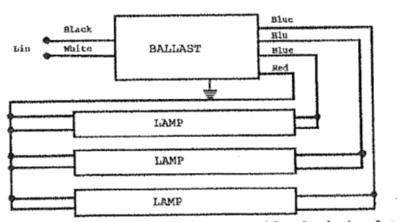
Safety:
- No PCB's
- UL listed (Class P, Type 1 Outdoor, Type HL)
- CSA Certified

Application:
- Minimum Starting Temperature: 0° F, -18° C
  For ES & 28W Lamps: 60° F, 16° C
- Maximum Ambient Temperature: 105° F, 40° C
- Sound Rated: A
- Remote Mounting: 20 ft. max. lead length, 18 AWG

Physical Parameters

Length:	9.50"	
Width:	1.70"	
Height:	1.18"	
Weight:	1.7 lbs.	
Lead Length:	White, Black	25" (± 1")
	Red	48" (± 1")
	Blue	31" (± 1")

Warranty:
Universal Lighting Technologies warrants to the purchaser that each electronic ballast will be free from defects in material or workmanship for a period of 5 years from date of manufacture when properly installed and under normal conditions of use. Call **1-800-BALLASTx800** for technical assistance.
Manufactured in North America



Note: For two lamp application, cap one blue lead, insulate

Ballast Must be Grounded

1-800-BALLAST www.universalballast.com November 2003

Universal Lighting Technologies

TRIAD®

B232IUNVEL-A

A Triad® Brand

APPLICATION and PERFORMANCE SPECIFICATION

Description: High frequency electronic ballast for (1 or 2) F32T8, (1 or 2) F32T8ES, (1 or 2) F28T8 (2) F25T8, (2) F17T8 and (1) F40T8 lamps. Also equivalent U-shaped lamps.

- Line Voltage: 108vac - 305vac, 50/60Hz
- Parallel Lamp Operation
- Instant Start
- Active Power Factor Correction

*60 Hz data

Lamp Type	Lamp #	Volts	Input Watts	Nominal Line Amps	Power Factor	Ballast Factor	Ballast Efficacy Factor	Harmonic Total	Crest Factor
F32T8	**2**	**120**	**48**	**0.40**	**>.95**	**0.77**	**1.60**	**< 10%**	**< 1.7**
F32T8	**2**	**277**	**48**	**0.17**	**>.95**	**0.77**	**1.60**	**< 10%**	**< 1.7**
F32T8ES	2	120	46	0.38	>.95	0.77	1.67	< 10%	< 1.7
F32T8ES	2	277	46	0.17	>.95	0.77	1.67	< 10%	< 1.7
F32T8	1	120	30	0.24	>.95	0.95	3.17	< 10%	< 1.7
F32T8	1	277	30	0.11	>.95	0.95	3.17	< 10%	< 1.7
F32T8ES	1	120	28	0.23	> .95	0.92	3.29	< 10%	< 1.7
F32T8ES	1	277	28	0.11	> .95	0.92	3.29	< 10%	< 1.7
F28T8	2	120	43	0.36	>.95	0.77	1.79	<10%	<1.7
F28T8	2	277	43	0.15	>.95	0.77	1.79	<10%	<1.7
F28T8	1	120	26	0.22	>.95	0.95	3.65	<10%	<1.7
F28T8	1	277	27	0.10	>.95	0.95	3.52	<10%	<1.7
F25T8	2	120	36	0.30	>.95	0.79	2.19	< 10%	< 1.7
F25T8	2	277	37	0.14	>.95	0.80	2.18	< 10%	< 1.7
F17T8	2	120	25	0.21	>.95	0.80	3.20	< 10%	< 1.7
F17T8	2	277	26	0.10	>.95	0.80	3.08	< 10%	< 1.7

Application and Performance Specification Information Subject to Change without Notification.

Performance:
- Meets ANSI Standard C82.11-1993
- Meets ANSI Standard C62.41-1991
- Meets FCC Part 18 (Class A) for EMI and RFI Non-Consumer Limits
- Meets CSA Standard 654 for Ballast Efficiency

Safety:
- No PCB's
- UL listed
(Class P, Type 1 Outdoor, Type HL)
- CSA Certified

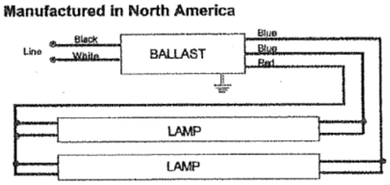
Application:
- Minimum Starting Temperature: 0° F, -18° C
  For ES & 28W Lamps: 60° F, 16° C
- Maximum Ambient Temperature: 105° F, 40° C
- Sound Rated: A
- Remote Mounting: 20 ft. max. lead length, 18 AWG

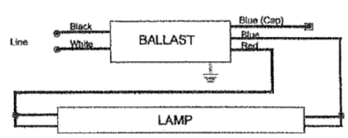
Physical Parameters

Length:		9.50"
Width:		1.70"
Height:		1.18"
Weight:		1.70 lbs
Lead Length:	Black, White	25" (+/-1")
	Red	48" (+/-1")
	Blue	31" (+/-1")

Warranty:
Universal Lighting Technologies warrants to the purchaser that each electronic ballast will be free from defects in material or workmanship for a period of 5 years from date of manufacture when properly installed and under normal conditions of use. Call **1-800-BALLASTx800** for technical assistance.

Manufactured in North America





For one lamp application, individually cap blue leads, insulate to 600 volts

Ballast Must be Grounded

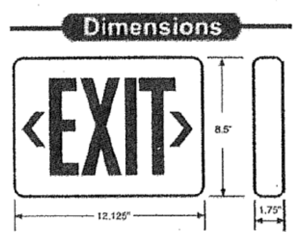
1-800-BALLAST **www.universalballast.com** July 2004

Polycarbonate Green Exit Signs

Part Numbers:
20744D Green LED Universal AC Only Exit Sign
20745D Battery Backup Green LED Universal Exit Sign
20745D/BLK Battery Backup Green LED Universal Exit Sign with Black Housing

Features

- Completely self-contained.
- Fully Automatic Operation.
- Compact, low profile design in a neutral finish.
- Push to test switch.
- Automatic, low voltage disconnect (LVD).
- 120 or 277 VAC operation.
- Injection-molded, V-O flame retardant, high impact, thermoplastic housing.
- Charge rate/power on LED indicator light.
- Energy consumption of less than 4 watts for red letters and less than 2 watts for green letters.
- LED lamp life of up to 25 years.
- Listed for damp location.
- Universal mounting canopy for top or side installation.
- Standard AC and emergency units available.
- Ni-cad battery on emergency (EM) units.



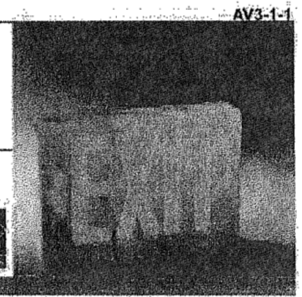
TECHNICAL CONSUMER PRODUCTS, INC.
Lighting to the Next Power

300 Lena Dr., Aurora, OH 44202
Toll Free: 1-800-324-1496 Fax: 1-330-995-6188
Visit us at www.tcpi.com

AV3-1-1

DLED52
Thermoplastic Stencil Face
w/Battery Back-Up
DLED52R, DLED52G, DLED52S-R, DLED52S-G

Project:
Location:
Fixture:
Contact/Phone:



PRODUCT SPECIFICATION

Electrical
Universal Voltage Input permits connection to supply voltages ranging from 120 to 277V. Battery regulates charger to optimize battery performance. Low voltage disconnect. Test switch and AC status lamp. AC line-latching enables installer to connect battery without A C power present without risk of draining battery. Surge protection. Brownout protection.

Lamp
Red or green premium grade LED s

Diffuser/Stencil
Evenly illuminated green or red vinyl diffuser. Die-cut pattern allows NFPA compliant chevron directional indicators to be removed/reinserted without cosmetic changes to sign. 3/4 stroke, 6 high letters meet NFPA requirements

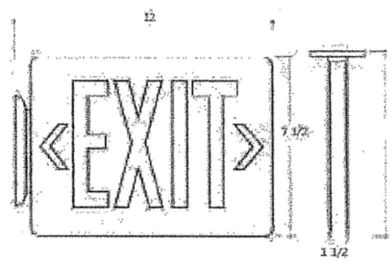
Housing
Slim injection molded, V-0 flame retardant, high-impact thermo plastic housing. Canopy fastens to steel reinforcing strap in housing for maximum impact resistance.

W arranty
Exit and emergency lighting products are warranted for one full year against defects in material and workmanship. Product specifications subject to change without notice.

Labels
UL listed. ETL approved for damp locations.

OPERATION
The emergency back-up is continously illuminated by normal A C power. Whenever normal AC power fails, the internal solid state transfer switch automatically connects internal battery to the LED lamps inside the exit sign to keep it continously lit for 90 minutes. When AC power is restored, the battery is recharged by the onboard solid state recharger and is accomplished within 12 hours.

PRODUCT DESCRIPTION
LED Exit Signs offer optimum efficiency and uniform light diffusion in an easy to install, snap-together housing. The compact battery back-up version uses highly reliable, maintenance free, sealed nickel cadium battery. Universal Voltage Input allows fool-proof connection to 120 V through 277 V supply.



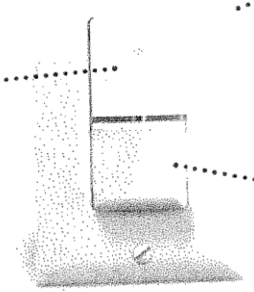
INSTALLATION
Mounting all signs can be top or end mounted using canopy or pendant. Single face signs can also be wall mounted over recessed or surface junction boxes. Universal signs are supplied with two stencil faceplates and 1 backplate to allow either single or double face installation. Male/female electrical quick-connect supplied to speed installation.

Product Codes

Catalog No.	Finish Codes	Input Voltage	Lamp	Emergency Wattage
DLED52R-B	Black	120/277V	Red LEDs	90min
DLED52G-B	Black	120/277V	Green LEDs	90min
DLED52S-R-B	Black Salida	120/277V	Red LEDs	90min
DLED52S-G-B	Black Salida	120/277V	Green LEDs	90min

dmf LIGHTING® T.800.441.4422 F.800.dmf.9666

WA-200 Automatic Wall Switch



Product Overview

Description

The WA-200 passive infrared automatic wall switch turns lighting on and off based on occupancy. These switches feature our innovative SmartSet™ technology which eliminates the adjustment process.

Operation

The WA-200 replaces existing wall switches and operates between 100 and 300 volts. The WA uses advanced passive infrared technology to detect occupancy and turn lights on. Once a space is vacated and the time delay elapses, lights automatically turn off. DIP switch settings allow for a variety of additional control options such as Manual or Automatic-ON, time delay, light level sensing, sensitivity, and audible or visual alerts.

SmartSet

Using SmartSet™ technology, the WA-200 requires no adjustment at installation. SmartSet continuously monitors the controlled space to identify usage patterns. Using this information, it automatically adjusts the time delay and sensitivity settings for optimal performance and energy efficiency. The sensor assigns short delays (as low as 5 minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times.

Applications

The WA-200's many options, ease of installation, and great energy saving potential add up to a large return on investment. The sensor's hard lens enables it to be used in public spaces such as teachers' offices and small storage areas in addition to standard applications of offices, small conference rooms, copy rooms, and other enclosed, small building spaces.

Features

- Advanced control logic based on RISC microcontroller provides:
  - Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
  - SmartSet automatically adjusts sensitivity and time delay settings to fit occupant patterns
  - Walk-through mode turns lights off 3 minutes after the area is initially occupied
  - One-step light level control setup learns desired hold-off level
- Zero-cross relay control guarantees reliable operation with non-linear loads even with temperature changes and product aging
- Hard lens makes sensor resistant to vandalism
- Terminal style wiring makes installation quick and easy, eliminating the need for wire nuts
- Choice of automatic-ON or manual-ON operation
- Optional alerts for impending shut-off include light flash, audible, or both
- For safety, there is no leakage to load in the off mode and sensor is safety grounded
- Tamper resistant design
- LED indicates occupancy detection

the Watt Stopper®
www.wattstopper.com
800.879.8585

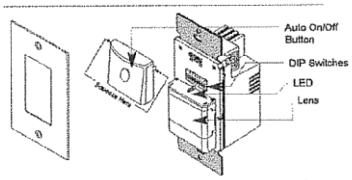
WA-200 Technical Information

Specifications

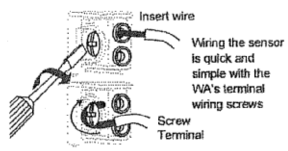
- Universal 100 - 300 VAC; 50/60 Hz operation
- Coverage of 180 degrees, maximum 300 sq ft, 150 sq ft for desktop activity
- Time delays: SmartSet (automatic), fixed (5, 10, 15, 20, or 30 minutes), walk-through, test-mode
- Sensitivity adjustment: SmartSet (automatic) or reduced sensitivity
- 1.0 mm hard, poly IR 2 lens; 2 level lens for superior desktop detection
- Compatible with all electronic ballasts and PL lamp ballast systems
- Dimensions: 2.6" x 1.7" x 1.9" (67mm x 43mm x 49mm) L x W x D
- UL and CUL listed; 5 year warranty

Controls & Wiring

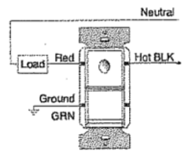
Controls & Installation



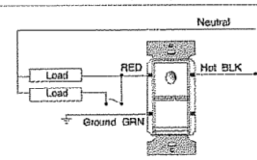
Wire Connections



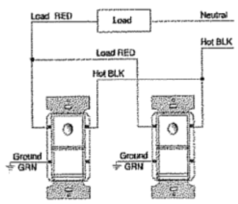
Single Level Lighting



Manual Bi-level Lighting



3-way Lighting



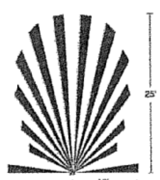
DIP Switch Settings

	Time Delay	1	2	3	
*	15 sec/SmartSet	↓	↓	↓	◄
	5 minutes	↓	↓	↑	
*	10 minutes	↓	↑	↓	
	10 minutes	↓	↑	↑	
*	15 minutes	↑	↓	↓	
	15 minutes	↑	↓	↑	
	20 minutes	↑	↑	↑	
*	30 minutes	↑	↑	↓	
	Sensitivity			4	
	High/SmartSet			↓	◄
	Low			↑	
	ON Mode			5	
	Auto On			↓	◄
	Manual On			↑	

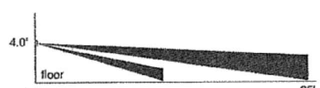
Light Level	6	
Disabled	↓	◄
Enabled	↑	
Audible Alerts	7	
Disabled	↓	
Enabled	↑	◄
Visible Alerts	8	
Disabled	↓	◄
Enabled	↑	

↑= ON ↓= OFF
◄ Factory settings
★ Walk-through mode enabled
Number indicates DIP switch position

Coverage



The 2-level lens provides superior coverage at a desk-top level by allowing the sensor to detect vertical as well as horizontal motion

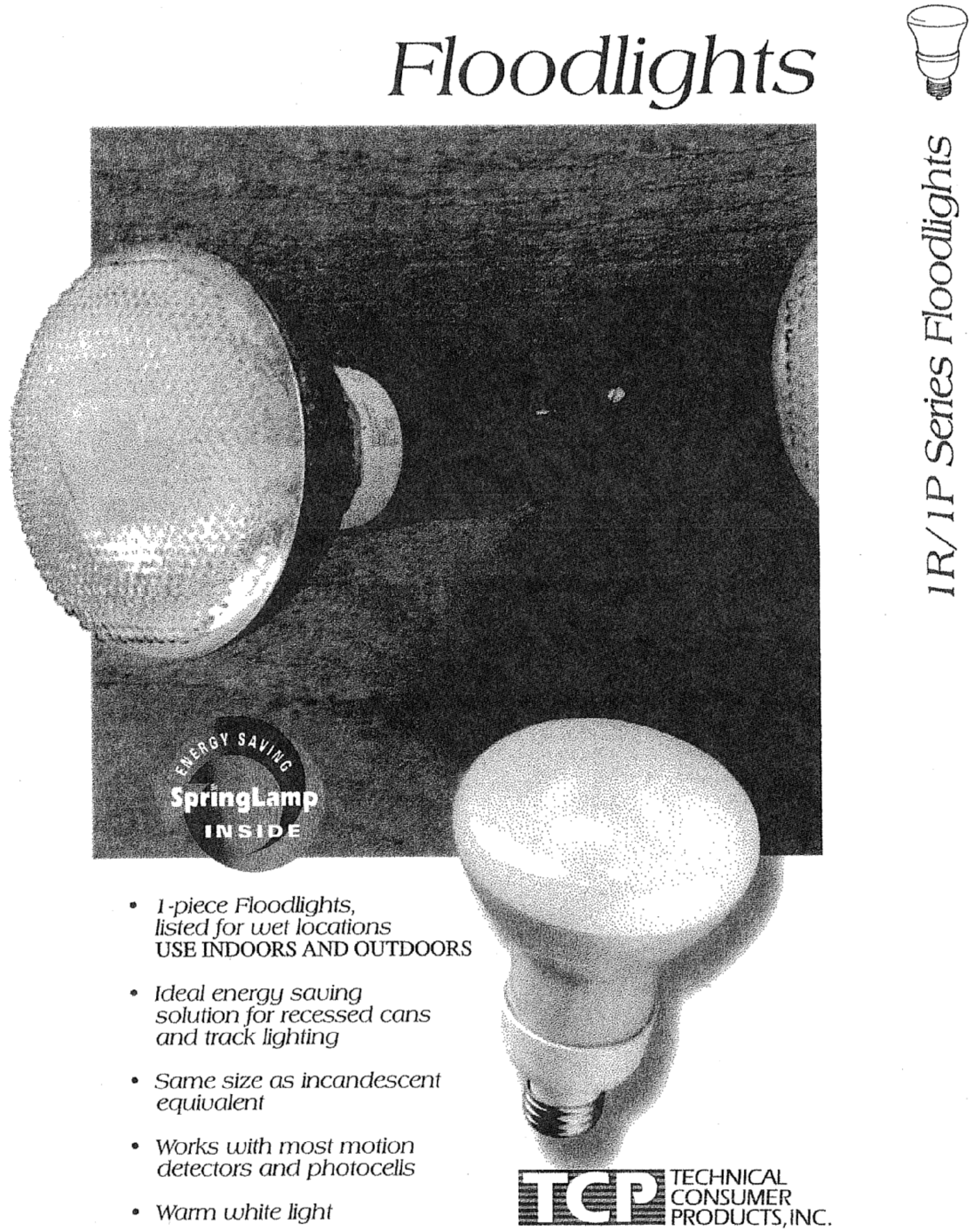


Ordering Information

Catalog No.	Voltage	Load Requirement	Coverage
WA-200	100/120 VAC; 50/60 Hz or 230/277 VAC; 50/60 Hz	0-800 Watt Ballast or 0-1200 Watt Ballast	up to 300 sq ft; 180°
ASP-211	Cover plate for single gang box (one included with each unit)		
ASP-422	Blank cover plate for 2-gang box		
ASP-432	Cover switch plate for 2-gang box with switch option		

Add to the end of catalog no.: -W for white, -I for ivory, -G for grey, -B for black, -A for light almond

The Watt Stopper®, Inc.
Pub. No. 14002

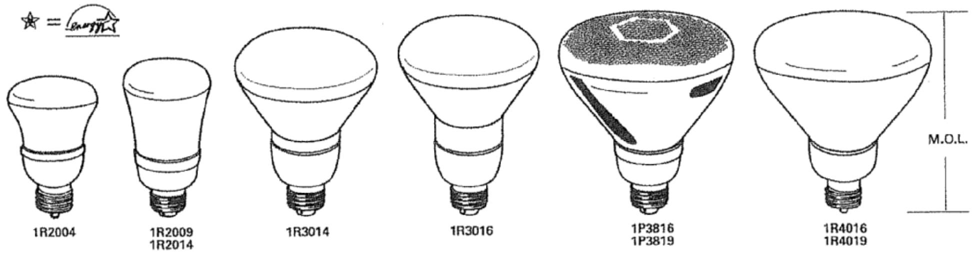

Floodlights
1R/1P Series Floodlights
ENERGY SAVING
SpringLamp
INSIDE
• 1-piece Floodlights, listed for wet locations USE INDOORS AND OUTDOORS
• Ideal energy saving solution for recessed cans and track lighting
• Same size as incandescent equivalent
• Works with most motion detectors and photocells
• Warm white light
TCP
TECHNICAL CONSUMER PRODUCTS, INC.

TCP Floodlights 1-Piece SPECIFICATIONS

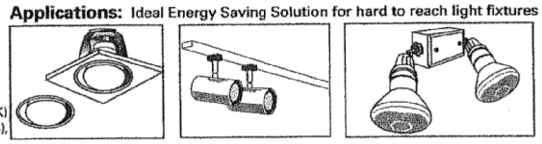
Lamp Type: One Piece Compact Fluorescent Floodlight, NPF, 8,000 Hour Life, Wet location listed

Item #	Watts	Incandescent Wattage Comparison	Initial Lumens	Color Rendering Index	Input Line Current	M.O.L. (inches)	Diameter (inches)
1R2004	4	15	130	82	.07A	4.00	2.50
1R2009	9	25	300	82	.15A	4.35	2.50
1R2014 ★	14	50	500	82	.23A	4.75	2.50
1R3014 ★	14	65	650	82	.23A	5.10	3.70
1R3016 ★	16	75	750	82	.27A	5.75	3.70
1R4016 ★	16	75	750	82	.27A	5.90	4.75
1R4019 ★	19	85	950	82	.32A	5.90	4.75
1P3016 ★	16	75	750	82	.27A	5.75	3.70
1P3816 ★	16	75	750	82	.27A	5.90	4.65
1P3819 ★	19	85	950	82	.32A	5.90	4.65

★ = Energy



Applications: Ideal Energy Saving Solution for hard to reach light fixtures



Perfect for:
- Recessed Cans
- Ceiling fixtures
- Track lights
- Outdoor fixtures

Special Application Options: (Ordering Suffix)

- 3100°K (31K), 3500°K (35K), 4100°K (41K), 5100°K (51K), 6500°K (65K)
- Pink (P), Soft Pink (SP), Red (R), Blue (B), Green (G)

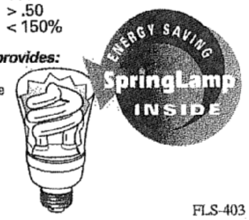
Features and Benefits:

- Long life, 8,000 hour average rated life
- Lasts 4 times longer than similar incandescent
- Replace less often, ideal for hard to reach places
- Lower maintenance and labor costs for lamp replacements
- 2700°K color temperature closest to incandescent light
- Quick run-up time
- Similar in size to standard incandescent floodlights
- Instant start, flicker free
- End of Life logic guards against violent failures
- World class phosphor insures high lumen output and excellent lumen maintenance

Specifications (at full brightness)

End of Life Protection	Yes
Ballast Type	Electronic
Starting Method	Modified Rapid Start
Input Line Voltage	120VAC
Input Line Frequency	60HZ
Lamp Life (rated)	8,000 Hours
Color Temperature	2700°K
Minimum Starting Temperature	-20 ° F
Maximum Operating Temperature	160 ° F
Adapter Screw in base	Edison E-26
U.L. / C.U.L. Listed	Yes
FCC Compliance	Part 18, Subpart C
Lamp Operating Frequency	45 KHZ
Lamp Current Crest Factor	< 1.60
Maximum Open Circuit Voltage	600V
Power Factor	> .50
Total Harmonic Distortion	< 150%

SpringLamp® INSIDE technology provides:
- **Higher lumen Output**
- **Long life** - 8,000 hours average rated life
- **Better lumen maintenance**



c UL USA

ISO 9002 CERTIFIED

12 MONTH WARRANTY

TECHNICAL CONSUMER PRODUCTS, INC.
Lighting the Way to Energy Efficiency

300 Lena Drive Aurora, Ohio 44202
PHONE: (330) 995-6111 or 1-800-324-1496
FAX: (330) 995-6188
E-MAIL: sales@ springlamp.com
WEBSITE: www.tcpi.com

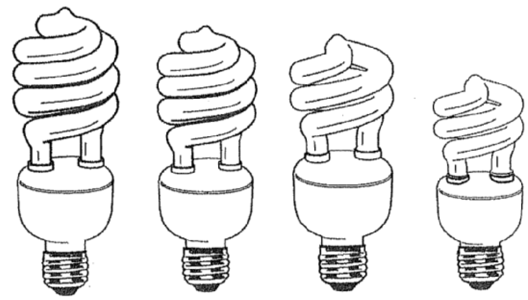
FLS-403

Energy Efficient Compact Fluorescent

UB BULBS

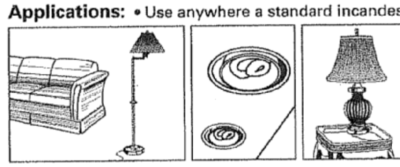
Features and Benefits:

- Long life, 10,000 hour average rated life
- Lasts 7 years, based on 4 hours use per day
- Lasts 10-13 times longer than similar incandescent
- Replace less often, ideal for hard to reach places
- Lower maintenance costs for lamp replacements
- Saves up to 75% in Energy Costs compared to similar light output incandescent lamps
- Quick run-up time
- Medium base and compact height fits anywhere a standard incandescent fits
- Instant start, flicker free
- End of Life logic guards against violent failures
- World class phosphor insures high lumen output and excellent lumen maintenance
- Up to 23 watts approved for enclosed fixtures



27 Watts   23 Watts   20 Watts   14 Watts

Applications: • Use anywhere a standard incandescent is used



Perfect for:
- Table lamps
- Floor lamps
- Ceiling fixtures
- Wall Sconces
- Closet lights
- Desk lamps

Compact Fluorescent Lamps, NPF, 10,000 Hours average rated life

Item #	Wattage	Incandescent Wattage Comparison	Initial Lumens	Input Line Current	Color Temperature	M.O.L. (inches)	Diameter (inches)	Power Factor
UB144★	14	60	800	.20A	2700°K	4.5	1.7	>.50
UB1441K4	14	60	800	.20A	4100°K	4.5	1.7	>.50
UB204★	20	75	1200	.31A	2700°K	4.6	2.3	>.50
UB2041K4	20	75	1200	.31A	4100°K	4.6	2.3	>.50
UB234★	23	90	1425	.38A	2700°K	5.0	2.3	>.50
UB2341K4	23	90	1425	.38A	4100°K	5.0	2.3	>.50
UB274★	27	100	1750	.46A	2700°K	5.2	2.4	>.50
UB2741K4	27	100	1750	.46A	4100°K	5.2	2.4	>.50

★= Energy Star   All items listed above are 4 packks   Color Temperatures Available - Warm White (2700 - 3000°K), Cool White (4100°K)

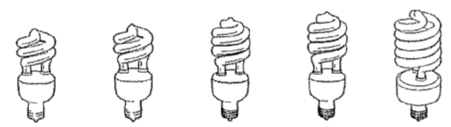
ENERGY STAR   C UL US   ISO 9002 CERTIFIED   12 MONTH WARRANTY

To Order Call: (800) 324-1496

UBF-205np

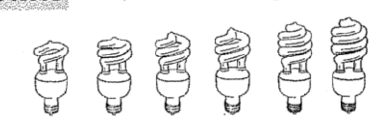
SpringLamp®

189 Series **SpringLamp® CFL, Electronic, NPF,**
120 volts, 10,000 Hours Avg. Life



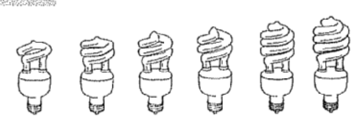
Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	Base Type	M.O.L. (inches)	Diameter (inches)
18915 ★	15	60	930	Medium	5.20	2.20
18920 ★	20	75	1200	Medium	5.40	2.20
18923	23	90	1400	Medium	5.70	2.20
18927 ★	27	100	1950	Medium	6.20	2.20
NEW 18932	32	130	2200	Medium	6.25	2.40
18942 ★	42	150	2800	Medium	7.10	2.72

180 Series **SpringLamp® CFL, Electronic, NPF,**
120 volts, 15,000 Hours Avg. Life



Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	Base Type	M.O.L. (inches)	Diameter (inches)
18009	9	35	400	Medium	4.00	1.75
18011	11	40	550	Medium	4.50	1.75
18015	15	60	930	Medium	5.30	2.20
18020	20	75	1200	Medium	5.56	2.20
18023	23	90	1400	Medium	5.80	2.20
18027	27	100	1950	Medium	6.00	2.20

182 Series **SpringLamp® CFL, Electronic, HPF,** **HPF**
120 volts, 10,000 Hours Avg. Life

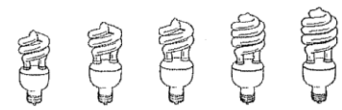


Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	Base Type	M.O.L. (inches)	Diameter (inches)
18214*	14	60	900	Medium	4.75	1.75
18219*	19	75	1250	Medium	4.70	2.17
18209	9	35	400	Medium	4.70	2.20
18211	11	40	550	Medium	4.85	2.20
18215 ★	15	60	930	Medium	5.30	2.20
18220 ★	20	75	1200	Medium	5.56	2.20
18223 ★	23	90	1400	Medium	5.80	2.20
18227	27	100	1950	Medium	6.00	2.20

** Mini SpringLamp®, HPF*

5

188 Series **SpringLamp® CFL, Electronic, NPF,**
120 volts, 6,000 Hours Avg. Life



Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	Base Type	M.O.L. (inches)	Diameter (inches)
18814 ★	14	60	800	Medium	4.7	1.75
18815 ★	15	60	930	Medium	5.3	2.20
18820 ★	20	75	1200	Medium	5.5	2.20
18823 ★	23	90	1400	Medium	5.8	2.20
18825 ★	25	100	1600	Medium	6.0	2.20

3 way SpringLamp® **NEW**

190 Series **3 Way SpringLamp® CFL, Electronic, NPF,**
120 volts, 10,000 Hours Avg. Life, Medium base

3 WAY

- *3 distinct light levels*
- *FCC compliant at each level*
- *Only true 50 -150w incandescent light output equivalent*

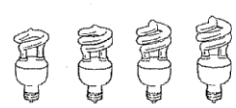
Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	M.O.L. (inches)	Diameter (inches)
19032	15/ 23/ 32	50/ 100/ 150	800/ 1700/ 2200	6.25	2.40

Dimmable SpringLamp®

TCP was the first to introduce a dimmable Compact Fluorescent Lamp.
The dimming range is from 100% down to 20%.

101 Series **SpringLamp® CFL, Electronic, HPF,** **HPF**
120 volts, 10,000 Hours Avg. Life

DIMMABLE

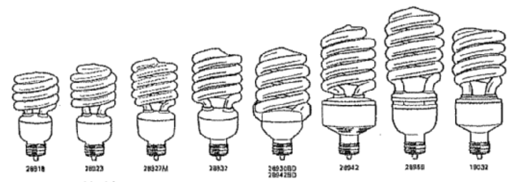


Item #	Wattage	Incandescent Watts Comparison	Initial Lumens	Base Type	M.O.L. (inches)	Diameter (inches)
10109	9	35	400	Medium	4.70	2.20
10111	11	40	550	Medium	4.85	2.20
10115	15	60	930	Medium	5.30	2.20
10120 ★	20	75	1200	Medium	5.56	2.20

T2 technology

289 Series Specifications

T2 SpringLamp® Compact Fluorescent, NPF



Ideal for:

Item #	Wattage	Incandescent Wattage Comparison	Initial Lumens	Input Line Current	M.O.L. (inches)	Diameter (inches)	Life vs. Incandescent	Table/ floor Lamps	Chandeliers	Recessed Cans	Bare bulb Fixtures	High Bay Fixtures	Ceiling Fixtures	Desk Lamp	Outdoor Lights
28918	18	75	1200	.30A	4.6	2.3	13X	•	•	•	•		•		•
28923 ★	23	100	1600	.38A	4.6	2.3	13X	•	•	•	•		•		•
28923FS	23	100	1200	.38A	5.0	2.3	13X	•	•	•	•				•
28927	27	100	1850	.45A	5.7	2.7	13X	•	•		•				
28927M ★	27	100	1850	.45A	5.1	2.4	13X	•			•				
28930BD	30	120	2100	.50A	5.4	3.0	13X	•							
28932 ★	32	130	2100	.53A	6.1	2.7	13X	•			•				
28942	42	150	2800	.70A	7.0	2.8	13X	•			•	•			
28942BD	42	150	2650	.70A	5.7	2.7	13X	•							
28968	68	300	4200	1.13A	9.5	4.1	13X					•			
19032	14/19/32	40/75/150	450/1100/1950	.53A	6.8	2.4	8X	•						•	

★ = ENERGY STAR   FS = Full Spectrum 5500˚K, 90CRI,   BD = Base Down use only

Special Application Options (Ordering Suffix)

- 3100˚K (31K), 3500˚K (35K), 4100˚K (41K), 5100˚K (51K), 6500˚K (65K)
- Long Neck 1.65" (165), 1.75" (175), 2.25" (225)
- Wet location (WL) • Shatter Resistant (SS)

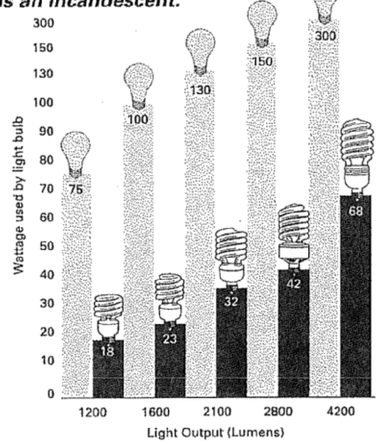
Special Notes

68 watt is NOT for use in recessed cans.
Use in an enclosed recessed can voids the warranty.

27 Watt and above NOT recommended for a totally enclosed glass trim covered recessed can.
Use a 27 watt in an open recessed can with no cover.
Up to 23 watt is UL approved for totally enclosed fixtures.

Energy Savings (SpringLamp® compared to incandescent)

Save electricity costs by using less wattage with the same light output as an incandescent.



Features and Benefits

- ✱ NEW Small size
- ✱ NEW Amalgam Technology- provides cooler operating temperatures for consistent performance in any position
- ✱ Long life, 10,000 hour average rated life
- ✱ No lead glass- Better lumen maintenance over life of bulb
- ✱ 2700˚K color temperature closest to incandescent light
- ✱ Medium base
- ✱ Replace less often, ideal for hard to reach places
- ✱ End of Life logic guards against violent failures
- ✱ 15 Month Warranty

Specifications (at full brightness)

End of Life Protection	Yes
Ballast Type	Electronic
Starting Method	Modified Rapid Start
Input Line Voltage	120VAC
Input Line Frequency	50/60HZ
Lamp Life (rated)	10,000 Hours
Color Temperature	2700˚K
Color Rendering Index	84
Minimum Starting Temperature	-20 ˚ F
Maximum Operating Temperature	160 ˚ F
U.L. / C.U.L. Listed	Yes
FCC Compliance	Part 18, Subpart C
Lamp Operating Frequency	45 KHZ
Lamp Current Crest Factor	< 1.60
Maximum Open Circuit Voltage	600V
Power Factor	> .50
Total Harmonic Distortion	< 150%

c UL us   15 MONTH WARRANTY

TECHNICAL CONSUMER PRODUCTS, INC.

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SL289-105

Appendix D: CoolTrol Logging Output Sheets

Figure D–1. Temperature Log Output

(HYCAL)
(NC dh relay)
(8-97 harness)
Cooler #1 Setpoint: 40

		DH	H	DP	ST	I	C	BYP	SOL	FAN	ACT	AS	Df	El
07/07	17:0	55	33	55	87	40	33	0	6	15			1	
07/07	17:1	50	34	54	87	43	40	0	0	15			1	
07/07	17:2	50	35	55	86	42	35	0	14	15			1	
07/07	17:3	50	35	55	86	41	32	0	15	15			1	
07/07	18:0	53	36	55	85	41	32	0	15	15				
07/07	18:1	52	36	54	85	40	31	0	15	15				
07/07	18:2	50	37	54	84	40	31	0	15	15				
07/07	18:3	50	37	54	83	40	30	0	15	15				
07/07	19:0	50	37	53	83	40	30	0	15	15				
07/07	19:1	50	38	53	82	39	29	0	15	15				
07/07	19:2	50	39	54	81	41	34	0	0	5				
07/07	19:3	50	39	54	82	41	32	0	14	14				
07/07	20:0	66	38	55	83	40	30	0	15	15			1	
07/07	20:1	70	39	56	84	40	32	0	9	15			1	
07/07	20:2	70	40	56	84	42	39	0	0	15			1	
07/07	20:3	70	40	56	84	43	36	0	10	15			1	
07/07	21:0	70	41	57	84	40	31	0	15	15				
07/07	21:1	70	42	58	84	40	30	0	15	15				
07/07	21:2	70	42	58	84	40	29	0	15	15				
07/07	21:3	70	42	58	84	40	31	0	9	13				
07/07	22:0	70	43	58	84	41	34	0	7	9				
07/07	22:1	70	42	58	84	40	30	0	15	15				
07/07	22:2	70	42	58	84	40	30	0	15	15				
07/07	22:3	70	42	57	83	40	29	0	15	15				
07/07	23:0	70	43	57	83	40	32	0	4	9				
07/07	23:1	70	43	57	83	41	32	0	12	12				
07/07	23:2	70	43	57	83	40	29	0	15	15				
07/07	23:3	70	43	57	83	40	34	0	2	6				
07/08	00:0	0	0	0	0	0	0	0	0	0				
07/08	00:1	0	0	0	0	0	0	0	0	0				
07/08	00:2	0	0	0	0	0	0	0	0	0				
07/08	00:3	50	42	53	78	46	39	0	3	4				
07/08	01:0	46	40	50	77	42	32	0	15	15				
07/08	01:1	30	40	49	76	40	30	0	15	15				|
07/08	01:2	44	41	50	76	40	29	0	15	15				
07/08	01:3	50	42	51	77	39	28	0	15	15				
07/08	02:0	50	43	52	77	41	34	0	0	5				
07/08	02:1	50	45	53	77	41	31	0	15	15				
07/08	02:2	50	45	53	77	40	29	0	15	15				
07/08	02:3	50	45	53	77	40	34	0	1	6				
07/08	03:0	50	46	53	76	41	32	0	13	13				
07/08	03:1	50	46	53	76	40	30	0	10	14				
07/08	03:2	50	46	53	76	41	35	0	4	5				
07/08	03:3	50	46	53	76	40	30	0	15	15				
07/08	04:0	50	46	53	76	40	32	0	4	8			1	
07/08	04:1	50	47	53	76	41	33	0	10	11			1	
07/08	04:2	50	47	53	76	40	34	0	5	15			1	
07/08	04:3	50	47	53	76	42	39	0	0	15			1	
07/08	05:0	50	47	53	75	42	33	0	13	15			1	
07/08	05:1	50	47	53	75	40	29	0	15	15			1	
07/08	05:2	50	49	53	75	40	33	0	2	7			1	
07/08	05:3	50	48	54	76	41	32	0	12	12			1	

Figure D–2. Run Log Output

```
RUNTIME MINUTES DOWNLOAD
v5.01.10
(HYCAL) (NC dh relay)   (8-97 harness)
Cooler #1 Setpoint: 38
Cooler #2 Setpoint: -5

 13:04:37  10/9/2006

YEAR:00 -----------------
Cooler 1
        MONTH  ON PEAK  OFFPEAK
TOTAL MIN       01       00000   00000
TOTAL MIN       02       00000   00000
TOTAL MIN       03       00000   00000
TOTAL MIN       04       00000   00000
TOTAL MIN       05       00000   00000
TOTAL MIN       06       00000   00000
TOTAL MIN       07       00000   00000
TOTAL MIN       08       00000   00000
TOTAL MIN       09       00000   00000
TOTAL MIN       10       00000   00000
TOTAL MIN       11       00000   00000
TOTAL MIN       12       00000   00000

        MONTH  ON PEAK  OFFPEAK
SOLENOID        01       00000   00000
SOLENOID        02       00000   00000
SOLENOID        03       00000   00000
SOLENOID        04       00000   00000
SOLENOID        05       00000   00000
SOLENOID        06       00000   00000
SOLENOID        07       00000   00000
SOLENOID        08       00000   00000
SOLENOID        09       00000   00000
SOLENOID        10       00000   00000
SOLENOID        11       00000   00000
SOLENOID        12       00000   00000

        MONTH  ON PEAK  OFFPEAK
FANS    01      00000   00000
FANS    02      00000   00000
FANS    03      00000   00000
FANS    04      00000   00000
FANS    05      00000   00000
FANS    06      00000   00000
FANS    07      00000   00000
FANS    08      00000   00000
FANS    09      00000   00000
FANS    10      00000   00000
FANS    11      00000   00000
FANS    12      00000   00000

        MONTH  ON PEAK  OFFPEAK
BYPASS  01      00000   00000
BYPASS  02      00000   00000
BYPASS  03      00000   00000
BYPASS  04      00000   00000
BYPASS  05      00000   00000
BYPASS  06      00000   00000
BYPASS  07      00000   00000
BYPASS  08      00000   00000
BYPASS  09      00000   00000
BYPASS  10      00000   00000
BYPASS  11      00000   00000
BYPASS  12      00000   00000

DOOR HEATER     01       00000
DOOR HEATER     02       00000
DOOR HEATER     03       00000
DOOR HEATER     04       00000
DOOR HEATER     05       00000
DOOR HEATER     06       00000
DOOR HEATER     07       00000
DOOR HEATER     08       00000
DOOR HEATER     09       00000
DOOR HEATER     10       00000
DOOR HEATER     11       00000
```

Appendix E: Surveys

Surveys for the Convenience Store Energy Efficiency Delivery Program follow. Included surveys are:

- Edison Program Manager
- Implementer—Quantum Staff
- Participants
- Interested Potential Participants
- Nonparticipants

Convenience Store Energy Efficiency Delivery Program

Edison Program Manager

Interview Guide

Date ____

Interviewer ____

This is ____________ with Quantec Consulting. We are evaluating the Convenience Store Energy Efficiency Program. I'd like to speak with _____________________ If not, could I schedule a time to call back to reach Mr./Ms. _____________________?
If someone other than original contact is respondent, repeat introduction.

Program Design

12. What changes were made in program design, approach or outreach from the plan originally submitted?
13. Were the targets met? If not, why not?
    - ❑ No, Why not ____
    - ❑ Yes
    - ❑ Unknown
14. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

15. Were there any issues related to interaction with Quantum, billing, incentives program tracking, or processing contractor rebates.
    - ❑ No
    - ❑ Yes, explain ____
    - ❑ Unknown
16. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Overall Lessons Learned

17. Are there barriers to the widespread adoption of these measures in the Convenience Store market that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ No
    - ❑ Yes,
      a. What are they?
      b. How were they addressed or what suggestions do you have?
    - ❑ Unknown

18. What have you learned about the convenience store market? What characteristics make a good candidate for this program?
19. Other comments / issues

Thank you for your time.

Convenience Store Energy Efficiency Delivery Program

Implementer—Quantum Staff

Interview Guide

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

I am calling on behalf of Southern California Edison. Edison has contracted with us to evaluate the Convenience Store Energy Efficiency Program. I'd like to speak with ________________________ Is ______ available?
If not, could I schedule a time to call back to reach Mr./Ms. ________________________?
If someone other than original contact is respondent, repeat introduction.

Program Design

20. What changes were made in program design, approach or outreach from the plan originally submitted?
21. Were the targets met? If not, why not?
    - ❑ No, Why not ____
    - ❑ Yes
    - ❑ Unknown
22. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

23. Were there any issues related to interaction with Edison billing, incentives program tracking, or processing contractor rebates.
    - ❑ No
    - ❑ Yes, explain ____
    - ❑ Unknown
24. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Marketing and Outreach

25. What was your strategy for identifying the target market of convenience stores? What characteristics or criteria were used to identify potential participating stores? Issues related to identifying and recruiting potential participants? How long did it take? What did it involve? Number/portion of targeted or eligible convenience stores contacted.
26. How was the program marketed? What methods of contact were employed? What was the relative success of the different methods if different methods were attempted?
    - ❑ Mail
    - ❑ Email
    - ❑ Phone call

- ❑ Presentation at industry meetings
- ❑ Other, specify ______________________________________

27. Were contacts and refusals tracked in a spreadsheet? What is known about the disposition of interested/non-interested contacts?
28. I understand Edison compiled a list of potential participants initially.
    a. How did you use the list?
    b. Did you expand the list? If so, how?
        - ❑ No
        - ❑ Yes, How? ____
        - ❑ Unknown

Delivery and Implementation

29. Did any issues emerge since project completions/installations?
30. Any central or recurring or unaddressed issues emerge with HVAC system owners, contractors or the measures installed at any time during the process?
31. Have any of the equipment/measures been removed since they were installed with this program? If so, what, when, how many?
    - ❑ No
    - ❑ Yes, Explain?
    - ❑ Unknown

Overall Lessons Learned

32. What is the size of the existing market? What characteristics make a good candidate for this program?

    ____
33. Were there unique issues at particular sites that would be encountered in technology diffusion? Have barriers to technology administration or diffusion been identified?
    - ❑ No
    - ❑ Yes, Explain ____
    - ❑ Unknown
34. Are there barriers to the widespread market penetration for this program that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____
35. Is the program scalable into a larger program? What aspects of the program will have to change if it were expanded?
    - ❑ No
    - ❑ Yes, Explain ____
    - ❑ Unknown

36. If the program were expanded to other hard-to-reach commercial retail facilities, other than those reached so far, is there anything that you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, etc?
37. What characteristics make a good candidate for this program?
38. Other comments?

Thank you for your time.

Convenience Store Energy Efficiency Delivery Program

Participants

Contact Person ____
Facility Name ____
Facility Type ____
Measures Installed____
Date ____
Interviewer ____

Hello, my name is ________________from Quantec. I am calling on behalf of Southern California Edison. We are evaluating the Convenience Store Energy Efficiency Program. This program provided direct installation of energy efficiency measures to the convenience stores this past year. I'd like to speak with ______________________or someone knowledgeable about your participation in this program. Is _______________ available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach

1. Do you remember when you were contacted about the Convenience Store Energy Efficiency program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes When were you contacted? ______________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Edison
   - ❑ Program implementer/Quantum
   - ❑ Maintenance contractor
   - ❑ Other, specify ______________________________________
3. How was the information delivered? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ In person
   - ❑ Email
   - ❑ Other, specify ______________________________________
4. Could you tell me the benefits of program participation, as they were explained to you? [Do not read. Check all that apply]
   - ❑ Program will help customers save energy and/or money
   - ❑ Southern California Edison would pay for the audits
   - ❑ 100% financing available for project costs
   - ❑ 1-year payback expected on investment
   - ❑ This was an experiment
   - ❑ It was never explained to me
   - ❑ Other, record comments verbatim ______________________________

5. Why did you decide to participate? What factors were key to your decision? [Do not read list. Probe if needed]
   - ❑ Save money
   - ❑ Save energy
   - ❑ This is an experiment
   - ❑ 1-year payback expected on investment
   - ❑ Financing package was important
   - ❑ Other, specify ____
6. Was the financing package important in the decision to participate?
   - ❑ No
   - ❑ Yes ....[Ask 6b]
   - ❑ Uncertain..[Ask 6b]
     - 6b. Would you have participated without financing?
       1. No
       2. Yes
7. How important was Edison's sponsorship of this program to your decision to participate? Would you say… [Read and check one]
   - ❑ Not at all important
   - ❑ Somewhat unimportant
   - ❑ Neutral
   - ❑ Somewhat important
   - ❑ Very important

   Explain response _______________________________________

Delivery and Implementation

8. Were you aware of the following technologies before being contacted about this program? [Refer to the respondent's measure list; record in Table 1]

Table 1. Product Awareness Grid: Enter For each installed program measure [Refer to respondent's measure list]

Measure/Service	No	Yes	Uncertain
T8 lighting			
CFLs			
LED exit signs			
Occupancy sensors for bathroom lights and fans			
Evaporative Fan Motors and controls			
Microprocessor controls for HVAC condensers			
AC economizer repair			
Control systems for evaporators and AC compressors			
Anti-sweat heater controls			
Other measures from their measure list in spreadsheet Specify:			

9. Did you experience any problems with the contractors any time during the audit or installation process? (Probe: during the audit, ordering, installation)
   - ❑ No
   - ❑ Yes Please describe

10. Were there any problems with the efficiency measures at any time during the installation process? (Probe: audit, ordering, installation)
    - ❑ No
    - ❑ Yes Please describe, what problems, which measures

Market/Customer Response

Table 2. Customer Response -- Questions 11 - 16

Measure/Service	Col A Q11 Operational issues N/Y describe	Col B Q12 Didn't install	Col C Q13 Removed N/Y when, how, number	Col D Q14 Plans Equip replacement N/Y	Col E Q14b Same efficiency? Likelihood Scale 1-5	Col F Q15 Changed operations N/Y when, how	Col G Q16 Change in performance N/Y describe
T8 lighting							
CFLs							
LED exit signs							
Occupancy sensors for bathroom lights and fans							
Evaporative Fan Motors and controls							
Microprocessor controls for HVAC condensers							
AC economizer repair							
Control systems for evaporators and AC compressors							
Anti-sweat heater controls							
*Other							

*Add measures as needed; refer to spreadsheet with measures installed

11. Did any operational issues come up during or since the project completion that required the attention of you or your staff? (Table 2 Col A)
    - ❑ No
    - ❑ Yes, Please describe ____
    - ❑ Uncertain
12. Did you decide not to install items that were recommended? (Interviewer: check the measures list; many had items recommended and not installed) (Table 2 Col B)
    - ❑ No
    - ❑ Yes
        - If so, what,? ____
        - Why did you decide against it?____________________________
    - ❑ Unknown
13. Have any of the equipment/measures been removed since they were installed through this program? (Table 2 Col C)
    - ❑ No
    - ❑ Yes Measure____
        1. If so, why was it removed?_______________________________
        2. What was removed?_____________________________________
        3. When ?____

4. How many? ____

- ❑ Unknown

14. Was any of the equipment that was replaced or upgraded with the project going to be replaced or upgraded anyway? (Table 2 Col D)
    - ❑ No
    - ❑ Yes
      - Which equipment ________(Table 2 Col D)_____________________
      - 14b. Assuming the Edison program did not exist or you were never made aware of the program, what is the likelihood that you would have installed equipment with the same efficiency that was installed through the program? (Table 2 Col D)
        - ❑ Not at all likely
        - ❑ Somewhat unlikely
        - ❑ Neutral
        - ❑ Somewhat likely
        - ❑ Very likely
15. Have you changed the manner in which you operated equipment or lighting after hearing about the program, after the audit, or after the equipment was installed? (Table 2 Col F)
    - ❑ No
    - ❑ Yes
      - When was the change made? __________________________
      - How did you change operations? For example, did you reduce the number of operating hours or change the operation schedules?
    - ❑ Unknown
16. Have you noticed any change in equipment operation or performance since the installation? (Table 2 Col G)
    - ❑ No
    - ❑ Yes Describe______________________________________
    - ❑ Uncertain
17. How much energy do you think you're saving from the equipment that was installed through the Edison program? What is the average percentage reduction in your monthly bill? __________%

Free Ridership

RECORD ANSWERS TO 18 to 22 IN TABLE 3

18. Before this Program, had you previously installed the same type of *energy efficiency measures* installed through this program, without an incentive? [Note: refer to the spreadsheet listing measures installed at this respondent's store]
    - ❑ No
    - ❑ Yes, [Table 3 Col A] [Ask about each type of measure listed, then proceed to ask the follow up questions for installed measures identified in column A]
      - If Yes, To the same level of efficiency? [Table 3 Col B]
        - ❑ No What efficiency? ___________________________
        - ❑ Yes
      - If Yes, Number or percent of *energy efficiency measures* installed [Table 3 Col C] ___ # or %

- ❑ Uncertain

19. Before participating in this Program, did you consider installing *the energy efficiency measures* without the program incentive? [ask each item on list of installed measures]
    - ❑ No...If No to all, skip to Spillover
    - ❑ Yes ....[Ask 20-22]
    - ❑ Uncertain
20. Would you have installed the *energy efficiency measure…* [Table 3 Col D]
    - ❑ In the same year
    - ❑ In one to two years
    - ❑ In three to five years
    - ❑ More than five years out
21. Did you have funding for *energy efficiency measure* in your short or long-term capital improvements plan or budget? [Table 3 Col E]
    - ❑ No
    - ❑ Short Term (0-1 years)
    - ❑ Long Term 1-5 years)
22. Was the *energy efficiency measure* already ordered? [Table 3 Col F]
    - ❑ No
    - ❑ Yes

Table 3. Free-Ridership Grid: Enter For each installed program measure

	Installed before Program (Q18)			Considered installing without incentives (Q19-22)		
	Col A	Col B	Col C	Col D	Col E	Col F
Measure*	Installed w/o incentive?	Same level of Efficiency?	Amount of Measures?	Time Frame	Budgeted?	Ordered?
T8 lighting						
CFLs						
LED exit signs						
Evaporative Fan Motors and controls						
Microprocessor controls for HVAC condensers						
AC economizer repair						
Control systems for evaporators and AC compressors						
Anti-sweat heater controls						
Other (from spreadsheet)						
(Ask) Were there other measures installed through the Edison program we did not mention? *Other						
*Other						

*Add measures as needed, from spreadsheet or listed by respondent

23. If *energy efficiency measures* were considered before this program and not installed, why were they not installed?
    - Record measure and reason: Measure __________________________
        - ❑ High first cost
        - ❑ In capital budget for future installation
        - ❑ Unable to obtain financing
        - ❑ Didn't know a contractor
        - ❑ Other, specify ____

Spillover

24. Do you operate other stores?
    - ❑ No
    - ❑ Yes
        1. If Yes, Please describe
        2. [If not already determined from the spreadsheet & introduction, ask:] Did any of these participate in this Edison program?
25. Would you install these *energy efficiency measures*, either at your own expense; or with incentives in the future?
    - ❑ Not at own expense or with incentives
    - ❑ Yes at own expense.......................................Which Measures?________
    - ❑ Yes with incentives ....Which Measures?________
    - ❑ Uncertain
26. (If Q24 = Yes) Do you have any plans to install *energy efficiency measures* at other businesses you own or manage?
    - ❑ No
    - ❑ Yes, When?
        1. This year
        2. In one to two years
        3. In three to five years
        4. More than five years out
27. Since participating in the program, have you installed any other additional energy efficiency measures we have not talked about, without incentives from your utility or other energy organizations?
    - ❑ No
    - ❑ Yes, Please describe the type of energy efficient equipment you added (specify type, quantity, and efficiency level)
28. [ASK IF 26 OR 27 = YES] Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Moderately influential
    - ❑ Not at all influential

Market Barriers to Adoption

29. Can you tell me how satisfied you are with the performance of the efficiency measures installed through this program? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied

Comments (record verbatim, note if satisfaction with some measures and dissatisfaction with others) ____

30. How satisfied are you with the program overall? Would you say
    Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied

Comments (record verbatim, note if satisfaction with some measures and dissatisfaction with others) ____

31. Do you have any suggestions for program changes and improvements? (for example, the selection of products, marketing, delivery, warranty service, training, etc.)?
32. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When, what program was it? ______________________
    - ❑ Uncertain

Thank you for your time.

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Convenience Store Energy Efficiency Delivery Program

Interested Potential Participants

(Received audit but did not participate. Also includes Drop-outs.)

Contact Person ____
Facility Name ____
Measures Installed____
Date ____
Interviewer ____

Hello, my name is ________________from __________. I am calling on behalf of Southern California Edison. We are evaluating the Convenience Store Energy Efficiency Program which was administered by Quantum. This program offered energy efficiency equipment to convenience stores. Your responses will help Edison improve their programs and better serve customers. May I have about 5 minutes of your time?
I'd like to speak with __________________ or someone who would have worked with the person who conducted the energy audit. Is ________________________ available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Screen

We understand that your business received an energy audit but did not install any of the recommended energy efficiency measures and participate in the program. Is this correct?

- ❑ Yes [Continue with this survey]
- ❑ No [Continue with non-part survey]
- ❑ Uncertain [Continue with non-part survey]

Marketing and Outreach

1. Someone from Southern California Edison or Quantum would have provided information about energy efficiency equipment. Do you remember how you first heard about the Energy Efficiency Program? [Do not read responses] [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ In person
   - ❑ Email
   - ❑ Other, specify ____
2. Why did you decide not to participate? What factors were key to your decision? [Do not read. Mark all that apply. Capture comments verbatim.]
   - ❑ Don't have funding /not in the capital budget
   - ❑ Didn't want to spend money up front
   - ❑ Don't believe the technologies will save any energy or money
   - ❑ Payback is too long
   - ❑ Too busy
   - ❑ Just not interested right now/too busy right now

- ❑ Didn’t look into it
- ❑ Didn’t think I qualified
- ❑ Didn’t understand what it was about
- ❑ Decision maker is someone else and they weren’t interested
- ❑ Might do it in the future
- ❑ Other, specify ___________________________________
- ❑ Uncertain

3. Do you feel that the energy audit was useful?
   - ❑ No
     - Why wasn’t it useful? __________________________
   - ❑ Yes
     - How was it useful? __________________________
   - ❑ Uncertain

Product *Installation*

4. In this program, energy efficiency equipment and measures were offered. I’d like to read a list of these items. Please tell me if you have installed any of these items (record in Table 1)

Table 1. Product Installation Grid

Measure/Service	Installed	Year Installed	Not installed	Don’t know if installed	Not familiar with technology
T8 lighting					
CFLs					
LED exit signs					
Occupancy sensors for bathroom lights and fans					
Evaporative Fan Motors and controls					
Microprocessor controls for HVAC condensers					
AC economizer repair					
Control systems for evaporators and AC compressors					
Anti-sweat heater controls					

Spillover

5. Would you install any of these or other energy efficiency technologies, either at your own expense or with incentives?
   - ❑ Not at own expense or with incentives ....Skip to Q8
   - ❑ Yes, at own expense
     - Which technology? __________________
   - ❑ Yes, with incentives
     - Which technology? __________________
   - ❑ Uncertain ....Skip to Q8
6. Do you have funding for any of these *technologies* in your budget?
   - ❑ No..Skip to Q8
   - ❑ Yes
     - Which technology? ____________________________

Market Barriers to Adoption

7. For each technology named in #6: Do you think you will install the *energy efficiency technologies…*
   - ❑ This year
   - ❑ In one to two years
   - ❑ In three to five years
   - ❑ More than five years out
8. Do you have suggestions for changes that could be made that would influence your decision to participate in a program like this in the future? For example, changes in terms of cost, marketing, product selection or other things? [Do not read. Mark all that apply. Capture comments verbatim.]
   - ❑ Cost
   - ❑ Education/marketing
   - ❑ Time
   - ❑ More information about energy savings
   - ❑ Other, specify ____
9. What do you think are the major reasons businesses like this (convenience stores or small grocery stores) don't install energy efficient equipment? [Capture comments verbatim.]
10. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When, what program was it? ______________________
    - ❑ Uncertain

Thank you for your time.

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Convenience Store Energy Efficiency Delivery Program

Nonparticipants

(Contacted about the program but did not respond)

Contact Person ____
Facility Name ____
Facility Type ____
Measures Installed____
Date ____
Interviewer ____

Hello, my name is ________________from __________. I am calling on behalf of Southern California Edison. We are evaluating the Convenience Store Energy Efficiency Program administered by Quantum. This program offered energy efficiency measures to convenience stores. Your responses will help Edison improve their programs and better serve customers. May I have about 5 minutes of your time?
I'd like to speak with __________________ or the person who may remember being contacted about this program. _______________________ Is that person available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Screen

Our records show that your business received information about the program but did not participate. Is this correct?

- ❑ Yes [Continue with this survey]
- ❑ No [Thank and Terminate]
- ❑ Uncertain [[Thank and Terminate]

Marketing and Outreach

1. Someone from Edison or Quantum would have provided information about energy efficiency equipment. Do you remember how you heard about the Energy Efficiency Program? [Do not read responses] [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ In person
   - ❑ Email
   - ❑ Other, specify ______________________________________
2. Did you follow up after receiving information about the program?
   - ❑ No
     - Could you please tell me why you did not follow up? (Do not read. Check all that apply. Capture comments verbatim.)
       1. Don't have funding /not in the capital budget
       2. Don't believe the technologies will save any energy or money

3. Too busy
4. Payback is too long
5. Just not interested right now
6. Didn't look into it
7. Didn't think I qualified
8. Didn't understand what it was about
9. Decision maker is someone else and they weren't interested
10. Might do it in the future
11. Other, specify ___________________________________

❑ Yes

- Did you receive additional information? (Record comments verbatim)
- Why did you decide not to participate? (Do not read. Check all that apply. Capture comments verbatim.)
  1. Don't have funding /not in the capital budget
  2. Don't believe the technologies will save any energy or money
  3. Too busy
  4. Payback is too long
  5. Just not interested right now
  6. Didn't look into it
  7. Didn't think I qualified
  8. Didn't understand what it was about
  9. Decision maker is someone else and they weren't interested
  10. Might do it in the future
  11. Other, specify ___________________________________

❑ Uncertain

Product Installation

3. In this program, energy efficiency equipment and measures were offered. I'd like to read a list of these items. Please tell me if you have installed any of these items (record in Table 1)

Table 1. Product Installation Grid

Measure/Service	Installed	Year Installed	Not installed	Don't know if installed	Not familiar with technology
T8 lighting					
CFLs					
LED exit signs					
Occupancy sensors for bathroom lights and fans					
Evaporative Fan Motors and controls					
Microprocessor controls for HVAC condensers					
AC economizer repair					
Control systems for evaporators and AC compressors					
Anti-sweat heater controls					

Spillover

4. Would you install any of these or other energy efficiency technologies in the future, either at your own expense or with incentives?
   - ❑ Not at own expense or with incentives ....Skip to Q7
   - ❑ Yes, at own expense
     - Which technology? ___________________
   - ❑ Yes, with incentives
     - Which technology? ___________________
   - ❑ Uncertain ....Skip to Q7
5. Do you have funding for any of these *technologies* in your budget?
   - ❑ No..Skip to Q7
   - ❑ Yes
     - Which technology? ______________________________
6. For each technology named in #5: Do you think you will install the *energy efficiency technologies…*
   - ❑ This year
   - ❑ In one to two years
   - ❑ In three to five years
   - ❑ More than five years out

Market Barriers to Adoption

7. Do you have suggestions for changes that could be made that would influence your decision to participate in a program like this in the future? For example, changes in terms of cost, marketing, product selection or other things? [Do not read. Mark all that apply. Capture comments verbatim.]
   - ❑ Cost
   - ❑ Education/marketing
   - ❑ Time
   - ❑ More information about energy savings
   - ❑ Other, specify ____
8. What do you think are the major reasons businesses like this (convenience stores or small grocery stores) don't install energy efficient equipment? [Capture comments verbatim.]
9. Have you participated in any other Southern California Edison energy efficiency programs?
   - ❑ No
   - ❑ Yes, When, what program was it? ______________________
   - ❑ Uncertain

Thank you for your time.

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6. Cool Cash Program

Appendix A: Surveys

Following are the surveys for the Cool Cash/Cool Bill program.

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Participant

Draft Questions

Cool Cash/Cool Bill

Participant Survey

Name:

Hi my name is___. I'm calling on behalf of Southern California Edison. We understand your hotel received new power controllers and occupancy sensors through this program and I'd like to ask you a few questions about your experience with the program.
My questions should take about 15 minutes, is this a good time?

1. Are you the person most involved in the decision to participate in the Cool Cash/Cool Bill program sponsored by SCE? Yes☐ No ☐.
    a. If no: Can you tell me who at your hotel was responsible for deciding:
    [Continue with survey]

    b. If yes: What were your primary considerations in deciding whether or not to participate?

Marketing and Outreach

2. How did you first hear about the Cool Cash program?
3. Had you heard of occupancy sensor and PTAC control technology prior to contact with the program? Yes ☐ /No ☐
    a. *If yes:* Were you familiar with the Smart Systems technology before contact with the program? Yes ☐ /No ☐
        i. *If yes:* How did you hear about it?

Decision-Making

4. Is there an energy manager at your company? Yes ☐ /No ☐
5. Who has the authority to decide whether or not to participate in programs like this?

6. Before controllers were installed, how were you managing air conditioner usage in unrented rooms?
    ☐ leave AC on
    ☐ cleaning crew shuts off AC
    ☐ leave AC off
    ☐ don't know.

Delivery and Implementation

7. Did program representatives describe specific benefits resulting from installation of the new equipment?
    a. [If so] Can you recall the benefits described?
        ☐ bill savings
        ☐ energy savings
        ☐ reduced maintenance
        ☐ improved comfort
        ☐ other ________________
8. Did any issues emerge during scheduling or installation?
9. After installation, how did the equipment work? ***(if replacements were required: how long did it take?)***
10. During the summer months, do your guests typically stay in the room in the afternoon or leave the room to return in the evening?
    a. What is your best estimate for the percentage of guests who stay in their rooms during the summer months?
11. Have you heard any comments from customers about the equipment? [If so, what?]

12. Have you had any issues with vandalism or intentional equipment disabling? Yes ☐ /No ☐
    a. [If yes] What happened?

Freeridership/Spillover

13. Would you have installed any occupancy sensors without the program incentive?

    a. If yes, would you have installed the same number of units?
    b. Would you have installed the same level of efficiency?
    c. Were the units already planned or budgeted for?
14. Would you have installed any PTAC power controllers without the program incentive? Yes ☐ /No ☐
    a. If yes, would you have installed the same number of units?
    b. Would you have installed the same level of efficiency?
    c. Were the units already planned or budgeted for?
15. Have any of these measures been installed elsewhere in this hotel in the previous two years? Yes ☐ /No ☐
    a. If yes, in how many rooms?
16. Has the company installed the same or similar technology in other hotel buildings?

    a. If so, where and when?
    b. Other cities? If so, where and when?
17. How does capital planning/spending work for these types of projects typically?

18. On a scale of 1-5, where one is not at all important and five is very important, how important was the program incentive in your decision to install the occupancy sensors/PTAC controllers?

Market/Customer Response

19. Have the measures met your expectations? Yes ☐ / No ☐
    a. If no, why not?
20. Are you aware of any energy savings in your hotel?
    a. Are you aware of any bill savings? (Have they compared the difference after installing controllers?)
21. Were you told about other functions that can be tied to the occupancy sensor (for example to automate lighting or dampers)? Yes ☐ / No ☐.
    a. If yes: Did you consider using these?
        i. If yes: Are you using them?
            1. If no: Do you plan to?
    b. Why/Why not?

Firmographics

22. What is the age of your hotel building?
23. How many rooms does your hotel have?
24. Is your hotel part of a larger chain? Yes ☐ / No ☐ [If so, can they estimate the number of affiliated hotels?]
25. Do you know the occupancy rate during the summer and winter of 2004? And 2005 *(This information will be kept confidential; it is solely to help us estimate the overall effectiveness of the program.)* If not; can you tell me who at your hotel would know this information?

General Questions

26. Overall, what would you say worked best about the program?
27. What didn’t work well?
28. Are there changes or improvements you would recommend?

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SCE Staff

Draft Questions

Cool Cash/Cool Bill

SCE Staff

Program Design

1. How would you describe the project's design and strategy overall?
    a. Do you feel the design is effective?
2. Was the program implemented as designed?
    a. If not, why was it changed and how did it differ from the proposal?

Program Administration

3. How would you describe your working relationship with Honeywell? Did any issues emerge over the course of implementation?
    a. Any issues related to billing or invoices?
    b. Any issues related to tracking systems or reporting?

Marketing and Outreach

Are you familiar with Honeywell's specific activities in marketing the program and conducting outreach?
[if yes:]

4. What is your understanding of the marketing and outreach approach for Cool Bill/Cool Cash?
5. What was the overall strategy for identifying target market hotels?
6. Thinking about the various ways hotel/motel owners heard about the program opportunity, how would you rate the effectiveness of each of the strategies:
    - Phone call?
    - Canvasser/direct contact?
    - Mail?
    - Any other way?
7. If more than one method was attempted, can you describe the relative success of different methods?

Delivery and Implementation

Were you aware of the activities by Honeywell in delivering and implementing the program? [if yes:]

8. What was the role of the manufacturer in program delivery?
9. How was training organized and conducted?
    a. Were technicians unfamiliar with the technology prior to the program?
10. Were there any post-installation issues or equipment failure? If so, how frequent, how were they handled? [If a replacement was required:] How long did it take?

Market/Customer Response

How aware were you of the market or customer responses to the program? [if aware:]

11. What do you believe are the primary reasons this technology is not already installed in hotels/motels in California? [What are the major barriers?]
12. Since the program offered direct installation of power controllers and motion and infrared occupancy sensors, what, if any, remaining concerns or barriers emerged?
    a. If any, how did the program overcome those concerns?
13. Were there any specific barriers that emerged related to replacing old PTAC units?
14. Were occupancy sensors/controls required with new PTAC units installed? If not, why not?
15. Were participating hotels provided with energy or bill savings estimates?
16. Were the other functions (automate lighting, dampers) also described to potential participants? How would you describe the overall interest in these other functions?
17. What did you learn about the hotel/motel market decision making?

General Questions

18. How would you describe the transferability of this program?
19. Could the program work on a statewide basis?
    a. [If the program were implemented statewide, is there anything you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, ect.?]
20. What worked best about the program?
21. What didn’t work well?
22. Are there changes or improvements you would recommend?

Smart Systems Staff

Draft Questions

Cool Cash/Cool Bill

Smart Systems Staff

1. Can you describe to me your role in the program?
2. When did you begin working on the program and what portion of your time was dedicated to Cool Cash/Cool Bill?
3. How did you work with Honeywell in implementing the program?
4. Did Smart Systems assist Honeywell in identifying likely participants? If yes, how?
    a. We understand that the initial plan involved using a list from the American Lodging Association for contact information. Were you aware of this list? If yes, how was it used? Was it expanded?
    b. What other sources of information were used to identify potential participants? What is Smart Systems' overall strategy for identifying target market hotels?
    c. Can you estimate the number or portion of targeted or eligible hotels contacted?
    d. Can you describe characteristics of hotel likely to be interested vs. those less likely to consider participating? (Are there types of hotels/ownership models more or less likely to participate in the program or want the technology?

Delivery and Implementation

5. Were you involved in the outreach activities for the program? ***If yes:*** Thinking about the various ways hotel/motel owners heard about the program opportunity, how would you rate the effectiveness of each of the strategies:
    - Phone call?
    - Canvasser/direct contact?
    - Mail?
    - Any other way?
6. If more than one method was attempted, can you describe the relative success of different methods?
7. How was training organized and conducted?
    a. Were the Honeywell technicians unfamiliar with the technology prior to the program?
8. Were there any post-installation issues or equipment failure? If so, how frequent, how were they handled? [If a replacement was required:] How long did it take?

Market/Customer Response

9. In your opinion, what are the primary reasons this technology is not already installed in hotels/motels in California? [What are the major barriers?]
10. Since the program offered direct installation of power controllers and motion and infrared occupancy sensors, what, if any, remaining concerns or barriers emerged? [Why did some hotels decide not to participate?]
    a. If any, how did the program overcome those concerns?
11. Were the other functions (automated lighting, dampers) also described to potential participants? How would you describe the overall interest in these other functions?
12. What did you learn about the hotel/motel market decision making?

General Questions

13. How does your experience with this program compare with programs elsewhere? What was different here?
14. How would you describe the transferability of this program?
15. Could the program work on a statewide basis?
    a. [If the program were implemented statewide, is there anything you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, ect.?]

Honeywell Staff

Draft Questions

Cool Cash/Cool Bill

Honeywell Staff

1. When did you begin working on this program?
2. What is your specific role in the program, and how long did you have that role?

3. What portion of your time was dedicated to Cool Cash/Cool Bill?

Program Design

4. How did Honeywell arrive at the project design?
5. What specific experience with or information about the hotel market informed the program design?
6. What portion of hotels would you estimate are “small to medium?”
    a. Are there specific features or criteria you look for in assessing whether or not a hotel is “small to medium”?
    b. Were there specific screening criteria developed? (If so, what were they? If not, would you recommend developing any?)
7. What experience with or information about the sensor and control technology informed the program design?
8. Was the program implemented as designed?
    b. If not, why was it changed and how did it differ from the proposal?
9. Have you implemented a similar program elsewhere? (If so, where? And what was learned?)

Program Administration

10. Were there any issues that emerged in working with SCE?
11. Any issues related to billing or invoices?
12. Any issues related to tracking systems or reporting?

Marketing and Outreach

13. We understand that the initial plan involved using a list from the American Lodging Association for contact information. How was this used? Was it expanded?
14. What other sources of information were used to identify potential participants?
15. What was the overall strategy for identifying target market hotels?
16. Can you estimate the number or portion of targeted or eligible hotels contacted?

17. Can you describe characteristics of hotels likely to be interested vs. those less likely to consider participating? (Are there types of hotels/ownership models more or less likely to participate in the program or want the technology?)

Delivery and Implementation

18. Thinking about the various ways hotel/motel owners heard about the program opportunity, how would you rate the effectiveness of each of the strategies:
    - Phone call?
    - Canvasser/direct contact?
    - Mail?
    - Any other way?
19. If more than one method was attempted, can you describe the relative success of different methods?
20. What was the role of the manufacturer in program delivery?
21. How was training organized and conducted?
    a. Were technicians unfamiliar with the technology prior to the program?
22. Were there any post-installation issues or equipment failure? If so, how frequent, how were they handled? [If a replacement was required:] How long did it take?

Market/Customer Response

23. What are the primary reasons this technology is not already installed in hotels/motels in California? [What are the major barriers?]
24. Since the program offered direct installation of power controllers and motion and infrared occupancy sensors, what, if any, remaining concerns or barriers emerged?
    a. If any, how did the program overcome those concerns?
25. Were there specific barriers related to replacing old PTAC units?
26. Were occupancy sensors/controls required with new PTAC units installed? If not, why not?
27. Were participating hotels provided with energy or bill savings estimates?
28. Were the other functions (automated lighting, dampers) also described to potential participants? How would you describe the overall interest in these other functions?
29. What did you learn about the hotel/motel market decision making?

General Questions

30. How would you describe the transferability of this program?
31. Could the program work on a statewide basis?
    a. [If the program were implemented statewide, is there anything you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, ect.?]
32. What worked best about the program?
33. What didn’t work well?

34. Are there changes or improvements you would recommend?

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7. Energy Efficiency for Oil Producers Program

Appendix A: Oil Production Program Field Plan and Instruments

Memorandum

To: **Ben Bronfman**

From: **Floyd Keneipp**

Copy: **Shahana Samiullah, Kevin Cooney, Steven Long**

Date: **June 27, 2006**

Re: **Sample Design and Field Data Collection Plan for Global Energy Partner's Oil Production**

The intent of the following sample design and field data collection plan is to:

- Specify data collection objectives.
- Define the sample of sites that will undergo verification activities.
- Define how projects that may be installed subsequent to the verification process will be accounted for.
- Define customer contact protocol and site activities.
- Provide the data collection and communication instruments used during field activities (See Appendix A1).

Data Collection Objectives:

Field activities will provide verification of program records with respect to overall project goals. In addition, this process will confirm several key components needed to derive the adjusted gross savings, net savings, TRC Test Value and Participant Cost Test Value attributable to this program, including:

1. Measure installation verifications.
2. Confirm energy savings assumptions for energy efficiency measures including: conversion of outdated pumping systems; well pumping optimization through pump-off controllers; other motor controllers; proper sizing of motors, pumps, and specification of

premium efficient motors; variable frequency drives and controllers; water reduction technologies; load balancing on rod pumps; and splitting water injection systems into high pressure and low pressure systems.

It should be noted that the aforementioned data will be collected through both on-site verification activities and supporting participant surveys to be administered onsite and through the telephone (See Appendix A1). In addition, a review of relevant literature and past Program records (where available) will be conducted for comparative analysis. Example documents to be reviewed include:

- Sources cited in the 2003 – 2004 evaluation where researchable issues could not be resolved.
- Engineering documents supporting the savings estimates for new measures added to the current program, primarily for water reduction technologies.

Measure Installation Verification and Sample Design:

The onsite verification process will entail observations of installed measures and the collection of key energy performance variables including, but not limited to:

1. Measure presence.
2. Appropriate installation verification.
3. Key facility performance data, such as daily schedules, seasonal variations in schedules and control strategies.

Furthermore, in the event that recorded measures are not present, Summit Blue will make an extensive effort to determine the cause of removal along with future installation plans.

The evaluation will also include a billing analysis which will be conducted for this program on select wells and installations to be discussed further in the subsequent planning documents. No pre-installation field activity or data logging is planned for this evaluation.

Sampling Methodology

The Oil Production Program implemented a variety of energy efficiency measures commensurate with the needs of each participating site. Table 1 depicts the number and type of participant installations according to the most recent flat file provided to Summit Blue by Global Energy Partners.

Table 1: Measure Records

Measure	Quantity Installed	kW	kWh
Balance Well	7	10.5	83,950
Install circuit rider motor controllers	8	86.0	724,027
Install HE motor and pump	23	941.4	7,899,049
Install POC	90	866.1	7,153,878
Larger #4 ESP cable	3	9.4	75,000
Redesign and install HE motor and pump	5	31.0	247,835
Replace system with RBP	31	368.1	2,945,000
VFD controller and POC	1	28.6	250,485
VFD drive	2	181.9	1,593,403
Water shut off	3	20.5	175,358
Total	173	2,543.5	21,147,985

A total of 30 (17.3% of total measures installed) measures are expected to receive verification activities and provide representative information. As such, a weighted methodology was employed when developing the field verification sample. This methodology accounted for each measure's contribution to the total energy savings attributed to the Program as well as each measure's percentage of the total number of measures installed through the Program.

The formula used to derive the number of sites that would undergo the verification process is as follows:

*# of Verifications of a Specific Measure = T*c*[(P+E)/2]*

Where:

T = Total Number of Verification Visits Planned

c = Constant

P = Specific Measure's Percentage of Total Measures Installed

E = Specific Measure's Percentage of Total Energy Savings Attributable to the Program

'C' was a constant developed to ensure that the verification activities were commensurate with the available budget while maintaining statistical accuracy. Moreover, many sites installed more than one measure which reduced the total number of sites that needed to be visited. In the event that the number of verification visits attributed to a certain measure was less than one (using the aforementioned methodology), the measure was assigned one verification visit by default assuming that installations were completed at a minimum of one installation site.

Table 2 displays the distribution of sites that will partake in Summit Blue's verification activities. It should be noted that a number of wells are "submersible" and have no surface equipment to verify on-site. As such, Summit Blue will place more priority in contacting the well representatives at these sites in order to gather relevant information needed to conduct on-going analysis. No pre- or post-measure installation data logging will be conducted for this evaluation.

Table 2: Distribution of Verification Activities

Measure	Verifications
Balance Well	0
Install circuit rider motor controllers	3
Install HE motor and pump	10
Install POC	12
Larger #4 ESP cable	1
Replace system with RBP	1
VFD controller and POC	1
VFD drive	1
Water shut off	1
Total	30

No verifications will be conducted on the "Balance Well" measure due to the fact that the participating site was removed from the Program. Table 3 provides the sample of sites that will be verified respectively. The methodology utilized to derive the table is discussed in the subsequent section.

Table 3: Sites Receiving Verification Activities

Strata	Customer Name	Measures Verified
1	Site 1	Circuit Riders (3); HE Motor and Pump (10); Install POC (12)
1	Site 2	Larger #4 ESP Cable (1)
1	Site 3	VFD Drive (1)
1	Site 4	Replace System with RBP (1)
1	Site 5	VFD Controller and POC (1)
1	Site 6	Water Shut Off (1)
Alt	Site 7	Replace System with RBP (1)
Alt	Site 8	VFD Drive (1)
Alt	Site 9	HE Motor Pump (2)
Alt	Site 10	HE Motor Pump (4)
Alt	Site 11	Water Shut Off (1)

Potential Adjustments to Verification Sample Based on Ongoing Installations:

According to our conversation with Global Representatives, all installations are required to be completed by the end of June. Given that the field verification activities will take place in early July, no additional measures are expected to be installed following the site visitations. If, however, additional measures are installed, records for each new measure installation will be reviewed and gross savings will be adjusted according to this data along with a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with Global management.

Sampling and Uncertainty

No discernable preference was shown when developing the field sample set from qualifying sites. As a result, the sample set is assumed to have little or no bias. However, the sample may be adjusted during the course of the evaluation if additional installations occur or discrepancies are discovered. Furthermore, any revised sample sets will be random in order to minimize overall bias on the impact analysis.

Billing analysis of metered data will be conducted to provide an estimate of energy savings achieved by the program installations if it is possible to isolate the load. However, the number of sites that will qualify for this analysis will not be certain prior to entering the field. As of now, Summit Blue assumes that the number of sites with isolated loads is randomly distributed and, therefore, does not impose a bias on the overall impact analysis. It is expected that billing analysis can be conducted on approximately 80 of 237 wells.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

The evaluation methodology does not correspond directly to any of the IPMVP options. Instead, Summit Blue is proposing an alternative method that relies heavily on billing analysis, comprehensive engineering calculations and interviews with relevant participants and Program staff. As such, some performance parameters will be based on secondary data or estimates included in the ex-ante calculations. Engineering adjustments made to specific measure savings will be extrapolated to the population of installed measures for the specific program given that they prove representative.

Calculation of Gross and Adjusted Gross Demand Impacts:

This evaluation will use the Energy Efficiency Policy Manual[16] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September.   Peak demand savings will be calculated by reviewing well operating hours to confirm that they are operating during the peak demand period and peak savings during the designated period will be determined based on the billing data, where available.   Adjusted program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this program will be reported in the format provided in Appendix A2. Future savings will be based on measure expected life-cycle, and on estimates that customers will replace failed measures with the same technology.

Customer Contact Protocol and Site Activities

Field activities will typically involve the following steps;

1. Summit Blue will coordinate with the implementation contractor and primary customer contact to establish field activity dates and identify site level contacts.

2. All inspections of the wells will take place between July 5th and July 14th.

3. The customer contact at each site will be provided with a letter of introduction on EDISON letterhead that provides a description of the activities to be undertaken at their site.

4. SBC staff will visually inspect each site to confirm operation and analyze installations.

5. In order to support billing analysis, evaluation staff will confirm meter numbers for wells with dedicated meters. In the event that there are non-dedicated meters on the premise, Summit Blue will confirm their meter numbers as well assuming the percentage of well loads attributable to the meter is meaningful.

6. The energy assumptions will be compared with the billing analysis on related wells in order to further validate program assumptions.

7. The results of these field activities will be used to calculate installation rates and develop adjusted gross program savings.

[16] Version 2, August 2003

Appendix A1 – Measure Installation Verification Worksheet:

SITE INFORMATION

Date:________________

Customer Name: ______________________________

EDISON Account Number ______________________________ Phone: ______________________________

Street Address: ______________________________

City / Town: ______________________________ State: __________ Zip: ______________

PRIMARY OPERATING HOURS

Day Type	**Season / Business Hours**		
Season definition / Months	1	2	3
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

WELL INFORMATION

	Meter Number		**Meter Number**	
	Pre	**Post**	**Pre**	**Post**
Measure				
Verified Quantity				
Fluid Depth				
Mid-perf Depth				
Gross Production Rate (bbl/day)				
Oil Production Rate (bbl/day)				
kWh/bbl/1000'				
Change in kWh/bbl/1000'				
Peak kW				
Peak kW Reduction				

	Meter Number		Meter Number	
	Pre	**Post**	**Pre**	**Post**
Measure				
Verified Quantity				
Fluid Depth				
Mid-perf Depth				
Gross Production Rate (bbl/day)				
Oil Production Rate (bbl/day)				
kWh/bbl/1000'				
Change in kWh/bbl/1000'				
Peak kW				
Peak kW Reduction				

INSTALLATION INFORMATION

	1	2	3	4
Measure Description				
LOI Signed (Y/N/DK)				
Pre-Installation Audit Completed (Y/N/DK)				
Participation Agreement Signed (Y/N/DK)				
Installation Complete (Y/N/DK)				
Post-Installation Audit Completed (Y/N/DK)				
Incentive Paid (Y/N/DK)				

FURTHER QUESTIONS

1. Are the installlations in working condition? (Y / N). If no, describe;

2. Do the installations appear to be properly installed? (Y / N) If no, describe;

3. Has any of the equipment been removed or replaced since installation? (Y / N) If yes, describe;

    a. Why were they removed or replaced?

    b. When were they removed or replaced?

4. How likely will new measures that fail during their lifetime be replaced by the same technology? Please give us a % estimate of likelihood where 100% means that you are certain that failed installations will be replaced by the same technology and 0% means that you will use a different system.__________%

5. Do you or your maintenance company maintain, or know where to obtain, retrofit equipment in the event of failure? (Y / N / DK)

PROCESS QUESTIONS

1) Did you have any contact with any program personnel either during the technical analysis of your facility (to identify projects), during the installation, or at any other time? Y/N/DK

a) (if Y) Were the program personnel you came into contact with professional and courteous? Y/N/DK
b) Did the program personnel you came into contact with do their best to minimize disruptions to your facility? Y/N/NA, no disruption/DK

2) As far as you know, were there any problems related to scheduling, obtaining equipment, or the installation? Y/N/DK
3) On a scale of 1 – 5, where 5 is “very disruptive” and 1 is “not at all disruptive”, how disruptive was(were) the project(s) to your normal operations? 1/2/3/4/5/DK
   a) (if 4 or 5) Was there something the program could have done to reduce the disruption? Y/N/DK
   b) (if Y) What? (open)

4) Have you had to make any changes to your normal operating procedures as a result of the project(s)? Y/N/DK
5) Has all of the equipment been functioning as expected since the installation? Y/N/DK
6) (if N) What have been the problems? (open)
7) Have you noticed any changes in the energy usage of your systems? Y/N/DK
   a) (if Y) What changes? (open)
8) Have you noticed any changes in productivity?
   a) (if Y) What changes? (open)

LOCATION OF INSTALLATIONS:

(map locations) ____

Comments:

____

____

____

____

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Appendix B: Oil Production Program Field Activity Sample Details

Table 1: Measure Installation Sheet

BCMsrDesc	BCMsrQty	OperHrs	RMsrCde	RMsrDesc	AsBltTotkW	AsBltTotkWh
Un-controlled well	1	8760		Install circuit rider motor controllers	9.3	81277
Un-controlled well	1	8760		Install circuit rider motor controllers	6.6	58118
Un-controlled well	1	8760		Install circuit rider motor controllers	0.8	7338
Un-controlled well	1	8760		Install circuit rider motor controllers	3.1	27360
Un-controlled well	1	8760		Install POC	15.4	135011
Un-controlled well	1	8760		Install POC	5.5	48383
Un-controlled well	1	8760		Install POC	0.5	4110
Un-controlled well	1	8760		Install POC	7.9	69160
Un-controlled well	1	8760		Install POC	27.9	244194
Un-controlled well	1	8760		Install POC	53.0	464584
Un-controlled well	1	8760		Install POC	2.9	25745
Un-controlled well	1	8760		Install POC	9.7	84560
Un-controlled well	1	8760		Install POC	37.2	326001
Un-controlled well	1	8760		Install POC	0.9	8098
Un-controlled well	1	8760		Install POC	8.4	73156
Un-controlled well	1	8760		Install POC	3.9	34528
Un-controlled well	1	8760		Install POC	24.5	214591
Un-controlled well	1	8760		Install POC	4.5	39831
Un-controlled well	1	8760		Install POC	0.3	2670
Un-controlled well	1	8760		Install POC	32.8	287272
Un-controlled well	1	8760		Install POC	16.0	140193
Un-controlled well	1	8760		Install POC	0.7	5792
Un-controlled well	1	8760		Install POC	7.6	66796
Un-controlled well	1	8760		Install POC	31.2	273025
Un-controlled well	1	8760		Install POC	23.2	203479
Un-controlled well	1	8760		Install POC	18.5	162020
Un-controlled well	1	8760		Install POC	19.4	169518
Un-controlled well	1	8760		Install POC	0.6	5380
Un-controlled well	1	8760		Install POC	16.7	146700
Un-controlled well	1	8760		Install POC	7.6	66346
Un-controlled well	1	8760		Install POC	2.7	23345
Un-controlled well	1	8760		Install POC	18.1	158912
Un-controlled well	1	8760		Install POC	11.6	101428
Un-controlled well	1	8760		Install POC	8.1	70574
Un-controlled well	1	8760		Install POC	12.1	106171
Un-controlled well	1	8760		Install POC	5.5	48290
Standard #4 ESP cable	1	8760		Larger #2 ESP cable	3.9	34182
Standard #4 ESP cable	1	8760		Larger #2 ESP cable	2.1	18408
Standard #4 ESP cable	1	8760		Larger #2 ESP cable	2.8	24499
KOBE System	20	8760		Replace system with RBP and POCs	99.1	868248
Standard motor and drive	1	8760		VFD drive	44.7	391310
Uncontrolled water infiltration	1	8760		Water shut off	15.2	132837
Un-controlled well	1	8760		VFD controller and POC	28.6	250485
Standard motor and pump	1	8760		Install HE motor and pump	54.1	473848
Standard motor and pump	1	8760		Install HE motor and pump	69.1	605120
Standard motor and pump	1	8760		Install HE motor and pump	7.1	62380
Standard motor and pump	1	8760		Install HE motor and pump	45.8	401604
Standard motor and pump	1	8760		Install HE motor and pump	66.8	585110
Standard motor and pump	1	8760		Install HE motor and pump	47.0	411975
Standard motor and pump	1	8760		Install HE motor and pump	48.7	426351
Standard motor and pump	1	8760		Install HE motor and pump	32.8	287631
Standard motor and pump	1	8760		Install HE motor and pump	38.0	333253
Standard motor and pump	1	8760		Install HE motor and pump	26.9	235842
Standard motor and pump	1	8760		Install HE motor and pump	79.3	694715
Standard motor and pump	1	8760		Install HE motor and pump	30.5	267432
Standard motor and pump	1	8760		Install HE motor and pump	98.0	858160
Standard motor and pump	1	8760		Install HE motor and pump	12.8	112559
Standard motor and pump	1	8760		Install HE motor and pump	61.2	536394
Standard motor and pump	1	8760		Install HE motor and pump	30.2	264443
Standard motor and pump	1	8760		Install HE motor and pump w/ VSD	31.5	276105
Standard motor and pump	1	8760		Install HE motor and pump w/ VSD	99.1	868391
Standard motor and pump	1	8760		Install HE motor and pump w/ VSD	45.6	399448
Uncontrolled water infiltration	1	8760		Water shut off	4.9	42521
Un-controlled well	1	8760		Install circuit rider motor controllers	11.3	99044
Un-controlled well	1	8760		Install circuit rider motor controllers	8.4	73224
Un-controlled well	1	8760		Install circuit rider motor controllers	15.9	139413
Un-controlled well	1	8760		Install circuit rider motor controllers	11.3	99191
Un-controlled well	1	8760		Install POC	20.9	183502
Un-controlled well	1	8760		Install POC	22.6	197617
Un-controlled well	1	8760		Install POC	22.5	197029
Un-controlled well	1	8760		Install POC	29.4	257608
Un-controlled well	1	8760		Install POC	26.5	232318
Un-controlled well	1	8760		Install POC	16.7	145860
Un-controlled well	1	8760		Install POC	14.8	129392

Table 2: Measure Summary and Savings Sheet

RMsrDesc	Data	Total
Install circuit rider motor controllers	Sum of BCMsrQty	8.00
	Sum of AsBltTotkW	66.70
	Sum of AsBltTotkWh	584,965.00
Install HE motor and pump	Sum of BCMsrQty	16.00
	Sum of AsBltTotkW	748.30
	Sum of AsBltTotkWh	6,556,817.00
Install HE motor and pump w/ VSD	Sum of BCMsrQty	4.00
	Sum of AsBltTotkW	176.20
	Sum of AsBltTotkWh	1,543,944.00
Install POC	Sum of BCMsrQty	87.00
	Sum of AsBltTotkW	730.96
	Sum of AsBltTotkWh	6,403,587.03
Larger #2 ESP cable	Sum of BCMsrQty	3.00
	Sum of AsBltTotkW	8.80
	Sum of AsBltTotkWh	77,089.00
Replace system with RBP and POCs	Sum of BCMsrQty	34.00
	Sum of AsBltTotkW	145.30
	Sum of AsBltTotkWh	1,272,657.00
VFD controller and POC	Sum of BCMsrQty	1.00
	Sum of AsBltTotkW	28.60
	Sum of AsBltTotkWh	250,485.00
VFD drive	Sum of BCMsrQty	2.00
	Sum of AsBltTotkW	181.90
	Sum of AsBltTotkWh	1,593,403.00
Water shut off	Sum of BCMsrQty	3.00
	Sum of AsBltTotkW	20.10
	Sum of AsBltTotkWh	175,358.00
Total Sum of BCMsrQty		158.00
Total Sum of AsBltTotkW		2,106.86
Total Sum of AsBltTotkWh		18,458,305.03

Appendix C: GEP Retrofit Measure Cut Sheets

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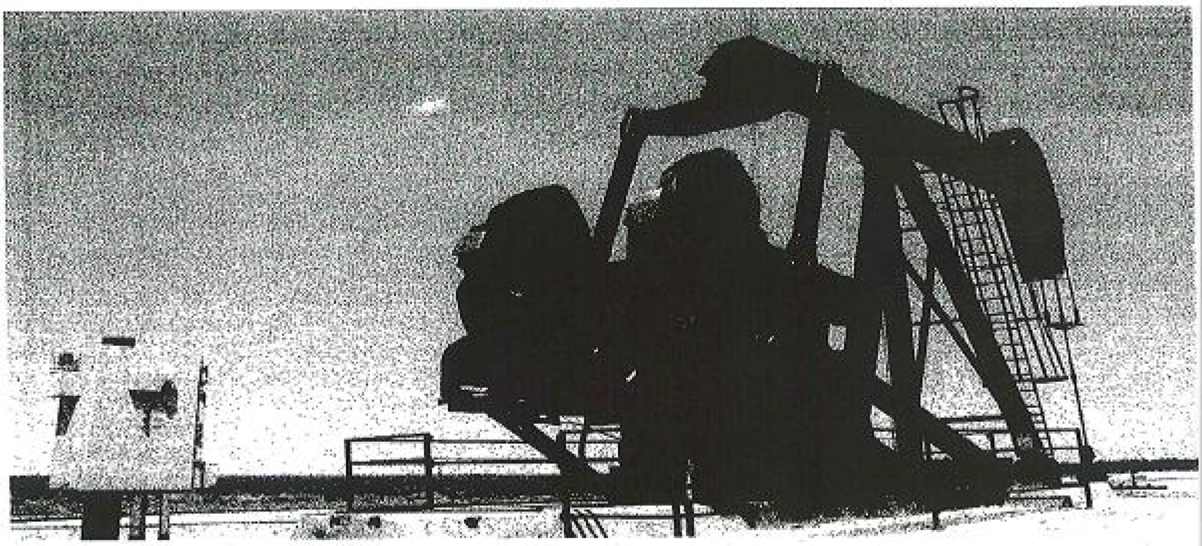
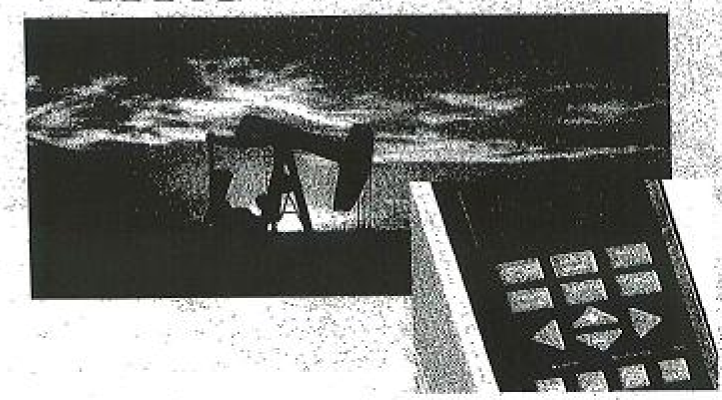


Sensorless Artificial Lift Technology
for Increasing Oil Pump Production and Efficiency

01/26/2006 14:02 3107635003 WESCO PAGE 03/05

What is SALT?

- FEWER MECHANICAL FAILURES
- INCREASED PRODUCTION
- REDUCED ENERGY CONSUMPTION
- REDUCED CAPITAL COSTS



Sensorless Artificial Lift Technology (SALT) is a patented technology that uses a sensorless vector variable frequency drive with pump-off software built into it. The drive uses the motor's rotor relationship to the stator to determine load and position. Unlike standard pump-off controllers, which shut off the pump during periods of low production, SALT reduces the pump speed, maintaining and maximizing production while reducing energy consumption and mechanical stress.

When production drops, SALT slows the well down, allowing time for it to recover. The drive then returns to nearly full speed. This cycle is repeated until the drive finds the optimum pump speed for maximum production and minimum energy consumption.

SALT also provides warning capabilities for conditions such as pump off, paraffin buildup, leaking valves, and maximum and minimum loads. These warnings, as well as information regarding the number of strokes per day, pump leakage, inferred production and pump fillage are all maintained in a log that reports pump activity from the previous thirty days. All of this functionality is built directly into the drive, eliminating the need for an external surface or pump card.

VERSATILE

SALT can be used with:

- Beam Pumps
- Rota-Flex Systems
- Electric Submersible Pumps
- Progressive Cavity Pumps

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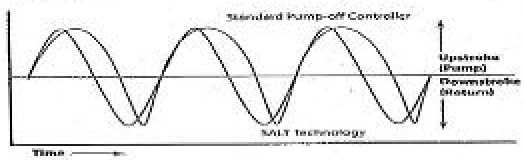
Advantages of SALT

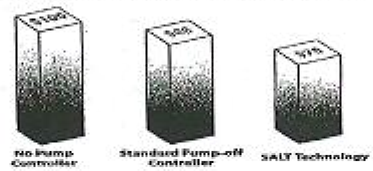
Fewer Mechanical Failures

- Decreases pump speed during the peak mechanical loads in each stroke by as much as 50%
- Reduces the amount of sand, iron sulfide and other contaminants that tend to fall back onto the pump when the unit shuts down, as with standard pump-off controllers
- Eliminates peak load setting violations
- Reduces speed during high loads, and increases speed during low loads, resulting in significantly fewer rod failures



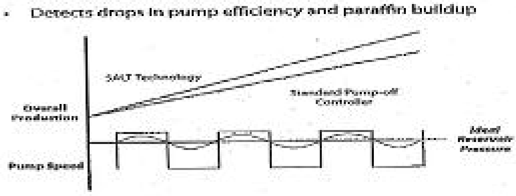
Reduced Energy Consumption

- Keeps excess energy from being taken from the power grid and eliminates regeneration, reducing energy usage by 20% or more over standard pump-off controllers, and 30-35% over wells not using pump-off controllers
- Provides power factor of .97, eliminating the need for power correction
- Avoids the peak demand charges caused by standard pump-off controllers that run at at higher rate of speed, then shut down. Reductions of as much as 50% in overall demand charges have been accomplished in many wells.



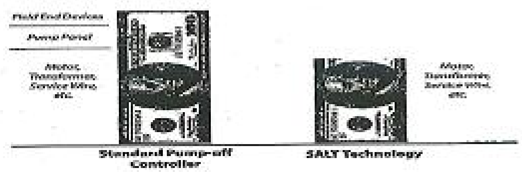
Increased Production

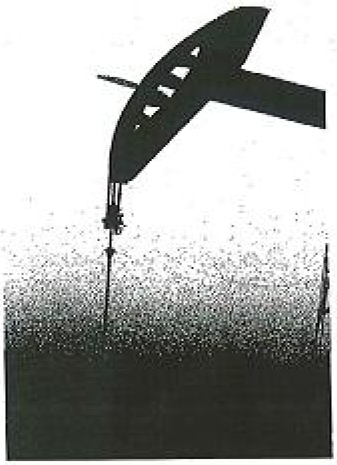
- By eliminating down time, hydrostatic pressure is kept at an optimum level, allowing for greater flow from the reservoir into the well bore
- During periods of increased well productivity, the number of strokes per minute are increased to maximize production
- Reduced downstroke speed eliminates rod float, while increased upstroke speed increases the average number of strokes per minute for heavy crude
- Detects drops in pump efficiency and paraffin buildup



Reduced Capital Costs

- Increases system efficiency, allowing the use of smaller motors and transformers
- Can replace NEMA D motors with more efficient and less expensive NEMA B motors
- Replaces the standard pump panel and requires no field end devices, such as load cells, position indicators or pump cards
- Eliminates sheave changes
- Installs in less than ½ of the time required for traditional pump-off controllers





Specifications

- 240V, 480V or 575V 50/60Hz supply voltage
- NEMA 3R enclosure: 0-50 degrees C ambient (lower and higher ambient temperature options available)
- Modbus protocol standard (other serial communication protocols available
- HOA switch
- Local or remote control
- MOV surge protection
- Fused or circuit breaker input
- Speed potentiometer
- 0-10V, 4-20mA input
- VFD size 1-350 HP

Basic Parameters

- Minimum load set point
- Maximum load set point
- Minimum strokes per minute
- Maximum strokes per minute
- Pump fillage
- Restart time
- Waxing
- Pump leakage

Panel Display

- DC bus voltage
- Frequency
- Unit temperature
- Motor temperature
- Motor RPM
- Motor load
- Motor voltage
- Motor current
- Voltage or current reference
- kW usage
- Running condition (pump off)
- Strokes per day (30-day history)
- Pump-offs per day (30-day history)
- Waxing percentage (30-day history)
- Pump leak percentage (30-day history)
- Strokes per minute
- Faults (30 in history)
- Time until restart
- Pump fillage
- Inferred production

WELL 2 WEB, INC.
700 SW Mustang, Andrews, TX 79714
1807 Echeta Rd, Gillette, WY 82718
Phone: 432.523.2255
Fax: 432.523.7702
www.w2wi.com
sales@w2wi.com

F7 Drive, 0.5 - 500 HP

The F7 Drive: This AC drive is the Industrial Workhorse that can handle every conventional application found within the typical industrial plant from simple variable torque pumping to sophisticated networked material handling. All of this is possible with the smart and flexible design platform of the F7, providing both Normal and Heavy Duty ratings, four modes of control, network communication options, application-specific drive software, power/packaging options, and an array of standard and optional input/output choices.

The F7 is factory-programmed and ready to run. For operational simplicity and clarity, the LCD operator display has 5 lines x 16 characters. It can be set to any of 7 languages. The keypad is intuitive and includes parameter copying to move a chosen set of parameters from one drive to another. If the application requires programming, the F7 makes it easy. Parameters are grouped in easy to use sets; quick start and advanced. To enhance parameter and data management, Drive Wizard software for the PC is available at no charge, for upload/download, trending, and graphing.

This drive is designed for tough industrial environments. It is rugged and reliable, with an MTBF of 28 years. A variety of enclosure options provide the right environmental protection. The dual ratings, Normal and Heavy duty, enable the most economical match of overload capacity and starting torque for the application. Providing the right fit to power requirements is also easy with 208/240 and 480 volt ratings, built-in bus choke (30 HP and above) and 12-pulse capability (30 HP and above), common bus capability, and regeneration options. Patented high slip braking can eliminate the need for dynamic braking resistors for high inertia loads. Other features include motor auto-tuning and a wide range of configurable options, such as breakers and fuses.

To provide the optimum control method, the F7 can operate in conventional V/f, V/f with encoder feedback, open loop vector, or closed loop vector mode. Drive performance can be further enhanced for a specific application with optional software.

The F7 supports the industry's open architecture, open connectivity demands with network communications choices such as DeviceNet, Profibus-DP, and others. Drive coordination with other equipment is simplified with inputs and outputs for digital pulse train, 4 to 20ma, -10 to +10V, and an assortment of programmable contacts.

For new installations or retrofits, the F7 is truly the Industrial Workhorse, perfect for every conventional application…and even some unconventional ones.

YASKAWA

F7 Drive

Performance Features

- Ratings: 0.5 to 150HP, 208 to 240 VAC
  0.75 to 500HP, 480 VAC
- Overload capacity:
  150% for 1 min heavy duty,
  nominal 110% for 1 min normal duty
- Starting torque:
  150%, at 1Hz (V/f), at 0.5 Hz (open loop), at 0.3 Hz (closed loop)
- Output frequency: 0.01 to 300Hz for heavy duty, 400Hz for normal duty
- Controlled speed range:
  40:1 (V/f), 40:1 (V/f with PG), 100:1 (open loop), 1000:1 (closed loop)
- Speed regulation:
  2-3% (V/f), 0.02% (V/f with PG), 0.2% (open loop), 0.01% (closed loop)
- Speed/frequency resolution: 0.01% with digital reference, 0.1% with analog reference, 0.01 Hz with Modbus
- Electronic reversing
- Adjustable accel/decel: 0.1 to 6000 sec
- Stall prevention
- Drive efficiency: 98 to 98%
- Displacement power factor: 0.98
- Power loss ride-thru: 2 sec
- Inertial ride thru
- Selectable auto restart after momentary power loss
- Programmable auto restart
  (0 to 10 attempts) on re-settable fault
- Critical frequency rejection: 3 selectable, adjustable bands

Protective Features

- DC bus CHARGE indicator
- Optically-isolated controls
- Phase-to-phase / phase-to-neutral short circuit protection
- Ground fault protection
- Electronic motor overload (UL)
- Current and torque limit
- Over-torque / under-torque detection
- Fault circuit: over-current, over-voltage, and over-temperature
- Input/output phase loss

Service Conditions

- Ambient service temperatures:
  -10 to 40ºC (104ºF) NEMA1, to 45ºC (113ºF) protected chassis
- Humidity: non-condensing 95%
- Altitude: to 3300 feet (1000 meter)
- Input voltage: +10% / -15%, 3 phase, 200 to 240VAC, 380 to 480VAC
- Enclosure: NEMA 1 or protected chassis (other options)
- Input frequency: 50/60Hz ± 5%
- 3-phase, 3-wire phase insensitive
- Vibration: 1G, (10 to 20Hz), 0.2G (20 to 50Hz)

Design Features

- LCD keypad display, 5 lines x 16 characters, backlit, 7 languages, copy function
- Multi-speed settings: 17 available
- Setpoint (PID) trim control
- Signal follower: bias and gain
- Up / down / hold reference (digital M.O.P.)
- Timer function; on/off delay
- 32-bit microprocessor logic
- Easy access, quick start parameter groups
- Non-volatile memory/program retention
- Flash memory for update and custom applications
- 24VDC control logic
- DC injection braking, adjustable level
- Dynamic braking
- High-slip braking
- Ramp to stop or coast to stop
- Dual motor parameter sets
- Synchronized start into rotating motor
- Motor auto-tuning, static and dynamic
- Common bus capability
- DC link choke: 30 to 150HP at 240VAC, 30 to 500HP at 480VAC
- Terminal strip, quick disconnect
- Split cover for easy wiring
- Plug-in heat sink fan

Inputs and Outputs

- Analog inputs: -10 to +10VDC (20K ohms) or 4 to 20 mA (250 ohm)
- Analog outputs: -10 to +10VDC or 4-20mA proportional to output parameters
- Digital pulse train input/output (32KHz max)
- Digital inputs: 8 multi-function
- Programmable outputs: Three form A
- Fault contacts: form C
- RS-485/422 communication terminals

Additional Features for V/f

- Torque boost: full range, auto
- V/f ratio: 15 preset, one adjustable
- Slip compensation

Standards & Reliability

- UL, cUL & CE listed
- IEC: 146A
- MTBF: Exceeds 28 years
- Tested on fully-loaded motors
- Surface mount technology

Options

- Remote display/keypad
- LED Keypad
- Various feedback cards
- DriveWizard™ software (upload / download)
- DeviceNet, Profibus-DP
- Custom drive software: Dancer trim, 1000Hz, Digital velocity follower, etc.
- 115 VAC interface
- Input breaker, disconnect, fuses
- DB resistors and modules
- NEMA 12 enclosures
- Input/output reactors
- EMC-compliant filters
- DC link choke if not standard
- Isolation transformer
- Line regeneration (RC5 or DC5)
- Dynamic braking if not standard
- Twelve-pulse rectification with input transformers: 30 to 150HP at 240V, 30 to 500HP at 480V

Other Industrial Drives


V7 Drive NEMA 1, V/f or open loop vector, 1/8 - 10 HP. *Flyer FL.V7.01*


V74X Drive Integral NEMA 4X/12, V/f or open loop vector, 1/8-15 HP. *Flyer FL.V74X.01*


G7 Drive Ultimate Performance Solution 3 level Inverter, 1/8 - 500 HP. *Flyer FL.G7.01*


P7 Drive Industrial Fan/Pump, V/f, Normal Duty, 5 - 500 HP. *Flyer FL.P7.01*

YASKAWA
Yaskawa Electric America, Inc.
2121 Norman Drive South
Waukegan, IL 60085
800-YASKAWA (927-5292) Fax: 847-887-7310
DrivesHelpDesk@yaskawa.com www.yaskawa.com

F7 Drive

Specifications and Features for F7 Drive

The F7 Drive: This AC drive is the Industrial Workhorse that can handle every conventional application found within the typical industrial plant, from simple variable torque pumping to sophisticated networked material handling. All of this is possible with the smart and flexible design platform of the F7, providing both Normal and Heavy Duty ratings, four modes of control, network communication options, application-specific drive software, and an array of standard and optional input/output choices.

The F7 is factory-programmed and ready to run. For operational simplicity and clarity, the LCD operator display has 5 lines x 16 characters. It can be set to any of 7 languages. The keypad is intuitive and includes parameter copying to move a chosen set of parameters from one drive to another. If the application requires programming, the F7 makes it easy. Parameters are grouped in easy to use sets; quick start and advanced. To enhance parameter and data management, DriveWizard software for the PC is available at no charge, for upload/download, trending, and graphing.

This drive is designed for tough industrial environments. It is rugged and reliable, with an MTBF of 28 years. A variety of enclosure options provide the right environmental protection. The dual ratings, Normal and Heavy duty, enable the most economical match of overload capacity and starting torque for the application. Providing the right fit to power requirements is also easy with 208/240 and 480 volt ratings, built-in bus choke above 30 HP, 12-pulse capability above 30 HP, common bus capability, and regeneration options. Patented high slip braking can eliminate the need for dynamic braking resistors for high inertia loads. Other features include motor auto-tuning and a wide range of configurable options, such as breakers and fuses.

To provide the optimum control method, the F7 can operate in conventional V/f, V/f with encoder feedback, open loop vector, or closed loop vector mode. Drive performance can be further enhanced for a specific application with optional software.

The F7 supports the industry's open architecture, open connectivity demands with network communications choices such as DeviceNet, Profibus-DP, and others. Drive coordination with other equipment is simplified with inputs and outputs for digital pulse train, 4 to 20 mA, -10 to +10 V, and an assortment of programmable contacts.

For new installations or retrofits, the F7 is truly the Industrial Workhorse, perfect for every conventional application...and even some unconventional ones

Peformance Features

- Ratings:
  0.5 to 150 HP, 208 to 240 VAC
  0.75 to 500 HP, 480 VAC
- Overload capacity:
  150% for 1 min heavy duty, nominal
  110% for 1 min normal duty
- Starting torque:
  150%, at 1Hz (V/f), at 0.5 Hz (open loop), at 0.3 Hz (closed loop)
- Output frequency:
  0.01 to 300 Hz for heavy duty, 400 Hz for normal duty
- Controlled speed range:

Design Features

- LCD keypad display, 5 lines x 16 characters, backlit, 7 languages, copy function
- Multi-speed settings: 17 available
- Setpoint (PID) trim control
- Signal follower: bias and gain
- Up / down / hold reference (digital M.O.P.)
- Timer function; on/off delay
- 32-bit microprocessor logic
- Easy access, quick start parameter groups
- Nonvolatile memory/program retention

40:1 (V/f), 50:1 (V/f with PG), 200:1 (open loop), 1000:1 (closed loop)

- Speed regulation:
  2-3% (V/f), 0.02% (V/f with PG), 0.2% (open loop), 0.01% (closed loop)
- Speed/frequency resolution:
  0.01% with digital reference, 0.1% with analog reference, 0.1 Hz with Modbus
- Electronic reversing
- Adjustable accel/decel: 0.1 to 6000 sec
- Stall prevention
- Drive efficiency: 96 to 98%
- Displacement power factor: 0.98
- Power loss ride-thru: 2 sec
- Inertial ride-thru
- Selectable auto restart after momentary power loss
- Programmable auto restart (0 to 10 attempts) on re-settable fault
- Critical frequency rejection: 3 selectable, adjustable bands

Protective Features

- DC bus CHARGE indicator
- Optically-isolated controls
- Phase-to-phase / phase-to-neutral short circuit protection
- Ground fault protection
- Electronic motor overload (UL)
- Current and torque limit
- Over-torque / under-torque detection
- Fault circuit: over-current, over-voltage, and over-temperature
- Input/output phase loss

Inputs and Outputs

- Analog inputs:
  -10 to +10 VDC (20K ohms) or 4 to 20 mA (250 ohm)
- Analog outputs:
  -10 to +10 VDC or 4-20 mA proportional to output parameters
- Digital pulse train input/output (32 KHz max)
- Digital Inputs: 8 multi-function
- Programmable outputs: Three form A
- Fault contacts: form C
- RS-485/422 communication terminals

Additional Features for V/f

- Torque boost: full range, auto
- V/f ratio: 15 preset, one adjustable
- Slip compensation

- Flash memory for update and custom applications
- 24 VDC control logic
- DC injection braking, adjustable level
- Dynamic braking
- High-slip braking
- Ramp to stop or coast to stop
- Dual motor parameter sets
- Synchronized start into rotating motor
- Motor auto-tuning, static and dynamic
- Common bus capability
- DC link choke: 30 to 150 HP at 240 VAC, 30 to 500 HP at 480 VAC
- Twelve-pulse capability: 30 to 150 HP at 240 VAC, 30 to 500 HP at 480 VAC
- Terminal strip, quick disconnect
- Split cover for easy wiring
- Plug-in heat sink fan

Service Conditions

- Ambient service temperatures:
  -10 to 40°C (104°F) NEMA 1, to 45°C (113°F) protected chassis
- Humidity: non-condensing 95%
- Altitude: to 3300 feet (1000 meter)
- Input voltage: +10% / -15%, 3 phase 200 to 240 VAC, 380 to 480 VAC
- Enclosure: NEMA 1 or protected chassis (other options)
- Input frequency: 50/60 Hz ± 5%
- 3-phase, 3-wire phase insensitive
- Vibration: 1G, (10 to 20Hz), 0.2G (20 to 50Hz)

Standards & Reliability

- UL, cUL & CE listed
- IEC: 146A
- MBTF: Exceeds 28 years
- Tested on fully-loaded motors
- Surface mount technology

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Appendix D: Oil Production program Data Collection Sample and Analysis

Table 1: Evaluation Results

Pump #	Recorded Measure	Operating Hours	Availability	POC?			VSD?					
				Model #	Serial #	Part #	Serial #	Part #	Type #	Hz	Amps	Voltage
Hole 1	POC	54%	360/365 da	RPC	714229-07	060-5001B	No					
Hole 2	POC	57%	360/365 da	RPC	714229-17	060-5001B	No					
Hole 3	POC	72%	360/365 da	RPC	714229-03	060-5001B	No					
Hole 4	POC	41%	360/365 da	RPC	714229-113	060-5001B	No					
Hole 5	POC	52%	360/365 da	RPC	714229-22	060-5001B	No					
Hole 6	POC	77%	360/365 da	RPC	714229-18	060-5001B	No					
Hole 7	POC	32%	360/365 da	RPC	714229-28	060-5001B	No					
Hole 8	POC	43%	360/365 da	RPC	714229-15	060-5001B	No					
Hole 9	POC	87%	360/365 da	RPC	714229-14	060-5001B	No					
Hole 10	POC	34%	360/365 da	RPC	714229-24	060-5001B	No					
Hole 11	POC	72%	360/365 da	RPC	714229-01	060-5001B	No					
Hole 12	POC	37%	360/365 da	RPC	714229-09	060-5001B	No					

Pump #	Recorded Measure	Operating Hours	Availability	VSD?						Submersible?	Catronix?	
				Serial #	Part #	Type #	Hz	Amps	Voltage		Serial #	Model #
Hole 13	Circuit Riders	24 hours/day	360/365 da	Serial #: 125		Model #: MCP-600-270				Yes		
Hole 14	Circuit Riders	24 hours/day	360/365 da	04100456	100104220	S3A42OK(	60	27	418.8	Yes		
Hole 15	Circuit Riders	24 hours/day	360/365 da	No						No		
Hole 16	Circuit Riders	24 hours/day	360/365 da	No						No		

Pump #	Recorded Measure	Operating Hours	Availability	Submersible?
Hole 17	Larger #4 ESP Cable	24 hours/day	N/A	Yes
Hole 18	Larger #4 ESP Cable	24 hours/day	N/A	Yes
Hole 19	Larger #4 ESP Cable	24 hours/day	N/A	Yes

Pump #	Recorded Measure	Operating Hours	Availability	POC?			VSD?					
				Model #	Serial #	Part #	Serial #	Part #	Type #	Hz	Amps	Voltage
Hole 20	Replace System with F	7:11 (29%)	360/365 da	RPC	714132-54	060-5000B	No					
Hole 21	Replace System with F	8:35 (35%)	360/365 da	RPC	714132-42	060-5000B	No					

Pump #	Recorded Measure	Operating Hours	Availability	VSD?						Submersible?	Catronix?	
				Serial #	Part #	Type #	Hz	Amps	Voltage		Serial #	Model #
Hole 22	HE Motor and Pump	24 hours/day	360/365 da	50701979	100159801	S3B42OK(	58	23.7	407	Yes	No	
Hole 23	HE Motor and Pump	24 hours/day	360/365 da	No			N/A	30	N/A	Yes	No	
Hole 24	HE Motor and Pump	24 hours/day	360/365 da	No			N/A	19	N/A	Yes	No	
Hole 25	HE Motor and Pump	24 hours/day	360/365 da	41001283	100104191	S3A411KC	63	26	434	Yes	No	
Hole 26	HE Motor and Pump	24 hours/day	360/365 da	51102010	100159796	S3B413KC	20	30.8	166.4	Yes	No	
Hole 27	HE Motor and Pump	24 hours/day	360/365 da	Serial #: 64	Part #: AC 9	Model #: S	60	34	128	Yes		
Hole 28	HE Motor and Pump	24 hours/day	360/365 da	041004454	100104220	S3A42OK(	57	31.3	391.2	Yes		
Hole 29	HE Motor and Pump	24 hours/day	360/365 da	VSD-T-199	7026669	R3A411KC	57	25.8	386	Yes		
Hole 30	HE Motor and Pump	24 hours/day	360/365 da	No			60	34	114	Yes	84A22190	4301187A-
Hole 31	HE Motor and Pump	24 hours/day	360/365 da	No			60	51	120	Yes	88A14112	4301187A-
Hole 32	HE Motor and Pump	24 hours/day	360/365 da	No			60	50	118	Yes	82A-9003	14A530-25
Hole 33	HE Motor and Pump	24 hours/day	360/365 da	010803704	7026537	R3B42OK(	52	40.6	377	Yes		
Hole 34	HE Motor and Pump	24 hours/day	360/365 da	040804349	100104220	S3A42OK(	55	44.7	405.2	Yes		
Hole 35	HE Motor and Pump	24 hours/day	360/365 da	041004455	100104220	S3A42OK(	62	34.5	400.4	Yes		

Measure Derived Savings (kWh)

Measure	Projects	Flat File Gross Ex-ante Energy Savings (kWh)	Correction Factor*	Evaluated Gross Energy Savings (kWh)
HE motor and Pump	16	6,556,818	0.83	5,447,052
Pump off controllers	87	6,403,588	0.96	6,160,267
Variable speed drives	7	3,387,833	0.98	3,320,075
Replace system with RBP	34	1,272,658	1.00	1,272,657
Motor Controllers	8	584,965	0.98	573,266
Water shut off	3	175,358	1.00	175,358
Larger ESP cable	3	77,089	0.98	75,547
Total	158	18,458,309		17,024,222

**The Correction Factor represents the aggregated impact of the differences between the savings methodologies employed by Global and the Evaluation Team*

Measure Derived Savings (kW)

Measure	Projects	Flat File Gross Ex-ante Demand Savings (kW)	Correction Factor*	Evaluated Gross Demand Savings (kW)
HE motor and Pump	16	748	0.73	550
Pump off controllers	87	731	0.79	574
Variable speed drives	7	387	0.98	379
Replace system with RBP	34	145	1.00	145
Motor Controllers	8	67	0.98	65
Water shut off	3	20	1.00	20
Larger ESP cable	3	9	0.98	9
Total	158	2,107		1,742

**The Correction Factor represents the aggregated impact of the differences between the savings methodologies employed by Global and the Evaluation Team*

Measure Energy Savings (kWh)

Measure	Projects	Flat File Gross Ex-ante Energy Savings (kWh)	Evaluated Gross Energy Savings (kWh)	NTG	Evaluated Net Energy Savings (kWh)
HE motor and Pump	16	6,556,818	5,447,052	0.8	4,357,642
Pump off controllers	87	6,403,588	6,160,267	0.8	4,928,214
Variable speed drives	7	3,387,833	3,320,075	0.8	2,656,060
Replace system with RBP	34	1,272,658	1,272,657	0.8	1,018,126
Motor Controllers	8	584,965	573,266	0.8	458,613
Water shut off	3	175,358	175,358	0.8	140,286
Larger ESP cable	3	77,089	75,547	0.8	60,438
Total	158	18,458,309	17,024,222	0.8	13,619,378

Measure Demand Savings (kW)

Measure	Projects	Flat File Ex-ante Energy Savings (kWh)	Evaluated Gross Demand Savings (kW)	NTG	Evaluated Net Energy Savings (kWh)
HE motor and Pump	16	748	550	0.8	440
Pump off controllers	87	731	574	0.8	459
Variable speed drives	7	387	379	0.8	303
Replace system with RBP	34	145	145	0.8	116
Motor Controllers	8	67	65	0.8	52
Water shut off	3	20	20	0.8	16
Larger ESP cable	3	9	9	0.8	7
Total	158	2,107	1,742	0.8	1,394

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Appendix E: Surveys

Following are the surveys for the Energy Efficiency for Oil Producers Program. Included surveys are:

- Program Implementers
- Operator
- Participant

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Energy Services for Oil Production

Program Implementers

Draft Staff Interview Guide

1. How long have you been involved with this program?
2. What is your specific role in the program?

Program Design/Evolution

3. The program design was carried over from a successful program Global implemented a few years ago. How does the new program compare to the old one? Are there any significant differences? What are they?
4. What are the rules that determine whether a producer is eligible to participate?
    a. How did you determine these eligibility requirements? (if carried over from original program, how were they originally determined? What considerations went into their determination?)
5. The technical proposal for this program outlines estimates about various characteristics of the oil production market (4,000 oil wells in the Edison service territory, majority owned by small- to medium-sized producers). How did Global arrive at these estimates?
    a. Over the course of implementation, have you found these estimates to be correct?
6. Are producers asked to pay for any portion of the technical analysis that identifies potential projects at their facilities?
7. The 2004 evaluation gave a few specific recommendations related to program design – I'd like to go through them with you and find out what actions you may have taken in response and what the results were.
    a. Conduct further research on interactions between energy efficiency measures and well characteristics.
    b. Adjust program timing to accommodate producers' capital budgeting cycles.
    c. Consider extending a program to new wells.
    d. Leverage the role that vendors and other trade allies can play:
        i. What is valuable about involving vendors and other trade allies?
        ii. What actions have been taken to expand the role of vendors and other trade allies?
8. Since you have begun implementing this program with IDEEA, have you needed to make any refinements in response to market conditions? What?
9. Do you know of any other programs offered elsewhere that are similar?

Program Administration

10. Were there any issues that emerged working with Edison?
11. Any issues related to billing or invoices?
12. Any issues related to tracking systems or reporting?

Marketing/Outreach

13. The marketing plan outlined in the proposal focuses on reaching out to past participants and previously identified nonparticipants, though new contacts would also be pursued. How successful were efforts to obtain participation with each of these groups?
14. The 2004 evaluation recommended that you continue using multiple channels to inform producers about the program. Did you do so?
    a. What methods were used to generate new contacts?
    b. How do those methods compare to those used in the prior program?
15. The proposal indicates you will target hard-to-reach producers—it seems that would include ones with only a few wells. What portion of the participants that ended up getting recruited would fall into the hard-to-reach category?
16. From all of your experience reaching out to targeted producers, what would you say are the keys to gaining their interest and cooperation?
17. What in your view are the biggest barriers to obtaining participation among targeted producers and getting them to implement the projects?
    a. First cost
    b. Lack of knowledge about energy efficiency costs & benefits
    c. Lack of knowledge about available financial options
    d. Organizational practices that inhibit decisions
18. Have most of your efforts to generate new contacts have been focused on outreach to owners, or have you engaged in outreach to operators as well?
    a. What sorts of contact have you had with the operators?
    b. How important is the involvement of operators when it comes to obtaining a producer's participation, getting projects successfully completed, or ensuring positive outcomes?

Delivery and Implementation

19. How did Global determine which projects were viable and economically feasible?
20. Incentives were set at $0.08/first-year kWh of savings, up to 50% of the project cost for motors, drives, and controls, $0.05/kWh for all other measures. How were these levels determined?
    a. The 2004 evaluation recommended you provide more certainty and clarity about eligibility and the incentives. What actions were taken in response to this?
21. Were there any issues related to scheduling installations and obtaining equipment, or incentive payments?
22. The 2004 evaluation gave several specific recommendations for changes in implementation which I'd like to go through with you and find out what actions were taken in response, and what the results have been:
    a. Simplify and streamline program processes.
    b. Make more use of case studies in promotion and recruitment.
    c. Examine ways to increase producer access to used and reconditioned equipment.
    d. Collect more comprehensive data on each participating well.

Lessons Learned

23. What have been the most important lessons learned over the course of implementing the program?

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Energy Services for Oil Production

Operator

Draft Operator Instrument

1. Did you have any contact with any program personnel either during the technical analysis of your facility (to identify projects), during installation, or at any other time? Y/N/DK
    a. (if Y) Were the program personnel you came into contact with professional and courteous? Y/N/DK
    b. Did the program personnel you came into contact with do their best to minimize disruptions to your facility? Y/N/DK/NA—no disruption
2. As far as you know, were there any problems related to scheduling, obtaining equipment, or the installation? Y/N/DK
3. On a scale of 1 – 5, where 5 is “very disruptive” and 1 is “not at all disruptive”, how disruptive was(were) the project(s) to your normal operations? 1/2/3/4/5/DK
    a. (if 4 or 5) Was there something the program could have done to reduce the disruption? Y/N/DK
        i. (if Y) What? (open)
4. Have you had to make any changes to your normal operating procedures as a result of the project(s)? Y/N/DK
5. Has all of the equipment been functioning as expected since the installation? Y/N/DK
    a. (if N) What have been the problems? (open)

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Energy Services for Oil Production

Participant

Draft Participant Instrument

Were you involved in your company's decision to participate in the Energy Services for Oil Production program sponsored by Edison?
(if no, get name of someone who was)

1. (if yes, probe:) Who else was involved in decision? Who made final decision? Are these the same people who make decisions about other project upgrades? When and how did you find out about the opportunity to participate in Energy Services for Oil Production program? (if aware from 02-03, when/how did you find out the program was available again?) (if they don't mention 02-03 program) Were you aware there was a program like this in 2002 or 2003?
    a. (if yes) Did you do any projects with that program in 02-03?
        i. (if no) Did you identify any projects to do in 02-03? (probe for level of involvement)

Explain: Global offered a program in 2002-2003, and is currently offering a similar one, but all my questions will focus on the program services offered in 2004 and 2005.)

2. Why did you decide to participate at this time, (04-05)? (response could be good prior experience, for new contacts should be about expected benefits) worthwhile to go thru to see if we could qual for money

Marketing and Outreach

a. Have you ever participated or considered participating in a utility energy efficiency program before this one? (Probe if yes to see if they had ever considered installing projects similar to those done in this program.) When program representatives were explaining the 04/05 program to you, do you remember what they said were the main benefits of participating? Did you get a pretty clear understanding of the benefits (potential savings, incentives, etc.)?,

3. Throughout your involvement in the 04-05 program, did you have a clear understanding of the steps of participation, what to expect, and on what schedule?
    a. Probe: were there any problems related to scheduling, obtaining equipment, or any problems with the installation? (expect to hear problems about scheduling rigs)
    b. After coming up with some ideas for projects to do, how did the program support you in making a decision about whether to move forward, and which projects to move on? Before you participated in this program in 04-05, did you know how your wells' energy use compares to others., (if no) Do you know that now?
    c. (if yes) When/how did you find out about that?
4. Where did the ideas come from for the projects you completed in 04-05? (probe: confirm whether ideas came from 02-03 program contact).., .
    a. Had you considered any of these ideas before? (if yes) Why hadn't you gone forward with any of these ideas before now? (Probe: Money? Credibility of project ideas? Thinking about it as an investment?)

i. If working with the program had not been an option, would you ever have initiated any of these projects by yourself?
   1. (if yes) Which ones?
      i. Do you think these project(s) would have been done about the same way without the program? (if no) How would things have been different?
   2. When do you think you would have gone ahead with the project(s)? , (if no) Why not? (Probe: economics of project? Waiting for program? Inertia?)

b. (if no to 9) Why did you decide to do it at this time?

5. How important was the financial incentive to your decision to go forward with these projects in 04-05? (if payback length) What was the maximum payback time you would be comfortable with? Since the 04-05 program concluded, have you initiated any more energy efficiency projects? (Probe: independently or part of a program?) – trying to save energy? ---Do you have energy efficiency projects you might do in the future? (Probe: independently or part of a program) (Probe: When do you think you might install the projects?)

Delivery and Implementation

6. Have there been any problems with the pumping facilities since the upgrade projects have been completed? No .
7. As far as you know, have the program upgrades resulted in any changes to your operations procedures?
   a. (if so) Has this caused any problems?

Have the expected energy savings materialized? Firmagraphics

8. Is there someone at your company who has the responsibility for tracking energy costs? (is that you or someone who reports to you about energy costs?)
9. How many wells does your company operate in total (estimate OK)? Several thousand,
   a. How old are they? 30yrs
10. How many sites? 12 or so

General Questions

11. Overall, what would you say worked best about the program? Was there anything you'd say didn't work? Or do you have any suggestions for ways the program could be improved?

8. EnergySolve Demand Response Program

Appendix A: Impact Field Research Plan and Instruments

Memorandum

To: **Ben Bronfman**

From: **Floyd Keneipp**

Copy: **Shahana Samiullah, Kevin Cooney, George Coronel**

Date: **April 28, 2006**

RE: **Sample design and field data collection plan for the EnergySolve Demand Response Program.**

The intent of the sample design and site data collection plan is to:

- Specify data collection objectives.
- Define the sample of sites that receive verification visits.
- Define the sample of sites that receive data logging for lighting run hours and lighting power consumption.
- Define customer contact protocol and site activities
- Define data logger data collection protocol
- Provide the data collection and communications instruments used during field activities.

Data Collection Objectives

Field activities will provide several key components needed to calculate the adjusted gross savings for this program, including;

1. Complete measure installation verifications
2. Install data loggers to verify measure savings estimates attributable to lighting operating hours and customer enacted dimming activities.

The approach to each of these activities is discussed below.

Complete measure installation verifications

The onsite verification process will entail observations of installed measures and collection of key energy performance variables:

1. Measure presence (part numbers for lamp and ballast retrofits)
2. Appropriate installation
3. If missing, determine if they were ever present, and/or the removal date and reason
4. Key facility performance data, such as daily schedules, seasonal variations in schedules, occupancy, and control strategies (program specific)

The measure installation verification worksheet is provided as a separate document titles ‘Edison / IDEEA Demand Response Program Evaluation - Measure Installation Verification Worksheet’.

Install data loggers to verify measure savings estimates

Energy savings from the systems are based on two components;

1. The permanent kW and kWh reduction result from the retrofit
2. Savings may also result from dimming capability of the retrofit

Data loggers will be installed to provide data necessary to calculate ex-post savings values as discussed below:

1. The permanent kW and kWh reduction result from replacing a 34 or 40W T12 lamp with a 28W T5 lamp. Interval data logging will be conducted on approximately 45 lighting circuits at 14 sites to verify estimated kWh savings by verifying facility lighting run hours. The loggers will be in place for between 45 and 60 calendar days. The sample of sites and lighting circuits used to verify lighting run hours has been selected based on several factors;
    a. Company B sites share a common layout, fixture type, and operational characteristics such as run hours. Each site typically has 2 to 4 lighting circuits that have been retrofit by the program. Because all of the Company B sites are nearly identical, it was concluded that logging operating hours on all lighting circuits at 12 individual Company B sites would provide a sample that is representative of the population of 90 facilities participating the program.
    b. All Company A sites also share a common layout and operational characteristics. It was concluded that logging operating hours on all lighting circuits at 2 individual Company A sites would provide a sample that is representative of the population of 8 facilities participating the program.
2. Savings may also result from the dimming capability of the Retrolux retrofit. The dimming activities will be recorded through the use of light level loggers and logging power consumption at a sample of lighting fixtures. The lighting power loggers will also help establish the correlation between light levels and power reductions due to dimming actions. These power loggers will be in place for between 45 and 60 calendar days. Data from both the lighting run hour and power loggers will be compared to EnergySolve UBAR recorded data to verify field data with savings estimates provided by the UBAR system.

Sample Design

Appendix A provides the samples for both Company A and Company B. The design for each strata is discussed below. The evaluation contractor is aware that Edison has conducted verification visits at a number of program installations and this data has been requested from Edison. The sites selected in this field plan were selected at random from the population of sites retrofit and is not influenced by the Edison verification activities. During field activities, the M&V contractor will review for consistency the Edison data where overlap occurs.

Sample of Sites Receiving Only Verification Visits

A total of 90 Company B locations and 34 Company A locations participated in the program as of the completion of this plan. Each location was assigned a random number. These random numbers were sorted in ascending order and the first 25 Company B sites and first 8 Company A sites were selected to receive verification visits. Up to an additional 25 Company B sites will receive verification visits in a second phase of verification visits if a review of the first phase sample of 25 sites indicates that there is significant variance in run hours, facility layouts, or installations rates compared to program records. In addition, the team will use billing analysis to identify any anomalies that require an expanded, phase 2 sample.

Sample of Sites Receiving Lighting Run Hour Data Logging

From the total of 90 Company B locations installed, a random selection of 12 Company B locations were selected to receive data loggers that record lighting run hours. From the 8 Company A locations receiving verification visits, 2 sites were selected to receive data loggers that record lighting run hours. Appendix A also includes a table showing which specific circuits at Company A are to receive lighting run hour data loggers. Specifying specific circuits for Company A sites is necessary because there is a greater diversity of fixtures retrofit at Company A than Company B.

Sample of Sites Receiving Lighting Run Hour and Lighting Power Data Logging

The SBC field personnel will ask each site operator if they undertake any dimming activities and the first 3 Company B sites and the first Company A site that respond affirmative will receive data loggers at between 2 and 3 lighting circuits that are dimmed. These same lighting fixtures will also receive lighting intensity data loggers in order to provide insight on light level variations when dimming actions are undertaken. Because dimming activity is at the discretion of the customer, the decision to install power loggers will be based on identifying customer who dim their lighting. The final selection of the sites to receive such logging will be at the discretion of the field personnel conducting the work.

Table 1 provides a description of the distribution of site verification and data logging activities between the 2 companies that participated in the program, Company A and Company B. Table 2 provides sample details.

Table 1 –Site data collection sample and activities

Entity	Installed sites	Site verification visits only	Sites receiving participant surveys	Sites receiving verification and lighting level logging	Circuits receiving lighting run hour logging	Sites receiving power logging[17]	Fixtures receiving lighting power logging
Goodyear Tire Store	34	8	8	2	20	1	4
Company B	225	25[18]	25	12	25	3*	6
Total	259	33	33	14	45	4	10

Potential Adjustments to Verification Sample Based on Ongoing Installations

As of the submission of this field plan, 90 Company B sites have been installed out of 225 committed, and all Company A sites have been installed. It is likely that the remaining Company B sites will be installed by the time the implementation contractor reports final invoicing in July 2006. If the additional Company B installations occur, the evaluation contractor will contact Company B project management to confirm the installations. Records for each new Company B installed will be reviewed and gross savings will be adjusted according to this data, and a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with Company B management.

Sampling and Uncertainty

This sample plan represents little bias because the Company B and Company A sites are homogeneous and the sample of sites being verified and sites receiving lighting run hour logging is random, The billing analysis will occur on a census if sites.

It is recognized discrepancies may occur between the billing analysis and metered data. Because all Company B and Company A sites are homogenous, we expect that whole facility influences (plug loads, power equipment) will also be consistent and impacts from the installed measures can be isolated with a census billing analysis (IPMVP Option C). It is expected that the partial field data collected through metering should correlate to changes in consumption recorded through billing data. However, where discrepancies occur, a preference will be given to metered data and engineering calculations (IPMVP Option A).

[17] Depending on customer enacted dimming activities

[18] Phase 1 verifications. Phase 2 will include up to an additional 37 sites if needed.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

Energy impacts will be calculated on a per site basis based on the number of fixtures retrofit, the base fixture and retrofit fixture unit demand (full power), site operating parameters (hours per year), and a billing analysis. Adjusted program gross energy savings will be based on this analysis and the installation rates based on verification data.

Calculation of Gross and Adjusted Gross Demand Impacts

This evaluation will use the Energy Efficiency Policy Manual[19] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated based on fixture kW draw, by reviewing UBAR data on the frequency of customer enacted dimming actions, and also from metered data provided by power logging. It is unlikely that customer enacted dimming is occurring in a way that impacts system demand, but this potential will be reviewed as field data is collected Adjusted Program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this program will be reported in the format provided in Appendix B. Future savings will be based on manufacturer statement of expected system life, and on estimates from customers on the likelihood that they will replace failed T5 lamps and Retrolux ballasts with the same technology. There are no Therms savings estimated for this program.

Customer Contact Protocol and Site Activities

Field activities will typically involve 3 components;

1. Summit Blue will coordinate with the implementation contractor and primary customer contact to establish field activity dates and identify site level contacts.
2. The customer contact at each site will be provided with a letter of introduction on Edison letterhead that provides a description if the activities to be undertaken at their site.
3. SBC staff will conduct a room-by-room, fixture-by-fixture audit noting fixture count, type, voltage, lamp wattage, conditions, etc.
4. A detailed description will be provided where data logging equipment has been installed. A data logger installation worksheet is provided as a separate document titles ‘Edison /

[19] Version 2, August 2003

IDEEA Demand Response Program Evaluation - Measure Installation Verification Worksheet'.

5. Where data loggers have been installed, a pick-up date will be provided to each site. SBC staff will call each site in advance to returning to retrieve loggers.

Data Logger Data Collection Protocol

HOBO lighting intensity loggers and power loggers will be used for run-time hour monitoring, dimming activities and energy consumption. The process for collecting the data using HOBO data loggers is as follows.

1. All inspections and data logging will take place between April 15 and May 28.
2. Initialize each logger as close as possible to the date it is deployed
3. Lighting on/off and intensity loggers will be set inside of fixture lens so that the light sensor is facing a lamp and minimizes the influence of ambient light. Power loggers with clamp-on current transducers will be connected at the facility power panel for lighting circuits being monitored.
4. SBC staff will randomly verify that the data loggers are recording light fixture operation.
5. If the space is occupied, SBC will inform the tenants it is conducting an energy study on the building and ask them not to move, remove or tamper with the logger. Also, participants will be asked to use the lights as usual, that is – not change their normal behavior during the study.
6. After 45 to 60 days, data loggers will be retrieved. Data loggers will be downloaded directly to a computer on the day they are retrieved.

Table 2: Company A Circuits

Strata	Verification Site Number	Base Msr Code	Base Msr Desc	Retrofit Msr Code	Retro Msr Desc	As Blt Retro Msr Qty
1	1	4LF40T12	2x4 T12	2LF28T5	2x4 2L Retrolux Prismatic lense	3
1	1	2LF60T12	2x8 T12	2LF28T5	1x8 2L T5	52
1	1	1LF60T12	1x8 T12	2LF28T5	1x8 2L T5	7
2	2	4LF40T12	2x4 T12	2LF28T5	2x4 2L Retrolux Prismatic lense	8
2	2	2LF60T12	2x8 T12	2LF28T5	1x8 2L T5	37
2	2	1LF60T12	1x8 T12	2LF28T5	1x8 2L T5	0

Customer Name: ______________________________

Contact Name: ______________________ Phone: ______________________

Street Address: ______________________________

City / Town: ______________________ State: __________ Zip: ______________

Market Sector (check one):

☐ Company B Site Number ☐ Company A Site Number ☐ Other: ______________________

Building Description:

PRIMARY SCHEDULES AND OPERATING HOURS

Day Type	Season / Business Hours		
Season definition / Months	1	2	3
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

LIGHT FIXTURE DATA

Measure Code	Database Fixture	Dbase Qty	Space Code	Verified Fixture	Verified Qty	Verified Watts	% Lamps Operating	Dimmed?	Season / Business Hour code		
								Y / N	1	2	3
								Y / N	1	2	3
								Y / N	1	2	3
								Y / N	1	2	3
								Y / N	1	2	3
								Y / N	1	2	3

Space Type Codes: C = Cubicle Office Area; **E** = Enclosed Office; **N** = Conf Rm; **H** = Hallway; **S** = Retail Sales Area; **R** = Restroom;

W = Warehouse/Storage; **T** = Storage Closet/Backroom; **L** = Lobby/Common Use Area; **F** = Food Display/Sales;

P = Production/Mfg; **D** = Dining; **K** = Kitchen/Food Prep; **X** = Exhibit/Display; **O** = Other

Measure Codes: WHDim = Westinghouse T5 with dimming capability; **WH =** Westinghouse T5 retrofit without dimming

O = other (define ____)

Questions

1. Is the equipment in working condition? (Y / N). If no, describe;

2. Does the equipment appear to be properly installed? (Y / N) If no, describe;

3. Has any of the equipment been removed or replaced since installation? (Y / N) If yes, describe;

   a. Why were they removed or replaced?

   b. When were they removed or replaced?

4. How likely is it that lamps and ballasts that fail during their lifetime will be replaced by the same technology? Please give us a % estimate of likelihood where 100% means that you are certain that failed lamps/ballasts will be replaced by the same technology and 0% means that you will use a different system. _________%

5. Do you or your maintenance company maintain an Retrolux ballasts and T5 lamps to use when the new lights fail due to age? Y / N / DK

6. Do you know where to purchase a new Retrolux ballast or T5 lamp when they fail? Y / N / DK

DIMMING SYSTEM OPERATION

1. Do you notice if the lights are ever dimmed? (Y / N)

1a. [If Yes to 1] Please describe what you notice;

1b. [If Yes to 1] Who initiates the dimming activities? Please describe.

1c. How often is dimming initiated?

1c. When do you typically initiate dimming?

Dimming Actions	**Season / Business Hours**		
Season definition / Months	1	2	3
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

2. How do you plan to use the dimming system in the future?

3. Other comments about the dimming system:

LOGGER DATA

Fixture Data				
Fixture – reference floor plan sketch	# ___	# ___	# ___	# ___
Logger Type **O/F** = On/Off **I** = Intensity **P** = Power	I P	I P	I P	I P
Use Type: **A** = Area **T** = Task **X**= Exit **C** = Accent **D** = Display/Advertising **O**= Other	A T X D O	A T X D O	A T X D O	A T X D O
Space Type: **C** = Cubicle Office **E** = Enclosed Office **N** = Conf Rm **H**= Hallway **S** = Retail Sales **W** = Warehouse/Storage **R** = Restroom **O** = Other	C E N H S W R O	C E N H S W R O	C E N H S W R O	C E N H S W R O
Mounting: **R** = Recessed **H** = Hanging/Suspended **S** = Surface-mount **T =** Torchiere **O** =Other ________________	R H S T O	R H S T O	R H S T O	R H S T O
Number of lamps per fixture				
Lamp Type: [INCLUDE WATTAGE FOR EACH]				
Q = Quartz/Halogen	Q	Q	Q	Q
I = Incandescent	I	I	I	I
FT5 = Fluorescent T5 Retrolux Retrofit	FT5	FT5	FT5	FT5
FO = Fluorescent Tube – Other	FO	FO	FO	FO
UT = Fluorescent U-tube	UT	UT	UT	UT
OF = Other Fluorescent (e.g. Biax)	OF	OF	OF	OF
For Fluorescent tubes: Length in ft. (e.g. 1.5 2 4 8)				
Diameter (T5 T8 T10 T12)				
CFL = Compact Fluorescent	CFL	CFL	CFL	CFL
CIR = Circline Fluorescent	CIR	CIR	CIR	CIR
MV = Mercury Vapor	MV	MV	MV	MV
MH = Metal Halide	MH	MH	MH	MH

PS = Pulse-Start Metal Halide	PS	PS	PS	PS
H = High Pressure Sodium Vapor	H	H	H	H
L = Low Pressure Sodium Vapor	L	L	L	L
Logger Data				
Location:				
Floor				
Tenant/Suite Number				
Fixture Location – reference floor plan sketch				
Logger ID Number:				
Deploy Date:				
Data Retrieval Date:				
Logger Removal Date:				
Field Notes				

Floor Plan Sketch:

(map locations)

Comments:

Appendix B: Site Activity Details

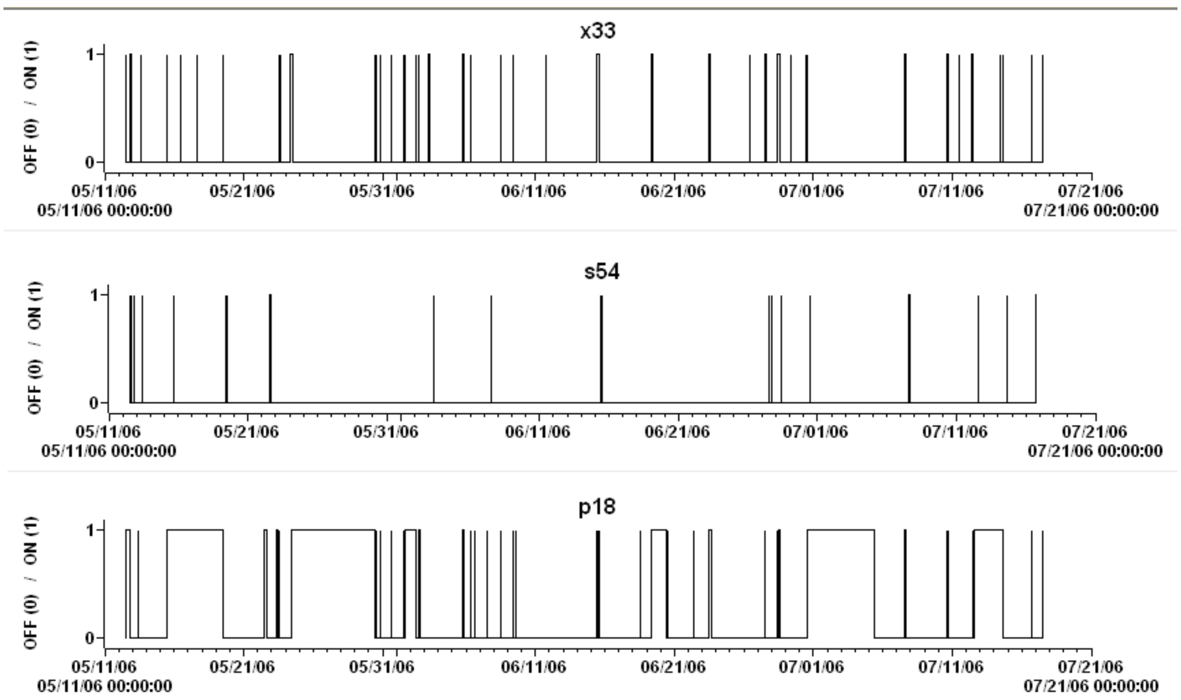
Company B Verification Analysis

Site Address	Committed	Recorded	Verified Installed	Verified Working
Verification Only				
9	16	N/A	21	21
10	16	N/A	24	24
11	16	N/A	15	13.66
12	16	N/A	27	24
Power Logging				
2	69	69	68	68
3	16	40	40	39
8	16	N/A	19	18
On-Off Logging				
1	16	31	32	32
4	37	37	37	37
5	16	17	17	17
6	16	16	16	15
7	26	26	26	25

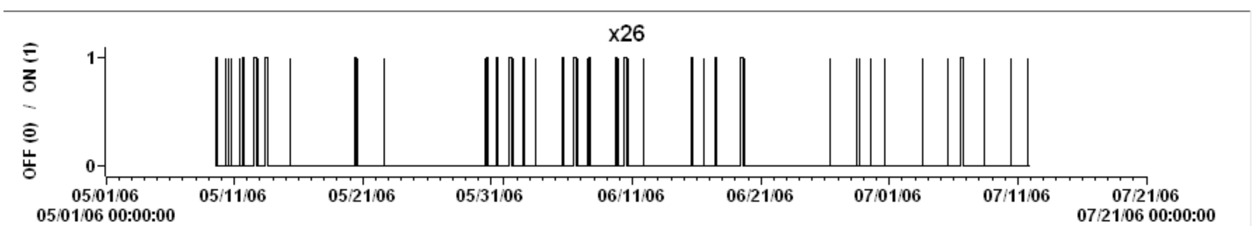
Company B Load Profiling Verification:

	Office Weekdays	Office Weekends	Storage Weekdays	Storage Weekends
12:00 AM	5.30%	3.47%	2.76%	5.99%
1:00 AM	5.30%	3.28%	2.76%	5.71%
2:00 AM	5.30%	3.28%	2.76%	5.71%
3:00 AM	5.30%	3.28%	2.76%	5.71%
4:00 AM	5.41%	3.28%	2.94%	5.71%
5:00 AM	5.30%	3.28%	2.76%	5.71%
6:00 AM	5.30%	3.28%	2.76%	5.71%
7:00 AM	5.76%	3.28%	4.03%	5.71%
8:00 AM	8.56%	5.03%	16.35%	6.00%
9:00 AM	24.85%	5.98%	28.00%	6.02%
10:00 AM	33.99%	5.74%	34.35%	5.71%
11:00 AM	37.54%	6.33%	37.65%	5.72%
12:00 PM	39.02%	5.63%	39.89%	5.80%
1:00 PM	39.92%	6.05%	40.16%	6.67%
2:00 PM	39.92%	5.00%	41.84%	6.80%
3:00 PM	38.08%	3.96%	41.17%	5.71%
4:00 PM	34.26%	3.28%	40.28%	5.71%
5:00 PM	24.15%	3.66%	27.29%	6.03%
6:00 PM	16.35%	4.21%	16.39%	6.62%
7:00 PM	12.83%	4.37%	9.92%	7.24%
8:00 PM	9.37%	3.28%	5.53%	6.67%
9:00 PM	7.41%	3.61%	4.40%	7.06%
10:00 PM	6.46%	3.28%	3.11%	5.88%
11:00 PM	5.36%	3.32%	2.76%	5.87%

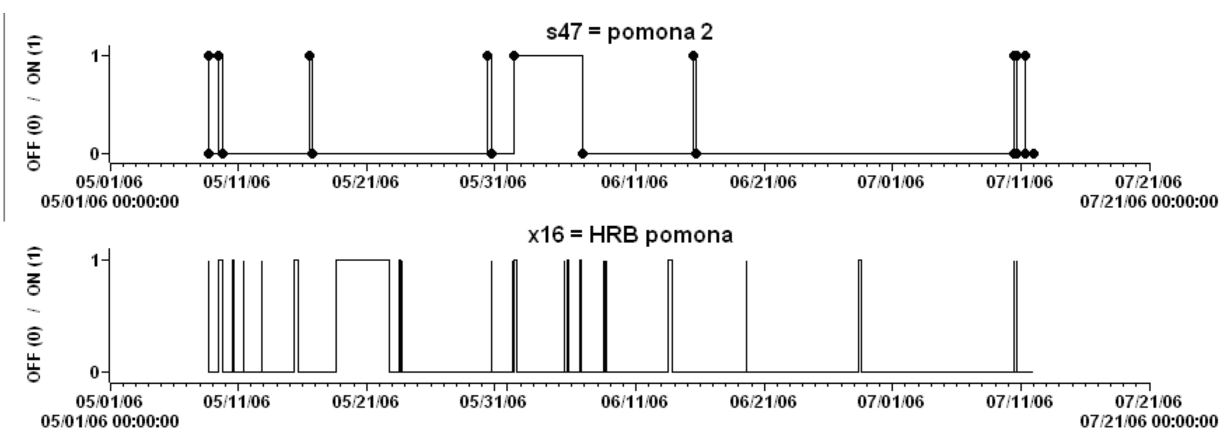
Site 1: On/Off Logging



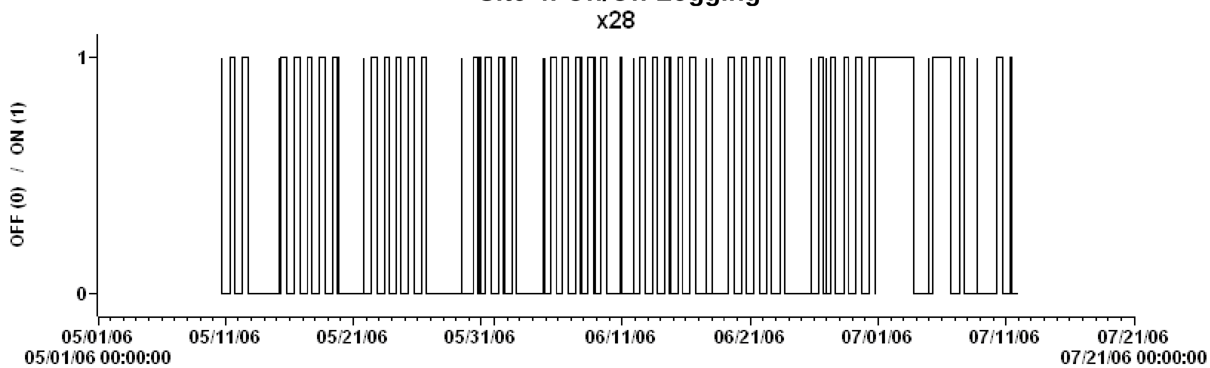
Site 2: On/Off Logging

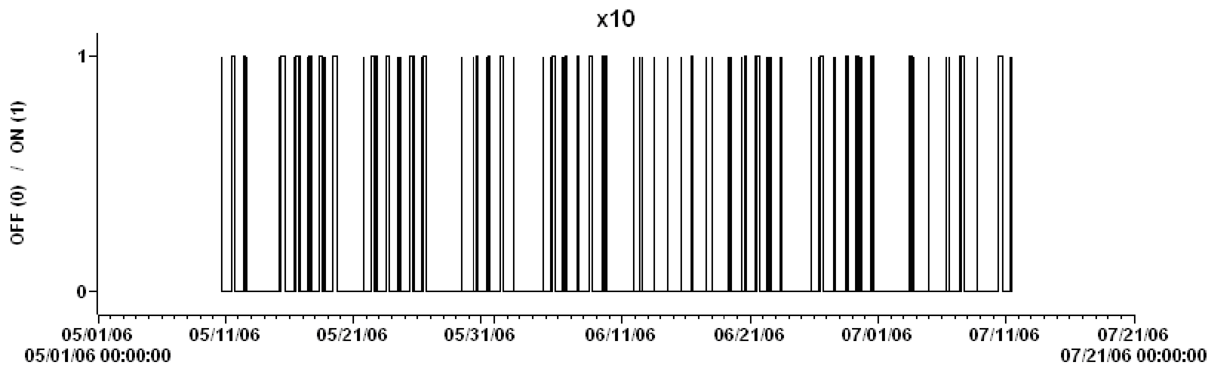


Site 3: On/Off Logging

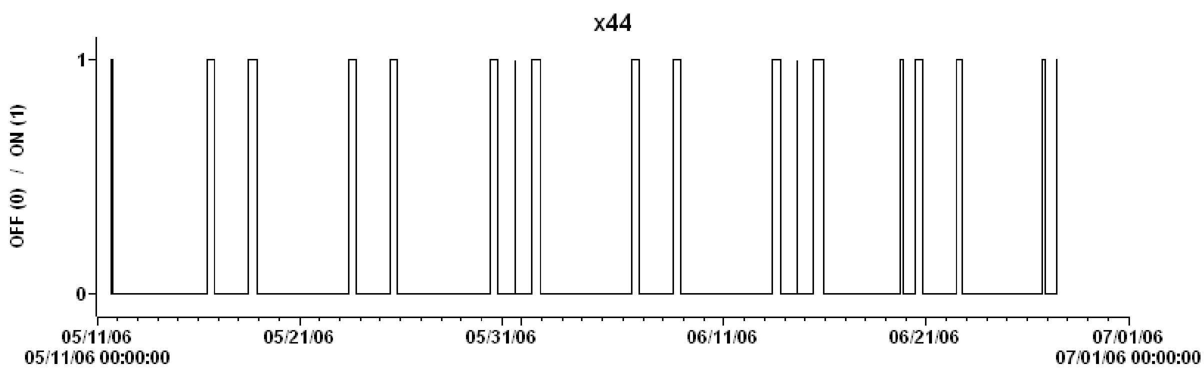


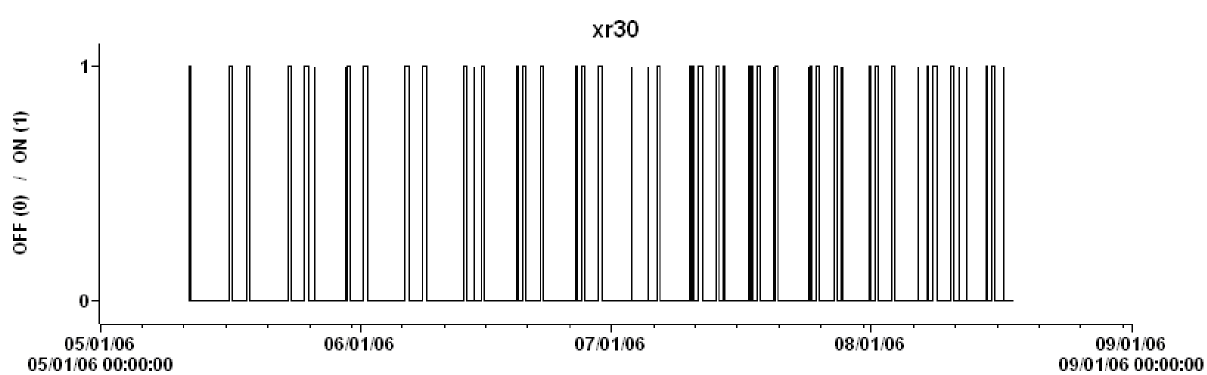
Site 4: On/Off Logging



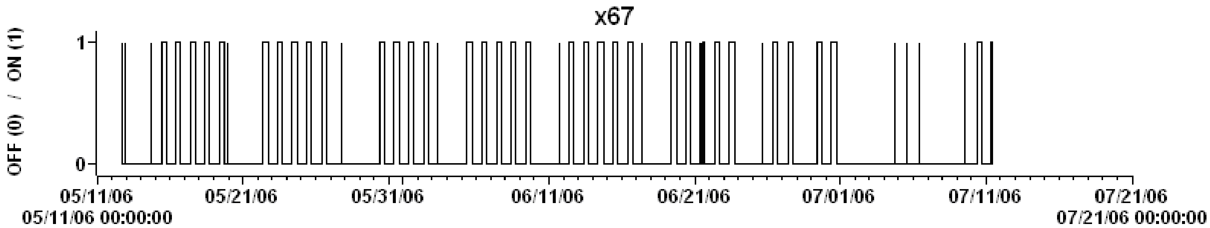


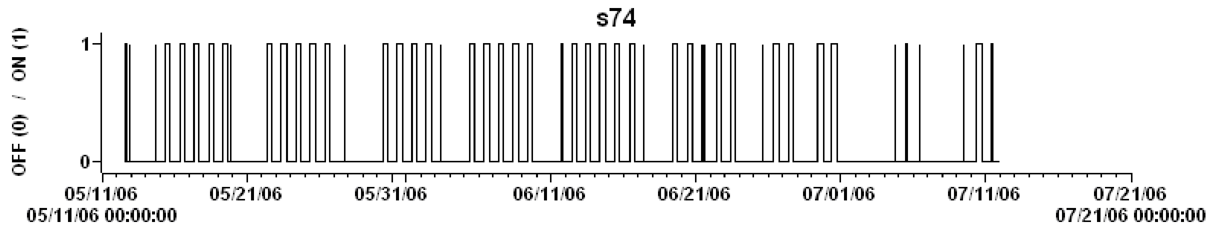
Site 5: On/Off Logging

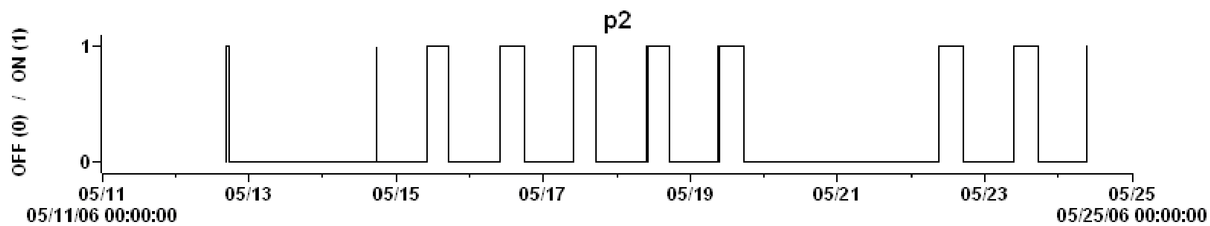




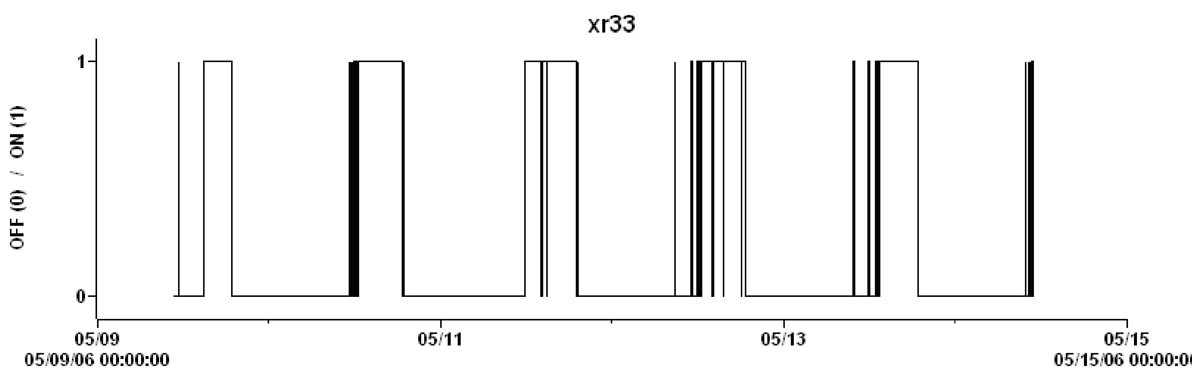
Site 6: On/Off Logging







Site 7: On/Off Logging



Company B Power Logging Activities:

Logger #	Intensity Logger #	O/F Logger #	kW	KVA	KVAR	PF	DPF	VOLTS	CF	AMPS
988624	983744	833938	0.62	0.64	0.41	0.83	0.85	121.3	1.4	6.19
988619	983741		0.57	0.73	0.46	0.78	0.8	121.9	1.4	6.02
988621	983743		0.48	0.52	0.19	0.93	0.95	119.7	1.4	4.35
988622	983746	816637	0.68	0.75	0.32	0.91	0.92	118.9	1.4	6.34
988625	983740	833192	0.82	0.82	0.04	1	1	116	N/A	7
988626	983742	816647	0.68	0.68	0.04	1	1	113.1	N/A	5.98

Company A Power Logging Activities:

Intensity Logger #	O/F Logger #	kW	KVA	KVAR	PF	DPF	VOLTS	CF	AMPS	Phase
983745	816568	0.63	0.63	0.03	1	1	121	1.4	5.25	Single
983748		0.59	0.72	0.41	-0.82	-0.83	121	1.4	5.97	Single

Appendix C: Surveys

Surveys for the EnergySolve Demand Response Program follow. The surveys are:

- Edison Program Manager
- Program Implementer—EnergySolve
- Westinghouse Manufacturer
- Participant Corporate Representatives
- Participant Company A and Company B Site Managers
- Participant Independent Lighting Contractor / In-house Lighting Contractors
- Nonparticipant Lighting Contractors

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EnergySolve Demand Response Program

Edison Program Manager

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
3. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with Energy Concepts & Controls, billing, incentives and program tracking.
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration?

Overall Lessons Learned

6. Are there barriers to the widespread installation of these cold cathode lamps that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
7. What characteristics make a good candidate for this program?
8. Other comments / issues

Thank you for your time.

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EnergySolve Demand Response Program

Program Implementer—EnergySolve

Interview Guide

Respondent ____
Date ____
Interviewer ____
Hello, my name is ___________________________ from _______________.

I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program. I'd like to speak with _______________________ Is _______ available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Program Design

1. What changes did you make in program design, approach or outreach from the plan originally submitted? How did the program evolve?
2. Were the targets met? If not, why not?
3. What was/were the innovative aspect(s) of this program?
4. Why was direct install delivery mechanism chosen?

Program Administration

5. Were there any issues related to interaction with Edison, billing, incentives and program tracking.
6. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Marketing and Outreach

7. What was your strategy for identifying target market? What characteristics or criteria were used to identify potential participants? Issues related to identifying and recruiting participants? How long did it take? What did it involve?
8. How was the program marketed? Were contacts and refusals tracked in a spreadsheet? What is known about the disposition of interested/non-interested contacts?
9. What were the barriers to installation of T5 lighting applications?
10. How do you see the dimming capability being used by end users?
11. Do you see this as being centralized (regional, corporate wide) or local (site level) control?
    - ☐ Centralized
    - ☐ Local
12. Did you discuss with customers the potential to have a utility control lighting as part of a demand response initiative?
13. What action is the customer expected to take if they have any issues with the way the dimming mechanism works?

14. How will the end users and the utility interface to achieve the demand response capability inherent in the Retrolux / UBAR system?

Delivery and Implementation

15. What expertise is needed to conduct the audit and identify candidate sites?
16. Was specialized training for lighting contractors and installers required, if so how many were trained?
17. What is the overall level of training of this type among technicians? Does the manufacturer regularly train technicians about how to install and troubleshoot this type of equipment?
18. Any issues emerge during installation, with technology or lighting contractors?
19. Any issues emerge with the transceivers or Network Operating System?
20. Any issues emerge with the UBAR reporting tool?
21. Any issues emerge with commissioning?
22. Any issues emerge with training site managers?

Market/Customer Response

23. Have site managers asked questions or expressed difficulties of any kind? Have site managers provided feedback about the dimming options?

Overall Lessons Learned

24. What do you now know about the industry? What characteristics make a good candidate for this program?
25. What commercial building and business characteristics make a good candidate for this technology?
26. Were the businesses chosen good examples? Could a case study be developed from them that would be useful in convincing others to use the technology?
27. Were there unique issues at any particular site that would be encountered in wider program implementation?
28. Is there a viable market niche for this technology?
29. Are there barriers to the widespread installation of these cold cathode lamps that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Fans not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____
30. If the program were expanded to other facilities, is there anything that you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, etc?

Thank you for your time and assistance in evaluating this program.

EnergySolve Demand Response Program

Westinghouse Manufacturer

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Hello, my name is ___________________________ *from* _______________.
I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program for Edison. This program promoted installation of dimmable T5 lighting that replaced T12 lamps.

I'd like to ask a couple of questions about the T5 lighting.

1. Can you tell me how long you've been working with the program implementers, EnergySolve and about your experience with the Edison program?
2. How has the program impacted the manufacture or distribution of these lamps? (speed of development, price, distribution, product development)
3. Are the T5 lamps only available through EnergySolve and the Edison program? How do you distribute these lamps? Are they sold 'off the shelf'?
4. EnergySolve offered business owners an incentive through their maintenance agreement to install and purchase the lamps. Do you think incentives will be needed to install these lights on a larger scale?
5. What do you think the barriers to the widespread installation of the T5 dimmable lamps are? [Do not read. Check all that apply]
   - ❑ Cost
   - ❑ Education/marketing
   - ❑ Time
   - ❑ Lights not appropriate to market
   - ❑ Facility managers don't think they'll save energy or money
   - ❑ Other, specify ____
6. What do you think needs to happen to for this product to become widely installed?
7. Do you have any suggestions to improve this program?

Thank you for your time.

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EnergySolve Demand Response Program

Participant Corporate Representatives

Interview Guide

Business Name ____
Staff Name ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________.
I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program for Edison. This program promoted installation of T5 dimmable lighting that replaces T12 fluorescent lighting. I'd like to speak with _____________________
Is [he/she] available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach

1. Do you remember being contacted about the Energy Solve Demand Response program sponsored by Southern California Edison? [Do not read responses]
    - ❑ No
    - ❑ Yes, When were you contacted? _______________________
    - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
    - ❑ Manufacturer
    - ❑ Dealer/distributor
    - ❑ Installer
    - ❑ Other, specify ____
3. How was the information delivered? [Do not read. Check all that apply]
    - ❑ Mail
    - ❑ Phone call
    - ❑ Attended a presentation
    - ❑ Trade Show
    - ❑ Other, specify ____
4. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
    - ❑ T5 dimmable lighting will save energy and/or money
    - ❑ Southern California Edison would pay for the fans
    - ❑ This was an experiment
    - ❑ T5 dimmable lighting would give control where I didn't have any before
    - ❑ No one has ever talked to us about Edison programs before
    - ❑ Other, record comments verbatim _________________________

5. Why did you decide to participate? What factors were key to your decision? [Do not read. Check all that apply]
   - ❑ The audit was free
   - ❑ The lighting was free
   - ❑ A good way to save energy and money
   - ❑ Payback was reasonable
   - ❑ Paid for lamps with service maintenance agreement
   - ❑ Other, specify ____
6. Were you aware of the T5 dimmable lighting before being contacted about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
7. How important was Edison's sponsorship of this program to your decision to participate? Please explain your answer.
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important
8. Can you tell me about the incentive that was offered? What did you have to pay for the lamps and installation?
9. What was the decision making process involved in the decision to install the lamps at other sites?

Lighting Maintenance

10. Is there an energy manager on-site at your stores?
    - ❑ No
    - ❑ Yes
11. What is the typical schedule for lighting upgrades/equipment replacement?
    - ❑ No set schedule
    - ❑ Annual review
    - ❑ Bi-annual
    - ❑ Monthly
    - ❑ Other Specify____
12. Who is responsible for the maintenance of lighting equipment?
    - ❑ Site manager at individual sites
    - ❑ Energy manager for all the sites
    - ❑ Outside contractor
    - ❑ Other Specify____
13. Are you satisfied with the EnergySolve Demand Response service maintenance and reporting contract?
    - ❑ No What would you like to see different?____________________
    - ❑ Yes
    - ❑ Uncertain
14. Do you use the interval data (15 minute energy use/savings data)?
    - ❑ No Why not? ____

- ❑ Yes How do you use it? ________________________________
- ❑ Uncertain

15. How useful are the UBAR energy savings results? Explain how you use the data
    - ❑ Very useful
    - ❑ Useful
    - ❑ Neutral
    - ❑ Not particularly useful
    - ❑ Not useful at all
16. Have lighting schedules been changed as result of system installation?
    - ❑ No
    - ❑ Yes How have they changed? ___________________________
    - ❑ Uncertain
17. Are you aware of the various demand response initiatives being offered by the Edison?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
18. Would you participate with Edison to use the lighting's demand response capability as part of a utility demand response program?
    - ❑ No
    - ❑ Yes Do you know how you would participate? _____________
    - ❑ Uncertain
19. Have you used dimming options in response to utility demand response initiatives?
    - ❑ No
    - ❑ Yes When? ____
    - ❑ Uncertain
20. Have you used dimming options for your own economic reasons?
    - ❑ No
    - ❑ Yes Explain? _______________________________________
    - ❑ Uncertain
21. How do you see the dimming capability being used by end users? Do you see this as being centralized (regional, corporate wide) or local (site level) control?
22. Would you install this type of lighting ahead of regularly scheduled maintenance replacements where lighting has not already been installed?
    - ❑ No
    - ❑ Yes Explain? ____________________________________
    - ❑ Uncertain
23. Has the installation of the T5 dimmable lighting resulted in any other benefits (non-energy) to your operations?

Spillover

24. Would you install this type of lighting system at other stores in the future, either at your own expense; or with incentives?
    - ❑ Not at own expense or with incentives
    - ❑ Yes at own expense
    - ❑ Yes with incentives
    - ❑ Uncertain

25. Do you have any plans to install T5 dimmable lighting at other stores you manage?
    - ❑ No
    - ❑ Yes, When
        1. This year
        2. In one to two years
        3. In three to five years
        4. More than five years out
26. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ No
    - ❑ Yes, Please describe the type of energy efficient equipment you added
27. [ASK IF 26 OR 27 = YES] Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment or the T5 lighting?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Market Barriers to Adoption

28. Can you tell me how satisfied you are with the performance of the lighting and dimming options? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
29. Are there barriers to the widespread installation of the T5 dimmable fixtures that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____
30. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?
31. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
32. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No

- ❑ Yes, When, what program was it? ________________________
- ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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EnergySolve Demand Response Program

Participant Company A and B Site Managers

Business Name ____
Site Manager ____
Date ____
Interviewer ____

Hello, my name is ________________________ from _____________. I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program. This program promoted installation of T5 dimmable lighting that replaced fluorescent lighting. I'd like to speak with the site manager, ____________________ Is ____________ available?
If not, could I schedule a time to call back to reach Mr./Ms. ____________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach

1. Do you remember when you were contacted about the EnergySolve Demand Response program sponsored by Southern California Edison?
   - ❑ No
   - ❑ Yes When were you contacted? __________________________
   - ❑ Uncertain
2. Can you tell me who contacted you and explained what the program was about and what your participation would involve? [Do not read]
   - ❑ EnergySolve
   - ❑ Corporate Manager
   - ❑ Lighting contractor
   - ❑ Other, specify __________________________________
3. Were you aware of the T5 dimmable lighting before being contacted about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
4. Were you involved in the decision to install the T5 dimmable lighting in your store?
   - ❑ No
   - ❑ Yes
     1. If yes,
     2. What was your involvement? _______________________
     3. Did you have any initial objections?
        1. Yes - What were they? ___________________
        2. No
   - ❑ Uncertain
5. Did someone discuss the installations with you before the contractors arrived to install the lighting?
   - ❑ No – skip to Q7
   - ❑ Yes

1. Who contacted you about the installation prior to the arrival of the contractors? ________________________________
2. Did you have any initial objections at that point?___________
   a. Yes What were they? _____________________then ask Q6
   b. No – skip to Q7

- ❑ Uncertain – skip to Q7

6. Were any of your objections realized?
   - ❑ No – skip to Q7
   - ❑ Yes
     1. Which ones were realized?_____________
     2. What happened? __________________________
   - ❑ Uncertain – skip to Q7

Market/Customer Response

7. Can you tell me how satisfied you are with the performance of the lighting and dimming options? Would you say:
   - ❑ Very satisfied
   - ❑ Somewhat satisfied
   - ❑ Neutral
   - ❑ Somewhat not satisfied
   - ❑ Not at all satisfied
8. Have staff raised any issues with dimming the lighting? If yes, what were the issues? [Do not read, mark all that apply. If no, probe with: Was the lighting too dark when dimmed, etc.]
   - ❑ Too dark when dimmed
   - ❑ Changes in lighting levels cause physical discomfort or eye strain
   - ❑ Lights could be dimmed more often
   - ❑ Lights could be dimmed more intensely
   - ❑ Other, specify ___________________________________
   - ❑ None
9. How often are dimming options used? [Do not read, mark all that apply. Probe if needed]
   - ❑ Many times a day
   - ❑ Once a day
   - ❑ Rarely
   - ❑ Never..(skip to Q11)
   - ❑ Programmed into set schedule
   - ❑ Other, describe _______________________________________
10. When do you enact dimming options? That is, what is the schedule?
11. Is stepped dimming used? If used, How often?
    - ❑ Many times a day
    - ❑ Once a day
    - ❑ Rarely
    - ❑ Never..(skip to Q13)
    - ❑ Programmed into set schedule
    - ❑ Other, describe _______________________________________

12. Has dimming impacted the work environment?
    - ❑ No
    - ❑ Yes How? ____
    - ❑ Uncertain
13. Have you ever looked at the data to see how much energy is being saved?
    - ❑ No -
    - ❑ Yes - In your opinion was this information useful?

      1 – Yes - What about the information was useful? What, if anything, would make the information more useful? Is there anything else that would make this information more useful?

      2- No - What about the information not useful? What, if anything would make the information more useful? Is there anything else that would make the information more useful?

      3- Uncertain. - What would make this information more useful? Is there anything else that would make this information more useful?
    - ❑ Uncertain -

Delivery and Implementation

14. Did any operational issues emerge during or since the installation of the lighting that required the attention of you or your staff? If yes, what were they?
15. Have there been failures or malfunctions?
    - ❑ No
    - ❑ Yes Describe them __________________________________
    - ❑ Uncertain
16. Was training about dimming options and system operations provided?
    - ❑ Yes
    - ❑ No – Skip to Q18
    - ❑ Uncertain – Skip to Q18
17. Was it enough information to meet your needs?
    - ❑ No - What about the training was not useful? What, if anything would make the training more useful? Is there anything else that would make the training more useful?
    - ❑ Yes What about the training was useful? What, if anything, would make training more useful? Is there anything else that would make this training more useful?
    - ❑ Uncertain - What would make this training more useful? Is there anything else that would make this training more useful?

Free Ridership

18. Have you installed T5 dimmable lighting at other stores you manage?
    - ❑ No
    - ❑ Yes, When did you install T5 dimmable lighting at other stores you manage?
        1. This year
        2. In one to two years
        3. In three to five years
        4. More than five years out

19. Do you have any plans to install T5 dimmable lighting at other stores you manage?
    - ❑ No
    - ❑ Yes, When do you plan to install T5 dimmable lighting at other stores you manage?
        1. This year
        2. In one to two years
        3. In three to five years
        4. More than five years out
        5. Uncertain

Spillover

20. Since hearing about the program, have you added any other energy efficient equipment in your store?
    - ❑ Yes
    - ❑ No..(Skip to 23)
21. Please describe the type of energy efficient equipment you added.
22. Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Market Barriers to Adoption

23. Are there barriers to the widespread installation of the T5 dimmable fixtures that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ None
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____
24. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?

    1 – Has response (specify)

    2 – No response/DK/Not Sure
25. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied

26. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ______________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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EnergySolve Demand Response Program

Participant Independent Lighting Contractor
In-house Lighting Contractors

Interview Guide

Business Name ____
Respondent ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from ________________. I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program. This program promoted installation of T5 dimmable lighting that replaced T12 fluorescent lighting. The Edison Program Manager is George Colonel.
I'd like to speak with the site manager, ________________________ Is that person available?

Marketing and Outreach

1. Do you remember being contacted about the Energy Solve Demand Response program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No
   - ❑ Yes, When were you contacted? ________________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about? [Do not read. Check all that apply]
   - ❑ Manufacturer
   - ❑ Dealer/distributor
   - ❑ Installer
   - ❑ Other, specify ____
3. Were you aware of the T5 dimmable lighting before being contacted about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
4. Have you installed the T5 dimmable lighting before?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain

Delivery and Implementation

5. What expertise is needed to conduct the audit and identify candidate sites?
6. Was specialized training for lighting contractors and installers required?
   - ❑ No
   - ❑ Yes,

6. Who did the training?
7. What did it include?
8. How many were trained?

7. What is the overall level of training of this type among technicians?
8. Does the manufacturer regularly train technicians about how to install and troubleshoot this type of equipment?
   - ❑ No
   - ❑ Yes
9. Any issues emerge during installation, with technology or site?
10. Any issues emerge with the transceivers or Network Operating System?
11. Any issues emerge with the UBAR reporting tool?
12. Any issues emerge with commissioning?
13. Any issues emerge with training site managers?

Overall Lessons Learned

14. What commercial building and business characteristics make a good candidate for this technology? What is the potential in the small commercial business?
15. Were there unique issues at any particular site that would be encountered in wider program implementation?
16. Are there barriers to the widespread installation of the T5 dimmable fixtures that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____
17. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?

Thank you for your time and assistance in evaluating this program.

EnergySolve Demand Response Program

Nonparticipant Lighting Contractors

Interview Guide

Business Name ____
Respondent Name ____
Date ____
Interviewer ____

Hello, my name is _________________________ from ______________. I am calling on behalf of Southern California Edison. We are evaluating the Energy Solve Demand Response Program for Edison. This program promoted installation of T5 dimmable fluorescent lighting that replaces T12 fluorescent lighting. I'd like to speak with someone who is knowledgeable about your fluorescent lighting options. We are interested to know what energy efficient fluorescent lighting you install.

1. Can you tell me about your experience installing retrofit lighting?
2. Have you heard about T5 dimmable lighting that replaces T12 fluorescent lighting?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
3. Have you installed T5 dimmable lighting or similar dimming technology before?
   - ❑ No
   - ❑ Yes, When, how many installations? _________________________
   - ❑ Uncertain
4. Do you install any energy efficient lighting that would replace T12s?
   - ❑ No
   - ❑ Yes, What do you install? _________________________
   - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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9. Miniature Cold Cathode Lighting Program

Appendix A: Billing Analysis Results

As noted in the discussion of the Impact Evaluation methodology, a billing analysis was completed, but results proved too uncertain to use in the impact evaluation. This Appendix reports on the billing analysis methodology and results.

Methodology

To conduct the billing analysis, Quantec first requested monthly energy consumption data from Edison for each of the 23 Cold Cathode program participants dating back to June 2003. However, as evident in Table A–1, Edison was only able to provide data for 21of the 23 participants.

In an effort to ensure quality results, several filters were applied to the raw billing data prior to conducting the analysis. First, after matching each participant's pre- and post-installation periods (i.e., limiting the analysis to only the same months of the year in the pre- and post-periods), all participants without a minimum of six matched pre- or post-installation monthly meter readings were dropped from the analysis. While an entire year of data is preferred in order to understand the full range of annual use, sufficient time had not passed since the average installation to impose such a stringent filter.

Second, unfortunately it was not known whether the provided meter data represented total energy consumption for the participating site or a dedicated meter for the site's retrofitted signage. However, by evaluating each participant's average daily pre-installation consumption it was possible to identify and exclude those sites where the provided meters were clearly not dedicated meters. For example, two of the four sites—both two amusement parks—dropped from the analysis based on their observed pre-installation daily energy consumption, were found to be consuming in excess of 35,000 kWh each day.

The effect of the two filters discussed above upon overall sample size is captured in Table A-1.

Table A–1. Cold Cathode Billing Analysis Data Attrition

Metric	Number of Unique Participants Removed	Percentage of Total Unique Participants Removed	Number of Unique Participants	Percentage of Total Unique Participants
Total program participants	- - -	- - -	23	100.0%
Matched to billing data	2	8.7%	21	91.3%
Minimum of six matching months in pre- and post-period	2	8.7%	19	82.6%
Average daily pre-period energy consumption less than 5,000 kWh	4	17.4%	15	65.2%
Final sample			15	65.2%

Also, although billing analyses typically involve weather normalization, no such normalization was utilized, since the energy consumption of the retrofitted signage is not impacted by weather.

Results

Since the sites remaining in the analysis still varied considerably in size (from 514 kWh to 2,990 kWh per day in the pre-period), the sites were broken up into tiers based on their observed pre-installation consumption. The three tiers were defined as follows:

- Tier 1: Less than 1,000 kWh a day
- Tier 2: 1,000 kWh – 1,999 kWh a day
- Tier 3: 2,000 kWh – 2,999 kWh a day

Once separated into tiers, regression models were conducted using a pre-post indicator and dummy variables for each participating site to as independent variables to determine the impact of the Program upon daily energy consumption at both the site level and tier level. The results of the tier level billing analysis, as well as the number of sites in each tier, is provided in Table A–2, while site level regression results are offered in Table A–3.

Table A–2. Cold Cathode Billing Analysis – Savings by Tier

Tier	n	Average Daily Pre-Installation Consumption (kWh)	Average Daily Savings (kWh)	Percent of Pre-Installation Consumption Saved
Tier 1	6	790	327	41.4%
Tier 2	7	1,549	379	24.5%
Tier 3	2	2,592	444	17.1%
Overall	15	1,369	366	26.7%

Table A–3. Cold Cathode Billing Analysis – Savings by Site

Tier	Site	Average Daily Pre-Installation Consumption (kWh)	Daily Savings (kWh)	Percent of Pre-Installation Consumption Saved
Tier 1	Site 7	947	297	31%
Tier 1	Site 9	580	184	32%
Tier 1	Site 10	514	397	77%
Tier 1	Site 15	768	536	70%
Tier 1	Site 16	951	499	52%
Tier 1	Site 17	907	59	6%
Tier 2	Site 4	1,024	807	79%
Tier 2	Site 5	1,848	91	5%
Tier 2	Site 8	1,176	182	16%
Tier 2	Site 12	1,922	535	28%
Tier 2	Site 18	1,852	109	6%
Tier 2	Site 19	1,663	345	21%
Tier 2	Site 20	1,983	445	22%
Tier 5	Site 6	2,194	502	23%
Tier 5	Site2	2,990	385	13%

As evident in Table A–4, the savings observed in the analysis ranged dramatically by site. In addition, as shown in Table A–4 (organized by tier and site), the results of the billing analysis differed significantly from the Program's expected savings, as well as from the engineering savings estimates.

Table A–4. Cold Cathode Billing Analysis – Savings by Site

Tier	Site	Billing Analysis: Annual Energy Savings (kWh)	Engineering Estimates: Annual Energy Savings (kWh)	Difference (kWh)	Percent of Estimated Engineering Savings Observed in Billing Analysis
Tier 1	Site 7	108,542	140,160	31,618	77%
Tier 1	Site 9	67,235	158,599	91,364	42%
Tier 1	Site 10	144,940			
Tier 1	Site 15	195,594			
Tier 1	Site 16	181,980	690,260	508,280	26%
Tier 1	Site 17	21,454	152,494	131,040	14%
Tier 2	Site 4	294,433	590,354	295,921	50%
Tier 2	Site 5	33,208	214,697	181,489	15%
Tier 2	Site 8	66,573	115,632	49,059	58%
Tier 2	Site 12	195,147	214,445	19,298	91%
Tier 2	Site 18	39,927			
Tier 2	Site 19	126,002			
Tier 2	Site 20	162,352			

Tier 5	Site 2	140,564	231,469	90,905	61%
Tier 5	Site 6	183,285	286,541	103,256	64%

There are several possible reasons for the discrepancy between the engineering savings estimates and the savings determined through the billing analysis. First, as noted above, it was unknown whether the meters being used where dedicated meters or meters for the entire site. While four meters that were clearly not dedicated exclusively to the retrofitted sign were removed from the final analysis, it is possible that other non-Program end-uses are being captured on the meter and distorting the results. Second, since some of the meter data initially provided exhibited pre-installation energy consumption lower than the total expected Program savings, it is possible that other meters for the site (perhaps that monitored the sign or that also captured sign energy usage) were not included in the analysis. Although a list of such sites was complied and sent back to Edison (who in turn provided additional "potential" meter data for nearby meters under the same account that may or may not capture sign energy consumption), integrating the "potential" meters did not significantly alter the results.[20] In fact, the aggregating of the potential meters into the analysis only decreased the clarity and possibly the reliability of the data.

In conclusion, while the billing analysis showed savings at all participating sites, given the data quality issues discussed above it is uncertain how accurate the results of the effort are. Although other factors and end uses potentially on the meter may be distorting—by either overstating or understating—the true impact of the Program, it is clear that two-thirds of the participating sites experienced a decrease in their energy consumption of more than 20%. Further, three sites (possibly with dedicated meters) exhibited savings exceeding 70%. While the billing analysis was unable to accurately determine the energy impact of the Program, the results of select sites lend legitimacy to the savings estimates projected by the Program and confirmed by evaluation engineers.

[20] Additional meters were not identified for each flagged (observed consumption less than expected program savings) site. Of those meters identified as being on the same account and in the vicinity of the participating site, only those meters identified as being at the same geographic site were aggregated into the analysis.

Appendix B: Impact Evaluation Field Plan

Memorandum

To: **Ben Bronfman**

From: **Floyd Keneipp**

Copy: **Shahana Samiullah, Kevin Cooney, Steven Long**

Date: **April 27, 2006**

RE: Sample design and field data collection plan for the Energy Controls and Concepts Miniature Cold Cathode Hardware Incentive Program.

The intent of the sample design and field data collection plan is to:

– Specify data collection objectives.

– Define the sample of sites that receive verification visits.

– Define how projects that may be installed after the completion of this verification effort will be accounted for

– Define customer contact protocol and site activities

– Provide the data collection and communications instruments used during field activities. See Appendix A.

<u>Data Collection Objectives</u>

Field activities will provide several key components needed to calculate the adjusted gross savings for this program, including;

1. Complete measure installation verifications
2. Confirm the energy savings assumptions for installed signs, including 'flash rate' assumptions.

<u>Installation Verification - Sample Design</u>

Tables 1 and 2 provide the sample of exterior and interior signs to be verified, respectively.

<u>Sample of Exterior Signs Receiving Verification Visits</u>

Exterior signs consist of larger advertising signs, such as those seem at automobile dealerships, and also smaller accent or decorative signs, such as those seem at amusement park rides. A total of 30 exterior signs have been installed through the program as of April 6, 2006, and 15 signs

(50%) were selected to receive verification activities[21]. In developing the field verification sample, the 30 installed exterior signs were first sorted by contribution to program savings and then separated into 2 groups; signs that contributed the median amount of savings or greater, per sign, and signs that contributed less than the median, per sign. A total of 22 signs contributed more than the median savings, per sign, and 12 signs were selected at random from this group. A total of 8 signs contributed less than the median savings, per sign, and 3 signs were selected at random from this group. This method provides a verification sample that is weighted towards individual signs that contribute a higher percentage of program savings, and yielded a sample that accounts 69.6% of total exterior sign savings.

Sample of Interior Signs and Lamps Receiving Verification Visits

Interior signs and lamps are used for interior area lighting or decoration. As of the date of this plan, no interior signs have been installed. A total of 123 signs have been identified as committed, with all of these signs committed to one customer, the operator of two large restaurant chains. It is unclear if any of these projects will occur prior to the program closing in June. Because these are committed, no sample has yet been drawn for interior signs.

Potential Adjustments to Verification Sample Based on Ongoing Installations

It is likely that no additional exterior signs will be installed, however it is likely that some interior signs installations will occur before the program closes in June, 2006. If the implementation contractor does report additional installations during this time, evaluators will contact the customer to identify which sites have been installed. This sample will be based both on the number of sites installed, and also the distribution of savings attributed by those sites. Based on this, evaluators will select a representative sample of sites at which onsite verification visits will occur. These onsite inspections will occur prior to May 31, 2006.

Sampling and Uncertainty

The sample of signs receiving verification is random, so represents little bias. The billing analysis will occur on external signs with dedicated meters or signs on meters with loads that can be characterized without additional metering. It is assumed that the distribution of signs with dedicated meters and signs without meters is random, so there is likely little bias in this analysis. No internal signs are included in the sample as yet because no internal signs have been completed. The sample may be adjusted during the course of the evaluation if installations occur, and the sample of these potential installations will be random in order to minimize sample bias.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

[21] An additional 40 signs have been identified as committed; however it is unclear if any of these projects will occur prior to the program closing in June.

Energy impacts will be calculated on a per sign basis based on the number of lamps replaced, the base lamp and efficient lamp unit demand, sign operating parameters (hours per year and flash rates), and a billing analysis. Adjusted program gross energy savings will be based on this analysis and the installation verification data.

Calculation of Gross and Adjusted Gross Demand Impacts

This evaluation will use the Energy Efficiency Policy Manual[22] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated by reviewing sign operating hours to confirm that signs are operating during the peak demand period and peak savings during the designated period will be determined based on the flash rate analysis and billing data, where available. Adjusted program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this program will be reported in the format provided in Appendix C. Future savings will be based on manufacturer statement of expected lamp life, and on estimates that customers will replace failed lamps with the same technology. There are no therms savings estimated for this program.

Customer Contact Protocol and Site Activities

Field activities will typically involve the following steps:

1. The evaluators will coordinate with the implementation contractor and primary customer contact to establish field activity dates and identify site level contacts.
2. All inspections of exterior signs will take place between April 15 and April 28. Inspection of interior signs and lamps will occur prior to May 31, pending any installations of interior lamps as discussed above.
3. The customer contact at each site will be provided with a letter of introduction on Edison letterhead that provides a description if the activities to be undertaken at their site.
4. Evaluators will visually inspect each sign to confirm operation, and also count the retrofit lamps installed on each sign.
5. Evaluators will attempt to identify lamp wattage, however some exterior signs cannot be accessed due to height restrictions, even with a ladder. In these cases, lamp wattage verification will occur primarily by reviewing replacement lamp stock, if available.
6. In order to confirm flash rates on exterior signs, each exterior sign will be observed for no less than 1/4 hour. During this time, a digital photograph will be taken each time a sign changes message, or at some consistent time interval, to be determined by the field technician, to gain a sense of the average number of lamps illuminated These photographs will be analyzed in order to estimate the % of lamps operating for each

[22] Version 2, August 2003

message displayed, and what is the resulting kW and kWh. These values will be compared to flash rate assumptions made in the program design.

7. In order to support billing analysis, evaluators will confirm meter numbers for exterior signs with dedicated meters, or where non-dedicated meters can be associated with a sign, assuming the percentage of load attributable to the sign is meaningful.
8. The estimated average load from the flash rate analysis, discussed above, will be compared with the billing analysis on related signs in order to further validate program assumptions.
9. The results of these field activities will be used to calculate installation rates and develop adjusted gross program savings.

Table 1: Exterior Sign Field Sample

Strata	Site number	Rate
1	1	GS-2
1	2	GS-1
1	3	GS-1
1	4	GS-1
1	5	GS-1
1	6	GS-1
1	7	GS-1
1	8	GS-1
1	9	GS-1
1	10	GS-2
1	11	TOU-8
1	12	GS-1
1	13	Tou-8
Alt	14	TOU-8
Alt	15	GS-1
Alt	16	GS-1
Alt	17	GS-1

SITE INFORMATION Date: ____________________

Customer Name:			
Contact Name:		Phone:	
Street Address:			
City / Site Number			

Market Sector (check one):

Site Description:

Electric Meter Number (if applicable): ______________________________

PRIMARY SCHEDULES AND OPERATING HOURS

Day Type	**Season / Business Hours**		
Season definition / Months	Season 1	Season 2	Season 3
Monday to Friday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Saturday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Sunday	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __
Holidays	from __ __ to __ __	from __ __ to __ __	from __ __ to __ __

SIGN / LAMP DATA

Sign type Code	**Measure Code**	**Database lamp part number**	**Dbase lamp Qty**	**Verified lamp part number**	**Verified lamp Qty**	**% Lamps Operating**	**Flash Rate applies?**
							Y / N

Sign Type Codes: E = Exterior Sign; **I** = Interior Sign

O = other (define____)

1. Is the sign in working condition? (Y / N). If no, describe;

2. Does the equipment appear to be properly installed? (Y / N). If no, describe;

3. Was any of the equipment been removed or replaced since installation? (Y / N). If yes, describe;

   a. Why were they removed or replaced?

   b. When were they removed or replaced?

4. How likely is it that cold cathode lamps that fail will be replaced new cold cathode lamps. Please give us a % estimate of likelihood where 100% means that you are certain that failed lamps will be replaced by the same technology and 0% means that you will use a less energy efficient lamp.

_________%

5. Do you or your signs maintenance company maintain an inventory of cold cathode lamps to use when lamps fails? Y / N / DK

6. Do you know where to purchase a cold cathode lamp when a lamp fails? Y / N / DK

FLASH RATE ANALYSIS

Observation period	Start time:		Finish time:	
Message duration (minutes : seconds)				
Message – reference photo #				
Estimated % lamps on				
Estimated kW				
Message duration (minutes : seconds)				
Message – reference photo #				
Estimated % lamps on				
Estimated kW				
Message duration (minutes : seconds)				
Message – reference photo #				
Estimated % lamps on				
Estimated kW				

Field Notes

Appendix C: Impact Evaluation Sample Calculations

Field Verification Sample Flash Rate, and Ex-post Gross Demand and Energy Savings Calculations

Site	Recorded Lamp Count	Verified Lamp Count	Recorded Unit Savings (kW)	Verified Unit Savings (kW)	Average Flash Rate	Recorded Savings (kW)	Verified Savings (kW)	Recorded Savings (kWh)	Verified Savings (kWh)
1	2560	2560	0.0108	0.023	0.37	27.6	21.8	242,278	158,599
2	3840	3840	0.0108	0.023	0.37	41.5	32.7	363,418	214,697
3	3840	3840	0.0108	0.025	0.41	41.5	39.4	363,418	286,541
4	3840	3840	0.0037	0.025	0.33	14.2	31.7	124,109	115,632
5	3840	3840	0.0037	0.025	0.40	14.2	38.4	124,109	140,160
6	3840	3840	0.0074	0.025	0.34	28.4	32.6	248,218	214,445
7	3840	3840	0.0108	0.023	0.36	41.5	31.8	363,418	231,469
8	3840	3840	0.0074	0.020	0.32	28.4	24.6	248,218	152,494
9	5120	5120	0.0074	0.025	0.40	37.9	51.2	330,957	336,384
10	5120	5120	0.0108	0.045	0.39	55.3	89.9	484,557	590,354
11	5120	5120	0.0074	0.025	0.30	37.9	38.4	330,957	266,304
12	5120	5120	0.0108	0.025	0.35	55.3	44.8	484,557	277,984
13	6144	6144	0.0108	0.045	0.38	66.4	105.1	581,468	690,260
Total / Avg	56,064	56,064	NA	NA	0.36	490.0	582.2	4,289,679	3,675,323

Program Ex-post Gross Demand and Energy Savings Calculations

Site	Flash Rate (Derived)	Lamp Count	Base Consumption	Retrofit Consumption	Unit Savings	Annual Operating Hours	Sign Savings kWh	Sign Savings kW
1	0.36	30	0.054	0.008	0.046	6,435	3,197	0.5
2	0.36	44	0.054	0.008	0.046	6,435	4,689	0.7
3	0.36	62	0.030	0.005	0.025	6,435	3,591	0.6
4	0.36	79	0.052	0.008	0.044	6,435	8,023	1.2
5	0.36	88	0.030	0.005	0.025	6,435	5,097	0.8
6	0.36	90	0.040	0.004	0.036	6,435	7,506	1.2
7	0.36	102	0.030	0.005	0.025	6,435	5,908	0.9
8	0.36	116	0.025	0.005	0.020	6,435	5,375	0.8
9	0.36	533	0.053	0.005	0.048	6,435	58,805	9.1
10	0.36	604	0.011	0.003	0.008	6,435	11,194	1.7
11	0.36	697	0.054	0.008	0.046	6,435	74,279	11.5
12	0.36	716	0.025	0.005	0.020	6,435	33,176	5.2
13	0.36	965	0.011	0.003	0.008	6,435	17,885	2.8
14	0.36	1920	0.045	0.008	0.037	6,435	164,580	25.6
15	0.36	2032	0.025	0.005	0.020	6,435	94,152	14.6
16	0.36	2560	0.030	0.005	0.025	6,435	148,271	23.0
17	0.37	2560	0.028	0.005	0.023	7,280	158,599	21.8
18	0.36	3072	0.030	0.005	0.025	6,435	177,925	27.6
19	0.36	3317	0.011	0.003	0.008	6,435	61,477	9.6
20	0.37	3840	0.028	0.005	0.023	6,570	214,697	32.7
21	0.41	3840	0.030	0.005	0.025	7,280	286,541	39.4
22	0.33	3840	0.030	0.005	0.025	3,650	115,632	31.7
23	0.40	3840	0.030	0.005	0.025	3,650	140,160	38.4
24	0.34	3840	0.030	0.005	0.025	6,570	214,445	32.6
25	0.36	3840	0.028	0.005	0.023	7,280	231,469	31.8
26	0.36	3840	0.030	0.005	0.025	6,435	222,406	34.6
27	0.32	3840	0.025	0.005	0.020	6,205	152,494	24.6
28	0.40	5120	0.030	0.005	0.025	6,570	336,384	51.2
29	0.36	5120	0.045	0.005	0.040	6,435	474,466	73.7
30	0.39	5120	0.050	0.005	0.045	6,570	590,354	89.9
31	0.30	5120	0.030	0.005	0.025	6,935	266,304	38.4
32	0.35	5120	0.030	0.005	0.025	6,205	277,984	44.8
33	0.36	5120	0.030	0.005	0.025	6,435	296,541	46.1
34	0.38	6144	0.050	0.005	0.045	6,570	690,260	105.1
Total / Avg	36.1%	87,171				6,367	5,553,865	874.1

Follow Survey of Operator Post Installation Run Hours Changes

Site	Annual Operating Hours	Decrease	Increase	No Change	Comments
1	6AM - 12PM			Yes	
2	Interior Lamps = 10AM - 10PM			Yes	
	Signs = 6PM - 12AM				
3	Daily = 6AM - 12AM			Yes	
4	6A - 9A			Yes	
	1PM - 4PM				
	6PM - 10PM				
5	6A - 9A			Yes	
	1PM - 4PM				
	6PM - 10PM				
6	12AM - 12AM			yes	
7	6AM - 11PM		yes		Extending
8	6AM - 11PM			yes	
9	6AM - 12AM			yes	No problems with the signs at night. During the day, however, there is an "intensity by angle" issue. The lights appear to have different intensities when viewed from different angles dependent upon how they're screwed in. This represents a potential advertising issue that must be dealt with.
10	12AM - 12AM				
11	6AM - 12PM			yes	

Example Flash Rate Analysis for Site 17

Lamps / Grid	64									
Metric	Recorded	Verified								
Lamp count	3,840	3,840								
Measure kW / lamp	0.005	0.005								
Base kW / lamp	0.028	0.028								
Op Hours		6,205								
Frame #		1	2	3	4	5	6	7	8	9
2.85984	t	5%	20%	20%	20%	20%	20%	20%	20%	8%
17.79456	m	0%	60%	60%	60%	60%	60%	60%	60%	0%
14.93472	b	0%	60%	60%	60%	60%	60%	60%	60%	0%
		37%								
2	Column	1	2	3	4	5	6	7	8	9
2.6208	Top Row	15%	20%	20%	20%	20%	15%	5%	20%	5%
16.3072	Middle Row	0%	10%	40%	80%	80%	80%	40%	10%	0%
13.6864	Bottom Row	50%	20%	60%	60%	60%	60%	40%	50%	30%
		34%								
3		1	2	3	4	5	6	7	8	9
2.088	t	30%	40%	40%	40%	20%	20%	20%	20%	20%
12.992	m	10%	5%	20%	20%	20%	20%	20%	20%	20%
10.904	b	30%	30%	30%	30%	40%	40%	40%	40%	40%
		27%								
4		1	2	3	4	5	6	7	8	9
0.7632	t	0%	0%	15%	30%	0%	0%	0%	0%	0%
4.7488	m	0%	30%	40%	40%	40%	0%	0%	0%	0%
3.9856	b	10%	20%	20%	20%	0%	0%	0%	0%	0%
		10%								
5		1	2	3	4	5	6	7	8	9
3.096	t	10%	80%	40%	60%	80%	80%	80%	80%	40%
19.264	m	15%	20%	20%	15%	15%	15%	10%	10%	5%
16.168	b	30%	50%	50%	50%	50%	50%	50%	50%	20%
		40%								
6		1	2	3	4	5	6	7	8	9
3.2976	t	20%	60%	70%	70%	60%	40%	10%	20%	5%
20.5184	m	60%	60%	60%	60%	60%	40%	70%	80%	20%
17.2208	b	0%	0%	80%	80%	80%	0%	10%	20%	10%
		42%								
7		1	2	3	4	5	6	7	8	9
4.1904	t	80%	30%	30%	30%	30%	30%	30%	40%	95%
26.0736	m	40%	80%	30%	80%	30%	60%	95%	100%	95%
21.8832	b	80%	50%	30%	30%	40%	50%	80%	70%	20%
		54%								
8		1	2	3	4	5	6	7	8	9
3.1824	t	0%	10%	95%	70%	70%	70%	90%	10%	0%

19.8016	m	0%	10%	60%	50%	50%	50%	50%	5%	0%
16.6192	b	20%	40%	20%	60%	70%	60%	70%	60%	15%
		41%								
9		1	2	3	4	5	6	7	8	9
0.5328	t	0%	5%	10%	5%	5%	10%	0%	0%	0%
3.3152	m	5%	10%	10%	10%	10%	50%	5%	5%	5%
2.7824	b	0%	10%	5%	5%	10%	10%	0%	0%	0%
		7%								
10		1	2	3	4	5	6	7	8	9
2.088	t	0%	60%	40%	30%	10%	30%	30%	30%	5%
12.992	m	20%	25%	30%	40%	25%	15%	40%	30%	30%
10.904	b	10%	30%	30%	20%	15%	50%	30%	30%	20%
		27%								
11		1	2	3	4	5	6	7	8	9
0.936	t	5%	10%	15%	15%	0%	40%	25%	25%	30%
5.824	m	5%	10%	10%	5%	5%	5%	10%	10%	10%
4.888	b	10%	10%	10%	10%	10%	10%	10%	10%	10%
		12%								
12		1	2	3	4	5	6	7	8	9
2.5776	t	0%	0%	10%	60%	60%	60%	10%	0%	0%
16.0384	m	55%	55%	55%	55%	55%	55%	55%	55%	55%
13.4608	b	0%	0%	10%	60%	60%	60%	10%	0%	0%

Per side														
Frame	1	2	3	4	5	6	7	8	9	10	11	12	Max	Avg
Flash Rate	37%	34%	27%	10%	40%	42%	54%	41%	7%	27%	12%	33%	54%	32%
Measure kW	2.9	2.6	2.1	0.8	3.1	3.3	4.2	3.2	0.5	2.1	0.9	2.6	4.2	2.4
Base kW	17.8	16.3	13.0	4.7	19.3	20.5	26.1	19.8	3.3	13.0	5.8	16.0	26.1	14.6
Delta kW	14.9	13.7	10.9	4.0	16.2	17.2	21.9	16.6	2.8	10.9	4.9	13.5	21.9	12.3
Per sign														
Frame	1	2	3	4	5	6	7	8	9	10	11	12	Max	Avg
Flash Rate	37%	34%	27%	10%	40%	42%	54%	41%	7%	27%	12%	33%	54%	32%
Measure kW	5.7	5.2	4.2	1.5	6.2	6.6	8.4	6.4	1.1	4.2	1.9	5.2	8.4	4.7
Base kW	35.6	32.6	26.0	9.5	38.5	41.0	52.1	39.6	6.6	26.0	11.6	32.1	52.1	29.3
Delta kW	29.9	27.4	21.8	8.0	32.3	34.4	43.8	33.2	5.6	21.8	9.8	26.9	43.8	24.6

Example Flash Rate Analysis for Site 6

Lamps / Grid	64											
Metric	Recorded	Verified										
Lamp count	3,840	3,840										
Measure kW Reduction / lamp	0.0108	0.0108										
Base kW / lamp	0.0300	0.0300										
Verified annual hours	7,280	7,280										
Picture 1	35.93%											
Picture 2	46.35%											
Picture 3	48.80%											
Picture 4	38.60%											
Picture 5	39.69%											
Picture 6	41.51%											
Picture 7	40.47%											
Picture 8	35.16%											
Picture 9	43.60%											
Picture 10	33.80%											
Frame	1	2	3	4	5	6	7	8	9	10	Max	Avg
Flash Rate	36%	46%	49%	39%	40%	42%	40%	35%	44%	34%	49%	41%
Cold cathode kW	14.9	19.1	20.3	16.2	16.6	17.4	16.6	14.5	18.2	14.1	20.3	16.8
Base lamp kW	41.5	53.0	56.4	44.9	46.1	48.4	46.1	40.3	50.7	39.2	56.4	46.7
Delta kW	26.5	33.9	36.1	28.8	29.5	31.0	29.5	25.8	32.4	25.1	36.1	29.9

Example Flash Rate Analysis for Site 9

Lamps / Grid	64												
Metric	Recorded	Verified											
Lamp count	3,840	3,840											
Measure kW Reduction / lamp	0.0108	0.0108											
Base kW / lamp	0.028	0.028											
Verified annual hours	7,280	7,280											
Picture 1	882	45.9%											
Picture 2	697	36.3%											
Picture 3	826	43.0%											
Picture 4	665	34.6%											
Picture 5	593	30.9%											
Picture 6	618	32.2%											
Picture 7	624	32.5%											
Picture 8	616	32.1%											
Picture 9	592	30.8%											
Picture 10	753	39.2%											
Picture 11	718	37.4%											
Frame	1	2	3	4	5	6	7	8	9	10	11	Max	Avg
Flash Rate	46%	36%	43%	35%	31%	32%	33%	32%	31%	39%	37%	46%	36%
Cold cathode kW	19.1	15.1	17.8	14.4	12.8	13.3	13.5	13.3	12.8	16.3	15.5	19.1	14.9
Base lamp kW	49.4	39.0	46.3	37.2	33.2	34.6	34.9	34.5	33.2	42.2	40.2	49.4	38.6
Delta kW	30.3	24.0	28.4	22.9	20.4	21.3	21.5	21.2	20.4	25.9	24.7	30.3	23.7

Example Flash Rate Analysis for Site 12

Lamps / Grid												
Metric	Recorded	Verified										
Lamp count	3,840	3,840										
Measure kW Reduction / lamp	0.0074	0.0074										
Base kW / lamp	0.03	0.03										
Verified annual hours	3,276											
Picture 1	631	33%										
Picture 2	639	33%										
Picture 3	835	43%										
Picture 4	739	38%										
Picture 5	818	43%										
Picture 6	524	27%										
Picture 7	488	25%										
Picture 8	520	27%										
Picture 9	691	36%										
Picture 10	721	38%										
Frame	1	2	3	4	5	6	7	8	9	10	Max	Avg
Flash Rate	33%	33%	43%	38%	43%	27%	25%	27%	36%	38%	43%	34%
Cold cathode kW	9.3	9.5	12.4	10.9	12.1	7.8	7.2	7.7	10.2	10.7	12.4	9.8
Base lamp kW	37.9	38.3	50.1	44.3	49.1	31.4	29.3	31.2	41.5	43.3	50.1	39.6
Delta kW	28.5	28.9	37.7	33.4	37.0	23.7	22.1	23.5	31.2	32.6	37.7	29.9

Appendix D: Surveys

Following are the surveys for the Miniature Cold Cathode Lighting Program.

These surveys are included in this appendix:

- Edison Program Manager
- Program Implementer—ECC
- Litetronics Manufacturer
- Sign Maintenance Contractors
- Participating Facilities
- Partial Participants (Drop-outs)
- Non-Participants

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Miniature Cold Cathode Hardware Incentive Program

Edison Program Manager

Interview Guide

Staff Name ____

Date ____

Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted? How did the program evolve?
2. Were the targets met? If not, why not?
3. What were the innovative aspects of this program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with Energy Concepts & Controls, billing, incentives and program tracking.
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration?

Overall Lessons Learned

6. Are there barriers to the widespread installation of these cold cathode lamps that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
7. What do you now know about the industry? What characteristics make a good candidate for this program?
8. Other comments/issues

Thank you for your time.

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Miniature Cold Cathode Hardware Incentive Program

Program Implementer – ECC

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Program Design

1. What changes did you make in program design, approach or outreach from the plan originally submitted? How did the program evolve?
2. Were the targets met? If not, why not?
3. What was/were the innovative aspect(s) of this program?

Program Administration

4. Were there any issues related to interaction with Edison, billing, incentives and program tracking.
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Marketing and Outreach

6. What was your strategy for identifying target market? What characteristics or criteria were used to identify potential participants? Issues related to identifying and recruiting participants? How long did it take? What did it involve?
7. How was the program marketed? Were contacts and refusals tracked in a spreadsheet? What is known about the disposition of interested/non-interested contacts?
8. What were the barriers to installation of cold cathode lamps to internal sign and area lighting applications?

Overall Lessons Learned

9. What characteristics make a good candidate for this program?
10. Is there a viable market niche for this technology?
11. Are there barriers to the widespread installation of these cold cathode lamps that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Fans not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ________________________________
12. If the program were expanded to other facilities, is there anything that you would suggest doing differently in terms of the selection of products, marketing, delivery, warranty service, training, etc?
13. Other comments

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Miniature Cold Cathode Hardware Incentive Program

Litetronics Manufacturer

Staff Name ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________.
I am calling on behalf of Southern California Edison. We are evaluating the Miniature Cold Cathode Hardware Incentive Program for Edison. This program promoted installation of cold cathode lighting that replaced incandescent bulbs in signs.

I'd like to ask a couple of questions about the cold cathode lamps.

1. Can you tell me how long you've been working with Energy Concept and Controls, and how participation in the Edison program has worked out for you?
2. How has the program impacted the manufacture or distribution of these lamps? (speed of development, price, distribution)
3. Are the cold cathode lamps only available through the Edison program?
4. How do you distribute these lamps? Are they sold 'off the shelf' anywhere?
5. The installations were targeted for outdoor signs and low wattage interior applications. Do you feel this was an appropriate application for the technology?
6. The interior applications appear to be sensitive to color rendition. Do you plan to manufacture a larger range?
7. I understand you might also be working on a higher wattage cold cathode lamp, which would increase the applications where the lamp would be suited. Is that correct?
8. Do you feel the cold cathode will compete with CFLs or are these two different market segments?
9. ECC offered business owners an incentive to purchase the lamps. Do you think incentives will be needed to install these lights on a larger scale?
10. What do you think the barriers to the widespread installation of the *cold cathode lamps* are? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____
11. What do you think needs to happen to for this product to become widely accepted?
12. Do you have any suggestions to improve this program?

Thank you for your time.

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Miniature Cold Cathode Hardware Incentive Program

Sign Maintenance Contractors

Business Name ____
Maintenance contractor for: ________________________________
Date ____
Interviewer ____

Hello, my name is ______________________ from ____________.
I am calling on behalf of Southern California Edison. We are evaluating the Miniature Cold Cathode Hardware Incentive Program for Edison. This program promoted installation of cold cathode lighting that replaced incandescent bulbs in signs.
I'd like to speak with the owner or facility manager, or someone who would be knowledgeable about your lighting for signs. Who would that be? ___________________ *Is that person available?*
If not, could I schedule a time to call back to reach Mr./Ms. ___________________*?*
If someone other than original contact is respondent, repeat introduction *(italics above).*

Free Ridership

1. Cold cathode lamps were installed to replace incandescent lamps in signage at ___________________. Have you used this or similar technology before?
   - ❑ No
   - ❑ Yes
     - When, how many installations? ___________________
     - How does this technology compare? ___________________
   - ❑ Uncertain
2. Were cold cathode lamps planned for installation at any of the facilities you work with before this project? (Would they have instituted something similar on their own?)
   - ❑ No
   - ❑ Yes,
     - When
       1. This year
       2. In one to two years
       3. In three to five years
       4. More than five years out
     - Did you have funding these measures in your short or long-term capital improvements plan/budget?
       1. No
       2. Short Term (0-1 years)
       3. Long Term 1-5 years)
     - Was it already ordered?
       1. Yes
       2. No
   - ❑ Uncertain

Delivery and Implementation

3. Did the new lamp technology cause any difficulty with the sign programming software, for example, was that threshold wattage of cold cathode too low?
4. Were there any difficulties with the installation, maintenance or performance of the new lamps?
5. Can you tell me how satisfied you are with the performance of the cold cathode lamps? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied

Spillover

6. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ Yes
    - ❑ No...(Go to Q9)
7. Please describe the type and quantity of the equipment or measures.
8. Overall, how influential would you say the program was in your decision to install additional measures?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Moderately influential
    - ❑ Not at all influential
9. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ______________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

Miniature Cold Cathode Hardware Incentive Program

Participating Facilities

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

Hello, my name is ________________________ from ______________. I am calling on *behalf of Southern California Edison. We are evaluating the Miniature Cold Cathode Hardware Incentive Program for Edison. This program promoted installation of cold cathode lighting that replaced incandescent bulbs in signs.*
I'd like to speak with ______________(the owner or facility manager) or someone who would be knowledgeable about your participation in the program. Is ______ available?
If not, could I schedule a time to call back to reach Mr./Ms. ______________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach

1. Do you remember when you were contacted about the Miniature Cold Cathode Hardware Incentive program sponsored by Southern California Edison?
   - ❑ No
   - ❑ Yes When were you contacted? ____________________
   - ❑ Uncertain
2. Who contacted you and explained what the program was about?
   - ❑ Energy Concepts & Controls
   - ❑ Other, specify___________________________________
3. How was the information delivered?
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Other, specify ___________________________________
4. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
   - ❑ Energy efficient cold cathode lamps will save energy and/or money
   - ❑ Southern California Edison would pay for the audit
   - ❑ Southern California Edison would pay for the lamps
   - ❑ This was an experiment
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim ____________________
5. Why did you decide to participate? What factors were key to your decision? [Do not read. Check all that apply]
   - ❑ The audit was free
   - ❑ A good way to save energy and money
   - ❑ Payback was reasonable
   - ❑ Other, specify ___________________________________

6. Were you aware of the mini cold cathode lamps before being contacted about this program?
   - ❑ No
   - ❑ Yes Where did you hear about cold cathode lamps?________
   - ❑ Not Sure
7. How important was Edison's sponsorship of this program to your decision to participate? Please explain your answer.
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important

Delivery and Implementation

8. How did you determine which signs would receive cold cathode lamps?
   - ❑ Replaced them all
   - ❑ Auditor told us which ones to replace
   - ❑ Replaced lamps that had the most use
   - ❑ Replaced lamps giving trouble
   - ❑ Other, specify ____
9. How did the installation of the cold cathode lamps fit with planned lamp replacement and planned maintenance?
10. Did you have to pay anything to participate in this program (purchase or install the lamps)?
    - ❑ No
    - ❑ Yes How much and for what? ________________________
    - ❑ Uncertain
11. Were the cold cathode lamps installed in-house or by a third party contractor?
    - ❑ In-house
    - ❑ Third party
    - ❑ Other, specify ____
12. Did issues emerge during or since the installation of the lamps that required the attention of you or your staff? (e.g. triax issue--some cold cathode could not be installed)
    - ❑ No
    - ❑ Yes What were they? How were they resolved? __________
    - ❑ Uncertain

Market/Customer Response

13. What kind of sign maintenance has been done since the cold cathode lamps were installed?
    - ❑ None
    - ❑ Some Describe ______________________________________
    - ❑ Uncertain
14. Have you removed any of the lamps since installation?
    - ❑ No
    - ❑ Yes Why? How many? ______________________________
    - ❑ Uncertain

15. Have you inventoried the cold cathode lamps for failure?
    - ❑ No
    - ❑ Yes How many failed? ____________________________
    - ❑ Uncertain
16. What are your plans for lamp failure?

17. How did the installation of the cold cathode lamps influence your operating procedures? For example, did you change anything in the way the signs were operated from when they were incandescent lamps, such as the hours of use?
    - ❑ No
    - ❑ Yes What did you change? __________________________
    - ❑ Uncertain
18. Did you see energy savings or any other effects after installation?
19. Have you changed any behavior or taken any actions that would impact energy use since the cold cathode lamps were installed?
    - ❑ No
    - ❑ Yes Describe____________________________________
    - ❑ Uncertain
20. Would you have installed the *Technology* without the program incentive?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
21. Has the installation of the cold cathode lamps resulted in any other benefits (non-energy) to your operations?

ASK 22 THROUGH 27 IF ANSWER TO Q6 = YES; IF Q6 = NO, SKIP TO Q27

Free Ridership

RECORD ANSWERS TO 22 - 26 IN TABLE 1

22. Before this Program, had you previously installed the same type of cold cathode lamps without an incentive?
    - ❑ No
    - ❑ Yes, [Table 1 Col A]
        - If Yes, To the same level of efficiency? [Table 1 Col B]
            1. No What efficiency? _____________________________
            2. Yes
        - If Yes, Number or percent of store fixtures were installed with T5? [Table 1 Col C] ___ # or %
    - ❑ Uncertain
23. Before participating in this Program, did you consider installing the cold cathode lamps without the program incentive?
    - ❑ No[Skip to Spillover]
    - ❑ Yes
    - ❑ Uncertain ....[Skip to Spillover]
24. Would you have installed the cold cathode lamps [Table 1 Col D]
    - ❑ In the same year
    - ❑ In one to two years

- ❑ In three to five years
- ❑ More than five years out

25. Did you have funding for cold cathode lamps in your short or long-term capital improvements plan/budget? [Table 1 Col E]
    - ❑ No
    - ❑ Short Term (0-1 years)
    - ❑ Long Term 1-5 years)
26. Were they already ordered? [Table 1 Col F]
    - ❑ No
    - ❑ Yes

Table 2. Free-Ridership Grid: Enter For each installed program measure

	Installed before Program (Q4)			Considered installing without incentives (Q6 - Q8)		
	Col A	Col B	Col C	Col D	Col E	Col F
Measure*	Installed w/o incentive?	Same level of Efficiency?	Amount of Measures?	Time Frame	Budgeted?	Ordered?
Technology location 1						
Technology location 2						
Technology location 3						
Technology location 4						

*Add locations as needed

27. If cold cathode lamps were considered and not installed before this program, why were they not installed?
    - ❑ High first cost
    - ❑ In capital budget for future installation
    - ❑ Unable to obtain financing
    - ❑ Didn't know a contractor
    - ❑ Other, specify ____

Spillover

28. Would you install cold cathode lamps in the future, either at your own expense; or with incentives?
    - ❑ Not at own expense or with incentives
    - ❑ Yes at own expense
    - ❑ Yes with incentives
    - ❑ Uncertain
29. Do you have any plans to install cold cathode lamps at other businesses you own or manage?
    - ❑ No
    - ❑ Yes, When
        - This year
        - In one to two years
        - In three to five years

- More than five years out

30. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ No
    - ❑ Yes, Please describe the type of energy efficient equipment you added
31. [ASK IF 29 OR 30 = YES] Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment or the cold cathode lamps?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Market Barriers to Adoption

32. Can you tell me how satisfied you are with the performance of the cold cathode lamps? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
33. What characteristics *(of your signs/interior lamps)* make them good candidates for the installation of the cold cathode lamps?
34. Are there barriers to the widespread installation of the cold cathode lamps that you are aware of? What are they? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____
35. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?
36. How satisfied are you with the program overall?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
37. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When, what program was it? ______________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

Miniature Cold Cathode Hardware Incentive Program

Partial Participants (Drop outs)

Businesses that did not follow-through with installations

These are businesses listed in the Program's Participant flat file and do not have a measure complete date, or have notes that decided not to install.

Business Name ____
Business Type ____
Date ____
Interviewer ____

Hello, my name is ________________________ from _____________.
I am calling on behalf of Southern California Edison. We are evaluating the Miniature Cold Cathode Hardware Incentive Program for Edison. This program promoted installation of cold cathode lighting that replaced incandescent bulbs in signs.
I'd like to speak with the owner or facility manager, or someone who would be knowledgeable about your lighting for signs. Who would that be? _____________________ Is that person available?
If not, could I schedule a time to call back to reach Mr./Ms. _____________________?
If someone other than original contact is respondent, repeat introduction *(italics above).*

Marketing and Outreach

1. Do you remember being contacted about the Cold Cathode Incentive program sponsored by Edison? [Do not read responses]
   - ❑ No Is there someone else who would have received information about this program with whom we could speak?
     - No, thank and terminate
     - Yes, start interview again
   - ❑ Yes When were you contacted? ___________________________
   - ❑ Uncertain
2. How did you first hear about the program? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Energy Concepts & Controls
   - ❑ Sign Maintenance company
   - ❑ Other, specify ___________________________________
3. Could you tell me how the program was explained to you? What are the program's benefits? [Do not read. Check all that apply]
   - ❑ Cold cathode lighting will save energy and/or money
   - ❑ Southern California Edison would pay for the lighting
   - ❑ This was an experiment
   - ❑ We'd have to install the lights ourselves
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim ____________________________

4. Were you provided with energy savings estimates?
   - ❑ No
   - ❑ Yes Do you remember what they were? ________________________
   - ❑ Uncertain
5. Were you aware of the cold cathode lighting before being approached by Energy Concepts and Controls (program implementers)?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
6. Why did you decide not to follow-through with your original decision to participate? (What were the factors in your decision to drop out from the program?) [Do not read list. Probe if needed]
   - ❑ Wasn't enough incentive
   - ❑ Don't have funding /not in the capital budget
   - ❑ Don't think the cold cathode lighting will save any energy or money
   - ❑ Payback is too long
   - ❑ Just not interested right now/too busy right now
   - ❑ Didn't look into it
   - ❑ Didn't think I qualified
   - ❑ Didn't understand what it was about
   - ❑ Decision maker is someone else and they weren't interested
   - ❑ Might do it in the future
   - ❑ Other, specify ____
7. How important was the incentive in your original decision <u>to participate</u>? [Read answer options and check one]
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important
8. How much did the extended cold cathode lamp life influence your original decision to install the lamps? [Read answer options and check one]
   - ❑ No influence
   - ❑ Neutral
   - ❑ A lot of influence

Free Ridership

RECORD ANSWERS TO 9 - 13 IN TABLE 1

9. Before hearing about this Program, had you previously installed the same type of *cold cathode lamp* without an incentive?
   - ❑ No
   - ❑ Yes, [Table 1 Col A]
     - If Yes, To the same level of efficiency? [Table 1 Col B]
       1. No What efficiency? ______________________________
       2. Yes

- If Yes, Number or percent of store fixtures were installed with T5? [Table 1 Col C] ___ # or %

- ❑ Uncertain

10. Before hearing about this Program, did you consider installing the *cold cathode lamp* without the program incentive?
    - ❑ No...[Skip to Spillover]
    - ❑ Yes
    - ❑ Uncertain ....[Skip to Spillover]
11. Would you have installed the *cold cathode lamp* [Table 1 Col D]
    - ❑ In the same year
    - ❑ In one to two years
    - ❑ In three to five years
    - ❑ More than five years out
12. Did you have funding for this *Technology* in your short or long-term capital improvements plan/budget? [Table 1 Col E]
    - ❑ No
    - ❑ Short Term (0-1 years)
    - ❑ Long Term 1-5 years)
13. Was it already ordered? [Table 1 Col F]
    - ❑ No
    - ❑ Yes

Table 1. Free-Ridership Grid: Enter For each installed program measure

	Installed before Program (Q4)			Considered installing without incentives (Q6 - Q8)		
	Col A	Col B	Col C	Col D	Col E	Col F
Measure*	Installed w/o incentive?	Same level of Efficiency?	Amount of Measures?	Time Frame	Budgeted?	Ordered?
Technology location 1						
Technology location 2						
Technology location 3						
Technology location 4						

*Add locations as needed

14. If *cold cathode lamps* were considered and not installed before this program, why was it not installed?
    - ❑ High first cost
    - ❑ In capital budget for future installation
    - ❑ Unable to obtain financing
    - ❑ Didn’t know a contractor
    - ❑ Other, specify ____

Spillover

15. Would you install this type of *cold cathode lamp* in the future, either at your own expense; or with incentives?
    - ❑ Not at own expense or with incentives
    - ❑ Yes at own expense

- ☐ Yes with incentives
- ☐ Uncertain

16. Are there <u>other types</u> of energy efficient lighting that you would install in the future, either at your own expense; or with incentives? (e.g. LED)
    - ☐ Not at own expense or with incentives
    - ☐ Yes at own expense
        - What kind of lighting? ________________________________
    - ☐ Yes with incentives
        - What kind of lighting? _______________________________
    - ☐ Uncertain
17. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ☐ No
    - ☐ Yes, Please describe the type of energy efficient equipment you added
18. Have you participated in any other Southern California Edison energy efficiency programs?
    - ☐ No
    - ☐ Yes When, what program was it? _____________________________
    - ☐ Uncertain

Thank you for your time and assistance in evaluating this program.

Miniature Cold Cathode Hardware Incentive Program

Nonparticipants

(received mailer but did not participate)

Business Name ____
Business Type ____
Date ____
Interviewer ____

Hello, my name is ___________________________ *from* _______________. *I am calling on behalf of Southern California Edison. We are evaluating the Miniature Cold Cathode Hardware Incentive Program*. This program promoted installation of cold cathode lighting that replaced incandescent light bulbs. I'd like to speak with ______________________. Is he/she available?
____

If not, Could I schedule a time to call back to reach Mr./Ms. __________________
If someone other than original contact is respondent, repeat introduction *(italics above).*

(Note to callers: everyone will get questions 1 and 2)

Marketing and Outreach

1. Do you remember being contacted about the Cold Cathode Incentive program sponsored by Southern California Edison? [Do not read responses]
   - ❑ No Would _______**PROVIDE ANOTHER NAME FROM THE CONTACT LIST** _______ have received information about this program? Could we speak with him/her?
     - No, ***If all possible respondents from contact list do not remember being contacted, and they have no suggestions about who would be the appropriate person to speak with, ask Question 2, then terminate***
     - Yes, start interview again
   - ❑ Yes When were you contacted? ______________________________
   - ❑ Uncertain, ***If all possible respondents from contact list do not remember being contacted, and they have no suggestions about who would be the appropriate person to speak with, ask Question 2, then terminate***
2. We'd like to ask a couple of questions that will help us determine whether you might have had an application for the type of lighting installed in this program.
   a. Does your business have lighted exterior signs where the lights flash?
   - ❑ No
   - ❑ Yes
   - ❑ Record any comments made by respondent

   b. Does your business use a high volume of low wattage interior lights?
   - ❑ No
   - ❑ Yes
   - ❑ Record any comments made by respondent

Terminate if don't remember contact and unfamiliar with program

3. Do you remember how you first heard about the program? [Do not read. Check all that apply]
   - ❑ Mail
   - ❑ Phone call
   - ❑ Energy Concepts & Controls
   - ❑ Sign Maintenance company
   - ❑ Other, specify ____
4. Could you tell me how the program was explained to you? [Do not read. Check all that apply]
   - ❑ Cold cathode lighting will save energy and/or money
   - ❑ Southern California Edison would pay for the lighting
   - ❑ Extended lamp life
   - ❑ Can use this where CFL cannot be used
   - ❑ This was an experiment
   - ❑ We'd have to install the lights ourselves
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim ________________________________
5. What are the program's benefits? [Do not read. Check all that apply]
   - ❑ Cold cathode lighting will save energy and/or money
   - ❑ Southern California Edison would pay for the lighting
   - ❑ Extended lamp life
   - ❑ Can use this where CFL cannot be used
   - ❑ This was an experiment
   - ❑ We'd have to install the lights ourselves
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, record comments verbatim ________________________________
6. Were you aware of the cold cathode lighting before hearing about this program?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain
7. Why did you decide not to participate? (What were the factors in your decision not to participate in the program?) [Do not read list. Probe if needed]
   - ❑ Wasn't enough incentive
   - ❑ Don't have funding /not in the capital budget
   - ❑ Don't think the cold cathode lighting will save any energy or money
   - ❑ Payback is too long
   - ❑ Just not interested right now/too busy right now
   - ❑ Didn't look into it
   - ❑ Didn't think I qualified
   - ❑ Didn't understand what it was about
   - ❑ Decision maker is someone else and they weren't interested
   - ❑ Might do it in the future
   - ❑ Other, specify ____
8. How important was Edison's sponsorship of this program to your decision? [Read answer options and check one]
   - ❑ Not at all important

- ❑ Somewhat important
- ❑ Not important and not unimportant
- ❑ Somewhat important
- ❑ Very important

9. Please tell me why Edison's sponsorship of this program was (read in response from Q7) to your decision. [Record verbatim response]
10. How important was the incentive or rebate in your decision? [Read answer options and check one]
    - ❑ Not at all important
    - ❑ Somewhat important
    - ❑ Not important and not unimportant
    - ❑ Somewhat important
    - ❑ Very important
11. Were you provided with energy savings estimates?
    - ❑ No
    - ❑ Yes Do you remember what they were? ________________________
    - ❑ Uncertain
12. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes When, what program was it? ______________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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10. Mobile Home Evaporative Cooler Program

Appendix A: Impact Evaluation

The following section contains the Impact Evaluation of UCONS Hard-To-Reach Mobile Home Evaporative Cooler Program Final Report prepared by Alternative Energy Systems Consulting.

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Impact Evaluation of UCONS Hard-To-Reach Mobile Home Evaporative Cooler Program

Final Report

Prepared for

Southern California Edison

Prepared by

Alternative Energy Systems Consulting

In Association with

Stellar Processes

November 18, 2006

Section E Executive Summary

This report presents the results of the impact evaluation of the 2005 UCON Hard-To-Reach (HTR) Mobile Home Evaporative Cooler Program in Southern California Edison (SCE) territory. The study began as a preliminary energy savings assessment which started in July 2005 and was later rolled over into a final impact evaluation. These findings, with follow-up phone surveys and literature review, were used to develop ex-post gross and net savings estimates for the program.

E.1 Program Background

UCONS and American Synergy Corporation (ASC) work together to design and implement energy efficiency programs that service hard-to-reach sectors such as the mobile home market. In response to Southern California Edison's request for optional bids (Proposal Request # V308420), they developed a program that targeted customers who use both compressor-driven air conditioners and evaporative coolers (i.e., swamp coolers).

The idea behind the energy efficiency program was to make improvements to existing evaporative coolers so that customers would use them more frequently than their air conditioners. The program design assumes that poor performance and odor are the main reasons residents choose to turn on, or switch to, their air conditioner rather than conditioning the space solely with the evaporative coolers. To address these issues, the program offered a complete evaporative cooler tune-up at no cost to the customer. In addition to the tune-up, UCONS and ASC investigated a variety of fan depowerment options.

The objective of the fan depowerment component of the program was to evaluate customer acceptance and demonstrate the potential energy savings associated with fan depowerment. Prior to implementing this measure, UCONS and ASC created an evaporative cooler mock-up and tested various combinations of belts, pulleys, and pads to determine how they could reduce fan power while maintaining the cooling performance. They also developed a single phase power measurement device specifically for this program that allowed them to easily read fan power in the field while changing the belts and adjusting the pulleys.

To take advantage of a resident's attention to energy efficiency, the program design included offering compact fluorescent lamps, interior and exterior, and programmable thermostats as incentives for participation. Up to three compact fluorescent lamps were given to each participant. No programmable thermostats were installed. The implementer was unable to find programmable thermostats for evaporative coolers. Typical controllers are timers.

E.2 Evaluation Project Overview

The primary objective of the study was to verify gross and net impacts (kW and kWh) for the four components of the HTR Mobile Home Evaporative Cooler Program. With the help of Stellar Processes, billing analysis was employed to demonstrate of overall impact of the program. Field inspections were conducted to verify the estimated fan depowerment demand savings. A secondary objective was the assessment of customer attitudes, behavior and satisfaction.

E.3 Key Findings

First year ex-post energy savings are presented in Table E.1. For all measures a net-to-gross ratio of 0.89 was used.

Table E.1: Summary of First Year Ex-Post Energy Savings (kWh)

Measure	Gross Program Savings	Gross Savings / Unit	Net Program Savings	Net Savings / Unit
Evaporative Cooler Tune-up	187,308	86.0	166,704	76.5
Evaporative Cooler Fan Depowerment	148,672	201.5	132,318	179.3
Programmable Thermostat	0	0.0	0	0.0
Energy Star CFL - Exterior	25,773	24.2	22,938	21.5
Energy Star CFL - Interior	129,108	21.0	114,906	18.7
Common Area Energy Star CFL - Exterior	199,735	191.5	177,764	170.4
Common Area Energy Star CFL - Interior	19,187	35.4	17,076	31.5
Overall	709,782		631,706	

Summer coincidental demand savings are presented in Table E.2. These savings refer to the peak demand of the utility's system load.

Table E.2: Summary of First Year Ex-Post Energy Savings (kW)

Measure	Gross Program Savings	Gross Savings / Unit	Net Program Savings	Net Savings / Unit
Evaporative Cooler Tune-up	0.0	0.0000	0.0	0.0000
Evaporative Cooler Fan Depowerment	0.0	0.0000	0.0	0.0000
Programmable Thermostat	0.0	0.0000	0.0	0.0000
Energy Star CFL - Exterior	0.0	0.0000	0.0	0.0000
Energy Star CFL - Interior	14.4	0.0024	12.9	0.0021
Common Area Energy Star CFL - Exterior	0.0	0.0000	0.0	0.0000
Common Area Energy Star CFL - Interior	1.8	0.0034	1.6	0.0030
Overall	16.3		14.5	

Comparison to Reported Savings Estimates

Table E.3 compares evaluation results for the net first year to the UCONS savings claims. The overall kilowatt-hour realization rate is 0.18.

Table E.3: First Year Energy Savings (kWh) Comparison

Measure	Ex-Ante Net Program Savings	Ex-Post Net Program Savings	Realization Rate
Evaporative Cooler Tune-up	1,802,731	166,704	0.09
Evaporative Cooler Fan Depowerment	361,251	132,318	0.37
Programmable Thermostat	0	0	0.00
Energy Star CFL - Exterior	310,895	22,938	0.07
Energy Star CFL - Interior	541,700	114,906	0.21
Common Area Energy Star CFL - Exterior	304,473	177,764	0.58
Common Area Energy Star CFL - Interior	171,100	17,076	0.10
Overall	3,492,149	631,706	0.18

Table E.4 compares ex-ante and ex-post summer coincidental demand savings. Direct measurement of coincidental demand savings was not conducted for this study. However, field observations, engineering analysis and evidence collected during the literature review reveal that the majority of the claimed demand savings will not be coincidental with the peak demand of the utility system load. The overall kilowatt realization rate is 0.01.

Table E.4: First Year Energy Savings (kW) Comparison

Measure	Ex-Ante Net Program Savings	Ex-Post Net Program Savings	Realization Rate
Evaporative Cooler Tune-up	2,035.3	0.0	0.00
Evaporative Cooler Fan Depowerment	197.0	0.0	0.00
Programmable Thermostat	0.0	0.0	0.00
Energy Star CFL - Exterior	19.0	0.0	0.00
Energy Star CFL - Interior	109.4	12.9	0.12
Common Area Energy Star CFL - Exterior	74.3	0.0	0.00
Common Area Energy Star CFL - Interior	38.6	1.6	0.04
Overall	2,473.6	14.5	0.01

Customer Attitude, Behavior and Satisfaction

The evaluator surveyed 67 participants to assess their attitudes, changes in customer behavior, and satisfaction with the program. Some of the important findings include the following:

- 61.5% feel that evaporative coolers are an effective means of space cooling;
- 56.7% prefer using evaporative coolers over their air conditioner;
- 9.1% run their evaporative coolers and air conditioners simultaneously;
- 51.8% have their coolers serviced annually; and
- 23.8% reported using their evaporative cooler more since participating in the program, 33.3% reported less, and 42.8% reported no change; and
- 4.8% increase in air conditioner usage was reported for the summer of 2006.

Regarding customer satisfaction, on a scale of 1 to 10, the average customer rating for the overall program was 8.7, and for customer service it was 8.9.

Introduction

Overview

This report presents the results of the impact evaluation of the UCON Hard-To-Reach (HTR) Mobile Home Evaporative Cooler Program in Southern California Edison territory. The program provides direct installation of compact fluorescent fixtures (CFLs), evaporative cooler tune-ups, evaporative cooler fan depowerments, and programmable thermostats in qualifying mobile home parks.

The primary objective of the study was to verify gross and net impacts (kW and kWh) for the four components of the HTR Mobile Home Evaporative Cooler Program. Billing analysis was employed to demonstrate the overall impact of the program. Field inspections were conducted to verify the estimated fan depowerment demand savings. Secondary objectives included an assessment of customer preferences, behavior, and satisfaction.

Program Description

Over the years UCONS and American Synergy Corporation (ASC) have worked together to design and implement energy efficiency programs that service hard-to-reach sectors such as the mobile home market. Their years of experience have exposed them to the varied requirements of these residential energy consumers. In response to Southern California Edison's request for optional bids (Proposal Request # V308420), these two companies developed an innovative program that targets customers who use both compressor-driven air conditioners and evaporative coolers (i.e., swamp coolers).

The idea behind their efficiency program was to make improvements to existing evaporative coolers so that customers will use them more frequently than their Air conditioners. The program design assumes that poor performance and odor are the main reasons residents choose to turn on, or switch to, the compressor-driven air conditioners rather than conditioning the space solely with the evaporative coolers. To address these issues, the program provides a complete evaporative cooler tune-up.

Fan depowerment is another energy conservation measure offered by the program. The original program approval limited the program to 100 retrofits until performance could be verified. ASC tested an evaporative cooler mock-up and found that replacing the belt and/or adjusting the fan pulley was as effective at reducing the fan operating demand as installing a motor controller. Belt material and evaporative cooler pad type was also found to contribute to performance. Initial field tests showed potential savings as high as 200 Watts.

To take advantage of a resident's attention to energy efficiency, the program offered compact fluorescent lamps, interior and exterior, as incentives for participation. Up to three compact fluorescent lamps are offered to each site. Programmable thermostats for evaporative coolers were part of the original scope of work; however, this technology is currently not available on the market. The program targets are summarized in Table 1.1.

Table 1.1: HTR Mobile Home Evaporative Cooler Program Targets

Measure	Watts / Unit	kWh / Unit	Units	Ex-Ante kW Savings	Ex-Ante kWh Savings
Evaporative Cooler Tune-up	1050.0	930.0	2,500	2,625.0	2,325,000
Evaporative Cooler Fan Depowerment	300.0	550.0	100	30.0	55,000
Programmable Thermostat	150.0	256.0	250	37.5	64,000
Energy Star CFL - Exterior	20.0	328.0	2,500	50.0	820,000
Energy Star CFL - Interior	20.0	99.0	5,000	100.0	495,000
Common Area Energy Star CFL - Exterior	80.0	328.0	2,000	160.0	656,000
Common Area Energy Star CFL - Interior	80.0	354.7	1,000	80.0	354,700
Totals				3,082.5	4,769,700

A description of the program proposals and procedures are included in Appendices A and B.

Evaluation Summary

The primary objective of this study was to develop ex-post gross and net impacts (kWh and kW) for the program's targeted energy conservation measures. Customer satisfaction was also evaluated.

Billing analysis was used to estimate the evaporative cooler tune-up and CFL savings. This analysis began in July of 2005 as part of an assessment of the deemed energy savings. A sample of sixty customers who participated in the program in June and July of 2005 were evaluated. No fan depowerment or programmable thermostat measures had been implemented during these first few months of the program.

To evaluate the fan depowerment measure, 24 onsite inspections were conducted with UCONS during the first round of fan depowerments. SCE originally approved 100 sites until further verification of the measures performance could be undertaken. While at the site, CFL installations were also confirmed.

Report Organization

The remainder of this report is organized as follows:

- Section 2 presents the study methodology, including the sample design and data collection activities, and analysis approach;
- Section 3 contains the evaluation results, presented by measure;
- Appendix A contains the UCONS Optional Program Proposals;
- Appendix B contains the UCONS Program Procedures;
- Appendix C contains the UCONS Fan Depowerment Field Test Protocol;
- Appendix D contains the UCONS Palm Springs Cooling Comparison; and
- Appendix E contains the evaluator's phone form.

Methodologies

Overview

This section describes the methodologies used to evaluate the impact of the HTR Mobile Home Evaporative Cooler Program. The final ex-ante savings reported to SCE by UCONS are summarized in Table 2.1.

Table 2.1: HTR Mobile Home Evaporative Cooler Program Reported Results

Measure	Watts / Unit	kWh / Unit	Units	Ex-Ante kW Savings	Ex-Ante kWh Savings
Evaporative Cooler Tune-up	1050.0	930.0	2,178	2,286.9	2,025,540
Evaporative Cooler Fan Depowerment	300.0	550.0	736	220.8	404,800
Programmable Thermostat	150.0	256.0	0	0.0	0
Energy Star CFL - Exterior	20.0	328.0	1,065	21.3	349,320
Energy Star CFL - Interior	20.0	99.0	6,148	123.0	608,652
Common Area Energy Star CFL - Exterior	80.0	328.0	1,043	83.4	342,104
Common Area Energy Star CFL - Interior	80.0	354.7	542	43.4	192,247
Totals				2,778.8	3,922,663

The following sections detail the sample design, M&V options selected, utility bill data analysis, typical building characteristics, onsite data analysis, and phone survey.

Sample Design

The preliminary program assessment began in July of 2005. The target completion date for the study was October 31, 2005. The results of the study were to be used by SCE to assess future program funding.

The California Evaluation Framework was used to determine the appropriate sample sizes for the billing analysis and direct measurements. Sample size was based on the following assumptions (see Table 2.2):

Table 2.2: Sample Sizes

Measure	P	D	c_v	n_o	N	n
Statistical Analysis	.90	0.15	0.75	68	2500	66
Depowerment Study	.90	0.15	0.50	32	100	24

Based on the estimated variance of ten fan depowerments completed prior to the onsite inspections, a coefficient of variance of 0.50 was considered appropriate for this measure. To be conservative, a higher value of 0.75 was assumed for the utility bill analysis.

At the time of the sample selection, the pool of participants for which there was sufficient post-installation utility bill data was limited to those who participated in the program in April and May of 2005. From this early population of 517 sites, a sample of 120 individually metered mobile homes was randomly selected, anticipating an attrition rate of approximately 50%.

Given the study's deadline, utility bill analysis, onsite inspections and phone surveys occurred simultaneously. In this population, no fan depowerments, common area CFLs, or programmable thermostats had been implemented. Therefore, the conclusions of the billing analysis refer to the impact of the evaporative cooler and residential CFL installations only.

The original program proposal called for 100 fan depowerments until measure performance could be verified. For this study, pre- and post-installation operating conditions were investigated. The evaluator accompanied a field technician to 24 mobile homes as fan depowerments were completed.

Phone surveys were conducted to better understand suppositions related to customer preferences and behavior, and assess customer satisfaction. An effort was made to complete phone surveys for all participants in the billing analysis. In the end 67 phone surveys were completed.

M&V Options

To verify measure performance, this study employed utility bill data analysis (Option-C) for the evaporative cooler tune-ups and compact fluorescent lamps installations, and onsite data analysis (Option-A) for the fan depowerment.

Building Characteristics

Given that little site-specific information was available at the time of the billing analysis, mobile home audits could not be conducted so the impact evaluation team applied typical default values to many of the modeling parameters. For example, it was quickly observed that the buildings were not sensitive to solar irradiation and therefore tended to have a high amount of solar shading. Local weather from Palm Springs was selected as representative for these participants. Site-specific values included size (square footage) and empirical matching of internal gains and cooling setpoints to reflect the actual operation. Table 2.3 shows the averages of these values.

Table 2.3: Average Modeling Parameters

Size, sqft	UA, Btu/deghr	Internal Gain, Pre, kWh/unit	Internal Gain, Post, kWh/unit	Cooling Setpoint, Pre, degF	Cooling Setpoint, Post, degF
1,367	172	4,109	4,083	97.0	96.5

Figure 2.1 offers an example of fitting the modeled assumptions to match the actual consumption history, and shows electricity usage is generally low during the winter season. Cooling load becomes apparent only starting in about June. This suggests that consumers are content with evaporative cooling (if any) and do not turn on the compressor-driven air conditioner until there are warm temperatures. This sort of manual operation is apparent in the bills. Excursions due to vacation schedules or other choices affect the amount of consumption. This is modeled by empirically changing the cooling setpoint to match the actual bills.

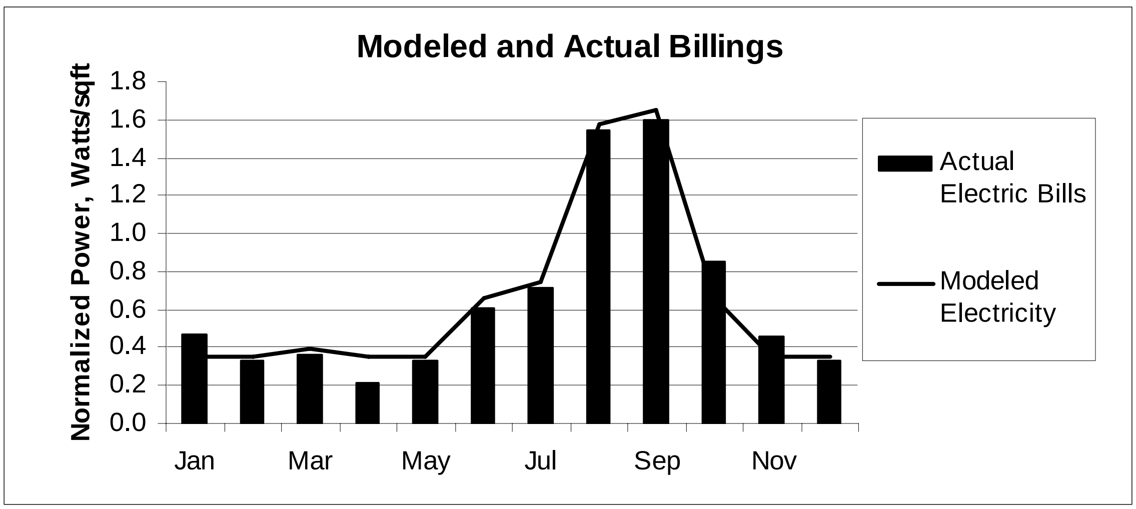

Figure 2.1: Typical Modeling Example

It is interesting to note that cooling continued into October even though the temperatures were not different from those during spring months when no cooling was needed. This is typical of these participants. It is assumed that there was a certain amount of fatigue with hot weather and desire for cooling after the hot summer. In contrast, during spring, it appears that some warmth was welcome after a cool winter. Thus, it can be seen that the choice to consume cooling energy is very much a variable choice made by the consumer – the engineering model cannot assume consistent operation of compressor-driven air conditioning throughout the year.

Since we have no direct information on scheduling, internal gains (lights and plug loads) are assumed to be a constant for both years. Obviously this is not true during vacation periods but is assumed for purposes of a comparative model.

Utility Bill Data Analysis

The impact evaluation process seeks to identify the savings due to the specific energy conservation measure by review of the pre- and post-retrofit energy consumption. The Billing Simulation Model (EZ Sim) estimates energy savings. The model uses historical billing information to produce reliable estimates of long-term energy and demand savings. The model differs from statistical regression model in that it is based on a simulation of the building physics[23]. Its use also enables examination of the energy savings on a measure-by-measure basis. When reviewing a single measure, the model is not different from a statistical approach. However, the model has an advantage in being able to model variation in consumer behavior, such as vacations or manual scheduling.

The model includes a set of calculations based on performance curves that duplicate DOE-2 results[24]. EZ Sim's methodology, however, is very different from that of DOE-2. While DOE-2 produces detailed hourly simulations, EZ Sim computes monthly energy consumption based on average daily temperatures, equipment, and operations. Thus, it is quick and relatively easy to conduct the model runs. Furthermore, EZ Sim is explicitly designed to calibrate to consumption records and actual weather data, while DOE-2 is difficult to calibrate and adjust to local weather conditions. Savings are computed as the difference in energy consumption between the two models (pre- and post-retrofit) when operated under "typical" weather conditions. This modeling procedure allows for a fair comparison when weather, hours of operation, or other site conditions might have changed.

This study focused on a sample of 60 projects completed in April and May of 2005. The evaluators found no evidence of a savings impact from the evaporative cooler tune-ups and CFL installations. The impact averaged slightly negative at –255 kWh/unit, which was barely significant at the 90% level as shown in Table 2.4.

Table 2.4: Summary of Utility Bill Analysis (Option-C)

Variable	Mean	Standard Deviation	Standard Error	90% CL Lower	90% CL Higher	t-test	Significance (2-tailed)
Savings (kWh/unit)	-255	991	128	-469	-41	2.000	0.05

The question, then, is why were savings not observed? The answer appears to be that the contractors primarily treated homes that already had *working* evaporative coolers.

[23] The billing simulation approach is judged a significant improvement over statistical billing analysis because it provides a better understanding of how individual projects and measures contribute to program results.

[24] The simulation model was benchmarked against DOE-2 in the PacifiCorp's 1992-1995 evaluation of the EF Commercial Program and approved by their Evaluation Steering Committee as an alternative to DOE-2.

This is confirmed by the consumer survey which indicated most participants were previously using coolers and expected to use their evaporative coolers to about the same extent after the repair.

There is evidence to support the hypothesis that consumers with evaporative coolers operate with reduced cooling energy. While we did not examine a group with compressor-driven air conditioners only, previous studies indicated typical consumption of about 4,000 kWh/yr with air conditioners, whereas these participants were using approximately 2,000 kWh/yr.

If the program was limited to those cases with non-functioning coolers, we would expect to see savings on the order of 2,000 kWh/yr. It does not appear, however, that any of these participants were in that category.

In practice, it would be difficult for the contractor to limit participation in the field. It was hoped that the repairs would capture a significant number of non-functional units. It appears that consumers understand the benefits of evaporative coolers and are already motivated to keep their unit functioning optimally. Thus, there were no non-functional units. Another possibility for why the study showed no change in cooling consumption is that the consumers may have rejected using evaporative coolers both before and after repairs because of allergies or similar perceived problems. The consumer survey supports both of these explanations.

Onsite Data Analysis

To verify the fan depowerment measure performance, the evaluator accompanied ASC field technicians to 24 project sites. The study found an average demand reduction lower than what was presented by UCONS. The average demand savings with the evaporative fan on high speed was 95 Watts. At the low speed setting, the average demand reduction was 33 Watts. Both results are presented in Table 2.5.

Table 2.5: Summary of Fan Depowerment Savings (Option-A)

Variable	Mean (Watts)	Standard Deviation	Standard Error	90% CL Lower	90% CL Higher	t-test	Significance (2-tailed)
High Speed Savings (Watts)	95	72	15	66	123	6.33	0.05
Low Speed Savings (Watts)	33	19	4	26	41	8.25	0.05

The average baseline and post installation demand measurements observed in the field are the following:

- The average high speed fan demand for the baseline was 451 Watts.
- The average low speed fan demand for the baseline was 231 Watts.
- The average high speed fan demand for the post case was 357 Watts.

- The average low speed fan demand for the post case was 197 Watts.

UCONS conducted similar field tests at ten sites prior to implementing this measure. These tests showed that the performance of evaporative coolers could be improved by (a) adjusting the size of the motor pulley, (b) adjusting the width and length of the belt, (c) selecting the right belt material, and (d) installing new pads. Based on the results from all ten sites, the average demand savings was 116 Watts. However, they anticipated demand savings of 150 to 200 Watts/unit because they felt their sample was not representative of a larger program. For additional information about the test conducted by UCONS, the full report is included as Appendix C. It appears that the implementation of this measure might not have been as selective as intended in the original program design. The ex-ante savings reported to SCE are 550 kWh and 300 Watts/unit.

In addition to verifying fan depowerment savings, the inspector verified the direct installation of three Energy Star CFLs at each site. An evaluation of the CFL retention and spillover effects was beyond the scope of this study. However, these variables were investigated as part of the literature review.

Phone Survey

The objective of the phone surveys was to assess customer attitudes, behavior changes, and customer satisfactions. A total of 67 phone surveys were completed. The customer survey instruments can be found in Appendix E.

Secondary Source Data

This study relied heavily on the following secondary studies for its comparative study of ex-ante deemed savings estimates:

- *2005 CFL Metering Study*, KEMA-XENERGY Inc., February 25, 2006
- *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study.* Itron Inc., December 2005.
- *Impact Evaluation of the 2002 California Low Income Energy Efficiency (LIEE) Program.* West Hill Energy & Computing, Inc. June 17, 2005.
- *Impact Evaluation of the 2001 Statewide Low Income Energy Efficiency (LIEE) Program*. KEMA-XENERGY Inc. and Business Economic Analysis & Research. April 8, 2003.
- *Impact Evaluation of the 2000 Statewide Low Income Energy Efficiency (LIEE) Program*. KEMA-XENERGY Inc. and Business Economic Analysis & Research. April 2, 2002.

Impact Evaluation Results

Overview

This section presents the results of the UCONS Evaporative Cooler Program Impact Evaluation. First, further discussion of the billing analysis is presented. This is followed by a comparative study of the deemed measure savings. The ex-post gross and net savings are summarized in Table 3.1.

Table 3.1: HTR Mobile Home Evaporative Cooler Program Evaluation Results

Measure	Watts / Unit	kWh / Unit	Units	Ex-Post kW Savings	Ex-Post kWh Savings
Evaporative Cooler Tune-up	0.0	86.0	2,178	0.0	187,308
Evaporative Cooler Fan Depowerment	0.0	202.0	736	0.0	148,672
Programmable Thermostat	0.0	0.0	0	0.0	0
Energy Star CFL - Exterior	0.0	24.2	1,065	0.0	25,773
Energy Star CFL - Interior	2.4	21.0	6,148	14.4	129,108
Common Area Energy Star CFL - Exterior	0.0	191.5	1,043	0.0	199,735
Common Area Energy Star CFLs - Interior	3.4	35.4	542	1.8	19,187
Totals				16.3	709,782

Billing Analysis Results

For the sample analyzed, the average ex-ante energy savings was 1,565 kWh per mobile home. The billing analysis showed an average ex-post savings of -255 kWh (±214). This is a difference of 1,820 kWh. To understand the disparity between the ex-ante and ex-post savings the evaluators examined the verification methodology, phone survey results, and ex-ante savings assumptions.

The EZ Sim model uses dry-bulb weather data to normalize the pre and post datasets. The argument was made by UCONS that the model does not account for the effects of the extreme temperature and humidity conditions. Days with higher maximum temperatures and higher humidity should increase the usage of the compressor-driven air conditioners. UCONS estimated that these factors could increase annual energy consumption by 150 to 300 kWh/yr per mobile home. For a more detailed description of this argument see Appendix D. Assuming a correction factor of 300 kWh/yr would increase the verified savings to 45 kWh/yr (±214). With the adjustment, the ex-ante savings are still significantly different (1,520 kWh/yr) than the billing analysis estimate.

The preliminary findings showed that discrepancies between the program design and program implementation were more influential than weather and behavior. Specifically, the majority of the evaporative coolers studied appear to have been in good working order before the tune-up. Identifying and restricting the program to poorly working and non-operational units may be very difficult in a mobile home community. Additional follow-up phone surveys support these conclusions. For these reasons, the analysis of a control group was not undertaken.

From the billing analysis, it can be inferred that the core program measures, evaporative cooler tune-ups and CFL installations, did not have the decisive effects forecasted by the program model. In addition to the discrepancies between program design and implementation, assumptions related to the deemed savings estimates could also contribute to the gap between the claimed and verified program impact. Therefore, prior impact evaluations of this sector were explored to gauge the reasonableness of the ex-ante savings. The relevant findings from the prior and current studies are summarized by measure in the following sections.

Evaporative Cooler Tune-up

The evaporative cooler tune-ups are performed when an existing operational evaporative cooler is not functioning properly. To qualify for the program, the mobile home must also have a functioning compressor-driven air conditioner.

The evaporative cooler tune-ups consisted of the following activities: cleaning water reservoir, adding water deodorizer, checking water pump, replacing fan belt, installing filter screen, checking alignments, adjusting fan motor, replacing pads, checking for leaks, checking oil bearings, cleaning drain plug, cleaning air intake louvers, adjusting blower pulley, adjusting float, and adjusting water supply lines.

In the Optional Program Proposals submitted to SCE (Appendix A), UCONS presented the following customer survey results as justifications for supporting this measure:

- Broken or inoperable fans or water pumps (less than a third of the customers reported this as a major problem).
- Musty smell or odor from mold or mildew or dusty air during windy conditions (nearly half of customers reported this as a problem).
- Inability to achieve sufficient cooling from evaporative cooling alone during the hottest days (most customers in the hottest climate zones reported this as a problem).

UCONS estimated the energy savings by de-rating compressor-driven air conditioner to evaporative cooler replacement savings reported in the 2001 DEER Database. The reported ex-ante energy savings are 930 kWh and 1,050 Watts/unit.

Table 3.2: Evaporative Cooler Tune-up Savings Estimates

Source	kWh/Unit	Watts/Unit
Ex-ante Savings	930.0	1050.0
PY2002 LIEE Evaluation	86.0	not reported
PY2001 LIEE Evaluation	94.8	not reported
PY2000 LIEE Evaluation	not reported	not reported

Based on the prior Low Income Energy Efficiency (LIEE) Program Impact Evaluations, it appears that the ex-ante savings were overstated. The LIEE ex-post kilowatt-hour savings reported in Table 3.2 are for mobile homes in SCE territory. The 2002 LIEE study found that the energy savings from "evaporative cooler maintenance" were approximately 86 kWh/unit. The estimate was used as the ex-post deemed savings, which results in a realization rate of 0.09.

The determination of coincidental demand savings would require 15-minute sub-metering. In the absence of this data, no demand savings should be reported. As presented in the Palm Springs Cooling Comparison, it is reasonable to infer that during the peak cooling periods participants will switch from evaporative coolers to compressor-driven air conditioners.

In the CPUC workbook, the reported effective useful life (EUL) for this measure was 15 years. This is for a new evaporative cooler. The appropriate EUL is 4 years[25].

Fan Depowerment

UCONS conducted experiments on a mock evaporative cooler and field tests at 10 sites to determine the potential fan depowerment energy savings. The details of this study can be found in Appendix C. The estimated ex-ante fan depowerment savings are 300 Watts and 550 kWh/unit.

The results of the impact study showed average demand savings of 33 Watts (±7) on low speed and 95 Watts (±28) on high speed. The UCONS study made no reference to the effects of low speed operation. As with the evaporative cooler tune-up, there is no evidence to support the reported coincident demand savings.

A determination of the diversity factor of the evaporative cooler would require additional sub-metering. The evaluator looked to the 2005 DEER Database for deemed estimates of evaporative cooler energy consumption. The database specifies energy savings for an air conditioner to direct evaporative cooler retrofit. The data was used to estimate average energy consumption of an evaporative cooler representative of the participant demographics – i.e., climate zone and building vintage.

To be consistent with the UCONS study, the ex-post savings estimate will be based on the verified percent reduction of the high speed setting. This percent reduction was applied to the DEER estimate of evaporative cooler usage. The estimated weighted average was approximately 711.8 kWh/1000ft^2. The assumed typical mobile home size is 1,367 ft^2. The verified high speed demand reduction was 20.8%. Therefore, the ex-post energy savings is 202.4 kWh/unit, which results in a realization rate of 0.28.

UCONS assumed an EUL of 15 years. Because this is similar to the evaporative cooler maintenance measure, the EUL of 4 years should also be applied here.

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[25] Low Income Energy Efficiency Program Costs and Billing Savings 2006 Report, Page 10.

Programmable Thermostats

UCONS estimated programmable thermostat savings to be 256 kWh and 2.35 Watts. The original program goal was 250 installations. No programmable thermostats were installed. According to the ASC program manager, they were unable to find programmable thermostats for evaporative coolers that suited their needs. The only evaporative cooler controllers on the market are timers.

Compact Fluorescent Lamps

The program defines four compact fluorescent lamp (CFL) retrofit types: Energy Star CFL – Exterior; Energy Star CFL – Interior; Common Area Energy Star CFLs – Exterior; and Common Area Energy Star CFLs – Interior. The source of these savings estimates is the 2004-05 Comprehensive Hard-To-Reach Mobile Home Program funded under CPUC Contract #1275-1276.

The lamps offered by the technician were 13 Watt and 14 Watt screw-in CFLs. These are standard replacements for 60 Watt incandescent lamps. According to the program manager, the 14 Watt lamps were only installed at the beginning of the program and the majority of the installations were 13 Watt lamps. Baseline incandescent lamp sizes ranged from 25 to 100 Watts; however, technician field notes confirmed that the majority of the replacements were 60 Watts (57.7%). The average for this sample was 59 Watts. For evaluation purposes the assumed standard installation is a 60 Watt incandescent to a 13 Watt CFL.

As described above, the ex-ante savings could not be substantiated based on the utility bill analysis. Therefore, the ex-ante savings were compared to current literature to substantiate their reasonableness. Where the ex-ante savings differed by more than 10% of impact study findings for equivalent measures, alternative deemed savings were considered and, if judged to be more accurate, implemented as ex-post estimates. Where equivalent measures could not be found, an alternative deemed savings was calculated.

Table 3.3: Energy Star CFL Savings Estimates

Source	Watt/Unit	kWh/Unit
Ex-Ante (Energy Star CFL – Exterior)	20.0	328.0
Ex-Ante (Energy Star CFL – Interior)	20.0	99.0
Ex-Ante (Common Area Energy Star CFLs – Exterior)	80.0	328.0
Ex-Ante (Common Area Energy Star CFLs – Interior)	80.0	354.7
2005 DEER Database	3.4	35.4
PY2002 LIEE Evaluation	not reported	21.0
PY2001 LIEE Evaluation (Porch Lights)	not reported	24.2
PY2001 LIEE Evaluation	not reported	16.4
PY2000 LIEE Evaluation	not reported	22.8

Comparing the program estimates to the 2005 DEER Database and the most recent LIEE Impact Evaluations (see Table 3.3) all four categories of ex-ante CFL savings estimate appear to be overstated.

The exterior CFL installations refer to porch and driveway lighting. Only the 2001 LIEE study itemized mobile home porch light savings. This source was also used in the Low Income Energy Efficiency Program Costs and Billing Savings 2006 Report. The estimated savings are 24.2 kWh/unit. No coincidental demand savings should be reported for these installation because the CFL usage is primarily night lighting.

For the interior Energy Star CFLs, the latest LIEE Impact Evaluation (2002) was the energy savings source used by the evaluator. The reported savings is 21.0 kWh/unit. The 2005 CFL Metering Study estimates a coincidence factor of 5%. Applied here, the resultant coincident demand savings is 2.4 Watts/unit.

The exterior common area CFL installations are typically street lighting throughout the mobile home park. Usage occurs from dawn to dusk, approximately 12 hours per day. Assuming the typical 13 Watt CFLs replacement, the calculated ex-post gross unit savings is 205.9 kWh/unit. Assuming burn-out rate of 7%, the adjusted ex-post savings estimate is 191.5 kWh/unit. Fixture operations are off peak so coincident demand savings should not be reported.

The typical interior common area CFL installations are primarily mobile home park club houses. The lighting usage profile of these buildings would be closer to a small office than a residential dwelling. Therefore, the 2005 DEER Database provides a reasonable estimate of energy usage and coincidental demand savings, 35.4 kWh/unit and 3.4 Watts/unit.

Table 3.4: Energy Star CFL Realization Rates

Measure	Ex-Ante Watt/Unit	Ex-Post Watt/Unit	Realization Rate
Energy Star CFL – Exterior	328.0	24.2	0.07
Energy Star CFL – Interior	99.0	21.0	0.21
Common Area Energy Star CFLs – Exterior	328.0	191.5	0.58
Common Area Energy Star CFLs – Interior	354.7	35.4	0.10

Measure specific kilowatt-hour realization rates are summarized in Table 3.4. The EUL for residential CFL installations is 8 years.

Phone Survey Results

The findings of the customer survey support suspicions, raised by the utility bill analysis, that not all program participants conform to the attributes assumed in the program design.

In particular, most participants felt their evaporative coolers were effective at providing cooling and preferred using them; however, they did not report increasing their usage in place of their compressor-driven air conditioners. This implies that, in the absence of the program, they may currently be making the most of their evaporative coolers. Also, 51.8% of the participants reported having their evaporative coolers serviced at least once in the three year period prior to 2005, challenging the assumption that the evaporative coolers serviced were in a state of disrepair. A summary of these results are presented in Table 3.5 - 3.7.

Table 3.5: How effective do you think the evaporative cooler is at providing cooling?

Answer	Response
Not Effective	9.2%
Somewhat Effective	4.6%
Moderately Effective	24.6%
Very Effective	61.5%

Table 3.6: Which method of cooling do you prefer?

Answer	Response
Compressor-Driven	30.3%
Evaporative Cooler	56.1%
No Preference	13.6%

Table 3.7: Since the ASC technician serviced your evaporative cooler have you been using it…?

Answer	Response
More	23.8%
Less	33.3%
Same	42.9%

The program did receive high marks for its customer satisfaction. The overall program and customer service ratings are summarized in Table 3.8.

Table 3.8: Customer Satisfaction

	Average Rating
Program Satisfaction	8.7
Customer Service	8.9

Conclusions

This section presents the major findings of the impact evaluation. It begins with a summary of the measurement and verification results, and is followed by a discussion of the discrepancies between the ex-ante and published savings estimates. The report closes with ex-post gross and net impacts, and recommendations for future program improvements and/or studies.

The results of the measurement and verification activities are the following:

- The utility bill analysis showed savings of approximately -255 kWh (±214) per mobile home. Assuming an extreme temperature and humidity correction of 300 kWh, as proposed by UCONS, increases the savings to 45 kWh/unit (±214). With this adjustment, the results are still well below the average ex-ante savings of 1,565 kWh per mobile home for this sample.
- The onsite data analysis results differed from UCONS anticipated fan depowerment savings. The average measured demand reduction was 95 Watts. The original field tests conducted by UCONS also showed lower savings. Their study measured fan depowerment savings of 116 Watts/unit. However, they did not change their original ex-ante estimate in their reporting to SCE which had been approved at 300 Watts/unit. The verified percent demand reduction was applied to an estimate of the evaporative cooler usage, which was based on deemed values from the 2005 DEER Database. The ex-post kilowatt-hour savings for the participation demographics is 202.4 kWh/unit.
- The customer survey and onsite inspections revealed that the program was not reaching the targeted population specified in the program design. The program targeted mobile home customers who had discontinued or reduced the use of there evaporative coolers as a result of maintenance or performance issues. Fifty-two percent of the participant reported servicing their evaporative coolers annually. Also, not all evaporative coolers appeared to be in the state of severe disrepair.

It should be noted that the billing analysis, site inspections and customer surveys were limited to individually metered mobile home parks. The program participants in master metered parks may represent a subpopulation for which the program design assumptions may be more accurate.

Given the observed discrepancies, the next step was a comparison of the deemed ex-ante measure savings to the most recent literature. In general, the ex-ante kilowatt-hour savings differed from published reports by 63.2% to 92.6%. The specific discoveries are the following:

- The ex-ante evaporative cooler kilowatt-hour savings are significantly higher than those found in the most recent statewide low income energy efficiency (LIEE) impact report. The program claimed 930 kWh/unit; the 2002 LIEE study reported 86 kWh/unit. Also, coincident demand savings should not be claimed for evaporative cooler measures where compressor-driven air conditioners are utilized. The logic is that residential customers will shift from evaporative coolers to compressor-driven air conditioners during peak cooling events.
- The ex-ante fan depowerment estimates were greater than field observations. With a fan speed setting on high, this study found an average demand reduction of 95 Watts, a percent savings of 20.8%. This was applied to evaporative cooler

energy usage estimates from the 2005 DEER Database. The ex-post savings estimate was 202.4 kWh/unit, which is 63.2% less than the ex-post deemed savings. For the same reason stated above, coincident demand savings should not be claimed for this measure.

- Compact fluorescent lamp (CFL) ex-ante measure savings are significantly higher than those found in the literature review. The data source of these estimates is the 2004-05 Comprehensive Hard-To-Reach Mobile Home Energy Savings Program implemented by UCONS and ASC. The overall kilowatt-hour realization rate for the CFL installations is 0.25. Also, summer coincident demand savings should not be claimed for fixture lighting that typically operates off peak – i.e., porch lighting and mobile home park street lighting.

For future programs or evaluation studies, the evaluator recommends the following.

- Assume ex-ante deemed savings that are supported by the most recent evaluation studies or the 2005 DEER Database. In the case of weather sensitive measures such as evaporative cooler tune-up, implemented savings should be specified by square footage, climate zone, and building age.
- Be more selective when identifying potential consumers or mobile home parks for program participation. Adding the evaporative cooler tune-up and fan depowerment measures to a standard mobile home program will allow the implementer to customize the program offering to meet the needs of individual mobile home parks. Also, screen for participant who might not use their evaporative coolers for medical reasons or are seasonal residents who relocate in the summer.
- From the beginning of the program, coordinate with the managers of master metered mobile home parks to collection billing usage. Including master meter participant will results in a more representative billing analysis.

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- **UCONS Optional Program Proposals**

Optional Proposals for:

Evaporative Cooling Repair, Upgrades and Innovation for Qualifying SCE mobile home customers

Prepared in Response to:

SCE November 16, request for optional bids (Proposal request No. V308402)

Submitted:

Thomas Eckhart, PE

November 22, 2004

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SCE's November 16 requests for innovative options have impact on four of the five evaluation criteria provided bidders. We have organized our response to demonstrate the likely impact for each of these Evaluation Criteria:

1) **Evaluation Criteria #1 (Approach to Scope of Work)**

Our base bid included the same level of lighting approved by the CPUC and SCE in the current third party mobile home program (provided to customers without evaporative cooling). While lighting is not an innovative measure, it has proven to be a desired and reliable means of assuring that market barriers to promptly delivering energy efficiency to this hard to reach sector are addressed and that all energy saving targets are achieved in a timely manner. In fact, both UCONS and its subcontractors have achieved all prior California mobile home milestones on or ahead of schedule.

Customer satisfaction has also been stipulated in the RFP as criteria for program success. Lighting has proven to be a highly successful tool for achieving both energy savings and customer satisfaction. However, we concur with SCE that the mobile home evaporative cooler (E/C) innovative program can still achieve project milestones and a high level of customer satisfaction with a reduction in the overall application of lighting. We request SCE support in adjusting the application of lighting measures during the project to address if parties mutually concur on the need.

2) Evaluation Criteria #2 (Program Innovation and Efficiencies)

The base bid achieves energy savings by a combination of innovative approaches to:

- breaking down current customer barriers
- application of simple and innovative replacement and repair of equipment which adversely impact cooler performance and operation
- a combination of education of homeowners and local repair trades to ensure long term displacement of compressor A/C loads

To the extent the base bid is impacted by the two new options requested by SCE, it is necessary to provide a background of the operational and customer issues which have caused mobile home owners to turn away from their current evaporative coolers and to rely increasingly on new or add-on compressor A/C equipment.

As summarized in our base bid, this program does not replace compressor A/C systems with evaporative coolers. Instead, this program provides innovative services and equipment to mobile home customers of SCE who have BOTH evaporative cooling and compressor A/C systems. It is important to understand why a large number of these customers have either curtailed or greatly reduced use of their E/C systems. Understanding this problem leads to both the innovative solutions and the engineering determination of annual energy savings and peak demand savings.

This program is directed at the large segment of SCE mobile home customers who have discontinued (or reduced) their use of evaporative cooling and are increasing their reliance on backup or alternative compressor A/C systems. The primary reasons reported by both the mobile home customer and repair trades in the SCE service area are:

1) broken or inoperable fans or water pumps (less than a third of the customers reported this as a major problem).
2) musty smell or odor from mold or mildew or dusty air during windy conditions (over nearly half of customers reported this as a problem).
3) inability to achieve sufficient cooling from evaporative cooling alone during the hottest days (most customers in the hottest climate zones reported this as a problem)

The Mobile Home E/C program designed by UCONS and proposed to SCE addresses each of these principle problems by the following innovative methods:

1) Repair or replace broken components of the existing evaporative cooler system. The basic components of E/C are described in detail in the base bid. Our installation teams will restore each E/C unit to a full operational status. This service will include a replacement of all pads on all filter units and a thorough cleaning of the water storage box (sump).
2) The musty smell and odor arises from a combination of warm water sitting for long periods of time in a sump with no material to mitigate growth of mold and bacteria. In addition, the older pads used for retaining water become easily clogged, reducing air flow and promoting growth of bacteria and mold. There are newer materials used in newer E/C applications which we will modify to fit in the older systems we have encountered in most mobile home applications.

Some of the new materials used in pads/screens actually inhibit mold and bacteria as well as increase evaporation rates for a given fan cfm. E/C repair technicians and manufacturers of newer E/C equipment in recent years have produced materials to mitigate formation of mildew and mold in sumps. UCONS has taken these technological enhancements and developed easy to install retrofit applications for both pads and E/C sumps.

3) Many of the older E/C systems in the hotter climate zones are not adequate to maintain mobile home customer dwellings below 90 deg. F without supplemental compressor A/C units. For these homeowners, the goal is not to wholly displace the compressor A/C units, but to increase the effectiveness of existing E/C units to displace a large segment of the energy consumption from the compressor A/C units. The energy savings aspects are addressed separately in our proposal and in this submittal.

UCONS and our implementation team have evaluated many mobile home E/C applications in SCE service area. We are knowledgeable of this customer segment and with the materials and repair techniques to improve the performance of E/C systems. We also see substantial additional savings from the proper application of fan controls (fan de powering), and from solar PV, but not as a renewable energy resource for the solar innovation. The solar PV option is a practical load displacement option as suggested by the CEC (proposal appendix B). At SCE's request we have removed solar PC in both the energy and financial worksheets, but believe this innovative feature can prove significant benefits to your customers without violating either CPUC or CEC guidelines.

<u>We have expanded the fan de powering option in accordance with SCE's inquiry.</u> In our base bid we proposed installing up to 100 new fans and fan controls to evaluate customer acceptance and to verify predicted level of savings. This option has not undergone the same level of testing and customer evaluations as have the measures and services defined under the base program. However, our conversations with: E/C maintenance technicians; manufacturers of E/C equipment; and mobile home customers confirms that this innovative application for providing additional energy savings could be expanded to become part of the base program for all mobile home customers by July 2005 if the following conditions are met:

- on-going evaluation of control devices for fan depowering demonstrate no adverse impact on existing motors
- customers finds that slightly lower air flows (and better pad designs) results in greater efficiency and greater comfort (which is the consensus of all repair technicians and the majority of mobile home owners surveyed.

<u>Option 3 provides a significantly higher level of innovative measures and energy savings for the same base bid, but with a much lower level of lighting applications. This option could be implemented as early as July 2005 if both UCONS and SCE confirm the benefits for fan depowering, as expected.</u>

3) <u>Evaluation Criteria #3 (Tracking System)</u>

There is no major impact on tracking system requirements resulting from the 2 options bids

4) **Evaluation Criteria #4 (Skill and Experience)**

UCONS has been delivering comprehensive and innovative programs to mobile home customers in the Western states since 1994, and has supported nearly 19,000 mobile home energy efficiency upgrades in California for SCE and for PG&E since. We have carefully evaluated all measures and installation requirements for the base bid so that both SCE and its mobile home customers are assured that this program will meet all milestones and provide a high level of customer satisfaction.

Option 3 (expanded fan de powering option) has the potential for greatly expanding the benefits of this innovative program. However, we are cautious and conservative in our applications of new programs and new measures. We recommend a careful review of this option from January through June 2005. If both parties concur, we can expand the mobile home program to provide this to all participating customers post July 2005.

5) **Evaluation Criteria #5 (Total kW demand reduction and total kWh energy savings)**

All savings for non-E/C measures have been approved as deemed savings by the CPUC and SCE for the current ASC third party mobile home program. For base program evaporative cooling savings, annual savings are expressed as kWh/sq.ft. and kW/sq.ft. (page 15, Section IV of UCONS' proposal). These values were obtained by de rating the DEER savings shown on page 190 of the 2001 DEER report (default A/C to direct evaporative cooling).

The average (non coastal climate zone) savings for E/C versus default A/C is shown to be nearly 2000 kWh (much less than the 3200 to 4000 kWh referenced by the CEC and DOE studies referenced in appendix B).

Why then has UCONS de rated the energy savings estimates even further? As stated in our base bid, this program is designed to NOT replace or remove existing A/C compressor systems from mobile homes, but to decrease reliance on the more costly and energy intensive compressor systems by restoring the existing E/C units to efficient operation and addressing customer complaints related to odors or dust. The 930 kWh shown in UCONS' Workbooks is based on a typical 1000 sq. ft. mobile home (the average size for the several thousand units treated to date). A reduction from the 2000 kWh value shown in DEER is based on a conservative weighting of:

- restoring to normal operation EC units not currently operable (25% of current homes providing savings of nearly 1500 kWh annually.
- increasing efficiency of existing systems by replacement of old pad designs and general maintenance of all components (100% of current homes providing savings of nearly 1000 kWh annually).
- removing odor and dust problems which have caused many customers to not use otherwise operable systems (35% of current homes providing savings of 1500 kWh annually)

The estimated savings impact from addressing these typical E/C problem areas is projected to be nearly 1200 kWh for the first cooling season following the delivery of this innovative program. This finding parallels input from:

a) a survey of mobile home customers who estimated they currently use their evaporative cooler on average 30-40% of the time, and
b) a separate survey of service technicians and mobile home customers who reported typical summer monthly bills ~ $50 to $75 lower (when E/C units were newer or when serviced regularly).

During our November 16 interview, SCE inquired as to the budget for “developing new infrastructure with local HVAC trades to repair inoperable or inefficient units” (Section V11, page 21). We were unable to conference in our operations staff who report that “the purpose of working with local trades and SCE mobile home customers is to ensure PERSISTENCE of energy savings beyond the first year”. While most of the enhancements provided under this innovative program will continue to provide long term benefits, the input we have received from both E/C service technicians and mobile home customer is that a regular, annual service can be an effective and low cost item which will provide significant long term benefits.

For that reason, UCONS will provide all participants in this program an annual reminder for three years reminding the customer of the benefits of a basic inspection and “check up” for their E/C units. Total annual cost for such a service are far less than the energy savings each customer would derive as E/C units are not complex and servicing many mobile homes within a park is a desirable service for technicians. It is important to note that the mobile home cooling bill in the hotter climate zones typically exceeds $400 annually and often exceeds $700 annually. Older mobile homes are typically very hard to cool structures often occupied by lower or fixed income ratepayers. These customers would very much like to find a way to either return their evaporative cooler systems to operation or find a way to address the typical problems summarized above. This program serves a real need on the part of this customer segment.

In summary, the 930 kWh estimated energy savings shown in the proposal Workbooks is much lower than the 3200-4000 kWh described in the appendices and also much lower than DEER. We believe it prudent to provide a conservative estimator of savings. We also recognize the importance of a rigorous demonstration of savings to the CPUC and will closely monitor E/C savings (pre and post) for subsequent cooling seasons. UCONS has conducted prior such measurement and valuations. We have high regards for SCE’s EM&V Team and would look forward to a rigorous evaluation of our program.

We are prepared to review our data and assumptions with SCE’s engineering and EM&V Team, but believe that parties will concur that there is a strong likelihood that the deemed savings values presented in our Workbook will be exceeded.

On a final note, the DEER single family measure savings provided on page 190 also includes a forecast of estimated peak demand savings. The average value of 1.8 kW from DEER (for those climate zones to be treated within SCE service area), were not de rated in the base proposal bid as were the energy savings. For that reason, the Workbooks were rerun with the devalued DEER estimates for both annual energy savings (kWh) and for peak demand savings (kW). The attached EXCEL summary sheet includes all Workbook revisions.

Even with the de rating of peak savings described above, the Workbooks still show an extremely high peak demand component for the evaporative cooling IDEEA program. Option 3 provides a peak load reduction of 5834 kW (or $260/kW) and the smaller Option 2 program provides a peak load reduction of 2743 kW (or $300/kW). These are substantially higher peak demand savings than are typically realized from residential DSM programs.

- **UCONS Program Procedures**

Program Procedures: Evaporative Cooler Tune-up Program

<u>Task 1: Develop Program Design</u>

UCONS and Synergy Company build upon 22 years of experience, to provide a program design that will deliver a market response and provide immediate cost-effective savings in this innovative program of Evaporative Cooler Tune-up.

The program design has been completed in preparation for a timely launch of this program. An overview of the Program is as follows:

Marketing Method	▪ Direct mail and canvass notification ▪ Telemarketing
Delivery Approach	▪ On-site survey ▪ Direct installation of products and services
Customer and Market Segments	* Hard-to-Reach Mobile Home Customers in warmer and dryer climates
Contract Length	11 months of field operations Marketing and field activities begin January 2005 **Customer installations targeted for completion by October 31, 2005** Final Invoice and Report by December 31, 2005

While the elements of our program design are highlighted above, it is also important to understand the sequence of customer interactions and overall program below.

Depicted below is the <u>Process Flow Diagram and Process Flow Narrative</u> of the Evaporative Cooler Tune-Up Program:

Marketing and Customer Outreach		
Identify areas that offer highest benefit to SCE & the community ⬇		
Send direct mail piece to target customers	Canvasser is dispatched to target neighborhoods to distribute language specific materials	Marketing staff places calls to target customer to offer Program

Customer responds to any of the 3 outreach initiatives to request participation

Customer Enrollment

Once customer requests participation, the Customer Service Rep will verify eligibility including:

- Location
- Customer classification (Mobile Home Resident with Evaporative Cooler)
- Measures have not previously been installed

CSR will set convenient time for the installer and technician to visit customer site

Delivery of On-site Services

The installer and technician arrive on-site, explain the survey and installation process, and obtain customer agreement to program rules

Installer and technician conduct the site walk-through to determine eligible measures

The installer and technician perform the immediate installation of equipment and measures as needed:

- Evaporative Cooler Diagnostic, tune-up and repair. Check for fan de-powerment applications.
- Compact Flourescent Lamps

▪ Programmable T-Stats ▪ CFL Hardwire Fixture ▪ Common Area Lighting 🡇
Program team will ensure site is left clean with all trash and discarded materials removed from site 🡇
Program team will then notify customer when all work is completed and request customer signature of acceptance 🡇
Data Entry, Reporting and Invoicing
Paperwork is returned to Program office 🡇
Paperwork is reviewed for completeness and accuracy 🡇
After review, data is entered in Program tracking system and available for reporting and invoicing 🡇
SCE will have access to customer and Program data on virtual time basis this includes: production, energy savings estimates and site specific customer records 🡇
Invoices will be generated and delivered to SCE within 14 days from the end of the preceding month

Task 1: Deliverable	**Due Date**
Complete the Basic Program Design Template and Organization	December 15, 2004
Finalize details on Program Design	January 15, 2005

Template and Organization	

Task 2: Build Program Workbook

In Appendix A, the program workbook is attached and includes all program related costs that comprise the overall budget.

Task 2: Deliverable	**Due Date**
Complete Program Workbook	November 18, 2004
Finalize Program Workbook after visits with SCE for Purchase Order	December 14, 2004

Task 3: Develop Program Tracking System

UCONS will build upon Synergy Companies existing system to capitalize on its systems strengths, while finding improvements and streamlining the existing system to meet the reporting requirements of SCE.

Synergy will add to its existing capability to accomplish the following features:

1). Allow upload of data files by field personnel into an online application. Field personnel can sign on using unique personal user ids/passwords so that they can be tracked.

2). An online interface/login for SCE where they could access the Summary Reports (as defined on PG F-2 of the RFP).

3). Provide capability to upload the CSV file online (required biweekly) for SCE to download, if desired.

4). Provide capability to encrypt and decrypt CSV flat file.

The software tool facilitates cost-effective projects by streamlining the installation tracking, and record keeping functions. Though it has a sophisticated analysis component, we plan for the software to be a fully integrated management system that includes the following:

- Progress Tracking
- Inter-Team Communication
- Security
- Quality Control
- Report Generation
- Invoicing/Reporting

Appendix C is a sample of the customer work order and technician worksheet that will be completed after delivery of services. Work orders will be faxed to the Synergy Offices daily, reviewed and data entered upon receipt. Program expense data and activities will be logged weekly. Customer data, production numbers, measurable energy efficiency activities and program expenditures will all be available to SCE on a virtual time basis.

A copy of the Program report is provided as Appendix C-1.

Task 3: Deliverable	**Due Date**
Selection of Contractor	December 14, 2004
Complete approved Tracking and Reporting Software	January 31, 2005

Task 4: Implement Approved Program Design

The work plan in of this document highlights the major tasks milestones for this Program. It is our intention to begin the delivery of field service no later than January 2005.

Task 4: Deliverable	**Due Date**
Initiate full implementation of program design and plan	January 7, 2005
Begin marketing and field services	January 11, 2005

With the assumption of a January start date marketing, installation and invoicing activities are shown in the chart below:

Production Benchmarks

	Direct Mail/Canvass Notifications	**Appointments for Installation**	**Education, Installations, and Invoices Complete**
5-Jan	1,000	0	0
5-Feb	1,000	150	0
5-Mar	3,000	325	100
5-Apr	4,000	325	200
5-May	4,000	750	300
5-Jun	4,000	750	550
5-Jul	3,000	650	550
5-Aug	0	0	550
5-Sep	0	0	0
5-Oct	0	0	0
5-Nov	0	50	0
5-Dec	0	0	0
Total	**20,000**	**3,000**	**2,250**

Task 5: Invoice for Work Completed

UCONS and Synergy Companies will prepare an invoice for all work complete within 14 days following the end of each month. The invoice packet will contain an invoice cover sheet with the amount of the invoice, a summary of the work completed, with an estimate of energy savings, based on the work done. A "Service Call" list that has each customer served with essential contact information will support each invoice and the work performed at each site.

A sample of the invoice and service call list is attached in Appendix D.

Task 5: Deliverable	***a. Due Date***

Provide a monthly invoice for all work completed during the month by the 14th of the following month. Invoice to include number of unit's complete, estimated savings, and a service list of all customers served. Also to be included with the invoice will be a copy of the monthly workbook report.	February 14, 2005 and monthly thereafter

Task 6: Perform Program Reporting

UCONS and Synergy Companies is accustomed to providing a monthly narrative and worksheet reports through the 3rd party programs for the last three years and has a system set up to handle timely monthly reporting on this program. During the last three years, there has not been a late report once in submitting reports. If there has ever been a question on the report, UCON's team puts the request as a top priority and provides a quick response.

Task 6: Deliverable	**Due Date**
Provide a monthly workbook report for all work completed during the month by the 14th of the following month. The workbook will be provided with the monthly invoice materials.	February 14, 2005 and monthly thereafter

- ## Fan Depowerment Field Test Protocol

Field Test of Fan Depowering Protocol

Introduction – Cal-UCONS and American Synergy are embarked on an innovative energy saving program for SCE that involves restoring failed evaporative coolers to displace the use of compressor cooling. Part of this program is to reduce the power required of the evaporative coolers by lowering the fan power requirements. Prior work done in early May and June 2005, included setting up an instrumented evaporative cooler mockup and testing various combinations of belts, pulleys, and cooler pads in an attempt to deliver essentially the same evaporative cooling performance with a saving of fan power of about 200 watts, about 40% of fan power..

The initial work done on this mockup showed that total fan power was composed significantly of motor losses (low power factor) and fan belt losses. Also fan belt tension could have an unexpectedly large effect on the fan power. The original program intent was to reduce the expected fan power of about 500 Watts by about 200 Watts by reducing the fan speed. The focus of effort shifted to finding a combination of a slightly reduced fan speed and reducing belt losses.

A special field instrument for measuring fan power and exercising the fan under field conditions was devised in June 2005 and other special tools and parts for the field work were assembled in

July 2005 and a limited field test of the protocol was conducted. The limited test showed the intended results in a few cases, but was limited at that time by the need for belts and pulleys of un expected sizes. There was also the need for training of field technicians to carry out the work independently. After this limited field test in July, the appropriate parts were secured, field forms were prepared, and a field technician was assigned to the project. By August the project was ready to proceed.

This particular work reports on the results of a field trial of the fan de-powering protocol in early August 2005. This work also includes tests on the shop evaporative cooler mockup of an improved method for measuring “saturation effectiveness” of evaporative cooler pads, and some checkup tests of motor pulley choices.

The outcome of this work has been to order or secure a few refinements to the compliment of field tools and parts, and the full training of a field technician so that a larger scale field test of 100 units is immediately ready to proceed.

Initial Results – A two day training exercise led to initial results from 10 sites in Hemet CA. These results are given in Table 1. These first ten sites showed an average reduction in fan power of about 116 W. These sites included an unusual cluster of cases with an already small motor pulley. It is more likely that the broader population will realize savings of about 175 Watts. The replacement belts used in this portion of the test were standard black 3/8 inch V belts. Had Kevlar green belts been used the savings would increase by not more than about 20 Watts.

Even with the deliberate preparations, several of these sites had unexpected belt or pulley requirements, so that the power reductions were not fully realized. Nevertheless, even this limited sample shows that a reasonable expectation for fan de-powering is in the range of 150-200Watts.

Table 1 Fan De-powering results

Site	Fan power Savings W	Notes
1	135	65 inch belt unavailable, pulley reduction only
2	197	
3	152	
4	125	
5	60	Existing small motor pulley
6	85	Existing small motor pulley
7	228	
8	60	Existing small motor pulley

9	37	50 inch belt not available, call back
10	85	Existing small motor pulley

It is apparent in table 1 that the cases with the low savings are for situations with an existing small motor pulley and the savings are due to the belt replacement only. Notably, these cases are in the same part of the same park and probably reflect the good judgment of the same installation contractor. Based on earlier inspections, it is unusual to find an existing 2 or 2.25 inch motor pulley. Usually, the motor pulley size is 2.5 inches or 3 inches.

In case 9 the original power reduction was 214 Watts, but the homeowner called us back because he was not satisfied with the lower flow because it did not project through the bed room and into the living room. The original 3 inch pulley was restored and the reported savings are due to belt tension adjustment only. This homeowner made a point of using the evaporative cooler exclusively. In this case, an unavailable 2.5 inch or 2.75 inch pulley and an unavailable 50 inch belt would have led to more savings.

Cases 2, 3, 4 and 7 with an average savings of 175 Watts are more representative of what can be expected where the appropriate replacement belt is available.

The replacement belts were all a standard black 3/8 V belt. In case 3, a Kevlar belt was tested and it increased savings by 30 watts, but the site was left with the standard belt. The use of Kevlar belts should still be seriously considered.

Fan Pilot Execution – Currently, the Evaporative cooler program has 2 to 3 two person crews in the field. The fastest way to complete the fan de-powering measurements is to refer completed, but fan eligible, jobs to the fan de-powering technician. The fan technician needs to follow or work with the cooler crews for a few weeks. It would be far too time consuming for the fan technician generate his own jobs and do the full cooler fix with the fan de-powering as an add on.

All jobs that have the proper motor and pump plugs and have a fan with a belt are fan eligible jobs. The fan technician and the cooler crews need to coordinate so that the fan work can be done very soon after the cooler work, and on fan eligible jobs, the customers need to understand that the fan work will follow. This special level of coordination needs to apply to the next few weeks of activity if the fan work is to be completed quickly.

Field Data Form Changes – The field data forms should be amended to include the make and model number of the evaporative cooler. Also the section pertaining to the fan motor adjustment should be changed to refer to a slide adjustment rather than a side adjustment.

Homeowner Perceptions – Homeowners generally recognized the lower flow. In two cases the occupant preferred the lower flow as quieter or less disruptive. In all cases the homeowners were delighted that the utility offered a program of this sort. And in almost all cases the homeowners were confused about the current utility programs, thinking that evaporative cooler programs had been cancelled.

This reinforces the common wisdom that utility programs need to be consistent in-order find their way into public perceptions and thereby to minimize outreach costs. For the broader evaporative cooler program it is apparent that a significant portion of the program effort goes to outreach.

For the most part, the program outreach is direct door to door. But there are some powerful indirect approaches. One afternoon we had the good fortune to repair a unit for a woman newly elected to the park board. She is well respected, and she generated three jobs before we could leave the park that day. There is an inherent networking aspect to working in a close area such as a park, and there should be some sort of referral component to each job.

General Comments - The Eastlake gated community proved instructive. This is a relatively upscale cluster of manufactured houses. The residents own their sites and share common grounds expenses, and there is a comprehensive set of CC&Rs. As late as 2000 this community banned the use of "swamp coolers" as unsightly and implicitly as evidence of "poor mans cooling". But the California energy crisis in 2000 changed all that. Non roof mounted evaporative coolers were now allowable. So here is a population with 100% compressor cooling and a substantial portion also with evaporative cooling.- all easily accessible window units.

On a hot afternoon this community is quiet (which is a premium with these residents), except for the humming of the compressor based cooling systems. The evaporative coolers are much quieter, and the beige window-mounted units are quite well blended in. This is a case where a large scale substitution of evaporative cooling over compressor cooling has been done well. The evaporative cooling blends in well and leads to a quieter neighborhood. Not to mention the significant energy savings. The residents here with evaporative coolers use them almost all the time, compressor use is conscious and sparing. It is probable that a slightly more effective evaporative cooler would completely substitute for compressor cooling.

There remains in this park a significant potential for the installation of new evaporative cooling. And there remain many parks where the policy is still to discourage or forbid evaporative cooling. These are the choice targets for an evaporative cooler program. And the Eastlake park is a good example of what it would look and sound like.

The one call-back, case#9, was instructive. This person clearly favored the use of his evaporative cooler and prided himself on not using his compressor for the last three years, (except last week). But he had a distribution problem. The cooler was mounted in the bedroom window, and he wanted the flow in the adjacent living room. He counted on opening a far window and shooting the airflow through the bedroom door into the living room. And he distinctly preferred the high flow capability. A modern through the wall unit would probably have solved his problem.

At another site this distribution problem was solved by having two coolers. The performance of an evaporative cooler does not depend on its size and a multiple unit solution is practical from a performance standpoint. In the case we observed, the small unit had a direct drive fan, a potentially very efficient unit.

In southern California, the evaporative cooler is a practical reality.

Notes on Motor Pulley Sizing – In general the smaller units, with belts shorter than about 47 inches, should be fitted with a 2.25 inch motor pulley. Typically, these units will have 2.5 inch or larger pulley.

The larger units, with belts longer than about 47 inches, should be fitted with a 2.5 inch pulley. Typically these units will have a 3 inch pulley or an adjustable pulley. If the pulley is adjustable it should be opened about 1.5 turns. In two cases we used a 2.25 inch pulley on these larger units (for lack of a 2.5 inch pulley) and the fan power was reduced by more than 200 watts, but the flow was also dramatically reduced. In these cases a 2.5 inch pulley should have been used.

We tried experiments on the mockup to see if a variable speed pulley could be used to achieve the effect of a 2.5 inch pulley. It could achieve the effect of the 2.5 inch pulley, but it appeared that the fixed pulley was more efficient. Where possible, a fixed pulley should be used (except in the case of an existing variable pulley that can be opened by 1.5 turns).

Tests for Saturation Effectiveness – Prior thermal output tests on the shop mockup showed that the aspen pads were much better than the plastic ones, and that the saturation effectiveness of the pads was in the range of 55-70%. But these prior tests may not have allowed enough time to fully saturate the pads. Also these tests used wet bulb measurements from two different thermometers. The change in wet bulb between the inlet and outlet conditions is small, usually one deg F or less, and there was a possibility that the calibration correction for the thermometers, which was a few deg F, would bias the results. So the test was re-structured to allow for full saturation of the pads and to use only one thermometer for the wet bulb measurements.

This revised test procedure was applied again to the plastic and the aspen pads, (with the fan at high speed), with the results shown in Table 2.

Table 2 Thermal Output Tests

Pad Type	Outdoor dry bulb Temperature, deg F	Outdoor Humidity, percent	Outlet dry bulb Temperature, deg F	Cooling BTU	Saturation Effectiveness
Plastic	88.8	45.2	73.8	19,200	64%
Plastic	88.5	44.8	74	16,800	61%
Aspen	90.6	45.7	72.6	23,400	78%

Table 2 shows that the aspen pads still significantly outperform the plastic ones, and that the saturation effectiveness for the aspen pads was greater than 75% while the plastic pads had an effectiveness of less than 65%.

These tests were done at a higher dry bulb temperature than prior tests, and they show for both pads that the evaporative cooler output increases with increasing out door temperature.

Also noteworthy is that this season is regarded as the humid season when the clouds form over the mountains. These tests showed that the evaporative cooler is capable of adequately conditioning the air under these conditions. However, there are more extreme conditions, perhaps only a few days a year that exceeds this capability.

These tests would be instructive with variables such as fan speed, relative humidity, and temperature changed. Most importantly, these brief tests confirmed prior thermal output measurements and proved a slightly more accurate measurement technique.

- **Palm Springs Cooling Comparison**

Palm Springs Cooling Comparison

Introduction -This comparison uses weather data taken at the Palm Springs airport. The data includes daily maximum and minimum temperatures and the daily mean dewpoint temperature. Daily wet bulb temperatures were not available. Since the wet bulb temperature is fundamental to the calculation of evaporative cooler performance, wet bulb temperature was estimated from the dew point and dry bulb max and min temperatures. This estimate used an algorithm developed and tested on the Bakersfield weather data that included both wet bulb and dew point temperatures.

Comparison of maximum daily dry bulb temperatures – For the full 150 day summer half of the year, the maximum dry bulb temperatures are as in Figure 1.

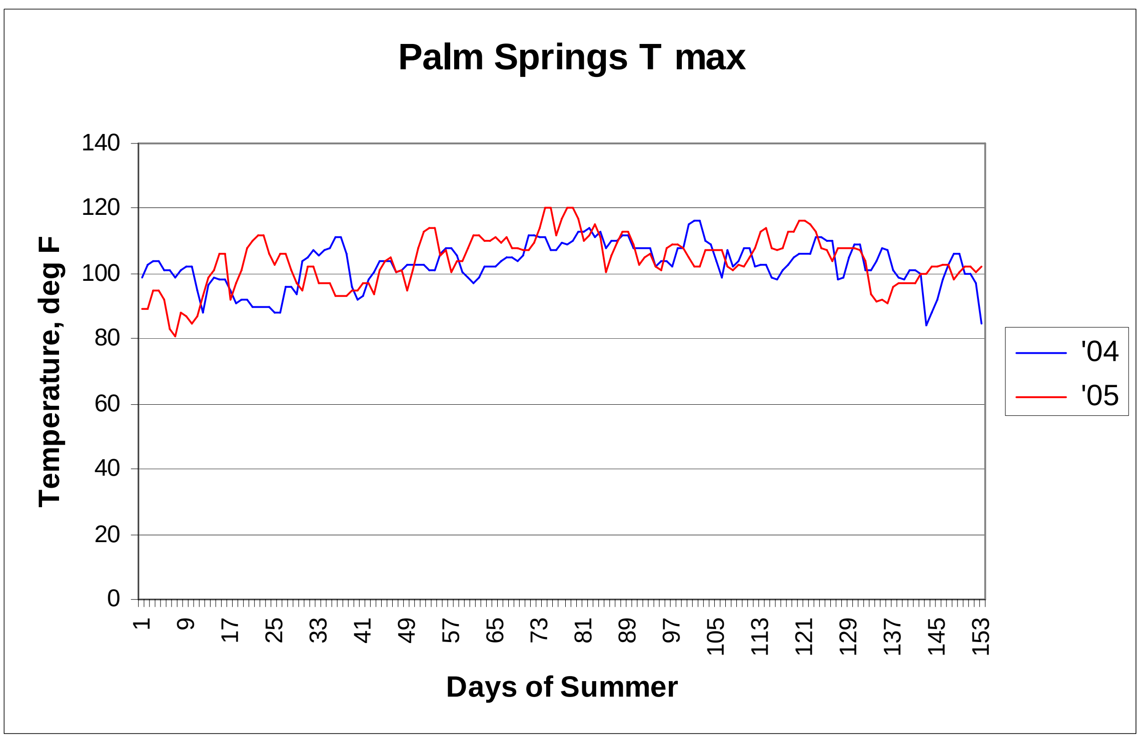

Figure 1 Daily Maximum Temperatures – Palm Springs

The average monthly temperatures are in Table 1. On the basis of mean monthly temperatures, Year 2005 appears only slightly warmer in July and August.

Table 1 Average Monthly Maximum Temperatures Palm Springs

Month	Year 2004	Year 2005
May	96.5	97.5
Jun	102.8	101.9
July	108.3	111.3
August	105.7	107.7
September	101.0	101.0

However, these monthly averages of maximum temperatures may mask the real extremes. A more detailed view of the two warmest months is given in Figure 2.

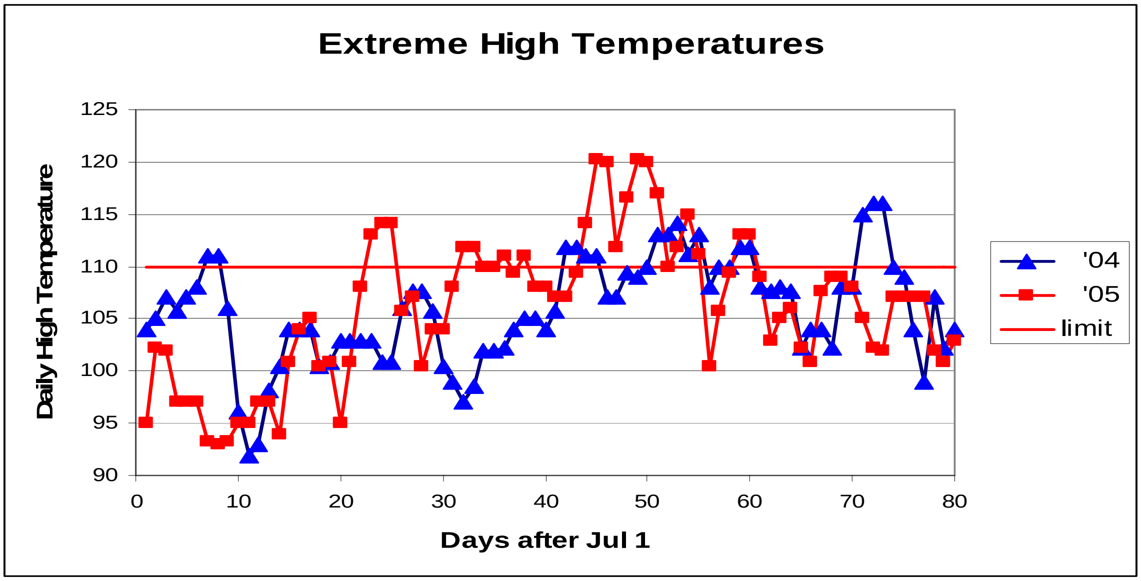

Figure 2 Maximum Daily Temperatures Expanded View Palm Springs

Note in Figure 2 the line at 110 deg F labeled as the limit. Considering 110 deg F as a limit, year 2004 experienced 5 hot spells: 2 days, 4 days, 6 days, 4 days, and 4 days. Year 2005 experienced 4 hot spells: 3 days, 7 days, 13 days, 4 days. Year 2005 had the most very hot days, about 27 days above 110 deg and year 2004 had about 20 days.

Year 2005 had at least 7 more very hot days than 2004. Also 6 of the hottest days of 2005 were a full 5 degrees hotter than the hottest days of 2004. This is consistent with anecdotal evidence that 2005 was a very hot summer.

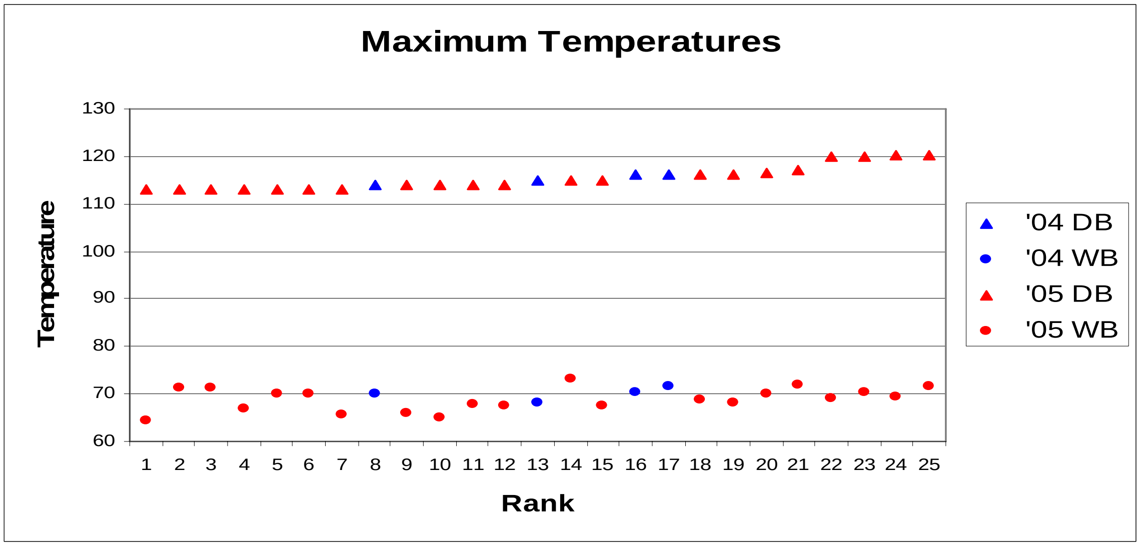

Figure 3 The 25 hottest days of 2004 and 2005 Palm Springs

Figure 3 presents the wet bulb and mean and dry bulb maximum temperatures for the 25 hottest days of 2004 and 2005. Of these 25 hottest days, 21 are for 2005.

It is important to note that the wet bulb mean temperature appears to peak at about 70 deg. F for both years.

In practical terms, the wet bulb temperature represents the performance of a “perfect” evaporative cooler. This observed upper limit for the wet bulb temperature for both years suggests that the evaporative cooler operation for either year was not impaired by excursions of exceptionally high wet bulb temperatures (high humidity)

Modeled Evaporative Cooler Discharge Temperatures - Another point of comparison between 2004 and 2005 is in terms of estimated evaporative cooler discharge temperatures as shown in Figure 4.

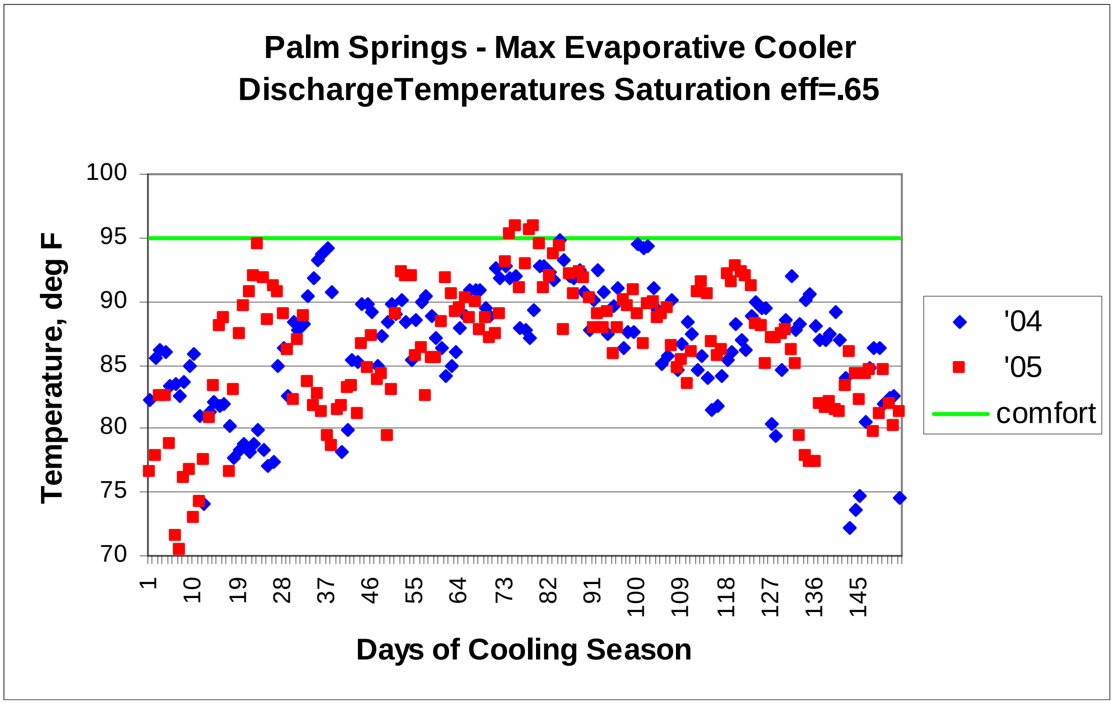

Figure 4 Maximum Daily Evaporative Cooler Discharge Temperatures

Figure 4 shows generally higher maximum evaporative cooler discharge temperatures. Year 2005 shows at least 4 days above 95 deg F while year 2004 shows none.

It is not known at what temperature or under what other conditions evaporative cooler use is discontinued. But assuming that 95 deg F is the comfort limit, then 2005 has 4 days above that limit while 2004 has none. Also in 2005 the hot spells were longer and with higher night lows. It is reasonable to suppose several more days of compressor cooling in 2005 than in 2004.

Conclusion – By all measures, the summer of 2005 was hotter than the summer of 2004 in Palm Springs. In terms of monthly averages, the two years differ by only a modest 3 degrees F in July and August. But considered in terms of "hot spells", year 2005 was much more extreme than 2004.

The year 2005 had about 10 more extremely hot days (>110 deg) than 2004. Also in terms of estimated evaporative cooler output temperatures, the year 2005 had about 4 days more with discharge greater than 95 deg than 2004.

Also aggravating the 2005 cooling season, were longer hot spells with maximum temperatures fully 5 degrees hotter than the hottest of 2004. The minimum night time temperatures during the hot spells of 2005 were also about 4 degrees warmer than the hottest night time temperatures of 2004.

While it is not clearly known what conditions will provoke a participant to switch from evaporative cooling to compressor cooling, it is clear that year 2005 had more extreme temperatures to provoke such a switch. If it can be assumed that the switchover point is near or about 110 deg outdoor max dry bulb, (or evaporative cooler discharge temperatures greater than about 95 deg), then an approximate estimate of increased compressor use can be made.

From these comparisons, it is reasonable to consider that year 2005 had from 5-10 more full compressor days of operation than year 2004. Assuming about 30 kWh per compressor operating day, it is expected that 2005 would show about 150-300 kWH/yr more cooling energy than year 2004. It is probable that both the participant group and a hypothetical control group would show an increase in cooling energy of 150-300 kWh for 2005 relative to 2004.

▪ Phone Survey Form

Customer Information

Index ____________ Name ______________________________ Date ____________

Address ____

Customer Survey

1. How effective do you think the evaporative/swamp cooler (EC/SC) is at providing cooling?

☐ Not (1) ☐ Somewhat (2) ☐ Moderately (3) ☐ Very (4)

2. Which method of cooling do you prefer?

☐ A/C Cooling (1) ☐ EC/SC Cooling (2) ☐ No Preference (3)

3. Do you run your EC/SC and A/C units simultaneously?

☐ Yes (1) ☐ No (2)

4. In which of the last four years did you have your evaporative/swamp cooler serviced?_____________

~~Year~~	~~Yes~~	~~No~~	~~NO EC/SW~~
~~2002~~			
~~2003~~			
~~2004~~			
~~2005~~			

5. [*Phone survey only*] Since the American Synergy Corp. (ASC) technician serviced your EC/SC have you been using it?

☐ More (1) ☐ Less (2) ☐ Same (3)

[*if "More" or "Less" ask 7 and 8, If "Same" ask 7 only*]:

6: This summer (2006) when you cooled your home, what percent of the time did you use your AC and what percent did you use your EC/SC?

AC=________ EC= ________ (total may exceed 100% if they use them at the same time)

No AC ______ No EC ______

7: How about last summer, (2005) when you cooled your home, what percent of the time did you use your AC and what percent did you use your EC/SC?

AC=_________ EC=_________ (total may exceed 100% if they use them at the same time)

No AC ______ No EC ______

8. Have you recently participated in any other American Synergy Programs?

☐ Yes (1) ☐ No (2) Month/Yr ____________ Measures: ____________

Measure ID#: (1) screw-in compact fluorescent lamps, (2) hard-wire compact fluorescent lamps, (3) HVAC duct testing and sealing, (4) air conditioner diagnostic tune-ups, (5) programmable thermostats; hot water heater measures such as (6) pipe insulation,

9. Have you recently participated in any other energy efficiency programs?

☐ Yes (1) ☐ No (2) Month/Yr ____________

Utility/Program/Measures:

10. On a scale of 1 to 10, how would you rate the ASC Evaporative/Swamp Cooler Tune-up Program?

☐ ____________ (1-10)

11. On a scale of 1 to 10, how would you rate ASC's customer service?

☐ ____________ (1-10)

12. Would you like to make any comments about, or recommendations for, the program?

Comments/Recommendations:

11. New Technology for Multifamily HVAC Controls Program

Appendix A: Field Plan and Impact Instruments

SUMMIT BLUE
CONSULTING

Memorandum

From: **Floyd Keneipp**

Copy: **Shahana Samiullah, Kevin Cooney, Davi Ibarra, Mike Yim**

Date: **August 12, 2006**

Re: **Sample design and field data collection plan for RMC's New Technology for Multifamily HVAC Controls Program**

The goal of the New Technology for Multifamily HVAC Controls Program is to reduce HVAC energy consumption in inland communities through new, wireless occupancy sensing technology (Energy Eye™). By place multiple occupancy sensors throughout an apartment that communicate with a central thermostat, the utilization of air conditioners and electric heat pumps can be reduced in the absence of residential inhabitants. The energy savings provided by this technology occur without occupant involvement and accommodate resident daily changes in schedule. As a direct installation program, this Program was offered at no cost to the owner or tenant. The Program proposed to install this HVAC control technology into approximately 1,400 units, with an anticipated savings of 1.92 MWh (net) for the entire project.

The intent of the following sample design and field data collection plan is to:

- Specify data collection objectives.
- Define the sample of residential sites that will undergo verification activities.
- Define participant contact protocol and site activities.
- Provide the data collection and communication instruments used during field activities (See Appendix A)

Data Collection Objectives:

Field activities will provide verification of Program records with respect to overall project goals. This process will confirm several key components needed to accurately analyze Program impacts, gross energy savings and net energy savings achieved. The Program components to be confirmed include:

1. Complete measure installation verifications
2. Verify energy savings assumptions
3. Correlate installation reports with participant interviews.

The approach to each of these activities is discussed further below. It should be noted that the aforementioned data will be collected through both on-site verification activities and supporting participant surveys to be administered on-site and through the telephone (See Appendix A). Surveys that include a range of process evaluation related topics will also be administered to both apartment managers and tenants residing in apartments that have been retrofit through the program. These surveys may be found in Appendices E and F.

3. Complete Measure Installation Verifications:

The onsite verification process will entail observations of installed measures and the collection of key energy performance variables including, but not limited to:

1. Measure presence.
2. Appropriate installation verification.
3. Key operational characteristics including daily schedules, seasonal variations in schedules, and control strategies.

Furthermore, in the event that recorded measures are not present, Summit Blue will make an extensive effort to determine the cause of removal (if previously installed) along with future plans. These inquiries will be conducted through on-site interviews and the telephone should a representative not be available during the verification process.

4. Verify Energy Savings Assumptions:

Summit Blue will employ four methodologies to confirm the energy saving assumptions attributed to the installed wireless occupancy sensors:

1. Past billing analysis coupled with on-site observations and interviews.
2. An analysis of battery estimated useful lifetime (EUL) and sensor operating range.
3. A detailed review of secondary literature where possible.
4. A thorough review and discussion of energy saving estimates calculated by RMC.

No pre-installation field activity or data logging will occur in this evaluation. However, field representatives will be sure to note relationships between different factors such as rent rates and their impact on the economic viability of operating an HVAC system..

On-site-site verification activities will be conducted at three types of residences:

1. Apartments that are not currently occupied (no more than 20% of sample at any site)
2. Apartments that are currently occupied but will be vacated within the next month
3. Apartments that are currently inhabited by a tenant

The collected data will be used to provide the necessary information required to calculate ex-post savings values and yield the kW and kWh reduction values resulting from the installation of the wireless occupancy sensors. Billing analysis will be conducted to provide an estimate of energy savings achieved by the Program installations. Appendix G provides the data sheet to be used to collect meter information at each site in the verification sample.   Billing data will be analyzed for all participating apartments and complexes and will include both the 2005 and 2006 Edison peak season as defined for residential customers. It is expected that around 500 records will be analyzed depending on the availability of billing records and the ability of the field team to collect relevant meter numbers. Finally, the analysis of battery EUL and sensor operating range will be used to address persistence risk issue arising from limited battery lifetime. The sample of sites subject to this verification process will be selected based on rationale discussed further in the subsequent "Sample Design" section of this document.

Summit Blue will also analyze relevant literature pertaining to this Program in order to confirm the legitimacy of the data collected. This will entail a thorough review of vendor literature and applicable reports for similar Programs (where available).   Moreover, Summit Blue will review and discuss Savings Calculations and E-Quest modeling assumptions with Program representatives in order to determine whether or not they are representative of the measures installed and apartment operating conditions.

Sample Design:

Sampling Methodology for Installation Verifications

A total of 6 out of 14 apartment complexes that were retrofitted through the Program will receive verification activities.   The 6 sites verified were selected from the 8 sites that have been in operation for at least 1 year prior to the verification inspections. This design allows us to best assess persistence issues such as battery and measure life, and also demographic issues such as tenant turnover and lifestyle changes.

Summit Blue anticipates verifying 68 distinct apartments distributed throughout the 6 apartment complexes with a minimum of 10 apartments at any 1 site.   This is based on a proportionate sample approach with a Program population of installed apartments of approximately 1400 apartments and a 90% confidence level and 10% error . Table 2 provides the list of sites to be verified and Table 3 provides a summary of installation activity at the sample of sites.

Table 2: Sites Receiving Verification Activities:

Property Name	Service Account Address	Service Account City	Site Contact Name	Phone	email / fax
1	N/A	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A
3	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A
6	N/A	N/A	N/A	N/A	N/A

Table 3: Summary of Installations at Sites Receiving Verification Activities:

Property Name	Approximate Install date	Number of units at complex	Number of units reported retrofit
1	4/1/2005	60	57
1	4/20/2005	290	236
3	5/17/2005	25	24
4	6/22/2005	44	35
5	7/27/2005	38	31
6	8/8/2005	140	121
Total		597	504

Potential Adjustments to Verification Sample Based on Ongoing Installations:

According to conversations with RMC staff, all installations are required to be completed by the end of June. Given that the field verification activities will take place in early August, no additional measures are expected to be installed following the site visitations. If, however, additional measures are installed, records for each new measure installation will be reviewed and gross savings will be adjusted according to this data along with a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with RMC representatives.

Sampling and Uncertainty

No discernable preference was shown when developing the field sample set from qualifying sites. As a result, the sample set is assumed to have little or no bias. However, the sample may be adjusted during the course of the evaluation if discrepancies are realized, and the updated sample will be random as well in order to minimize overall impact analysis bias.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts

The evaluation methodology does not correspond directly to any of the IPMVP options. Instead, Summit Blue is proposing an alternative method that relies heavily on billing analysis, comprehensive engineering calculations and interviews with relevant participants and Program staff. As such, some performance parameters will be based on secondary data or estimates included in the ex-ante calculations. Engineering adjustments made to specific measure savings will be extrapolated to the population of installed measures for the specific program given that they prove representative.

Calculation of Gross and Adjusted Gross Demand Impacts

This evaluation will use the Energy Efficiency Policy Manual[26] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated based on fan kW draw, by reviewing relevant data on the frequency of participant operation characteristics, and also from metered data provided by power logging. Adjusted Program gross demand savings will be based on this analysis and the installation verification data.

Reporting Demand and Energy Impacts

The energy and demand impacts for this Program will be reported in the format provided in Appendix B. Future savings will be based on manufacturer statement of expected system life, and on estimates from customers on the likelihood that they will replace failed retrofit fans with the same technology. There are no Therm savings estimated for this Program.

[26] Version 2, August 2003

Customer Contact Protocol and Site Activities

Field activities will typically involve 5 components;

1. Summit Blue will coordinate with the implementation contractor and apartment manager contacts to establish field activity dates and identify security issues. Field staff will collaborate with apartment managers to contact participating residents and gain approval for verification activities. Appendices C and D provide samples of customer contact letters used to recruit mangers and tenants to participate in the onsite inspections.
2. The apartment mangers at each site will be provided with a letter[27] of introduction on Edison letterhead that provides a description of the activities to be undertaken at their respective site. A secondary letter[3] on Edison letterhead will be provided for them to distribute to the residents that are anticipated to receive verification activities.
3. Summit Blue staff will conduct verification activities on residencies that have given their approval noting measure count, type, operating conditions, etc.
4. In order to support billing analysis, Summit Blue staff will confirm meter numbers at each site. In the event that there are non-dedicated meters at the site, Summit Blue will confirm their meter numbers as well assuming the load attributable to the meter is meaningful.
5. The energy assumptions will be compared with the billing analysis to further validate Program assumptions.
6. The results of these field activities will be used to calculate installation rates and develop adjusted gross Program savings.

[27] Appendix C

Appendix A – Measure Installation Verification Worksheet:

SITE INFORMATION **Date: ______________________**

Customer Name: ______________________ Application Code: ______________________

Contact Name: ______________________ Phone: ______________________

Apartment # Address: ______________________

City / Town: ______________________ State: __________ Zip: __________

SENSOR DATA

Ref #	Space code	Sensor type	Battery replaced	Battery rating	Signal confirmed	Signal strength
1		Door / Occupancy	Yes / No		Yes / No	
2		Door / Occupancy	Yes / No		Yes / No	
3		Door / Occupancy	Yes / No		Yes / No	
4		Door / Occupancy	Yes / No		Yes / No	
5		Door / Occupancy	Yes / No		Yes / No	
6		Door / Occupancy	Yes / No		Yes / No	

Space Type Codes: BR = Bedroom; **K** = Kitchen/Dining Room; **L** = Living Room; **H** = Hallway; **O** = Other

FURTHER QUESTIONS

1. Is the equipment in working condition to the best of your knowledge? (Y / N). If no, describe;

2. Does the equipment appear to be properly installed? (Y / N) If no, describe;

3. Has any of the equipment been removed or replaced since installation? (Y / N) If yes, describe;

   a. Why were they removed or replaced?

   b. When were they removed or replaced?

4. Do you use a thermostat to or timer to manually control your temperature settings? If yes, what temperature is it set to?

5. Are there any factors that influence your decision to operate the HVAC system? If yes, what?

LOCATION (map sensor location)

Comments:

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Appendix B: Apartment Manager Contact Letter

July 22, 2006

Dear Facility Manager,

Southern California Edison is conducting an important study to evaluate the effectiveness of its energy efficiency programs implemented on customer sites such as those under your management. In June 2005, energy savings control devices were installed at numerous apartments at Desert Horizon Apartments that adjust the air conditioning system to help save energy and maximize tenant comfort. Part of that installation included allowing representatives of Southern California Edison the ability to inspect the installations to determine if the systems were properly installed and operating correctly. Our inspection contractor, Summit Blue Consulting, would like to complete these inspections in August and are requesting your help.

We would like to access approximately 15 apartments and complete a brief 5 minute inspection of the system. The activity will include a visual inspection of the wireless sensor control devices that were installed and testing the system functions.

In addition to the inspection, as a free maintenance service we will be replacing batteries in all wireless sensors in the apartments we inspect.

You will be contacted by a representative for Southern California Edison shortly to schedule this work at a time that is convenient for you and your tenants. We will make the results of our inspection available to you upon completion of our work. Attached is a letter for you to provide to tenants informing them of this activity and asking for their cooperation if you feel this is necessary.

Thank you very much for your participation in the Program and help on this important inspection. If you have any questions about this inspection, please call Davi Ibarra, Southern California Edison Project Management at 626-302-9243 or Shana Samiullah, Southern California Edison Evaluation Management at 626-302-8293. Questions about scheduling the onsite activity and process may be directed to Floyd Keneipp at Summit Blue Consulting at 925-635-0270. Questions about the control system and installation may be directed to Dale Lessick at Resource Management Corporation at 949-981-8020.

Regards,

[Edison Contact Representative]

[Edison Contact Information]

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Appendix C: Tenant Contact Letter

Dear Tenant,

Southern California Edison is conducting an important study to evaluate the effectiveness of its energy efficiency programs implemented on customer sites such as your apartment unit. In April of 2005, an energy savings control device was installed at your residence to regulate the air conditioning system to help save energy while maximizing your comfort. Southern California Edison would like to verify that this device is properly installed and operating correctly.

The Southern California Edison inspection contractor, Summit Blue Consulting, would like to inspect the system on ________________________ between _______________________. We anticipate that this inspection will take a maximum of 5 minutes and will not be disruptive. It is not necessary that you be home and the inspector will be accompanied by a member of the property management staff at all times.

Please let us know whether or not it would be acceptable for us to complete this inspection by completing the brief questionnaire below and dropping it off at the office. Your help is greatly appreciated.

[ ] Yes, It is ok to inspect the air conditioning system in my apartment

[ ] No, It is not ok to inspect the air conditioning system in my apartment

If you have any questions please contact [Contact name] at the office.

Thanks again for your help,

Contact name

Contact number

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Appendix D: Meter Data Collection Sheet

Site Name ____________________

Site Facility Description ____________________

Number of bldgs with apartments ____________________

Apartment types	1 Bdrm Units	2 Bdrm Units	3 Bdrm Units
Ave sq ft of apartments			

Bldg Reference #	Building name / reference #	Number of 1 Bdrm Units	Number of 2 Bdrm Units	Number of 3 Bdrm Units	Number of Other Bdrm Units
1					
2					
3					
4					
5					
6					

Ref #	Meter #	Bldg Reference #	Apartment #	Apartment bdrm count estimate
1				
2				
3				
4				
5				
200				

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Appendix E: Verification Activities and Results

Total Recorded Installs through the MFHVAC Program

Customer Site	Installed
1	57
2	236
3	24
4	35
5	31
6	121
7	60
8	80
9	154
10	105
11	148
12	137
13	176
14	96
Total	1400

Average Voltage Readings per Site

Site	Installation Date	Average Motion Sensor Voltage	Average Door Sensor Voltage
1	4/1/2005	0.97	
2	4/20/2005	1.08	3.04
3	5/17/2005	0.91	3.02
4	6/22/2005	1.154	2.93
5	7/27/2005	1.05	
6	8/8/2005	1.81	3.03
2	11/1/2005	2.19	3.04

Energy Eye Readings

Site #	Apt. #	Battery Reading (Volts)	Location	LD1	LD2	LD3	LD4	LD5	LD6	LD7
1	108									
1	105	0.28	ML							
1		0.17	ML							
1	205	0.41	ML							
1		2.8	ML							
1	114	2.64	ML							
1		1.08	ML							

1	121									
1	123									
1	128									
1	130									
1	101									
1	209	0.29	ML							
1		0.07	ML							
2	407	1.72	ML	System Removed						
2		2.54	ML							
2		3.03	DM							
2	415	3.03	DM	GB	RB	RS	RS	RB	RB	RB
2		1.6	ML							
2		0.27	ML							
2		Battery Unseated	MB1							
2	413			Removed completely or never installed						
2	1128			Removed completely or never installed						
2	1034	3.03	DM	System Off						
2		2.9	ML							
2		2.87	ML							
2	1132			Removed completely or never installed						
2	1111	0.02	ML	GB	RS	RS	RS	RB	RS	RS
2		0.03	ML							
2		3.04	DM							
2	1113	0.02	ML	System off						
2		0.751	ML							
2		3.03	DM							
2	1101			Removed completely or never installed						
2	1201	3.05	DM	GB	RS	RS	RS	RB	RS	RB
2		2.8	ML							
2		1.75	ML							
2	1424	1.6	ML	GB	RS			RB	RB	
2		2.7	ML							
2		3.06	DM							
2	1436	1.39	ML	GB	RS	RS			RB	RS
2		2.7	ML							
2		3.05	DM							
2	1536	2.74	ML	GB	RS			RB	RB	

2		1.97	ML							
2		3.04	DM							
2	1836	0	ML	System off						
2		0	ML							
2		3.04	DM							
2	1325			Removed completely or never installed						
2	834	1.69	ML	System off						
2		2.53	ML							
2		3.06	DM							
2	1828	3.03 (Broken)	DM	GB	RB				RB	RS
2		0.77	ML							
2		1.16	ML							
2	1816	2.67	ML	System off						
2		2.73	ML							
2		3.03	DM							
2	2003	3.06	DM	Energy eye controller removed but sensors still in place						
2	2011	3.05	DM	GB	RS	RS	RS	RB	RS	RS
2		2.39	ML							
2		2.46	ML							
2		2.73	MB1							
2		2.72	MB1							
2	1013	3.05	DM	Energy eye controller removed but sensors still in place						
2		1.77	ML							
2		1.65	ML							
2	1022	3.01	DM	GB	RS			RB	RS	RS
3	01-08									
3	01-25	0.37	ML	GB	RS	RS		RB	RB	
3		0.03	ML							
3		3.06	DP							
3	01-09	0.988	ML	GB	RS	RS		RB	RB	
3		0.192	ML							

3	01-23	0.058	ML	GB	RS	RS	RS	RB	RB	RB
3		0.435	ML							
3		0.064	MB1							
3		0.516	MB1							
3		0.956	MB2							
3		0.277	MB2							
3		3.06	DP1							
3		3.05	DM							
3		3.04	DP2							
3	01-10	0.442	ML	GB	RS	RB		RB	RB	
3		0.194	ML							
3		0.24	MB1							
3		0	MB1							
3		2.66	DP1							
3		3.04	DM							
3	01-01									
3	01-03									
3	01-14									
3	01-24									
3	01-12									
3	01-05	0.153	ML	GB	RS	RS		RB	RB	
3		0.39	ML							
3	01-22	0.18	MB1	GB	RS	RS	RS	RB	RB	RB
3		0	MB1							
3		3.04	DP1							
3		3.06	DM							
3		3.05	DP2							
3		0.701	MB2							
3		0.2	MB2							
3	01-04									
3	01-17	1.38	ML	GB	RS	RS	RS	RB	RB	RB
3		2.46	ML							
3		2.67	MB1							
3		1.28	MB1							
3	01-04									
3	01-02									
3	01-07									

3	01-11									
3	01-15	0.085	ML	GB	RS	RS		RB	RB	
3		0.742	ML							
3		2.7	MB1							
3		1.69	MB1							
3		3.05	DM							
3		3.06	DP1							
3	01-13	1.34	ML1	GB	RS	RS		RB	RB	
3		2.79	ML1							
3		1.27	MB1							
3		0.39	MB1							
3		3.07	DP1							
3		3.06	DM							
3	01-18									
3	01-21									
3	01-16	1.53	MB1	GB	RS	RS		RB	RB	
3		2.65	MB1							
4	27	Removed Battery	ML	GB	RS	RS		RB	RB	
4		1.45	MB1							
4		2.7	MB1							
4		Painted Shut	DM							
4	42	Removed Door Sensor	DM	System Off						
4		3.07	DP1							
4		1.38	MB1							
4		2.56	MB1							
4	18	Removed Battery	DP							
4		Painted Shut	DM	GB	RS	RB		RB	RB	RB
4		2.71	ML							
4		1.22	ML							
4	14	3.05	DM	GB	RS	RS		RB	RS	RB
4		1.24	MB1							
4		2.61	MB1							
4	31	2.47	DM	GB	RB	RS		RB	RB	
4		0.41	MB1							
4		0.55	MB1							
4	32	Removed Door Sensor	DM	GB	RB	RS		RB	RB	
4		3.02	DP							
4		1.63	ML							
4		2.77	ML							
4	39	Removed Battery	DM	GB	RB	RS		RB	RB	
4		2.69	MB1							
4		2.71	MB1							

4		3.06	DP							
4	30	0.641	ML	System Off						
4		0.076	ML							
4		2.85	DM							
4	16	3.05	DM	GB	RS	RS		RB	RB	RB
4		0.272	ML							
4		0	ML							
5	838	0.63	ML							
5		2.72	ML							
5	882	0.27	ML							
5		2.61	ML							
5	886									
5	860	2.79	ML							
5		2.58	ML							
5	854	2.7	ML							
5		0.143	ML							
5	858	0.52	ML							
5		2.7	ML							
5	876									
5	852	0.01	ML							
5		0.132	ML							
5	810	2.6	ML							
5		0.76	ML							
5	804	0.02	ML							
5		0.2	ML							
6	112	3.01	DM	System Off						
6	121	3.04	DM	GB	RS	RS		RB	RB	RB
6		1.99	ML							
6		0.78	ML							
6	462	3.05	DM	GB	RS	RS	RB	RS	RB	RS
6		1.06	ML							
6		1.45	ML							
6	451	3.05	DP1	GB	RS	RB		RB	RB	RB
6		3.03	DM							
6		0.3	ML							
6		1.78	ML							
6	441	3.06	DM	GB	RS	RB		RB	RS	RB
6		2.78	MB1							
6		2.79	MB1							
6	423	3.05	DM	GS	RS	RS		RB	RB	RB
6		2.7	MB1							
6		2.7	MB1							
6	131	3.01	DM	GB	RS	RS	RS	RB	RB	RS
6		2.75	ML							
6		2.8	ML							
6	352	3.01	DM	GB	RS	RS	RS	RB	RS	RS
6		1.45	ML							

6		2.45	ML							
6	831	3.01	DM	GS	RS	RS	RS	RS	RS	RS
6		1.7	ML							
6		2.8	ML							
6	723	3.01	DM	GB	RS	RS	RS	RB	RS	RB
6		0.16	ML							
6		0.18	ML							

Key

Code	**Description**
ML	Motion Sensor (Living Room)
MB1	Motion Sensor (Bedroom)
MB2	Motion Sensor (Bedroom)
MB3	Motion Sensor (Bedroom)
DM	Door Sensor (Main Door)
DP1	Door Sensor (Patio)
DP2	Door Sensor (Patio)
RS	Red Solid
RB	Red Blinking
GB	Red Blinking
GS	Green Solid
SO	System Off

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Appendix F: Billing Analysis: Usage and Savings per Unit at Building Level

Site	Building Number	Treated Units	Pre-period Normalized Total usage	Pre-period Cooling usage	Cooling Savings	Estimated Savings	Realization Rate	Savings as % of Cooling Usage	Cooling Usage as % of Total Usage
Site 1	2	4	7416	3487	1313	2400	0.55	0.38	0.47
Site 1	3	4	4625	1572	258	2400	0.11	0.16	0.34
Site 1	4	4	6649	2434	335	2400	0.14	0.14	0.37
Site 1	5	4	6691	2436	388	2400	0.16	0.16	0.36
Site 1	7	4	4524	1373	-212	2400	-0.09	-0.15	0.3
Site 1	8	4	4540	1579	-159	2400	-0.07	-0.1	0.35
Site 1	9	4	3953	1483	785	2400	0.33	0.53	0.38
Site 1	10	4	5023	2984	1514	2400	0.63	0.51	0.59
Site 1	11	3	8081	2975	201	2400	0.08	0.07	0.37
Site 1	12	4	7364	3177	400	2400	0.17	0.13	0.43
Site 1	13	3	4471	1260	270	2400	0.11	0.21	0.28
Site 1	15	4	4404	1563	145	2400	0.06	0.09	0.35
Site 2	10a	7	5112	1232	33	2400	0.01	0.03	0.24
Site 2	10b	9	7640	1521	-694	2400	-0.29	-0.46	0.2
Site 2	11b	12	8178	1424	-727	2400	-0.3	-0.51	0.17
Site 2	12b	10	8152	1776	43	2400	0.02	0.02	0.22
Site 2	13a	7	4131	1039	94	2400	0.04	0.09	0.25
Site 2	13b	12	9461	1686	233	2400	0.1	0.14	0.18
Site 2	14a	7	5857	1939	919	2400	0.38	0.47	0.33
Site 2	14b	11	7613	1673	629	2400	0.26	0.38	0.22
Site 2	15a	6	5523	1667	503	2400	0.21	0.3	0.3
Site 2	16a	6	4248	2310	1511	2400	0.63	0.65	0.54
Site 2	16b	12	7549	1331	-469	2400	-0.2	-0.35	0.18
Site 2	1b	9	7803	1590	62	2400	0.03	0.04	0.2
Site 2	4a	2	8618	1915	-287	2400	-0.12	-0.15	0.22
Site 2	4b	6	9136	1700	-565	2400	-0.24	-0.33	0.19
Site 2	56a	3	4948	1155	143	2400	0.06	0.12	0.23
Site 2	56b	10	7464	1449	-475	2400	-0.2	-0.33	0.19
Site 2	5a	8	5449	1596	117	2400	0.05	0.07	0.29
Site 2	5b	10	7944	1744	570	2400	0.24	0.33	0.22
Site 2	61a	6	3181	819	164	2400	0.07	0.2	0.26
Site 2	61b	10	8563	1579	1088	2400	0.45	0.69	0.18
Site 2	6a	5	4841	1884	470	2400	0.2	0.25	0.39
Site 2	6b	11	6970	2031	581	2400	0.24	0.29	0.29
Site 2	7a	4	3489	1208	116	2400	0.05	0.1	0.35
Site 2	7b	5	7900	1167	-89	2400	-0.04	-0.08	0.15
Site 2	8a	6	6405	1722	763	2400	0.32	0.44	0.27
Site 2	8b	6	4921	1236	61	2400	0.03	0.05	0.25
Site 3	1	8	6499	3224	-224	2400	-0.09	-0.07	0.5
Site 3	2	8	7725	2552	121	2400	0.05	0.05	0.33

Site 3	3	7	6842	2809	158	2400	0.07	0.06	0.41
Site 4	3	4	5141	3457	64	2400	0.03	0.02	0.67
Site 4	4	4	5248	3908	549	2400	0.23	0.14	0.74
Site 4	5	4	5368	3175	257	2400	0.11	0.08	0.59
Site 4	7	4	2732	1775	-563	2400	-0.23	-0.32	0.65
Site 4	8	4	5514	3640	92	2400	0.04	0.03	0.66
Site 4	9	4	3147	1960	-646	2400	-0.27	-0.33	0.62
Site 4	10	4	6622	4161	618	2400	0.26	0.15	0.63
Site 5	1	5	6112	2408	562	2400	0.23	0.23	0.39
Site 6	1	3	8365	6892	620	2400	0.26	0.09	0.82
Site 6	3	3	7277	5818	-539	2400	-0.22	-0.09	0.8
Site 6	4	3	7479	5606	-1365	2400	-0.57	-0.24	0.75
Site 6	5	3	8823	6838	-335	2400	-0.14	-0.05	0.78
Site 6	6	3	6051	3866	-372	2400	-0.15	-0.1	0.64
Site 6	7	2	6225	4483	-1006	2400	-0.42	-0.22	0.72
Site 6	8	3	8201	6235	175	2400	0.07	0.03	0.76
Site 6	9	3	6448	3993	-911	2400	-0.38	-0.23	0.62
Site 6	10	2	4479	3625	-293	2400	-0.12	-0.08	0.81
Site 6	11	1	11892	7234	-337	2400	-0.14	-0.05	0.61
Site 6	13	2	10289	7419	1556	2400	0.65	0.21	0.72
Site 6	14	2	6068	4645	-222	2400	-0.09	-0.05	0.77
Site 6	15	3	8129	5958	-72	2400	-0.03	-0.01	0.73
Site 6	16	2	8882	5376	-138	2400	-0.06	-0.03	0.61
Site 6	17	2	6659	5210	-672	2400	-0.28	-0.13	0.78
Site 6	18	3	6863	4826	435	2400	0.18	0.09	0.7
Site 6	19	3	4966	3644	-917	2400	-0.38	-0.25	0.73
Site 6	20	3	8208	5176	-370	2400	-0.15	-0.07	0.63
Site 6	21	2	14605	7609	246	2400	0.1	0.03	0.52
Site 6	22	3	5758	4595	-793	2400	-0.33	-0.17	0.8
Site 6	23	3	6831	5698	-45	2400	-0.02	-0.01	0.83
Site 6	24	3	5260	3579	-96	2400	-0.04	-0.03	0.68
Site 6	25	3	9244	5559	494	2400	0.21	0.09	0.6
Site 6	26	1	6532	5468	750	2400	0.31	0.14	0.84
Site 6	27	1	8308	6115	-130	2400	-0.05	-0.02	0.74
Site 6	28	1	15095	8695	949	2400	0.4	0.11	0.58
Site 6	29	3	6326	5166	-181	2400	-0.08	-0.04	0.82
Site 6	30	3	7209	5056	911	2400	0.38	0.18	0.7
Site 6	31	2	7809	6239	728	2400	0.3	0.12	0.8
Site 6	32	3	8703	5313	-574	2400	-0.24	-0.11	0.61
Site 6	33	1	6803	4166	-569	2400	-0.24	-0.14	0.61
Site 6	35	3	6396	5131	179	2400	0.07	0.03	0.8
Site 6	36	2	5539	4212	251	2400	0.1	0.06	0.76
Site 6	37	2	8879	7259	241	2400	0.1	0.03	0.82
Site 6	38	2	7230	4804	-160	2400	-0.07	-0.03	0.66
Site 6	39	1	4642	3196	172	2400	0.07	0.05	0.69
Site 6	40	4	3309	2351	-388	2400	-0.16	-0.17	0.71
Site 6	42	2	3621	2331	-249	2400	-0.1	-0.11	0.64
Site 6	43	2	3409	2483	381	2400	0.16	0.15	0.73

Site 6	45	3	2771	1585	-361	2400	-0.15	-0.23	0.57
Site 6	46	2	5235	3729	26	2400	0.01	0.01	0.71
Site 6	47	3	3607	2395	21	2400	0.01	0.01	0.66
Site 6	48	2	4257	2976	-59	2400	-0.02	-0.02	0.7
Site 6	49	3	8747	6397	1310	2400	0.55	0.2	0.73
Site 6	51	4	8108	5699	696	2400	0.29	0.12	0.7
Site 6	52	2	9263	5131	406	2400	0.17	0.08	0.55

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Appendix G: Surveys

Following are the surveys for the New Technology for Multifamily HVAC Controls Program. Included surveys are:

- Edison Program Manager
- Implementer Staff—RMC
- EnergyEye Manufacturer
- Participating Owners/Managers
- Participating Tenants

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New Technology for Multifamily HVAC Controls Program

Edison Program Manager

Interview Guide

Staff ____

Date ____

Interviewer ____

Program Design

1. What changes were made in program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
   - ❑ No, Why not ____________________________
   - ❑ Yes
   - ❑ Unknown
3. What was/were the innovative aspect(s) of this program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction RMC, billing, incentives program tracking, or processing contractor rebates.
   - ❑ No
   - ❑ Yes, explain ____________________________
   - ❑ Unknown
5. Were program rules straightforward and easy to follow? What suggestions do you have for improving program administration in the coming year?

Overall Lessons Learned

6. Are there barriers to the widespread adoption of this occupancy sensor in the multifamily housing market that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
   - ❑ No
   - ❑ Yes,
     a. What are they ____
     b. How were they addressed or what suggestions do you have?
        ____
   - ❑ Unknown
7. What have you learned about the multifamily housing market through this program? What characteristics make a good candidate for this program?
8. Other issues/concerns

Thank you for your time.

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New Technology for Multifamily HVAC Controls Program

Implementer Staff—RMC

Respondent ____
Date ____
Interviewer ____

Program Design

1. Why did RMC choose this infrared detectors over other available technologies?
2. Why did RMC choose EnergyEye over other manufacturers.
3. Why do you think multifamily buildings are a viable market for these particular devices?
4. If there were any problems, why did they occur?

Program Administration

5. Were there any difficulties with the billing, incentives, or tracking with Edison? If so explain?
6. Were the program implementation rules easy to follow?
7. Any suggestions to improve the program?

Marketing and Outreach

8. What was your strategy for identifying target multifamily buildings?
9. What methods did you use for contact? (phone calls, canvassers, or other)
10. If multiple methods were used, which was the most effective?

Delivery and Implementation

11. Does the manufacturer regularly train technicians how to install and service this type of equipment?
12. Was the installation work subcontracted?
13. Did installation require specialized training?
14. If so, how many were trained?
15. If so, were technicians trained internally or externally?

Conclusions

16. In your estimation, what portion of multifamily housing would fit this market?
17. How would you target buildings in the future?
18. If the program were mainstreamed, what changes would improve it?
19. What programs besides incentives would be effective in creating interest in this product?
20. What needs to change for this product to be widely accepted by building manager/owners?

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New Technology for Multifamily HVAC Controls Program

EnergyEye Manufacturer

Interview Guide

Staff Name ____
Date ____
Interviewer ____

Hello, my name is ___________________________ from _______________. I am calling on behalf of Southern California Edison. We are evaluating the Multifamily HVAC Control Program. This program promoted installation of your Energy Eye occupancy sensors. I'd like to speak with, _____________________

1. Do you feel this was a successful and appropriate application for the technology?
2. Have you used this in any other multifamily application?
3. Is the use of occupancy sensors for hands free climate control in multifamily buildings a market you will pursue?
4. Are incentives needed for multifamily building manager/owners to install this technology?
5. Are there barriers to the widespread installation of the *sensors* in the multifamily application that you are aware of? What are they? [Do not read. Check all that apply]
   - ❑ Cost
   - ❑ Education/marketing
   - ❑ Time
   - ❑ Sensors not appropriate to market
   - ❑ Facility managers don't think they'll save energy or money
   - ❑ Other, specify ____
6. What do you think needs to happen to for this product to become widely accepted by multifamily building manager/owners?
7. Comments/issues/suggestions

Thank you for your time.

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New Technology for Multifamily HVAC Controls Program

Participating Owners/Managers

Name from list: ____
Respondent name (if different): ____
Respondent phone from list: ____
Building Name______________________________
Date: ____________________ Interviewer: ____

Hello, my name is ____________________________ from _______________.I am calling on behalf of Southern California Edison. We are evaluating the Multifamily Heating Ventilation Air-Conditioning (HVAC) Control Program for Edison. This program promoted installation of an occupancy sensing controls to reduce power loads and power bills in multifamily housing. I'd like to speak with the site manager, ________________________ Is that person available?
If not, could I schedule a time to call back to reach Mr./Ms. ________________________?
If someone other than original contact is respondent, repeat introduction *(italics above)*.

Marketing and Outreach

1. Do you remember being contacted about Multifamily Heating Ventilation Air-Conditioning program sponsored by Southern California Edison?
   - ❑ No
   - ❑ Yes When were you contacted? ______________________
   - ❑ Uncertain
2. Who initially contacted you and explained what the program was about?
   - ❑ Installer - RMC (Resource Management Corporation)
   - ❑ Property owner/manager
   - ❑ Edison
   - ❑ Other, specify____
3. How was the information delivered?
   - ❑ Mail
   - ❑ Phone call
   - ❑ In person conversation
   - ❑ Attended a presentation
   - ❑ Other, specify _______________________________________
4. Could you tell me what benefits of the sensor technology and program were explained to you? [Do not read list, check all that apply -- Probe if needed]
   - ❑ Energy efficiency – the HVAC sensor controls will save energy and/or money
   - ❑ Southern California Edison would pay for the installation
   - ❑ This was an experiment
   - ❑ Help the environment
   - ❑ No one has ever talked to us about Edison programs before
   - ❑ Other, specify ____
5. Were you involved in the decision to install the HVAC sensor controls?
   - ❑ No

- Who made the decision: Name & number to contact them
- Skip to Q8

❑ Yes

- What was your involvement? ____________________________

❑ Uncertain

6. Why did you decide to participate? What factors were key to your decision? [Do not read. Check all that apply.]
   ❑ The sensors were free
   ❑ Payback was reasonable
   ❑ A good way to save energy and money
   ❑ Wanted to help tenants reduce energy bill
   ❑ Reduce tenant turnover
   ❑ Good advertisement for apartments
   ❑ Other, specify ____
7. How important was Edison's sponsorship of this program to your decision to participate? Please explain your answer.
   ❑ Not at all important
   ❑ Somewhat important
   ❑ Not important and not unimportant
   ❑ Somewhat important
   ❑ Very important
8. Were you aware of these types of HVAC control sensors in multifamily buildings before being contacted about the program?
   ❑ No
   ❑ Yes
   - Where did you see them?___________________________________
   ❑ Uncertain

Spillover -- Ask if Q5 = Yes (Decision maker)

9. Would you install this type of HVAC control sensor in the future, either at your own expense; or with incentives?
   ❑ Not at own expense or with incentives
   ❑ Yes at own expense
   ❑ Yes with incentives
   ❑ Uncertain
10. Do you have any current plans to install HVAC control sensor at other buildings you own or manage?
    ❑ No
    ❑ Yes, When
    5. This year
    6. In one to two years
    7. In three to five years
    8. More than five years out
11. Since participating in the program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    ❑ No

- ❑ Yes,   Please describe the type of energy efficient equipment you added

12. **[ASK IF 10 OR 11 = YES]** Overall, how influential would you say hearing about the program was in your decision to add energy efficient equipment or the energy efficient *air conditioner sensors*?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Energy Savings& Maintenance

13. Is there regularly scheduled maintenance on all your HVAC systems?
    - ❑ Yes
    - ❑ No
    - ❑ Uncertain
14. Are sensors installed in all apartment units?
    - ❑ No
        - Why were sensors not installed in all the apartment units? _________
    - ❑ Yes
15. Who is responsible for maintaining the sensors installed by the Edison program?
    - ❑ Installer - RMC
    - ❑ On-site Management
    - ❑ Maintenance contractor
    - ❑ Don't know
    - ❑ Other Specify:____

    15a. **[if other than DK]** The batteries in the sensors need to be changed occasionally as they wear out. Is checking the batteries in the sensors part of this maintenance?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain
16. How often are the sensors serviced/batteries tested? [Don't read, check one]
    - ❑ At least once every 6 months
    - ❑ Once every year
    - ❑ Once every 2 years
    - ❑ Don't know
    - ❑ Other Specify:____
17. How do you track how many batteries or which batteries are replaced?
    - ❑ No
    - ❑ Yes
18. Have any issues emerged with the HVAC control sensors? [Do not read list, check all that apply]
    - ❑ Sensors need frequent service
    - ❑ Sensors are ineffective at controlling temperatures
    - ❑ Tenants have tampered with sensors
    - ❑ Other issues, specify:____

19. Have any of the tenants commented or complained about the HVAC control sensors?
    - ❑ Yes
    - ❑ No

    19a. **[If yes]** If so, what was the issue? [Don't read, check all that apply, probe if 'Other']
    - ❑ Don't save energy.
    - ❑ Utility bills [circle 1] haven't changed / have gone up
    - ❑ AC system shuts off at night and the apartment gets hot
    - ❑ It's hard to keep the apartment at a comfortable temperature
    - ❑ Don't know
    - ❑ Other [Probe]
20. Has tenant turnover decreased since installation of the sensors?
    - ❑ No
    - ❑ Yes
        - Increased or decreased?
21. Have rent rates changed since installation of the sensors?
    - ❑ No
    - ❑ Yes
        - Increased or decreased?
        - Was the change related to installation of the sensors?

Market Barriers to Adoption

22. Do you understand how the HVAC control sensors work?
    - ❑ Yes
    - ❑ No

    22a. **[if No]** Does any of the staff at your complex understand how the HVAC control sensors work?
    - ❑ Yes
    - ❑ No
    - ❑ Don't know
23. Can you tell me how satisfied you are with the performance of the HVAC control sensors? Would you say:
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
    - ❑ Don't know
24. Do you think there would be barriers to the widespread installation of the control sensors? What would they be? [Do not read. Check all that apply]
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Sensors not appropriate to market
    - ❑ Owners or building managers don't think they'll save energy or money
    - ❑ Other, specify ____

25. Do you have any suggestions for program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?
26. How satisfied are you with the company that installed the sensors?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
27. How satisfied are you with the Edison program overall?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
28. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes, When, what program was it? ________________________
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this program.

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New Technology for Multifamily HVAC Controls Program

Participating Tenants

Name from list: ____
Respondent name (if different): ____
Respondent phone from list: ____
Building Name/Number__________________________ Unit Number ______________________
Date: ____________________ Interviewer: ____

Hello, my name is ____________________________ from ________________. I am calling on behalf of Southern California Edison. We are evaluating the Multifamily Heating and Air-Conditioning Control Program for Edison. This program installed an occupancy sensing system to reduce energy use in multifamily housing. May I speak to speak to [Resident] or any other adult in the household. ***[Name to be provided--these people have agreed to participate]***

- ❑ Respondent interested ....Continue
- ❑ Respondent refused...Is there another adult living in the apartment we could talk to about the air conditioning control sensor? Who would that be? _____________________ Is that person available

Marketing and Outreach

1. Were you living in the apartment when a new type of thermostat and air conditioning control sensor was installed to help conserve energy? ***[***
   - ❑ No
     - When did you move in? _________________[Skip to question 6]
   - ❑ Yes
   - ❑ Uncertain
     - When did you move in? __________________[skip to question 6]
2. Do you remember who contacted you and explained what the heating and air conditioning sensor controls were for?
   - ❑ Installer
   - ❑ Landlord
   - ❑ Fellow Resident
   - ❑ Other, specify____
   - ❑ Do not recall being contacted

   Q2a, If remember being contacted, When were you contacted? _____________________
3. How was the information delivered?
   - ❑ Mail
   - ❑ Phone call
   - ❑ In person conversation
   - ❑ Attended a presentation
   - ❑ Other, specify____
4. Could you tell me what you think the benefits of the heating and air conditioning control sensors are? [Do not read list, check all that apply -- Probe if needed]
   - ❑ Energy efficiency – the sensor controls will save energy and/or money
   - ❑ Southern California Edison would pay for the installation

- ❑ This was an experiment
- ❑ Help the environment
- ❑ No one has ever talked to us about Edison programs before
- ❑ No benefits
- ❑ Other, Probe____

5. Do you think your energy bills are lower since the sensors were installed?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain

   Q5a. ASK If Q5(2) "Yes" How has the installation of sensors decreased your energy bills?" [Capture verbatim response, Probe until unproductive, clarify completely.]
6. Do energy bills influence your decision about where or what apartment to rent?
   - ❑ No
   - ❑ Yes
   - ❑ Uncertain

   Q6a. ASK if Q6(2) "Yes" In what way do energy bills influence your decision about what apartment to rent? [Capture verbatim]

Delivery and Implementation

The energy control device that was installed has an occupancy sensor that tells the air conditioner when somebody is home and then makes the air conditioner run to cool your house. When nobody is at home, the sensor tells the air conditioner to shut off and save energy, then when somebody comes in it tells the air conditioner to turn back on.

7. Are you comfortable with this kind of energy control device in your home?
   - ❑ Yes
   - ❑ No
   - ❑ No opinion

   Q7a. ASK if Q7(2) "No" Why are you uncomfortable with this kind of energy control devise in your home? [Capture verbatim]
8. Do you have any other concerns about the control sensors? [Do not read list, check all that apply; capture verbatim for 'other']
   - ❑ Effectiveness
   - ❑ Security concerns
   - ❑ Aesthetics
   - ❑ No control in decision
   - ❑ Other [Probe]____
9. Do you manually operate the air conditioner or do you let the sensor control the air conditioning system?
   - ❑ Let the sensor control the system
   - ❑ Manually operate
   - ❑ Uncertain

   Q9a – Ask if Q9(2) "Manually operate" How do you manually operate the air conditioner? *(Interviewers: We are looking for their decision point to change the settings, or times they change the settings, for example, " we turn on the air conditioner when we get home from work" or "we turn the AC off when we leave for work" "we let it run all the time" "we change the temperature" etc.)*   [Capture verbatim]

10. Have you changed the times or temperatures for heating or cooling your apartment since the sensors were installed?
    - ❑ No
    - ❑ Yes
    - ❑ Uncertain

    Q10a. ASK IF Q10(2) “Yes” How have the times and/or temperatures for heating and/or cooling your apartment changed since the sensors were installed? [Capture verbatim]

Market/Customer Response

11. Are you satisfied with the functioning of the sensor controls?
    - ❑ Very satisfied
    - ❑ Somewhat Satisfied
    - ❑ Neither satisfied nor dissatisfied
    - ❑ Somewhat dissatisfied
    - ❑ Very dissatisfied

    Q11a. [If neither, somewhat, and very dissatisfied at Q11] Why are you dissatisfied? [Don’t read, check all that apply]
    - ❑ Utility bills haven’t changed
    - ❑ Don’t save energy
    - ❑ Utility bills have gone up
    - ❑ AC system shuts off at night and the apartment gets hot
    - ❑ It’s hard to keep the apartment at a comfortable temperature
    - ❑ Don’t know
    - ❑ Other [Probe]____
12. Are you satisfied with the level of comfort in your home?
    - ❑ Very satisfied
    - ❑ Somewhat Satisfied
    - ❑ Neither satisfied nor dissatisfied
    - ❑ Somewhat dissatisfied
    - ❑ Very dissatisfied

    Q12a. [If neither, somewhat and very dissatisfied at Q12] Explain if not satisfied *(for example, doesn’t cool as well as before sensor installed, etc.)* [Capture verbatim]

Thank you for your time and assistance in evaluating this program.

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12.Refrigerated Warehouse Program

Appendix A: Refrigerated Warehouse Field Plan and Instruments

SUMMIT BLUE
CONSULTING

Memorandum

To: Ben Bronfman
From: Floyd Keneipp
Copy: Shahana Samiullah, Kevin Cooney, George Coronel, Anne West
Date: August 17, 2006
RE: Sample design and field data collection plan for Onsite Energy Corporation's Refrigerated Warehouse Program.

The goal of the Refrigerated Warehouse Program is to reduce energy usage by almost four million kWh within the Edison territory. Working directly with customers in the refrigerated warehouse market segment, a variety of energy efficiency projects were implemented with a focus on both demand reduction and energy efficiency. The Program focuses primarily on the following technologies:
Energy efficient freezer and cooler doors to reduce refrigeration system loads

Table 1. Refrigeration controls to optimize refrigeration system operation

Table 2. Lighting retrofits involving new T5 and T8 fluorescent fixtures that can operate at very low temperatures, and associated lighting controls

Table 3. Automatic non-condensable purgers.

The intent of the following sample design and field data collection plan is to:

- Specify data collection objectives.
- Define the sample of sites that will undergo verification activities.
- Define customer contact protocol and site activities.

- Provide the data collection and communication instruments used during field activities (See Appendix A and B).

Data Collection Objectives:

Field activities will provide verification of Program records with respect to overall project goals. This process will confirm several key components needed to accurately analyze Program impacts, gross energy savings and net energy savings achieved. The engineering documents for all projects installed by the Program received an independent 3rd party review by kW Engineering (kWE) prior to installation. Exhibit 1 provide a summary of the savings applied for by Onsite, and the savings accepted by kWE after their review. This review indicates that almost 77% of savings approved for the Program result from lighting retrofits. The vast majority of these lighting savings are attributable to savings achieved through the replacement of high intensity discharge (HID) lighting with industrial fluorescent fixtures employing linear T8 lamps. In addition, kWE did not recommend any revisions to the Onsite estimated savings for lighting retrofits, whole savings attributable to mechanical retrofits were reduced approximately 1% from 969,085 to 958,905 annual kWh.

Exhibit 1: Program savings applied for by Onsite and the savings accepted by kWE

Savings detail	Onsite Application	kWE Accepted
Total IDEEA Program savings	4,166,468	4,156,288
Savings from lighting measures (kWh)	3,197,383	3,197,383
% of project savings from lighting measures	76.7%	76.9%
Savings from mechanical measures (kWh)	969,085	958,905
% of project savings from mechanical measures	23.3%	23.1%

Exhibit 2 provides further details from the kWE review about the lighting retrofits, including the Approved savings lighting (kWh), the fixture retrofit and control contributions to the approved savings, and the interactive effects attributable to reductions in heat attributable to the new lighting system. The 'Total' provides the total savings attributable to the lighting system plus the interactive effect savings.

Exhibit 2: Details from the kWE review of lighting retrofits

Project	kWE approved lighting system savings (kWh)	fixture retrofit contribution	control contribution	Interactive effects	Total
1	176,214	130,011	46,203	30,388	206,602
2	1,200,912	TBD	TBD	382,547	1,583,459
3	117,618	TBD	TBD	19,919	137,537
4	1,212,880	TBD	TBD	56,905	1,269,785
Total	2,707,624	TBD	TBD	489,759	3,197,383

Exhibit 3 provides a comparison of mechanical retrofit savings applied for by Onsite, and savings approved by the kWE review.

Exhibit 3. Mechanical savings applied for by Onsite and the savings accepted by kWE

Project	Onsite mechanical recommendations	kWE mechanical recommendations
1	855,821	845,641
3	113,264	113,264
Total	969,085	958,905

The Program components to be confirmed include:

1. Complete measure installation verifications.
2. Verify energy savings assumptions.
3. Complete a Program process evaluation survey (See Appendix B)
4. Correlate installation reports with participant interviews.

The approach to each of these activities is discussed further below. It should be noted that the aforementioned data will be collected through both on-site verification activities and supporting participant surveys to be administered on-site and through the telephone (See Appendix A). The general approach described will below will discuss or plan to conduct onsite verifications of all measures installed by the Program, with a data logging activities intended to clarify lighting retrofit savings attributable to the lighting measures, including research into savings attributable to the lighting control technology.

4. <u>Complete Measure Installation Verifications:</u>

The onsite verification process will entail observations of installed measures and the collection of key energy performance variables including, but not limited to:

1. Measure presence.
2. Appropriate installation verification.
3. Key facility performance data, such as daily schedules, seasonal variations in schedules, and control strategies.

Furthermore, in the event that recorded measures are not present, Summit Blue will make an extensive effort to determine the cause of removal (if previously installed) along with future plans. These inquiries will be conducted through on-site interviews and the telephone should a representative not be available during the verification process.

5. *Verify Energy Savings Assumptions:*

Summit Blue will employ four methodologies to confirm energy saving assumptions attributed to the energy efficient measures:

1. Data Logging
2. Billing analysis
3. A detailed review of secondary literature where possible.
4. A detailed review and discussion of Onsite and kWE energy saving estimates, engineering models, and vendor documentation of expected savings.

Data logging will be conducted on a specific number of sites determined by the rationale discussed further in the subsequent "Sample Design" section of this document. Subsequent billing analysis will be conducted on all sites in order to provide an estimate of energy savings achieved by the Program installations. This effort is plausible due to the fact that each participant site is interval metered and subject to time of use (TOU) rates. Furthermore, the analysis will include the 2006 summer peak season because the additional heat load will likely influence measure performance and resulting savings. Summit Blue will also analyze relevant literature pertaining to this Program in order to confirm the legitimacy of the data collected. This will entail a thorough review of vendor literature and applicable reports for similar Programs (where available). Moreover, Summit Blue will review and discuss the savings assumptions provided by kW Engineering prior to project installations with Program representatives in order to determine whether or not the assumptions and calculations made in the documents are representative of the measures installed and field operating conditions.

Sample Design:

Sampling Methodology for Installation Verifications:

Due to the large variety of measures installed, coupled with the fact that some measures were previously verified by Edison representatives, it was deemed most appropriate to coordinate Summit Blue's verification activities in such a way as to 'fill-in the gaps' and delegate priority according to the following criteria:

1. Sites most relevant for contributing to the existing knowledge database.
2. Sites that contribute significantly to energy savings attributable to the Program
3. Sites that contribute significantly towards the total number of measures installed

Accordingly, Exhibit 4 depicts the sites receiving verification activities and the contacts at each site. The sample set was created to ensure:

1. Compatibility with budget requirements

2. Statistical accuracy
3. Maximum coverage of reported Program impacts

Table 2: Sites Receiving Verification Activities

Project	Site Contact	Vendor Contacts	Logger install date	Logger removal date
1	NA	NA	8/18/2006	
2	NA	NA	8/25/2006	
3	NA	NA	8/18/2006	
4	NA	NA	8/25/2006	

Sampling Methodology for Sites Receiving Data Logging:

The impact evaluation will make extensive use of the existing metering at the participant sites. Additionally, post installation data logging will be used for the HID lighting retrofit projects to verify warehouse aisle vacancy estimates. The sample of measures chosen to be verified was dependent upon the percentage of the total number of measures installed as well as the percentage of total energy savings attributable to each measure. Thus, the sites with the greatest impact on Program savings will receive a commensurate amount of data logging as this will maximize the quality of data collected. Data logging will occur over the Edison peak summer period definition of 6/2/2006 – 10/6/206, for approximately 3 weeks.

Data loggers will be installed to provide data necessary to calculate ex-post savings values as discussed below:

1. The primary intent of the data logging is to verify assumptions about the impact of lighting controls installed that are designed to either shut-off or dim lights when an area is unoccupied.
2. Loggers will be placed primarily on high bay retrofit applications where high intensity discharge (HID) lighting fixtures were replaced with industrial fluorescent fixtures in high bay areas.   Lighting fixtures retrofit in office or low bay areas may not be logged as these represent lower impact retrofits.
3. Data logging will be conducted on approximately 4 to 6 lights at each facility. Lighting fixtures to be logged will be selected to provide an accurate indication of the net impact of the retrofit on the facility. As such, fixtures will be selected that represent average usage for various area, such as dock and storage areas.   The loggers will be in place for between 30 and 60 calendar days.
4. All 4 sites that received lighting retrofits from the Program will be logged.

Potential Adjustments to Verification Sample Based on Ongoing Installations:
According to conversations with Onsite staff, all installations are required to be completed by the end of June. Given that the field verification activities will take place in early July, no additional measures are expected to be installed following the site

visitations. If, however, additional measures are installed, records for each new measure installation will be reviewed and gross savings will be adjusted according to this data along with a review of the verification data developed during field activities. No additional site visits are planned to confirm additional installations unless discrepancies are discovered in discussions with Onsite representatives.

Sampling and Uncertainty:
No discernable preference was shown when developing the field sample set from qualifying sites. As a result, the sample set is assumed to have little or no bias. However, the sample may be adjusted during the course of the evaluation if discrepancies are realized, and the updated sample will be random as well in order to minimize overall impact analysis bias.

Gross Impact Analysis

Calculation of Gross and Adjusted Gross Energy Impacts:
The proposed impact evaluation plan adheres to Chapter 6 of the California Energy Efficiency Policy Manual (version 2, August 2003). The evaluation plan does not correspond directly to any of the IPMVP options. We are proposing an alternative method that relies on developing Program-specific adjustments to the Ex-ante savings values. The approach is similar to Option A: Partially Measured Retrofit Isolation, in that it will use partial short term field measurement of energy use to verify or adjust Ex-ante energy and demand savings estimates for measures installed. Some performance parameters will be based on secondary data or estimates included in the Ex-ante calculations. Engineering adjustments made to specific measure savings will be extrapolated to the population of installed measures for the specific Program.
Calculation of Gross and Adjusted Gross Demand Impacts:
This evaluation will use the Energy Efficiency Policy Manual[28] peak demand period definition of noon to 7 p.m. Monday through Friday, June, July, August, and September. Peak demand savings will be calculated based on fan kW draw, by reviewing relevant data on the frequency of participant operation characteristics, and also from metered data provided by power logging. Adjusted Program gross demand savings will be based on this analysis and the installation verification data.
Reporting Demand and Energy Impacts:
The energy and demand impacts for this Program will be reported in the format provided in Appendix B. Future savings will be based on manufacturer statement of expected system life, and on estimates from customers on the likelihood that they will replace failed retrofit fans with the same technology. There are no Therm savings estimated for this Program.

Customer Contact Protocol and Site Activities

Field activities will typically involve 5 components;

1. Summit Blue will coordinate with the implementation contractor and primary customer contact to establish field activity dates and identify site level contacts. Moreover, Summit Blue field staff will collaborate with site managers to address any security issues.
2. Summit Blue staff will conduct a site-by-site, measure-bye-measure audit noting measure count, type, operating conditions, etc.
3. A detailed description will be provided where data logging equipment has been installed. Correspondingly, a data logger installation worksheet is provided as a separate document in Appendix A.
4. Where data loggers have been installed, a pick-up date will be provided to each site. Summit Blue staff will call each site in advance to returning to retrieve loggers.

Data Logger Data Collection Protocol

HOBO 4 channel loggers will be used to collect relevant information pertinent to project objectives. The process for collecting the data acquired by the HOBO data loggers is as follows:

1. All inspections and data logging are planned to take place between August 17th and August 29th.
2. Initialize each logger as close as possible to the date it is deployed
3. Summit Blue staff will randomly verify that the data loggers are recording operation.
4. Summit Blue staff will inform facility representatives of the energy study being conducted on the building and ask them not to move, remove, or tamper with the loggers installed. Moreover, participants will be asked to operate the equipment as usual; that is – not change their normal behavior during the study.
5. After 30 to 60 days, data loggers will be retrieved. Data loggers will be downloaded directly to a computer on the day they are retrieved.

[28] Version 2, August 2003

Appendix A – Measure Installation Verification Worksheet:

Refrigerated Warehouse Program

HOBO Light Logger Installation Record

Site Information

Customer Name ______________________________

Street Address ______________________________

City/Town ____________________ State ________ Zip ____________

Edison meter number ____________________

Measure verification

Measure description	
Measure mfr and model #	
Base description	
Number of measures	
Operation description	
Is the equipment in working condition	
Does the equipment appear to be properly installed	
Has any of the equipment been removed or replaced since installation	
Notes	

Lighting detail and logging data

Location number						
Area usage code						
Area operating temperature						
Fixture Location						
Base fixture type code						
Retrofit fixture type code						
Circuit number of fixture logged						
Number of fixtures on logged circuit						
Fixture control type code						
Number of fixtures on logged circuit with controls						
Connected load of circuit with logged fixture						
Logger ID Number:						
Deploy Date:						
Data Retrieval Date:						
Logger Removal Date:						

Area usage codes

- *Office = OF*
- *High bay – open storage area - HBO*
- *High bay – racked storage area - HBR*
- *High bay – docks – HBD*
- *Other – OT [define]*

Retrofit fixture type code

- *T5/L = T5 industrial with number of lamps (L)*
- *T8/L = T5 industrial with number of lamps (L)*

Base fixture type code

- *HPS = High pressure sodium with (W) watts*
- *MH = Metal Halide with (W) watts*
- *- Other [define]*

Fixture control type code

a. *DO/B– dedicated on/off shutting off (B) ballasts*

b. *DD/B/M – dedicated dimming (B) ballasts to a minimum ballast output wattage (M)*

c. *- Other [define]*

FURTHER QUESTIONS

1. How likely will new measures that fail during their lifetime be replaced by the same technology? Please give us a % estimate of likelihood where 100% means that you are certain that failed measure will be replaced by the same technology and 0% means that you will use a different system. _________%

2. Do you or your maintenance company maintain, or know where to obtain, retrofit equipment in the event of failure? (Y / N / DK)

LOCATION OF INSTALLATIONS

(Map locations)

Appendix B: Refrigerated Warehouse Field Activity Sample Details

Site Logging Information:

Site 1 Intensity Distribution (Weekday)		Site 1 Intensity Distribution Weekend	
Hour	Average Intensity	Hour	Average Intensity
12:00 AM	25.47727273	12:00 AM	19.836
1:00 AM	28.03636364	1:00 AM	20.832
2:00 AM	24.83363636	2:00 AM	17.314
3:00 AM	23.96909091	3:00 AM	15.334
4:00 AM	22.35727273	4:00 AM	17.224
5:00 AM	28.38090909	5:00 AM	19.984
6:00 AM	29.21	6:00 AM	19.586
7:00 AM	28.88	7:00 AM	19.85
8:00 AM	31.60727273	8:00 AM	20.318
9:00 AM	32.72	9:00 AM	20.672
10:00 AM	26.00727273	10:00 AM	17.098
11:00 AM	32.5	11:00 AM	20.838
12:00 PM	29.65181818	12:00 PM	20.106
1:00 PM	32.5	1:00 PM	19.568
2:00 PM	29.02090909	2:00 PM	16.322
3:00 PM	28.79727273	3:00 PM	17.238
4:00 PM	23.05727273	4:00 PM	17.07
5:00 PM	26.77727273	5:00 PM	22.812
6:00 PM	30.19545455	6:00 PM	21.986
7:00 PM	26.88090909	7:00 PM	20.322
8:00 PM	29.72545455	8:00 PM	21.082
9:00 PM	29.26181818	9:00 PM	22.078
10:00 PM	23.09818182	10:00 PM	17.018
11:00 PM	30.11363636	11:00 PM	17.802

Site 2 Instensity Distribution (Weekday)			Site 2 Intensity Distribution (Weekend)	
Hour	Average Intensity		Hour	Average Intensity
12:00 AM	45.175		12:00 AM	22.53
1:00 AM	42.47045455		1:00 AM	13.045
2:00 AM	41.45568182		2:00 AM	18.9675
3:00 AM	55.00454545		3:00 AM	26.08
4:00 AM	74.16363636		4:00 AM	24.21
5:00 AM	75.45795455		5:00 AM	36.99
6:00 AM	78.09659091		6:00 AM	38.995
7:00 AM	73.55227273		7:00 AM	30.0275
8:00 AM	76.61022727		8:00 AM	34.0575
9:00 AM	80.32954545		9:00 AM	36.105
10:00 AM	77.95		10:00 AM	38.935
11:00 AM	75.60340909		11:00 AM	47.7825
12:00 PM	79.11136364		12:00 PM	40.8075
1:00 PM	91.00795455		1:00 PM	49.3675
2:00 PM	89.48181818		2:00 PM	56.5325
3:00 PM	89.53409091		3:00 PM	44.325
4:00 PM	91.42727273		4:00 PM	49.3525
5:00 PM	77.34431818		5:00 PM	37.5275
6:00 PM	87.19772727		6:00 PM	34.8525
7:00 PM	80.65909091		7:00 PM	43.4425
8:00 PM	83.83409091		8:00 PM	40.5475
9:00 PM	69.89659091		9:00 PM	36.29
10:00 PM	60.90795455		10:00 PM	37.09
11:00 PM	52.53636364		11:00 PM	20.36

Site 3 Intensity Distribution (Weekday)		Site 3 Intensity Distribution (Weekend)	
Hour	Average Intensity	Hour	Average Intensity
12:00 AM	2	12:00 AM	2
1:00 AM	2	1:00 AM	2
2:00 AM	2	2:00 AM	2
3:00 AM	2	3:00 AM	2
4:00 AM	24.1	4:00 AM	10.58
5:00 AM	208.7545455	5:00 AM	122.6675
6:00 AM	351.7045455	6:00 AM	272.4525
7:00 AM	847.4215909	7:00 AM	413.6375
8:00 AM	702.6943182	8:00 AM	480.995
9:00 AM	518.35	9:00 AM	339.775
10:00 AM	595.6102273	10:00 AM	345.5475
11:00 AM	572.9420455	11:00 AM	300.3925
12:00 PM	400.6636364	12:00 PM	238.7875
1:00 PM	520.35	1:00 PM	255.045
2:00 PM	568.0125	2:00 PM	249.275
3:00 PM	499.8795455	3:00 PM	279.2525
4:00 PM	561.3295455	4:00 PM	255.295
5:00 PM	546.8272727	5:00 PM	167.7375
6:00 PM	465.3465909	6:00 PM	35.1925
7:00 PM	362.5943182	7:00 PM	11.59
8:00 PM	194.9602273	8:00 PM	2
9:00 PM	66.88863636	9:00 PM	2
10:00 PM	3.3	10:00 PM	2
11:00 PM	4.6	11:00 PM	2

Site 4 Intensity Distribution (Weekday)			Site 4 Intensity Distribution (Weekend)	
Hour	Average Intensity		Hour	Average Intensity
12:00 AM	3.768181818		12:00 AM	4.293333333
1:00 AM	2.824242424		1:00 AM	2.9
2:00 AM	2.787878788		2:00 AM	2.913333333
3:00 AM	4.142424242		3:00 AM	2.886666667
4:00 AM	14.16515152		4:00 AM	2.98
5:00 AM	15.31515152		5:00 AM	3.086666667
6:00 AM	17.99545455		6:00 AM	3.383333333
7:00 AM	19.43484848		7:00 AM	8.766666667
8:00 AM	18.60606061		8:00 AM	9.723333333
9:00 AM	18.05757576		9:00 AM	10.01333333
10:00 AM	19.08181818		10:00 AM	10.52
11:00 AM	19.39848485		11:00 AM	10.13
12:00 PM	19.21969697		12:00 PM	9.79
1:00 PM	18.94242424		1:00 PM	7.476666667
2:00 PM	19.27272727		2:00 PM	4.41
3:00 PM	17.94848485		3:00 PM	3.076666667
4:00 PM	17.04090909		4:00 PM	3.04
5:00 PM	15.43484848		5:00 PM	3.113333333
6:00 PM	14.54090909		6:00 PM	3.2
7:00 PM	13.45909091		7:00 PM	3.113333333
8:00 PM	13.41363636		8:00 PM	3.08
9:00 PM	13.33333333		9:00 PM	3.026666667
10:00 PM	12.06515152		10:00 PM	3.08
11:00 PM	6.733333333		11:00 PM	2.973333333

HID Savings Analysis:

Site 1 HID Retrofit Analysis

Fixture Count	Dim %	Full Hrs	50% Hrs	fix kW @ 0% dim	fix kW @ 50% dim	Msre kWh	Interact %	Ineract kWh saved	kWh Saved
16	42.00%	5080.8	3679.2	0.234	0.117	25909.9776	0.35	9068.49216	34513.13856
16	42.00%	5080.8	3679.2	0.234	0.117	25909.9776	0.35	9068.49216	34513.13856
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
14	42.00%	5080.8	3679.2	0.234	0.117	22671.2304	0.35	7934.93064	30198.99624
4	42.00%	5080.8	3679.2	0.234	0.117	6477.4944	0.35	2267.12304	8628.28464
79	42.00%	5080.8	3679.2	0.234	0.117	127930.514	0.35	44775.68	170408.6216
7	42.00%	5080.8	3679.2	0.234	0.117	11335.6152	0.35	3967.46532	15099.49812
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
13	42.00%	5080.8	3679.2	0.234	0.117	21051.8568	0.35	7368.14988	28041.92508
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
8	42.00%	5080.8	3679.2	0.234	0.117	12954.9888	0.35	4534.24608	17256.56928
60	42.00%	5080.8	3679.2	0.234	0.117	97162.416	0.35	34006.8456	129424.2696
55	42.00%	5080.8	3679.2	0.234	0.117	89065.548	0.35	31172.9418	118638.9138
8	43.00%	4993.2	3766.8	0.234	0.117	12872.9952	0.35	4505.54832	17309.86512
9	43.00%	4993.2	3766.8	0.234	0.117	14482.1196	0.35	5068.74186	19473.59826
3	43.00%	4993.2	3766.8	0.234	0.117	4827.3732	0.35	1689.58062	6491.19942
28	43.00%	4993.2	3766.8	0.234	0.117	45055.4832	0.35	15769.4191	60584.52792
6	43.00%	4993.2	3766.8	0.234	0.117	9654.7464	0.35	3379.16124	12982.39884
6	43.00%	4993.2	3766.8	0.234	0.117	9654.7464	0.35	3379.16124	12982.39884

18	43.00%	4993.2	3766.8	0.234	0.117	28964.2392	0.35	10137.4837	38947.19652
18	43.00%	4993.2	3766.8	0.234	0.117	28964.2392	0.35	10137.4837	38947.19652
18	43.00%	4993.2	3766.8	0.234	0.117	28964.2392	0.35	10137.4837	38947.19652
12	43.00%	4993.2	3766.8	0.234	0.117	19309.4928	0.35	6758.32248	25964.79768
6	43.00%	4993.2	3766.8	0.234	0.117	9654.7464	0.35	3379.16124	12982.39884
9	43.00%	4993.2	3766.8	0.234	0.117	14482.1196	0.35	5068.74186	19473.59826
9	43.00%	4993.2	3766.8	0.234	0.117	14482.1196	0.35	5068.74186	19473.59826
3	43.00%	4993.2	3766.8	0.234	0.117	4827.3732	0.35	1689.58062	6491.19942
25	43.00%	4993.2	3766.8	0.234	0.117	40228.11	0.35	14079.8385	54093.3285
58	43.00%	4993.2	3766.8	0.234	0.117	93329.2152	0.35	32665.2253	125496.5221
18	43.00%	4993.2	3766.8	0.234	0.117	28964.2392	0.35	10137.4837	38947.19652

Site 2 HID Retrofit Analysis:

Fixture Count	0% dim savngs	100% dim	Full OP hours	Dim Op hours	Save at 0% dim	Save at 100% dim	Net fixture save	interactive	Net saved
2	227	303	5168.4	3591.6	2346.4536	2176.5096	4522.9632		4522.963
3	227	303	5168.4	3591.6	3519.6804	3264.7644	6784.4448		6784.445
2	227	303	5168.4	3591.6	2346.4536	2176.5096	4522.9632		4522.963
6	227	303	5168.4	3591.6	7039.3608	6529.5288	13568.8896		13568.89
10	152	303	5168.4	3591.6	7855.968	10882.548	18738.516		18738.52
8	152	303	5168.4	3591.6	6284.7744	8706.0384	14990.8128		14990.81
8	152	303	5168.4	3591.6	6284.7744	8706.0384	14990.8128		14990.81
37	152	303	5168.4	3591.6	29067.0816	40265.4276	69332.5092		69332.51
12	152	303	5168.4	3591.6	9427.1616	13059.0576	22486.2192		22486.22
17	152	303	5168.4	3591.6	13355.1456	18500.3316	31855.4772		31855.48
38	262	458	5168.4	3591.6	51456.5904	62508.2064	113964.797	45585.91872	159550.7
32	262	458	5168.4	3591.6	43331.8656	52638.4896	95970.3552	38388.14208	134358.5
15	262	458	5168.4	3591.6	20311.812	24674.292	44986.104		44986.1
3	262	458	5168.4	3591.6	4062.3624	4934.8584	8997.2208		8997.221
4	262	458	5168.4	3591.6	5416.4832	6579.8112	11996.2944		11996.29
25	262	458	5168.4	3591.6	33853.02	41123.82	74976.84		74976.84
10	262	458	5168.4	3591.6	13541.208	16449.528	29990.736		29990.74
6	262	458	5168.4	3591.6	8124.7248	9869.7168	17994.4416		17994.44
7	262	458	5168.4	3591.6	9478.8456	11514.6696	20993.5152		20993.52
1	262	458	5168.4	3591.6	1354.1208	1644.9528	2999.0736		2999.074
11	262	458	5168.4	3591.6	14895.3288	18094.4808	32989.8096		32989.81
4	262	458	5168.4	3591.6	5416.4832	6579.8112	11996.2944		11996.29
17	107	303	5168.4	3591.6	9401.3196	18500.3316	27901.6512		27901.65
11	262	458	5168.4	3591.6	14895.3288	18094.4808	32989.8096		32989.81

Site 3 HID Retrofit Analysis:

Annual Operating Hours	Dim %	Full Hrs	50% Hrs	Save @ 0% dim	Save @ 100% dim	Fix	kWh save @ 0% dim	kWh save @ 50% dim	Light Net	Interact	Net HID
4784	0.44	2679	2105	0.224	0.458	13	7,801	12,533	20,334	4,677	25,011
3248	0.44	1819	1429	0.224	0.458	13	5,297	8,509	13,806	3,175	16,981
4784	0.44	2679	2105	0.224	0.458	2	1,200	1,928	3,128	720	3,848
4784	0.44	2679	2105	0.224	0.458	2	1,200	1,928	3,128	720	3,848
4784	0.44	2679	2105	0.224	0.458	2	1,200	1,928	3,128	720	3,848
4784	0.44	2679	2105	0.224	0.458	2	1,200	1,928	3,128	720	3,848
4784	0.44	2679	2105	0.224	0.458	2	1,200	1,928	3,128	720	3,848
4784	0.44	2679	2105	0.224	0.458	11	6,601	10,605	17,206	3,957	21,163
4784	0.44	2679	2105	0.224	0.458	11	6,601	10,605	17,206	3,957	21,163
4784	0.44	2679	2105	0.224	0.458	8	4,801	7,713	12,513	2,878	15,391
4784	0.44	2679	2105	0.224	0.458	8	4,801	7,713	12,513	2,878	15,391
4784	0.44	2679	2105	0.224	0.458	8	4,801	7,713	12,513	2,878	15,391

Site 4 HID Retrofit Analysis:

Net Operating Hours	% dimming	Net Operating Hours at rated kW	Net Operating Hours at 50% rated kW	Base fixture kW	Measure fixture kW	Rated kW savings / unit at 0% dimming	Rated kW savings / unit at 50% dimming	Fixture Count	kWh Savings at rated kW	kWh Savings at 50% rated kW	Total kWh saved	Inter-active Savings	Total Savings
6,240	0.44	3,494	2,746	465	218	0.247	0.3705	2	1,726	2,034	3,761	0	3,761
6,240	0.44	3,494	2,746	458	218	0.240	0.360	6	5,032	5,930	10,962	0	10,962
6,240	0.44	3,494	2,746	458	218	0.240	0.360	3	2,516	2,965	5,481	0	5,481
4,368	0.44	2,446	1,922	458	218	0.240	0.360	7	4,109	4,843	8,953	1,791	10743.18
4,368	0.44	2,446	1,922	465	218	0.247	0.371	12	7,250	8,545	15,795	3,159	18954.04
4,368	0.44	2,446	1,922	465	218	0.247	0.371	6	3,625	4,272	7,898	1,580	9477.022
4,368	0.44	2,446	1,922	458	218	0.240	0.360	64	37,572	44,281	81,853	16,371	98223.39

Appendix C: Surveys

Following are Program surveys. Surveys included in this appendix are:

- Edison Program Manager
- Program Implementer—Onsite Energy
- Participating Warehouses
- Partial Nonparticipant Owners/Managers

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Refrigerated Warehouse Program

Edison Program Manager

Interview Guide

Staff ____
Date ____
Interviewer ____

Program Design

1. What changes were made in Program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
   - ❑ No, Why not ______________________________
   - ❑ Yes
   - ❑ Unknown
3. What was/were the innovative aspect(s) of this Program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with Onsite Energy, billing, incentives Program tracking, or processing contractor rebates.
   - ❑ No
   - ❑ Yes, explain ______________________________
   - ❑ Unknown
5. Were Program rules straightforward and easy to follow? What suggestions do you have for improving Program administration in the coming year?

Overall Lessons Learned

6. Are there barriers to the widespread adoption of these measures in the refrigeration warehouse market that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
   - ❑ No
   - ❑ Yes,
     1. What are they ____
     2. How were they addressed or what suggestions do you have?

        ____
   - ❑ Unknown
7. What have you learned about the refrigeration warehouse industry through this Program? What characteristics make a good candidate for this Program?

Thank you for your time.

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Refrigerated Warehouse Program

Program Implementer—Onsite Energy

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

I am calling on behalf of Southern California Edison. Edison has contracted with us to evaluate the Refrigerated Warehouse Program. I'd like to speak with _______________.
If not available, could I schedule a time to call back to reach Mr./Ms. _______________?

Program Design

1. What changes were made in Program design, approach or outreach from the plan originally submitted?
2. Were the targets met? If not, why not?
   - ❑ No, Why not____
   - ❑ Yes
   - ❑ Unknown
3. What was/were the innovative aspect(s) of this Program? How was the market segment chosen? Why?

Program Administration

4. Were there any issues related to interaction with Edison billing, incentives Program tracking, or processing contractor rebates.
   - ❑ No
   - ❑ Yes, explain ____
   - ❑ Unknown
5. Were Program rules straightforward and easy to follow? What suggestions do you have for improving Program administration in the coming year?

Marketing and Outreach

6. What was your strategy for identifying the target market of refrigeration warehouses? What characteristics or criteria were used to identify potential participating stores? Issues related to identifying and recruiting potential participants? How long did it take? What did it involve? Number/portion of targeted or eligible convenience stores contacted.
7. How was the Program marketed? What methods of contact were employed? What was the relative success of the different methods if different methods were attempted?
   - ❑ Mail
   - ❑ Email
   - ❑ Phone call
   - ❑ Presentation at industry meetings
   - ❑ Other, specify ____________________________________

8. Were contacts and refusals tracked in a spreadsheet? What is known about the disposition of interested/non-interested contacts?
9. All of the projects completed have an HID lighting retrofit component. What is the likelihood that the customers would have pursued the mechanical retrofits without the economic benefits of the lighting retrofits? Please discuss.

Delivery and Implementation

10. Did any issues emerge since project completions/installations?
11. Any central or recurring or unaddressed issues emerge with owners, contractors or the measures installed at any time during the process?
12. Have any of the equipment/measures been removed since they were installed with this Program? If so, what, when, how many?
    - ❑ No
    - ❑ Yes, Explain____
    - ❑ Unknown

Overall Lessons Learned

13. What building/business characteristics make a good candidate for this Program?
14. Why was this project limited to refrigerated warehouses?
15. Have barriers to technology administration or diffusion been identified?
    - ❑ No
    - ❑ Yes, Explain ____
    - ❑ Unknown
16. Are there opportunities in this market?
    - ❑ No
    - ❑ Yes, Explain ____
    - ❑ Unknown
17. Are there barriers to the widespread installation of the Program measures that you are aware of? What are they? How were issues/barriers addressed, or, if not addressed, what suggestions do you have to address them?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Other, specify ____
18. Is the Program scalable into a larger Program? What aspects of the Program will have to change if it were expanded?
    - ❑ No
    - ❑ Yes, Explain ____
    - ❑ Unknown

Thank you for your time

Refrigerated Warehouse Program

Participating Warehouses

Delivered during site visits by Summit Blue

Facility Name ____
Facility Type ____
Date ____
Interviewer ____

Marketing and Outreach

1. Could you tell me who contacted you about Edison's Refrigerated Warehouse lighting and refrigeration efficiency Program and explained what the Program was about?
   - ❑ Program Implementer - Onsite Energy
   - ❑ Installer
   - ❑ Edison rep
   - ❑ Other, specify __________________________________
2. How was the information delivered?
   - ❑ Mail
   - ❑ Phone call
   - ❑ Attended a presentation
   - ❑ Trade Show
   - ❑ Other, specify __________________________________
3. How was the Program explained to you? What are the Program's benefits?
4. Were you aware of the energy efficient lighting and refrigeration technologies that were installed in your warehouse before being contacted about this Program?
   - ❑ No
   - ❑ Yes
   - ❑ Not Sure
5. Why did you decide to participate? What factors were key to your decision?
6. How important was Edison's sponsorship of this Program to your decision to participate? Please explain your answer.
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important
7. How important was the incentive in the decision to participate?
   - ❑ Not at all important
   - ❑ Somewhat important
   - ❑ Not important and not unimportant
   - ❑ Somewhat important
   - ❑ Very important

8. About what percentage of your overall project cost was contributed by Edison through this Program? (i.e., how much were incentives & what % cost did they cover)?
9. [ASK IF PROJECT INCLUDED MECHANICAL COMPONENT]   What is the likelihood that you would have pursued the mechanical retrofits without the economic benefits of the lighting retrofits? Please discuss.

Delivery and Implementation

10. How did this lighting and refrigeration work fit with planned replacement and/or maintenance? Was any of this equipment scheduled for replacement/upgrade before the Program? [If yes, probe]
    a. Which equipment
    b. What is the likelihood that you would have installed equipment with the same efficiency that was installed through the Program?
        [Highly likely / somewhat likely / somewhat unlikely / Highly unlikely / Don't know]
11. Were any issues/problems encountered during the audit or installation?
12. Did you change the manner in which you operated equipment or lighting after hearing about the Program, after the audit, or after the equipment was installed?
    - ❑ No...Continue to Q13
    - ❑ Yes
        i. Did you reduce the number of operating hours or change the operation schedules? How?

Market/Customer Response

13. Has any lighting/mechanical equipment been removed since they were installed with this Program?
    - ❑ No...Continue to Q14
    - ❑ Yes
        a. If Yes, what, how many?
        b. Why were they removed or replaced?
        c. When were they removed or replaced?
        d. How likely is it that equipment will be replaced with equally efficient equipment
    - ❑ Not Sure

Lighting Response

14. Has the lighting equipment performance met your expectations?
    - ❑ No...Please explain
    - ❑ Yes
    - ❑ Not Sure
15. Have you noticed a change in the level of light since the new lighting was installed?
    - ❑ No
    - ❑ Yes
        - [If yes] Has it [increased a lot / increased some / decreased some / decreased a lot]
    - ❑ Not Sure

16. Are you satisfied with the performance of the systems that dims the lights when an area is unoccupied?
    - ❑ No..Please explain
    - ❑ Yes
    - ❑ Not Sure
17. In the refrigerated areas, do you feel that the level of heat generated by the new lighting system is less that the heat generated by the old lights that were replace?
    - ❑ No
    - ❑ Yes
        - Is it [a little reduction / some reduction / a great deal of reduction / other – (please explain 'other')]
    - ❑ Not Sure

Mechanical Installations Only -- # 18-19

18. Has the mechanical equipment performance met your expectations?
    - ❑ No..Please explain
    - ❑ Yes
    - ❑ Not Sure
19. Has the installation of the lighting/mechanical equipment resulted in any other benefits (non-energy) to your operations?
    - ❑ No
    - ❑ Yes ....Please explain
    - ❑ Not Sure

Free Ridership

RECORD ANSWERS TO 20-24 IN TABLE 1

20. Before this Program, had you previously installed the same type of *technology* without an incentive?
    - **a. LIGHTING**
        - ❑ No
        - ❑ Yes, [Table 1 Col A]
            - If Yes, To the same level of efficiency? [Table 1 Col B]
                1. No What efficiency? ________________________________
                2. Yes
            - If Yes, Number or percent of store fixtures were installed with T5? [Table 1 Col C] ___ # or %
        - ❑ Uncertain
    - **b. MECHANICAL**
        - ❑ No
        - ❑ Yes, [Table 1 Col A]
            - If Yes, To the same level of efficiency? [Table 1 Col B]
                1. No What efficiency? ________________________________
                2. Yes
            - If Yes, Number or percent of store fixtures were installed with T5? [Table 1 Col C] ___ # or %
        - ❑ Uncertain

21. Before participating in this Program, did you consider installing the *Technology* without the Program incentive?
    a. **LIGHTING**
        - ❑ No [If No/Uncertain to lighting & mechanical, Skip to Spillover]
        - ❑ Yes
        - ❑ Uncertain [If No/Uncertain to lighting & mechanical, Skip to Spillover]
    b. **MECHANICAL**
        - ❑ No [If No/Uncertain to lighting & mechanical, Skip to Spillover]
        - ❑ Yes
        - ❑ Uncertain [If No/Uncertain to lighting & mechanical, Skip to Spillover]
22. Would you have installed the *Technology* [Table 1 Col D]
    a. **LIGHTING**
        - ❑ In the same year
        - ❑ In one to two years
        - ❑ In three to five years
        - ❑ More than five years out
    b. **MECHANICAL**
        - ❑ In the same year
        - ❑ In one to two years
        - ❑ In three to five years
        - ❑ More than five years out
23. Did you have funding for this *Technology* in your short or long-term capital improvements plan/budget? [Table 1 Col E]
    a. **LIGHTING**
        - ❑ No
        - ❑ Short Term (0-1 years)
        - ❑ Long Term 1-5 years)
    b. **MECHANICAL**
        - ❑ No
        - ❑ Short Term (0-1 years)
        - ❑ Long Term 1-5 years)
24. Was it already ordered? [Table 1 Col F]
    a. **LIGHTING**
        - ❑ No
        - ❑ Yes
    b. **MECHANICAL**
        - ❑ No
        - ❑ Yes

Table 3. Free Ridership Grid: Enter For each installed Program measure

	Installed before Program (Q4)			Considered installing without incentives (Q6 - Q8)		
	Col A	Col B	Col C	Col D	Col E	Col F
Measure*	Installed w/o incentive?	Same level of Efficiency?	Amount of Measures?	Time Frame	Budgeted?	Ordered?
Lighting						
Mechanical (condenser, compressor etc.)						
Controls						

*Add locations or technology as needed

25. If *Technology* was considered and not installed before this Program, why was it not installed?
    a. **LIGHTING**
        - ❑ High first cost
        - ❑ In capital budget for future installation
        - ❑ Unable to obtain financing
        - ❑ Didn't know a contractor
        - ❑ Other, specify ________________________________
    b. **MECHANICAL**
        - ❑ High first cost
        - ❑ In capital budget for future installation
        - ❑ Unable to obtain financing
        - ❑ Didn't know a contractor
        - ❑ Other, specify ________________________________

Spillover

26. Would you install this type of *Technology* in the future, either at your own expense; or with incentives?
    a. **LIGHTING**
        - ❑ Not at own expense or with incentives
        - ❑ Yes at own expense
        - ❑ Yes with incentives
        - ❑ Uncertain
    b. **MECHANICAL**
        - ❑ Not at own expense or with incentives
        - ❑ Yes at own expense
        - ❑ Yes with incentives
        - ❑ Uncertain

27. Do you have any plans to install *Technology* at other warehouses you manage?
    a. **LIGHTING**
        - ❑ No
        - ❑ Yes, When
            9. This year
            10. In one to two years
            11. In three to five years
            12. More than five years out
    b. **MECHANICAL**
        - ❑ No
        - ❑ Yes, When
            1. This year
            2. In one to two years
            3. In three to five years
            4. More than five years out
28. Since participating in the Program, have you installed any additional energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ No
    - ❑ Yes, Please describe the type of energy efficient equipment you added.
29. [ASK IF 27 OR 28 = YES] Overall, how influential would you say participating in the Program was in your decision to add other energy efficient equipment?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Neutral
    - ❑ Somewhat not influential
    - ❑ Not at all influential

Market Barriers to Adoption

30. Can you tell me how satisfied you are with the performance of the *Technology*? Would you say:
    a. **LIGHTING**
        - ❑ Very satisfied
        - ❑ Somewhat satisfied
        - ❑ Neutral
        - ❑ Somewhat not satisfied
        - ❑ Not at all satisfied
    b. **MECHANICAL**
        - ❑ Very satisfied
        - ❑ Somewhat satisfied
        - ❑ Neutral
        - ❑ Somewhat not satisfied
        - ❑ Not at all satisfied

31. Do you think refrigerated warehouses are a viable market niche for these technologies? Explain.
32. Are there barriers to the widespread installation of the *Technology* in refrigerated warehouses that you are aware of? What are they? [Do not read. Check all that apply]
    a. LIGHTING
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____

    b. MECHANICAL
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Lights not appropriate to market
    - ❑ Facility managers don’t think they’ll save energy or money
    - ❑ Other, specify ____

Satisfaction

33. How satisfied are you with the Program overall?
    - ❑ Very satisfied
    - ❑ Somewhat satisfied
    - ❑ Neutral
    - ❑ Somewhat not satisfied
    - ❑ Not at all satisfied
34. Do you have any suggestions for Program changes in terms of the selection of products, marketing, delivery, warranty service, training, etc.?
35. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes,   When, what Program was it?
    - ❑ Uncertain

Thank you for your time and assistance in evaluating this Program.

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Refrigerated Warehouse Program

Partial Nonparticipant Owners/Managers

Warehouses that heard about the Program and decided not to participate, or who signed on and dropped out.

I am calling on behalf of Southern California Edison. We are evaluating the Refrigerated Warehouse Program. This Program worked directly with refrigeration warehouses to implement energy efficiency projects. I'd like to speak with ______________________ or the person who may remember being contacted about this Program. Is ___ available?
If not, could I schedule a time to call back to reach Mr./Ms. _______________________?
If someone other than original contact is respondent, repeat introduction.

Marketing and Outreach
Questions for nonparticipating businesses that were contacted about the Program and chose not to participate, or who were Program dropouts

1. Do you remember when you were contacted about Edison's Refrigerated Warehouse lighting and refrigeration efficiency Program? [Do not read responses]
    - ❑ No, don't remember
    - ❑ Yes When were you contacted? ______________________________
    - ❑ Uncertain
2. Who contacted you and explained what the Program was about? [Do not read. Check all that apply]
    - ❑ Edison
    - ❑ Program implementer/Onsite Energy
    - ❑ Maintenance contractor
    - ❑ Other, specify _______________________________________
3. How was the information delivered? [Do not read. Check all that apply]
    - ❑ Mail
    - ❑ Phone call
    - ❑ In person
    - ❑ Email
    - ❑ Other, specify _______________________________________
4. Could you tell me how the Program was explained to you? What are the Program's benefits? [Do not read. Check all that apply]
    - ❑ Program will help customers save energy and/or money
    - ❑ Southern California Edison would pay for the audits
    - ❑ Southern California Edison offered incentives to help with project costs
    - ❑ This was an experiment
    - ❑ It was never explained to me
    - ❑ Other, record comments verbatim _______________________________
5. Why did you decide not to participate [Do not read list. Probe if needed]
    - ❑ Wasn't enough incentive
    - ❑ Don't have funding /not in the capital budget
    - ❑ Don't believe the technologies will save any energy or money

- ❑ Payback is too long
- ❑ Just not interested right now/too busy right now
- ❑ Didn't fit with regular maintenance schedule
- ❑ Didn't look into it
- ❑ Didn't think I qualified
- ❑ Didn't understand what it was about
- ❑ Decision maker is someone else and they weren't interested
- ❑ Might do it in the future
- ❑ Other, specify ____

6. Were you aware of the following technologies or services before being contacted about this Program? (record in Table 1)

Table 4. Product Awareness Grid: Enter For each installed Program measure

Measure/Service	No	Yes	Uncertain
Energy efficient freezer & cooler doors			
Refrigeration control systems			
Low temp T5 fixtures			
Automatic non-condensable purgers			
Variable frequency drives on process pumps and fans			

Free Ridership/Early Adopters

7. Before hearing about this Program, had you previously installed any of these types of *technologies* without an incentive? [Please note if respondent comments they installed with an incentive: from whom, what Program, when, etc.]
   a. LIGHTING (Low temp T5 fixtures)
   - ❑ No
   - ❑ Yes, [Table 2 Col A]
     - If Yes, To the same level of efficiency? [Table 2 Col B]
       1. No What efficiency? ______________________________
       2. Yes
     - If Yes, Number or percent of store fixtures were installed with T5? [Table 2 Col C] ___ # or %
   - ❑ Uncertain

   b. MECHANICAL
   - ❑ No
   - ❑ Yes, [Table 2 Col A]
     - If Yes, To the same level of efficiency? [Table 2 Col B]
       1. No What efficiency? ______________________________
       2. Yes
     - If Yes, Number or percent of store fixtures were installed with T5? [Table 2 Col C] ___ # or %
   - ❑ Uncertain

8. Would you install this type of *Technology* in the future, either at your own expense; or with incentives?
    a. **LIGHTING (**Low temp T5 fixtures)
        - ❑ Not at own expense or with incentives [Skip to Q13]
        - ❑ Yes at own expense
        - ❑ Yes with incentives
        - ❑ Uncertain [Skip to Q13]
    b. **MECHANICAL**
        - ❑ Not at own expense or with incentives [Skip to Q13]
        - ❑ Yes at own expense
        - ❑ Yes with incentives
        - ❑ Uncertain [Skip to Q13]
9. Do you have any plans to install *Technology* at other warehouses you own or manage? [Table 2 Col D]
    a. **LIGHTING (**Low temp T5 fixtures)
        - ❑ No
        - ❑ Yes, When
            13. This year
            14. In one to two years
            15. In three to five years
            16. More than five years out
    b. **MECHANICAL**
        - ❑ No
        - ❑ Yes, When
            1. This year
            2. In one to two years
            3. In three to five years
            4. More than five years out
10. Do you have funding for this *Technology* in your short or long-term capital improvements plan/budget? [Table 2 Col E]
    a. **LIGHTING (**Low temp T5 fixtures)
        - ❑ No
        - ❑ Short Term (0-1 years)
        - ❑ Long Term 1-5 years)
    b. **MECHANICAL**
        - ❑ No
        - ❑ Short Term (0-1 years)
        - ❑ Long Term 1-5 years)
11. Is it already ordered? [Table 2 Col F]
    a. **LIGHTING (**Low temp T5 fixtures)
        - ❑ No
        - ❑ Yes
    b. **MECHANICAL**
        - ❑ No
        - ❑ Yes

Table 5. Free-Ridership Grid: Enter For each installed Program measure

	Installed before hearing about Program (Q4)			Considered installing without incentives (Q6 - Q8)		
	Col A	Col B	Col C	Col D	Col E	Col F
Measure*	Installed w/o incentive?	Same level of Efficiency?	Amount of Measures?	Time Frame	Budgeted?	Ordered?
Energy efficient freezer & cooler doors						
Refrigeration control systems						
Low temp T5 fixtures						
Automatic non-condensable purgers						
Variable frequency drives on process pumps and fans						

*Add locations or technology as needed

12. Have you considered the *lighting or mechanical technology* and not installed it?
    - ❑ No..[Skip to Q14]
    - ❑ Yes, why was it not installed?
    - **a. LIGHTING (**Low temp T5 fixtures)
        - ❑ High first cost
        - ❑ In capital budget for future installation
        - ❑ Unable to obtain financing
        - ❑ Didn't know a contractor
        - ❑ Other, specify ____
    - **b. MECHANICAL**
        - ❑ High first cost
        - ❑ In capital budget for future installation
        - ❑ Unable to obtain financing
        - ❑ Didn't know a contractor
        - ❑ Other, specify ____

Spillover

13. Since hearing about the Program, have you installed any other energy efficiency measures without incentives from your utility or other energy organizations?
    - ❑ No
    - ❑ Yes, Please describe the type of energy efficient equipment you added
14. Overall, how influential would you say hearing about the Program was in your decision to install other energy efficient equipment?
    - ❑ Very influential
    - ❑ Somewhat influential
    - ❑ Moderately influential
    - ❑ Not at all influential

Market Barriers to Adoption

15. Thinking about refrigerated warehouses in general what are the barriers to the installation of refrigeration warehouse efficiency measures such as the lighting and mechanical measures we've been talking about?
    - ❑ Cost
    - ❑ Education/marketing
    - ❑ Time
    - ❑ Facility managers don't think they'll save energy or money
    - ❑ Doesn't fit with regular maintenance schedules
    - ❑ Other, specify ____
16. Do you have any suggestions for Program changes that would have influenced your decision not to participate?   [for example, selection of products, marketing, delivery, warranty service, training, etc.]
17. Have you participated in any other Southern California Edison energy efficiency programs?
    - ❑ No
    - ❑ Yes,   When, what Program was it? ______________________
    - ❑ Uncertain

Thank you for your time.

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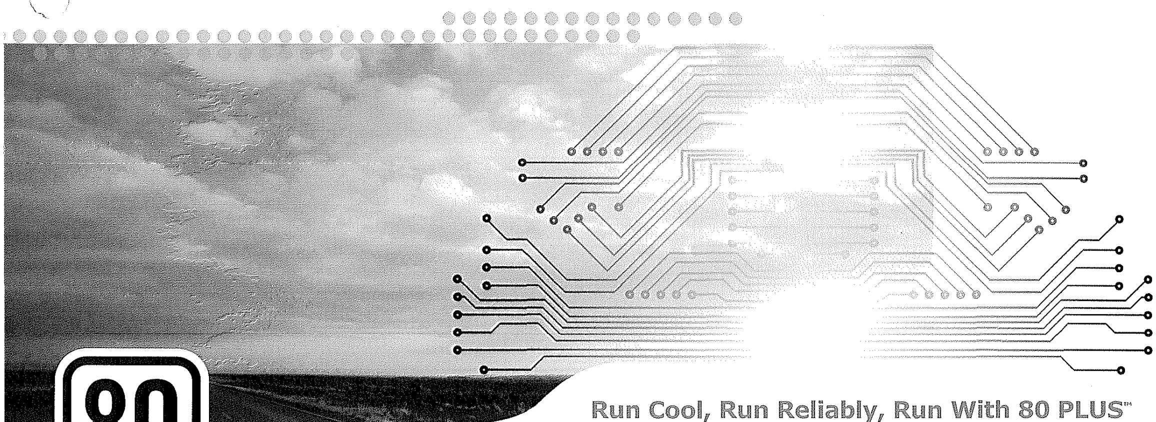
13.80 Plus Program

Appendix A: 80 Plus Marketing Materials

This section contains image samples of 80 Plus Marketing Materials.



80 PLUS™

Run Cool, Run Reliably, Run With 80 PLUS™

Energy-Efficient Computers Run With 80 PLUS™

Plug In to the Power of Innovation

What is 80 PLUS™?

80 PLUS™ is an innovative, electric utility-funded incentive program to integrate more energy-efficient power supplies into desktop computers and servers.

The 80 PLUS™ performance specification requires power supplies in computers and servers to be 80% or greater energy efficient. This makes an 80 PLUS™ certified power supply at least 33% more efficient than current power supplies.

What are Power Supplies?

Power supplies are the devices that power computers and servers. They convert AC power from electric utilities into DC power used in most electronics.

New ENERGY STAR® Specification Adopts 80 PLUS™

98% of computers on the market meet the current ENERGY STAR® specifications, which are now over more than a decade old. The EPA has drafted updated requirements that include 80 PLUS™ efficiency levels. The new requirements are expected to take effect in late 2007.

Take Advantage of 80 PLUS™

Computer Industry

Incorporate 80 PLUS™ certified power supplies into personal computers and servers to tap into a new and growing market opportunity. The 80 PLUS™ program provides: financial incentives, cooperative marketing funds to help promote qualified products, innovative market differentiation, and the ability to meet a growing demand for green IT products.

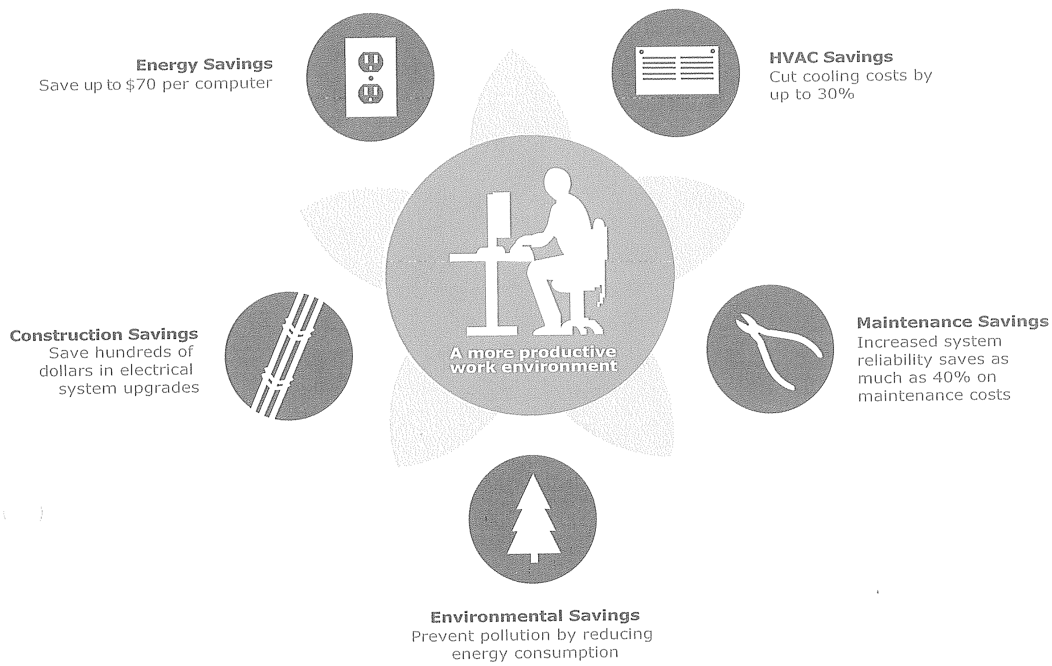
Consumers (Commercial and Institutional)

Specify 80 PLUS™ in purchasing policies and realize the many benefits of energy-efficient computers. 80 PLUS™ computers: reduce energy consumption and save money, reduce heat output from computers and decrease building cooling costs, increase computer reliability and save on computer maintenance costs, and allow more computers to be run on the same branch circuit and avoid costly electrical infrastructure upgrades.

Electric Utilities and Energy Efficiency Organizations

Add 80 PLUS™ to energy efficiency portfolios to achieve cost-effective energy savings and bring verifiable efficiencies to the largest component of plug load. 80 PLUS™ provides: significant peak and non-peak energy savings, resource acquisition at less than $.03 per kWh, energy-efficient power supplies that operate at a high power factor, and a unique opportunity to bring energy efficiency to the consumer electronics industry.

Benefits of 80 PLUS™ Qualified Computers



Huge Savings on Every Computer

80 PLUS™ In the News

Going Beyond ENERGY STAR® to Save Energy When Purchasing Computers
FEMP Focus (U.S. Department of Energy newsletter) Winter/Spring 2005

"If you buy 1,000 computers [with 80 PLUS™ qualified power supplies] a year, participating in this program could cut your electric bills by $18,000 after just two years, not counting air conditioning savings and the value of improving power quality."

Power Thrifty PCs: Billion-Dollar Savings With Better Power Supplies
Steven Ashley, Scientific American, June 2004

"Making PC power supplies 80% efficient...could save U.S. energy use by 1% to 2% and pare $1 billion or more from the nation's yearly electric bills while cutting emissions from generating plants significantly."

Electron Leak? Raging Torrent!
Bill Machrone, PC Magazine, November 16, 2004

"...desktop power supplies need an efficiency overhaul to counteract another trend: Graphics card power consumption is rising much faster than any other component in the system, potentially doubling between this year and next—making it by far the hungriest component in the system."

Boosting Power Supply Efficiency for Desktop Computers
Dhaval Dalai, Power Electronics Technology, February 2005

"Wouldn't it be nice to have a power supply that does not stand out like a sore thumb in your computer system? Not to mention the fact that each year such a transition would save greater than 10 billion kWh of energy globally."

Intel Backs a More-Efficient PC Power Supply: New Design Could Reduce Computer's Needed Energy By a Third, at a Cost of $10
Jim Carlton, Wall Street Journal, February 26, 2004

"According to the NRDC, the more efficient power supplies would save enough electricity annually to meet the needs of a city the size of Chicago, reducing power-plant emissions by the equivalent of 13 million cars."

"These energy-efficient computers are helping us to overcome the challenge we face in getting technology into our older schools. The reduction in energy consumption from each 80 PLUS™ qualified computer ultimately means that more of our students will have access to these essential educational tools."

Ken Ainsworth, Technology Director for Marysville School District

....

"The 80 PLUS™ program is helping us deliver superior technology to our customers. Moreover, they gain significant benefits from the energy savings and improvements in product reliability."

Jordan Malkin, Operations Manager for Microstandard

For more information on 80 PLUS™ contact:
info@80PLUS.org
1.877.4.80PLUS or visit
www.80PLUS.org

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Appendix B: Surveys

Following are the surveys for the evaluation of the 80 PLUS Program. Included surveys are:

- Edison Program Manager
- Ecos Staff
- EPA Staff
- Power Supply Manufacturers
- Participant Trade Allies
- Nonparticipant Power Supply Manufacturers
- Nonparticipant Trade Ally

IDEEA Program Evaluation – 80 Plus

Edison Program Manager

Interview Guide

Name: ____

Title:____________________________________ Phone: ______________________________

Interview date: _________________________________ Interviewer initials: ______________

1. Please describe your role as 80 Plus Program Manager.
2. The programs goals include increased use by manufacturers of power supply systems that meet 80 Plus standards; increased outreach to manufacturers about the benefits of these systems, and outreach to the general consumer. Could you describe efforts to reach power supply manufacturers? What more do you think could be done?
3. The program was approved for 2005 program year before an evaluation was completed. On what basis was the decision made to renew or mainstream the program?
4. What kind of reporting and data is provided by the implementers?
5. Have there been data or reporting issues?
6. How could the program design be improved?
7. Should additional efforts be made to promote the program with the general consumer?
8. Other comments and issues

IDEEA Program Evaluation - 80 PLUS

Ecos Consulting Staff

Interview Guide

Staff Name: ____ Title: ___________________
Interview Conducted by:______________________________ Date: ___________________

1. What has your role been in working with EDISON on the 80 Plus portion of IDEEA?
2. What do you feel have been among the most valuable lessons that ECOS has learned to date in terms of working with power supply manufacturers in California? With other market actors?
3. Given the experience in the market now, are there are other indicators (in addition to market penetration) that should be used to evaluate the Program's success? Have project goals been modified for its final year?

Marketing & Market Actors

4. What role do the key market actors play?
   - ❑ sponsors
   - ❑ power supply manufacturers
   - ❑ system integrators
   - ❑ end users
   - ❑ EPA for ES
   - ❑ OEMs
   - ❑ Others?
5. What outreach activities have been most successful? Least successful?
6. What do you think is needed to increase interest/participation of the various market actors?
7. How long does it typically take from 80 PLUS certification to see the product sold in the marketplace?
8. Does it take more effort to influence some of the market players than others? What differences have you observed?
9. Do you think that sponsorship has an impact or influence on decisions to manufacture/specify/integrate 80 PLUS ? Could you give me an example?
10. Did the "group support" letters impact/influence decisions to manufacture 80 PLUS ?
11. What needs to happen for 80 PLUS power systems to become "mainstream"? What percent of the market is considered 'mainstreamed'? Or, what does it mean with this product?
12. Is there a 'tipping point' for this market? What is it?
13. What impact will Hewlett Packard's participation in the 80 Plus Program have on 80 PLUS ?
14. Are there significant differences between the market in CA and in the Northwest? What are some of the differences that you have observed?

Non-Energy Benefits

15. What have you identified as non-energy benefits of 80 PLUS? What role do you think that non-energy benefits have play in promoting 80 PLUS? (Probe for additional market drivers, including heat budget - both individual system and at business level with hot computer rooms, remodeling for cooling, Wall St. example, etc.)

Incremental Costs

16. When the Program began, projected rebates were designed to be roughly equivalent to the incremental cost associated with building an 80+ power supply (rebates were sent directly to the OEMs with the expectation that the end user would realize savings in lower operating costs (desktops 85kW/yr and 301 kW/yr for servers). Have you found that anticipated incremental costs for produce these machines are higher than anticipated?
17. Do you believe it will decrease over time? By how much?

EPA ENERGY STAR Spec

18. Who role do you think the 80 PLUS initiative had on the new EPA ENERGY STAR specifications?
19. What role did other market actors play in influencing the new ENERGY STAR specifications?

20. What are some of the concerns raised by those opposing the new ENERGY STAR specifications? How have they reacted to 80 PLUS?

Market Response

21. Do you think that the personal computer market is changing in response to increased energy efficiency demands? Do you think this is part of a larger trend in the market?
22. Where is the market for 80 PLUS power supplies going from here? (Mention blade servers, System Integrators I buying chassis with the power supply installed)

Other

23. Would you like to add anything else about your experience with the 80 PLUS product, or add anything that we should consider in this evaluation?

Thank you for your time.

80 PLUS Program

Environmental Protection Agency Staff

Interview Guide

Staff Name ______________________________
Date ______________________________
Interviewer ______________________________

Introduction

My name is ____________________. We are conducting an evaluation of the 80 PLUS program, and have a few questions regarding the new ENERGY STAR specification for computers. Is this a good time to talk?
(Proceed or arrange call time)

ENERGY STAR Specifications

1. How was the upcoming ENERGY STAR computer specification developed?
2. How does it differ from the current specification?
3. What were the primary reasons for the changes?
4. (If not mentioned) Why was the decision made to include standards for power supply efficiency as part of the new specifications?
5. Who have been some of the most important market actors to contribute to the development and/or changes of Energy Star specifications?
6. Do you believe the 80 PLUS initiative had any influence on the upcoming specifications? How so?
7. On a scale of "1" to "5", where "1" is not at all influential and "5" is extremely influential, how important was the 80 PLUS initiative in influencing the specifications?
8. Did the development of the ENERGY STAR computer specification differ from the development of other specifications? (If yes) How so?

Marketing & Market Actors

9. How do you believe the change in the ENERGY STAR specifications will impact the computer power supply market? How so?
10. How will it impact the PC market in general?

Non-Energy Benefits

11. What is the role/importance of other non-energy benefits vs. the energy savings for efficiency power supplies? Which ones are most important? (If necessary probe: decreased parts count, reduced footprint, quieter operation, etc.)

Other

12. Is there anything else that you would like to add, or any other topics you would like us to consider for this evaluation?

Thank you for your time.

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IDEEA Program Evaluation – 80 Plus

Participant Power Supply Manufacturers

Interview Guide

Name: ____
Title:_________________________________ Phone: ________________________________
Interview date: __________________________________ Interviewer: _____________________

Background

1. How long have you worked at ______________________? What is your role here?
2. Which component parts are manufactured by your company? How many power supplies are manufactured? (Standard and 80PLUS)
3. How did you first learn about 80 PLUS? Did you know about this technology before approached by ECOS?

Decision-making

4. (Nonparticipant manufacturers) What are the factors behind your decision to not manufacture such power supplies? How much of this is related to incremental cost?
5. Are you familiar with the financial incentives available to support the production of 80 Plus?
6. What are the incremental costs of manufacturing 80 PLUS? Has the incremental cost changed since you started manufacturing these systems? How will it change as production increases?
7. What will it take to bring manufacturing costs in line with current power supply manufacturing cost? Is there a tipping point that brings the price down?

Marketing & Market Actors

9. What is your opinion of the 80 PLUS marketing materials?
10. How would you describe the current market demand for 80 PLUS products?
11. What needs to happen for 80 PLUS power supplies to become mainstreamed?
12. How will the 80 PLUS power supply influence changes in the industry?
13. What other changes are happening in the PC industry? Are they synergistic with 80 PLUS?
14. What impact does the 80 PLUS power supply have on development of other system components?

Thank you for your time.

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80 PLUS Program
Participant Trade Allies
Interview Guide

Business ______________________________
Staff Name ______________________________
Date ______________________________
Interviewer ______________________________

Introduction

Hello, my name is ____________________. I am calling on behalf of Quantec, LLC. We are conducting an evaluation of 80 PLUS Personal Computer power supplies. As part of this, we would like to speak with power supply manufacturers that are not currently participating in the 80 PLUS program. Do you have a few minutes to talk with me, or may I arrange a time to call you back? The interview will take about 20 minutes.
(Proceed or arrange call time)

Background

1. Are you familiar with 80 Plus standard for power supplies? [IF NOT, PROBE FOR ANOTHER RESPONDENT AT COMPANY] How did you first learn about 80 PLUS?
2. How long have you worked at ______________________? What is your role there?
3. What types of computer systems does your company produce? Approximately how many systems a year?
4. Why did your company decide to participate in the 80 PLUS initiative? *(listen for but do not prompt: enhanced reliability, improved performance and efficiency, environmental performance)*
5. Do you recall hearing about "group support" letters in favor of 80 PLUS? [IF YES, PROBE - WHAT THEY HEARD AND IF IT INFLUENCED THEM]. Do you recall hearing about sponsorship by other agencies [SAME PROBE]; newspaper articles; trade shows etc. Anything else?

Sales

6. Could you tell me approximately how many PCs your company sold last year? Do you know approximately how many – or what percentage of these – were Energy Star certified?
7. [ASK OF THOSE THAT HAVE SOLD 80 PLUS PCs] Was this what you expected to sell? Why/Why not?
8. IF APPLICABLE: Why do you think you have not sold [MORE/ANY] 80 PLUS PCs?
9. What are the projected sales for 80 PLUS through this year? Next year? [DESCRIBE YEAR THEY USE, I.E., CALENDAR YEAR OR FISCAL YEAR-DATES, USE CALENDAR YEAR FOR PROJECTION]

Production

10. Let's talk about some of the challenges you may have encountered in order to offer 80 PLUS PCs? [LISTEN FOR: ISSUES WITH THE UNITS, DELIVERY CONCERNS, ETC.) What did you do in order to get past these challenges?

11. What specific ordering or production changes, if any, has your company had to make in order to produce 80 PLUS qualified PCs? [IF RESPONDENT HAS NOT PRODUCED ANY, WHAT CHANGES DO THEY ANTICIPATE MAKING IN THE FUTURE]
12. What is (or was) the lead time needed to bring 80 PLUS to full production?

ENERGY STAR

13. Do you think that the 80 PLUS program impacted ENERGY STAR standards?
14. Is your company changing product offerings in response to the new expected ENERGY STAR specifications? How?

Incremental Cost

15. What is the incremental cost of manufacturing 80 PLUS PCs? Has the incremental cost changed since you started offering these systems? How will it change as production increases?
16. What financial incentives (if any) do you receive to produce this product?
17. Do incentives cover the incremental cost?

Non-Energy Benefits

18. Are there any benefits for you to producing 80 PLUS power supplies other than saving energy? And for your customers?
19. IF OTHER BENEFITS ARE MENTIONED: What is the role/importance of these benefits vs. the energy savings for efficiency power supplies? Which ones are most important? [IF NECESSARY PROBE: DECREASED PARTS COUNT, REDUCED FOOTPRINT, QUIETER OPERATION, ETC.]
20. Of these other benefits, which specific ones do you think are most compelling to end users, or your potential customers? Do you mention these benefits when you are marketing 80 PLUS Power supplies to your customers.

Marketing & Market Actors

21. What percentage of your customers are aware of 80 PLUS?
22. What percentage request it?
23. What types of customers are aware of or request 80 PLUS?
24. What are you doing to market 80 PLUS to your customers? What is your company doing to getting customers more interested or willing to commit to 80 Plus power supplies?
25. What do you think are the barriers to widespread adoption of 80 PLUS Power supplies?
26. How will the 80 PLUS power supply influence changes in the industry?
27. What other changes are happening in the PC industry? Do you see them as being synergistic or at odds with 80 PLUS?

Goals and Success Indicators

28. What are your goals with to respect 80 PLUS in the near future? How would you measure its success?
29. What do future program opportunities look like with respect to increased power supply efficiency components? (Listen for and probe: blade servers, System Integrators buying chassis with the power supply installed)

Additional Information

30. Would you like to add anything else about your experience with 80 PLUS, or add anything that we should consider in this evaluation?

Thank you for your time.

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80 PLUS Program

Nonparticipant Power Supply Manufacturers

Interview Guide

Business ____
Staff Name ____
Date ____
Interviewer ____

Introduction

Hello, my name is ____________________. I am calling on behalf of Quantec, LLC. We are conducting an evaluation of 80 PLUS Personal Computer power supplies. As part of this, we would like to speak with power supply manufacturers that are not currently participating in the 80 PLUS program. Do you have a few minutes to talk with me, or may I arrange a time to call you back? The interview will take about 20 minutes. (Proceed or arrange call time)

Background

1. How long have you worked at ______________________? What is your role there?
2. Which personal computer component parts are manufactured by your company? How many different power supplies do you manufacture?
3. Are you familiar with the 80 PLUS standards for power supplies? Am I correct that your company does not currently participate in the 80 Plus program? Has your company been approached by ECOS or another advisor regarding the 80 PLUS program?

INTERVIEWER - IF NOT AWARE: Give interviewee a brief description of what 80 PLUS is. Also, ask probing questions – Is your company considering manufacturing these? Why/Why not? What are the barriers to taking this on?

4. Do you recall which factors influenced the decision to NOT manufacture 80 PLUS power supplies? *(enhanced reliability, improved performance and efficiency, environmental performance)*
5. Could you tell me who your primary customers are?
6. Are your customers aware of 80 PLUS? What percentage requests it? What are the barriers to asking for it? Do you plan to promote 80 PLUS compatible power supplies to your customers in the future?
7. What do you feel are the barriers to adopting 80 Plus for the nonparticipating manufacturers? Is it just customer demand (if applicable)? What do you think needs to happen for 80 PLUS power supplies to become standard?
8. What specific changes could 80 Plus influence in the industry?
9. What other changes are happening in the PC industry? Are they synergistic with 80 PLUS?
10. Do you have any general comments that you would like to add regarding 80 PLUS?

Thank you for your time.

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80 PLUS Program

Nonparticipant Trade Ally

Interview Guide

Business ______________________________
Staff Name ______________________________
Date ______________________________
Interviewer ______________________________

Introduction

Hello, my name is ____________________. I am calling on behalf of Quantec, LLC. We are conducting an evaluation of 80 PLUS Personal Computer power supplies. As part of this, we would like to speak with system integrators that are not currently participating in the 80 PLUS program. Do you have a few minutes to talk with me, or may I arrange a time to call you back? The interview will take about 20 minutes.
(Proceed or arrange call time)

Background

1. Are you familiar with 80 PLUS standards for power supplies? [IF NOT, PROBE AWARE, ASK FOR ANOTHER RESPONDENT AT COMPANYTHAT MIGHT BE AWARE; IF NO RESPONDENT IS AWARE THEN TERMINATE]
2. [IF YES] How would you describe the 80 PLUS Program?
   [IF RESPONDENT DEMONSTRATES UNDERSTANDING OF THE PROGRAM CONTINUE; IF NOT EXPLAIN THAT WE ARE LOOKING FOR SOMEONE WITH MORE DETAILED KNOWLEDGE OF THE PROGRAM THAT MAY HAVE CONSIDERED PARTICIPATING; PROVIDE PROGRAM WEB SITE AND CONTACT INFO IF THEY ARE INTERESTED]
3. How did you first learn about 80 PLUS?
4. Why did your company decide to NOT to participate in the 80 PLUS initiative? *(listen for but do not prompt: enhanced reliability, improved performance and efficiency, environmental performance)*
5. On a scale of 1 to 5, where 1 is “very unlikely’ and 5 is “very likely,” how likely are to you manufacture computers with the 80 PLUS power supply in the next year? Why is that?

ENERGY STAR

6. Do you think that the 80 PLUS program impacted ENERGY STAR standards?
7. Is your company changing product offerings in response to the new expected ENERGY STAR specifications? How?

Incremental Cost

8. What is the incremental cost of manufacturing 80 PLUS PCs? Has the incremental cost changed since you started offering these systems? How will it change as production increases?
9. What financial incentives (if any) do you receive to produce this product?
10. Do incentives cover the incremental cost? (can start up costs be excluded to determine)?

Non-Energy Benefits

11. What Non-Energy Benefits do you associate with 80 Plus power supplies?
12. What is the role/importance of other non-energy benefits vs. the energy savings for efficiency power supplies? Which ones are most important? [IF NECESSARY PROBE: DECREASED PARTS COUNT, REDUCED FOOTPRINT, QUIETER OPERATION, ETC.]
13. Which specific benefits do you think are the most compelling to end users, or your potential customers?

Marketing & Market Actors

14. What percentage of your customers aware of 80 PLUS?
15. What percentage request it?
16. What types of customers are aware of or request 80 PLUS?
17. What do you think are the barriers to widespread adoption of 80 Plus Power supplies? [PROBE FOR BARRIERS AMONG ALL MARKET ACTORS, INCLUDING CUSTOMERS, SI'S, POWER SUPPLY MANUFACTURERS, ETC.]
18. What needs to happen for 80 PLUS power supplies to become mainstreamed?
19. How will the 80 PLUS power supply influence changes in the industry?
20. What other changes are happening in the PC industry? Do you see them as being synergistic or at odds with 80 PLUS?

Additional Information

21. How long have you worked at ______________________? What is your role there?
22. What types of computer systems does your company produce? Approximately how many systems a year?
23. Would you like to add anything else about 80 PLUS, or add anything that we should consider in this evaluation?

Thank you for your time.