Southwestern Public Service Company

2013 Energy Efficiency and Load Management Annual Report

Prepared in Compliance with the Efficient Use of Energy Act and 17.7.2 NMAC (Energy Efficiency Rule)

August 1, 2014

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Glossary of Acronyms and Definition

Acronym/Defined Term	Definition
2013 Annual Report	SPS's 2013 Energy Efficiency and Load Management Annual Report
2012 Plan	SPS's 2012 Energy Efficiency and Load Management Plan
ADM	ADM Associates – 2013 independent program evaluator for the State of New Mexico
CFL	Compact Fluorescent Light bulb
Commission	New Mexico Public Regulation Commission
DSM	Demand-Side Management – refers to the energy efficiency and load management programs collectively
EE Rider	Energy Efficiency Rider
EISA	Energy Independence and Security Act of 2007
EUEA	New Mexico Efficient Use of Energy Act, as amended by Senate Bill 418 (2007), House Bill 305 (2008), and House Bill 267 (2012) §§62-17-1 through 62-17-11 NMSA 1978
Evaluator	Independent Program Evaluator, the third-party contractor that will conduct all measurement & verification of the programs
kW	Kilowatt
kWh	Kilowatt hour
LED	Light Emitting Diode
Net Generator kW; Net Generator kWh	Demand and energy savings, respectively, measured at the generator, corrected for transmission line losses and free-rider/drivership

ICO	Interruptible Credit Option
M&V	Measurement and Verification
NEB	Non-Energy Benefits refers to benefits of the energy efficiency and load management programs that are unrelated to the generation, transmission, distribution, or cost of energy
Rule	Energy Efficiency Rule 17.7.2 NMAC (2007 version)
SPS	Southwestern Public Service Company, a New Mexico corporation
Stipulation	Settlement Agreement between the parties to Case No.l 11-00400-UT
TRC	Total Resource Cost, a test of cost-effectiveness as defined in the Efficient Use of Energy Act
UCT	Utility Cost Test the cost-effectiveness standard implemented on July 1, 2013. Also known as the Program Administrator Test
Xcel Energy	Xcel Energy Inc.

Document Layout
Southwestern Public Service Company's ("SPS") 2013 Energy Efficiency and Load Management Annual Report ("2013 Annual Report") includes the following sections:

- Section I provides the Executive Summary consisting of an Introduction, Background, and Summary of Results.
- Section II provides the reporting requirements as stated in 17.7.2.13 NMAC.
- Section III provides the program descriptions including an explanation of deviations from goal and changes during 2013, organized into the Residential, Business, and Planning & Research Segments.
- Appendix A provides the Measurement and Verification ("M&V") Report of SPS's 2013 program year prepared by ADM Associates, Inc. ("ADM").

Section I. Executive Summary

Introduction

In accordance with the Efficient Use of Energy Act ("EUEA"), as amended by Senate Bill 418 (2007), House Bill 305 (2008), and House Bill 267 (2013), and the New Mexico Public Regulation Commission's ("Commission") Energy Efficiency Rule ("17.7.2 NMAC", "Rule"), SPS, respectfully submits for Commission review its 2013 Annual Report. The EUEA and its associated Rule require public utilities to offer cost-effective energy efficiency and load management programs and authorizes them to receive cost recovery for qualified expenditures. Further, 17.7.2.13.B NMAC requires SPS to file with the Commission on August 1 of each year, a report on its energy efficiency and load management programs during the prior calendar year. The specific reporting requirements of the Rule and Revised Rule are discussed in Section II.

With this 2013 Annual Report, SPS provides the expenditures and savings results for 11 energy efficiency and load management direct impact programs in the Residential Segment (including Low-Income) and Business Segment (including Large Customer). In addition, the 2013 Annual Report includes a summary of the Planning and Research Segment, which supports the direct impact programs. The M&V Report of SPS's 2013 savings is included as Appendix A.

Background

SPS filed its 2012 Energy Efficiency and Load Management Plan ("2012 Plan") on October 26, 2011 (Case No. 11-00400-UT).[1] SPS and various other parties to the case agreed to a stipulation ("Stipulation"), which was approved by the Commission on June 7, 2012. Based off the modifications agreed to as part of the Stipulation, SPS filed a Revised 2012 Plan on August 6, 2012.. The Stipulation included the following revisions to the originally proposed 2012 Plan: the combination of Home Energy Services and the Low-Income Program into one comprehensive Home Energy Services program, an increase in goals and budget for the Home Lighting & Recycling program, the Lighting Efficiency component of the Business Comprehensive program, and the Small Business Lighting program. Further, the budget

[1] *In the Matter of Southwestern Public Service Company's Application for Approval of its (a) 2012 Energy Efficiency and Load Management Plan and Associated Programs, (b) Cost Recovery Tariff Rider, and (c) Requested Variance*, Case No. 11-00400-UT, Final Order Adopting Certification of Stipulation (Jun. 7, 2012).

modifications approved on June 12, 2013 included budget decreases for the following programs: Energy Feedback Pilot, Evaporative Cooling Rebates, Home Energy Services, Refrigerator Recycling, Business Comprehensive, Interruptible Credit Option, Saver's Switch® for Business, Market Research, Measurement & Verification, Planning & Administration, and Product Development

Summary of Results

In compliance with 17.7.2.13 NMAC, Table 1 below shows SPS's program goals, budgets, and Total Resource Cost ("TRC") Test ratios as approved by the Commission on June 7, 2012, as well as those budget modifications approved by the Commission on June 12, 2013 in Case No. 11-00400-UT.[2]

Table 1, below, provides SPS's 2013 Commission-approved demand-side management ("DSM")[3] goals and budgets.

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[2] As part of the revisions to House Bill 267, the cost-effectiveness standard was changed from the TRC to the UCT effective July 1, 2013. This change occurred after the Commission's approval of the Revised 2012 Plan, which used the TRC for cost-effectiveness testing. SPS has continued to use the TRC in this status report in order to remain consistent with the Plan approved by the Commission. However, UCT values for each program are available in Appendix A of this report.

[3] Demand-Side Management is a term referring to the Energy Efficiency and Load Management programs implemented in program year 2013.

Table 1: 2013 SPS DSM Goals and Budgets as Modified on June 12, 2013 in Case No. 11-00400-UT[4]

Program	Participants	Budget	Peak Demand Savings kW	Annual Energy Savings kWh	Demand Loss Factor	Generator kW	Generator kWh	TRC Test
Residential Segment								
Energy Feedback Pilot	15,000	$190,000	423	5,292,807	16.20%	505	6,000,915	1.69
Evaporative Cooling Rebates	450	$259,414	828	1,010,050	16.20%	989	1,145,181	6.54
Home Energy Services: Residential & Low Income	2,300	$1,853,573	2,061	8,967,806	16.20%	2,459	10,167,580	3.59
Home Lighting & Recyling	70,175	$948,506	1,223	10,234,750	16.20%	1,460	11,604,025	4.24
Refrigerator Recycling	500	$151,265	45	422,500	16.20%	53	479,025	1.14
Residential Saver's Switch	945	$549,199	1,710	21,600	16.20%	2,041	24,490	5.06
School Education Kits	2,500	$162,241	14	540,992	16.20%	16	613,370	127.91
Residential Segment Total	**91,870**	**$4,114,198**	**6,304**	**26,490,505**	**16.20%**	**7,523**	**30,034,586**	**3.95**
Business Segment								
Business Comprehensive	1,219	$3,380,634	2,208	12,158,268	11.00%	2,481	13,201,160	2.81
Interruptible Credit Option	1	$46,617	1,578	14,000	11.00%	1,773	15,201	13.02
Saver's Switch for Business	82	$271,879	470	3,480	11.00%	528	3,779	2.67
Small Business Lighting	99	$1,260,849	614	2,624,220	11.00%	690	2,849,316	1.42
Business Segment Total	**1,401**	**$4,959,979**	**4,870**	**14,799,968**	**11.00%**	**5,472**	**16,069,455**	**2.49**
Planning & Research Segment								
Business Education		$50,000						
Consumer Education		$151,941						
Market Research		$91,597						
Measurement & Verification		$35,000						
Planning & Administration		$389,696						
Product Development		$88,612						
Planning & Research Segment Total		**$806,846**						
2013 TOTAL	**93,271**	**$9,881,023**	**11,174**	**41,290,472**	**14.01%**	**12,995**	**46,104,040**	**2.85**

Table 2 provides SPS's actual 2013 program achievements, expenditures, and TRC test ratios, verified by the Commission's Independent Program Evaluator ("Evaluator"), ADM Associates, Inc.

[4] Case No. 11-00400-UT, *Order on Unopposed Motion to Reopen Case and to Modify Program Budgets* (Jun. 12, 2013).

Table 2: 2013 SPS DSM Third-Party Verified Achievements and Expenditures

Program	Participants	Actual Spend	Peak Demand Savings kW	Annual Energy Savings kWh	Demand Loss Factor	Generator kW	Generator kWh	TRC Test	UCT Test
Residential Segment									
Energy Feedback Pilot	12,958	$186,317	357	3,222,538	16.20%	426	3,653,671	1.09	1.09
Evaporative Cooling Rebates	303	$176,301	478	628,710	16.20%	570	712,823	12.87	8.89
Home Energy Services: Residential & Low Income	1,541	$982,863	428	3,098,549	16.20%	511	3,513,094	4.02	3.12
Home Lighting & Recyling	116,250	$944,714	1,827	12,839,947	16.20%	2,180	14,557,763	5.66	6.06
Refrigerator Recycling	481	$140,982	73	379,316	16.20%	87	430,063	2.29	1.73
Residential Saver's Switch	1,981	$584,631	1,626	15,690	16.20%	1,941	17,789	0.39	0.32
School Education Kits	3,504	$147,494	15	850,705	16.20%	18	964,518	3.22	2.49
Residential Segment Total	**137,018**	**$3,163,303**	**4,804**	**21,035,455**	**16.20%**	**5,732**	**23,849,722**	**4.85**	**3.59**
Business Segment									
Business Comprehensive	332	$2,713,630	2,327	14,183,620	11.00%	2,615	15,400,239	2.91	4.18
Interruptible Credit Option	0	$1,638	0	0	11.00%	0	0	0.00	0.00
Saver's Switch for Business	279	$226,443	322	2,676	11.00%	362	2,906	0.18	0.15
Small Business Lighting	193	$1,368,398	604	2,452,470	11.00%	678	2,662,834	0.96	1.43
Business Segment Total	**804**	**$4,310,109**	**3,253**	**16,638,766**	**11.00%**	**3,654**	**18,065,978**	**2.24**	**3.10**
Planning & Research Segment									
Business Education		$1							
Consumer Education		$143,102							
Market Research		$56,673							
Measurement & Verification		$32,592							
Planning & Administration		$145,576							
Product Development		$66,947							
Planning & Research Segment Total		**$444,892**							
2013 TOTAL	**137,822**	**$7,918,303**	**8,056**	**37,674,221**	**14.18%**	**9,387**	**41,915,701**	**2.64**	**3.12**

In 2013, SPS achieved verified electric savings of 9,387 kilowatts ("kW") and 41,915,701 kilowatt-hours ("kWh") at the generator, at a total cost of $7,940,473 (see Table 2 below.) This equals 91% of SPS's 2013 approved energy goal, while spending 80% of the modified, approved budget. The portfolio was cost-effective with a TRC Test ratio of 2.64 and a Utility Cost test ("UCT") ratio of 3.12.

As shown in Table 2, most of the direct impact energy efficiency programs were cost-effective under both the TRC Test and UCT. Four of the programs did not pass the TRC test and three did not pass the UCT in 2013. While each of the products listed below is discussed in more detail later in the Status Report, a summary of the primary reasons for individual programs falling below 1.0 on the TRC test or UCT follows.

- Residential Saver's Switch: For 2013, the program resulted in a TRC and UCT of lower than 1.0. SPS remains hopeful that as the program grows the cost-effectiveness will improve. As part of the 2014 Plan, SPS has incorporated cost-

reductions that will help improve cost-effectiveness while still providing the funding necessary to grow the program.

- Interruptible Credit Option ("ICO"): ICO didn't have any participants in 2013, and therefore achieved a TRC ratio of less than 1.0. Increasing participation will continue to be a challenge in the current economic climate, but given that it has a relatively small budget, offering the program is a valuable option for customers if economic conditions do change.
- Small Business Lighting: In 2013, Small Business Lighting experienced low realized savings for completed projects. SPS has worked with the third party evaluator and implemented increased rigor for inspecting completed projects to ensure future savings are realized.
- Business Saver's Switch: For 2013 this program achieved a TRC and UCT that is lower than 1.0. SPS remains hopeful that as the program grows cost-effectiveness will improve. As part of the 2014 Plan, SPS has incorporated cost-reductions that will help improve cost-effectiveness while will providing the funding necessary to grow participation in the program.

SPS works in good faith to comply with the EUEA and to offer cost-effective energy efficiency and load management programs to all of its customers and will be evaluating each of these programs to ensure they are cost-effective in the future or removed from the portfolio.

Section II: 17.7.2.13 NMAC Reporting Requirements

This section of the 2013 Annual Report follows the reporting requirements and section headings as specified in 17.7.2.13.C NMAC.

(1) Independent Measurement and Verification Report:

17.7.2.13.C(1) NMAC requires that utilities provide a M&V Report compiled by the Evaluator every year with its Annual Report. In compliance with the reporting requirements, the M&V Report (included as Appendix A) includes:

- Expenditure documentation, at both the total portfolio and individual program levels;
- Measured and verified savings;
- Cost-effectiveness of all of SPS's energy efficiency and load management programs;
- Deemed savings assumptions and all other assumptions used by the Evaluator;
- Description of the M&V process, including confirmation that:
    - Measures were actually installed;
    - Installations meet reasonable quality standards; and
    - Measures are operating correctly and are expected to generate the predicted savings.

Section 1.5 within the 2013 M&V Report (*see* Appendix A) contains a summary of program recommendations provided by the Evaluator. SPS has evaluated these recommendations and will implement the recommendations in 2014 where possible or consider adopting the recommendations as part of a future plan filing. SPS has discussed these recommendations and its proposed actions with the Evaluator.

(2) Program Expenditures Not Included in the M&V Report:

In 2013, SPS spent a total of $7,918,303 for its energy efficiency and load management programs. These expenditures included all expenses incurred by SPS to develop and implement the programs. All of these expenditures were included in the M&V Report provided by the Evaluator.

(3) Budgeted Funds Not Spent in Program Year, and
(4) Material Variances in Program Costs

SPS's 2013 forecasted budget was approved by the Commission on June 7, 2012. At that time, SPS anticipated that it would spend a total of $9,983,734. On May 1, 2013, SPS filed a motion to decrease the 2013 program budgets for several programs, pursuant to 17.7.2.14.C NMAC. Commission approval was received on June 12, 2013.[5] With this approval, the final portfolio budget decreased to $9,881,023. In 2013, SPS had actual expenditures of $7,918,303. As presented in Table 3, below, SPS under spent its approved budgets by $1,962,720. Concurrent with the filing of the 2013 Annual Report, SPS has also filed a budget modification for its 2013 program portfolio. This budget modification seeks to reduce the 2013 budget by $1,327,844 the total amount under spent by all programs with a

[5] Case No. 11-00400-UT, *Order on Unopposed Motion to Reopen Case and to Modify Program Budgets* (Jun. 12, 2013).

variance greater than 25 percent. With this budget modification, the amount under spent from the final approved budget (less than one percent) is within the 25 percent budget flexibility allowed by 17.7.2.14.C NMAC.

Table 3: 2013 Forecasted Budget, Actual Expenditures, and Variance by Program

Program	Budget	Actual Spend	Variance	% Variance
Residential Segment				
Energy Feedback Pilot	$190,000	$186,317	($3,683)	-2%
Evaporative Cooling Rebates	$259,414	$176,301	($83,113)	-32%
Home Energy Services: Residential & Low Income	$1,853,573	$982,863	($870,710)	-47%
Home Lighting & Recyling	$948,506	$944,714	($3,792)	0%
Refrigerator Recycling	$151,265	$140,982	($10,283)	-7%
Residential Saver's Switch	$549,199	$584,631	$35,432	6%
School Education Kits	$162,241	$147,494	($14,747)	-9%
Residential Segment Total	**$4,114,198**	**$3,163,303**	**($950,895)**	**-23%**
Business Segment				
Business Comprehensive	$3,380,634	$2,713,630	($667,004)	-20%
Interruptible Credit Option	$46,617	$1,638	($44,979)	-96%
Saver's Switch for Business	$271,879	$226,443	($45,436)	-17%
Small Business Lighting	$1,260,849	$1,368,398	$107,549	9%
Business Segment Total	**$4,959,979**	**$4,310,109**	**($649,870)**	**-13%**
Planning & Research Segment				
Business Education	$50,000	$1	($49,999)	-100%
Consumer Education	$151,941	$143,102	($8,839)	-6%
Market Research	$91,597	$56,673	($34,924)	-38%
Measurement & Verification	$35,000	$32,592	($2,408)	-7%
Planning & Administration	$389,696	$145,576	($244,120)	-63%
Product Development	$88,612	$66,947	($21,665)	-24%
Planning & Research Segment Total	**$806,846**	**$444,892**	**($361,954)**	**-45%**
2013 TOTAL	**$9,881,023**	**$7,918,303**	**($1,962,720)**	**-20%**

(5) Tariff Collections

On May 31, 2013, SPS filed Advice Notice No. 249 for its Eighth Revised Rate No. 44 EE Rider, which proposed to recover $6.8 million in 2013 energy efficiency costs over a 12-month period, as well as to change the EE Rider from a per kWh charge to three percent of each customer's bill, due to the 2012 amendments to the EUEA. In the Order issued June 26, 2013, the Commission suspended the updated EE Rider rate for 180 days .[6] On June 25, 2014 the Commission approved SPS's Advice Notice No. 251 for its Ninth Revised

6 Case No. 11-00400-UT, *Order Suspending Rates and Approving Hearing Examiner* (Jun. 26, 2013).

Rate No. 44 EE Rider in the Final Order in Case No. 13-00286-UT[7] and on August 1, 2014 SPS's rider to collect three percent of adjusted customer bills will be put into effect to collect $8,659,105 in 2014.[8]

(6) Program-Specific Metrics

The following table provides SPS's 2013 program expenditures by cost category.

Table 4: 2013 SPS Energy Efficiency Program Costs by Cost Category

Program	Total Incentive	Internal Admin.	Third-Party Delivery	Promotion	Total Cost
Residential Segment					
Energy Feedback Pilot	$0	$5,606	$171,293	$0	$186,317
Evaporative Cooling Rebates	$65,625	$31,826	$7,714	$70,122	$176,301
Home Energy Services: Residential & Low Income	$219,870	$108,839	$551,948	$91,409	$982,863
Home Lighting & Recyling	$467,128	$72,302	$127,050	$273,314	$944,714
Refrigerator Recycling	$34,650	$17,316	$31,930	$57,085	$140,982
Residential Saver's Switch	$111,498	$95,267	$202,756	$53,715	$584,631
School Education Kits	$33,568	$7,580	$106,346	$0	$147,494
Residential Segment Total	**$932,340**	**$338,736**	**$1,199,037**	**$545,644**	**$3,163,303**
Business Segment					
Business Comprehensive	$2,031,200	$298,604	$293,982	$3,331	$2,713,630
Interruptible Credit Option	$0	$1,638	$0	$0	$1,638
Saver's Switch for Business	$26,570	$27,433	$96,503	$16,517	$226,443
Small Business Lighting	$846,398	$92,536	$398,891	$1,134	$1,368,398
Business Segment Total	**$2,904,168**	**$420,211**	**$789,375**	**$20,982**	**$4,310,109**
Planning & Research Segment					
Business Education	$0	$0	$1	$0	$1
Consumer Education	$0	$24,990	$9,232	$108,881	$143,102
Market Research	$0	$3,316	$53,357	$0	$56,673
Measurement & Verification	$0	$9,452	$0	$0	$32,592
Planning & Administration	$0	$135,662	$9,914	$0	$145,576
Product Development	$0	$52,347	$14,600	$0	$66,947
Planning & Research Segment Total	**$0**	**$225,767**	**$87,105**	**$108,881**	**$444,892**
2013 TOTAL	**$3,836,508**	**$984,714**	**$2,075,517**	**$675,507**	**$7,918,303**

The following paragraphs and tables provide program-specific information in sections a) through g) which correspond to the items listed in 17.7.2.13.C(7) NMAC.

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[7] *In the Matter of Southwestern Public Service Company's Application for Approval of its (A) 2012 Energy Efficiency and Load Management Plan and Associated Programs, (B) Request for Financial Incentives for 2013-2015; (C) Cost Recovery Tariff Rider, and (D) Request to Establish Lower Minimum Savings Requirements for 2014 Under the Efficient Use of Energy Act,* Case No. 13-00286-UT, Final Order (Jun. 25, 2014).

[8] This value also includes 0.285 percent for approved 2013 and 2014 incentives.

a. Comparison of forecasted savings to verified achieved savings for each of the utility's energy efficiency programs

Please refer to Tables 1 and 2 above for SPS's forecasted and achieved verified savings by program.

b. Number of program participants served by each project

Please refer to Table 2 above for the number of program participants.

c. Utility and participant costs, including M&V costs by program

Table 4, above, shows the utility costs, including M&V, broken down by program. Participant costs vary by measure and project and are not easily summarized. SPS does not typically charge customers to participate in the DSM programs, but customers often must purchase specific measures from equipment suppliers in order to qualify for rebates.

d. Total avoided supply-side costs by type of avoided cost (generation, transmission, distribution, etc.)

Table 5, below, shows the third-party verified avoided supply-side costs broken down by type of cost, including avoided generation, avoided transmission and distribution, avoided marginal energy costs, and non-electric acquisition costs.

Table 5: 2013 SPS Third-Party Verified Avoided Costs by Program and Type

Program	Avoided Generation Costs (NPV)	Avoided Transmission and Distribution Costs (NPV)	Avoided Marginal Energy Costs (NPV)	Non-Electric Acquisition Costs (NPV)
Residential Segment				
Energy Feedback Pilot	$34,969	$5,380	$163,004	$0
Evaporative Cooling Rebates	$772,790	$118,891	$676,129	$0
Home Energy Services: Residential & Low Income	$791,514	$121,771	$1,818,693	$0
Home Lighting & Recyling	$1,061,485	$163,305	$4,337,879	$0
Refrigerator Recycling	$58,867	$9,057	$175,775	$0
Residential Saver's Switch	$159,489	$24,537	$866	$0
School Education Kits	$10,614	$1,633	$355,163	$0
Residential Segment Total	**$2,889,728**	**$444,574**	**$7,527,509**	**$0**
Business Segment				
Business Comprehensive	$2,279,927	$350,758	$8,774,821	$0
Interruptible Credit Option	$0	$0	$0	$0
Saver's Switch for Business	$30,228	$4,651	$140	$0
Small Business Lighting	$528,797	$81,353	$1,349,118	$0
Business Segment Total	**$2,838,952**	**$436,762**	**$10,124,079**	**$0**
Planning & Research Segment				
Business Education	N/A	N/A	N/A	N/A
Consumer Education	N/A	N/A	N/A	N/A
Market Research	N/A	N/A	N/A	N/A
Measurement & Verification	N/A	N/A	N/A	N/A
Planning & Administration	N/A	N/A	N/A	N/A
Product Development	N/A	N/A	N/A	N/A
Planning & Research Segment Total	**$0**	**$0**	**$0**	**$0**
2013 TOTAL	**$5,728,681**	**$881,335**	**$17,651,588**	**$0**

e. Total cost per kWh and kW saved over the life of the measure

Table 6, below, shows the total cost per actual generator kWh and kW saved over the lifetime of the program.

Table 6: 2013 SPS Third-Party Verified Lifetime Cost per Generator kW and kWh Saved

Program	Total Utility Costs	Total Lifetime Generator kWh	Cost per Generator kWh	Total Generator kW
Residential Segment				
Energy Feedback Pilot	$186,317	3,653,671	$0.0510	426
Evaporative Cooling Rebates	$176,301	10,692,345	$0.0165	570
Home Energy Services: Residential & Low Income	$982,863	65,176,582	$0.0151	511
Home Lighting & Recyling	$944,714	93,169,684	$0.0101	2,180
Refrigerator Recycling	$140,982	2,150,317	$0.0656	87
Residential Saver's Switch	$584,631	17,789	$32.8645	1,941
School Education Kits	$147,494	9,186,510	$0.0161	18
Residential Segment Total	**$3,163,303**	**184,046,898**	**$0.0172**	**5,732**
Business Segment				
Business Comprehensive	$2,713,630	198,772,128	$0.0137	2,615
Interruptible Credit Option	$1,638	0	N/A	0
Saver's Switch for Business	$226,443	2,906	$77.9348	362
Small Business Lighting	$1,368,398	31,954,008	$0.0428	678
Business Segment Total	**$4,310,109**	**230,729,041**	**$0.0187**	**3,654**
Planning & Research Segment				
Business Education	$1	0	N/A	0
Consumer Education	$143,102	0	N/A	0
Market Research	$56,673	0	N/A	0
Measurement & Verification	$32,592	0	N/A	0
Planning & Administration	$145,576	0	N/A	0
Product Development	$66,947	0	N/A	0
Planning & Research Segment Total	**$444,892**	**0**	**N/A**	**0**
2013 TOTAL	**$7,918,303**	**414,775,939**	**$0.0191**	**9,387**

f. Total economic benefits for the reporting period, and
g. Net present value of all economic benefits for the life of the measures.

Table 7, below, provides the total economic benefits and TRC net present economic value benefits by program. The total economic benefits are calculated by dividing the total economic net benefits of each program over the lifetime of the program. At the portfolio level, the total lifetime net benefit is divided by the average lifetime of the programs, weighted on the generator kWh provided by each program.

Table 7: Third-Party Verified Total Economic Benefits Derived from SPS 2013 Programs

Program	Total TRC Net Benefits (NPV)	Lifetime (Years)	Total Economic Beneifts Reporting Period
Residential Segment			
Energy Feedback Pilot	$17,038	1.00	$17,038
Evaporative Cooling Rebates	$1,446,027	15.00	$96,402
Home Energy Services: Residential & Low Income	$2,301,381	18.55	$124,047
Home Lighting & Recyling	$4,716,628	6.40	$736,973
Refrigerator Recycling	$137,367	5.00	$27,473
Residential Saver's Switch	($288,241)	1.00	($288,241)
School Education Kits	$253,484	9.52	$26,614
Residential Segment Total	**$8,583,684**		**$740,306**
Business Segment			
Business Comprehensive	$7,486,340	14.09	$531,395
Interruptible Credit Option	$0		$0
Saver's Switch for Business	($164,854)	1.00	($164,854)
Small Business Lighting	($91,783)	12.00	($7,649)
Business Segment Total	**$7,229,703**		**$358,892**
Planning & Research Segment			
Business Education	($1)		($1)
Consumer Education	($143,102)		($143,102)
Market Research	($56,673)		($56,673)
Measurement & Verification	($32,592)		($32,592)
Planning & Administration	($145,576)		($145,576)
Product Development	($66,947)		($66,947)
Planning & Research Segment Total	**($444,892)**		**($444,892)**
2013 TOTAL	**$15,368,495**		**$654,307**

(7) Non-Energy Benefits

Non-energy benefits ("NEBs") refer to all monetary benefits of the energy efficiency and load management programs that are unrelated to the generation, transmission, distribution, or cost of energy. NEBs may include greenhouse gas emissions reductions, improvements in safety and comfort, reduced arrearages on customer bills, reduced water consumption, and reduced labor and maintenance costs, amongst others. Generally speaking, non-energy benefits are difficult to quantify. ADM did not specifically identify the value of any NEBs in the TRC Test in this 2013 M&V Report.

The following table shows the emission reductions associated with SPS's 2013 energy efficiency portfolio. These values were estimated by applying the lifetime and annual energy savings from the 2013 program achievements to the emission rates for SPS's Cunningham

Station-2 Plant[9], which is believed to be a fair proxy for the generation avoided by the 2013 energy efficiency programs.

Table 8: Greenhouse Gas Emissions Avoided With 2013 Programs

Emission Type	Avoided Electric Emissions Rate (lbs/MWh)	Annual Avoided Emissions (lbs)	Lifetime Avoided Emissions (lbs)
CO_2	1,300.000000	54,490,411	539,208,721
SO_2	0.006585	276	2,731
NOx	2.268000	95,065	940,712

The following table shows the amount of water conserved by the 2013 program achievements, due to the reduced need for energy generation. These values are estimated by applying the lifetime and annual energy savings to the water consumption rate for SPS's Cunningham Station Plant average[10], which is believed to be a fair proxy for the energy generation avoided by the energy efficiency programs.

Table 9: Water Consumption Avoided With 2013 Programs

Non-Energy Benefit Type	Avoided Water Consumption Rate (gal/MWh)	Annual Avoided Water Consumption (gal)	Lifetime Avoided Water Consumption (gal)
Water Savings	670	28,083,519	277,899,879

(8) Self-Direct Programs

The Large Customer Self-Direct product was included within the Business Comprehensive program in 2013. This product had no individual goals because it was unknown at the time of filing who might choose to participate. This program had no participants or spending in 2013.

[9] Source: Case No. 12-00298-UT, *SPS's 2012 Integrated Resource Plan for New Mexico*; Table 3-7: Emission Rates (p. 39).

[10] Ibid.

Section III: Segment and Program Descriptions

Residential Segment

SPS has approximately 93,000 customers in its Residential Segment in New Mexico. The service area is relatively rural, with only a few small cities, including Clovis, Roswell, Artesia, Carlsbad, Portales, and Hobbs. The climate in this part of New Mexico consists of winters with very little snow and hot, relatively dry summers.

In 2013, SPS offered seven residential programs with opportunities for all residential customers, including low-income customers, to participate. In total, SPS spent $3,163,303 on these programs and achieved 4,804 kW and 21,035,455 kWh savings at the customer level.

Overall, the Residential Segment of programs was cost-effective with a TRC of 4.85. Only one program, the Saver's Switch program, was not cost-effective at either the TRC or UCT levels. Achievements were 79 percent of the annual kWh goal with significant contributions from the Home Lighting and Home Energy Services programs. Each of the programs under the Residential Segment are discussed in more detail below.

Energy Feedback Pilot (formerly Consumer Behavior Program)

The Energy Feedback Pilot provides participating customers with different forms of feedback regarding their energy consumption in order to study which methods affect residential customer energy usage. The feedback communication strategies and associated tips and tools are intended to result in a decrease in energy usage by inducing changes in the behavior of participating customers. Furthermore, the program attempts to build a persistent increase in, or earlier adoption of, energy efficient technologies and energy efficient practices.

In 2013, The Energy Feedback Pilot provided an average of 13,430 customers with a Home Energy Report by mail six times in 2013. The report provided information on the customer's energy usage and benchmarked their energy consumption behavior as compared to 100 similar customers. The pilot aimed to produce a decrease in energy usage by inducing changes in the behavior of the end-user and an increased or earlier adoption of energy efficient technologies and energy efficient practices.

Table 10: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Energy Feedback Pilot	12,958	15,000	$186,317	$190,000	357	423	3,222,538	5,292,807	1.09	1.09

Deviations from Goal

The Energy Feedback Pilot did not achieve its filed savings impact goals in 2013 but was cost-effective under both the TRC and UCT. The program fell short of goals for two reasons. First, participants saved an average of 1.53% in 2013 and the forecast was 2% energy savings per customer. In the M&V report, the Evaluator determined that one

possible reason for this result was the high market share of evaporative coolers in the SPS service area. Unlike central air conditioners, evaporative coolers offer less flexibility in savings through behavioral changes. Second, achievements were lower due to natural attrition in the program which was mainly due to customers moving from their home. Eighty-four (84) customers selected to opt-out of the program in 2013 (0.06%). The annual average number of customers receiving reports in 2013 was 13,324 11% lower than the original forecast of 15,000 participants. An attrition rate of 8.3% was recorded between January and December of 2013 which brought the participation level from13,901 at the beginning of the year to 12,780 by December. This attrition rate is very typical across the third-party implementer's program with other utilities.

Changes in 2013
None.

Evaporative Cooling

The Evaporative Cooling Rebate Product provides a cash rebate to electric customers who purchase and permanently install high-efficiency evaporative cooling equipment for residential use in New Mexico. This tiered rebate program provides $200 or the cost of the unit, whichever is less, for Standard System (Tier 1) units. Tier 1 units blow at least 2,500 cubic feet of air per minute. A $1,000 rebate is offered for Premium System (Tier 2) units with a minimum media saturation[11] effectiveness of 85%, a remote thermostat, and a periodic purge water control.

Table 11: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Evaporative Cooling Rebates	303	450	$176,301	$259,414	478	828	628,710	1,010,050	12.87	8.89

Deviations from Goal
The Evaporative Cooling Program did not meet the participant or savings goals for 2013 but the program was cost-effective. SPS continued significant outreach, including on-line media ads, bill inserts, radio ads, and print ads, but the program participation fell short overall. Weaker than expected participation is likely attributable to three issues:

1. Contractor community preferences for central air conditioning units;
2. Homeowner's Association restrictions on roof-mounted evaporative coolers; and,
3. New home construction uses refrigerated air systems, which makes retrofitting for evaporative coolers costly and technically difficult.

[11] Media saturation effectiveness is the measure of the efficiency of the evaporative cooling unit. When operating, the unit intakes warm outside air and passes it through the media filter inside the unit where the water is, and the blows the cooled air into the home.

To make the program more successful in 2014, SPS plans to: utilize available marketing and advertising dollars, continue trade incentives, and coordinate with local retailers to further increase participation.

Changes in 2013
None.

Home Energy Services

The Home Energy Services Program provides incentives to energy efficiency service providers for the installation of a range of upgrades that save energy and reduce costs for existing households. Qualifying customers receive attic insulation, air infiltration reduction, duct leakage repairs, and high efficiency central air conditioners.

The primary objective of this program is to achieve cost-effective reductions in energy consumption in residential and low-income homes. Additional objectives of the program are to:

- encourage private sector delivery of energy efficiency products and services;
- utilize a whole-house approach to efficiency upgrades; and
- significantly reduce barriers to participation by streamlining program procedures.

SPS partners with qualifying third-party contractors to deliver these services to qualifying residential customers. Contractors must apply to the program and be approved in order to participate. SPS requires contractors to receive pre-approval for targeted multi-family sites prior to installation of any energy efficiency components for which an incentive will be requested.

Table 12: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Home Energy Services: Residential & Low Income	1,541	2,300	$982,863	$1,853,573	428	2,061	3,098,549	8,967,806	4.02	3.12

Deviations from Goal
The Home Energy Services program did not achieve its participation or energy savings goals for 2013; however, it was highly cost-effective. This is attributable in large part due to significant underperformance in the Low-Income portion of the program. This lack of participation was due to the verification requirements under the program; a process which SPS has proposed to revise as part of its 2014 Plan, which was approved by the Commission on June 25, 2014. Furthermore, revisions to the deemed savings early in the year by the Evaluator reduced the overall savings in the program. A decrease in deemed savings will result in lower per participant savings, and to counteract this effect, additional participants will be needed; however, in 2013 contractors were not able to add enough homes to make

up the lost savings. As stated above, revisions to the Low-Income program are expected to have a significant and positive impact on program participation in 2014..

Changes in 2013
SPS began targeting multi-family residences for participation in the Low-Income portion of the Home Energy Services program.

Home Lighting and Recycling

The Home Lighting and Recycling Program helps customers save energy and money by offering energy efficient compact fluorescent light ("CFL") and light emitting diode ("LED") bulbs at a discounted price at participating retailers. SPS works with retailers and manufacturers to buy down the prices of bulbs. The price of a CFL bulb is bought down to the point that each retail location can offer at least one CFL bulb for approximately $1.00 each. LED bulbs receive a buy down discount of up to $10 each but unit prices vary. This provides an inexpensive way for customers to reduce energy usage and their impact on the environment.

SPS marketed the program extensively through a variety of advertising and promotions, including television, radio, on-line, publications, bill inserts, community events, and point of purchase displays. SPS also participated in many local events including the annual Chili Cook-Off in Hobbs and the Cinco De Mayo celebration in Roswell. SPS partnered with Domino's Pizza to deliver free CFLs with each pizza order for a limited time period. This was a unique promotion in that it delivered bulbs directly to customers' homes and was an extremely low-cost way to reach consumers. SPS leveraged the Refrigerator Recycling program and installed CFLs in customers' homes during the Refrigerator Recycling visit.

Table 13: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Home Lighting & Recyling	116,250	70,175	$944,714	$948,506	1,827	1,223	12,839,947	10,234,750	5.66	6.06

Deviations from Goal
The Home Lighting and Recycling Program exceeded its energy savings goals, while spending was proportionally less per bulb than the anticipated budget. The achievements were the result of extensive promotions and outreach designed to maintain high customer awareness of CFL lighting as an easy energy efficiency option. Furthermore, the program significantly exceeded its participation goal for the year, which SPS believes is due to a higher rate of bulbs purchased by each participating customer. When SPS developed the 2012-2013 DSM Plan it forecasted that each participant would purchase 4 CFL bulbs; however, based on recent experience with the program SPS has reason to believe customers may be purchasing more than 4 bulbs at a time. In 2014, SPS will continue to investigate whether this change is ongoing.

Changes in 2013

SPS made adjustments to its deemed savings based upon changes mandated by the Energy Independence and Security Act ("EISA") of 2007.

Refrigerator Recycling

The Refrigerator Recycling Product is designed to decrease the number of inefficient secondary refrigerators, primary refrigerators and freezers in residential households. The product reduces energy usage by allowing customers to dispose of their operable, inefficient appliances in an environmentally safe and convenient manner. Customers receive a $75 incentive and free pick up and disposal services to recycle the freezer or refrigerator. This product is primarily marketed by bill inserts, direct mailers, radio and on-line/social media efforts.

Table 14: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Refrigerator Recycling	481	500	$140,982	$151,265	73	45	379,316	422,500	2.29	1.73

Deviations from Goal
Despite significant outreach efforts, the Refrigerator Recycling Product did not achieve the participant or electric energy savings goal in 2013. However, the program was cost-effective and showed increased participation over the previous year's results largely due to including the freezer and primary refrigerator measures in 2013. In total, 481 customers participated in the program, with over 22 percent and 6 percent of those customers recycling a freezer or primary refrigerator, respectively. Due to customer reluctance to remove working additional appliances enhanced advertising and marketing efforts have been planned for 2014 to help promote the program offerings.

Changes in 2013
In 2013, SPS fully implemented the inclusion of primary refrigerators and freezers for recycling.

Saver's Switch (Residential)

Saver's Switch is a demand response program that offers bill credits as an incentive for residential customers to allow SPS to control operation of customers' central air conditioners and electric water heaters on days when the SPS system is approaching its peak. This program is generally utilized on hot summer days when SPS's load is expected to reach near-peak capacity. Saver's Switch helps reduce the impact of escalating demand and price for peak electricity.

When the program is activated, a control signal is sent to interrupt the air conditioning load during peak periods, typically in the afternoons on weekdays. For air conditioners, SPS utilizes a cycling strategy to achieve a 50% reduction in load. For enrolled electric water heaters, the entire load is shed for the duration of the control period. Due to limitations in

available over-the-air control systems, the program is currently available only in the cities of Portales, Hobbs, Clovis, Roswell, Artesia, and Carlsbad. In 2013, the program was activated on four occasions.

Table 15: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Residential Saver's Switch	1,981	945	$584,631	$549,199	1,626	1,710	15,690	21,600	0.39	0.32

Deviations from Goal
The 2013 program year was the third operational year for the Saver's Switch program and SPS continues to make adjustments to improve program performance. As a load management program that is evaluated on a one-year basis, a substantial number of existing participants are needed to offset the high first-year costs for any new participants added to the program. Initial costs incurred for each switch, including, M&V, recruitment, installations, and acquisition are significantly larger than the ongoing costs, which are primarily annual bill credits. SPS anticipates that the program will need additional years of growth to achieve a cost-effective TRC or UCT value. However, even in the short term the program offers a significant benefit as a load reduction resource during peak times. The following table compares 2013 program achievements versus 2012 program achievements.

Table 16: Comparison of 2012 versus 2013 Residential Saver's Switch Achievements

Measure	*2012 Value*	*2013 Value*
Average Per-Unit Peak kW Reduction	0.847	0.821
Number of Units	1,494	1,981
Peak kW Reduction	1,265.00	1,626.40
kWh Savings	12,427	15,690

As the table shows, participation and program achievements increased in 2013 compared to 2012.

Changes in 2013
None.

School Education Kits

The School Education Kits program provides classroom and in-home activities that enable students and parents to install energy efficiency and water conservation products in their homes. The program is targeted to fifth grade students. A third-party contractor fully implemented the School Education Kits program, including recruiting and training teachers, providing all materials, and tracking participation by schools and teachers. Energy savings

are based on the number of measures that are installed in the homes of the students. Students complete surveys to determine the measure installation rates.

Table 17: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
School Education Kits	3,504	2,500	$147,494	$162,241	15	14	850,705	540,992	3.22	2.49

Deviations from Goal
The product exceeded its participant and savings goals for 2013 by providing more kits than originally anticipated while coming in under budget.

Changes in 2013
None.

Business Segment

SPS has over 22,000 customers in its Business Segment in New Mexico, including commercial, industrial, and agricultural customers of all sizes.

In 2013, SPS offered four business programs with opportunities for all commercial and industrial customers to participate. In total, SPS spent $4,310,109 on these programs and achieved 3,253 kW and 16,638,766 kWh savings at the customer level.

Overall, the Business Segment of programs was cost-effective with a TRC of 2.24. However, only one program, the Business Comprehensive program, was cost-effective at both the TRC and UCT levels. Achievements were 112 percent of the annual kWh goal due to the Business Comprehensive program exceeding goal by approximately 2,000,000 kWh. Each of the programs under the Residential Segment are discussed in more detail below.

Business Comprehensive

The Business Comprehensive program bundles traditional prescriptive and custom products in a way that is more easily understood by customers. Business Comprehensive encompasses of the Computer Efficiency, Cooling Efficiency, Custom Efficiency, Large Customer Self-Direct, Lighting Efficiency, and Motor & Drive Efficiency products. Customers can choose to participate in the any or all of the individual program components.

Table 18: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Business Comprehensive	332	1,219	$2,713,630	$3,380,634	2,327	2,208	14,183,620	12,158,268	2.91	4.18

Deviations from Goal
The Business Comprehensive program surpassed its full-year goal. Performance was mostly driven by participation in the Motors & Drives product by mining and oil field customers, and by participation in the Cooling Efficiency product by schools and hotels.

Changes in 2013
None.

Interruptible Credit Option

The ICO program was developed to offer significant savings opportunities to SPS business customers who can reduce their electric demand for specific periods of time when notified. In return for participating, customers receive a monthly credit on their demand charges.

Table 19: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Interruptible Credit Option	0	1	$1,638	$46,617	0	1,578	0	14,000	0.00	0.00

Deviations from Goal
The ICO programs did not have any participants during 2013. The ICO program is best suited for SPS's largest customers, most of whom are in the oil and gas industries. Due to the current economic conditions, most of these large customers see a financial benefit to continuing production, rather than being paid to curtail their load. SPS spent a small amount of the budget on marketing materials such as Customer ICO System Guides and Program Features and Benefits collateral. Current promotions will continue through 2014.

Changes in 2013:
None.

Saver's Switch for Business

Saver's Switch is a demand response program that offers bill credits as an incentive for commercial customers to allow SPS to control operation of their central air conditioners on days when the system is approaching its peak. This program is generally utilized on hot summer days when SPS's load is expected to reach near-peak capacity. Saver's Switch helps reduce the impact of escalating demand and price for peak electricity.

When the product is activated, a control signal is sent to interrupt the air conditioning load during peak periods, typically in the afternoon on weekdays. SPS utilizes a cycling strategy to determine how a customer's air conditioning is being operated in order to achieve a 50% reduction in load. Due to limitations in available paging systems, the program is currently available only in the cities of Portales, Hobbs, Clovis, Roswell, Artesia, and Carlsbad. In 2013, the program was activated on four occasions.

Table 20: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Saver's Switch for Business	279	82	$226,443	$271,879	322	470	2,676	3,480	0.18	0.15

Deviations from Goal
Similar to the Residential Saver's Switch program, this program has been in operation for three years and SPS continues to make changes to the program design to improve performance. In response to the 2012 evaluation, which found lower than expected per-unit load reduction estimates, SPS conducted a review of installed Business Saver's Switches.

The review found that the vast majority of deployed switches were operational and received signals which indicated that 2012 issues were likely not due to system infrastructure.

In 2013, the observed load relief values returned to levels more consistent with forecasts. Like the residential program, Saver's Switch for Business is evaluated on a one-year basis. Therefore, the program requires a sizeable installed base of ongoing participants to counter the fixed costs, such as measurement and verification, and growth costs, such as hardware, installations, and marketing. The program has not yet achieved cost-effectiveness under the TRC or UCT tests; however, program participation and achievements have increased compared to 2012. SPS anticipates the program will need additional time to grow before returning cost-effective values under the TRC or UCT. However, even in the short term the program offers a significant benefit as a load reduction resource during peak times. The following table compares 2013 program achievements versus 2012 program achievements.

Table 21: Comparison of 2012 versus 2013 Residential Saver's Switch Achievements

Measure	*2012 Value*	*2013 Value*
Average Per-Unit Peak kW Reduction	0.277	1.190
Number of Units	191	199
Peak kW Reduction	52.84	236.81
kWh Savings	352	1,909

Changes in 2013
None.

Small Business Lighting

The Small Business Lighting Program offers free lighting audits, energy saving recommendations, paperwork assistance, and attractive rebates to business customers with peak demand of up to 400 kW. The program, implemented by Franklin Energy, addresses barriers that traditionally prevent small businesses from investing in energy efficiency products, including: insufficient knowledge of lighting equipment and lack of awareness of energy savings potential in lighting system upgrades, lack of time and staff to complete the necessary steps to upgrade lighting systems, lack of capital to make lighting improvements, and lack of access to quality contractors.

Small Business Lighting is marketed through numerous channels, including: direct trade outreach, customer outreach by Franklin Energy, Energy Efficiency Specialists in SPS's call centers, and general SPS branded trade and customer direct mail communication. Strategies used to raise product awareness and stimulate product participation in 2012 included:

- increased staffing to meet growing program participation volume, in-person lighting audits and energy-saving recommendations by Franklin Energy's Energy Advisor;
- electrical and lighting trade outreach; and
- updated sales literature, direct mail, and Web content development.

Table 22: 2013 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW	Peak Demand Goal kW	Annual Energy Savings kWh	Energy Savings Goal kWh	TRC Test	UCT Test
Small Business Lighting	193	99	$1,368,398	$1,260,849	604	614	2,452,470	2,624,220	0.96	1.43

Deviation from Goal
The Small Business Lighting program nearly met its achievement goal while remaining within 10% of its budget. Customer interest in the free on-site audits remains strong. The audit includes detailed and actionable recommendations for energy savings – including SPS's specific rebates.

Changes in 2013
None.

Planning & Research Segment

The Planning and Research Segment consists of internal functions (not customer-facing), which support the direct impact programs. The overall purpose of the Planning and Research Segment is to:

- provide strategic direction for SPS's energy efficiency and load management programs;
- ensure regulatory compliance with energy efficiency legislation and rules;
- guide SPS internal policy issues related to energy efficiency;
- train SPS Marketing staff for compliance and cost-effectiveness;
- evaluate program technical assumptions, program achievements, and marketing strategies;
- provide oversight of all evaluation, measurement, and verification planning and internal policy guidance;
- provide segment and target market information;
- analyze overall effects to both customers and the system of SPS's energy efficiency portfolio;
- measure customer satisfaction with SPS's energy efficiency efforts; and
- develop new conservation and load management programs.

The segment includes energy efficiency and load management-related expenses for Business Education, Consumer Education, DSM Planning & Administration, Market Research, Measurement & Verification, and Product Development. Each Planning and Research program is discussed below.

Business Education

In 2012, SPS retained an oil and gas industry expert to evaluate energy efficiency opportunities at large customer sites. Such studies provide a prioritized list of projects for customers to use to evaluate and gain internal approval for upgrades, provide technical detail necessary for energy efficiency rebate applications and analysis, and offer SPS representatives specific knowledge on the customer's operations to engage in relevant energy efficiency opportunities.

Deviations from Goal
The program concluded in 2012 after a review of the oil and gas industry. No further reviews were planned for 2013.

Changes in 2013
None.

Consumer Education

Consumer Education is an indirect program that focuses primarily on creating public awareness of energy efficiency while providing residential customers with information on what they can do in their daily lives to reduce their energy usage. The program also supports the various energy efficiency and load management products. SPS employs a variety of resources and channels to communicate conservation and energy efficiency messages, including: the Xcel Energy Inc. ("Xcel Energy") website, bill inserts, events, radio, print, and on-line advertising.

The Consumer Education Program is targeted to all New Mexico residential electric customers. In spreading its messages, the Consumer Education program focuses on:

- web presence on ResponsibleByNature.com;
- community-based marketing events;
- messaging through local radio stations as well as on-line advertising;
- targeted communications to address seasonal usage challenges;
- conservation messaging through Xcel Energy's newsletters and bill inserts to residential customers; and
- publication of reference education materials (in English and Spanish).

Deviations from Goal
None.

Changes in 2013
None.

DSM Planning & Administration

The Planning and Administration area manages all energy efficiency and load management regulatory filings (including this Annual Report), directs and carries out benefit-cost analyses, provides tracking results of energy conservation achievements and expenditures, and analyzes and prepares cost recovery reports. Planning and Administration, which includes outside legal assistance, coordinates and participates in all DSM-related rulemaking activities and litigated hearings. This area also supports the DSM component of resource planning and provides planning and internal policy guidance to meet all energy efficiency and load management regulatory requirements. These functions are needed to ensure a cohesive and high-quality energy efficiency portfolio that meets legal requirements as well as the expectations of SPS's customers, regulators, and Commission Staff.

In 2013, SPS developed and filed its 2014 DSM Plan designed to cover its program offerings and administrative operations for the 2014 and 2015 program years. SPS received approval of this Plan on June 25, 2014.

Deviations from Goal
None.

Changes in 2013

None.

Market Research

The Market Research group spearheads energy efficiency-related research efforts that are used to inform SPS's decision-making concerning energy efficiency and load management. In 2013, the Market Research group oversaw the SPS portion of several Xcel Energy-wide projects such as the Awareness, Attitude & Usage Study, E-Source Membership, and the Dun & Bradstreet list purchase. In addition, an updated DSM Potential study for SPS's New Mexico service area was completed in order to support SPS's 2014 Plan filing.

Deviations from Goal
None.

Changes in 2013
None.

Measurement & Verification

The Measurement & Verification budget funds the internal staff from the Planning and Administration area who oversee M&V planning, data collection, and internal policy guidance. In addition, this area coordinates the day-to-day activities providing necessary information and program tracking data to the Evaluator as well as serving on the Commission's Evaluation Committee.

17.7.2.13.C(1) NMAC requires that utilities submit an M&V Report conducted by the approved Evaluator every year with its Annual Report. All New Mexico utilities have contracted with ADM Associates, Inc. as their Evaluator for 2013 programs. The 2013 M&V Report is provided as Appendix A of this document. In compliance with the reporting requirements, the 2013 M&V Report includes:

- expenditure documentation, at both the total portfolio and individual program levels;
- measured and verified savings;
- evaluation of cost-effectiveness of all of SPS's energy efficiency and load management programs;
- deemed savings assumptions and all other assumptions used by the Evaluator;
- description of the M&V process, including confirmation that:
    - measures were actually installed;
    - installations meet reasonable quality standards; and
    - measures are operating correctly and are expected to generate the predicted savings.

Deviations from Goal
None.

Changes in 2013
None.

Product Development

Product Development identifies, assesses, and develops new energy efficiency and load management products and services. The product development process starts with ideas and concepts from customers, regulators, energy professionals, interest groups, and Xcel Energy staff. These ideas are then carefully screened and only ideas with the most potential are selected for the development process.

In 2013, the Product Development team developed prescriptive rebates or new program offerings for the following list of products as part of the 2014 DSM Plan filing:

Business

- Cooling – additional measures
    - Anti-Sweat Heater Controls
    - Evaporator Fan Motor Controls
    - Medium Temperature Refrigerated Case Replacement
    - No Heat Refrigerated Case Doors
- Lighting Efficiency – additional measures
    - ENERGY STAR Qualified Interior Commercial LED Retrofit Fixture (screw-in) Downlights, 25 Watts or less
    - Bi-Level Stairwell Fixtures with Integrated Sensors
    - LED Wall Pack Fixtures – Exterior and Parking Garage
    - LED Parking Garage Low Bay Fixtures
- Computer Efficiency – additional measure
    - Networked Based PC Power Management
- Motors & Drives – additional measures
    - Cycling Refrigerated Dryer
    - Dewpoint Demand Control
    - Mist Eliminator Filter
- Online Energy Feedback
- Building Tune-Up

Residential

- Refrigerator Recycling – Primary Refrigerator
- Refrigerator Recycling - Freezer

In an attempt to serve the growing need of our burgeoning oil-well customers, the Product Development team also investigated prescriptive rebates for the following measures:

- Sucker-rod Pump (SRP) VSDs
- Composite/Fiberglass Pump Rods on SRPs

Unfortunately, these oil-well customers-related-measures did not prove to be cost-effective, thus Product Development was unable to file them in the 2014 DSM plan.

Deviations from Goal
In 2013, the Product Development area was under budget by 24 percent. Product Development was able to capture efficiencies due to our ability to leverage work done in other Xcel Energy jurisdictions at no additional cost to the Product Development budget.

Changes in 2013
None.

Appendix A: Measurement & Verification Report:
SPS 2013 Program Year

Provided by ADM Associates, Inc., June 2014

Southwestern Public Service Company DSM Portfolio Program Year 2013

Prepared for:

New Mexico Energy Efficiency Evaluation Committee

Final: June 2014

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1. Executive Summary

This report is to provide a summary of the evaluation effort of the 2013 Demand Side Management (DSM) portfolio by the Southwestern Public Service Company (SPS, a division of Xcel Energy).

1.1 Summary of SPS Energy Efficiency Programs

New Mexico Investor-Owned Utilities (IOUs) are required to develop cost-effective DSM programs, using ratepayer funds to reduce energy demand and consumption. IOUs submit their portfolios to the New Mexico Public Regulatory Commission (NMPRC) for approval. In 2013, the SPS DSM portfolio contained the following programs:

- Residential Evaporative Cooling
- Residential Home Energy Services
- Residential Low Income
- Energy Feedback Pilot
- Home Lighting & Recycling
- School Education Kits
- Residential Refrigerator Recycling
- Business Comprehensive
- Large Customer Self-Direct[1]
- Small Business Lighting Efficiency
- Residential Saver's Switch
- Business Saver's Switch
- Interruptible Credit Option[2]

For 2013, ADM evaluated a subset of the portfolio. The programs evaluated for this program year include:

[1] No participants in 2013

[2] No participants in 2013

- Business Comprehensive;
- Small Business Lighting;
- Home Energy Services;
- Residential Low Income;
- School Education Kits;
- Evaporative Cooling Rebates;
- Energy Feedback Pilot
- Residential Saver's Switch; and
- Business Saver's Switch.

1.2 Evaluation Objectives

The objectives of this evaluation include:

- Development of program-specific evaluation plans;
- Design a sample allowing for 90% confidence and +/- 10% statistical precision for each program;
- Conduct onsite verification inspections, telephone surveying, and onsite metering as needed;
- Evaluate gross savings by program;
- Provide net savings totals through evaluation of free-ridership;
- Evaluate cost-effectiveness of each program using the Total Resource Cost (TRC) test and Utility Cost Test (UCT); and
- Evaluate programs within the portfolio and make recommendations for amendments and improvements.

1.3 Summary of Findings

Gross savings were estimated by engineering analysis, simulation modeling, participant surveying, and on-site monitoring where appropriate for the program and measure type. ADM then estimated free-ridership and associated net-to-gross ratios (NTGRs) for the evaluated programs Table 1-1 and 1-2 below present the gross and net impact by program. It should be noted that these tables include both evaluated and non-evaluated programs. Non-evaluated programs are shown as having 100% gross and net realization rates.

Table 1-1 Gross Impact Summary

Program	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Lifetime Energy Savings (kWh)		Gross Realization Rate
	Expected	Realized	Expected	Realized	Expected	Realized	
Home Energy Services	1110.1	411.4	2,667,588	3,238,576	49,172,082	60,466,478	121.4%
Home Lighting & Recycling	2,315.50	2,315.50	16,266,656	16,266,656	104,106,598	104,106,598	100.0%
Business Lighting	974.3	462.9	4,481,938	1,920,177	53,783,264	23,042,129	42.8%
Business Cooling	408.3	494.3	1,304,476	1,663,813	14,632,482	18,069,745	127.5%
Business Motors & Drives	1,147.90	1,304.70	8,169,466	8,998,493	123,220,556	134,977,514	110.1%
Business Computers	47.4	47.5	346,905	346,905	1,734,523	1,734,523	100.0%
Business Custom	465	470.5	3,851,854	3,858,934	57,944,499	57,672,498	100.2%
Small Business Lighting	939.4	649.5	3,549,021	2,639,335	149,058,882	110,852,070	74.4%
Energy Feedback Pilot	660	356.6	2,521,583	3,222,538	2,521,583	3,222,538	127.8%
Evaporative Cooling Rebates	928	721.1	1,052,736	948,996	15,791,040	14,234,940	90.1%
Low Income	39.4	45.4	72,144	86,673	737,161	1,251,920	120.1%
Refrigerator Recycling	112.2	112.2	583,564	583,564	2,917,820	2,917,820	100.0%
School Education Kits	27.2	14.8	1,217,854	850,705	9,389,654	8,102,502	69.9%
Total	9174.7	7406.4	46,085,785	44,625,365	585,010,144	540,651,275	96.8%

Table 1-2 Net Impact Summary

Program	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Expected	Realized	Expected	Realized	Expected	Realized	
Home Energy Services	1032.4	382.6	2,480,857	3,011,876	45,730,036	56,233,825	121.4%
Home Lighting & Recycling	1,827.0	1827.0	12,839,947	12,839,947	82,175,661	82,175,661	100.0%
Business Lighting	730.7	365.2	3,361,454	1,515,020	40,337,448	18,180,240	45.1%
Business Cooling	357.3	397.9	1,141,417	1,339,369	12,803,422	14,546,145	117.3%
Business Motors & Drives	889.6	1119.4	6,353,647	7,720,707	98,576,445	115,810,707	121.5%
Business Computers	41.8	41.8	305,276	305,276	1,526,380	1,526,380	100.0%
Business Custom	372	402.7	3,081,483	3,303,248	46,355,599	49,367,658	107.2%
Small Business Lighting	873.7	603.5	3,300,590	2,452,470	39,607,074	29,429,641	74.3%
Energy Feedback Pilot	660.0	356.6	2,521,583	3,222,538	2,521,583	3,222,538	127.8%
Evaporative Cooling Rebates	616.1	477.8	698,942	628,710	10,484,130	9,430,648	90.0%
Low Income	39.4	45.4	72,144	86,673	737,161	1,251,920	120.1%
Refrigerator Recycling	73.0	73.0	379,316	379,316	1,896,580	1,896,580	100.0%
School Education Kits	27.2	14.8	1,217,854	850,705	9,389,654	8,102,502	69.9%
Total	7540.2	6107.7	37,754,510	37,655,855	392,141,173	391,174,445	99.7%

Additionally, ADM evaluated the Residential and Business Saver's Switch programs, providing independent verification of the per-unit kW Factor and total available demand reduction. The results of these evaluations are presented in Table 1-3.

Table 1-3 Saver's Switch Evaluation Results

Sector	Peak kW Factor	# Units	Available Demand Reduction	kWh Savings
Residential	.821	1,981	1,626.4	15,690
Business	1.190	279	322.0	2,676
Total	0.862	2,260	1,948.4	18,366

Finally, the Evaluators estimated cost-effectiveness of the 2013 programs and overall portfolio using the Total Resource Cost (TRC) test and Utility Cost (UCT) test. The results are provided in Table 1-5.

Table 1-4 Cost Effectiveness Testing by Program

Program	*NPV of TRC Benefits*	*NPV of UCT Benefits*	*NPV of TRC Costs*	*NPV of UCT Costs*	*TRC*	*UCT*
Home Energy Services (Res & LI)	$3,064,374	$3,064,374	$762,993	$982,863	4.02	3.12
Home Lighting & Recycling	$5,728,424	$5,728,424	$1,011,796	$944,714	5.66	6.06
Evaporative Cooling	$1,567,810	$1,567,810	$121,783	$176,301	12.87	8.89
Energy Feedback Pilot	$203,353	$203,353	$186,315	$186,315	1.09	1.09
Refrigerator Recycling	$243,699	$243,699	$106,332	$140,982	2.29	1.73
School Education Kits	$367,410	$367,410	$113,926	$147,494	3.22	2.49
Business Lighting	$1,202,923	$1,202,923	$1,521,558	$1,130,100	0.79	1.06
Business Cooling	$1,106,114	$1,106,114	$477,417	$338,187	2.32	3.27
Business Custom	$2,564,467	$2,564,467	$404,046	$196,160	6.35	13.07
Business Motors & Drives	$6,438,590	$6,438,590	$1,486,023	$1,039,862	4.33	6.19
Business Computers	$93,412	$93,412	$30,122	$21,718	3.10	4.30
Small Business Lighting	$1,959,268	$1,959,268	$2,051,051	$1,368,398	0.96	1.43
Residential Saver's Switch	$184,892	$184,892	$473,133	$584,631	0.39	0.32
Business Saver's Switch	$35,019	$35,019	$199,873	$226,443	0.18	0.15
Interruptible Credit Option	$0	$0	$1,638	$1,638	0.00	0.00
Business Education	-	-	$1	$1	-	-
Consumer Education	-	-	$143,102	$143,102	-	-
Market Research	-	-	$56,673	$56,673	-	-
Measurement & Verification	-	-	$32,592	$32,592	-	-
Planning & Administration	-	-	$145,576	$145,576	-	-
Product Development	-	-	$66,947	$66,947	-	-
Total:	$24,759,755	$24,759,755	$9,392,897	$7,930,697	2.64	3.12

1.4 Conclusions

The Evaluators found the following:

- **Business programs did not have adequate quality assurance performed.** Though the program manuals in place for Business Lighting and Small Business Lighting detailed a rigorous QA process, the Evaluators found that this process was not put into practice, and as a result a significant number of projects were found to have high verification failure rates.
- **The SPS portfolio does not include an adequate mechanism to incentivize high efficiency residential refrigerated air systems.** These units are covered under the Home Energy Services Program, but the per-kWh incentive structure of that program does not adequately encourage the needed outreach for this measure. SPS has not had any uptake of this measure through Home Energy Services in any program year.
- **Home Energy Services has observed sharply declining participation.** Savings for Home Energy Services have decline each year since a 2010 peak. SPS should investigate other avenues for savings for this program, such as allowing mobile and manufactured homes to participate.

- **Participation in Business Comprehensive has become increasingly diverse.** There have been several successful initiatives in Business Comprehensive, including the introduction of upstream Business Computers incentives, increased outreach for Guest Room Energy Management systems, and participation from smaller oil producers in SPS' Business Motors & Drives Program. The Business Comprehensive Program has achieved a level of measure diversity significantly higher than observed in other New Mexico utilities' programs, and has had the greatest success in engaging their industrial sector.

1.5 Recommendations

The Evaluators' recommendations are as follows:

1.5.1 Home Energy Services

- **Provide fixed incentives for central air conditioning replacement.** The per-kWh model does not adequately encourage uptake of this measure. SPS should develop separate per-ton incentives for central air conditioning and heat pumps in a manner similar to El Paso Electric Company's program elsewhere in New Mexico. Ideally this would be included as part of an aggregated Residential High Efficiency Cooling Program along with the evaporative cooling rebates.
- **Update the contractor list on the program website.** The Evaluators found that the contractor list was out of date; it included one contractor that had been removed from the program and did not include newly added contractors.
- **Expand program eligibility to include mobile & manufactured housing.** Mobile and manufactured housing account for 16.1% of the residential housing stock for SPS. This housing often has electric radiant heating and could be a viable addition to the program

1.5.2 School Education Kits

- **Update deemed savings according to the new kit compision .** This would constitute installed net savings of:
  - 274.85 kWh;
  - .007978 kW; and
  - 7.9 Therms.
- **Addition of a bathroom faucet aerator to the kit.** Based off a literature review of similar programs along with program staff interviews, the Evaluators recommend adding a 1.0 GPM bathroom aerator to the school education kit. This could be a cost-effective addition that provides increased savings per-kit.

If this is added during non-evaluation years, we recommend that SPS use a 50% in-service rate and 54.3% electric water heating rate (the most recent rates reported for the kitchen aerator) along with unit energy savings of 180 kWh. Those three values translate to an additional 49 kWh should a 1.0 GPM bathroom aerator be added to the kit.

1.5.3 Evaporative Cooling Rebates

- **Add Western Cooling Control to the program.** This measure produces viable savings and is offered elsewhere in New Mexico. With SPS' relatively warm climate, it would be even more effective for SPS than for PNM.
- **Reorganize the program to include all high efficiency HVAC equipment for the residential market.** EPE has had success with that program design in their New Mexico service territory, and the Evaluators conclude that the residential HVAC market in SPS territory would be better-served by a similar program design.
- **Focus landlord outreach on owner-occupants and landlords that are responsible for the property utility bills.** Landlords that were not responsible for their tenants' bills displayed higher free-ridership than owner-occupants or landlords that are responsible for their property utility bills.

1.5.4 Business Comprehensive & Small Business Lighting

- **Maintain the new QA process for 2014.** The new QA process is more stringent than typical for a program of this type. However, given the performance of the program in 2013, the Evaluators see this as a necessity until such time that the program is shown to be providing reasonable quality assurance.
- **Develop a delamp calculator for participating trade allies.** Such a calculator would use existing deemed wattages for baseline and post-retrofit fixture types, but would allow for contractors to be more creative in their design of a lighting retrofit. This should be paid in a per-kWh incentive so as to encourage contractors to maximize the savings from a particular project. Development of such a tool would require a training session for participating contractors in order to assure its proper use and application.
- **Reintroduce the rebate sign-over.** This feature was removed from the program in response to the QA issues from one group of contractors in 2013. This should be reintroduced, but on a grantee-basis. SPS put participating trade allies through a certification process that allows them to engage in rebate sign-over. The requirement for this should be at least one program year of demonstrated performance and validation by program QA.

2. General Methodology

This chapter details general impact evaluation methodologies by program-type as well as data collection methods applied. This chapter will present full descriptions of:

- Gross Savings Estimation;
- Sampling Methodologies;
- Free-Ridership determination; and
- Data Collection Procedures.

2.1 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators provide a glossary of terms to follow:

- *Ex Ante* – A program parameter or value used by implementers/sponsoring utilities in estimating savings before implementation
- *Ex Post* – A program parameter or value as verified following completion of the evaluation effort
- *Deemed Savings* – A savings estimate for homogenous measures, in which an assumed average savings across a large number of rebated units is applied (e.g., assuming 398 kWh savings for a low-flow showerhead)
- *Gross Savings* – Energy or demand savings as determined through engineering analysis and verification
- *Gross Realization Rate* – Ratio of Ex Post Savings / Ex Ante Savings (e.g. If ADM verifies 300 kWh per showerhead, Gross Realization Rate = 300/398 = 75%)
- *Free-Ridership* – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program
- *Net Savings* – Gross savings factoring off free-ridership, (erg., if Free-Ridership for low-flow showerheads = 50%, net savings = 300 kWh x 50% = 150 kWh)
- *Net-to-Gross-Ratio (NTGR)* = (1 – Free-Ridership %), also defined as Net Savings / Gross Savings
- *Ex Ante Net Savings* = Ex Ante Gross Savings x Ex Ante Free-Ridership Rate
- *Ex Post Net Savings* = Ex Post Gross Savings x Ex Post Free-Ridership Rate
- *Net Realization Rate* = Ex Post Net Savings / Ex Ante Net Savings

- *Effective Useful Life (EUL)* – The average lifetime of a measure, denominated in years
- *Gross Lifetime kWh* = Ex Post Gross Savings x EUL
- *TRC* – Total Resource Cost Test, taking the ratio of net benefits over net costs, including both participant and utility costs
- *UCT* – Utility Cost Test, taking the ratio of net benefits over net utility costs.

2.2 Overview of Methodology

The Evaluators' methodology in the evaluation of the 2013 SPS DSM Portfolio is intended to provide:

- Net impact results at the 90% confidence and +/-10% precision level;
- Program feedback and recommendations via process evaluation; and
- Cost effectiveness testing at the program and portfolio level.

In doing so, this evaluation will provide the NMPRC with verified net savings results, provide the sponsoring utilities with recommendations for program improvement, and ensure cost-effective use of ratepayer funds. By leveraging experience and lessons learned from impact evaluation of past program years, we been able to expand upon the 2013 evaluation effort, in order to use the results of this impact evaluation to better inform SPS as to methods by which program and portfolio performance could be improved.

2.3 Sampling

Sampling is necessary to evaluate savings for the SPS DSM portfolio insomuch as verification of a census of program participants is typically cost-prohibitive. As per NMPRC requirements, samples are drawn in order to ensure 90% confidence at the +/-10% precision level. Programs are evaluated on one of three bases:

- Census of all participants
- Simple Random Sample
- Stratified Random Sample

2.3.1 Census of Participants

A census of participant data was used for select programs where such review is feasible. An example of this is the statistical analysis of billing data associated with the Energy Feedback Pilot. .

2.3.2 Simple Random Sampling

For programs with relatively homogenous measures (largely in the residential portfolio), the Evaluators conducted a simple random sample of participants. The sample size for verification surveys is calculated to meet 90% confidence and 10% precision (90/10). The sample size to meet 90/10 requirements is calculated based on the coefficient of variation of savings for program participants. Coefficient of Variation (CV) is defined as:

$$CV = \frac{Mean_x}{Standard\ Deviation_x}$$

Where x is the average kWh savings per participant. Without data to use as a basis for a higher value, it is typical to apply a CV of .5 in residential program evaluations. The resulting sample size is estimated at:

$$n_0 = \left(\frac{1.645 * CV}{RP}\right)^2$$

Where,

1.645 = Z Score for 90% confidence interval in a normal distribution

CV = Coefficient of Variation

RP = Required Precision, 10% in this evaluation

With 10% required precision (RP), this calls for a sample of 68 for programs with a sufficiently large population. However, in some instances, programs did not have sufficient participation to make a sample of this size cost-effective. In instances of low participation, the Evaluators then applied a finite population correction factor, defined as:

$$n = \frac{n_0}{1 + {}^{n_0}/_N}$$

Where

n_0 = Sample Required for Large Population

N = Size of Population

n = Corrected Sample

For example, if a program were to have only 100 participants, the finite population correction would result in a final required sample size of 41. The Evaluators applied finite population correction factors in instances of low participation in determining samples required for surveying or onsite verification.

2.3.3 Stratified Random Sampling

For the SPS business portfolio, Simple Random Sampling is not an effective sampling methodology as the CV values observed in business programs are typically very high because the distributions of savings are generally positively skewed. Often, a relatively small number of projects account for a high percentage of the estimated savings for the program.

For example, the 2013 SPS Small Business Lighting Program had a CV of 1.52 for non-hotel facilities at year's end. Using the base simple random sample function, this would call for a sample of 625. This component had 162 participating facilities, and as such, a finite population adjustment is needed. Adjusting for the population, the required simple random sample is 129, which would be prohibitively expensive.

To address this situation, we use a sample design for selecting projects for the M&V sample that takes such skewness into account. With this approach, we select a number of sites with large savings for the sample with certainty and take a random sample of the remaining sites. To further improve the precision, non-certainty sites are selected for the sample through systematic random sampling. That is, a random sample of sites remaining after the certainty sites have been selected is selected by ordering them according to the magnitude of their savings and using systematic random sampling. Sampling systematically from a list that is ordered according to the magnitude of savings ensures that any sample selected will have some units with high savings, some with moderate savings, and some with low savings. Samples cannot result that have concentrations of sites with atypically high savings or atypically low savings. As a result of this methodology, the required sample for this component of the Small Business Lighting program was reduced to 13, with one certainty stratum and 4 sample strata.

2.3.4 Free-Ridership

In determining ex post net savings for the SPS DSM portfolio, the Evaluators provide estimates of free-ridership for individual programs. Free-riders are program participants that would have implemented the same energy efficiency measures at nearly the same time absent the program. Rather than apply a binary scoring (0% vs. 100% free-ridership), the Evaluators applied a free-ridership probability to program participants, based upon four factors:

(1) Financial ability to purchase high efficiency equipment absent the rebate

(2) Importance of the rebate in the decision-making process

(3) Prior planning to purchase high efficiency equipment

(4) Demonstrated behavior in purchasing similar equipment absent a rebate

In this methodology, Part (1) is essentially a gateway value, in that if a participant does not have the financial ability to purchase energy efficient equipment absent a rebate, the other components of free-ridership become moot. As such, if they could not have afforded the high efficiency equipment absent the rebate, free-ridership is scored at 0%. If they did have the financial capability, we then examine the other three components, each contributing an equal scoring of 33% to free-ridership. It should be noted that having financial ability does not necessarily imply free-ridership; it just opens the possibility that other factors could contribute. A participant that was financially able to purchase high efficiency lighting, for example, could still be scored at 0% free-ridership if it is demonstrated that:

(1) The rebate factored into their decision-making process;

(2) They did not have prior plans to install high efficiency equipment before learning of the available rebates; and

(3) They did not demonstrate prior behavior of purchasing similar equipment absent a rebate.

There are other contributing factors to free-ridership, specifically in instances of programs that provide outreach to customers. For example, if in a large commercial retrofit, a sponsoring utility provides assistance in energy efficiency measure recommendation, or in providing cost-benefit analysis of a measure to a business, these could factor into the decision-making in ways that mitigate free-ridership, in that there are cases where a participant did not need a rebate to participate, but was induced to participate by the sponsoring utility's efforts in recommending and/or evaluating energy efficiency measures for them. Additional issues such as this are addressed on a program-by-program basis in methodology sections to follow.

For residential programs, free-ridership is calculated as the average score determined for the sample of participants surveyed. For business programs, a weighted average is taken of verified kWh savings, as the free-ridership scores of high-savers contribute a larger share of the overall free-ridership rate. Once free-ridership is determined, the Evaluators then estimate the Net-to-Gross Ratio (NTGR), calculated as:

NTGR = 1 – % Free-Ridership

2.4 Data Collection

This subsection provides descriptions of The Evaluators' data collection procedures, including:

- Telephone Surveying;
- Residential On-Site Verification; and
- Business On-Site Verification & Metering.

2.4.1 Telephone Surveying

The Evaluators conducted a large volume of telephone surveys in evaluating the 2013 SPS DSM portfolio. These surveys were designed to collect a variety of data needed in the evaluation effort, including:

- Verification of installation of rebated equipment;
- Parameters used in gross savings calculations (room of installation for residential CFLs, whether a refrigerator was used indoors vs. outdoors, etc.);
- Data on decision-making to be used in determining program free-ridership; and
- Feedback from participants from their experiences with the program.

Surveys with business program participants, rebate consultancies, CFL distributing agencies, and trade allies were conducted by ADM staff. Surveys with residential program participants were conducted by Research & Polling, an experienced survey firm, with ADM performing quality control checking on the survey programming and monitoring a sample of phone calls. This ensured that interviewers were adhering to the survey script and that all questions were read correctly.

2.4.2 Onsite Surveys

On-site data collection procedures varied by program. For residential programs, site visits constituted a verification inspection of rebated equipment. For business participants, the Evaluators conducted onsite metering at facilities where factors contributing to energy savings, including lighting schedule and motor load factors, were subject to high uncertainty.

2.5 Cost Effectiveness Testing

The Evaluators performed the Total Resource Cost (TRC) and Utility Cost (UCT) tests as part of the 2013 EM&V effort.

2.5.1 Total Resource Cost Test

The TRC value is defined as:

$$TRC = \frac{\text{Electric Cost Decrease} + \text{Capacity Credit} + \text{NonElectric Cost Decrease}}{\text{Net Customer Investment} + \text{Utility Administrative Costs}}$$

The parameters for this equation are defined in Table 2-1.

Table 2-1 Parameters for TRC Testing

Parameter	Definition
UEPCD	Utility Electric Cost Decrease: The Net Present Value (NPV) of avoided production costs. Estimated by taking NPV of net kWh savings multiplied by $/kWh production costs over the life of the measure.
UGCC	Utility Generation Capacity Credit: The NPV of avoided capacity expansion costs. Estimated by taking NPV of net demand reduction multiplied by $/kW capacity expansion costs over the life of the measure.
NEACD	Non-Electric Acquisition Cost Decrease: NPV of gas savings created incidentally by electric DSM programs (from measures such as weatherization, low-flow showerheads, etc.). Estimated by taking NPV of net Therms savings multiplied by $/Therm of gas production/distribution by gas utilities serving the SPS territory.
NCI	Net Customer Investment: Net incremental costs accrued by program participants. Estimated by taking total measure-level incremental costs and multiplying by Net-to-Gross Ratio, as costs paid by free-riders would have occurred absent the program. For give-away programs, the incremental cost of equipment paid by the utility is substituted for this value as participant costs are $0 in such programs.
UAC	Utility Administrative Costs: Costs accrued by SPS for running the program. Costs include internal administration costs, marketing, and third-party implementation costs. Rebates are not considered a cost as they represent transfer payments from SPS to program participants.

2.5.2 Utility Cost Test

The UCT test is defined as:

$$UCT = \frac{\text{Electric Cost Decrease} + \text{Capacity Credit} + \text{NonElectric Cost Decrease}}{\text{Utilty Equipment Expenditures} + \text{Utility Administrative Costs}}$$

Most terms in this equation are defined and calculated in the same manner as the components of the TRC test. Where the UCT test differs, however, is in costs applied. The TRC test treats rebates as a transfer payment; it is simultaneously a cost to the utility and a benefit to the participant, and as such its impact ton TRC is neutral. The UCT is focused on the costs the sponsoring utility incurs in running a program, and as such rebate payments are included in the cost side of the equation. Net Customer Investment (NCI) is not factored in, as this cost is external to the utility. In giveaway programs, such as the School Education Kits program, Utility Equipment Expenditures (UEE) will be equal in value to NCI, as the “rebate” (100% of the measure incremental cost) is paid in full by the utility, and thus the NCI is paid by SPS.

3. Residential Saver's Switch

3.1 Program Description

The Residential Saver's Switch Program (RSSP) is a direct load control program in which participants agree to have a Smart Switch attached to their refrigerated air unit. When SPS has a system critical peak, they can send a signal to the unit that will set a cycling rate on the compressor, turning it off for an interval of time during the hottest hours of summer weekday afternoons. It is not activated on weekends or holidays, and activation is not to last longer than four hours on a given day. Participants receive a $40 incentive for their participation.

3.2 M&V Methodology

Demand reductions are evaluated metered data for a curtailed group with a baseline determined from adjusting usage on prior days. Reductions are calculated as:

$$Baseline\ kW = Mean\ kW(Baseline\ Days) * Offset\ Factor$$

Where,

Baseline Days = Three of the previous 5 non-weekend, non-holiday, non-event days displaying the highest average event-time load, and

Offset Factor = kW for the hour preceding curtailment / Average kW for this hour during baseline days

This is then translated to the entire population. What comes from these two methodologies is an "availability analysis", in which the in-season performance is multiplied by the number of installations at the end of the 2013 program year. This provides estimates of the value of the resource developed by the program implementation staff.

3.3 Impact Evaluation Results

The Evaluators estimated the available critical peak reduction from the RSSP by analysis of metered data from the curtailment group on all event days in 2013. The analysis was conducted with a sample of 93 metered units[3]. Monitoring equipment was deployed by contractors on behalf of SPS. The sample was drawn by the Evaluators and staff rode along for 20 residential installations to ensure proper procedures were adhered to.

[3] The original sample contained 99 metered premises. 6 premises were flagged as having issues with data quality or completeness. This was confirmed and these premises were dropped.

3.3.1 Residential Event Summaries

The Evaluators calculated hourly kW reductions for all hours of all events in 2013. Table 3-1 below summarizes the average hourly per-unit kW reductions for this group by event. To save space, the column labels give the savings by event hour. The event schedule for 2013 is:

- June 4th: 2 – 6 PM
- June 26th: 2 – 6 PM
- June 27th: 2 – 6 PM
- September 5th: 2 – 6 PM

Table 3-1 Hourly kW Reductions by Event

Date	Hr 1	Hr 2	Hr 3	Hr 4	Max
June 4th	0.80	1.01	1.03	1.07	1.07
June 26th	0.50	0.48	0.57	0.49	0.57
June 27th	0.60	0.63	0.70	0.63	0.70
September 5th	0.78	0.91	0.94	0.51	0.94
Average	0.67	0.76	0.81	0.68	0.82

Figure 3-1 through Figure 3-4 present the residential load profiles during the four load control events.

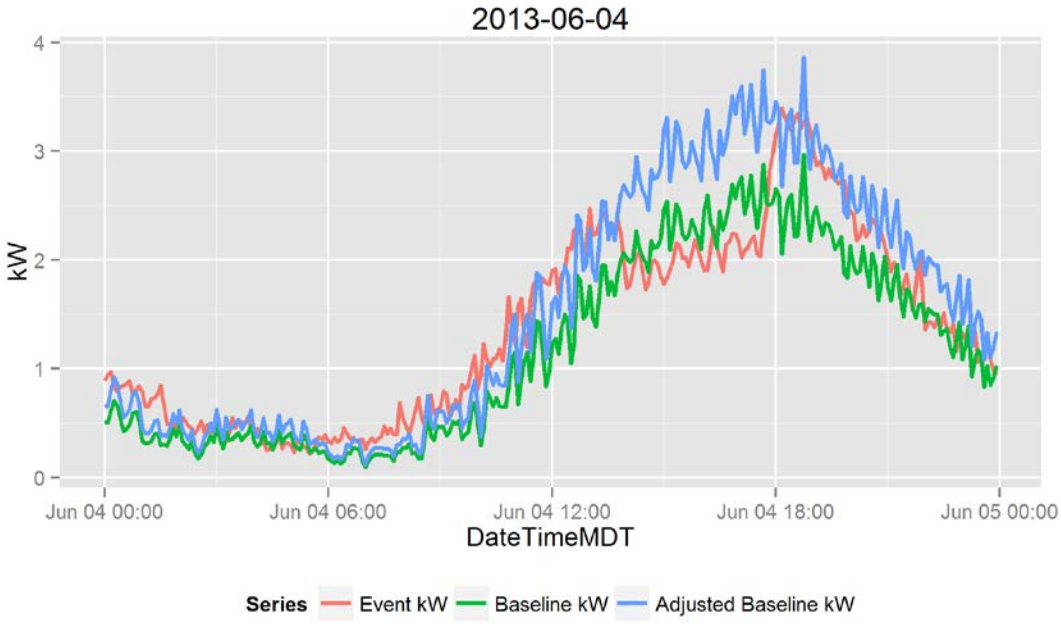

Figure 3-1 June 4th Event Residential Load Profile

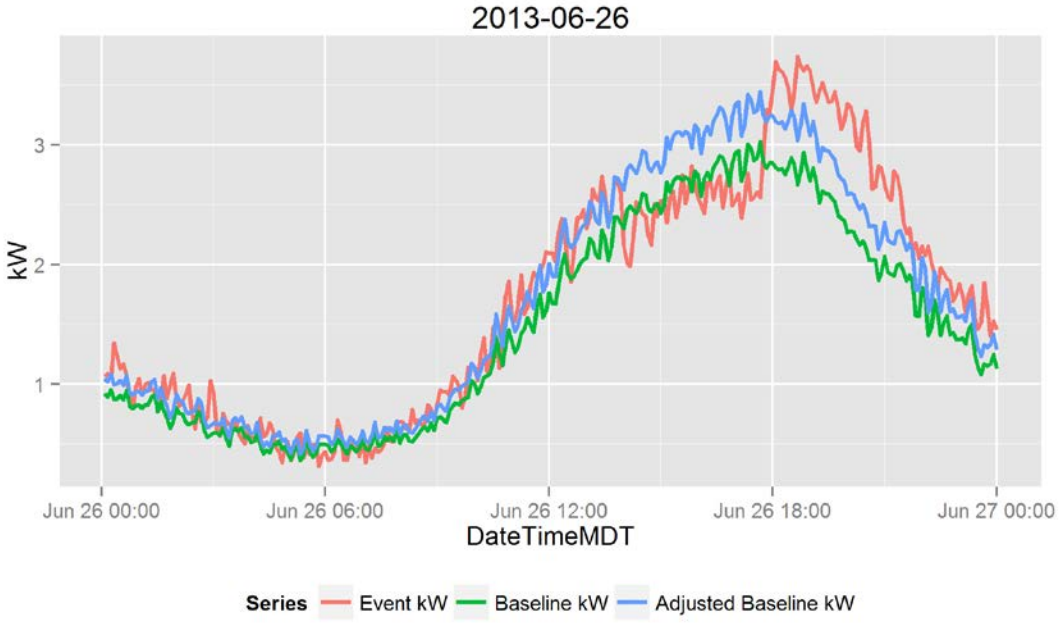

Figure 3-2 June 26th Event Residential Load Profile

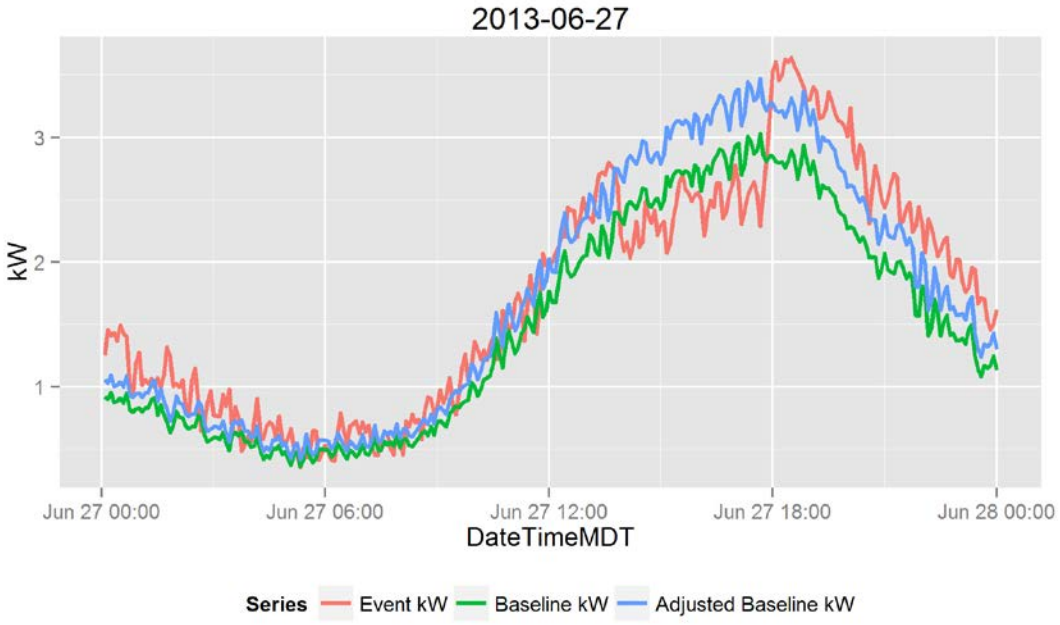

Figure 3-3 June 27th Event Residential Load Profile

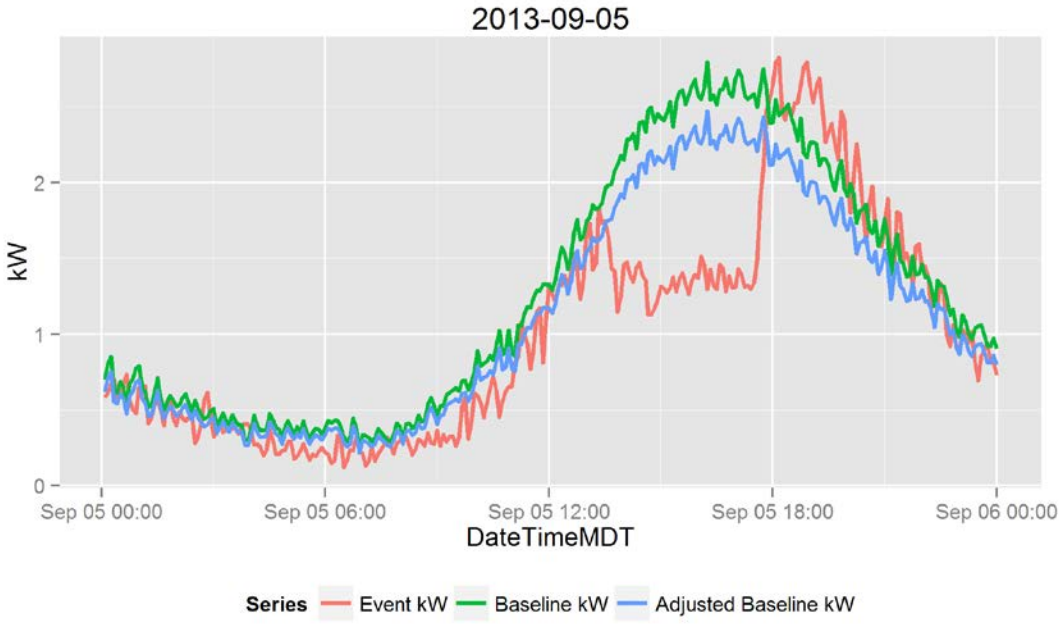

Figure 3-4 September 5th Event Residential Load Profile

3.3.2 kWh Savings

Though RSSP is a load-shifting program, it can provide overall kWh savings. To calculate savings, The Evaluators calculated two values for each event:

(1) kW Reduction Factor; and

(2) Snapback Factor.

These factors were determined as follows:

Reduction Factor:

The Reduction Factor is taken as the sum of kW reductions across all hours of the event.

Snapback Factor:

Snapback Factors are the sum of kW differences between the baseline and event day load for the three hours following the end of a curtailment event.

These two factors are then summed to develop the kWh Factor. The resulting savings from each event are summarized in Table 3-2.

Table 3-2 Residential Saver's Switch kWh Savings

Event Date	Reduction Factor	Snapback Factor	kWh Factor	Units	kWh Savings
June 4th	3.91	-0.08	3.84	1,981	7,607
June 26th	2.05	-1.45	0.59	1,981	1,169
June 27th	2.56	-0.90	1.66	1,981	3,288
September 5th	3.15	-1.32	1.83	1,981	3,625
				Total:	15,690

3.3.3 Residential Saver's Switch Performance Summary

To quantify the available demand reduction from the RSSP, the Evaluators took the maximum kW reduction observed for each event and averaged these values across events. The resulting available reduction from the RSSP is presented in Table 3-3.

Table 3-3 Residential Saver's Switch Performance Results

Measure	Value
Average Per-Unit Peak kW Reduction	0.821
Number of Units	1,981
Peak kW Reduction	1,626.40
kWh Savings	15,690

4. Business Saver's Switch

4.1 Program Description

The Business Saver's Switch Program (BSSP) is analogous to the RSSP in providing incentives for the installation of direct load control devices on businesses' refrigerated air conditioning units. Businesses receive an incentive of $20 per enrolled ton of air conditioning, paid as a bill credit to their October energy bill after the close of the cooling season.

4.2 M&V Methodology

The M&V methodology for BSSP is the same as indicated for RSSP in Section 3.1.

4.3 Impact Evaluation Results

The Evaluators estimated the available critical peak reduction from the BSSP in the same manner as for the Residential component. A sample of 50 units was developed by the Evaluators, and though SPS contractors installed the monitoring equipment, staff from the Evaluators were present at 10 business installations in order to ensure that proper procedures were adhered to.

4.3.1 Business Event Summaries

The Evaluators calculated hourly kW reductions for all hours of all events in 2013. Table 4-1 below summarizes the average hourly per-unit kW reductions for this group by event. The event schedule is identical to Residential Saver's Switch.

Table 4-1 Hourly kW Reductions by Event

Date	Hr 1	Hr 2	Hr3	Hr 4	Max
June 4th	1.10	1.17	1.47	1.42	1.47
June 26th	0.77	0.64	0.25	-0.20	0.77
June 27th	0.97	1.12	0.87	0.28	1.12
September 5th	1.39	1.31	1.28	0.34	1.39
Average	1.06	1.06	0.97	0.46	1.19

Figure 4-1 through Figure 4-4 below present the load shapes for each event day for the 2013 Business Saver's Switch Program.

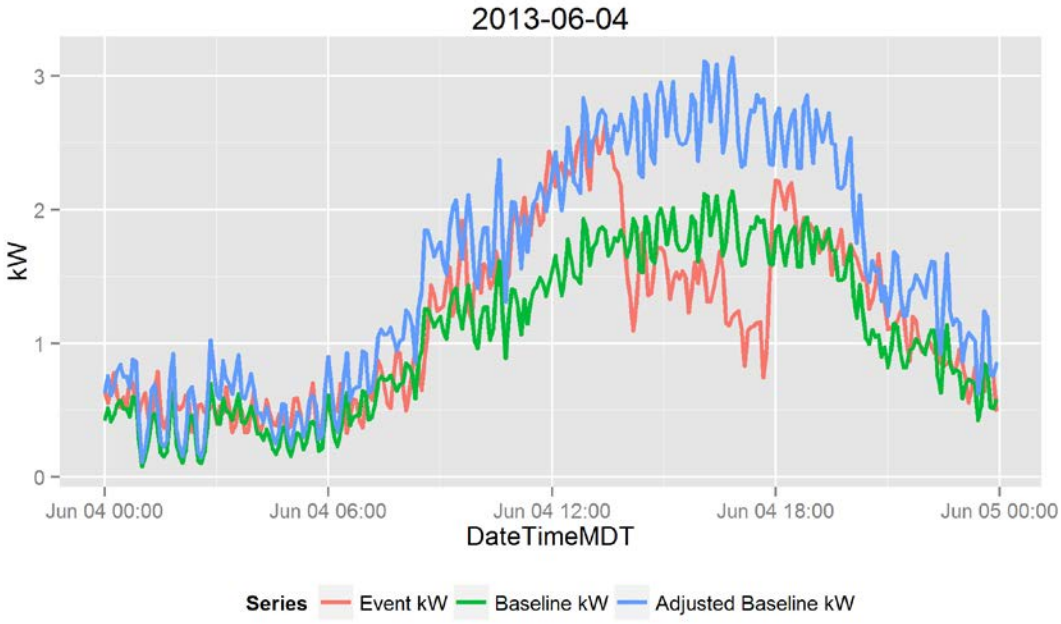

Figure 4-1 June 4th Event Business Load Profile

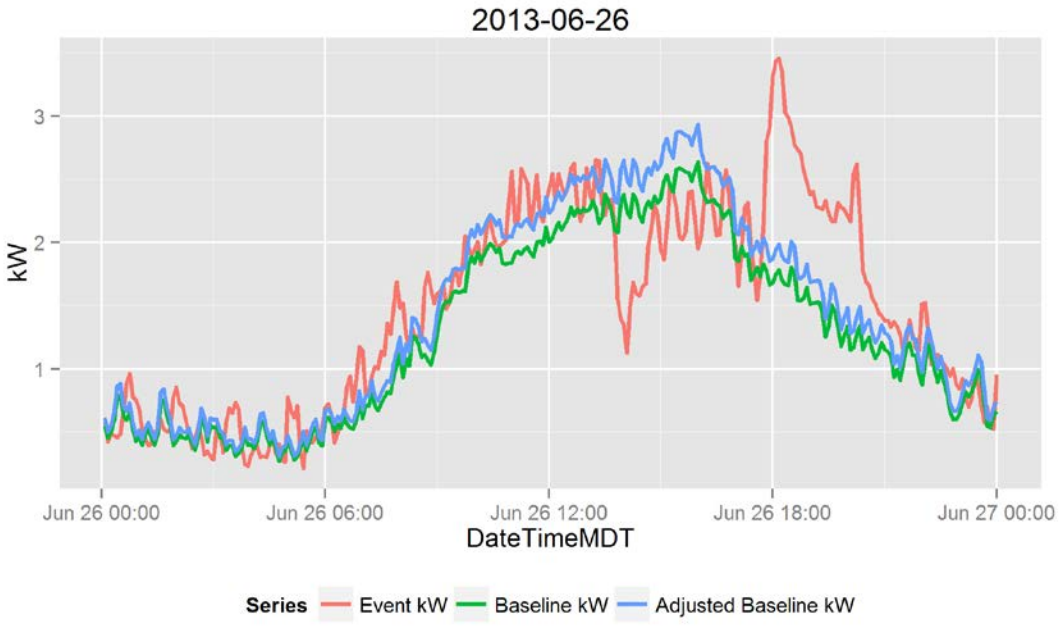

Figure 4-2 June 26th Event Business Load Profile

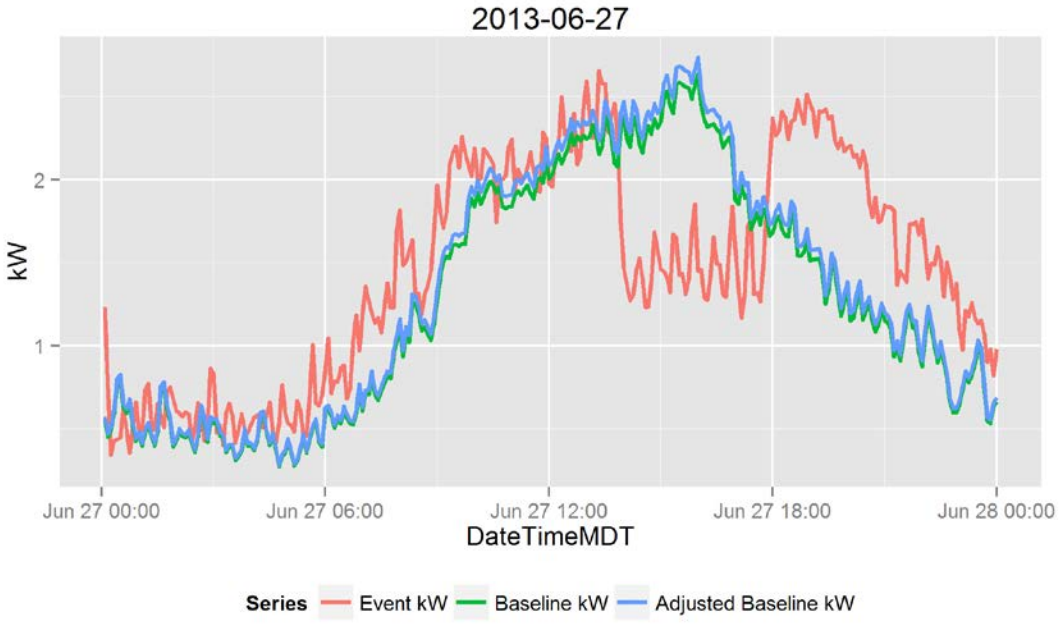

Figure 4-3 June 27th Event Business Load Profile

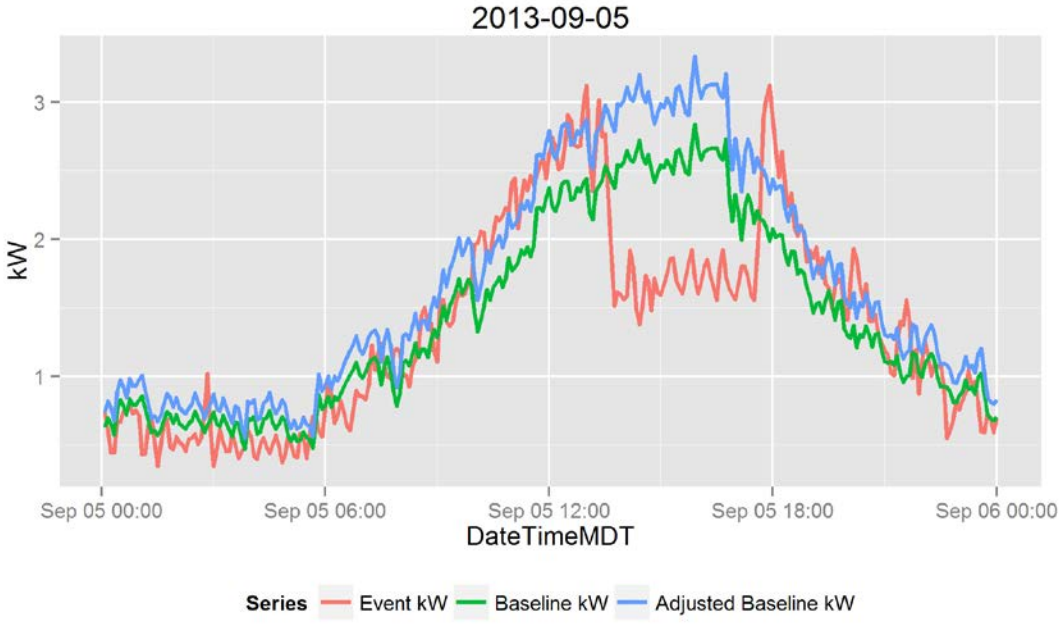

Figure 4-4 September 5th Event Business Load Profile

4.3.2 Business Saver's Switch kWh Savings

As with Residential Saver's Switch, the BSSP can provide kWh savings; they are calculated in the same manner as the Residential Saver's Switch program. The resulting savings from each event are summarized in Table 4-2 below.

Table 4-2 Business Saver's Switch kWh Savings

Event Date	Reduction Factor	Snapback Factor	kWh Factor	Units	kWh Savings
June 4th	5.15	0.00	5.15	279	1,437
June 26th	1.45	-2.28	-0.83	279	-232
June 27th	3.24	-2.26	0.98	279	273
September 5th	4.32	-0.03	4.29	279	1,197
				Total:	2,676

4.3.3 Business Saver's Switch Performance Summary

As with Residential Saver's Switch, to quantify the available demand reduction from the BSSP, the Evaluators took the maximum kW reduction observed for each event and averaged these values across events. The resulting available reduction from the BSSP is presented in Table 4-3 below.

Table 4-3 Business Saver's Switch Performance Results

Measure	Value
Average Per-Unit Peak kW Reduction	1.190
Number of Units	279
Peak kW Reduction	332.0
kWh Savings	2,676

5. Home Energy Services

5.1 Program Description

The Home Energy Services Program (HESP) provides incentives to energy efficiency service providers (EESPs or "contractors") to install a range of residential upgrades to existing homes that save energy and reduce energy costs. Professionally trained technicians use field tested protocols and advanced diagnostic equipment to determine the most cost-effective energy savings measures appropriate for each home. Typical upgrade services include installing insulation in the attic; stopping heat loss around windows, doors, and other infiltration points; repairing leaky ducts; and installing high efficiency central air conditioning. The main program provides services to all SPS residential customers. There is also a low income version of the program that provides a wider range of measures free of charge.

For the main HESP, the following is provided free-of-charge:

- Duct sealing;
- Infiltration improvement; and
- Low flow showerheads.

Ceiling insulation is provided with customer co-pay.

5.2 M&V Methodology

The M&V approach for the Residential Home Energy Services Program is aimed at the following:

- Verifying participation through participant surveying;
- Verifying post-retrofit duct leakage and infiltration at a sample of participants; and
- Providing estimates of net-to-gross savings and free-ridership.

Table 5-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 5-1 Data Sources for Gross Impact Parameters –Home Energy Services

Parameter	***Source***
Home Specifications	Tracking Data & Onsite Verification
Post Installation Duct Leakage & Infiltration	On-site Measurement

5.2.1 Review of Deemed Savings Estimates

The Evaluators reviewed the deemed savings estimates for measures rebated through the program in 2013. The deemed savings assumptions were based upon simulation models using weather from the Texas panhandle region, incorporating various home-specific characteristics, including:

- Heating/cooling type;
- Baseline & post retrofit duct leakage;
- Home square footage & number of stories; and
- Baseline & post retrofit Air Changes per Hour (ACH).

These values were verified based upon pre- and post-retrofit billing analysis of program participants.

5.2.2 Verification of Installed Measures

Verification of the weatherization measures installed was done in two steps;

- Review of the tracking data presented;
- Surveys of customers who installed rebated equipment; and
- On-site measurement of duct leakage and infiltration

5.2.2.1 On-Site Measurement Procedures

To measure duct leakage, evaluation field staff performed duct pressurization testing (using Duct Blasters®) on the ducting for central air conditioning systems. System static pressure (SSP) on the duct system was first measured, where SSP is a measurement of static pressure at the supply side plenum of the duct system when the supply fan is on and operating with registers in their normal position. This pressure is unique for each system. The ducts were then pressurized by means of a Duct Blaster® connected to the return side of the system. Total duct leakage was measured with the registers sealed and the Duct Blaster® pressurizing the duct system. Total Duct leakage at 50 Pa was then recorded.

An additional step was required to measure duct leakage to unconditioned space. A Blower Door® was set up in an exterior doorway and used to pressurize the house to the same pressure as the ducts. This prevented any leakage to other conditioned spaces within the residence; all leakage measured, once the home was pressurized, would therefore be only to unconditioned spaces. Duct leakage to unconditioned space was then measured at 25 Pa, where possible.

Finally, total home infiltration, measured in CFM, was calculated. One-time measurements of pressure differential between the conditioned and unconditioned space were taken to calculate a snap shot of total home infiltration, in CFM. However,

this measurement of infiltration will not remain constant throughout the year, as it is a function of pressure differential between the interior and exterior of the home. As this pressure varies, with changing wind and outdoor temperatures, so will infiltration of the residence's envelope.

5.2.2.2 Data Review & Sampling

The Evaluators reviewed tracking data for anomalous entries and to ensure that savings were calculated according to the methodologies outlined in SPS tech assumptions. Having validated the tracking data, we verified installation of rebated measures through telephone surveys with program participants. Due to markedly lower participation in 2013 than in prior years, the Evaluators opted to focus on process evaluation activities, with gross impacts validated through a review of measurements and savings calculations provided by SPS.

5.3 Impact Evaluation Results

5.3.1 Home Energy Services Gross Savings Estimates

To validate savings from the HESP, the Evaluators updated savings calculations provided by SPS to correspond to the recently-approved New Mexico TRM. Across all measures, the values applied by SPS in ex ante estimates had understated kWh savings when compared to the TRM. Program-level realization by measure category is summarized in Table 5-2 below.

Table 5-2 Home Energy Services Gross Realization Summary

Measure	*Expected kWh*	*Verified kWh*	*Expected kW*	*Verified kW*	*Expected Lifetime kWh*	*Verified Lifetime kWh*
Duct Sealing	2,004,848	2,371,970	507.552	280.83	36,087,264	42,695,465
Infiltration Control	215,549	240,802	66.735	35.30	2,371,039	2,648,820
Ceiling Insulation	416,455	590,943	500.603	95.32	10,411,375	14,773,584
Low Flow Showerhead	28,258	34,861	34.79	0	282,580	348,610
Programmable Thermostats	2,478	0	0.44	0	19,824	0
Total	2,667,588	3,238,576	1,110.1	411.4	49,172,082	60,466,478
Realization:	122.4%					

5.3.2 Home Energy Services Net Savings Estimates

The HESP provided training and certification to contractors to perform duct sealing and infiltration control services. Prior to the training of SPS trade allies, these services were not available within SPS service territory. To estimate free-ridership, the Evaluators thus took the approach of interviewing the participating contractors, in order to address whether:

- They had experience in providing these services prior to joining the program; and

- They had plans to obtain certification for these services prior to participation.

The Evaluators interviewed four participating contractors in the HESP, and based upon these interviews, we concluded that participating contractors would not have obtained the necessary certifications for duct sealing and infiltration control work absent the program. With that, the Evaluators are applying SPS's filed ex ante NTGR of 93% for the program. This is applied in discounting program kWh, kW, and lifetime kWh savings. The resulting net savings are presented in Table 5-3.

Table 5-3 Home Energy Services Net Realization Summary

Measurement	Expected Net Savings	Realized Net Savings	Net Realization Rate
Annual Energy (kWh)	2,480,857	3,011,876	122.4%
Demand (kW)	1,032.4	382.6	37.1%
Lifetime Energy (kWh)	45,730,036	56,233,825	123.0%

5.4 Process Evaluation

The Evaluators conducted a process evaluation of the HESP in order to address a range of issues:

- Is the program successfully engaging the necessary stakeholders?
- Are participants and trade allies satisfied with their experience with the program?
- What can be done to increase uptake of secondary program measures?

5.5 Data Collection Activities

The process evaluation of the HESP included the following data collection activities:

- *SPS Program Staff Interviews.* The Evaluators interviewed staff at SPS involved in the administration of the program. These interviews collected initial background information on program history and implementation, as well as capturing any operational changes or new developments in the program.
- *Energy Matters, LLC Staff Interviews.* Energy Matters, LLC (EML) provide contractor training and QA/QC support for the program.
- *Program Marketing Materials Review.* The Evaluators collected marketing materials used by the program. This included customer mailers and a review of the EPE program website. This was compared against marketing materials from successful programs run in other territories in informing marketing improvements.
- *Participant Surveying.* The Evaluators surveyed a sample of 80 program participants.

Table 5-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection

Table 5-4 SPS Home Energy Services Data Collection Summary

Target	Component	Activity	N	Role
SPS Program Staff	Product Manager	Interview	1	The Product Manager is responsible for the day-to-day administration of the program. This includes maintenance of contractor relationships and engaging in program marketing and outreach
Energy Matters LLC	Program Manager	Interview	1	Energy Matters, LLC conducts the contractor training and QA/QC inspections.
Program Participants	Weatherization Participants	Survey	80	Residential customers that received duct sealing, air infiltration sealing, or ceiling insulation improvements.
Vendors	Participants	Interview	3	Conduct direct marketing to customers. Install qualifying equipment. Some vendors also fill out program applications on behalf of customers.

5.5.1 Market Description

This section presents key background data on the target market for the ECRP. Data for this section are provided by the Energy Efficiency Potential Study for the State of New Mexico[4] and the American Community Survey (ACS)[5], and surveys with participating market actors.

5.5.1.1 Market Characteristics

To provide estimates of available market for SPS service territory, the evaluators combined ACS results for the following counties:

- Chaves
- Curry
- Eddy
- Lea
- Quay
- Roosevelt

Data from the most recent available ACS indicates that there was a total of 107,710 residences in SPS-served counties as of 2011. Of these, 85.0% are occupied, and of

[4] Global Energy Partners, 2011. "Energy Efficiency Potential Study for the State of New Mexico. Volume 2: Electric Energy Efficiency Analysis". Prepared for the Department of Energy under management of the State of New Mexico's Energy, Minerals, and Natural Resources Department's Energy, Conservation, and Management Division.

[5] Bureau of the Census. 2011. *American Community Survey, One-Year Data.*

that, 42.7% are low income. In theory, these participants would be directed to the Low Income Home Energy Services program, but in practice, many participate in the standard program instead due to income documentation requirements. As such, the evaluators have included those homes in the available market for HES. Overall, 19.6% of these customers used evaporative cooling[6]. The result is an effective market of 86,301 residences that would be eligible for weatherization services. The breakdown of housing by type is summarized in Figure 5-1.

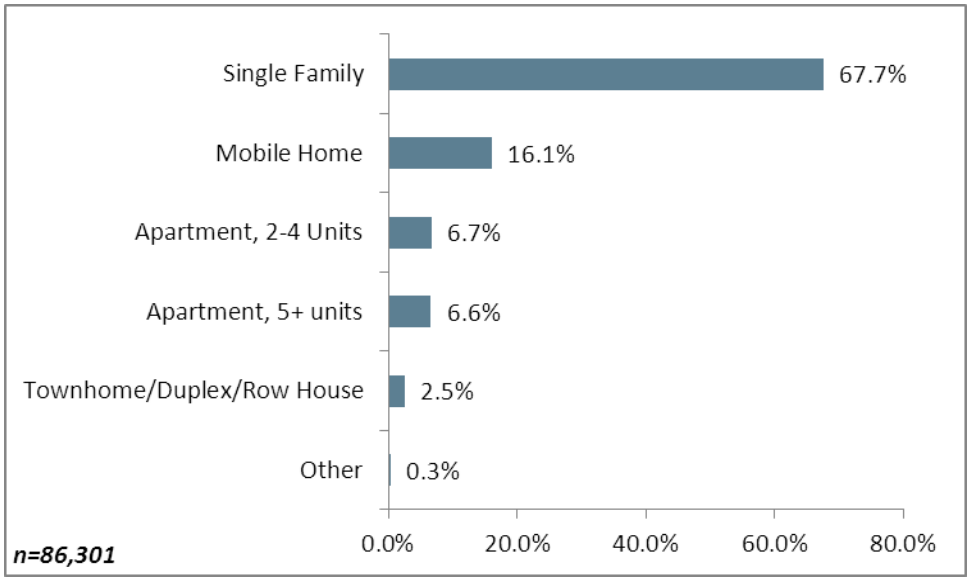

Figure 5-1 Distribution of Residential Buildings Types in SPS Service Territory

In addition, it was found that the available market for the HESP is:

- Occupied at a typical rate for New Mexico. 85.9% of housing was occupied at the time of data collection, compared to 85.0% occupancy statewide.
- Slightly higher in rental occupancy. 31.2% of occupied residencies are occupied by renters, compared to 30.4% statewide.

5.5.1.2 Market Barriers

In reviewing the program offerings and theory, the evaluators identified the following market barriers:

Weatherization:

- **Skepticism of the services offered.** The HESP provides weatherization services free of charge to end-use customers. Program staff indicated that this is received with some degree of skepticism from their residential

[6] As per the GEP Market Potential Study, Saturation varied from 18.0% for single family homes to 26.9% for multifamily.

customers, in that many do not believe that an electric utility would provide a free service to help customers use less energy.

- **High share of renters.** 31.2% of SPS residential customers are renters[7]. As a result, the program needs to go through landlords to obtain permission for work on these homes. The homes can still be serviced, with no difference in service or incentive level, however.
- **Use of evaporative cooling units.** 19.6% of SPS residential customers use evaporative cooling. For these customers, weatherization services do not provide viable electric savings.
- **Program theory that supports only high-return measures.** The program theory is based around marketing outreach by contractors that will result in installation of a comprehensive suite of measures for SPS residential customers. In practice, the contractors have instead identified the highest return measures that can be effectively provide free of charge.
- **Lack of necessary training in the contractor community.** Duct sealing and air sealing have specific skills and certifications required in order to correctly perform the work. This expertise was lacking in the SPS service territory and as such it was necessary for SPS to train the contractors to perform the work.

High-Efficiency Air Conditioning

- **Lower Income Level.** Median income in SPS service territory is $41,949, compared to $44,631 statewide.
- **High first-cost barrier.** The incremental cost of high efficiency cooling equipment can be a difficult barrier to overcome, with estimates of $119/ton and $357/ton for Tier I and Tier II units, respectively[8].

5.5.2 HES Longitudal Performance

The HESP has been in implemented by SPS since 2009. Table 5-5 presents the annual net savings performance of the HESP since program inception.

Table 5-5 HESP Longitudal Performance

2009	*2010*	*2011*	*2012*	*2013*
3,925,493	11,012,797	5,198,267	2,764,951	2,204,557

The program peaked in 2010, and participation has fallen off sharply since then. Through 2013, the program has reached 11,096. In interviews with SPS staff, it was found that this was a concerning issue, with staff indicating that “near the tail-end of

[7] Bureau of the Census. 2011. *American Community Survey, Five-Year Data.*

[8] Incremental cost estimates from State of Ohio Technical Reference Manual, Pg. 30. Vermont Energy Investment Corporation, 2010.

2011, the bottom really gave out". They had indicated that this was a surprise, given that the program was at the time below 10% saturation. It is the view of the evaluators that this is likely due to the early program years (2009 – 2011) capturing the segments of the consumer population with preexisting awareness, concern, and sense of responsibility for energy efficiency[9]. Following exhaustion of this segment, subsequent customers engaged by the program may be more skeptical and less interested.

5.6 Process Results & Findings

This section will present the results and key findings from the data collection activities. These findings are based upon interviews with utility staff, implementation staff, surveys with participants, and a thorough and in-depth literature review.

5.6.1.1 Program Theory & Design

The Home Energy Services Program was designed to engage and train the local contractor community in pushing a comprehensive suite of home efficiency improvements for residential customers. The program provides incentives for a range of measures, including:

- Duct sealing;
- Infiltration control;
- Ceiling insulation;
- Low flow showerheads; and
- Central air conditioning.

The program was designed to train contractors to provide an extended suite of services, and then leave it to these contractors to market the program to end-users.

5.6.1.2 Program Administration

The HESP is overseen by a Product Manager at SPS. The manager's responsibilities include leading contractor outreach and as well as other marketing efforts along with handling the day-to-day program administration. Much of the managerial needs of the HESP are focused on the handling of the trade ally network, ensuring that participating HVAC contractors receive adequate training and marketing materials in order to push the program. The Product manager for the HESP is also responsible for administration of the Low Income HESP, though the evaluators found that these programs are essentially different channels of the same offering and thus having one manager for both makes sense from an organizational standpoint.

[9] Rendazzo, Katherine & Jane Peters. *Reconsidering What We Measure: A White Paper, Parts I & II*

5.6.1.3 Program Implementation and Delivery

The HESP is implemented by participating trade allies. The participation process is as follows:

- *Customer recruitment*. The customer is contacted by a participating trade ally. When agreeing to participate, the contractor establishes an appointment time with the customer.
- *In-home audit*. At the first site visit, the trade ally conducts duct blast and blower door testing on the home, providing baseline values for potential duct sealing and air infiltration improvement. Further, the contractor reviews the residence's ceiling insulation level.
- *Installation*. After the audit, it is determined whether the customer's residence would benefit from the three building envelope measures. Duct sealing and infiltration improvement are provided free of charge. Ceiling insulation requires a copayment. The agreed-upon, qualifying measures are then performed on the home. In the cases of duct sealing and air infiltration control, the contractor then performs a post-retrofit test.
- *Application Submittal*. The contractor and customer work out the details on the application, though this is largely filled out by the contractor which the customer then reviews and signs. At the end of the month, the contractor enters the information from their completed applications into the Frontier Associates savings calculation database, the results of which are sent to SPS for review.
- *Application Review*. SPS rebate processing staff review the application, and ensure eligibility of the customer and of the measures installed. Any discrepancies are then worked out between SPS and the contractor. When this is completed, the final rebate is then calculated.
- *Rebate Payment*. Rebate payment occurs 4-6 weeks after receipt of the accepted application. The rebates are mailed directly to the participating contractor, and encompass the total rebates for all projects completed in that month.

5.6.1.4 Program Marketing & Outreach Efforts

From 2009 through 2012, the HESP was marketed only through direct efforts by participating contractors. These were at the time very successful, as the program was exceeding savings goals. However, with the drop off in participation that began in late 2011, and the subsequent low participation in 2012, SPS began developing co-branded marketed materials for their trade allies and in mass promotion of the program through traditional marketing channels. Participating trade allies are provided pre-made

marketing collateral, on which they can enter their own company information. An excerpt from this marketing collateral is presented in Figure 5-3.

Figure 5-2 SPS HESP Contractor Co-Branded Marketing Collateral

In addition, SPS now markets the program through bill inserts and traditional advertising channels. There are internal concerns as to the overall net impact this will have on cost-effectiveness; the old model of having all marketing be trade ally-driven outsources the bulk of the customer acquisition costs, and this move to traditional media marketing will increase overall program administration costs. It is the hope on the part of HESP staff, however, that the resulting increase in participation would justify the expense.

5.6.1.5 Tracking Data Review

The Evaluators received a tracking database developed internally by SPS. The initial gathering and compiling of tracking data is crucial in facilitating a smooth evaluation

effort, and as such the evaluators reviewed this tracking data in order to verify that it contained the required data to:

(1) Recreate energy savings calculations;

(2) Contact participants and trade allies; and

(3) Ensure proper rebate payment amounts;

Energy Savings Calculation Data

The Evaluators received tracking data from SPS. The tracking spreadsheet was found to contain:

- Measures installed;
- Pre- and post-installation measurements (duct leakage, air leakage, etc.);
- Expected savings; and
- EUL.

Participant and Trade Ally Contact Information

After reviewing the data, the Evaluators found that it contained full and comprehensive tracking data for all participants, including contact name, address, phone number, and a unique rebate number. However, the tracking data did not include information on the installing trade ally. The evaluators would recommend that the installing contractor be included in tracking data exports, so as to allow analysis of specific contractors' performance.

5.6.1.6 Quality Control Procedures Review

After reviewing the QA/QC procedures in place for the HESP, the evaluators found:

1. All applications are reviewed by SPS rebate processing staff. In this process, it is confirmed that the customer has an active SPS account, and has the necessary documentation to prove completion of the work performed.
2. Energy Matters LLC provides QA/QC inspection services for a sample of participants. Staff from Energy Matters LLC will at times ride along with the contractors to observe their pre- and post-retrofit testing procedures. These are supplemented by post-retrofit inspections on other homes. SPS staff informed the evaluators that these efforts are focused primarily on new contractors or on contractors showing performance issues.

The Evaluators interviewed the manager at Energy Matters LLC (EML) to discuss the details of the QA/QC process. This manager explained that post inspections are random, but done more often when a contractor is new to the program. Contractors are required to attend a training session administered by. Contractors are required to attend

a training session administered by EML, and from that point forward every job performed by this contractor must have a certified employee on site. The initial training typically takes two days and costs $500, and after passing, the contractor is put on a 30-day trial. During this trial, they are required to submit their appointment schedule to EML, who will randomly select jobs where they will show up on site in the middle of installation to review the work performed. Following this period, EML would randomly post-inspect homes by each contractor, after work had been completed.

The manager at EML indicated that he often found small problems, but that none of them were systemic (the manager stated that "very seldom was it the same error over again"). Examples given included caulking around a sink that had too-wide of a gap, where it was required that the contractor actually builds a cover plate. Generally, the training focused on ensuring that the contractors sealed the homes the appropriate amount and avoid over-sealing, which can cause issues with indoor air quality.

When SPS began pushing ceiling insulation, it was required that participating contractors be recertified. The training in this process involved instructing contractors as to the proper amounts of insulation to blow in and on distributing insulation. Contractors were informed that during post-inspection, they would be held accountable through being judged on the basis of the thinnest portion of insulation; this encouraged the contractors to blow in the insulation smoothly, rather than rushing the job and leaving uneven insulation.

5.6.1.7 Website Review

The SPS website provides information on their rebate programs, including eligibility and benefits of participation. One issue identified by the Evaluators, however, was that the list of participating contractors was outdated. There are presently five active contractors in the HESP; the website only lists three contractors, one of whom is no longer in the program.

5.6.2 Participant Survey Response

The Evaluators surveyed a sample of 80 program participants in the HESP. This survey addressed a range of topics, including:

- Sources of program awareness;
- Details related to the participation process; and
- Participant satisfaction

The results are presented in the subsections to follow.

5.6.2.1 Program Awareness

Respondents were asked several questions about how they found out about the program and the main reasons they chose to participate. Eight percent of respondents

were unaware that they were participating in a utility-sponsored program. Of those that were aware, 33.8% learned of the program from print media advertising. Thirty percent learned of the program from an SPS bill insert. An additional 16.3% learned of the program through word of mouth from their friends and relatives Figure 5-3 summarizes the sources of program awareness.

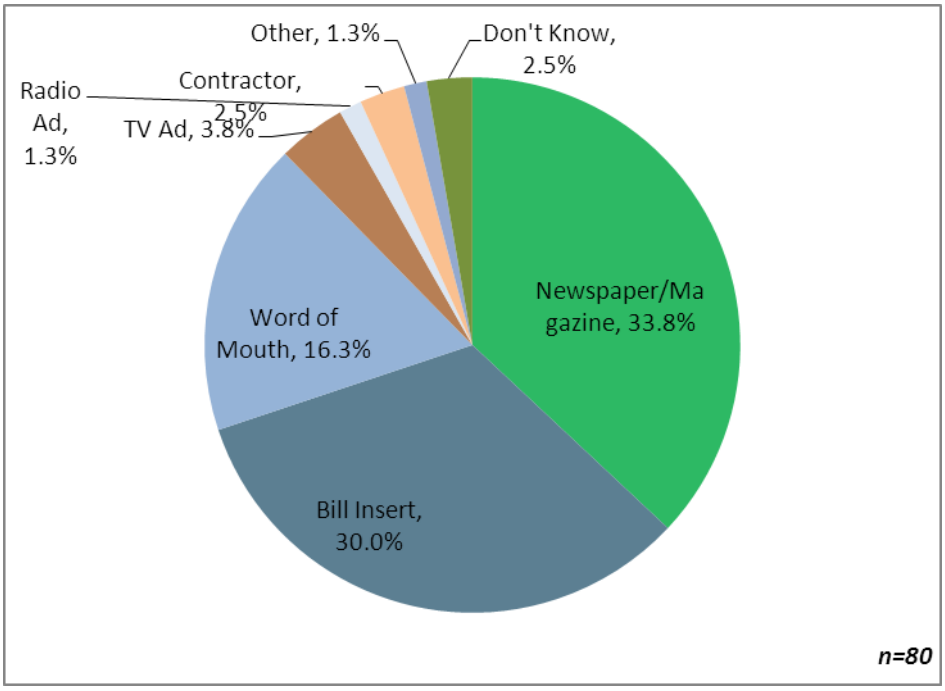

Figure 5-3 HESP Sources of Program Awareness

Respondents were then asked how they chose the contractor that performed the work. Fifty-four percent of respondents found their contractor by calling SPS and asking for a recommendation of whom to work with. An additional five percent selected a contractor featured on the SPS website. Sixteen percent selected a contractor that directly reached out to them.

Ninety-five percent of respondents indicated that the improvements installed through the program were a stand-alone project. Five percent stated that they had the work completed as part of a larger remodel.

5.6.2.2 Installation Process

Respondents were asked to detail their experience with the installation process. Ninety-five percent of respondents indicated that they would recommend this contractor to a friend or relative.

Respondents were then asked to rate a series of questions about their installation process on a scale of one to ten, where one means “very dissatisfied” and 10 means “very satisfied”. Their responses are summarized in Table 5-6.

Table 5-6 HESP to Installation

Component	*Mean Score*	*% Don't Know*
The contractor's explanation of the home energy assessment process	9.12	3.75%
The contractor's answers to your questions	9.26	3.75%
The contractor's level of knowledge about the work to be done	9.35	3.75%
The contractor's professionalism	9.34	1.25%
The quality of the work by the contractor	9.17	2.50%
n=80		

Respondents were also asked to rate a series of possible motivations for participating in the program on a scale of 1-10, where 1 means "not important at all" and 10 means "very important".

Table 5-7 HESP to Installation

Component	*Mean Score*	*% Don't Know*
The discount provided through the program	9.41	0%
Saving money on your energy bills	9.44	0%
Improving the air quality in your home	8.65	0%
Addressing health and safety issues in your home	8.61	2.50%
Increasing the value of your home	8.38	2.50%
Improving the comfort of your home	9.23	0%
n=80		

Respondents were also asked to identify if there were any other contributing factors to the timing of their decision to participate. Sixty-four percent indicated additional reasons. Common reasons included:

- Health, safety, and comfort issues;
- Wanting to improve their home before putting it up for sale;
- High energy bills during a heat wave;
- Receiving a report from SPS informing the participant that they are a high user; and
- Having a failed AC in need of repair.

5.6.2.3 Overall Satisfaction

Overall, 92.7% of respondents stated that if they knew in advance what would be required of them in participating, they would still participate again. Sixty-percent have noticed a decrease in their bill since participating, and 85.5% agreed that "they got what they expected" out of the program. Table 5-9 summarizes overall participant satisfaction levels with the program.

Table 5-8 HESP Participant Satisfaction

Component	*Mean Score*	*% Don't Know*
Improvement in home comfort after the upgrades	8.66	0%
Savings on utility bills	8.25	0%
Information provided by SPS	8.86	1.25%
Overall satisfaction with the program	9.36	0%
n=80		

5.7 Conclusions & Recommendations

5.7.1 Conclusions

Based on the 2013 EM&V, the Evaluators concluded the following:

- **Participants are generally satisfied with the work completed by the program contractors.** High satisfaction was indicated with the quality of the work by the contractor as well as with the energy savings observed following the completion of the retrofit.
- **The program model does not sufficiently encourage HVAC replacements.** The HESP has not had a single rebate for air conditioner replacement in all of its years of operation. The model of paying per-kWh motivates contractors to focus their outreach on higher-return measures such as duct sealing and ceiling insulation.
- **The program's training and QA/QC process for contractors is in accordance with best practices.** EML has a rigorous certification process for participating contractors, and the program has in the past removed contractors that were found to be completing subpar installations.
- **The program model has engaged landlord in participating.** The Evaluators found significant participation among landlords, who have actively sought out the program to improve the efficiency of their rental properties.

5.7.2 Recommendations

The Evaluators' recommendations are as follows:

- **Provide fixed incentives for central air conditioning replacement.** The per-kWh model does not adequately encourage uptake of this measure. SPS should develop separate per-ton incentives for central air conditioning and heat pumps in a manner similar to El Paso Electric Company's program elsewhere in New Mexico. Ideally this would be included as part of an aggregated Residential High Efficiency Cooling Program along with the evaporative cooling rebates.

- **Update the contractor list on the program website.** The Evaluators found that the contractor list was out of date; it included one contractor that had been removed from the program and did not include newly added contractors.
- **Actively market the eligibility of mobile and manufactured housing.** Mobile and manufactured housing account for 16.1% of the residential housing stock for SPS. This housing often has electric radiant heating and could be a viable addition to the program. Multiple survey respondents indicated that they would like mobile homes to be program-eligible. They are eligible, but this may not be widely known or marketed.

6. Home Energy Services – Low Income

6.1 Program Description

The Low Income Home Energy Services Program (LIHESP) is an extension of the HESP program, through which income-qualified customers identified by HESP contractors are eligible for extra incentives and measures. Participants in the LIHESP are similar to those in the standard HESP with the exception that they received direct installation of CFLs.

6.2 M&V Methodology

The M&V approach for the Residential Home Energy Services Program is aimed at the following:

- Verifying participation through participant surveying; and
- Updating calculations to reflect new TRM values and federal codes for lighting.

Table 6-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 6-1 Data Sources for Gross Impact Parameters – Home Energy Services

Parameter	***Source***
Home Specifications	Tracking Data & Onsite Verification

6.2.1 Review of Deemed Savings Estimates

The Evaluators reviewed the deemed savings estimates for measures rebated through the program in 2013. The deemed savings assumptions were based upon simulation models using weather from the Texas panhandle region, incorporating various home-specific characteristics, including:

- Heating/cooling type;
- Baseline & post retrofit duct leakage;
- Home square footage & number of stories; and
- Baseline & post retrofit Air Changes per Hour (ACH).

These values were verified based upon pre- and post-retrofit billing analysis of program participants.

6.2.2 Verification of Installed Measures

Verification of the weatherization measures installed was done in two steps;

- Review of the tracking data presented; and

- Surveys of customers who installed rebated equipment;

The Evaluators reviewed tracking data for anomalous entries and to ensure that savings were calculated according to the methodologies outlined in SPS tech assumptions. Having validated the tracking data, we verified installation of rebated measures through telephone surveys with program participants.

For CFLs, savings were calculated using New Mexico TRM guidelines for hours of use as well as updated baselines in accordance with EISA.

6.3 Impact Evaluation Results

6.3.1 Home Energy Services Gross Savings Estimates

To validate savings from the HESP, the Evaluators updated savings calculations provided by SPS to correspond to the recently-approved New Mexico TRM. Across all measures, the values applied by SPS in ex ante estimates had understated kWh savings when compared to the TRM. Program-level realization by measure category is summarized in Table 6-2.

Table 6-2 Home Energy Services Realization Summary

Measure	*Expected kWh*	*Verified kWh*	*Expected kW*	*Verified kW*	*Expected Lifetime kWh*	*Verified Lifetime kWh*
Duct Sealing	21,367	55,727	22.09	35.78	384,568	1,003,092
Infiltration Control	6,005	11,037	13.44	7.09	66,052	121,408
CFLs	44,772	19,909	3.90	2.52	286,541	127,420
Total	72,144	86,673	39.43	45.39	737,161	1,251,920
Realization:	120.14%					

Since this program is income-qualified, gross savings equal net savings (NTGR = 100%).

7. School Education Kits

7.1 Program Description

The School Education Kits Program (SEKP) provides a no-cost energy efficiency kit to 5th grade students and their teachers. This kit contains a mix of CFLs, a low-flow showerhead, and a kitchen faucet aerator. Data needed for M&V is collected through a take-home assignment given to the students, who are required to discuss the kit with their parents, install items of their choosing, and report back what has been installed. In 2013, a total of 3,504 kits were distributed.

7.1.1 Easy Savings Verification of Installation

The Evaluators verified installation based on the self-reported data sent back to the utility.

7.1.2 Easy Savings - Net Savings Estimates

A stipulated 100% net-to-gross ratio was applied.

7.2 Impact Findings

A total of 3,504 kits were distributed in 2013. The Evaluators received installation rates from the utility. Each part of the kit was individually evaluated.

7.2.1 Easy Savings Review of Deemed Savings Estimates

The Evaluators reviewed the deemed savings estimates used by SPS for the 2013 SEKP. All the information was self-reported by the students through the homework assignment, and sent back to the utility to determine installation rates.

7.2.1.1 CFLs

The kit contains one 13W and one 18W CFL. In reviewing the deemed savings applied for this measure, the Evaluators found that SPS had been applying past savings values from the last completed M&V review of this program (which occurred in 2010). The Evaluators concluded that it was necessary to update these values to correspond with new federal codes. Savings for CFLs are calculated as follows:

- CFL Savings = UES x In-Service Rate%

Where,

- UES = Unit Energy Savings, 25 kWh for 13W CFLs and 29 kWh for 18W CFLs
- In-Service Rate% = percentage of CFLs installed (61.0% for the 13W CFL and 58.0% for the 18W CFL).

With 3,504 of each CFL distributed, this totals:

- 112,373 kWh;
- 14.78 kW; and
- 426,059 lifetime kWh

7.2.1.2 Low Flow Showerhead

The New Mexico TRM specifies deemed savings of 491 kWh for a showerhead installed in a home with electric water heating. Savings for low flow showerheads were calculated as:

- SH kWh = 491 x In-Service% x ElecWater%

Where,

- 491 = Unit Energy Savings, 491 kWh as specified in the TRM for a 1.5 GPM showerhead
- In-Service Rate% = percentage of showerheads installed (55%)
- ElecWater% = percent of participant homes with electric water heating (54.3%)

With 3,504 showerheads distributed, this totals:

- 513,817 kWh; and
- 5,138,166 lifetime kWh.

In addition, natural gas savings included:

- 19,288 annual Therms; and
- 192,880 lifetime Therms.

7.2.1.3 Kitchen Faucet Aerator

The New Mexico TRM specifies deemed savings of 236 kWh for a 1.5 GPM faucet aerator installed a kitchen in a home with electric water heating. Savings for kitchen aerators were calculated as:

- KA kWh = 236 x In-Service% x ElecWater%

Where,

- 236 = Unit Energy Savings, 236 kWh as specified in the TRM for a 1.5 GPM faucet aerator installed in a kitchen
- In-Service Rate% = percentage of kitchen aerators installed (50%)
- ElecWater% = percent of participant homes with electric water heating (54.3%)

With 3,504 kits distributed, resulting savings are:

- 224,515 annual kWh; and
- 2,245,153 lifetime kWh.

In addition, natural gas savings included:

- 8,407 annual Therms; and
- 84,070 lifetime Therms.

7.2.2 Overall Net Savings Summary

Table 7-1 summarizes the net savings estimates for the 2013 School Education Kits Program. This program has a stipulated 100% NTGR and as a result gross savings equal net savings.

Table 7-1 2013 School Education Kits Savings Summary

	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		EUL Years	Lifetime Energy Savings (kWh)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post	
Total	27.191	14.789	1,217,854	850,705	9.52	9,389,654	8,102,502	69.9%

For 2014 and 2015, the student kit will include two 18W and two 13W CFLs, in addition to one 1.5 GPM kitchen faucet aerator and one 1.5 GPM showerhead. Table 7-2 summarizes the savings per kit from the 2013 configuration and the recommended savings for the new kit configuration for 2014 and 2015.

Table 7-2 School Education Kits Recommended Unit Energy Savings

	2013 Unit Energy Savings	2014-2015 Recommended Savings
kWh	242.78	274.85
kW	0.00776	.007978
Therms	7.90	7.90

7.3 Program Recommendations

- **Addition of a bathroom faucet aerator to the kit.** Based off a literature review of similar programs along with program staff interviews, the Evaluators recommend adding a 1.0 GPM bathroom aerator to the school education kit. This could be a cost-effective addition that provides increased savings per-kit. If this is added during non-evaluation years, we recommend that SPS use a 50% in-service rate and 54.3% electric water heating rate (the most recent rates reported for the kitchen aerator) along with unit energy savings of 180

kWh. Those three values translate to an additional 49 kWh should a 1.0 GPM bathroom aerator be added to the kit.

8. Evaporative Cooling Rebates

The Evaporative Cooling Rebates Program (ECRP) provides incentives to residential customers and landlords for evaporative coolers. The program provides incentives of $200 for Tier I and $1,000 for Tier II evaporative coolers.

8.1 M&V Methodology

The M&V methodology for the ECRP is as follows:

- First, savings for individual units are updated to correspond with New Mexico TRM values for the Roswell weather zone.
- Second, free-ridership is assessed on the basis of how many of the participating customers would have installed a refrigerated air system in the absence of the program.

Evaporative coolers use significantly less energy than refrigerated air units, ant the ECRP is designed to slow the change from evaporative cooling to refrigerated air that is occurring in New Mexico.

8.2 Impact Evaluation Findings

8.2.1 Gross Savings

In interviews with program participants, the Evaluators found that all respondents indicated having had their evaporative cooler installed and having received their rebate through the program. In accordance with the New Mexico TRM, evaporative coolers within SPS service territory are deemed at:

- 3,132 annual kWh;
- 2.38 peak kW; and
- 46,980 lifetime kWh.

This assumes a three-ton, 13 SEER/11.09 EER baseline DX system.

8.2.2 Net Savings

Net savings for evaporative coolers are not assessed in the traditional manner, as the equipment is less expensive than the baseline unit (a refrigerated air system). The rebate is designed to encourage residential customers to stay with evaporative cooling as opposed to making the investment to switch to refrigerated air. This was addressed with a series of questions pertaining to the baseline unit and what the survey respondent would have considered in the absence of the program incentive.

Q-3 Did you have specific plans to purchase an evaporative cooler prior before you learned about the Evaporative Cooling Rebate Program?

Sixty-eight percent of respondents indicated having plans to purchase an evaporative cooler prior to learning of the program.

Q-7 What type of cooling system did the home have in place prior to this?

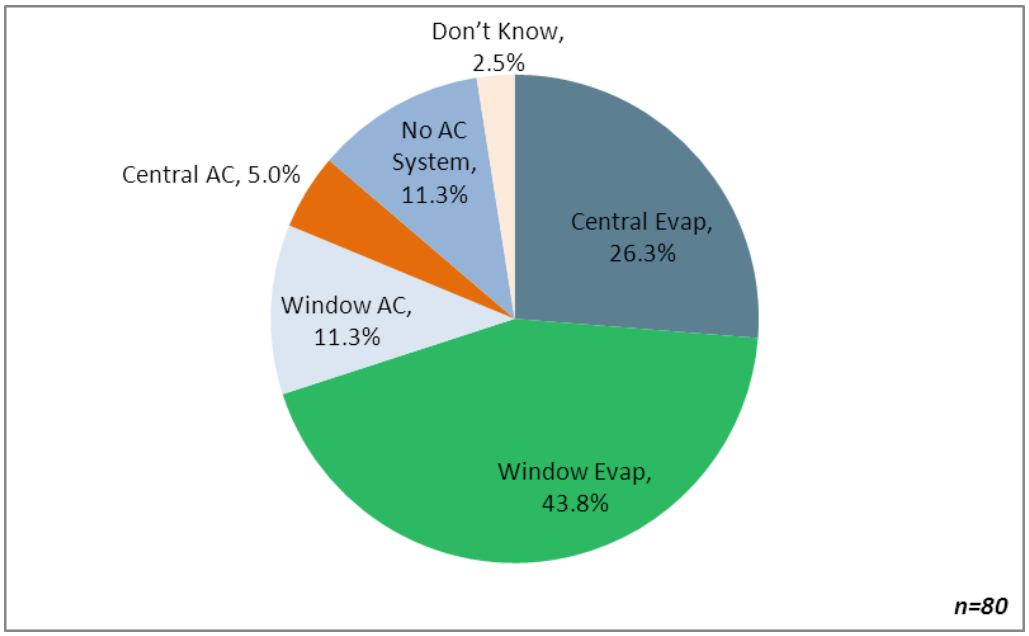

Figure 8-1 Pre-Existing Evaporative Cooling System

As seen in Figure 8-1, 70.0% of respondents had an evaporative cooler in place prior to installation of this unit. Sixteen percent had a refrigerated air system.

Q-8 If SPS' incentive for evaporative coolers were not available, would you have installed different equipment?

Twenty percent of respondents stated that they would have installed different equipment without the rebate. Of those 20%, 66.7% indicated that the system would have been a refrigerated air unit.

These responses were used to categorize survey respondents as follows:

- Had AC – switched to Evap: 100% NTGR
- Would have purchased AC – purchased Evap instead: 100% NTGT
- Would have purchased standard efficiency Evap, purchased high efficiency Evap instead: 100% NTGR
- Purchased Evap, would not have purchased AC: 0% NTGR

Based on surveys with 80 respondents, the Evaluators verified a NTGR of 66.25%.

8.2.3 Verified Savings

The verified gross and savings for the ECRP are summarized in Table 8-1 and Table 8-2, respectively.

Table 8-1 Evaporative Cooling Verified Gross Savings

Expected kWh	Verified kWh	Expected kW	Verified kW	Expected Lifetime kWh	Verified Lifetime kWh
1,052,736	948,996	928.0	721.14	15,791,040	14,234,940

Table 8-2 Evaporative Cooling Verified Net Savings

Expected kWh	Verified kWh	Expected kW	Verified kW	Expected Lifetime kWh	Verified Lifetime kWh
698,942	628,710	616.1	477.76	10,484,130	9,430,648

Savings were adjusted to conform to values listed in the New Mexico TRM.

8.3 Process Evaluation

8.3.1 Market Description

This section presents key background data on the target market for the ECRP. Data for this section are provided by the Energy Efficiency Potential Study for the State of New Mexico[10] and the American Community Survey (ACS)[11], and surveys with participating market actors.

8.3.1.1 Market Characteristics

The characteristics of the market for the ECRP are the same as those detailed for Home Energy Services in Section 5.5.1.1.

8.3.1.2 Market Barriers

In reviewing the program offerings and theory, the valuators identified the following market barriers:

- **Trend of owner-occupants switching to refrigerated air.** The potential study conducted by GEP estimates that statewide energy consumption of evaporative cooling will decline from 196 GWh in 2009 to 166 GWh in 2015 as a result of conversion to refrigerated cooling. Contractors within SPS' service territory actively push and market the option for evaporative to AC conversion.

[10] Global Energy Partners, 2011. "Energy Efficiency Potential Study for the State of New Mexico. Volume 2: Electric Energy Efficiency Analysis". Prepared for the Department of Energy under management of the State of New Mexico's Energy, Minerals, and Natural Resources Department's Energy, Conservation, and Management Division.

[11] Bureau of the Census. 2011. *American Community Survey, One-Year Data.*

- **High share of renters.** Thirty-one percent of residential customers in Dona Ana County are renters, and thus cannot make the decision for their residence[12].
- **Use of window units.** In the evaporative cooling market, window units are in wide use due to the ease of installation. The ECRP requires permanent installation of units with a ducted or multi-ducted distribution system.
- **Higher O&M costs.** Evaporative coolers have lost some cost advantage over refrigerated air systems due to increased operation & maintenance (O&M) costs. National Renewable Energy Laboratory reports estimate an average added O&M cost of $39/year[13]. At current SPS residential rates, this is equivalent to the cost savings from 444 kWh annually[14].
- **Poor reputation due to older technologies.** The common perception of evaporative coolers is the traditional "swamp cooler", which to many residential customers is associated with sub-par cooling performance and added humidity to the home. There is an information gap, with many residential customers unaware of advanced evaporative cooling technologies[15].
- **Restrictive building codes and practices.** New homes are built to use refrigerated air systems. The typical residential split system is not suited for evaporative cooling. For a home with a split system, retrofitting to evaporative cooling would cause performance issues. Further, homeowners associations have often placed restrictions on roof-mounted evaporative coolers in newer neighborhoods due to architectural concerns.
- **Lack of certification.** There is at present time no national system of certification for evaporative coolers, nor are they included in ENERGY STAR® listings.

8.3.2 ECRP Longitudal Performance

The ECRP has been in implemented by SPS since 2009. Table 8-2 presents the annual net savings performance of the ECRP since program inception.

[12] Bureau of the Census. 2011. *American Community Survey, One-Year Data.*

[13] Alliance for Sustainable Energy, LLC. "Dew Point Evaporative Comfort Cooling Summary Report". Prepared for the National Renewable Energy Laboratory, November 2012.

[14] Figure derived from SPS summer rate for customers not on a time-of-use rate schedule, $.087881/kWh. https://www.SPS'energy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/rates/NM/nm_sps_e_entire.pdf

[15] Southwest Energy Efficiency Project, 2007. *SWEEP/WCEC Workshop on Modern Evaporative Cooling Technologies, Workshop Summary.*

Table 8-3 ECRP Longitudal Performance

2009	2010	2011	2012	2013
281,081	297,317	495,381	484,595	628,710

ADM Associates evaluated the 2009 program year, though the timeframe for that evaluation was abbreviated. 2010 reflects the first year of firmer M&V of program performance, with savings in 2011 and 2012 reflective of the application of 2010 per-unit energy savings with higher participation levels. The program's annual net kWh performance goal for 2012 and 2013 was 641,680 annually.

8.3.3 Evaporative Cooling Survey Response

The Evaluators surveyed a sample of 80 evaporative cooling participants.

8.3.3.1 Response to Marketing

First, respondents were asked to identify how they learned of the ECRP. As seen in Figure 8-2, most respondents (61.3%) learned of the ECRP from a retailer or equipment dealer. Other commonly indicated sources include bill messages (11.3%) and word of mouth (11.3%). Other media sources were not listed. Though the marketing approach of using in-store signage is understandable, the Evaluators have concerns that this may be reaching potential participants too late in their decision-making process. Evaporative coolers are not an impulse buy; by the time a potential participant has entered a retailer that sells one, it is likely that they already have their purchase in mind. SPS should consider marketing channels that can reach potential program participants prior to the completion of their decision-making.

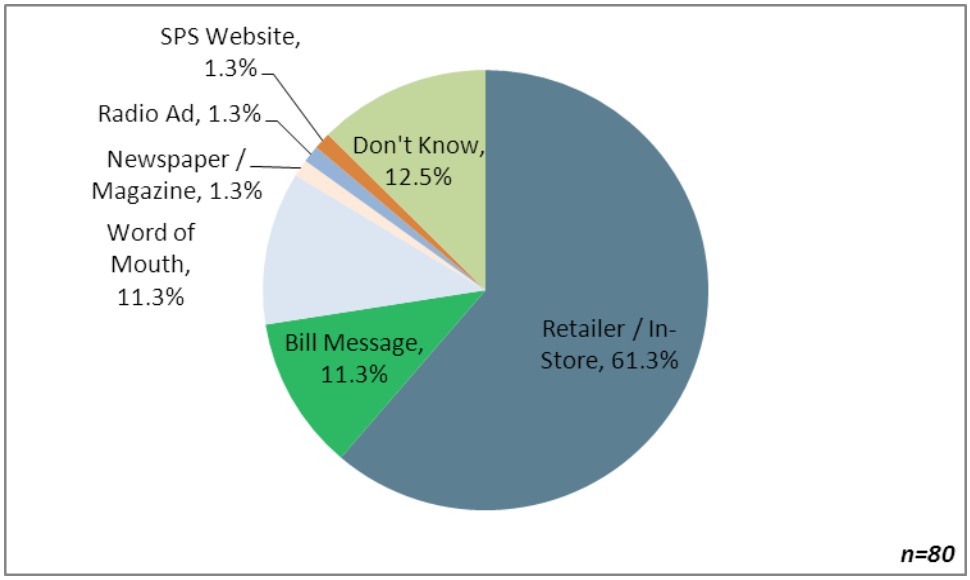

Figure 8-2 Sources of Program Awareness

Respondents were then asked to rate a series of potential sources of information on energy efficiency on a scale of 1-10, where one indicates “Not Influential at All” and 10 indicates “Very Influential”. Figure 8-3 summarizes the results.

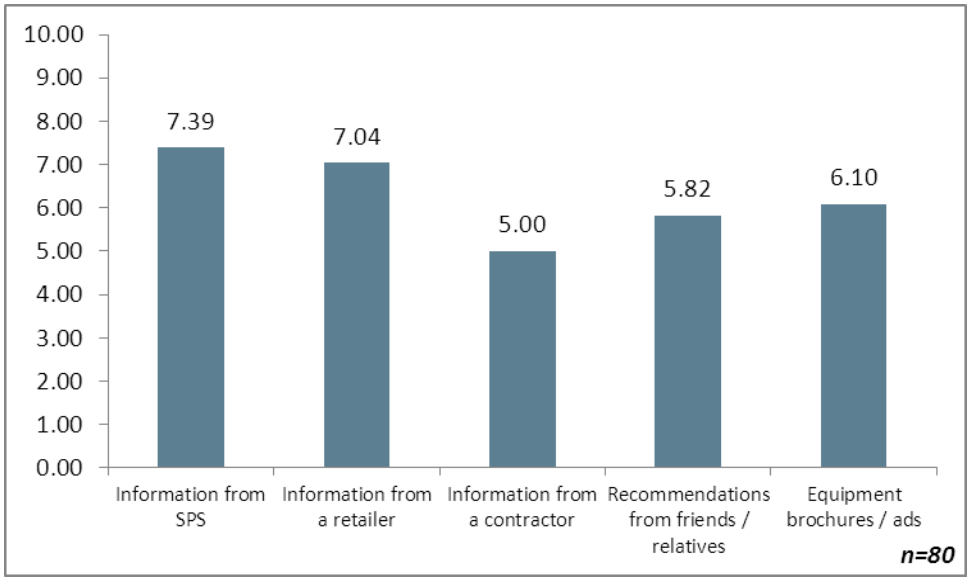

Figure 8-3 Levels of Influence of Sources of Information

“Information from SPS” was rated as the most influential source (7.39 out of 10). Secondarily, information from a retailer was also rated higher than other factors (7.04).

Respondents were then asked to rate the importance of a series of factors in their decision-making process to purchase their evaporative cooler. Figure 8-4 summarizes the results. Respondents gave the highest rating in importance to “Improving Home Comfort” (9.33) and “Program Financial Incentive” (8.65).

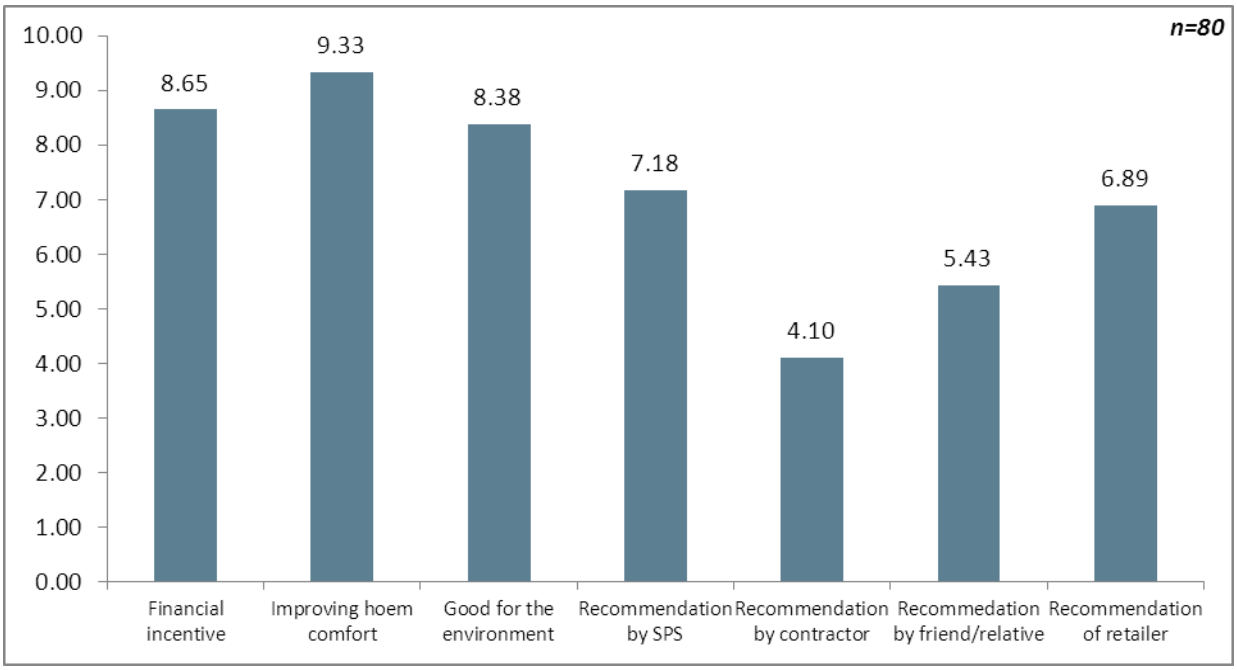

Figure 8-4 Importance of Factors in Decision-Making

8.3.3.2 Contractor Selection

Only 8.8% of respondents indicated having a contractor install their evaporative cooler. Respondents largely self-installed or had a friend or relative install their unit.

8.3.3.3 Participant Satisfaction

Respondents were asked to rate their satisfaction on a scale of 1-10, with 1 meaning "Very Dissatisfied" and 10 meaning "Very Satisfied". Figure 8-5 summarizes participant responses.

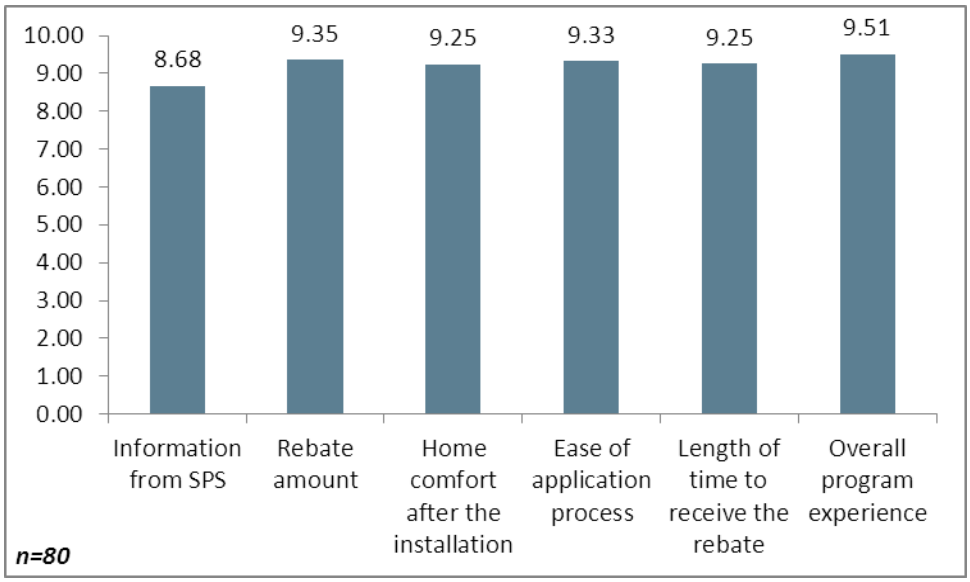

Figure 8-5 Evaporative Cooler Participant Satisfaction

Overall satisfaction is very high across all aspects of program participation. The only instances of dissatisfaction indicated were for "information provided by SPS". Some respondents rated this low due to not having received any information from SPS; all of their information on evaporative cooling and on program participation came from their contractor or equipment dealer.

8.3.3.4 Landlord Decision-Making

The six interviewed landlords were asked an extra set of questions related to their decision-making and how that is impacted by tenant occupancy rather than they themselves occupying the premise. Key findings from these questions were:

- One third of landlords surveyed pay the electric bill for at least one of the premises where they installed a rebated unit. For such premises, the decision-making is similar to a commercial facility in that the owner's profitability is directly affected by the equipment choice.
- Two-thirds of landlords handled the paperwork for their incentive themselves. The other two had paperwork filled out by a relative.
- Seventeen percent of landlords stated that some of their rental properties have refrigerated air systems. For these landlords, 60% of their rental properties have refrigerated air.
- No responding landlords indicated that they have switched some of their properties to refrigerated air.
- Eighty-three percent of landlords surveyed stated that in their experience, "tenants place value on a rental property being energy efficient". When asked

to explain what leads them to that conclusion, these landlords indicated having heard first-hand from a large number of tenants the need to keep their utility bills down.

8.3.4 Program Reorganization

Based on a comparison of program performance between the residential cooling programs implemented by SPS and EPE, the Evaluators recommend that the SPS portfolio be reorganized in a manner similar to EPE's current residential program design. Refrigerated air systems are currently rebated under the Home Energy Services Program on a per-kWh basis, and this has been unsuccessful in penetrating the market, with no participation in this channel in any of the past four program years. The Evaluators recommend that high efficiency refrigerated air systems and heat pumps be moved from Home Energy Services to a combined Residential Cooling program along with the current evaporative cooling rebates.

Elsewhere in New Mexico, PNM has begun offering incentives for the Western Cooling Control system, following intervention by the Southwest Energy Efficiency Project (SWEEP) into a residential program filing[16]. This device saves energy by reducing latent cooling (through which a refrigerated air system dehumidifies a space), which is an unnecessary function in a climate as dry as New Mexico's. The Evaluators concur that this is a viable measure, and should be investigated by SPS for program addition, especially given the warmer climate in southern New Mexico.

8.4 Recommendations

Based on the impact and process evaluation findings, the evaluators recommend the following:

- **Add Western Cooling Control to the program.** This measure produces viable savings and is offered elsewhere in New Mexico. With SPS' relatively warm climate, it would be even more effective for SPS than for PNM.
- **Reorganize the program to include all high efficiency HVAC equipment for the residential market.** EPE has had success with that program design in their New Mexico service territory, and the Evaluators conclude that the residential HVAC market in SPS territory would be better-served by a similar program design.
- **Focus landlord outreach on owner-occupants and landlords that are responsible for the property utility bills.** Landlords that were not

[16] First introduced to SWEEP by Proctor Engineering Group Ltd. in a 2012 presentation. http://swenergy.org/events/annual/2012/presentations/19%20Proctor.pdf.

responsible for their tenants' bills displayed higher free-ridership than owner-occupants or landlords that are responsible for their property utility bills.

9. Energy Feedback Pilot

The Energy Feedback Pilot is an educational program run by Opower, a third party implementer for SPS. The program provides educational materials to a sample of SPS residential customers, in which their usage is compared against similar households. The program is designed to encourage behavioral change and program participation on the part of the recipients of the Home Energy Report.

9.1 Control Group Validity Testing

The Evaluators tested the recipient and control group of the Home Energy Reports program for statistically significant differences in the pre-delivery period in order to ensure the validity of the comparison. This testing examined the data for a statistical difference in mean kWh usage by month. Each month has a resulting T-Stat and p-Value to check for any difference. There were no statistical differences in usage by month at the p = 0.05 (95% confidence) level. The resulting calculations are detailed in Table 9-1.

Table 9-1 Control Group Validity Testing Results

Month	Control kWh	Control Standard Error	Treatment kWh	Treatment Standard Error	T-Stat (Control - Trt)	PR >T
1	1901.5	8.17	1897.08	8.10	0.38	0.37
2	1868.55	9.04	1862.27	8.92	0.49	0.35
3	1310.33	6.10	1303.38	6.02	0.81	0.29
4	1017.47	3.82	1012.82	3.82	0.86	0.28
5	1126.68	4.20	1126.43	4.23	0.04	0.40
6	1597.3	5.70	1593.44	5.65	0.48	0.36
7	2045	7.01	2031.11	6.96	1.41	0.15
8	2035.85	6.53	2032.79	6.57	0.33	0.38
9	1755.38	6.52	1749.72	6.50	0.61	0.33
10	1179.07	4.67	1177.04	4.66	0.31	0.38
11	1129.73	4.35	1129.50	4.29	0.04	0.40
12	1755.79	8.16	1745.88	7.97	0.87	0.27

9.2 Data Cleaning Procedures

All screening procedures exist to reduce variability in the model and ensure an accurate savings estimate. The procedure to remove duplicate observations consists of checking for duplicate observations for each customer that appear on the same date, and ensuring only one of those observations remains. This does not remove any customers from the sample, but will remove observations as necessary. Further, Observations

with abnormally short or long meter read cycles were filtered from the model. This procedure removed observations where the meter read length was less than 10 or greater than 70 days.

9.3 Regression Model Specification & Results

The Evaluators utilized a fixed-effects regression model to determine the change in energy consumption for program participants versus a group of matched non-participants. This involves the use of Pre/Post and Participant/Non-Participant binary variables. Weather was incorporated into the model through the use of Heating Degree Days (HDD) and Cooling Degree Days (CDD). The Evaluators tested a variety of potential base temperatures for the HDD and CDD to maximize the coefficient T-Stats and R-Squared of the model. This resulted in a base temperature of 75 for CDD and 65 for HDD. The regression model is specified as follows:

$$\square kWh\square_{\square}(i,t) = \alpha_1 1\ \square\textbf{Customer Fixed Effects}\square_1 i + \beta_1 1\ \square HDD65\square_1 t + \beta_1 2\ \square CDD75\square_{\square} t + \beta_{\square} 3\ (\square Treatment\square_1$$

$$\begin{aligned} kWh_{i,t} = \alpha_1 &\text{Customer Fixed Effects}_i + \beta_1 HDD65_t + \beta_2 CDD75_t + \beta_3 Treatment_i \\ &+ \beta_4\left(Treatment_i * Post_{i,t}\right) + \beta_5(CDD75_t * Post_{i,t}) + \beta_6(HDD65_t * Post_{i,t}) \\ &+ \beta_7(Treatment_i * Post_{i,t} * HDD65_t) + \beta_8(Treatment_i * Post_{i,t} * CDD75_t) \\ &+ \varepsilon_{i,t} \end{aligned}$$

Where the subscript i denotes variations by customer and t signifies changes through time. The variables included in the both regression models are specified in Table 9-2 below.

Table 9-2 Variables Included in Regression Model

Variable	***Description***
Fixed Effects by Customer	Unique identifier for each customer to control for any customer specific differences.
Heating Degree Days (HDD)	Heating Degree Days calculated by summing up the number of heating degree hours per day. The setpoint of 65 was used for the models.
Cooling Degree Days (CDD)	Cooling Degree Days calculated by summing up the number of cooling degree hours per day. The setpoint of 65 was used for the models.
Post	Indicator if a participant's observation is post audit (=1 if post, =0 otherwise). 0 for all control group observations.
Treatment	Indicator of whether the customer is a program participant or in the control group (=1 if program participant, 0 if in control group).
kWh	Monthly kWh per customer.

The results of the regression model are listed in Table 9-3. The coefficients of interest are β_4, β_7, and β_8. When combined together with the Mean value of HDD65 and CDD75, program kWh savings can be calculated.

Table 9-3 Regression Coefficients & Model Details

Variable Description	***Regression Coefficients and Standard Errors***
Post	**-5.5771608 ***
	.190768
HDD (β_1)	**.050006495 ***
	(0.000153)
CDD (β_2)	**.10487605 ***
	(0..000299)
Treatment*Post (β_3)	**.3144422**
	(.269562)
HDD*Post (β_4)	**.00710207 ***
	(0.000312)
Treatment*HDD	**.00037123 ****
	.000217
Post*HDD	**.0071012 ***
	.000312
HDD65*Post*Treatment (β_6)	**-0.0018058 ***
	(0.000734)
CDD*Post (β_5)	**.10487605 ***
	(0.000299)
Treatment*CDD	**-.00016021**
	.000423
Post*CDD	**-.217847 ***
	.000519
CDD*Post*Treatment (β_7)	**-.0217847 ***
	(0.0018058)
R-Squared	0.535
Notes: (1) The dependent variable is daily kWh over the billing interval. (2) * denotes statistical significance at the 0.05 level. (3) ** denotes statistical significance at the 0.10 level. (4) Standard Errors are in parenthesis. (6) A negative value signifies savings.	

9.4 kWh Savings Results

The regression results from Table 9-3 were converted to kWh savings on a monthly basis using the mean HDD and CDD for each month in 2013. The resulting monthly savings are summarized in Table 9-5.

Table 9-4 Home Energy Report Monthly Savings

Month	*kWh Savings*
January 2013	587,672
February 2013	340,454
March 2013	269,072
April 2013	189,129
May 2013	208,185
June 2013	315,924
July 2013	233,739
August 2013	293,404
September 2013	105,548
October 2013	160,426
November 2013	368,306
December 2013	637,327

That process was conducted for the post months (April – December) and then summed up to reach a total of 239.83 kWh savings per participant. When compared to the average usage of the participant group in 2013 over those months, the percentage savings were determined to be 1.53%. Using the number of 2013 program participants (13,430), the results were scaled up to equal 3,222,538 kWh in 20132. These numbers are summarized in Table 9-5.

Table 9-5 Energy Feedback Pilot Savings Summary

2013 kWh Savings (Per Participant)	*2013 Participants*	*Percentage Savings*	*2013 Program kWh Savings*	*kW Savings*
239.83	13,430	1.53%	3,222,538	356.61

In terms of percent of annual consumption, these values are lower than observed elsewhere for similar programs. It is possible that this is due to the high market share of evaporative cooling in New Mexico, which gives customers less discretionary usage to curtail in response to the home energy report. Much of the energy savings from home energy reports programs in other territories is attributable to curtailment of AC usage, and as a result it should be expected that there is a lower return in savings when a large share of customers use evaporative cooling.

10. Business Comprehensive

The Business Comprehensive Program (BCP) is the aggregation of Business Lighting, Business Cooling, Business Custom, Business Computers, and Business Motor & Drive Efficiency.

10.1 Business Comprehensive Program

SPS' business portfolio was disaggregated into separate programs by measure category. Beginning in 2012, these programs were aggregated into Business Comprehensive. As presently constituted, this aggregated the following programs:

10.1.1 Business Lighting Efficiency

SPS is offering the Lighting Efficiency to facilitate the implementation of cost-effective efficient lighting in non-residential facilities. This program is available to existing nonresidential customers as well as new construction and offers prescriptive and custom incentives.

- Prescriptive incentives are offered on a per unit basis for lamps and fixtures for the following lighting types:
  - Compact fluorescent
  - T8 & T5 Fluorescent
  - Ceramic Metal Halide
  - Pulse-Start Metal Halide
  - LED exit signs
- In addition to lamp and fixtures, prescriptive incentives are offered on a per-unit basis for the following measures:
  - Occupancy Sensors
  - Photocells
  - T8 Delamping

10.1.2 Business Cooling Efficiency

The Business Cooling Efficiency Program is designed to help non-residential customers reduce their energy consumption by installing high efficiency cooling equipment. SPS is offering the Business Cooling Efficiency Program in New Mexico to facilitate the implementation of cost-effective cooling efficiency improvements in businesses. This program is available to existing nonresidential customers as well as new construction applications and offers prescriptive and custom incentives.

Prescriptive incentives are offered on a per-ton basis for common several classes of cooling equipment. These include the following:

- Condensing Units
- Split Systems
- Rooftop Units
- PTAC
- Water-Source Heat Pumps
- Chillers
- VAV Boxes

Custom incentives are available as well, and are determined based on the estimated amount of electrical energy and peak demand savings, calculated at rates per kWh for on peak or non-peak hour time frames.

10.1.3 Business Custom Efficiency

The Business Custom Efficiency Program is designed to help customers reduce their energy consumption by providing rebates for a wide variety of unique or unusual equipment and process improvements that are not covered by available prescriptive programs. This program is available to existing nonresidential customers as well as new construction applications.

The measures covered by this program fall outside of the scope of other SPS business programs; Business Lighting Efficiency, Business Cooling Efficiency, and Business Motor & Drive Efficiency each have custom components in addition to prescriptive measures, and cover a large amount of custom measures.

Businesses can receive rebates of up to $400 per kW saved. Participants must receive pre-approval for a measure before installation. In an effort to expand this program, in 2011 SPS began targeting customers with aggregated annual consumption greater than 10 GWh in order to increase awareness of the program. SPS intends to

- Increase awareness of energy conservation measures;
- Identify specific conservation opportunities;
- Drive customers to participate in existing prescriptive and customized rebate programs; and
- Drive customers to implement low-capital or short payback measures, even though they may not qualify for an implementation rebate under existing programs.

10.1.4 Business Motor Efficiency

SPS is offering the Business Motor & Drive Efficiency Program in New Mexico to facilitate the implementation of cost-effective energy efficiency improvements in businesses. This program is available to existing nonresidential customers as well as new construction applications and offers prescriptive and custom incentives.

- Prescriptive incentives are offered on a per HP or kW basis for the following measure types:
  - 1-500 HP motors meeting or exceeding NEMA Premium Efficiency standards
  - Variable frequency drives (VFDs)
  - Constant speed motor controllers
  - Energy efficient compressed air equipment upgrades
  - No-loss air drains
- Custom incentives are determined based on the estimated amount of electrical energy and peak demand savings, calculated at rates per kWh for on peak or non-peak hour time frames.

Businesses participating in the Motor & Drive Efficiency Program can receive:

- Cash incentives to help alleviate the costs of installing efficient motors/controls;
- Custom measures that address customers specific needs;
- Cost reductions in electricity bills; and
- Education via a motor inventory assessment.

In addition, participants will benefit from reduced downtime due to motor failure and lower maintenance expenses as NEMA Premium Efficiency Motors are manufactured with high quality materials and standards.

10.1.5 Business Computer Efficiency

The Business Computer Efficiency Program provides incentives for high efficiency plug loads. Measures eligible for the program include:

- High efficiency desktop PCs;
- High efficiency servers; and
- Network PC management software.

10.2 M&V Methodologies

10.2.1 Business Lighting Efficiency

Evaluation of the Business Lighting Efficiency Program (BLEP) requires the following:

- Stratified random sampling, selecting large saving sites with certainty;
- Review of deemed savings parameters; and
- Onsite verification inspection, with metering in facilities where lighting runtime is uncertain;

Parameters required for evaluation of the BLEP are presented in Table 10-1.

Table 10-1 Data Sources for Gross Impact Parameters – Business Lighting Efficiency Program

Parameter	***Source***
Project Details	Program Tracking Data
Fixture Wattage Review	Manufacturer's Literature
Hours of Operation	Comparison of deemed values with CA DEER values, on-site metering for projects with uncertainty
HVAC Interactive Factors	Simulations of archetypical buildings using Roswell NM TMY weather data
Peak Coincident Factor	Review of deemed values, assignment of new values based upon facility operating hours should deemed values not provide accurate estimates
Effective Useful Life	Comparison against CA DEER values
Net-to-Gross Ratio (NTGR)	Participant Surveying

10.2.1.1 Business Lighting Efficiency Gross Savings Estimates

The 2013 BLEP encompassed lighting retrofits, occupancy sensors retrofits, and installation of high efficiency lighting as part of new construction projects. The subsections below present the savings calculation methodology for each of these measure types.

Gross Savings Methodology for High Efficiency Lighting Retrofits

To calculate annual savings from lighting retrofits, the Evaluators applied the following equation:

$$Annual\ kWh\ Savings = (kW_{base} - kW_{post}) * Hours * HCEF$$

Parameters for this equation are defined in Table 10-2.

Table 10-2 Parameters for kWh Savings Calculation of Lighting Retrofit Measures

Parameter	Definition
kW_{base}	Total Baseline Fixtures x $W/Fixture_{base}$ / 1000W/kW
kW_{post}	Total Installed Fixtures x $W/Fixture_{post}$ / 1000W/kW
Hours	Annual Hours of Operation
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the Evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during the hottest summer weekdays. To provide the peak savings estimate for lighting, the facility's average runtime during the period of 3:00 – 6:00 PM on all summer weekdays was applied, in order to better reflect typical operation during the occurrence of a system peak. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = \left(kW_{base} - kW_{post}\right) * HCDF * PCF$$

Parameters for this equation are defined in Table 10-3.

Table 10-3 Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

Parameter	Definition
kW_{base}	Total Baseline Fixtures x $W/Fixture_{base}$ / 1000W/kW
kW_{post}	Total Installed Fixtures x $W/Fixture_{post}$ / 1000W/kW
PCF	Peak Coincident Factor: % Time During Peak Period in Which Lighting is Operating
HCDF	Heating/Cooling Demand Interactive Factor

Gross Savings Methodology for High Efficiency Lighting in New Construction Applications

The 2013 BLEP provided rebates to participating facilities for energy efficient lighting in new construction applications. Calculations of savings for lighting in new construction applications differs from retrofits in that the baseline is denominated in W/ft^2 for the space type. This is to capture the reduction in Lighting Power Density (LPD) generated by the project. Annual savings from an LPD reduction are calculated as:

$$Annual\ kWh\ Savings = \left(\frac{kW}{ft^2}_{base} - \frac{kW}{ft^2}_{post}\right) * Hours * HCEF * ft^2$$

Parameters for this equation are defined in Table 10-4.

Table 10-4 Parameters for kWh Savings Calculation of Lighting New Construction Measures

Parameter	Definition
kW/ft^2_{base}	Baseline LPD as Set by Building Code or Industry Standard
kW/ft^2_{post}	Total Installed Fixtures x $W/Fixture_{post}$ / 1000W/kW / Sq. Ft.
Hours	Annual Hours of Operation
HCEF	Heating/Cooling Energy Interactive Factor
Ft^2	Square Footage of the Facility

In a manner similar to lighting retrofits, the Evaluators then calculated peak savings for the measure. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = \left(\frac{kW}{ft^2}_{base} - \frac{kW}{ft^2}_{post}\right) * PCF * HCDF * ft^2$$

The parameters for this equation are defined in *Table 10-5*.

Table 10-5 Parameters for Peak Demand (kW) Savings Calculation of Lighting New Construction Measures

Parameter	Definition
kW/ft^2_{base}	Baseline LPD as Set by Building Code or Industry Standard
kW/ft^2_{post}	Total Installed Fixtures x $W/Fixture_{post}$ / 1000W/kW / Sq. Ft.
PCF	Peak Coincident Factor: % Time During Peak Period in Which Lighting is Operating
HCDF	Heating/Cooling Demand Interactive Factor
Ft^2	Square Footage of the Facility

Gross Savings Methodology for Lighting Controls in Retrofit & New Construction Applications

The methodology to be detailed encompasses The Evaluators' gross savings methodology for all lighting control measures, including:

- Occupancy Sensors;
- Photocell Controls; and
- Daylighting Controls;

The methodology for this measure does not differ between retrofit and new construction applications as in a new construction application, the measure is considered as a retrofit

to the installed lighting. Annual kWh savings from lighting controls are calculated as follows:

$$Annual\ kWh\ Savings = (Hours_{base} - Hours_{post}) * kW_{post} * HCEF$$

This captures savings attributable to a reduction in operating hours as a result of the lighting controls. In instances where controls are installed alongside a lighting retrofit, savings from occupancy sensors are calculated using the installed kW of the energy efficient lighting, in order to account for dissynergies (i.e., a simultaneous lighting retrofit and lighting control installation saves less than each of the two measures would have individually). The Evaluators then calculated peak savings for lighting controls as:

$$Peak\ kW\ Savings = (PCF_{base} - PCF_{post}) * kW_{post} * HCDF$$

Savings from lighting controls are attributable to a reduction in the facility's Peak Coincident Factor, that is, after installation of lighting controls, the facility lighting operates for fewer hours within the 3:00 – 6:00 PM range.

10.2.1.2 Business Lighting Efficiency Net Savings Estimates

In evaluating the 2013 BLEP, the Evaluators were tasked with providing net savings estimates. The net savings attributable to a program may differ from gross savings because of free-ridership. Free ridership impacts are the energy savings impact attributable to the installation of energy efficiency measures by participants who would have installed energy efficient lighting or lighting controls without the SPS rebate.

We used information collected through surveys of program participants to develop estimates of free-ridership. In these surveys, customers were questioned regarding their knowledge of energy efficiency, their reasons for participating, and the measure implementation decisions they would have made had they not participated in an IOU's program.

Our approach to estimating free-ridership using self-reported survey data has the following main features:

- We ask respondents two related sets of questions: (1) How much of the savings or measures would have been installed without the program, and (2) what was the likelihood that measures of the same or better efficiency would have been installed without the program. Using a combination of questions, we can derive the base value by filling in missing data with a hierarchy of responses.
- We use a variety of survey methods to help confirm the validity or consistency of responses provided to questions about free ridership. Asking related

questions about the importance of incentives, prior plans to install, increases in efficiency and timing of investment allows examination of the consistency of self-reports on free ridership.

The factors are then combined to assign individuals a probability of free-ridership. The assignments are split into terciles, with respondents labeled as having a 0%, 33%, 67%, or 100% chance of free-ridership. The categories of free-ridership are detailed in the subsections to follow.

Financial Ability

For Part 1, customers were asked:

> Question 13: Would you have been able to install the measure without the financial incentive from SPS?

If the customer answered No to this, then they are assigned 0% free-ridership, as without the financial ability to purchase high efficiency lighting equipment, other factors in the decision making process cannot contribute to the decision making absent the available rebate. This value essentially serves as a free-ridership "gateway". Respondents that lacked financial ability are definitely not free-riders, but being financially able to install a measure is not sufficient to label as a free-rider.

Prior Planning

Following this, customers are asked as to any plans they had to install high efficiency lighting equipment. This is addressed in the following questions:

> Question 36: When did you learn of the lighting efficiency program?
>
> Question 15: Did you have plans to install the equipment before participating in the program?

If the respondent indicates that they did have prior plans, or that they had not learned of the program until after having selected the equipment, then they can be considered a partial-free rider on this component.

Importance of Rebate in Decision Making

Once customers learn of the rebate, it is possible that this knowledge will sway their decision making process to install standard vs. high efficiency lighting equipment. To address this, we examined responses to the following two questions:

> Question 5: How important was SPS' rebate in your decision to buy high efficiency lighting equipment?
>
> Question 14: Before participating in the lighting efficiency program, had you installed any equipment similar to [Equipment/Measure] at your facility?

Question directly addresses the importance of the rebate, by having the respondent weigh its importance in the decision-making process for the project. Question 14 also addresses how important the rebate was to the decision making process as if the respondent had installed the same measure elsewhere at the facility then the rebate was likely not required to induce them to install the rebated project

Likelihood of Installing Similar Equipment without Rebate

Finally, customers are asked whether they would have installed high efficiency lighting equipment if the rebate were not available. This is addressed with four questions:

> Question 19: If the financial incentive from the lighting efficiency program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway?
>
> Question 20: How did availability of information and financial incentives through the lighting efficiency program affect the quantity (or number of units) of [Equipment/Measure] that you purchased and installed? Did you purchase and install more [Equipment/Measure] than you otherwise would have without the program?
>
> Question 21: How did availability of information and financial incentives through the lighting efficiency program affect the level of efficiency you chose for [Equipment/Measure] that you purchased and installed? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
>
> Question 22: How did availability of information and financial incentives through the lighting efficiency program affect the timing of your purchase and installation of [Equipment/Measure]? Did you purchase and install more [Equipment/Measure] earlier than you otherwise would have without the program?

If the respondent indicates on Question 19 that they “Probably would have installed” or “Definitely would have installed” the same equipment without the rebate, their answers to the three questions to follow are examined. Questions 20-22 address whether the project was modified due to available rebates from the program. If the respondent indicates that they did not modify the project, then they are likely a free-rider on this component. If they had modified the project, then that is an indicator that the program did affect their decision making, even if this runs counter to their response in Question 19.

Assignment of Free-Ridership and Partial Free-Ridership Scores

Based upon the answers to these four categories of questions, the respondents are placed in Free-Ridership Terciles, with scores of 0%, 33%, 67%, and 100% Free-

Ridership. The scoring is based upon all possible interactions between the four questions. Part 1 of free-ridership, Financial Ability, essentially serves as a gateway; if it does not equal "Yes" then other aspects of free-ridership are irrelevant. Table 10-6 presents the associated free-ridership score for each permutation of answers in the four free-ridership components. The table provides scoring at the individual participant level. Program-level free-ridership is then derived by aggregating the participant-level scores.

Table 10-6 Free-Ridership Scoring

Financial Ability	*Prior Planning*	*Rebate Was Important*	*Likely to Install w/o Rebate*	*Aggregated Category*	*Free-Ridership Score*
Y	N	N	Y	YNNY	.67
Y	N	N	N	YNNN	.33
Y	N	Y	Y	YNYY	.33
Y	N	Y	N	YNYN	0
Y	Y	N	Y	YYNY	1
Y	Y	N	N	YYNN	.67
Y	Y	Y	Y	YYYY	.67
Y	Y	Y	N	YYYN	.33
N	N	N	Y	NNNY	0
N	N	N	N	NNNN	0
N	N	Y	Y	NNYY	0
N	N	Y	N	NNYN	0
N	Y	N	Y	NYNY	0
N	Y	N	N	NYNN	0
N	Y	Y	Y	NYYY	0
N	Y	Y	N	NYYN	0

10.2.2 Business Cooling Efficiency

Evaluation of the Business Cooling Efficiency Program (BCEP) requires the following:

- Stratified random sampling, selecting large saving sites with certainty;
- Review of deemed savings parameters;
- Onsite verification inspections;
- DOE-2 Simulation of large, complicated retrofits and use of Equivalent Full Load Hours (EFLH) values for smaller projects.

Parameters required for evaluation of the BCEP are presented in Table 10-7.

Table 10-7 Data Sources for Gross Impact Parameters – Business Cooling Efficiency Program

Parameter	Source
Project Details	Program Tracking Data
Facility Billing Data (For Calibration of Large Retrofit Simulation Models)	SPS
Equipment Specifications (Size, Efficiency, etc.)	Manufacturer's Literature
Equivalent Full-Load Hours (EFLH)	SPS Deemed values, reviewed by ADM through simulation of archetypical facilities with Roswell NM TMY Weather Data
Effective Useful Life	Comparison against CA DEER values
Net-to-Gross Ratio (NTGR)	Participant Surveying

10.2.2.1 Business Cooling Efficiency Gross Savings Estimates

As stated above, gross savings estimates for facilities participating in the 2013 BCEP are evaluated by one of two methodologies:

- Calibrated DOE-2 simulation, for large retrofits; and
- Equivalent Full Load Hour calculations for smaller retrofits.

DOE-2 Simulation Modeling

In 2013, there were no cooling projects that required simulation modeling.

EFLH Calculations

For simpler cooling measures, including Package Terminal Heat Pumps (PTHPs) and Roof Top Units (RTUs), the Evaluators applied deemed EFLH values along with specifications of installed capacity and efficiency in evaluating savings. Parameters for EFLH calculations are defined in Table 10-8.

Table 10-8 Parameters for kWh Savings Calculation of HVAC Retrofits

Parameter	Definition
#Units	Quantity of Rebated HVAC Units
Cap	Unit Capacity (Measured in Tons)
$SEER_{base}$	Baseline SEER
$SEER_{Post}$	Installed SEER
EFLH	Equivalent Full Load Hours (Encompassing both heating and cooling hours in cases of heat pumps)

EFLH values are provided in SPS' technical assumptions for business cooling measures. The Evaluators tested these values via DOE-2 simulation modeling of

archetypical building types using Roswell NM TMY weather data, and revises EFLH by facility type where appropriate. .

10.2.3 Business Cooling Efficiency Net Savings Estimates

Net savings for the BCEP are estimated in the same manner as detailed in Section 10.2.1.2 for the Business Lighting Efficiency Program.

10.2.4 Business Custom Efficiency

Projects in Business Custom Efficiency have site-specific measurement and verification (M&V) plans developed, in a manner appropriate for the specific project's level of uncertainty and expected savings. One large custom project was selected for M&V in 2013, due to particularly .high expected savings. The project was a new construction sour gas compressor with a VFD. This project's expected savings exceeded 4 GWH. The methodology for this project is detailed in the site-level report provided in Appendix A.

10.2.5 Business Motor & Drive Efficiency

Evaluation of the Business Motor & Drive Efficiency Program (BMEP) requires the following:

- Stratified random sampling, selecting large saving sites with certainty;
- Review of deemed savings parameters; and
- Onsite verification inspections;

Parameters required for evaluating savings from the BMEP are detailed in Table 10-9.

Table 10-9 Data Sources for Gross Impact Parameters – Business Motor & Drive Efficiency Program

Parameter	***Source***
Project Details	Program Tracking Data
Load Factor	SPS deemed values & one-time readings for simple applications, power metering for larger, complicated applications.
Equipment Specifications (Size, Efficiency, etc.)	Manufacturer's Literature
Equivalent Full-Load Hours for HVAC Pumps & Ventilation Fans (EFLH)	SPS Deemed values, reviewed by ADM through simulation of archetypical facilities with Roswell NM TMY Weather Data
Hours of Operation for Industrial Motors & Drives	SPS deemed values for simple applications, end-use metering & facility staff interviews for complicated applications

Effective Useful Life	Comparison against CA DEER values
Net-to-Gross Ratio (NTGR)	Participant Surveying

10.2.5.1 Business Motor & Drive Efficiency Gross Savings Estimates

The 2013 BMEP provided rebates to participating facilities for projects including:

- NEMA Premium Efficiency Motors;
- Pump-Off Controllers (POCs);
- Variable Frequency Drives (VFDs) for Air Handler Units (AHUs) in HVAC Applications;
- VFDs in industrial pumping applications; and
- VFDs for compressed air systems.

Gross Savings for NEMA Premium Efficiency Motors

Savings from NEMA Premium Efficiency Motors are calculated as:

$$Annual\ kWh\ Savings = HP\ x\ LF\ x\ .746\ {}^{kW}/_{HP} * \left(\frac{1}{Eff_{std}} - \frac{1}{Eff_{prem}}\right) * Hrs$$

Parameters for this equation are detailed in Table 10-10.

Table 10-10 Parameters for kWh Savings Calculation of Premium Efficiency Motor Retrofits

Parameter	Definition
HP	Motor Horsepower
LF	Load Factor
Eff_{std}	Efficiency Rating of a Standard Efficiency Motor of the Specified HP
Eff_{prem}	Efficiency Rating of a Premium Efficiency Motor of the Specified HP
Hrs	Hours of Operation Per Year

Following this, peak demand (kW) reduction is calculated. Peak Coincident Factors for NEMA Premium Efficiency Motors are taken from SPS technical assumptions, which the Evaluators determined to be reasonable estimates of PCF. Demand savings are calculated as:

$$Peak\ kW\ Savings = HP\ x\ LF\ x\ .746\ {}^{kW}/_{HP} * \left(\frac{1}{Eff_{std}} - \frac{1}{Eff_{prem}}\right) * PCF$$

Gross Savings for HVAC VFDs

Savings from VFDs are calculated as:

$$Annual\ kWh\ Savings = HP\ x\ LF\ x\ .746\ {}^{kW}/_{HP} * \left(\frac{1}{Eff_{std}}\right) * Hrs * \%_{Savings}$$

Parameters for this equation are detailed in Table 10-11.

Table 10-11 Parameters for kWh Savings Calculation of Premium Efficiency Motor Retrofits

Parameter	Definition
HP	Motor Horsepower
LF	Load Factor
Eff_{std}	Efficiency Rating of a Standard Efficiency Motor of the Specified HP
Hrs	Hours of Operation Per Year
$\%_{savings}$	Average Savings Achieved by the VFD

Following this, peak demand (kW) reduction is calculated. Peak Coincident Factors for VFDs are taken from SPS technical assumptions, which the Evaluators determined to be reasonable estimates of PCF. Demand savings are calculated as:

$$Peak\ kW\ Savings = HP\ x\ LF\ x\ .746\ {}^{kW}/_{HP} * \left(\frac{1}{Eff_{std}} - \right) * \%_{savings} * PCF$$

Gross Savings for VFDs in Industrial Applications

The 2013 BMEP had numerous participants install VFDs on industrial pumps. These applications included mining, oil pumping, and food processing. Typically, the Evaluators treated these projects as custom, in that savings were calculated from end-use monitoring. Such sites were large savers, and in the sample frame were certainty sites, making the analysis constitute a one-off “case study”.

10.2.5.2 Business Motor & Drive Efficiency Net Savings Estimates

Net savings for the Business Motor & Drive Efficiency Program are estimated in the same manner as detailed in Section 4.5.2 for the Business Lighting Efficiency Program.

10.3 Impact Evaluation Results

The main features of the approach used for the impact evaluation are as follows:

- Data for the study have been collected through review of program materials, on-site inspections, and end-use metering. Based on data provided by SPS, sample designs were developed for on-site data collection for the impact evaluation. Sample sizes were determined that provide savings estimates for the program with ±10% precision at the 90% confidence level.

- On-site visits were used to collect data for savings impacts calculations. The on-site visits were used to verify installations and to determine any changes to the operating parameters since the measures were first installed. Facility staff were interviewed to determine the operating hours of the installed system and to locate any additional benefits or shortcomings with the installed system. For some sites, monitoring of lighting or HVAC equipment was conducted to obtain more accurate information on operating characteristics.

Gross savings were estimated using proven techniques, including engineering calculations using industry standards and verification of computer simulations developed by program contractors to determine energy savings. Table 10-12 summarizes the total participation in the 2013 BCP.

Table 10-12 2013 BCP Participation Summary

Program	# Projects	Expected kWh	Expected kW
Business Lighting	81	4,481,938	974.2
Business Cooling	53	1,304,476	408.3
Business Custom	6	3,851,854	465
Business Motors & Drives	27	8,169,466	1,147.90
Business Computers	153	346,905	47.454
Total	320	18,154,639	3,042.9

Data provided by SPS showed that during 2013, there were 320 projects in total for all program components, which were initially expected to provide gross savings of 18,154,639 kWh. The resulting overall sample is presented in Table 10-13.

Table 10-13 BCP Sample Summary

Component	# Sites in Population	Site Visit Sample Size	# Interviews	# Sites Represented in Interviews
Business Lighting	81	16	13	18
Business Cooling	53	4	12	15
Business Custom	6	1	3	3
Business Motors & Drives	27	7	8	21
Business Computers	153	0	0	0
Total	320	28	37	54

10.3.1 BCP Gross Savings Estimates

The Evaluators identified issues in stratifying strictly by expected savings for the 2013 BCP. Specifically, there were some systematic measure issues which did not

extrapolate to other measure categories. As such, the sample was stratified by measure category and then by savings.

10.3.1.1 BCP Sample Design – Custom

The custom component had a mix of HVAC, motors, and lighting projects. One project was sampled (this project accounted for 96.8% of custom efficiency savings). The remaining projects had realization rates assigned to them based on prescriptive program M&V for the appropriate measure category.

10.3.1.2 BCP Sample Design - Motors

The motors population for BCP was divided into three strata. One large motors project came within a couple days of the close of the program year and was not introduced in program tracking data until the third week of January, and as a result the Evaluators were not able to conduct M&V of this project. Stratum 4 includes a Business Custom motors project. Table 10-14 summarizes the strata boundaries and sample frames for the BCP.

Table 10-14 Business Motors Sample Design

	Stratum 1	***Stratum 2***	***Stratum3***	***Stratum 4***	***Totals***
Strata boundaries (kWh)	<45,000	40,000 – 300,000	300,000 – 750,000	>750,000	
Number of sites	13	7	5	2	27
Total kWh savings	232,456	1,019,875	2,476,573	4,440,562	8,169,466
Average kWh	17,881	145,696	495,315	2,220,281	302,573
Standard deviation of kWh savings	9,308	84,686	99,048	1,030,758	617,459
Coefficient of variation	.52	.58	.20	.46	2.04
Final sample	1	2	3	1	7

10.3.1.3 BCP Sample Design – Lighting

The Evaluators identified quality assurance issues with a specific subset of the Business Lighting population. Hotels that were served by the same group of contractors were found to have quality assurance failure. These issues largely did not appear in other lighting projects, and as a result the Evaluators separated hotels to a discrete population. Table 10-15 and Table 10-16 present the samples for non-hotel and hotel lighting projects, respectively.

Table 10-15 Business Lighting Sample Design – Non-Hotel

	Stratum 1	Stratum 2	Stratum3	Stratum 4	Totals
Strata boundaries (kWh)	<15,000	15,000 – 50,000	50,000 – 150,000	>150,000	
Number of sites	30	18	7	1	56
Total kWh savings	244,115	442,598	516,564	791,543	1,994,820
Average kWh	8,137	24,589	73,795	791,543	35,622
Standard deviation of kWh savings	3,790	10,347	20,093	-	105,411
Coefficient of variation	.47	.42	.27	-	2.96
Final sample	2	2	2	1	7

Table 10-16 Business Lighting Sample Design – Hotels

	Stratum 1	Stratum 2	Stratum3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	<25,000	20,000 – 75,000	70,000 – 175,000	175,000 – 250,000	>250,000	
Number of sites	9	6	5	2	3	25
Total kWh savings	115,547	196,952	503,859	302,408	1,368,652	2,487,118
Average kWh	12,839	32,775	100,772	151,204	456,217	116,163
Standard deviation of kWh savings	4,349	7,981	33,522	8,986	260,250	177,773
Coefficient of variation	.34	.24	.33	.06	.57	1.53
Final sample	1	2	2	1	3	9

10.3.1.4 BCP Sample Design – Cooling

The prescriptive cooling portion of the BCP had 55 projects. Ex ante savings from HVAC projects totaled 1,350,018 kWh. 226,371 was from one project which was sampled with certainty. The remaining were mostly Guest Room Energy Management (GREM) retrofits and were treated as one population, from which three sample projects were drawn for M&V.

10.3.1.5 Sample Design –Computers

It was decided to exclude Business Computers from the general stratification scheme and treat this component as a distinct population. This component was a very small contributor to program savings (accounting for only 1.91% of expected savings) and the level of effort required to conduct M&V would have been inappropriate given the size and participation level.

10.3.1.6 Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The

realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. Table 10-15 presents results at the site level.

Table 10-17 Expected and Realized Savings by Project

Project ID(s)	Facility Type	Program Category	Expected kWh Savings	Realized kWh Savings
1-7UP59	Industrial	Custom - Motors	3,728,747	3,728,747
OID1622808	Industrial	Motors	1,491,425	1,542,004
OID1657583	College/University	Lighting	791,543	66,306
OID1592896	Hotel/Motel	Hotel Lighting	752,485	262,818
OID1604694	Industrial	Motors	550,387	524,499
Multiple	Industrial	Motors	637,696	1,193,892
OID1736270	Industrial	Motors	385,234	400,560
OID1635958	Hotel/Motel	Hotel Lighting	264,502	249,856
OID1602147	Hotel/Motel	Hotel Lighting	361,665	197,265
OID1607575	Industrial	Motors	222,555	230,405
OID1726706	College/University	HVAC	226,371	238,522
OID1440466	Hotel/Motel	Hotel Lighting	144,850	47,637
OID1614493	Hotel/Motel	Hotel Lighting	158,143	62,217
OID1578113	Multifamily Housing	Lighting	100,812	96,455
OID1615370	Industrial	Motors	110,722	80,864
OID1580324	Hotel/Motel	Hotel Lighting	73,077	46,521
OID1573597	Multifamily Housing	Lighting	55,215	94,305
OID1599938	School/K-12	Lighting	47,429	64,070
OID1609923	Hotel/Motel	Hotel Lighting	42,448	11,943
OID1573019	Hotel/Motel	HVAC	41,296	63,423
OID1604078	Hotel/Motel	Hotel Lighting	32,324	13,052
OID1573016	Hotel/Motel	HVAC	22,942	25,335
OID1593446	Hotel/Motel	HVAC	17,334	15,946
OID1437765	Medical	Lighting	16,240	14,209
OID1719925	Hotel/Motel	Hotel Lighting	15,257	16,229
OID1573618	Hotel/Motel	Hotel Lighting	13,937	5,708
OID1589488	Office	Lighting	7,607	5,190
OID1599954	Industrial	Motors	3,165	1,625

From these site-level analyses, realization rates by measure category were developed. These are summarized in Table 10-18 and Table 10-19 below for kWh and kW, respectively.

Table 10-18 Gross kWh Realization by Measure Category

Program Category	Expected kWh Savings	Realized kWh Savings	Realization Rate
Lighting – Non-Hotel	1,994,820	1,470,709	73.7%
Lighting – Hotel	2,487,118	449,468	18.1%
Cooling	1,304,476	1,663,813	127.5%
Motors	8,169,466	8,998,493	110.1%
Computers	346,905	346,905	100.0%
Custom	3,851,854	3,858,934	100.2%
Overall	18,154,639	16,788,322	92.5%

Table 10-19 Gross kW Realization by Measure Category

Program Category	Expected kW Savings	Realized kW Savings	Realization Rate
Lighting – Non-Hotel	437.1	251.1	57.4%
Lighting – Hotel	537.2	211.8	39.4%
Cooling	408.3	494.3	121.1%
Motors	1,147.9	1,304.70	113.7%
Computers	47.4	47.5	100.2%
Custom	465	470.5	101.2%
Overall	3042.9	2779.9	91.4%

10.3.2 Business Comprehensive Net Savings Estimates

The Evaluators estimated net savings for all SPS business programs via detailed participant surveying of a representative sample of decision makers from each program. These questionnaires were used to provide estimates of free-ridership, with a separate estimate developed for each measure category. The subsections to follow will present The Evaluators' NTGR estimates by measure category for each program component, and the associated net savings. With verified savings compiled by stratum and by measure, the Evaluators then applied measure-category NTGRs to estimate program net savings. These are summarized in Table 10-20. For this table, the Custom Efficiency projects were calculated with the NTGRs associated with the larger measure category, but then separated into the Custom Efficiency line item.

Table 10-20 Verified Net kWh Savings by Component

Program	Expected NTGR	Verified NTGR	Verified Net kWh	Verified Net kW
Lighting	75.0%	78.9%	1,515,020	365.2
Cooling	87.5%	80.5%	1,339,369	397.9
Motors	80.0%	85.8%	7,720,707	1,119.4
Computers	88.0%	88.0%	305,276	41.8
Custom	80.0%	85.6%	3,303,248	402.7
Total	80.8%	84.5%	14,183,620	2,327.0

After evaluating the program components, the Evaluators compiled net savings to provide an overall net realization rate. These results are summarized in Table 10-21.

Table 10-21 SPS Business Comprehensive Net Realization Summary

Component	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Business Lighting	730.7	365.2	3,361,454	1,515,020	40,337,448	18,180,240	45.1%
Business Cooling	357.3	397.9	1,141,417	1,339,369	12,803,422	14,546,145	117.3%
Business Motors	889.6	1119.4	6,353,647	7,720,707	98,576,445	115,810,707	121.5%
Business Computers	41.8	41.8	305,276	305,276	1,526,380	1,526,380	100.0%
Business Custom	372.0	402.7	3,081,483	3,303,248	46,355,599	49,367,658	107.2%
Total	2391.4	2327.0	14,243,277	14,183,620	199,599,294	199,431,130	99.6%

10.4 Process Evaluation Findings

This chapter presents the results of the process evaluation of the Business Comprehensive Program[17]. The process evaluation focuses on aspects of program policies and organization, as well as the program delivery framework.

The process chapter begins with a discussion of the overall progress of the program and potential for meeting its goals. The chapter also includes discussion relating to certain issues that are critical to the future success of the program. This discussion is followed by an analysis of strategic planning and process recommendations, and concludes by highlighting key findings from the surveys of trade allies and customer participants.

10.4.1 Overall Program Success

The SPS business portfolio had a record year in terms of expected kWh savings. As in 2012, much of this was driven by the Business Motors & Drive Efficiency program (accounting for 58.8% of business-sector expected savings).

As demonstrated in Table 10-22, participation has climbed across almost all segments[18]. The only exceptions are the Business Lighting and Small Business Lighting programs, which had issues relating to low gross realization. The SPS portfolio is distinguished in the low percentage of savings provided by lighting. In many business rebate programs, it is not uncommon to see lighting account for 70% or more of

[17] "Business Comprehensive" is an aggregation of Business Lighting, Business Cooling, Business Custom, and Business Motors & Drives programs.

[18] This table includes Small Business Lighting for purposes of business portfolio-level comparison, though SBL is not part of Business Comprehensive.

expected savings. In 2013, lighting accounted for only 39.5% of expected savings for SPS. This diversity of participation will help ensure consistent savings from the portfolio in coming program years.

Table 10-22 Business Program kWh Savings by Year

Program	Program Year					
	2008	2009	2010	2011	2012	2013
Business Lighting	72,441	4,384,067	1,162,038	1,246,656	2,415,760	1,515,020
Business Cooling	34,217	72,936	359,605	708,151	325,401	1,339,369
Business Custom	28,719	-	111,137	465,361	312,199	3,303,928
Business Motors & Drives	-	260,023	524,117	9,843,831	7,719,667	7,720,707
Small Business Lighting	-	359,039	1,174,220	3,363,376	3,222,968	2,452,470
Business Computers	-	-	-	-	13,494	305,276
Total kWh Savings	135,377	5,076,065	3,331,117	15,627,375	14,009,489	16,636,770

The Business Comprehensive program (excluding Business Computer Efficiency and Small Business Lighting) had 169 participating facilities in 2012. Figure 10-1 presents the distribution of participants by facility type.

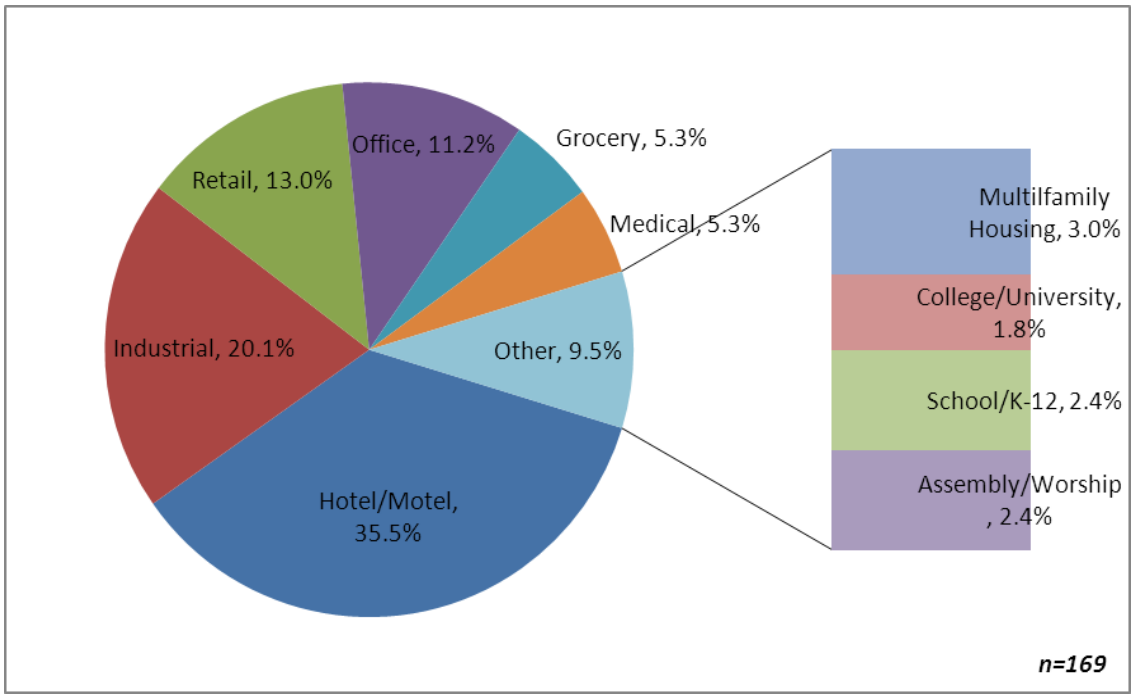

Figure 10-1 Business Comprehensive Distribution of Participants by Facility Type

The distribution of savings did not match the distribution of facilities, in that industrial facilities displayed exceedingly high savings per-project. Figure 10-2 summarizes the distribution of expected savings by facility type.

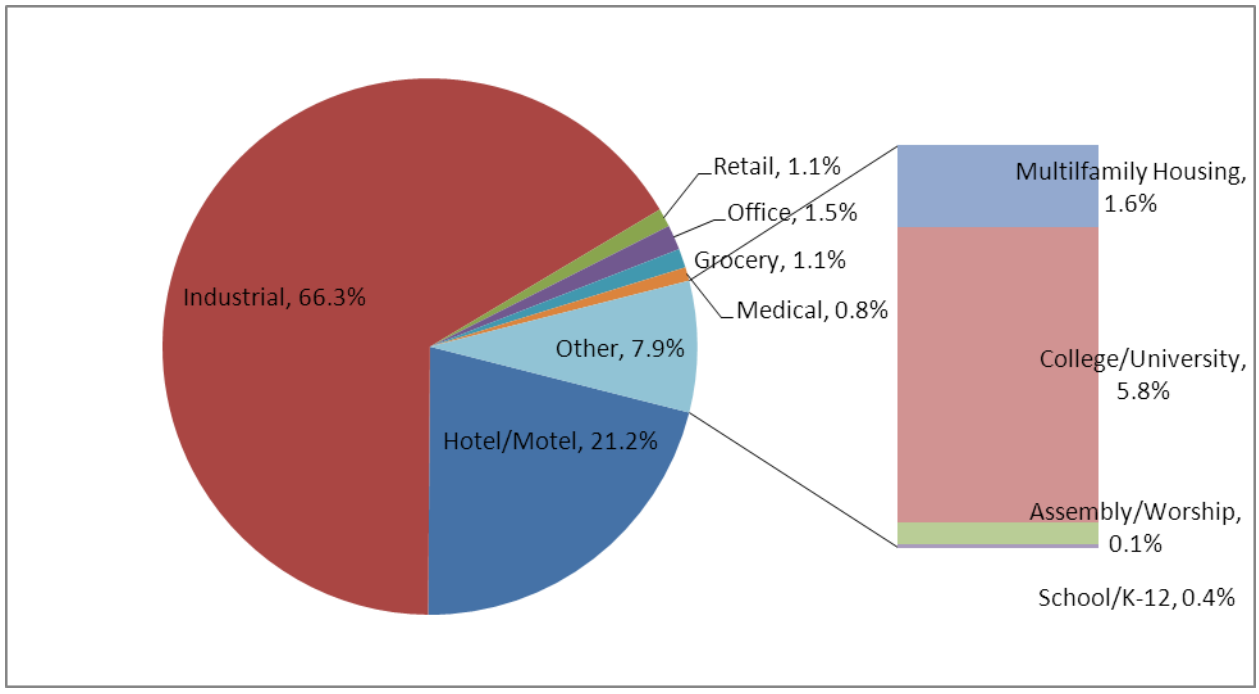

Figure 10-2 Business Comprehensive Distribution of Expected Savings by Facility Type

10.4.2 Quality Assurance & Verification

The BCP had significantly lower realization in 2013 than in any prior program year. As stated in the gross impact section of this chapter, this was due to the poor performance of hotel projects. The Evaluators were finding significant verification issues with hotel projects, and in response these projects were examined for commonalities. It was found that all of the hotel projects were implemented by the same group of five contractors that would conduct joint ventures on hotels across SPS territory. The Evaluators found that a large share of the LEDs listed on the project application were not on site. In some instances, the Evaluators' field staff found several hundred LEDs on site still in boxes. In other cases, the lighting fixtures were not found at all.

On this basis, the Evaluators initiated meetings with SPS to review the Quality Assurance (QA) procedures for the SBL program. Franklin Energy had a detailed QA process included in their program manual, but it was the Evaluators' finding that these procedures were not adhered to. Further, it was found that these procedures had not been implemented for several years, and it was a matter of luck that the QA shortfalls had not manifested into low realization in prior program years.

SPS staff responded quickly to the issues brought up by the Evaluators. Their steps to mitigate this included:

1) The contractors associated with the QA failure were barred from participating in all SPS energy efficiency programs;
2) Lighting projects at hotels became subject to added scrutiny;
3) SPS temporarily barred third-party rebate sign-over (where contractors receive the incentive instead of the end-user)
4) Franklin Energy was required to submit a revised and enhanced QA process; and
5) SPS program management staff resolved to watch Franklin more carefully to ensure adherence to the new QA process.

Due to these corrections, the inflow of such projects was stopped in August of 2013. The program was still affected significantly by these verification failures, however, as gross realization for hotel projects was 16.5%.

Additionally, the Evaluators identified one other project with significant quality assurance issues. A large Business Lighting project completed at a university (791,543 expected kWh) was found to have 8.38% realization. The Evaluators spoke with SPS staff regarding this project after the completed site visit, and it was found that the project was not physically post-inspected. The validation of this project was performed through review of a preliminary construction plan, which was scaled back significantly over the course of construction of the facility. Further, the project used baselines that were higher than allowable code, and applied common-area hours to dormitory spaces. However, the bulk of the loss of savings on this project was attributable to verification failure.

10.4.3 Summary of Program Offerings

To assess the breadth of the program offerings within SBL, the Evaluators benchmarked the program against the QuickSaver program implemented by PNM and the Small Business Energy Savings program implemented by EPE. The Evaluators' findings were as follows:

- **The Business Comprehensive Program has achieved a greater diversity of participation than seen in other IOU programs in New Mexico.** Lighting accounts for a lower share of overall savings than seen in PNM or EPE programs; in the 2013 BCP, lighting accounted for less than 20% of verified savings.
- **The BCP has had unique success with business computers that should be emulated.** Beginning in 2013, the BCP began seeing significant uptake of their upstream high efficiency computers measures. This is a viable avenue for

savings that other IOUs in New Mexico should consider for their non-residential programs.

10.4.4 Customer Outcomes

A survey was conducted to collect data about customer decision-making, preferences, and perspective of the Business Comprehensive Program. In total, 29 surveys were completed from various with participating facilities.

SPS utilizes multiple marketing strategies to make customers aware of its programs. The program partners with trade allies such as lighting contractors, motor vendors, HVAC companies, engineering firms and others who promote programs with their customers. SPS has a website where customers can learn about various measures and obtain forms. Additionally, SPS began funding "Business Education", which covers a range of channels such as direct business marketing and the funding of site audits for larger customers.

10.4.4.1 Program Awareness

Figure 10-3 displays the customer responses to how they learned about the program. A large volume of respondents indicated they learned about the program when they were directly approached by SPS staff members (41.4%) and through an equipment vendor or building contractor (31.0%). The next most-commonly indicated source of program awareness was word-of-mouth from friends and colleagues (17.2%).

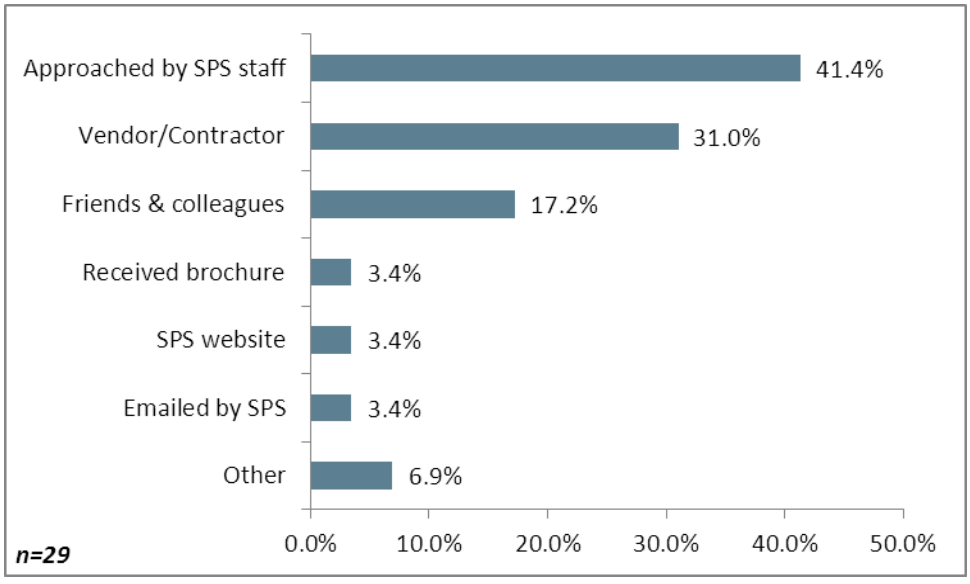

Figure 10-3 BCP Participant Sources of Program Awareness

Respondents were then asked to rate how influential various sources of information regarding energy efficiency would be on a scale of 1 to 10, with"1" meaning "not

influential at all" and 10 meaning "very influential." The resulting ratings are presented in Table 10-23.

Table 10-23 Level of Influence of Information Sources

Source of Awareness	***Amount of Influence***	***% Indicated "Don't know"***
An SPS account representative	6.38	0%
SPS website	4.70	11.5%
Brochure or Ads	5.16	3.8%
Trade associations or business groups	3.88	0%
Trade journals or magazines	3.56	3.8%
Friends or colleagues (i.e. word of mouth)	6.12	0%
An architect, engineer or energy consultant	5.92	3.8%
An equipment vendor	5.04	3.8%
Contractor	4.56	3.8%
N	26	

The highest amounts of influence correlated with the most frequent source of awareness; an SPS representative and word-of-mouth were the highest influences.

Respondents were also asked the best way of reaching out to companies for more information on energy saving opportunities. Table 10-24 summarizes the preferred methods of contact indicated by survey respondents.

Table 10-24 Preferred Methods of Contact Indicated by Program Participants

Potential Contact Sources	***Percent of Respondents***
Visits from program reps/staff/vendors	15.2%
Bill or bill inserts	3.0%
Email	21.2%
Direct Mail	15.2%
Phone	15.2%
Advantage Heating and Cooling locally	3.0%
Seminars	3.0%
Online	3.0%
Word of mouth	12.1%
Don't know	9.1%
N	26

The most effective ways of contact are through email, direct mail, phone calls, and visits from program staff or vendors.

An important question is when respondents learned about the program. As shown in *Table 10-25*, 46.2% of the customers learned about the program before they planned equipment replacements, and 34.6% learned about it during planning equipment replacement. The rest of the respondents (19.2%) indicated that they had learned about the program after the equipment had been specified and/or installed.

Table 10-25 When Customer Decision Makers Learned about the Program

When did you learn of the Business Comprehensive Program?	Percent of Respondents
Before planning for replacing the equipment began	46.2%
During your planning to replace the equipment	34.6%
Once equipment had been specified but not yet installed	3.8%
After equipment was installed	15.4%
Don't know	0%
N	26

10.4.4.2 Customer Decision-Making

Respondents were also asked to rate the amount of importance of various factors that contributed to decision-making on energy efficiency improvements. They were asked to rate each factor on a scale of 1 to 10, where10 was "very important" and 1 was "not important at all." Table 10-26 shows the importance for each factor.

Table 10-26 Importance of Factors for Decision-Making

Factors of Decision-Making	Amount of Importance	% Indicated "Don't know"
Incentive payments from SPS	8.44	3.8%
Past experience with energy efficient equipment	7.40	3.8%
Your organization's policies	6.52	3.8%
Advice and/or recommendations received from SPS	6.77	15.4%
Advice and/or recommendations received from vendors	5.32	3.8%
Promoting company image as environmentally friendly	6.27	0%
Productivity benefits/reduced waste	8.09	15.4%
N	26	

The highest amount of importance was placed on the incentive payments from SPS and productivity benefits/reduced waste. Another important factor was past experience with energy efficient equipment.

Thirty-nine percent of respondents indicated that their company has policies or procedures to address energy efficiency improvements. Of those respondents, 36.4% had a formal energy management plan. Other responses included Three out of five respondents that indicated that their organization has an energy management plan further stated that their plan includes specified reduction goals.

When asked if the respondent had any difficulties internally or externally with purchasing and installing energy efficiency upgrades, 34.6% said they had no difficulties at all. Those that did have issues cited a lack of funding for projects (26.9%), not enough time to oversee the project (3.8%), high costs of equipment (3.8%), and the current economy (3.8%).

10.4.4.3 Customer Interactions and Financial Incentives

Respondents were asked specific questions regarding their experience with SPS program, interactions with the SPS staff, and various questions about financial feasibility of purchasing equipment and the financial incentives.

Prior to participating in the Business Efficiency Program, 23.1% of respondents had installed efficient equipment similar to the rebated measure at their facility. Forty-two percent of respondents indicated that they did have plans to install the equipment before participating in the program. Of those respondents, 81.8% stated that would have installed the equipment without the program rebates and 54.5% stated that their project would have included the same equipment without the rebates.

Forty-two percent of respondents reported that they had previous experience with SPS energy efficiency programs prior to this project. Respondents that did have previous experience with XCEL programs said those interactions were very important in making the decision to install the energy efficiency equipment (with 10 of 11 respondents indicating so).

Respondents were then asked to rate their likelihood of installation in the absence of a program incentive. Thirty-one percent stated that they "Definitely would have installed", 34.6% stated that they "probably would have installed", 30.8% stated that they "probably would not have installed", and 3.8% stated that they "definitely would not have installed" the same equipment without the program rebate.

Respondents were then asked to identify what their course of action would have been without the program incentive. Their responses are summarized in Table 10-27.

Table 10-27 Project Installation without Program Incentives

If the rebate through the Business Efficiency Program were not available for this project, what would you have done differently?	***Percent of Respondents***
Would have done nothing differently	51.9%
Would have installed a lower quantity of equipment	7.4%
Would have installed a lower efficiency level of equipment	7.4%
Would have installed lower cost equipment	3.7%
Would have delayed the project	7.4%
Finance with bank	3.7%
Don't know/won't say	7.4%
N	26

10.4.4.4 Program Implementation

This section addresses questions with various parts of the program implementation, including pre- and post-inspection information, the application process, and incentive checks.

Thirty-nine percent of respondents had a program representative come to their facility for a pre-inspection. The pre-inspection, as observed by the respondents, consisted of a

walk through to the facility looking at the equipment, model numbers, and the amount and types of lighting. No design change was made due to pre-inspection. Eight percent of respondents received a post-inspection from program staff. Specifically, the post-inspection, from the respondent's view, included verification of installation(s), types of equipment, and quality of work. One respondent commented that their incentive amount changed 5-10% after the post-inspection.

Fifty-four percent of respondents had someone within their firm fill out the paperwork for the rebate, and 42.3% had the installing vendor or contractor fill out paperwork. No respondents indicated having issues getting their paperwork approved after it was turned in.

Eight respondents reported having issues receiving their incentive checks. Some respondents either have not received their checks altogether or had been sent to the wrong address. Seventy-percent of respondents got the expected amount from their incentive checks. A couple of respondents noted that they received a higher check than they expected. For 73.1% of respondents, the incentive they received met their expectations. For those that did not answer with a definite "yes", a few commented that they still have not received their rebate or received a smaller rebate than expected.

10.4.4.5 Satisfaction with Their Contractor/Vendor

Respondents were asked more specifically about their installing contractor, including how they choose the contractor, the contractor's awareness of the program, and the quality of installation.

Table 10-28 shows presents respondents' answers regarding how the customer chose their installing contractor. Almost 40% of respondents knew their installing contractor from prior work.

Table 10-28 How Customers Chose the Installing Contractor

How did you choose the contractor that performed the installation?	***Percent of Respondents***
Know from prior work	38.5%
Use a formal bidding process	26.9%
Select a contractor that reached out and contacted you	23.1%
Self-install this equipment with in-house staff	11.5%
N	26

Almost 77% of respondents replied that the energy efficiency measure met their expectations. Some comments included:

> *"[We have] not yet noticed [a difference], but within six months we will know if we saved enough money."*
>
> *"We have only seen about 5% reduction so far."*

"Electric bills [are] better than expected. 15% lower."

All respondents responded that they received a quality installation, and 96.2% of respondents had no problems during their installations.

10.4.4.6 Overall Program Satisfaction

Respondents were asked about their levels of satisfaction with several aspects of the program on a scale of 1 to 10, where 1 is very dissatisfied and 10 is very satisfied. Table 10-29 shows the results. Satisfaction was high across all elements, scoring no element lower than 7.50.

Table 10-29 Customer Decision Maker Satisfaction with Selected Elements Program Experience

Element of Program Experience	***Mean Score***	***% Indicated "Don't Know"***
Performance of the equipment installed	8.88	0%
Savings on monthly bill	8.00	11.5%
Incentive Amount	8.04	7.7%
The effort required for the application process	7.88	0%
Information provided by your contractor	8.64	3.8%
Quality of work by your contractor	9.32	0%
Information from SPS account rep	8.94	26.9%
The elapsed time until you received the incentive	7.67	0%
Overall program experience	8.52	3.8%
n=26		

Overall, respondents scored the program experience as 8.52. Respondents were very pleased with the quality of work by their contractor and the performance of the equipment installed. The highest uncertainty was towards the information provided by the SPS account representative. Respondents that scored individual elements less than 5 were asked to explain their dissatisfaction with the element. As mentioned in prior sections, respondents were dissatisfied with their incentive check in regards to the amount or never having received it. One respondent said they did not see a difference in their monthly bill. Another added that the process added burden to already busy days.

Thirty-one percent of respondents said that their company's perspective on energy efficiency has changed since participating in the program. Respondents further

explained that they plan “to be more environmentally friendly in a greater capacity” as well as becoming “more aware of [their] needs.”

10.5 Conclusions & Recommendations

10.5.1 Conclusions

The Evaluators’ conclusions for the Business Comprehensive program are as follows:

- **Program staff were not adhering to stated QA protocols.** The Evaluators found that numerous projects were failing verification inspection. Most of these projects were installed by the same group of contractors whom were taking advantage of lax QA procedures. However, the Evaluators found that a large lighting project accounting for 38.5% of the non-hotel population had significant QA/QC issues, and this project was not installed by the previously identified problematic group of contractors
- **Business Comprehensive has had successful outreach with Guest Room Energy Management.** The hospitality industry has a large presence in SPS territory, owing to the need for housing for oil workers. This segment has been successfully engaged, with significant uptake of GREM driving a record year for Business Cooling in terms of participation and savings.
- **Business Computers has been a successful program addition.** In its second year of implementation, Business Computers has increased from 13,494 to 305,276 kWh in annual savings. This channel for program savings could be a viable addition to the business program offerings of other New Mexico utilities.

10.5.2 Recommendations

The Evaluators’ recommendations are as follows:

- **Maintain the new QA process for 2014.** The new QA process is more stringent than typical for a program of this type. However, given the performance of the program in 2013, the Evaluators see this as a necessity until such time that the program is shown to be providing reasonable quality assurance.
- **Reintroduce the rebate sign-over.** This feature was removed from the program in response to the QA issues from one group of contractors in 2013. This should be reintroduced, but on a grantee-basis. SPS should put participating trade allies through a certification process that allows them to engage in rebate sign-over. The requirement for this should be at least one program year of demonstrated performance and validation by program QA.
- **Add customer contact names and phone numbers to tracking data exports.** The Evaluators were granted read-only access to the SalesForce CRM, allowing for easy pulling of project documentation. However, phone numbers were not

included in the main business program exports. This made it necessary for the Evaluators to pull every participation application manually to record contact names and phone numbers for surveying.

11. Small Business Lighting

The Business Comprehensive Program (BCP) is a targeted program for customers below 100 kW, providing higher incentives for high efficiency lighting retrofits.

11.1 SBL Impact Evaluation Approach

The gross and net savings impact evaluation approaches are the same as those detailed for the Business Lighting component of Business Comprehensive in Section 10.1.1.

11.1.1 Impact Evaluation Results

The main features of the approach used for the impact evaluation are as follows:

- Data for the study have been collected through review of program materials, on-site inspections, and end-use metering. Based on data provided by SPS, sample designs were developed for on-site data collection for the impact evaluation. Sample sizes were determined that provide savings estimates for the program with ±10% precision at the 90% confidence level.
- On-site visits were used to collect data for savings impacts calculations. The on-site visits were used to verify installations and to determine any changes to the operating parameters since the measures were first installed. Facility staff were interviewed to determine the operating hours of the installed system and to locate any additional benefits or shortcomings with the installed system. For some sites, monitoring of lighting or HVAC equipment was conducted to obtain more accurate information on operating characteristics.

Gross savings were estimated using proven techniques, including engineering calculations using industry standards and verification of computer simulations developed by program contractors to determine energy savings. Table 11-1 summarizes the total participation in the 2013 SBL Program.

Table 11-1 2013 SBL Participation Summary

# Projects	Expected kWh	Expected kW
193	3,549,021	939.4

Data provided by SPS showed that during 2013, there were 193 projects which were initially expected to provide gross savings of 3,549,021 kWh. The resulting overall sample is presented in Table 11-2.

Table 11-2 BCP Sample Summary

# Sites in Population	Site Visit Sample Size	# Interviews	# Sites Represented in Interviews
193	18	26	32

11.1.2 BCP Gross Savings Estimates

The Evaluators identified issues in stratifying strictly by expected savings for the 2013 SBL Program.

11.1.2.1 SBL Sample Design

Over the course of 2013 M&V, the Evaluators found numerous issues with hotel projects. These projects were installed through the same group of contractors, and displayed markedly lower realization than projects from other facility types. The Evaluators concluded that the issues causing low realization were idiosyncratic to the installing contractor, and as a result opted to separate hotels into a different stratum.

The SBL population was divided into five strata. Table 11-3 summarizes the strata boundaries and sample frames for non-hotel facilities.

Table 11-3 Small Business Lighting Sample Design – Non-Hotel

	Stratum 1	Stratum 2	Stratum3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	<7,500	7,500 – 20,000	20,000 – 75,000	75,000 – 150,000	>150,000	
Number of sites	82	48	25	5	1	161
Total kWh savings	295,415	565,730	782,311	481,472	158,147	2,348,612
Average kWh	3,603	11,786	31,292	96,294	158,147	14,181
Standard deviation of kWh savings	1,944	3,671	10,382	21,305	-	21,874
Coefficient of variation	.54	.31	.33	.22	-	1.54
Final sample	4	4	2	2	1	13

The hotel stratum contained 32 projects, totaling 1,265,946 kWh. A sample of five hotel projects was selected for M&V.

11.1.2.2 Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. *Table 11-4* presents results at the site level for non-hotels. *Table 11-5* presents results for hotels.

Table 11-4 Expected and Realized Savings by Project – SBL Non-Hotel

Project ID(s)	Expected kWh Savings	Realized kWh Savings
OID1560485	158,147	150,213
OID0147509	125,840	117,504
OID1579281	76,112	85,791
OID1530428	64,971	61,816
OID1560712	41,512	70,883
OID1444391	16,421	13,930
OID1622750	15,441	16,197
OID1578547	10,016	12,678
OID1561333	8,831	8,654
OID1502727	6,464	4,280
OID1582524	5,220	3,381
OID1589481	2,505	2,910
OID1560931	1,414	946

Table 11-5 Expected and Realized Savings by Project – SBL Hotels

Project ID(s)	Expected kWh Savings	Realized kWh Savings
OID1634102	363,901	32,629
OID1614399	74,584	38,473
OID1587068	15,366	7,757
OID1587111	16,893	8,208
OID1585063	821	1,339

From these site-level analyses, realization rates by measure category were developed. These are summarized in Table 11-5 Table 11-6 below for kWh and kW, respectively.

Table 11-6 Gross kWh Realization by Stratum – Non-Hotel

Stratum	Expected kWh Savings	Realized kWh Savings	Realization Rate
5	158,147	150,213	94.98%
4	201,952	203,295	100.67%
3	106,483	132,699	124.62%
2	50,709	51,459	101.48%
1	15,603	11,517	73.81%

Table 11-7 Gross kW Realization by Stratum – Non-Hotel

Stratum	Expected kW Savings	Realized kW Savings	Realization Rate
5	42.73	52.78	123.52%
4	53.81	45.47	84.50%
3	28.60	28.45	99.48%
2	17.16	13.99	81.53%
1	4.86	3.77	77.57%

The kWh and kW realization for hotels is summarized in Table 11-8.

Table 11-8 Gross Realization – Hotels

Savings Type	Expected Savings	Realized Savings	Realization Rate
kWh	471,565	88,406	18.75%
kW	60.48	14.14	23.38%

11.1.2.3 Program-Level Gross Realization

Using the realization rates presented in Table 11-5 and Table 11-6, the Evaluators extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. Table 11-9 presents results for the non-hotel population.

Table 11-9 SBL Program-Level Gross Realization by Stratum – Non-Hotel

Stratum	# Sites	Expected kWh Savings	Realized kWh Savings	kWh Gross Realization Rate	Expected kW Savings	Realized kW Savings	kW Gross Realization Rate
5	1	158,147	150,208	94.98%	42.73	52.78	123.52%
4	5	481,472	484,698	100.67%	113.70	96.07	84.50%
3	25	782,311	974,916	124.62%	214.91	213.79	99.48%
2	48	565,730	574,103	101.48%	184.49	150.42	81.53%
1	83	295,415	218,046	73.81%	86.18	66.85	77.57%
Total	162	2,283,075	2,401,970	105.60%	642.01	579.91	90.55%

For the hotel segment, realization rates from Table 11-8 were extrapolated to the overall population. The results of this extrapolation are presented in Table 11-10.

Table 11-10 SBL Program-level Gross Realization - Hotels

Savings Type	Expected Savings	Realized Savings	Realization Rate
kWh	1,265,946	237,365	18.75%
kW	297.43	69.54	23.38%

11.1.1 Business Comprehensive Net Savings Estimates

The Evaluators estimated net savings for all SPS business programs via detailed participant surveying of a representative sample of decision makers from each program. Based on interviews with a sample of 26 decision-makers, the Evaluators estimated a net-to-gross ration of 92.92%.

After evaluating the program components, the Evaluators compiled net savings to provide an overall net realization rate. These results are summarized in Table 11-11.

Table 11-11 SPS Small Business Lighting Net Realization Summary

Component	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Non-Hotel	597.1	538.9	2,123,260	2,231,911	25,479,117	26,782,926	105.1%
Hotel	276.6	64.6	1,177,330	220,560	14,127,957	2,646,715	18.7%
Total	873.7	603.5	3,300,590	2,452,470	39,607,074	29,429,641	74.3%

11.2 Process Evaluation Findings

The discussion of the Small Business Lighting Program's history and year-over-year performance is included along with the Business Comprehensives process evaluation findings (Section 10.4). Findings specific to the operation of SBL are included in the subsections to follow.

11.2.1 Quality Assurance & Verification

The SBL program had significantly lower realization in 2013 than in any prior program year. As stated in the gross impact section of this chapter, this was due to the poor performance of hotel projects. The Evaluators were finding significant verification issues with hotel projects, and in response these projects were examined for commonalities. It was found that all of the hotel projects were implemented by the same group of five contractors that would conduct joint ventures on hotels across SPS territory. The Evaluators found that a large share of the LEDs listed on the project application were not on site. In some instances, the Evaluators' field staff found several hundred LEDs on site still in boxes. In other cases, the lighting fixtures were not found at all.

On this basis, the Evaluators initiated meetings with SPS to review the Quality Assurance (QA) procedures for the SBL program. Franklin Energy had a detailed QA process included in their program manual, but it was the Evaluators' finding that these procedures were not adhered to. Further, it was found that these procedures had not been implemented for several years, and it was a matter of luck that the QA shortfalls had not manifested into low realization in prior program years.

SPS staff responded quickly to the issues brought up by the Evaluators. Their steps to mitigate this included:

1) The contractors associated with the QA failure were barred from participating in all SPS energy efficiency programs;
2) Lighting projects at hotels became subject to added scrutiny;
3) SPS temporarily barred third-party rebate sign-over (where contractors receive the incentive instead of the end-user)
4) Franklin Energy was required to submit a revised and enhanced QA process; and
5) SPS program management staff resolved to watch Franklin more carefully to ensure adherence to the new QA process.

Due to these corrections, the inflow of bad projects was stopped in August of 2013. The program was still affected significantly by these verification failures, however, as gross realization for hotel projects was 16.96% (compared to 105.6% for all other projects).

11.2.2 Summary of Program Offerings

To assess the breadth of the program offerings within SBL, the Evaluators benchmarked the program against the QuickSaver program implemented by PNM and the Small Business Energy Savings program implemented by EPE. The Evaluators' findings were as follows:

- **The SBL program is consistent with PNM and EPE programs in eligibility requirements and incentive levels.** Across all electric IOUs, the small business cutoff is 100 kW, and incentives are similarly increased for small versus large customers.
- **The SBL program has not had the same success in encouraging delamping.** Both EPE's and PNM's programs include a mechanism that encourages the installing contractors to develop a lighting retrofit that reduced lighting levels. A common example is a retrofit from four-lamp T12 to two-lamp high-output T8. This is feasible in the PNM and EPE programs because they provide their contractors with a calculator that allows for pre- and post-retrofit fixture types and counts to differ.

11.2.3 Overall Program Success

SBL had 193 participating facilities in 2013. Figure 11-1 presents the distribution of participants by facility type.

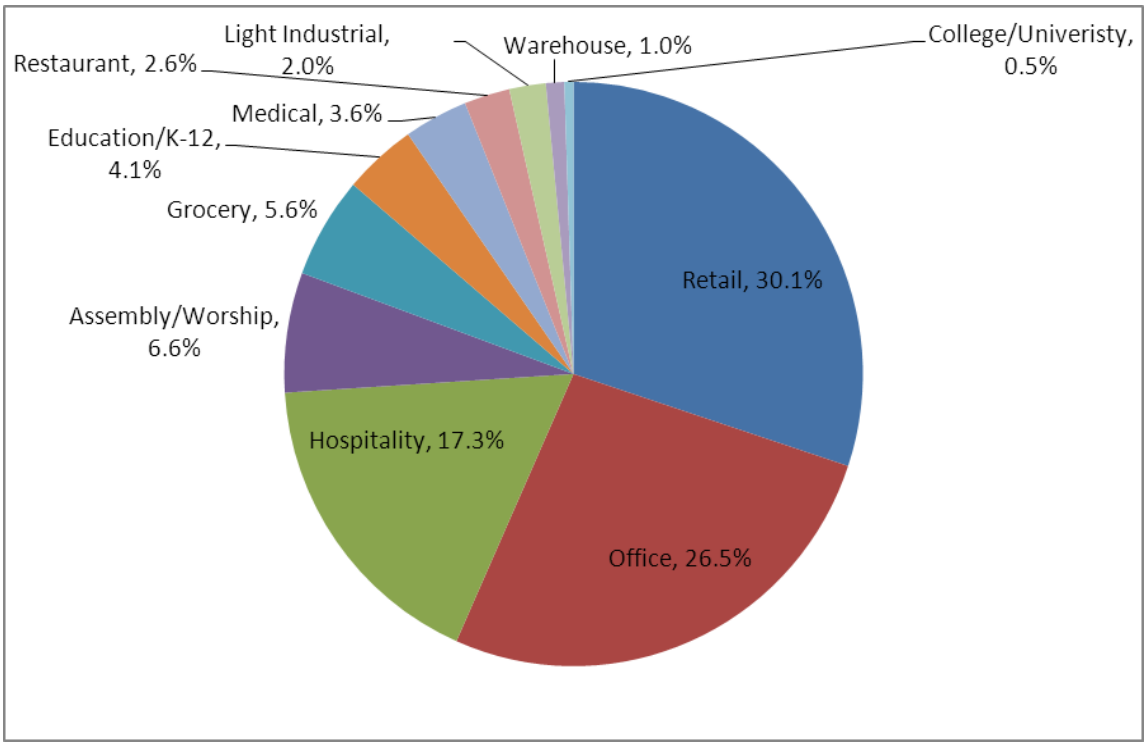

Figure 11-1 SBL Distribution of Participants by Facility Type

Figure 11-2 summarizes the distribution of expected savings by facility type.

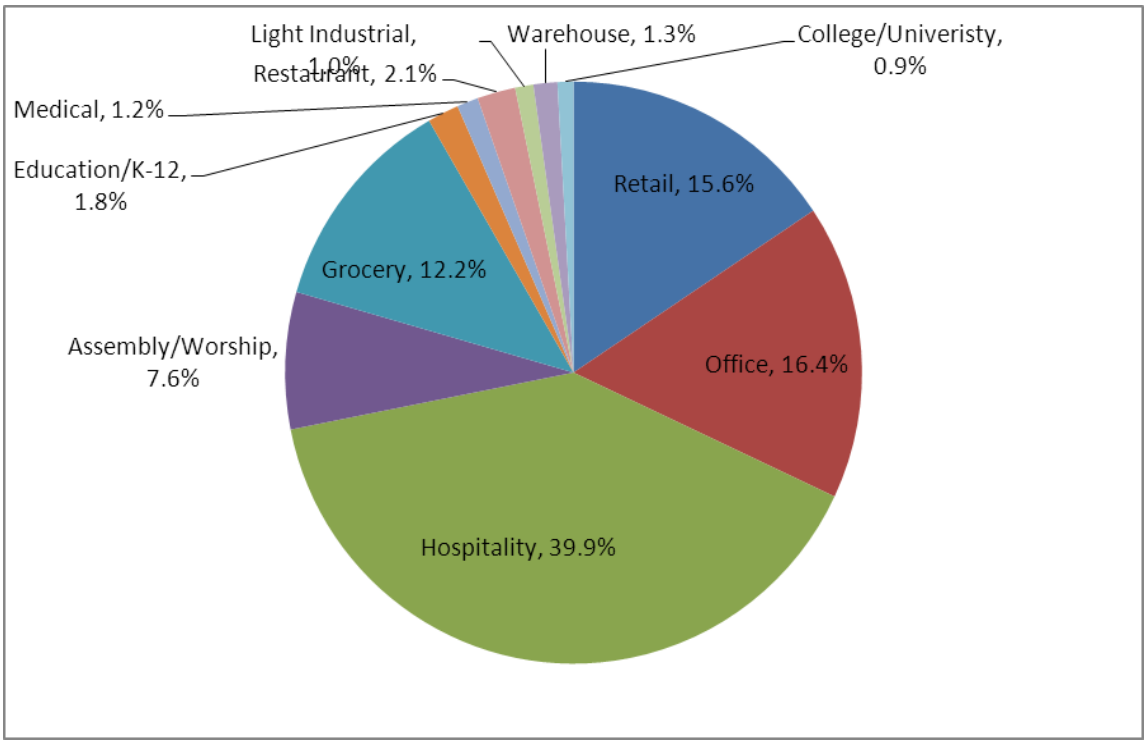

Figure 11-2 SBL Distribution of Expected Savings by Facility Type

11.2.4 Customer Outcomes

A survey was conducted to collect data on the participant decision-making process and to provide feedback for the program. In total, 26 participating decision-makers were interviewed.

11.2.4.1 Program Awareness

Table 11-12 displays the customer responses to how they learned about the program. A large volume of respondents indicated they learned about the program when they were directly approached by Franklin Energy and SPS staff (46.1% of all responses). Word-of-mouth also highly contributed to how customers learned about the program (30.8%), as well as brochures about the program (26.9%).

Table 11-12 How Customer Decision Makers Learned about the Program

Source of Awareness	*Percent of Respondents*
Approached directly by SPS Staff	19.2%
Approached directly by Franklin Energy Staff	26.9%
Received brochure	26.9%
Emailed by SPS	3.8%
SP' website	7.7%
Friends or colleagues (i.e. word of mouth)	30.8%
An architect, engineer or energy consultant	3.8%
An equipment vendor or building contractor	3.8%
Past experience with the program	7.7%
N	26

Respondents were then asked to rate a series of potential sources of information regarding energy efficiency on a scale of 1 to 10, meaning 1 "not very influential" and 10 was "very influential." The reported influence levels are summarized in Table 11-13.

Table 11-13 Level of Influence of Information Sources

Source of Information	*Amount of Influence*	*% Indicated "Don't know"*
An SPS account representative	6.16	3.8%
SPS website	3.82	15.4%
Brochure or Ads	5.15	0.0%
Trade associations or business groups	3.52	3.8%
Trade journals or magazines	2.52	3.8%
Friends or colleagues (i.e. word of mouth)	6.27	0.0%
An architect, engineer or energy consultant	5.17	7.7%
An equipment vendor	4.40	3.8%
Contractor	5.42	7.7%
Staff from Franklin Energy	7.20	3.8%
N	26	

The sources of information listed as being the most influential included staff from Franklin Energy (7.20), friends and colleagues (6.27), and staff from SPS (6.16). These three sources were also the most commonly indicated sources of program awareness.

Respondents were also asked the best way of reaching out to companies for more information on energy saving opportunities. Table 11-14 shows survey respondents' preferred method of contact regarding energy efficiency programs.

Table 11-14 Effective Ways of Contacting Potential Customers with Information

Potential Contact Sources	***Percent of Respondents***
Visits from program reps/staff/vendors	126.9%
Bill inserts	50.0%
Email	23.1%
Direct Mail	30.8%
Phone	7.7%
Don't know	3.8%
N	26

SBL participants were more likely to list direct mail and bill inserts than customers in the Business Comprehensive Program.

Respondents were then asked to identify their timing of having learned of the program relative to the timing of their decision on their equipment purchase. As shown in Table 11-15 76.9% of the customers learned about the program before they planned their equipment replacement, and 15.4% learned about it during planning equipment replacement, and 3.8% learned of the program after equipment was specified but not yet installed. An additional 3.8% could not identify when they learned of the program relative to their equipment selection.

Table 11-15 When Customer Decision Makers Learned about the Program

When did you learn of the Business Comprehensive Program?	***Percent of Respondents***
Before planning for replacing the equipment began	76.9%
During your planning to replace the equipment	15.4%
Once equipment had been specified but not yet installed	3.8%
After equipment was installed	0%
Don't know	3.8%
N	26

11.2.4.2 Customer Decision-Making

Respondents were also asked to rate the amount of importance of various factors that contributed to decision-making on energy efficiency improvements. They were asked to rate each factor on a scale of 1 to 10, where 10 was "very important" and 1 was "not important at all." Table 11-16 shows the importance for each factor.

Table 11-16 Importance of Factors for Decision-Making

Factors of Decision-Making	***Amount of Importance***	***% Indicated "Don't know"***
Incentive payments from SPS	8.88	0%
Past experience with energy efficient equipment	6.75	7.7%
Your organization's policies	5.29	7.7%
Advice and/or recommendations received from SPS	7.57	19.2%
Advice and/or recommendations received from vendors	5.24	3.8%
Promoting company image as environmentally friendly	5.84	3.8%
Productivity benefits/reduced waste	7.04	0%
N	26	

The highest amount of importance was placed on the incentive payments from SPS and on advice or recommendations from SPS. SBL respondents rated these factors higher than Business Comprehensive respondents. Further SBL respondents scored "promoting company image as environmentally friendly" and "advice and/or recommendations from contractors" significantly lower than Business Comprehensive respondents.

Respondents were asked about the types of equipment that uses the most and second most electricity within their facilities. Their answers are summarized in Figure 11-3.

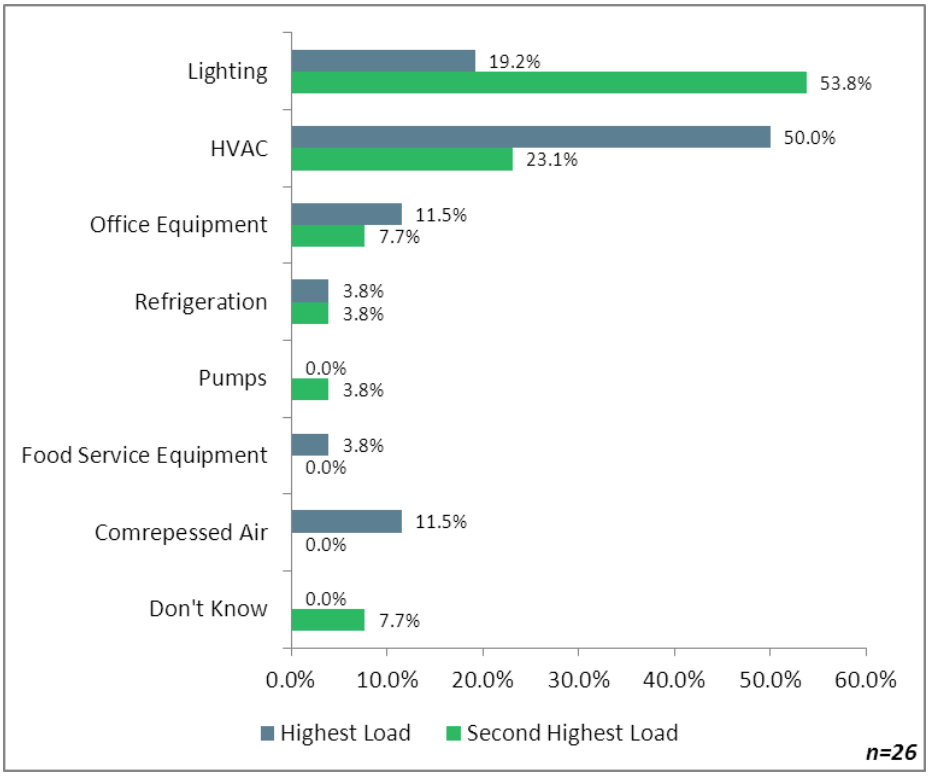

Figure 11-3 Summary of Facility Loads

11.2.4.3 Customer Interactions and Financial Incentives

Respondents were asked specific questions regarding their experience with SPS' program, interactions with the SPS' staff, and various questions about financial feasibility of purchasing equipment and the financial incentives.

Prior to participating in the Business Efficiency Program, only 26.9% of respondents had installed efficient equipment similar to the rebated measure at their facility. Thirty-five percent of respondents indicated having plans to install new lighting at their facility prior to learning of the program. Of these, 66.7% indicated that they would have gone forward with their plans, and 55.6% stated that the plans would have included the same equipment.

Thirty-one percent of respondents did not have previous experience with SPS' energy efficiency programs prior to participating in SBL. Sixty-three percent of those that had prior experience with SPS energy efficiency programs indicated that that prior experience was "Very Important" to their decision-making on their most recent project.

Forty-six percent of respondents would have been financially able to purchase their high efficiency lighting without the rebate. An additional 46.2% indicated that they would not have been financially able, and 7.7% "don't know" if they would have been financially able.

Twenty-three percent of respondents stated that if the financial incentive from the program were not available, they "definitely would have installed" the same equipment. Thirty-five percent stated that they "probably would have installed", 38.5% that they "probably would not have installed", and 3.8% stated that they "definitely would not have installed" similar equipment without the program's financial incentive.

Respondents were then asked what alternative projects they considered during their decision-making processes. These are summarized in Table 11-17 .

Table 11-17 Project Installation without Program Incentives

If the rebate through the Business Efficiency Program were not available for this project, what would you have done differently?	***Percent of Respondents***
Would have done nothing differently	30.8%
Would have installed a lower quantity of equipment	15.4%
Would have installed a lower efficiency level of equipment	11.5%
Would have installed lower cost equipment	0%
Would have delayed the project	0%
Don't know	42.3%
N	26

11.2.4.4 Program Implementation

This section addresses questions with various parts of the program implementation, including pre- and post-inspection information, the application process, and incentive checks.

Thirty-one percent of respondents had a pre-inspection completed by program staff. The pre-inspection, as observed by the respondents, consisted of a walk through to the facility looking at the equipment, model numbers, and the amount and types of lighting. Twenty-five percent of pre-inspections resulted in a revision of project scope. Fifteen percent of respondents had a post-inspection completed by program staff. None of the respondents reported their incentive changing as a result of post-inspection.

Forty-two percent of respondents had someone within their firm fill out the paperwork for the rebate, and 57.7% had the installing vendor or contractor fill out paperwork. Only one respondent indicated that they had issues with the application process. This respondent stated that they had to reconfigure their QuickBooks application to fit the Microsoft Excel format.

Twelve percent of respondents reported having issues receiving their incentive checks. These respondents all indicated that the check took longer to process than initially promised by program staff. Program staff should endeavor to "under promise and over deliver" in this regard, and should ensure that they quote conservative time estimates to potential program participants. Eighty-one percent of respondents reported that they check was for the amount they expected. Fifteen percent responded that they "don't know", as they could not remember what their precise initial rebate estimate was. One respondent indicated that their rebate check was lower than expected.

11.2.4.5 Satisfaction with Their Contractor/Vendor

Respondents were asked more specifically about their installing contractor, including how they choose the contractor, the contractor's awareness of the program, and the quality of installation.

Table 11-18 presents survey respondents' processes for selection of their contractor.

Table 11-18 How Participants Chose the Installing Contractor

How did you choose the contractor that performed the installation?	***Percent of Respondents***
Know the contractor from prior work	53.8%
Use a formal bidding process	11.5%
Select a contractor that reached out and contacted you	23.1%
Self-install this equipment with in-house staff	11.5%
N	26

Twenty-three percent of respondents that used a contractor indicated that the promotion of the SBL program influenced their choice of contractor

Seventy-three percent of respondents replied that the energy efficiency measure met their expectations. Twenty-three percent responded that they don't know if the equipment has met their expectations. All respondents indicated that the installation

went smoothly and that they feel they "got a quality installation". Ninety-six percent of respondents stated that their incentive agreement met their expectations as well.

11.2.4.6 Overall Program Satisfaction

Respondents were asked about their levels of satisfaction with several aspects of the program on a scale of 1 to 10, where 1 is "very dissatisfied" and 10 is "very satisfied". Table 11-19 shows the resulting satisfaction scores.

Table 11-19 Customer Decision Maker Satisfaction with Selected Elements Program Experience

Element of Program Experience	***Mean Score***	***% Indicated "Don't Know"***
Performance of the equipment installed	9.31	0%
Savings on monthly bill	7.53	26.9%
Incentive Amount	8.50	7.7%
The effort required for the application process	7.72	3.8%
Information provided by your contractor	8.35	11.5%
Quality of work by your contractor	9.15	0%
Information from SPS account rep	7.37	26.9%
The elapsed time until you received the incentive	8.00	26.9%
Overall program experience	8.62	0%
N=26		

Overall, respondents scored the program experience at 8.62 out of 10. Respondents indicated particularly high satisfaction with the performance of the equipment installed (9.31), the incentive amount (8.50), the quality of work by their contractor (9.15). Further, wait times to receive the rebate were rated at 8.00 out of 10, which is indicative of a generally expedient rebate process. Of those, most were for additional LED lighting in spaces not covered by their initial project.

Thirty-nine percent of respondents indicated that their perspective on energy efficiency has changed as a result of their participation. When asked to detail how, verbatim answers included:

"It saves us money, the lights are brighter and this inspires me to do more."

"[We're] more mindful of temperature settings and closing doors and turning off equipment".

"Made me more aware of the savings I can get and made me more enthusiastic about participating in more rebate offers."

"We are more aware of our consumption and trying to be more green."

11.2.5 Future Program Participation

Respondents were asked their likelihood of participating in SPS' energy efficiency programs in the future. Twenty-seven percent stated that they will definitely completed another project through an SPS energy efficiency program. An additional twenty-seven percent stated that they probably would. Figure 11-4 summarizes the most likely projects to be completed by these respondents. Respondents could indicate multiple projects so sums exceed 100%.

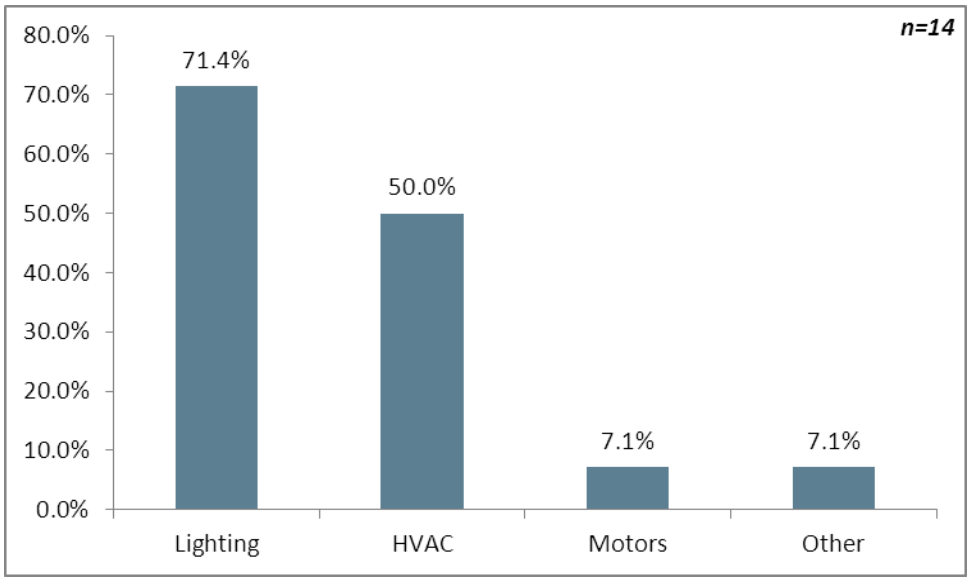

Figure 11-4 Likely Future Energy Efficiency Projects

Respondents that indicated that they would "probably not" or "definitely not" implement another energy efficiency project were asked to explain why. The most commonly indicated reason was that after replacing all the lighting, they did not feel there were any other cost-effective projects left in their facility. One respondent stated that they have since sold the property that they retrofitted.

11.3 Conclusions & Recommendations

11.3.1 Conclusions

The Evaluators' conclusions for the SBL program are as follows:

- **Franklin Energy was not adhering to stated QA protocols.** The Evaluators found that numerous projects were failing verification inspection. These projects were installed by the same group of contractors whom were taking advantage of lax QA procedures.
- **The SBL program has not successfully encouraged delamping.** The current SPS procedure for delamping requires significantly more documentation on the part of contractors and customers than observed in PNM and EPE programs. This results in a large share of potential savings being left on the table as most of the SBL projects are one-to-one fixture retrofits.
- **Participants are largely satisfied with their program experience.** Participants indicated high satisfaction with staff from SPS and from Franklin, placing high value in the information and recommendations by program staff.

11.3.2 Recommendations

The Evaluators' recommendations are as follows:

- **Maintain the new QA process for 2014.** The new QA process is more stringent than typical for a program of this type. However, given the performance of the program in 2013, the Evaluators see this as a necessity until such time that the program is shown to be providing reasonable quality assurance.
- **Develop a delamp calculator for participating trade allies.** Such a calculator would use existing deemed wattages for baseline and post-retrofit fixture types, but would allow for contractors to be more creative in their design of a lighting retrofit. This should be paid in a per-kWh incentive so as to encourage contractors to maximize the savings from a particular project. Development of such a tool would require a training session for participating contractors in order to assure its proper use and application.
- **Reintroduce the rebate sign-over.** This feature was removed from the program in response to the QA issues from one group of contractors in 2013. This should be reintroduced, but on a grantee-basis. SPS should put participating trade allies through a certification process that allows them to engage in rebate sign-over. The requirement for this should be at least one program year of demonstrated performance and validation by program QA.

12. Appendix A: Tables for SPS Annual Report

This section contains tables formatted for SPS' annual report submission.

Program	*Participants or Units*	*Annual Savings (kWh)*	*Annual Savings (kW)*	*Lifetime Savings (kWh)*	*Total Program Costs*
Home Energy Services (Res & LI)	1,541	3,098,549	428.0	57,485,745	$982,863
Home Lighting & Recycling	116,250	12,839,947	1827.0	79,797,708	$944,714
Evaporative Cooling	303	628,710	477.8	9,430,648	$1,039,863
Energy Feedback Pilot	12,958	3,222,538	356.6	3,222,538	$196,159
Refrigerator Recycling	481	379,316	73	1,896,580	$21,718
School Education Kits	3,504	850,705	14.8	8,102,502	$1,368,398
Business Lighting	81	1,515,020	365.2	18,180,240	$176,301
Business Cooling	55	1,339,369	397.9	14,546,145	$186,315
Business Custom	6	3,303,248	402.7	49,367,658	$1,130,099
Business Motors & Drives	37	7,720,707	1119.4	115,810,707	$140,982
Business Computers	153	305,276	41.8	1,526,380	$147,494
Small Business Lighting	193	2,452,470	603.5	29,429,641	$338,188
Residential Saver's Switch	1,981	15,690	1626.4	15,690	$584,631
Business Saver's Switch	279	2,676	322	2,676	$226,443
Interruptible Credit Option	0	-	-	-	$1,638
Business Education	-	-	-	-	$1
Consumer Education	-	-	-	-	$143,102
Market Research	-	-	-	-	$56,673
Measurement & Verification	-	-	-	-	$32,592
Planning & Administration	-	-	-	-	$145,576
Product Development	-	-	-	-	$66,947
Total	137,822	37,674,221	8,056.1	388,814,858	$7,930,697

Program	*Participants or Units*	*Participant Costs*	*Cost per kWh Saved*	*2013 Economic Benefits*	*Total Economic Benefits*
Home Energy Services (Res & LI)	1,541	$0	$0.02	$222,628	$3,064,374
Home Lighting & Recycling	116,250	$534,210	$0.01	$873,410	$5,728,424
Evaporative Cooling	303	$11,107	$0.11	$134,000	$1,567,810
Energy Feedback Pilot	12,958	$0	$0.06	$203,353	$203,353
Refrigerator Recycling	481	$0	$0.01	$42,992	$243,699
School Education Kits	3,504	$0	$0.17	$45,839	$367,410
Business Lighting	81	$1,298,624	$0.01	$116,717	$1,202,923
Business Cooling	55	$360,950	$0.01	$113,421	$1,106,114
Business Custom	6	$278,184	$0.02	$205,946	$2,564,467
Business Motors & Drives	37	$1,276,184	$0.00	$518,189	$6,438,590
Business Computers	153	$22,794	$0.10	$19,419	$93,412
Small Business Lighting	193	$1,529,051	$0.01	$190,229	$1,959,268
Residential Saver's Switch	1,981	$0	$37.26	$184,892	$184,892
Business Saver's Switch	279	$0	$84.62	$35,019	$35,019
Interruptible Credit Option	0	$0	-	$0	$0
Business Education	-	-	-	$0	$0
Consumer Education	-	-	-	$0	$0
Market Research	-	-	-	$0	$0
Measurement & Verification	-	-	-	$0	$0
Planning & Administration	-	-	-	$0	$0
Product Development	-	-	-	$0	$0
Total	137,822	$5,311,104	$0.02	$2,906,054	$24,759,755

Program	*Avoided Production Costs*	*Avoided Capacity Expansion Costs*	*Net Customer Investment*	*Administration Costs*	*Incentives*
Home Energy Services (Res & LI)	$2,456,142	$608,232	$0	$762,993	$219,870
Home Lighting & Recycling	$4,467,138	$1,261,286	$534,210	$477,586	$467,128
Evaporative Cooling	$676,129	$891,681	$11,107	$110,676	$65,625
Energy Feedback Pilot	$163,004	$40,349	$0	$186,315	$0
Refrigerator Recycling	$175,775	$67,924	$0	$106,332	$34,650
School Education Kits	$355,163	$12,247	$0	$113,926	$33,568
Business Lighting	$833,600	$369,323	$1,298,624	$222,934	$907,166
Business Cooling	$705,390	$400,724	$360,950	$116,467	$221,720
Business Custom	$2,091,183	$473,284	$278,184	$125,862	$70,298
Business Motors & Drives	$5,071,899	$1,366,691	$1,276,184	$209,839	$830,023
Business Computers	$72,749	$20,663	$22,794	$7,328	$14,390
Small Business Lighting	$1,349,118	$610,150	$1,529,051	$522,000	$846,398
Residential Saver's Switch	$866	$184,026	$0	$473,133	$111,498
Business Saver's Switch	$140	$34,879	$0	$199,873	$26,570
Interruptible Credit Option	$0	$0	$0	$1,638	$0
Business Education	$0	$0	$0	$1	$0
Consumer Education	$0	$0	$0	$143,102	$0
Market Research	$0	$0	$0	$56,673	$0
Measurement & Verification	$0	$0	$0	$32,592	$0
Planning & Administration	$0	$0	$0	$145,576	$0
Product Development	$0	$0	$0	$66,947	$0
Total	$18,418,296	$6,341,459	$5,311,104	$4,081,793	$3,848,904

13. Appendix B: Site Reports

This appendix contains the site reports for evaluation of the SPS 2013 Business Portfolio.

Project Number OID-1437765
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a nursing home that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (26) 4' 2L 25W T8 fixtures, replacing 4' 2L 40W T12 fixtures in corridors operating 24/7; and
- (9) 4' 2L 25W T8 fixtures, replacing 4' 2L 40W T12 fixtures in office spaces.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	*CA DEER 2008 Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Nursing Home	Office	3,723	3,468	1.103	1.133	.70
	Corridor	8,760	8,760	1.103	1.133	1.000

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*CEF*	*kWh Realization Rate*
	Base	**Post**	**Base**	**Post**	**Base**	**Post**				
4' 2L T12 to 4' 2L T8 25W	26	26	94	46	8,760	8,760	11,525	12,386	1.133	107.5%
4' 2L T12 to 4' 2L T8 25W	9	9	94	46	3,723	3,723	4,715	1,822	1.133	38.6%
						Total	**16,240**	**14,209**		**87.5%**

Lighting Retrofit kW Savings Calculations

Measure	**Quantity (Fixtures)**		**Wattage**		**PCF**		**Expected kW Savings**	**Realized kW Savings**	**CDF**	**kW Realization Rate**
	Base	**Post**	**Base**	**Post**	**Base**	**Post**				
4' 2L T12 to 4' 2L T8 25W	26	26	94	46	1.00	1.00	0.81	1.38	1.103	169.9%
4' 2L T12 to 4' 2L T8 25W	9	9	94	46	0.70	0.70	0.33	0.33	1.103	101.1%
						Total	**1.14**	**1.71**		**150.0%**

Results

The kWh realization rate for OID-1437765 is 87.5% and the kW realization rate is 150.0%. All 35 fixtures had been calculated with 24/7 operation, when 9 of the 35 fixtures were in an office space.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12 to 4' 2L T8 25W	12,386	1.38	107.5%	169.9%
4' 2L T12 to 4' 2L T8 25W	1,822	0.33	38.6%	101.1%
Total	**14,209**	**1.71**	**87.5%**	**150.0%**

Project Number OID-1573597
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a multifamily housing facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (938) 13.5W LED lamps, replacing 60W incandescent lamps in the apartments; and
- (5) 13.5W LED lamps, replacing 60W incandescent lamps in the office.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) determined by ADM's multifamily metering study conducted for PNM in 2010 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Multifamily Housing	Bedroom	874	1.064	1.430	0.19
	Living Room	2,048	1.064	1.430	0.32
	Kitchen	2,502	1.064	1.430	0.33
	Bathroom	1,029	1.064	1.430	0.15
	Hallway	1,002	1.064	1.430	0.09
	Hallway (exterior)	4,312	1.000	1.000	0.00
Small Office	Small Office- Open	3,066	1.097	1.313	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5W LED	268	268	60	13.5	2,048	2,048	N/A	27,156	1.064	N/A
60W Inc. to 13.5W LED	296	296	60	13.5	2,502	2,502	N/A	36,642	1.064	N/A
60W Inc. to 13.5W LED	102	102	60	13.5	1,029	1,029	N/A	5,193	1.064	N/A
60W Inc. to 13.5W LED	148	148	60	13.5	1,002	1,002	N/A	7,337	1.064	N/A
60W Inc. to 13.5W LED	50	50	60	13.5	1,002	1,002	N/A	2,479	1.064	N/A
60W Inc. to 13.5W LED	74	74	60	13.5	4,312	4,312	N/A	14,838	1.000	N/A
60W Inc. to 13.5W LED	5	5	60	13.5	2,594	2,594	N/A	662	1.097	N/A
						Total	**55,215**	**94,305**		**170.8%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	268	268	60	13.5	2,048	2,048	N/A	5.68	1.430	N/A
60W Inc. to 13.5W LED	296	296	60	13.5	2,502	2,502	N/A	6.48	1.430	N/A
60W Inc. to 13.5W LED	102	102	60	13.5	1,029	1,029	N/A	1.02	1.430	N/A
60W Inc. to 13.5W LED	148	148	60	13.5	1,002	1,002	N/A	0.88	1.430	N/A
60W Inc. to 13.5W LED	50	50	60	13.5	1,002	1,002	N/A	0.30	1.430	N/A
60W Inc. to 13.5W LED	74	74	60	13.5	4,312	4,312	N/A	0.00	1.000	N/A
60W Inc. to 13.5W LED	5	5	60	13.5	2,594	2,594	N/A	0.25	1.313	N/A
Total							**28.46**	**14.60**		**51.3%**

Results

The kWh realization rate for OID-1573597 is 170.8%. The kWh realization rate is higher because ADM used higher operating hours in the space types included in this project as determined from the 2010 metering study conducted for PNM than used the ex ante calculations. The kW realization rate is 51.3%. The exterior lighting in the hallways has a PCF of 0.00, which was not accounted for in ex ante calculations.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED	27,156	5.68	N/A	N/A
60W Inc. to 13.5W LED	36,642	6.48	N/A	N/A
60W Inc. to 13.5W LED	5,193	1.02	N/A	N/A
60W Inc. to 13.5W LED	7,337	0.88	N/A	N/A
60W Inc. to 13.5W LED	2,479	0.30	N/A	N/A
60W Inc. to 13.5W LED	14,838	0.00	N/A	N/A
60W Inc. to 13.5W LED	662	0.25	N/A	N/A
Total	**94,305**	**14.60**	**170.8%**	**51.3%**

Project Number OID-1573618
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (175) 13.5W LED lamps, replacing 60W incandescent lamps in the guest rooms.

The application listed 241 13.5W LED lamps. 66 LEDs failed verification.

M&V Methodology

ADM tallied verified fixtures on site, which differed from application amounts. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	***Annual Hours – Non-CFLs***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Motel	Motel – Guest Room	755	755	0.08	0.08	1.295

Savings Calculations

Using deemed values from the table above data, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

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Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	CEF	kWh Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED - Int. Ballast	175	175	60	13.5	755	755	13,937	5,708	0.929	41.0%
						Total	**13,937**	**5,708**		**41.0%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	CDF	kW Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED - Int. Ballast	175	175	60	13.5	0.08	0.08	4.44	0.84	1.295	19.0%
						Total	**4.44**	**0.84**		**19.0%**

Results

The kWh realization rate for OID-1573618 is 41.0% and kW realization rate is 19.0%. The surveyor only verified an estimated 175 lamps out of the 241 lamps that were listed in the application.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED - Int. Ballast	5,708	0.84	41.0%	19.0%
Total	**5,708**	**0.84**	**41.0%**	**19.0%**

Project Number OID-1578113
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a multifamily housing facility that received incentives from SPS for implementing energy efficient lighting. On-site, the evaluators verified the participant had installed:

- (1,623) 13.5W LED lamps, replacing 75W Incandescent lamps.

Initial project estimates were for 1,983 LEDs in the apartments. 360 LEDs failed verification.

M&V Methodology

The evaluators found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Multifamily Housing	Bedroom	874	1.064	1.430	0.19
	Living Room	2,048	1.064	1.430	0.32
	Kitchen	2,502	1.064	1.430	0.33
	Bathroom	1,029	1.064	1.430	0.15

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
75W Inc. to 13.5W LED-Int. Ballast	715	715	53	13.5	874	874	44,412	26,264	1.064	59.1%
75W Inc. to 13.5W LED-Int. Ballast	352	352	53	13.5	2,048	2,048	21,864	30,298	1.064	138.6%
75W Inc. to 13.5W LED-Int. Ballast	256	256	53	13.5	2,502	2,502	15,901	26,919	1.064	169.3%
75W Inc. to 13.5W LED-Int. Ballast	300	300	53	13.5	1,029	1,029	18,634	12,974	1.064	69.6%
						Total	**100,812**	**96,455**		**95.7%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
75W Inc. to 13.5W LED-Int. Ballast	715	715	53	13.5	0.19	0.19	23.70	7.62	1.430	21.8%
75W Inc. to 13.5W LED-Int. Ballast	352	352	53	13.5	0.32	0.32	11.67	6.34	1.430	36.8%
75W Inc. to 13.5W LED-Int. Ballast	256	256	53	13.5	0.33	0.33	8.49	4.76	1.430	38.0%
75W Inc. to 13.5W LED-Int. Ballast	300	300	53	13.5	0.15	0.15	9.94	2.54	1.430	17.3%
						Total	**53.80**	**21.25**		**39.5%**

Results

The kWh realization rate for OID-1578113 is 95.7% and the kW realization rate is 39.5%. The evaluator was unable to verify the installation of 360 13.5W LED lamps. The evaluator's calculations used higher hours and lower coincidence factors for some space types included in this project as determined from the 2010 metering study conducted for PNM than used in the ex ante calculations.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
75W Inc. to 13.5W LED-Int. Ballast	26,264	7.62	59.1%	21.8%
75W Inc. to 13.5W LED-Int. Ballast	30,298	6.34	138.6%	36.8%
75W Inc. to 13.5W LED-Int. Ballast	26,919	4.76	169.3%	38.0%
75W Inc. to 13.5W LED-Int. Ballast	12,974	2.54	69.6%	17.3%
Total	**96,455**	**21.25**	**95.7%**	**39.5%**

Project Number OID-1580324
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, ADM verified the participant had installed:

- (400) 13.5W LED lamps in the guestrooms;
- (63) 13.5W LED lamps in the common areas.

Initial project estimates were for 430 LEDs in the guestrooms and 78 in common areas. 15 common area LEDs failed verification and 30 guestroom LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11
	Lobby	8,760	1.148	1.566	1.00

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5W LED	400	400	60	13.5	799	799	63,133	17,061	1.148	27.0%
60W Inc. to 13.5W LED	63	63	60	13.5	8,760	8,760	9,944	29,460	1.148	296.3%
						Total	**73,077**	**46,521**		**63.7%**

Lighting kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5W LED	400	400	60	13.5	0.11	0.11	16.67	3.20	1.566	19.2%
60W Inc. to 13.5W LED	63	63	60	13.5	1.00	1.00	2.63	4.59	1.566	174.7%
Total							**19.30**	**7.79**		**40.4%**

Results

The kWh realization rate for OID-11602147 is 63.7%. Realization is low due to a high verification failure rate. Only 63 out of 78 common area LEDs could be verified and 400 out of 430 guestroom LEDs failed verification. In addition, the ex-ante calculations used higher hours of use than the ex post calculations as well as a higher peak coincidence factor.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
60W Inc. to 13.5W LED	17,061	3.20	27.0%	19.2%
60W Inc. to 13.5W LED	29,460	4.59	296.3%	174.7%
Total	**46,521**	**7.79**	**63.7%**	**40.4%**

Project Number OID-1589488
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting for New Construction. On-site, ADM verified the participant had installed:

- (5) 4' 2-Lamp T8 fixtures, replacing 4' 2-Lamp T12 fixture;
- (22) 4' 4-Lamp T8 fixtures, replacing 4' 4-Lamp T12 fixture;
- (2) 18W CFL lamps, replacing 75W Incandescent lamps.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	*CA DEER 2008 Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Office	Open	2,594	3,066	2,594	3,066	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	5	5	94	60	2,594	2,594	727	484	1.097	66.5%
4' 4L T12 to 4' 4L T8	22	22	188	118	2,594	2,594	6,581	4,382	1.097	66.6%
75W Inc. to 18W CFL	2	2	53	18	2,594	2,594	299	199	1.097	66.6%
						Total	**7,607**	**5,065**		**66.6%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	5	5	94	60	0.81	0.81	0.20	0.18	1.313	90.4%
4' 4L T12 to 4' 4L T8	22	22	188	118	0.81	0.81	1.79	1.64	1.313	91.5%
75W Inc. to 18W CFL	2	2	53	18	0.81	0.81	0.08	0.07	1.313	93.1%
Total							**2.07**	**1.89**		**91.5%**

Results

The kWh realization rate for OID-1589488 is 66.6%. The realization rate is low because ADM used lower operating hours in the space types receiving these fixtures, as per CA DEER 2008 guidelines, than the ex-ante calculations.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
4' 2L T12 to 4' 2L T8	484	0.18	66.5%	90.4%
4' 4L T12 to 4' 4L T8	4,382	1.64	66.6%	91.5%
75W Inc. to 18W CFL	199	0.07	66.6%	93.1%
Total	**5,065**	**1.89**	**66.6%**	**91.5%**

Project Number OID-1592896
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, ADM verified the participant had installed:

- (80) 32W CFL fixtures in the guestrooms;
- (320) 26W CFL fixtures in the guestrooms;
- (192) 32W CFL fixtures in the common areas;
- (49) 18W CFL fixtures in the common areas.

Initial project estimates were for 400 CFLs in the guestrooms and 416 in common areas. 175 common area CFLs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11
	Corridor	8,760	1.148	1.566	0.90

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
150W Inc. to 1L 32W CFL Multi 4-Pin	80	80	150	35	799	799	147,295	8,439	1.148	5.7%
100W Inc. to 1L 26W CFL Multi 4-Pin	320	320	72	29	799	799	220,302	12,621	1.148	5.7%
150W Inc. to 1L 32W CFL Multi 4-Pin	192	192	150	35	8,760	8,760	353,508	222,047	1.148	62.8%
60W Inc. to 1L 18W CFL Multi 4-Pin	49	49	60	20	8,760	8,760	31,380	19,711	1.148	62.8%
						Total	**752,485**	**262,818**		**34.93%**

Lighting kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
150W Inc. to 1L 32W CFL Multi 4-Pin	80	80	150	35	0.11	0.11	20.15	1.58	1.566	7.9%
100W Inc. to 1L 26W CFL Multi 4-Pin	320	320	72	29	0.11	0.11	30.13	2.37	1.566	7.9%
150W Inc. to 1L 32W CFL Multi 4-Pin	192	192	150	35	1.00	1.00	48.36	34.58	1.566	71.5%
60W Inc. to 1L 18W CFL Multi 4-Pin	49	49	60	20	1.00	1.00	4.29	3.07	1.566	71.5%
Total							**102.93**	**41.60**		**40.4%**

Results

The kWh realization rate for OID-1592896 is 34.93% and the kW realization rate is 40.4%. Realization is low due to a high verification failure rate in the common areas. Only 241 out of 416 common area CFLs could be verified. Further, based on the number of fixtures, ADM concluded that:

- Ex-ante calculations would have had to apply 8,760 hours of operation (i.e., common areas) to all fixtures, failing to account for guestroom lighting.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
150W Inc. to 1L 32W CFL Multi 4-Pin	8,439	1.58	5.7%	7.9%
100W Inc. to 1L 26W CFL Multi 4-Pin	12,621	2.37	5.7%	7.9%
150W Inc. to 1L 32W CFL Multi 4-Pin	222,047	34.58	62.8%	71.5%
60W Inc. to 1L 18W CFL Multi 4-Pin	19,711	3.07	62.8%	71.5%
Total	**262,818**	**41.60**	**34.93%**	**40.4%**

Project Number 1599938
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a primary school that received incentives from SPS for implementing energy efficient lighting. On-site, the evaluators verified the participant had installed:

- (25) 32W CFL lamps with occupancy sensors, replacing 100W Incandescent lamps;
- (25) 57W CFL lamps with occupancy sensors, replacing 170W Incandescent lamps;
- (30) LED Exit signs, replacing Incandescent Exit signs;
- (100) 4' 1-Lamp 25W T8 fixtures with occupancy sensors, replacing 4' 1-Lamp 32W T8 fixtures;
- (100) 4' 2-Lamp 25W T8 fixtures with occupancy sensors, replacing 4' 2-Lamp 32W T8 fixtures;
- (253) 4' 3-Lamp 25W T8 fixtures with occupancy sensors, replacing 4' 3-Lamp 32W T8 fixtures.

Two 32W CFLs, three 26W CFLs, and 21 4' 2-lamp 25W T8 fixtures failed verification. Nine additional 4' 1-Lamp T8 fixtures were found on site.

M&V Methodology

ADM found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	*CA DEER 2008 Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Primary School	Classroom	2,445	2,660	1.080	1.393	0.00

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
100W Inc. to 32W CFL	25	25	72	32	2,660	1,862	3,807	3,562	1.080	93.6%
170W Inc. to 57W CFL	25	25	170	57	2,660	1,862	10,755	9,344	1.080	86.9%
1L 40W Inc. Exit to 1L 2W LED Exit	30	30	40	6	8,760	8,760	3,883	9,650	1.080	248.5%
4' 1L T8 to 4' 1L T8 25W	100	100	31	23	2,660	1,862	3,046	4,280	1.080	140.5%
4' 2L T8 to 4' 2L T8 25W	100	100	58	43	2,660	1,862	5,711	8,015	1.080	140.4%
4' 3L T8 to 4' 3L T8 25W	253	253	85	64	2,660	1,862	20,227	29,218	1.080	144.4%
						Total	**47,429**	**64,070**		**94.5%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
100W Inc. to 32W CFL	25	25	72	32	0.00	0.00	0.12	0.00	1.393	0.0%
170W Inc. to 57W CFL	25	25	170	57	0.00	0.00	0.34	0.00	1.393	0.0%
1L 40W Inc. Exit to 1L 2W LED Exit	30	30	40	6	1.00	1.00	0.12	1.42	1.393	1141.7%
4' 1L T8 to 4' 1L T8 25W	100	100	31	23	0.00	0.00	0.10	0.00	1.393	0.0%
4' 2L T8 to 4' 2L T8 25W	100	100	58	43	0.00	0.00	0.18	0.00	1.393	0.0%
4' 3L T8 to 4' 3L T8 25W	253	253	85	64	0.00	0.00	0.65	0.00	1.393	0.0%
Total							**1.52**	**1.42**		**93.5%**

Results

The kWh realization rate for OID-1599938 is 135.1% and the kW realization rate is 93.5%. The evaluators calculated higher ex-post savings, as CA DEER 2008 guidelines utilize a greater magnitude of deemed reduction in hours of operation in comparison to that used in SPS' Business Lighting Efficiency Technical Assumptions. The evaluator could not verify two 32W CFL lamps, three 26W CFL lamps, and 21 4' 2-Lamp 25W T8 fixtures. The evaluator verified nine additional 4' 1-Lamp T8 fixtures and four additional 4' 3-Lamp fixtures.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
100W Inc. to 32W CFL	3,562	0.00	93.6%	0.0%
170W Inc. to 57W CFL	9,344	0.00	86.9%	0.0%
1L 40W Inc. Exit to 1L 2W LED Exit	9,650	1.42	248.5%	1141.7%
4' 1L T8 to 4' 1L T8 25W	4,280	0.00	140.5%	0.0%
4' 2L T8 to 4' 2L T8 25W	8,015	0.00	140.4%	0.0%
4' 3L T8 to 4' 3L T8 25W	29,218	0.00	144.4%	0.0%
Total	**64,070**	**1.42**	**135.1%**	**93.5%**

Project Number OID-1602147
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, ADM verified the participant had installed:

- (1209) 13.5W LED lamps in the guestrooms;
- (182) 13.5W LED lamps in the lobby, pool area, kitchen, restrooms and Banquet room;
- (48) 16W LED lamps in the lobby;
- (3) 13.5W LED lamps in the kitchen;
- (12) 13.5W LED lamps in hallways;
- (67) 16W LED lamps in hallways.

Initial project estimates were for 1650 LEDs in the guestrooms and 415 in common areas. 120 common areas LEDs failed verification and 210 guestroom LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

DEER Building Type	***DEER Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11
	Lobby	8,760	1.148	1.566	1.00
	Kitchen	4,524	1.148	1.566	0.88
	Corridor	8,760	1.148	1.566	1.00

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5W LED	1209	1209	60	13.5	799	799	287,284	51,567	1.148	17.9%
60W Inc. to 13.5W LED	182	182	60	13.5	8,760	8,760	43,247	85,108	1.148	196.8%
75W Inc. to 16W LED	48	48	53	16	8,760	8,760	9,076	17,860	1.148	196.8%
35W Halogen to 4W LED	30	30	42	4	8,760	8,760	5,826	11,464	1.148	196.8%
60W Inc. to 13.5W LED	3	3	60	13.5	4,524	4,524	713	725	1.148	101.6%
60W Inc. to 13.5W LED	12	12	60	13.5	8,760	8,760	2,851	5,612	1.148	196.8%
75W Inc. to 16W LED	67	67	53	16	8,760	8,760	12,668	24,930	1.148	196.8%
						Total	**361,665**	**197,265**		**54.5%**

Lighting kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	1209	1209	60	13.5	0.11	0.11	58.42	9.68	1.566	16.5%
60W Inc. to 13.5W LED	182	182	60	13.5	1.00	1.00	8.80	13.25	1.566	150.3%
75W Inc. to 16W LED	48	48	53	16	1.00	1.00	2.94	2.78	1.566	150.3%
32W Metal Halogen to 4W LED	30	30	42	4	1.00	1.00	1.18	1.79	1.566	150.3%
60W Inc. to 13.5W LED	3	3	60	13.5	0.88	0.88	0.14	0.19	1.566	132.3%
60W Inc. to 13.5W LED	12	12	60	13.5	1.00	1.00	0.58	0.87	1.566	150.3%
75W Inc. to 16W LED	67	67	53	16	1.00	1.00	4.11	3.88	1.566	150.3%
Total							**73.73**	**32.45**		**44.0%**

Results

The kWh realization rate for OID-11602147 is 54.5%. Realization is low due to a high verification failure rate. Initial project estimates had 220 6.5W LED lamps installed in common areas when only 30 4W LED lamps could be verified. In addition, the ex-ante calculations had 196 20W LED lamps installed in common areas when only 48 16W LED lamps could be verified. Only 1,209 out of 1,650 13.5W LED lamps could be verified in the guestrooms. The kW realization rate was low due to a higher peak coincidence factor used in the ex-ante calculations for guestrooms. The ex-ante calculations used higher hours of use.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED	51,567	9.68	17.9%	16.5%
60W Inc. to 13.5W LED	76,597	11.93	196.8%	150.3%
75W Inc. to 16W LED	25,632	3.99	196.8%	150.3%
32W Metal Halogen to 4W LED	10,318	1.61	196.8%	150.3%
60W Inc. to 13.5W LED	725	0.19	101.6%	132.3%
60W Inc. to 13.5W LED	5,050	0.79	196.8%	150.3%
75W Inc. to 16W LED	35,778	5.57	196.8%	150.3%
Total	**205,666**	**33.76**	**54.5%**	**44.0%**

Project Number OID-1604078
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (306) 13.5W LED lamps, replacing 60W incandescent lamps in the guestrooms.

Initial project estimates were for 342 LEDs in the guestrooms and 30 in common areas. All 30 common area LEDs failed verification and 36 guestroom LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	306	306	60	13.5	799	799	32,324	13,052	1.148	40.4%
						Total	**32,324**	**13,052**		**40.4%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	306	306	60	13.5	.11	.11	11.23	2.45	1.566	21.8%
Total							**11.23**	**2.45**		**21.8%**

Results

The kWh realization rate for OID-1604078 is 40.4%. Realization is low due to a high verification failure rate. Only 306 out of 372 fixtures could be verified, and all common area fixtures failed verification.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED	13,052	2.45	40.4%	21.8%
Total	**13,052**	**2.45**	**40.4%**	**21.8%**

Project Number OID-1609923
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (280) 13.5W LED lamps, replacing 60W incandescent lamps in the guestrooms.

Initial project estimates were for 368 LEDs in the guestrooms and 50 in common areas. All 50 common area LEDs failed verification and 88 guestroom LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	280	280	60	13.5	799	799	42,448	11,943	1.148	28.1%
						Total	**42,448**	**11,943**		**28.1%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	280	280	60	13.5	.11	.11	12.62	2.24	1.566	17.8%
Total							**12.62**	**2.24**		**17.8%**

Results

The kWh realization rate for OID-1609923 is 28.1%. Realization is low due to a high verification failure rate. Only 280 out of 418 fixtures could be verified, and all common area fixtures failed verification.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED	11,943	2.24	28.1%	17.8%
Total	**11,943**	**2.24**	**28.1%**	**17.8%**

Project Number OID-1614493
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (768) 13.5W LED lamps, replacing 60W incandescent lamps in the guestrooms; and
- (63) 13.5W LED lamps, replacing 60W incandescent lamps in the common areas.

Initial project estimates were for 960 LEDs in the guestrooms and 240 in common areas. 192 guestroom LEDs failed verification and 177 common area LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	*Space Type*	*Annual Hours – CFLs/LEDs*	*HCEF*	*HCDF*	*PCF*
Hotel	Guestroom	799	1.148	1.566	0.11
	Lobby	8,760	1.148	1.566	1.00

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5 W LED - Int. Ballast	768	768	60	13.5	799	799	146,154	32,757	1.148	22.4%
60W Inc. to 13.5W LED - Int. Ballast	63	63	60	13.5	8,760	8,760	11,989	29,460	1.148	245.7%
						Total	**158,143**	**62,217**		**39.3%**

Lighting Retrofit kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5 W LED - Int. Ballast	768	768	60	13.5	0.11	0.11	33.47	6.15	1.566	18.4%
60W Inc. to 13.5W LED - Int. Ballast	63	63	60	13.5	1.00	1.00	2.75	4.59	1.566	167.1%
Total							**36.22**	**10.74**		**29.7%**

Results

The kWh realization rate for OID-1614493 is 39.3% and the kW realization rate is 29.7%. Realization is low due to a high verification failure rate. Only 831 out of 1200 fixtures could be verified.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
60W Inc. to 13.5 W LED - Int. Ballast	32,757	6.15	22.4%	18.4%
60W Inc. to 13.5W LED - Int. Ballast	29,460	4.59	245.7%	167.1%
Total	**62,217**	**10.74**	**39.3%**	**29.7%**

Project Number OID-1635958
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a hotel that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, the evaluators verified the participant had installed:

- (1292) 13.5W LED lamps in the guestrooms;
- (884) 18W LED lamps in the guestrooms;
- (56) 18W LED lamps in the common areas;
- (209) 13.5W LED lamps in the common areas;
- (60) 13.5W LED lamps in the common areas; and
- (95) 13.5W LED lamps in the common areas.

Initial project estimates were for 2,726 LEDs in the guestrooms and 420 in common areas. 550 guestroom LEDs failed verification, 68 18W LEDs and 482 13.5W LEDs.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

DEER Building Type	***DEER Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11
	Lobby	8,760	1.148	1.566	1.00
	Corridor	5,913	1.148	1.566	0.90

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 13.5W LED - Int. Ballast	1292	1292	60	13.5	799	799	144,588	55,107	1.148	25.0%
75W Inc. to 18W LED - Int. Ballast	884	884	53	18	799	799	74,462	28,380	1.148	25.0%
75W Inc. to 18W LED - Int. Ballast	56	56	53	18	8,760	8,760	4,717	19,711	1.148	273.9%
60W Inc. to 13.5W LED - Int. Ballast	209	209	60	13.5	8,760	8,760	23,389	97,734	1.148	273.9%
60W Inc. to 13.5W LED - Int. Ballast	60	60	60	13.5	5,913	5,913	6,715	18,939	1.148	184.9%
60W Inc. to 13.5W LED - Int. Ballast	95	95	60	13.5	5,913	5,913	10,631	29,987	1.148	183.0%
						Total	**264,502**	**249,856**		**94.5%**

Lighting kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED - Int. Ballast	1292	1292	60	13.5	0.11	0.11	37.10	10.35	1.566	18.4%
75W Inc. to 18W LED - Int. Ballast	884	884	53	18	0.11	0.11	19.11	5.33	1.566	18.4%
75W Inc. to 18W LED - Int. Ballast	56	56	53	18	1.00	1.00	1.21	3.07	1.566	167.6%
60W Inc. to 13.5W LED - Int. Ballast	209	209	60	13.5	2.00	2.00	6.00	30.44	1.566	335.1%
60W Inc. to 13.5W LED - Int. Ballast	60	60	60	13.5	0.90	0.90	1.72	3.93	1.566	150.8%
60W Inc. to 13.5W LED - Int. Ballast	95	95	60	13.5	0.90	0.90	2.73	6.23	1.566	149.2%
						Total	**67.87**	**59.34**		**87.4%**

Results

The kWh realization rate for OID-1635958 is 94.5% and the kW realization rate is 87.4%. Realization is low due to a high verification failure rate. Initial project estimates had 2,726 LEDs in the guestrooms when only 2,176 guestroom LEDs could be verified. The kW realization rate was low due to a higher peak coincidence factor used in the ex-ante calculations for guestrooms. The ex-ante calculations used higher hours of use for guestrooms.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED - Int. Ballast	55,107	10.35	38.1%	27.9%
75W Inc. to 18W LED - Int. Ballast	28,380	5.33	38.1%	27.9%
75W Inc. to 18W LED - Int. Ballast	19,711	3.07	417.9%	253.6%
60W Inc. to 13.5W LED - Int. Ballast	97,734	30.44	417.9%	507.2%
60W Inc. to 13.5W LED - Int. Ballast	18,939	3.93	282.1%	228.2%
60W Inc. to 13.5W LED - Int. Ballast	29,987	6.23	282.1%	228.2%
Total	**249,856**	**59.34**	**94.5%**	**87.4%**

Project Number OID-1657583
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a University that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, ADM verified the participant had installed:

- (65) 26W 4-Pin CFL lamps; and
- (624) 26W 4-Pin CFL lamps.

Initial project estimates were for 1162 CFL lamps in the dormitory rooms and common areas.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
University	Common/Individual Work Area	8,760	1.102	1.335	1.00
	Dormitory	1,196	1.172	1.479	0.18

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
100W Inc. to 1L 26W CFL Multi 4-Pin	65	65	72	29	1.00	1.00	12.68	4.13	1.479	32.6%
100W Inc. to 1L 26W CFL Multi 4-Pin	624	624	72	29	0.18	0.18	121.73	7.14	1.479	5.9%
						Total	**134.41**	**11.28**		**8.4%**

Lighting kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
60W Inc. to 14W LED	68	68	60	14	0.88	0.88	4.76	3.67	1.335	77.2%
60W Inc. to 14W LED	12	12	60	14	0.81	0.81	0.84	0.59	1.313	69.9%
Total							**5.60**	**4.26**		**76.1%**

Results

The kWh realization rate for OID-1657583 is 8.4% and the kW realization rate is 8.4%. The evaluator could not verify 473 4-pin CFL fixtures, due to a miscalculation of ex ante fixtures. The ex post calculations used a lower coincidence factor and lower hours of use for dormitory rooms, which lowered the kWh and kW savings. SPS's Deemed Savings Technical Assumptions is missing a baseline fixture for 26W 4-pin CFL lamps for New Construction lighting projects.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
100W Inc. to 1L 26W CFL Multi 4-Pin	28,695	4.13	38.4%	32.6%
100W Inc. to 1L 26W CFL Multi 4-Pin	37,611	7.14	5.2%	5.9%
Total	**66,306**	**11.28**	**8.4%**	**8.4%**

Project Number OID-1719925
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a retail facility that received incentives from SPS for implementing energy efficient lighting as part of a new construction project. On-site, the evaluators verified the participant had installed:

- (68) 14W LED lamps in the sales area; and
- (12) 14W LED lamps in restrooms.

M&V Methodology

The evaluators confirmed installation of all fixtures listed in the project application. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Small Retail	Sales Area	4,013	1.102	1.335	0.88
Small Office	Restroom	3,957	1.097	1.313	0.81

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures

$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 14W LED	68	68	60	14	4,013	4,013	12,968	13,833	1.102	106.7%
60W Inc. to 14W LED	12	12	60	14	3,957	3,957	2,289	2,396	1.097	104.7%
						Total	**15,257**	**16,229**		**106.4%**

Lighting kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 14W LED	68	68	60	14	0.88	0.88	4.76	3.67	1.335	77.2%
60W Inc. to 14W LED	12	12	60	14	0.81	0.81	0.84	0.59	1.313	69.9%
Total							**5.60**	**4.26**		**76.1%**

Results

The kWh realization rate for OID-1719925 is 106.4% and the kW realization rate is 76.1%. The evaluator used a lower peak coincidence factor which lowered the kW savings. The ex post used higher hours of operation, as per CA DEER 2008 guidelines.

SPS's Deemed Savings Technical Assumptions is missing a baseline fixture for LED lamps for New Construction lighting projects.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
60W Inc. to 14W LED	13,833	3.67	106.7%	77.2%
60W Inc. to 14W LED	2,396	0.59	104.7%	69.9%
Total	**16,229**	**4.26**	**106.4%**	**76.1%**

Project Number OID-1440466
Program Business Comprehensive
Component Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (646) 13.5W LED lamps, replacing 75W incandescent lamps in the guestrooms.
- (61) 13.5W LED lamps, replacing 75W incandescent lamps in corridors.

Initial project estimates were for 520 LEDs in the guestrooms and 314 in common areas. All 30 common area LEDs failed verification and 36 guestroom LEDs failed verification. 126 LEDs listed as common area were actually installed in guestrooms, and 127 common area LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – CFLs/LEDs***	***HCEF***	***HCDF***	***PCF***
Hotel/Motel	Guestroom	799	1.148	1.566	0.11
	Corridor	7,884	1.148	1.566	0.67

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	646	646	53	13.5	799	799	134,313	23,406	1.148	17.7%
60W Inc. to 13.5W LED	61	61	53	13.5	8,760	8,760	81,105	24,231	1.148	193.9%
						Total	**215,418**	**47,637**		**32.9%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	646	646	53	13.5	.11	.11	20.10	4.40	1.566	21.9%
60W Inc. to 13.5W LED	61	61	53	13.5	.67	.67	1.90	3.77	1.566	198.8%
Total							**22.00**	**8.17**		**37.1%**

Results

The kWh realization rate for OID-1440466 is 32.9%. Realization is low due to a high verification failure rate. Only 707 out of 834 fixtures could be verified, and in addition, 126 LEDs listed as common area were actually installed in guestrooms.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
60W Inc. to 13.5W LED	23,406	4.40	17.7%	21.9%
60W Inc. to 13.5W LED	24,231	3.77	193.9%	198.8%
Total	**47,637**	**8.17**	**32.9%**	**37.1%**

Project Number OID-1573016
Program Business Comprehensive
Component Business Cooling

Project Background

The participant is a lodging facility that received incentives from SPS for implementing a Guest Room Energy Management (GREM) system. As a result the occupancy sensors and a door sensor connected to guest rooms' air conditioning system to shut off when the room is vacant and unoccupied. The realization rate for this project is 110%

The facility has mixtures of packaged terminal heat pumps (PTHPs) and packaged terminal air conditioning (PTAC) units with electrical resistance heating. and installed GREM system composed of ceiling mounted occupancy sensor and wireless power switch for PTHP unit in the guest room.

M&V Methodology

During the M&V visit, the evaluators took photographs of functioning GREM system components and interviewed facility manager for prior control method and guestroom keeping instructions. The evaluators followed the savings algorithm listed on the Cooling Efficiency Technical Assumptions for Hotel Room Controllers (HRC) with packaged terminal unit efficiency found during M&V visit.

The savings from GREM are calculated as:

$$kWh_{Savings} = N \times HRC\_Load \times HRC\_Eff \times HRC\_Op\_Hours$$

$$kW_{Peak\ Reduction} = N \times HRC\_Load \times HRC\_Eff \times CF$$

Where,

$kWh_{Savings}$	= Annual Energy Savings from GREM
$kW_{Peak\ Reduction}$	= Peak Demand Reduction from GREM
N	= Number of rooms being controlled
HRC_Load	= Capacity of a typical AC unit per room, 1 Ton/Room[19]
HRC_Eff	= Efficiency of AC unit, 1.749 kW/Ton
HRC_Op)Hours	= Annual operating hours reduced by GREM, 500 hours/room

[19] SPS Cooling Efficiency Technical Assumptions estimates a typical hotel room has 1.42 Ton AC unit rated at 1.115 kW/Ton. The evaluators found the average size is 1 Ton and the weighted average efficiency of packaged terminal units is 1.749 kW/Ton during M&V visit

CF = Coincident Factor, 6%

The table shown below presents expected and realized energy savings for the GREM project.

Savings Calculations

Measure	Quantity	Capacity (Tons)	Efficiency (kW/Ton)	Hours Reduced	Coincident Factor	Realized kWh Savings	Realized kW Peak Demand Reduction
GREM	45	1.00	1.749	322	0.06	25,339	4.73
Total						25,339	4.73

Results

Verified Gross Savings/Realization Rates

Measure	kWh Savings			kW Reduction		
	Expected	Realized	Realization Rate	Expected	Realized	Realization Rate
GREM	22,942	25,339	110%	4.28	4.73	110%
Total	22,942	25,339	110%	4.28	4.73	110%

The project level realization rate is 110%. The project has higher realization rate because the facility had mixture of PTACs with electric resistance heating and PTHP. The weighted average of the efficiency for the facility is 1.749 kW/Ton/Room which is less efficient than the 1.583 kW/Ton/Room value from the Technical Assumptions document. The less efficient units produce more savings from GREM.

The evaluators approached this project in three methods: building simulation analysis, billing analysis, and the suggested load reduction from the Cooling Efficiency Technical Assumptions. The building simulation analysis and the billing analysis both shown significantly less savings compare to ex ante savings, however, these results will not be applied due to significant uncertainty found in the results.

Comparison of Savings and Realization Rates by Different Analysis Method

	Ex Ante	Technical Assumptions Method with the Site Specific Parameters		Billing Analysis		Building Simulation Analysis	
		Ex Post	Realization Rate	Billing Analysis	Realization Rate	Simulation	Realization Rate
Annual Savings	22,942	25,339	110%	31,496	137%	12,060	53%

The evaluator's first approach was building simulation analysis. The evaluators used Energy Plus building energy model simulation to calculate the savings. The direct monitoring approach is not feasible because this would require deploying monitoring equipment nearly as many as the number of rooms due to difference in monitoring data from different rooms (high standard deviations). Therefore, The evaluators set up a numerous simulations similar to Monte Carlo simulation method with boundary conditions. The boundary conditions are the estimated hourly occupancy rates and the

annual average vacancy rates. Based on the interview with the facility management staff, this facility used to instruct housekeeping crews to turn off AC units upon check-outs, and to not change AC settings if the room is not going to be checked out. Therefore the majority of savings come from reduction in operating hours for the occupied room during the daytime when they are often not in the guest room. The Energy Plus motel model that the evaluators created contains 43 rooms and a lobby. The Lobby runs 24/7 and the 43 guestrooms operate in one of 4 randomly created annual schedules, which is mixture of 12 randomly created weekly schedules based on the facility manager interview. The weekly schedules contain one of 4 randomly created hourly temperature schedules or the room is vacant. Finally the simulation was performed four times to take account of different building orientation. The savings value from this analysis is the average kWh savings per room. The evaluators calibrated the building using the actual billing data with an assumption of 40% vacancy rate throughout the year. The resulting savings had a 20% realization rate. However, due to the lack of facility-specific monitored data, we have opted not to apply this rate. This measure has been flagged as needing further research and metering.

The second method the evaluators performed was the billing analysis. The evaluators received the facility billing data for 17 months prior to the installation and seven months of post installation. The evaluators used regression analysis to the billing data with the actual heating and cooling degree days and the resulting savings had a -26% realization rate, though with too low of an R-square to apply this value.

Lastly the evaluators decided to use the method listed on the Cooling Efficiency Technical Assumptions with the parameters found during M&V visit because other two methods are inconclusive at this point and further study is needed. The higher realization rate is mainly due to low efficient units found on site. The evaluators calculated the weighted average efficiency of packaged terminal units on site to be 1.749 kW/Ton/Room where the Technical Assumptions estimates 1.583 kW/Ton/Room. The lower efficiency units yield greater saving from GREM.

Project Number OID-1573016
Program Business Comprehensive
Component Business Cooling Efficiency

Project Background

The participant is a lodging facility that received incentives from SPS for implementing a Guest Room Energy Management (GREM) system. As a result the occupancy sensors and a door sensor connected to guest rooms' air conditioning system to shut off when the room is vacant and unoccupied. The realization rate for this project is 110%

The facility has mixtures of packaged terminal heat pumps (PTHPs) and packaged terminal air conditioning (PTAC) units with electrical resistance heating. and installed GREM system composed of ceiling mounted occupancy sensor and wireless power switch for PTHP unit in the guest room.

M&V Methodology

During the M&V visit, the evaluators took photographs of functioning GREM system components and interviewed facility manager for prior control method and guestroom keeping instructions. The evaluators followed the savings algorithm listed on the Cooling Efficiency Technical Assumptions for Hotel Room Controllers (HRC) with packaged terminal unit efficiency found during M&V visit.

The savings from GREM are calculated as:

$$kWh_{Savings} = N \times HRC\_Load \times HRC\_Eff \times HRC\_Op\_Hours$$

$$kW_{Peak\ Reduction} = N \times HRC\_Load \times HRC\_Eff \times CF$$

Where,

$kWh_{Savings}$	= Annual Energy Savings from GREM
$kW_{Peak\ Reduction}$	= Peak Demand Reduction from GREM
N	= Number of rooms being controlled
HRC_Load	= Capacity of a typical AC unit per room, 1 Ton/Room[20]
HRC_Eff	= Efficiency of AC unit, 1.749 kW/Ton
HRC_Op)Hours	= Annual operating hours reduced by GREM, 500 hours/room

[20] SPS Cooling Efficiency Technical Assumptions estimates a typical hotel room has 1.42 Ton AC unit rated at 1.115 kW/Ton. The evaluators found the average size is 1 Ton and the weighted average efficiency of packaged terminal units is 1.749 kW/Ton during M&V visit

CF = Coincident Factor, 6%

The table shown below presents expected and realized energy savings for the GREM project.

Savings Calculations

Measure	Quantity	Capacity (Tons)	Efficiency (kW/Ton)	Hours Reduced	Coincident Factor	Realized kWh Savings	Realized kW Peak Demand Reduction
GREM	45	1.00	1.749	322	0.06	25,339	4.73
Total						25,339	4.73

Results

Verified Gross Savings/Realization Rates

	kWh Savings			kW Reduction		
	Expected	Realized	Realization Rate	Expected	Realized	Realization Rate
GREM	22,942	25,339	110%	4.28	4.73	110%
Total	22,942	25,339	110%	4.28	4.73	110%

The project level realization rate is 110%. The project has higher realization rate because the facility had mixture of PTACs with electric resistance heating and PTHP. The weighted average of the efficiency for the facility is 1.749 kW/Ton/Room which is less efficient than the 1.583 kW/Ton/Room value from the Technical Assumptions document. The less efficient units produce more savings from GREM.

The evaluators approached this project in three methods: building simulation analysis, billing analysis, and the suggested load reduction from the Cooling Efficiency Technical Assumptions. The building simulation analysis and the billing analysis both shown significantly less savings compare to ex ante savings, however, these results will not be applied due to significant uncertainty found in the results.

Comparison of Savings and Realization Rates by Different Analysis Method

	Ex Ante	Technical Assumptions Method with the Site Specific Parameters		Billing Analysis		Building Simulation Analysis	
		Ex Post	Realization Rate	Billing Analysis	Realization Rate	Simulation	Realization Rate
Annual Savings	22,942	25,339	110%	31,496	137%	12,060	53%

The evaluator's first approach was building simulation analysis. The evaluators used Energy Plus building energy model simulation to calculate the savings. The direct monitoring approach is not feasible because this would require deploying monitoring equipment nearly as many as the number of rooms due to difference in monitoring data from different rooms (high standard deviations). Therefore, The evaluators set up a numerous simulations similar to Monte Carlo simulation method with boundary conditions. The boundary conditions are the estimated hourly occupancy rates and the

annual average vacancy rates. Based on the interview with the facility management staff, this facility used to instruct housekeeping crews to turn off AC units upon check-outs, and to not change AC settings if the room is not going to be checked out. Therefore the majority of savings come from reduction in operating hours for the occupied room during the daytime when they are often not in the guest room. The Energy Plus motel model that the evaluators created contains 43 rooms and a lobby. The Lobby runs 24/7 and the 43 guestrooms operate in one of 4 randomly created annual schedules, which is mixture of 12 randomly created weekly schedules based on the facility manager interview. The weekly schedules contain one of 4 randomly created hourly temperature schedules or the room is vacant. Finally the simulation was performed four times to take account of different building orientation. The savings value from this analysis is the average kWh savings per room. The evaluators calibrated the building using the actual billing data with an assumption of 40% vacancy rate throughout the year. The resulting savings had a 20% realization rate. However, due to the lack of facility-specific monitored data, we have opted not to apply this rate. This measure has been flagged as needing further research and metering.

The second method the evaluators performed was the billing analysis. The evaluators received the facility billing data for 17 months prior to the installation and seven months of post installation. The evaluators used regression analysis to the billing data with the actual heating and cooling degree days and the resulting savings had a -26% realization rate, though with too low of an R-square to apply this value.

Lastly the evaluators decided to use the method listed on the Cooling Efficiency Technical Assumptions with the parameters found during M&V visit because other two methods are inconclusive at this point and further study is needed. The higher realization rate is mainly due to low efficient units found on site. The evaluators calculated the weighted average efficiency of packaged terminal units on site to be 1.749 kW/Ton/Room where the Technical Assumptions estimates 1.583 kW/Ton/Room. The lower efficiency units yield greater saving from GREM.

Project Number OID-157301
Program Business Comprehensive
Component Business Cooling Efficiency

Project Background

The participant is a lodging facility that received incentives from SPS for implementing a Guest Room Energy Management (GREM) system. As a result the occupancy sensors and a door sensor connected to guest rooms' air conditioning system to shut off when the room is vacant and unoccupied. The realization rate for this project is 154%

The facility has mixtures of packaged terminal heat pumps (PTHPs) and packaged terminal air conditioning (PTAC) units with electrical resistance heating. and installed GREM system composed of ceiling mounted occupancy sensor and wireless power switch for PTHP unit in the guest room.

M&V Methodology

During the M&V visit, the evaluators took photographs of functioning GREM system components and interviewed facility manager for prior control method and guestroom keeping instructions. The evaluators followed the savings algorithm listed on the Cooling Efficiency Technical Assumptions for Hotel Room Controllers (HRC) with packaged terminal unit efficiency found during M&V visit.

The savings from GREM are calculated as:

$$kWh_{Savings} = N \times HRC\_Load \times HRC\_Eff \times HRC\_Op\_Hours$$

$$kW_{Peak\ Reduction} = N \times HRC\_Load \times HRC\_Eff \times CF$$

Where,

$kWh_{Savings}$	= Annual Energy Savings from GREM
$kW_{Peak\ Reduction}$	= Peak Demand Reduction from GREM
N	= Number of rooms being controlled
HRC_Load	= Capacity of a typical AC unit per room, 1 Ton[21]
HRC_Eff	= Efficiency of AC unit, 2.432 kW/Ton
HRC_Op)Hours	= Annual operating hours reduced by GREM, 322 hours/room

[21] SPS Cooling Efficiency Technical Assumptions estimates a typical hotel room has 1.42 Ton AC unit rated at 1.115 kW/Ton. ADM found the average unit size is 1 Ton and the weighted average efficiency of packaged terminal units is 2.432 kW/Ton during M&V visit.

CF = Coincident Factor, 6%

The table shown below presents expected and realized energy savings for the GREM project.

Savings Calculations

Measure	Quantity	Capacity (Tons)	Efficiency (kW/Ton)	Hours Reduced	Coincident Factor	Realized kWh Savings	Realized kW Peak Demand Reduction
GREM	81	1.00	2.432	322	0.06	63,440	11.83
Total						63,440	11.83

Results

Verified Gross Savings/Realization Rates

	kWh Savings			kW Reduction		
	Expected	Realized	Realization Rate	Expected	Realized	Realization Rate
GREM	41,296	63,440	154%	7.70	11.83	154%
Total	41,296	63,440	154%	7.70	11.83	154%

The project level realization rate is 154%. The project has higher realization rate because the facility had mixture of PTACs with electric resistance heating and PTHP. The weighted average of the efficiency for the facility is 2.432 kW/Ton/Room which is less efficient than the 1.583 kW/Ton/Room value from the Technical Assumptions document. The less efficient units produce more savings from GREM.

The evaluators approached this project in three methods: building simulation analysis, billing analysis, and the suggested load reduction from the Cooling Efficiency Technical Assumptions. The building simulation analysis and the billing analysis both shown significantly less savings compare to ex ante savings, however, these results will not be applied due to significant uncertainty found in the results.

Comparison of Savings and Realization Rates by Different Analysis Method

	Ex Ante	Technical Assumptions Method with the Site Specific Parameters		Billing Analysis		Building Simulation Analysis	
		Ex Post	Realization Rate	Billing Analysis	Realization Rate	Simulation	Realization Rate
Annual Savings	41,296	63,440	154%	-10,585	-26%	41,877	101%

The evaluator's first approach was building simulation analysis. The evaluators used Energy Plus building energy model simulation to calculate the savings. The direct monitoring approach is not feasible because this would require deploying monitoring equipment nearly as many as the number of rooms due to difference in monitoring data from different rooms (high standard deviations). Therefore, The evaluators set up a numerous simulations similar to Monte Carlo simulation method with boundary conditions. The boundary conditions are the estimated hourly occupancy rates and the

annual average vacancy rates. Based on the interview with the facility management staff, this facility used to instruct housekeeping crews to turn off AC units upon check-outs, and to not change AC settings if the room is not going to be checked out. Therefore the majority of savings come from reduction in operating hours for the occupied room during the daytime when they are often not in the guest room. The Energy Plus motel model that the evaluators created contains 43 rooms and a lobby. The Lobby runs 24/7 and the 43 guestrooms operate in one of 4 randomly created annual schedules, which is mixture of 12 randomly created weekly schedules based on the facility manager interview. The weekly schedules contain one of 4 randomly created hourly temperature schedules or the room is vacant. Finally the simulation was performed four times to take account of different building orientation. The savings value from this analysis is the average kWh savings per room. The evaluators calibrated the building using the actual billing data with an assumption of 40% vacancy rate throughout the year. The resulting savings had a 20% realization rate. However, due to the lack of facility-specific monitored data, we have opted not to apply this rate. This measure has been flagged as needing further research and metering.

The second method the evaluators performed was the billing analysis. The evaluators received the facility billing data for 17 months prior to the installation and seven months of post installation. The evaluators used regression analysis to the billing data with the actual heating and cooling degree days and the resulting savings had a -26% realization rate, though with too low of an R-square to apply this value.

Lastly the evaluators decided to use the method listed on the Cooling Efficiency Technical Assumptions with the parameters found during M&V visit because other two methods are inconclusive at this point and further study is needed. The higher realization rate is mainly due to low efficient units found on site. The evaluators calculated the weighted average efficiency of packaged terminal units on site to be 2.432 kW/Ton/Room where the Technical Assumptions estimates 1.583 kW/Ton/Room. The lower efficiency units yield greater saving from GREM.

Project Number OID-1593446
Program Business Comprehensive
Component Business Cooling Efficiency

Project Background

The participant is a lodging facility that received incentives from SPS for implementing a Guest Room Energy Management (GREM) system. As a result the occupancy sensors and a door sensor connected to guest rooms' air conditioning system to shut off when the room is vacant and unoccupied. The realization rate for this project is 154%

The facility has mixtures of packaged terminal heat pumps (PTHPs) and packaged terminal air conditioning (PTAC) units with electrical resistance heating. and installed GREM system composed of ceiling mounted occupancy sensor and wireless power switch for PTHP unit in the guest room.

M&V Methodology

During the M&V visit, the evaluators took photographs of functioning GREM system components and interviewed facility manager for prior control method and guestroom keeping instructions. The evaluators followed the savings algorithm listed on the Cooling Efficiency Technical Assumptions for Hotel Room Controllers (HRC) with packaged terminal unit efficiency found during M&V visit.

The savings from GREM are calculated as:

$$kWh_{Savings} = N \times HRC\_Load \times HRC\_Eff \times HRC\_Op\_Hours$$

$$kW_{Peak\ Reduction} = N \times HRC\_Load \times HRC\_Eff \times CF$$

Where,

$kWh_{Savings}$	= Annual Energy Savings from GREM
$kW_{Peak\ Reduction}$	= Peak Demand Reduction from GREM
N	= Number of rooms being controlled
HRC_Load	= Capacity of a typical AC unit per room, 1 Ton[22]
HRC_Eff	= Efficiency of AC unit, 1.457 kW/Ton
HRC_Op)Hours	= Annual operating hours reduced by GREM, 500 hours/room

[22] SPS Cooling Efficiency Technical Assumptions estimates a typical hotel room has 1.42 Ton AC unit rated at 1.115 kW/Ton. The evaluators found the average size is 1 Ton and the weighted average efficiency of packaged terminal units is 1.457 kW/Ton during M&V visit

CF = Coincident Factor, 6%

The table shown below presents expected and realized energy savings for the GREM project.

Savings Calculations

Measure	Quantity	Capacity (Tons)	Efficiency (kW/Ton)	Hours Reduced	Coincident Factor	Realized kWh Savings	Realized kW Peak Demand Reduction
GREM	34	1.00	1.457	322	0.06	15,952	2.96
Total						15,952	2.96

Results

Verified Gross Savings/Realization Rates

	kWh Savings			kW Reduction		
	Expected	Realized	Realization Rate	Expected	Realized	Realization Rate
GREM	17,334	15,952	92%	3.23	2.96	92%
Total	17,334	15,952	92%	3.23	2.96	92%

The project level realization rate is 92%. The project has lower realization rate because the facility had an equipment configuration that was more efficient than listed in the SPS Technical Assumptions. The weighted average of the efficiency for the facility is 1.457 kW/Ton per room and that is more efficient compare to the value of 1.583 kW/Ton/Room from the Technical Assumptions. The more efficient air conditioning units produce fewer saving from GREM.

The evaluators approached this project in three methods: building simulation analysis, billing analysis, and the suggested load reduction from the Cooling Efficiency Technical Assumptions. The building simulation analysis and the billing analysis both shown significantly less savings compare to ex ante savings, however, these results will not be applied due to significant uncertainty found in the results.

Comparison of Savings and Realization Rates by Different Analysis Method

	Ex Ante	Technical Assumptions Method with the Site Specific Parameters		Billing Analysis		Building Simulation Analysis	
		Ex Post	Realization Rate	Billing Analysis	Realization Rate	Simulation	Realization Rate
Annual Savings	17,334	15,952	92%	20,030	116%	7,684	44%

The evaluator's first approach was building simulation analysis. The evaluators used Energy Plus building energy model simulation to calculate the savings. The direct monitoring approach is not feasible because this would require deploying monitoring equipment nearly as many as the number of rooms due to difference in monitoring data from different rooms (high standard deviations). Therefore, The evaluators set up a numerous simulations similar to Monte Carlo simulation method with boundary

conditions. The boundary conditions are the estimated hourly occupancy rates and the annual average vacancy rates. Based on the interview with the facility management staff, this facility used to instruct housekeeping crews to turn off AC units upon check-outs, and to not change AC settings if the room is not going to be checked out. Therefore the majority of savings come from reduction in operating hours for the occupied room during the daytime when they are often not in the guest room. The Energy Plus motel model that the evaluators created contains 43 rooms and a lobby. The Lobby runs 24/7 and the 43 guestrooms operate in one of 4 randomly created annual schedules, which is mixture of 12 randomly created weekly schedules based on the facility manager interview. The weekly schedules contain one of 4 randomly created hourly temperature schedules or the room is vacant. Finally the simulation was performed four times to take account of different building orientation. The savings value from this analysis is the average kWh savings per room. The evaluators calibrated the building using the actual billing data with an assumption of 40% vacancy rate throughout the year. The resulting savings had a 20% realization rate. However, due to the lack of facility-specific monitored data, we have opted not to apply this rate. This measure has been flagged as needing further research and metering.

The second method the evaluators performed was the billing analysis. The evaluators received the facility billing data for 17 months prior to the installation and seven months of post installation. The evaluators used regression analysis to the billing data with the actual heating and cooling degree days and the resulting savings had a -26% realization rate, though with too low of an R-square to apply this value.

Lastly the evaluators decided to use the method listed on the Cooling Efficiency Technical Assumptions with the parameters found during M&V visit because other two methods are inconclusive at this point and further study is needed. The higher realization rate is mainly due to low efficient units found on site. The evaluators calculated the weighted average efficiency of packaged terminal units on site to be 1.457 kW/Ton/Room where the Technical Assumptions estimates 1.583 kW/Ton/Room. The higher efficiency units yield fewer savings from GREM.

Project Number	OID1585703, OID1633816, OID1633817, OID1633823, OID1633825, OID1639109, OID1639112, OID1712402, OID1712403, OID1798768, OID1799176
Program	Business Comprehensive
Component	Business Motor & Drive Efficiency

Project Background

The participant is a food manufacturing facility that received incentives from SPS for the installation of a large number of Variable Frequency Drives (VFDs) and premium efficiency motors. On-site, ADM verified the participant installed:

Variable Frequency Drives	*Premium Efficiency Motors*
▪ (1) 1.7 HP VFD	▪ (6) 1 HP Motors
▪ (6) 2 HP VFDs	▪ (1) 1.5 HP Motor
▪ (22) 3 HP VFDs	▪ (5) 2 HP Motors
▪ (11) 7.5 HP VFDs	▪ (3) 3 HP Motors
▪ (12) 10 HP VFDs	▪ (1) 7.5 HP Motor
▪ (4) 15 HP VFD	▪ (1) 10 HP Motor
▪ (3) 20 HP VFDs	▪ (2) 15 HP Motors
▪ (3) 25 HP VFDs	▪ (3) 20 HP Motors
▪ (5) 30 HP VFDs	
▪ (1) 4 HP VFD	
▪ (1) 50 HP VFDs	
▪ (1) 60 HP VFD	

M&V Methodology

ADM verified the installation of the VFDs and premium efficiency pumps during the field visit. During the on-site verification site contacts were interviewed, in order to determine typical operating profiles, and baseline control strategies which were determined to be constant speed.

ADM also installed monitoring equipment on a sample of the VFD controlled motors. During this period, kW was monitored using 5 minute intervals for approximately 8 weeks.

Savings Calculations

In order to calculate the energy savings for the installation of the VFDs, ADM used the data collected during the monitoring period. Using this data an average daily profile for each day of the week was determined for each monitored pump. Assuming that the GPM of the system would remain constant between the as-built and baseline system, pump affinity laws were used to determine corresponding flow rates for each hour of the

profile mentioned above. Assuming that the baseline pump used trim valves to modulate flow causing the pump to ride the curve of its impeller, manufacturer curves were used to determine the resulting kW demand necessary to produce the corresponding flow rate.

The annual savings for the installation of the VFD is the difference between the baseline and as-built profiles extrapolated to a yearly interval. The following table shows the resulting savings for the VFDs that were monitored, along with the motors that were monitored in a similar project at the same site in 2011:

Normalized Savings from Monitored Pumps

HP	Hours	kWh Savings	kWh/Hp	kW Reduction	kW/Hp
10	8,738	33,973	3,397	3.76	0.376
10	1,284	5,915	592	0.40	0.040
20	6,863	34,375	1,719	1.91	0.096
30	2,574	43,644	1,455	1.61	0.054
40	8,425	78,646	1,966	9.47	0.237
40	3,870	83,007	2,075	9.76	0.244
75	8,760	81,678	1,089	10.29	0.137
75	8,561	84,749	1,130	16.30	0.217
Weighted Average	**7,019**	**–**	**1,487**	**–**	**0.178**

Using this data, ADM applied the weighted average savings to the unmonitored VFDs, while the monitored VFDs retained their monitored savings. The following table shows the calculated savings for all of the installed VFDs:

VFD kWh and kW Savings Calculations

Quantity	HP	Total HP	Ex-Post	
			kWh	kW
1	1.7	1.7	2,527	0.30
6	2	12	17,839	2.14
22	3	66	98,118	11.75
11	7.5	82.5	122,648	14.72
12	10	120	178,395	21.39
4	15	60	89,197	10.69
3	20	60	89,198	10.70
3	25	75	111,497	13.37
5	30	150	222,995	26.75
1	40	40	59,465	7.13
1	50	50	74,331	8.91
1	60	60	89,198	10.70
Total			**1,155,408**	**138.55**

In order to calculate the savings from the installation of the premium efficiency motors, ADM used SPS's Deemed Savings Technical Assumptions informed by the hours of operations deduced from the monitoring data.

$$Annual\ kWh\ Savings = HP * LF * Conv * \left(\frac{1}{Eff_{base}} - \frac{1}{Eff_{post}}\right) * Hrs$$

Parameters for kWh Savings Calculation for Premium Efficiency Motors

Hp	Rated Horsepower of Installed Motor
LF	Motor Load Factor
Conv	Conversion Factor Between Horsepower and Kilowatts (.746)
Eff_{base}	Baseline Motor Efficiency from SPS's Deemed Savings Technical Assumptions
Eff_{post}	Installed Motor Efficiency
Hrs	Average Operating Hours of the Motor Determined from Monitoring

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Reduction = HP * LF * Conv * \left(\frac{1}{Eff_{base}} - \frac{1}{Eff_{post}}\right) * CF$$

Parameters for Peak Demand (kW) Savings Calculation for Premium Efficiency Motors

Hp	Rated Horsepower of Installed Motor
LF	Motor Load Factor
Conv	Conversion Factor Between Horsepower and Kilowatts (0.746)
Eff_{base}	Baseline Motor Efficiency from SPS's Deemed Savings Technical Assumptions
Eff_{post}	Installed Motor Efficiency
CF	Coincidence Factor (0.78)

The following table summarizes the savings for the installation of the new high efficiency motors:

Motor Retrofit kWh Savings Calculations

End-Use	Quantity	HP	Efficiency		Hours	Realized kWh Savings	Realized kW Reduction
			Base	Post			
Other	1	1	76.3%	85.5%	7,019	554	0.06
Pump	1	15	87.2%	91.0%	7,019	2,821	0.31
Pump	1	1	76.3%	85.5%	7,019	554	0.06
Fan	1	3	80.6%	89.5%	7,019	1,453	0.16
Pump	1	1	76.3%	87.5%	7,019	659	0.07

Fan	2	2	78.5%	88.5%	7,019	2,261	0.25
Pump	1	20	88.1%	93.0%	7,019	4,697	0.52
Other	2	1	76.3%	87.5%	7,019	1,318	0.15
Pump	1	3	80.6%	88.5%	7,019	1,305	0.14
Pump	1	1.5	77.4%	88.5%	7,019	955	0.11
Fan	1	7.5	85.3%	91.0%	7,019	2,163	0.24
Pump	1	10	86.3%	92.4%	7,019	3,004	0.33
Pump	1	1	76.3%	85.5%	7,019	554	0.06
Fan	1	20	88.1%	93.0%	7,019	4,697	0.52
Fan	1	20	88.1%	91.0%	7,019	2,841	0.32
Pump	1	2	78.5%	88.5%	7,019	1,131	0.13
Pump	1	3	80.6%	89.5%	7,019	1,453	0.16
Pump	1	15	87.2%	92.4%	7,019	3,802	0.42
Pump	1	2	78.5%	88.5%	7,019	1,131	0.13
Pump	1	2	78.5%	88.5%	7,019	1,131	0.13
					Total	**38,484**	**4.27**

Results

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
VFDs	1,155,408	138.55		
Premium Efficiency Motors	38,484	4.27		
Total	**1,193,892**	**142.82**	**187%**	**129%**

It was calculated that the installation of the VFDs and premium efficiency motors, decreases annual energy consumption by 1,193,892 kWh and a demand reduction of 142.82 kW resulting in a realization rate of 187%.

ADM attributes the high realization rate to SPS using a deemed savings approach for VFD savings. The assumption made by SPS assumes that the motors operates for anywhere from 3,380 to 5,667 hours depending on the application and size of the motor. They also assume that the VFDs reduce consumption by 33%. These assumptions do not properly reflect the system at hand as it was determined through monitoring data that on average the motors operate 7,019 hours. The high monitored hours is the same reason the realization rate for the premium efficiency motors is high.

Project Number	OID-1615370 and OID-1599954
Program	Business Comprehensive
Component	Business Motor and Drive Efficiency

Project Background

The participant is a manufacturing facility that that received incentives from SPS for installing energy efficient air compressor systems. On-site, ADM verified the participant had installed:

- (1) 100-HP Air Compressor with Variable Speed Drive, replacing (2) 50-HP Fixed Speed Air Compressors;
- (1) 100 HP High Efficiency Motor.

M&V Methodology

Savings from this project were evaluated via onsite verification and monitoring. Monitoring equipment was installed for two months to record usage. Savings from the air compressor were calculated using New Mexico's Technical Assumptions Workpapers for ex ante calculations.

Savings Calculations

Monitoring equipment calculations to determine energy consumption:

$$Power\ (W) = \frac{3 \times CT\ size \times 277V \times (Pulse\ Count / Duration\ in\ second)}{4}$$

$$Energy\ (WH) = \frac{3 \times CT\ Size \times 277V}{4 * 3600}$$

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline W / 1000 W/kW
kW_{post}	Total As-Built W/ 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating

Since the equipment was installed above sea level, the manufactory energy requirements were adjusted as shown below:

$$PV = nRT$$

$$\frac{P_1}{n_1} = \frac{RT}{V} = \frac{P_2}{n_2}$$

$$\frac{n_2}{n_1} = \frac{P_2}{n_2}$$

$$P = 101325(1 - 2.25577x10^{-5} \times height)^{5.25588}$$

P	Pressure, Pa (P_1 at sea level, P_2 at n-attitude)
V	Volume
n	Number of air molecules (n_1 at sea level, n_2 at n-attitude)
R	Gas Constant
T	Temperature

Overall kW and kWh Usage Calculations

	Compressor	***Hours***	***kWh***	***Peak kW***
Baseline	(2) 50-HP Fixed Speed	4,520	253,062	73.58
Post	(1) 100-HP VSD Compressor, High Efficiency Motor	4,520	170,574	28.27
Post	(1) 100-HP Fixed Speed Compress, *without* High Efficiency Motor	4,520	172,198	28.54

Measure 1: Variable Speed Drive

Savings calculations:

$$kWh\ Savings = Total\ kWh\ savings - kWh\ Savings\ from\ High\ Efficiency\ Motor$$

OID-1615370 kW and kWh Usage Calculations

Savings	Hours	kWh	Peak kW
NM Technical Assumptions	4,520	88,312	15.24
Realized Savings	4,520	80,864	45.03
Expected Saving	5,667	110,722	15.24
Realization Rate		**73.03%**	**295.49%**

Measure 2: High Efficiency Motor

Savings calculations:

$$Savings\ With\ Standard\ Efficiency\ Motor = \frac{(post\ kWh\ \times\ \%\ Efficiency\ of\ High\ Efficiency\ motor)}{EPACT\ Motor\ Efficiency}$$

% Efficiency of High Efficiency Motor	95.4% (100-HP, 1800, TEFC)
% EPACT Motor Efficiency	94.5% (100-HP, 1800, TEFC)

OID-1599954 kW and kWh Usage Calculations

Savings	Hours	kWh	Peak kW
NM Technical Assumptions	4,520	2,524.65	0.44
Realized Savings	4,520	1,625	0.27
Expected Saving	5,667	3,165	0.44
Realization Rate	-	51.33%	61.20%

Results

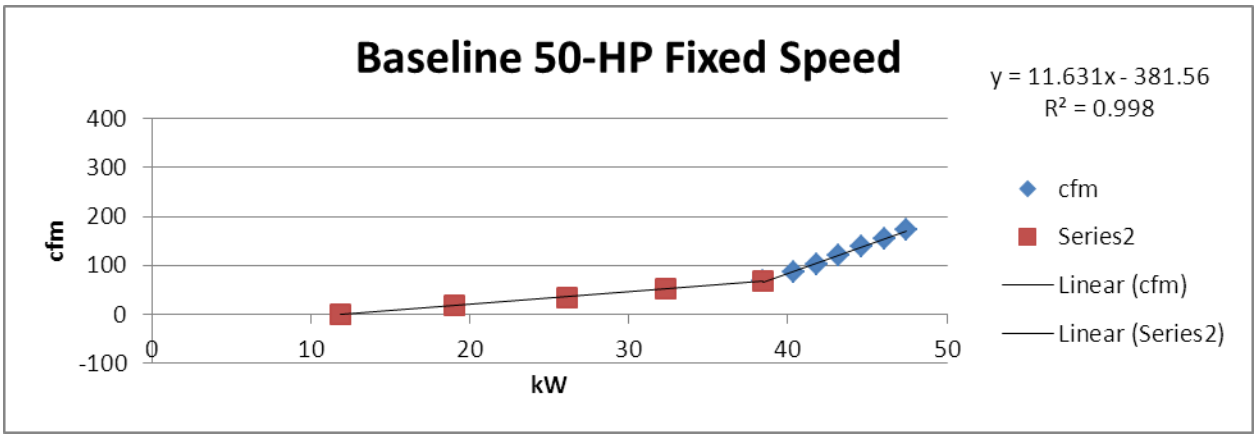
The kWh realization rate for OID-1615370 is 73.03% and the kWh realization rate for OID-1599954 is 51.33%. The evaluator monitored the post consumption for two months and created a baseline demand profile. ADM made two key assumptions. First, the evaluator assumed there was no seasonality in consumption. Second, the demand is the same before and after the retrofit. The ex ante calculations used incorrect hours of operation from the technical manual, using the stipulated hours for pumps rather than air compressors, and overestimated the expected savings. This facility does not run 24 hours a day 7 days a week, and the monitored hours of operation are significantly less than the technical assumptions. The evaluator also adjusted the CFM for altitude at this site, since the lower air pressure and lower suction pressure cause the air compressors to work harder to create the same amount of compressed air.

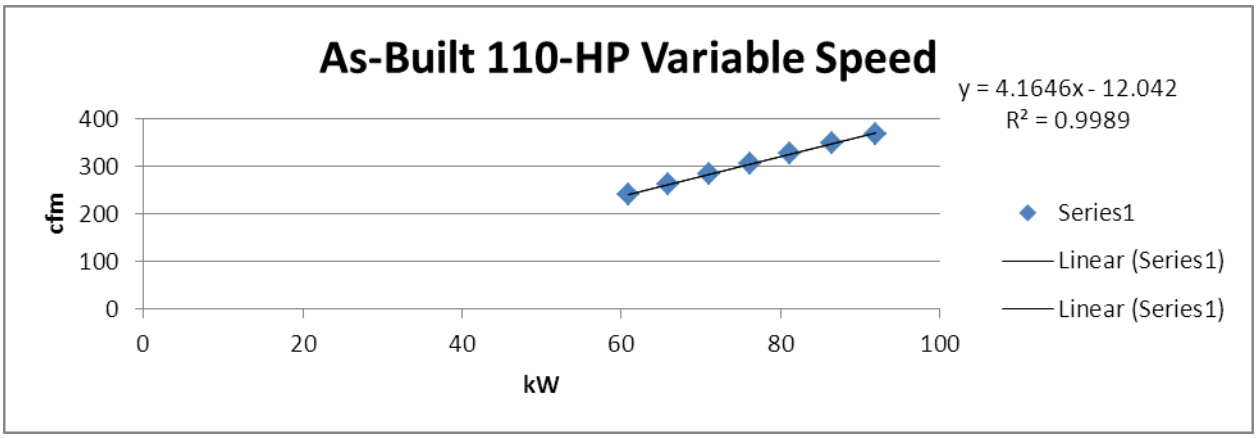
Verified Gross Savings & Realization Rates

Site Number	*Savings*	*kWh*	*Peak kW*
OID-1615370	**VSD Realized Savings**	80,864	45.03
	VSD Expected Savings	110,722	15.24
	VSD Realized Savings	**73.03%**	**295.49%**
OID-1599954	**Motor Realized Savings**	1,625	0.27
	Motor Expected Savings	3,165	0.44
	Motor Realized Savings	**51.33%**	**61.20%**

Appendix

Compressor CAGI Curves





Project Number OID-1604694
Program Business Comprehensive
Component Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site ADM verified the participant installed:

- (1) POC on a 7.5 HP 1200 RPM pumps;
- (3) POC on a 20 HP 1200 RPM pump;
- (1) POC's on 25 HP 1200 RPM pumps;
- (5) POC's on 30 HP 1200 RPM pumps;
- (6) POC's on 40 HP 1200 RPM pumps;
- (1) POC's on 50 HP 1200 RPM pumps;
- (2) POC's on 60 HP 1200 RPM pumps;
- (1) POC's on 75 HP 1200 RPM pumps.

M&V Methodology

ADM verified the installation of 20 out of 21 POC's on the pumps used to extract oil from the ground. One pump was found out of service. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

ADM used SPS's deemed POC calculator to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between ADM and SPS, which is informed by extensive monitoring performed by ADM at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left([8{,}760 \times \{8.366 + .956 \times Pump_{eff} \times TC \times 100\}] - [8{,}760 * TC]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting observed during the site visit

The summary of ADM's findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	ODP	7.5	1200	85.3%	10%	70%	8,308	0.95
Conventional	TEFC	20	1200	84.6%	10%	70%	22,337	2.55
Conventional	TEFC	20	1200	88.1%	10%	70%	21,450	2.45
Conventional	TEFC	20	1200	83.0%	26%	70%	18,331	2.09
Conventional	ODP	40	1200	86.0%	11%	70%	43,411	4.96
Conventional	ODP	30	1200	89.5%	18%	70%	28,585	3.26
Conventional	TEFC	25	1200	86.0%	18%	70%	24,790	2.83
Conventional	ODP	40	1200	0.0%	0%	70%	-	-
Conventional	ODP	10	1200	86.5%	17%	70%	9,992	1.14
Conventional	TEFC	30	1200	92.4%	10%	70%	30,677	3.50
Conventional	ODP	40	1200	94.1%	10%	70%	40,164	4.58
Conventional	TEFC	60	1200	90.4%	75%	70%	13,062	1.49
Conventional	ODP	60	1200	90.4%	56%	70%	27,575	3.15
Conventional	ODP	50	1200	89.9%	68%	70%	15,426	1.761
Conventional	TEFC	30	1200	89.4%	10%	70%	31,706	3.619
Conventional	TEFC	40	1200	93.0%	31%	70%	30,244	3.453
Conventional	ODP	40	1200	89.7%	22%	70%	35,976	4.107
Conventional	ODP	40	1200	89.7%	10%	70%	42,134	4.810
Conventional	ODP	30	1200	89.4%	10%	70%	31,706	3.619
Conventional	TEFC	30	1200	87.5%	77%	70%	5,958	0.680
Conventional	ODP	40	1200	87.5%	11%	70%	42,667	4.871
Total							**524,499**	**59.874**

Results

It was calculated that the installation of the POC's decreases annual energy consumption by 524,499 kWh and a demand reduction of 59.874 kW. OID-1604694 had a realization rate of 81.3% for kWh and 85.7% for kW.

ADM attributes the high realization rate to SPS assuming an average baseline time clock setting of 80%, which deceased the ex-ante calculated energy savings for this project. ADM used a recommended baseline time clock setting of 70%. The kW realization rate is low because the verified peak kW reduction savings are estimated based on a fixed multiplier for the kWh savings.

Verified Gross Savings & Realization Rates

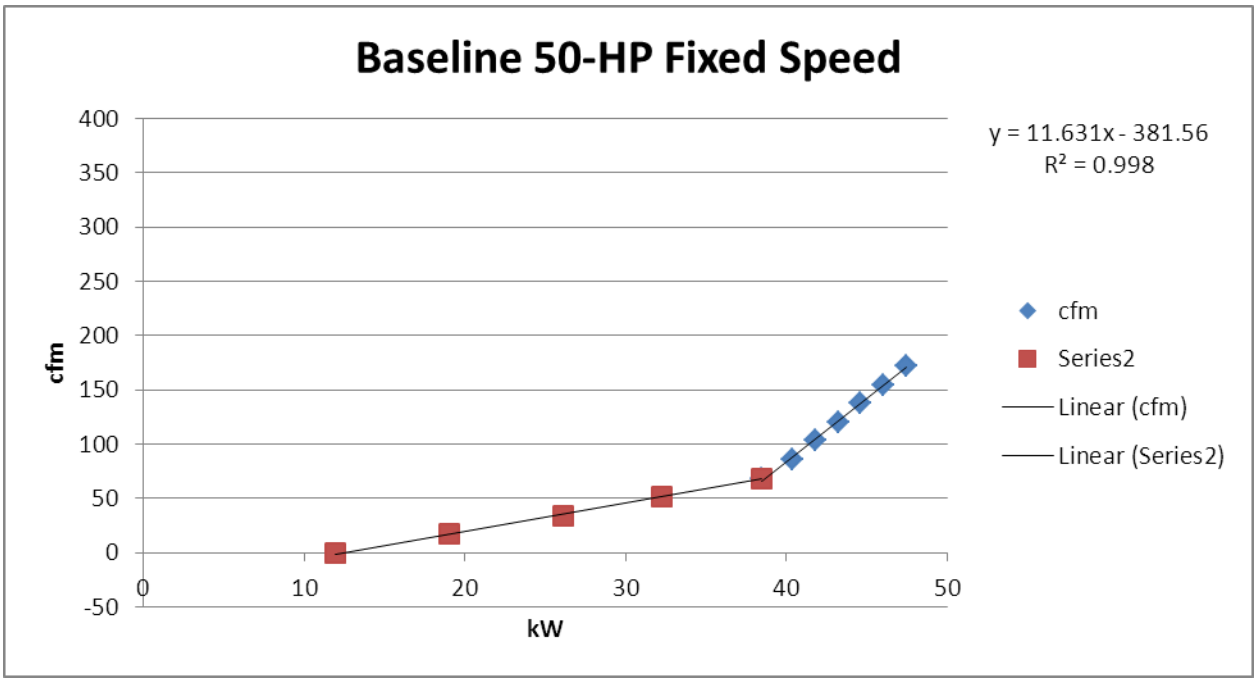
Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	644,875	69.84	524,499	59.874	81.3%	85.7%
Total	644,875	69.84	524,499	59.874	81.3%	85.7%

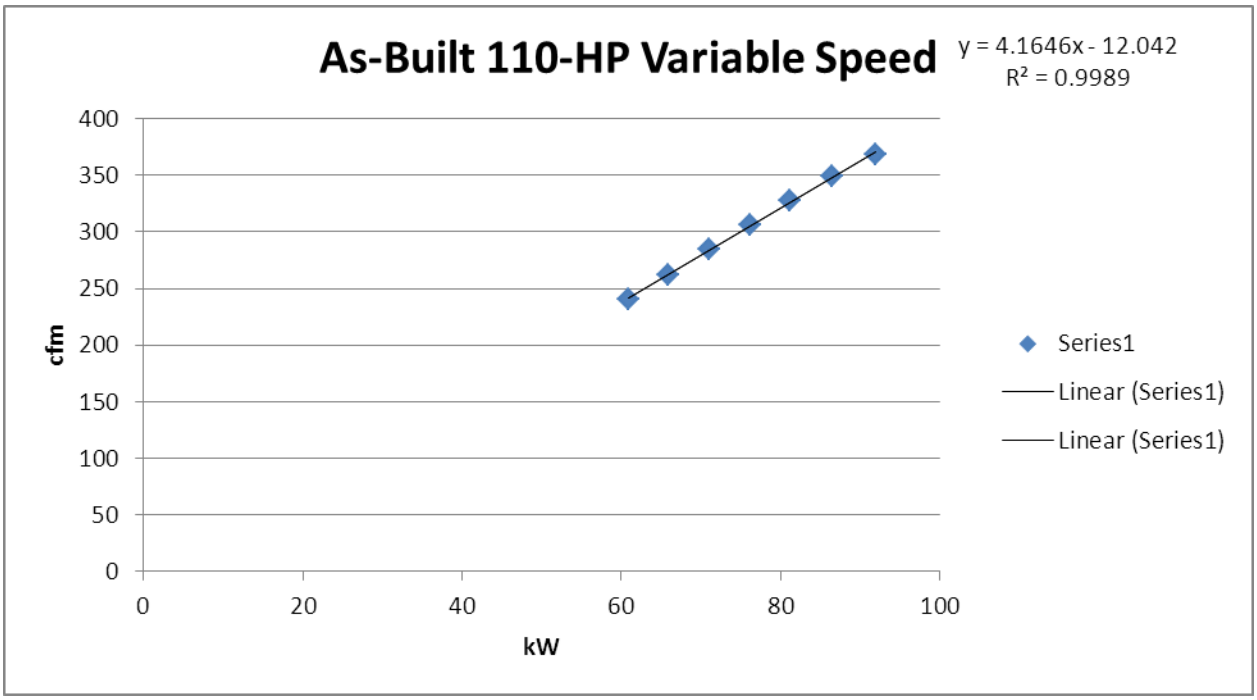
Verified Gross Savings & Realization Rates

Site Number	*Savings*	*kWh*	*Peak kW*
OID-1615370	**VSD Realized Savings**	80,864	45.03
	VSD Expected Savings	110,722	15.24
	VSD Realized Savings	**73.03%**	**295.49%**
OID-1599954	**Motor Realized Savings**	1,625	0.27
	Motor Expected Savings	3,165	0.44
	Motor Realized Savings	**51.33%**	**61.20%**

Appendix

Compressor CAGI Curves

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R² = 0.9989
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350
300
250
200
150
100
50
0
cfm
0
20
40
60
80
100
kW
Series1
Linear (Series1)
Linear (Series1)

Project Number OID-1607575
Program Business Comprehensive
Component Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site ADM verified the participant installed:

- (2) POC on a 20 HP 1200 RPM pump;
- (1) POC's on 25 HP 1200 RPM pumps;
- (1) POC's on 40 HP 1200 RPM pumps;
- (7) POC's on 50 HP 1200 RPM pumps;
- (2) POC's on 60 HP 1200 RPM pumps.

M&V Methodology

ADM verified the installation of the POC's on the pumps used to extract oil from the ground. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

ADM used SPS's deemed POC calculator to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between ADM and SPS, which is informed by extensive monitoring performed by ADM at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left(\left[8{,}760 \times \left\{8.366 + .956 \times Pump_{eff} \times TC \times 100\right\}\right] - \left[8{,}760 * TC\right]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting observed during the site visit

The summary of ADM's findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	ODP	60	1200	90.4%	60%	70%	24,520	2.80
Conventional	ODP	50	1200	89.9%	70%	70%	14,146	1.61
Conventional	ODP	50	1200	89.9%	60%	70%	20,547	2.35
Conventional	ODP	50	1200	87.5%	60%	70%	21,110	2.41
Conventional	ODP	20	1200	88.1%	60%	70%	8,387	0.96
Conventional	ODP	50	1200	89.5%	60%	70%	20,639	2.36
Conventional	ODP	20	1200	88.1%	60%	70%	8,387	0.96
Conventional	TEFC	40	1200	89.7%	60%	70%	16,474	1.88
Conventional	ODP	50	1200	87.5%	60%	70%	21,110	2.41
Conventional	ODP	25	1200	88.9%	60%	70%	10,389	1.19
Conventional	TEFC	50	1200	94.1%	60%	70%	19,630	2.24
Conventional	ODP	60	1200	90.4%	60%	70%	24,520	2.80
Conventional	TEFC	50	1200	89.9%	60%	70%	20,547	2.35
						Total	230,405	26.302

Results

It was calculated that the installation of the POC's decreases annual energy consumption by 230,405 kWh and a demand reduction of 26.30 kW. OID-1607575 had a realization rate of 86.3% for kWh and 152.5% for kW.

ADM attributes the high realization rate to SPS assuming an average baseline time clock setting of 80%, which deceased the ex ante calculated energy savings for this project. ADM used a recommended baseline time clock setting of 70%. The kW realization rate is high because the verified kWh savings increased the peak kW reduction savings, which are estimated based on a fixed multiplier for the kWh savings.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	267,069	17.25	**230,405**	**26.302**	86.3%	152.5%
Total	267,069	17.25	**230,405**	**26.302**	86.3%	152.5%

Project Number OID-1736270
Program Business Comprehensive
Component Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site ADM verified the participant installed:

- (2) POC on a 20 HP 1200 RPM pumps;
- (2) POC's on 25 HP 1200 RPM pumps;
- (9) POC's on 40 HP 1200 RPM pumps;
- (1) POC's on 50 HP 1200 RPM pump;
- (1) POC's on 60 HP 1200 RPM pump.

M&V Methodology

ADM verified the installation of the POC's on the pumps used to extract oil from the ground. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

ADM used SPS's deemed POC calculator to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between ADM and SPS, which is informed by extensive monitoring performed by ADM at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left(\left[8{,}760 \times \left\{8.366 + .956 \times Pump_{eff} \times TC \times 100\right\}\right] - \left[8{,}760 * TC\right]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting observed during the site visit

The summary of ADM's findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	TEFC	25	1200	88.9%	23%	70%	22,363	2.55
Conventional	TEFC	40	1200	89.7%	11%	70%	41,621	4.75
Conventional	TEFC	40	1200	89.7%	18%	70%	38,028	4.34
Conventional	TEFC	60	1200	87.5%	74%	70%	14,284	1.63
Conventional	TEFC	20	1200	88.1%	13%	70%	20,666	2.36
Conventional	TEFC	40	1200	88.5%	16%	70%	39,584	4.52
Conventional	TEFC	40	1200	89.7%	12%	70%	41,107	4.69
Conventional	TEFC	20	1200	88.1%	11%	70%	21,188	2.42
Conventional	TEFC	40	1200	87.5%	42%	70%	26,358	3.01
Conventional	TEFC	40	1200	89.7%	57%	70%	18,014	2.06
Conventional	TEFC	40	1200	94.1%	72%	70%	9,833	1.12
Conventional	TEFC	40	1200	89.7%	23%	70%	35,462	4.05
Conventional	TEFC	50	1200	89.5%	80%	70%	7,780	0.89
Conventional	TEFC	25	1200	88.0%	15%	70%	25,208	2.88
Conventional	TEFC	40	1200	88.5%	17%	70%	39,064	4.46
						Total	400,560	45.73

Results

It was calculated that the installation of the POC's decreases annual energy consumption by 400,560 kWh and a demand reduction of 45.73 kW. OID-1736270 had a realization rate of 88.5% for kWh and 100% for kW.

ADM attributes the low realization rate to SPS assuming an average baseline time clock setting of 80%, which deceased the ex-ante calculated energy savings for this project. ADM used a recommended baseline time clock setting of 70%. The kW realization rate is high because the verified kWh savings increased the peak kW reduction savings, which are estimated based on a fixed multiplier for the kWh savings.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	452,678	45.73	**400,560**	**45.73**	88.5%	100.0%
Total	452,678	45.73	**400,560**	**45.73**	88.5%	100.0%

Project Number OID-1622808
Program Business Comprehensive
Component Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site ADM verified the participant installed:

- (1) POC on a 4 HP 1200 RPM pump;
- (4) POC's on 15 HP 1200 RPM pumps;
- (10) POC's on 25 HP 1200 RPM pumps;
- (11) POC's on 30 HP 1200 RPM pumps;
- (7) POC's on 40 HP 1200 RPM pumps;
- (8) POC's on 50 HP 1200 RPM pumps;
- (5) POC's on 60 HP 1200 RPM pumps;
- (1) POC on a 75 HP 1200 RPM pump;
- (1) POC on a 100 HP 1200 RPM pump.

M&V Methodology

ADM verified the installation of the POC's on the pumps used to extract oil from the ground. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

ADM used SPS's deemed POC calculator to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between ADM and SPS, which is informed by extensive monitoring performed by ADM at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left(\left[8{,}760 \times \left\{8.366 + .956 \times Pump_{eff} \times TC \times 100\right\}\right] - \left[8{,}760 * TC\right]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting observed during the site visit

The summary of ADM's findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	ODP	50	1200	87.5%	39.2%	70%	34,768	3.97
Conventional	ODP	30	1200	89.4%	29.8%	70%	24,053	2.75
Conventional	ODP	30	1200	89.4%	10.0%	70%	31,706	3.62
Conventional	ODP	20	1200	87.5%	22.7%	70%	18,245	2.08
Conventional	ODP	25	1200	88.9%	38.8%	70%	17,259	1.97
Conventional	ODP	100	1200	89.5%	52.5%	70%	50,894	5.81
Conventional	ODP	40	1200	89.7%	36.8%	70%	28,390	3.24
Conventional	ODP	40	1200	89.7%	10.4%	70%	41,942	4.79
Conventional	ODP	25	1200	87.5%	10.0%	70%	26,996	3.08
Conventional	ODP	30	1200	87.5%	21.5%	70%	27,853	3.18
Conventional	ODP	30	1200	89.4%	37.2%	70%	21,213	2.42
Conventional	ODP	50	1200	89.9%	33.6%	70%	37,433	4.27
Conventional	ODP	50	1200	89.9%	39.7%	70%	33,571	3.83
Conventional	ODP	20	1200	88.1%	48.1%	70%	11,500	1.31
Conventional	ODP	30	1200	89.4%	24.3%	70%	26,192	2.99
Conventional	ODP	20	1200	88.1%	12.6%	70%	20,758	2.37
Conventional	ODP	15	1200	87.2%	29.3%	70%	12,440	1.42
Conventional	ODP	40	1200	89.7%	24.5%	70%	34,703	3.96
Conventional	ODP	50	1200	89.9%	59.1%	70%	21,107	2.41
Conventional	ODP	50	1200	89.9%	10.0%	70%	52,550	6.00
Conventional	ODP	30	1200	89.4%	20.8%	70%	27,550	3.14
Conventional	ODP	25	1200	88.9%	14.5%	70%	25,099	2.87
Conventional	ODP	25	1200	88.9%	19.5%	70%	23,491	2.68
Conventional	ODP	60	1200	90.4%	11.6%	70%	61,486	7.02
Conventional	ODP	30	1200	89.4%	28.9%	70%	24,406	2.79
Conventional	ODP	25	1200	88.9%	18.9%	70%	23,682	2.70
Conventional	ODP	15	1200	87.2%	15.3%	70%	15,212	1.74
Conventional	ODP	30	1200	89.4%	15.3%	70%	29,658	3.39
Conventional	ODP	15	1200	87.2%	10.0%	70%	16,253	1.86
Conventional	ODP	60	1200	90.4%	10.0%	70%	62,711	7.16
Conventional	ODP	25	1200	88.9%	30.0%	70%	20,099	2.29
Conventional	ODP	40	1200	89.7%	16.7%	70%	38,671	4.41
Conventional	ODP	25	1200	88.9%	10.0%	70%	26,571	3.03
Conventional	TEFC	60	1200	88.0%	64.4%	70%	21,763	2.48
Conventional	ODP	75	1200	89.5%	54.1%	70%	36,600	4.18
Conventional	ODP	60	1200	90.4%	48.1%	70%	33,571	3.83
Conventional	ODP	50	1200	89.9%	22.5%	70%	44,552	5.09
Conventional	ODP	4	1200	81.9%	20.2%	70%	4,044	0.46
Conventional	ODP	40	1200	89.7%	18.3%	70%	37,869	4.32
Conventional	ODP	30	1200	86.7%	12.4%	70%	31,719	3.62
Conventional	ODP	15	1200	87.2%	26.0%	70%	13,079	1.49
Conventional	TEFC	50	1200	89.9%	14.5%	70%	49,641	5.67
Conventional	ODP	30	1200	89.4%	15.8%	70%	29,479	3.37
Conventional	ODP	30	1200	89.4%	10.0%	70%	31,706	3.62
Conventional	ODP	25	1200	88.9%	43.8%	70%	15,632	1.78
Conventional	ODP	50	1200	89.9%	20.1%	70%	46,090	5.26

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	ODP	40	1200	89.7%	10.2%	70%	42,034	4.80
Conventional	ODP	60	1200	90.4%	33.6%	70%	44,717	5.10
Conventional	ODP	25	1200	88.9%	12.4%	70%	25,790	2.94
Conventional	ODP	40	1200	89.7%	16.7%	70%	38,685	4.42
Conventional	ODP	25	1200	88.9%	10.0%	70%	26,571	3.03
						Total	1,542,004	176.01

Results

It was calculated that the installation of the POC's decreases annual energy consumption by 1,542,004 kWh and a demand reduction of 176.01 kW. OID-1622808 had a realization rate of 110% for kWh and 104% for kW.

ADM attributes the high realization rate can be attributed to lower motor efficiencies being identified during on-site verification. This reduction in overall motor efficiency results in a slightly higher annual energy savings.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	1,402,167	169.07	1,542,004	176.01	110%	104%
Total	1,402,167	169.07	1,542,004	176.01	110%	104%

Project Number 1-7UP59
Program Business Comprehensive
Component Business Custom Efficiency

EXECUTIVE SUMMARY

The participant is an oil company that received incentives from SPS for the installation of a 1,750 Hp VFD on a reciprocating acid gas compressor. On site ADM verified installation of the VFD and that the compressor specifications matched project documentation. Gross kWh realization for this project is 100%.

M&V METHODOLOGY

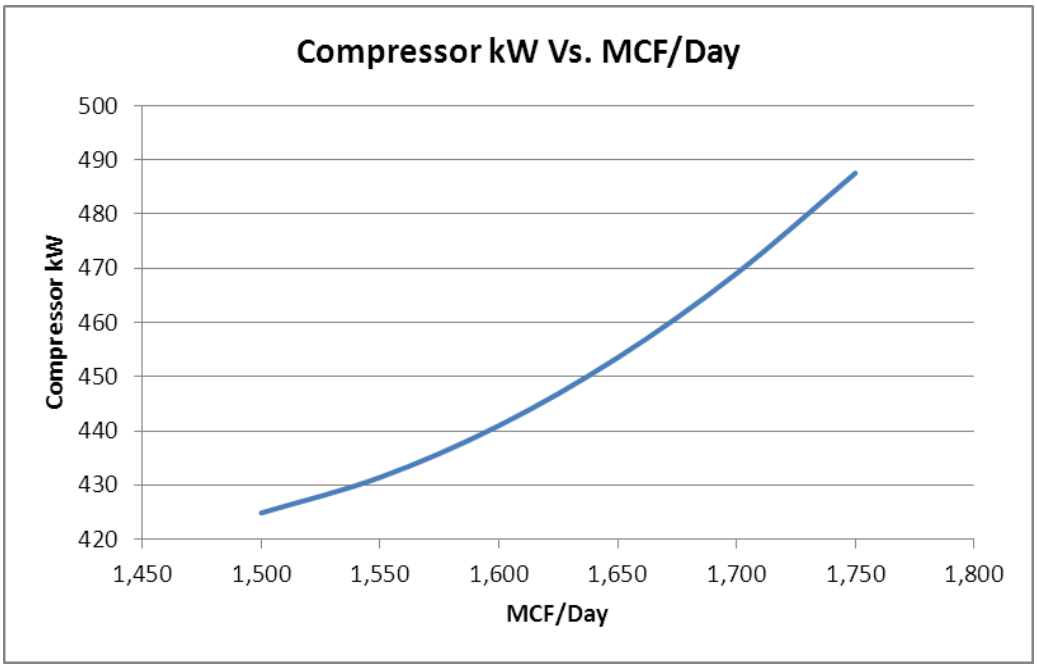
During the site visit, ADM verified the installation of the 1,750 Hp VFD on the sour gas compressor. During the oil production process; gas, oil and salt water is extracted from the oil wells. Upon reaching the treatment plant, the gases are stripped from the oil and separated into two categories “sweet” and “sour.” Sweet gases are considered to be profitable gas for the company (propane is an example). Sour gases have no monetary value and must be disposed of properly due to their potential health hazards as the gases are considered acidic.

The acid gas compressor is used to compress the unwanted gas back into a large geological void under New Mexico. In the baseline, the compressor uses a by-pass loop to regulate its capacity against a given discharge pressure. This control method is energy intensive as the compressor demand remains relatively constant during bypass. The addition of the VFD allows the compressor to modulate its output more effectively as the speed of the motor is regulated. This eliminates excess energy from being wasted as in by pass mode.

There are also secondary savings associated with the addition of the VFD, as a dry cooler is used to dissipate excess heat from the compressor. The VFD decrease the load on the compressor during periods of reduced operation, therefore there is less required heat rejection.

SAVINGS CALCULATIONS

As-built compressor energy consumption was determined by developing a correlation between compressor kW and acid gas flow rate. This was accomplished by using provided monitoring and production data, as agreed upon in the site specific monitoring agreement. The following graph illustrates the correlation between compressor kW and output:



Acid gas production data for August through December 2012 was provided on a daily level. Using this data an average annual production profile was calculated assuming the production from August to December was representative for the beginning of the year. Using the curve show above the require compressor kW was the calculated for each hour of the year.

The baseline compressor demand was also determined in a similar manner. The site placed the compressor in by-pass mode for approximately 30 minutes. During this time power monitoring was performed at one minute intervals. Originally the monitoring agreement required 48 hours of by-pass mode monitoring, however due to excessive heat buildup the site was able to maintain by-pass for 30 minutes. During the 30 minute by-pass mode, the power monitoring showed very little demand fluctuation allowing ADM to conclude that the reduced period was sufficient. During the by-pass period the compressor's average demand was 883.41 kW, it is also assumed that the compressor demand remains constant throughout the by-pass control range. The annual energy consumption for the baseline compressor control is the average kW multiplied by the annual hours of operation, resulting in 8,002,192 kWh.

The cooling energy required to cool the compressor is a function of the compressor demand for a given hour. Therefore, the addition of the VFD has a secondary savings impact as the compressor kW is reduced. The pre and post energy required for cooling the compressor was calculated using the following equation:

$$kWh_{cool} = \sum \frac{Eff_{cool} \times kW_{comp} \times \%_{Heat} \times 3{,}413}{12{,}000}$$

Parameters for Required kWh of Compressor Cooling

kWh_{cool}	Annual kWh for Compressor Cooling
Eff_{cool}	Dry Cooler Efficiency (0.2 kW/Ton)
kW_{comp}	Compressor kW Demand
$\%_{Heat}$	Percent of Compressor Energy as Heat

The annual cooling savings is the difference between the baseline and as-built consumption.

RESULTS

It was calculated that the installation of the VFD, decreases annual energy consumption by 3,728,747 kWh and a demand reduction of 425.66 kW. There was an initial savings reservation of 4,165,558 kWh and 476 kW for this project, but no rebate was paid until savings were verified. As a result, realization for this project is 100%.

ADM attributes the reduction in savings relative to the initial savings reservation the ex-ante calculations slightly overestimating the baseline compressor energy consumption. The ex-ante calculations assumed a baseline compressor kW of 953.1, while the monitoring data ADM received showed an average demand of 883.41 kW.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
Compressor VFD	4,165,558	476	3,728,747	425.66	90%	89%
Total	**4,165,558**	**476**	**3,728,747**	**425.66**	**90%**	**89%**

ADM also calculated the remaining year energy savings for the VFD as the plant intends to increase its output. Due to this increase in production the remaining energy savings will decrease as compressor usage increases. The average annual energy savings for years after Year 1 is calculated at 3,351,396 kWh and a demand reduction of 382.58 kW.

Project Number OID-0147509
Program Small Business Lighting Efficiency

Project Background

The participant is a grocery store that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (13) 4' 2L 28W T8 fixtures, replacing 4' 2L 40W T12 fixtures;
- (39) 4' 4L 28W T8 fixtures, replacing 4' 4L 40W T12 fixtures;
- (6) 4' 1L 28W T8 fixtures, replacing 4' 2L 40W T12 fixtures;
- (82) 8' 1L 59W T8 fixtures, replacing 8' 1L 75W T12 fixtures; and
- (230) 8' 2L 59W T8 fixtures, replacing 8' 2L 75W T12 fixtures.

M&V Methodology

Savings from this project were evaluated via onsite verification and monitoring of lighting runtime in a representative sample of spaces within the facility. ADM found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. For fixture retrofits, metered hours of use were applied to baseline and post conditions in calculating savings

Lighting Retrofit Monitoring Strategy & Results

Building Type	***CA DEER 2008 Space Type***	*Logger Type*	*Quantity*	*Annual Hours*	*HCEF*	*HCDF*	*PCF*
Grocery	Grocery – Retail Sales Area	HOBO U12 w/ CT	2	5,145	1.110	1.339	0.96

Savings Calculations

Savings from the T12 to T8 Retrofit were calculated using monitored data of the hours of operation. Monitoring equipment was installed in each space type for two months to record the hours of operation. The hours of operation were extrapolated to estimate annual runtime. The rationale behind this is to capture accurate energy savings from the facility since operations did not change after the retrofit was completed.

Using values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	CEF	kWh Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8 28W	13	13	94	52	5,273	5,273	3,317	3,196	1.110	96.3%
4' 4L T12 to 4' 4L T8 28W	39	39	188	99	5,274	5,274	21,088	20,321	1.110	96.4%
8' 1L T12 to 8' 1L T8	82	82	91	69	5,276	5,276	10,960	10,566	1.110	96.4%
8' 2L T12 to 8' 2L T8	9	9	173	110	5,277	5,277	3,445	2,992	1.000	86.9%
8' 2L T12 to 8' 2L T8	11	11	173	110	4,312	4,312	4,210	2,988	1.000	71.0%
8' 2L T12 to 8' 2L T8	210	210	173	110	5,273	5,273	80,378	77,441	1.110	96.3%
						Total	**123,398**	**117,504**		**95.2%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	CDF	kW Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8 28W	13	13	94	52	0.96	0.96	0.68	0.70	1.339	103.0%
4' 4L T12 to 4' 4L T8 28W	39	39	188	99	0.96	0.96	4.34	4.47	1.339	103.0%
8' 1L T12 to 8' 1L T8	82	82	91	69	0.96	0.96	2.25	2.32	1.339	103.0%
8' 2L T12 to 8' 2L T8	9	9	173	110	0.96	0.96	0.71	0.54	1.000	76.9%
8' 2L T12 to 8' 2L T8	11	11	173	110	0.00	0.00	0.87	0.00	1.000	0.0%
8' 2L T12 to 8' 2L T8	210	210	173	110	0.96	0.96	16.52	17.02	1.339	103.0%
						Total	**25.37**	**25.05**		**98.8%**

Results

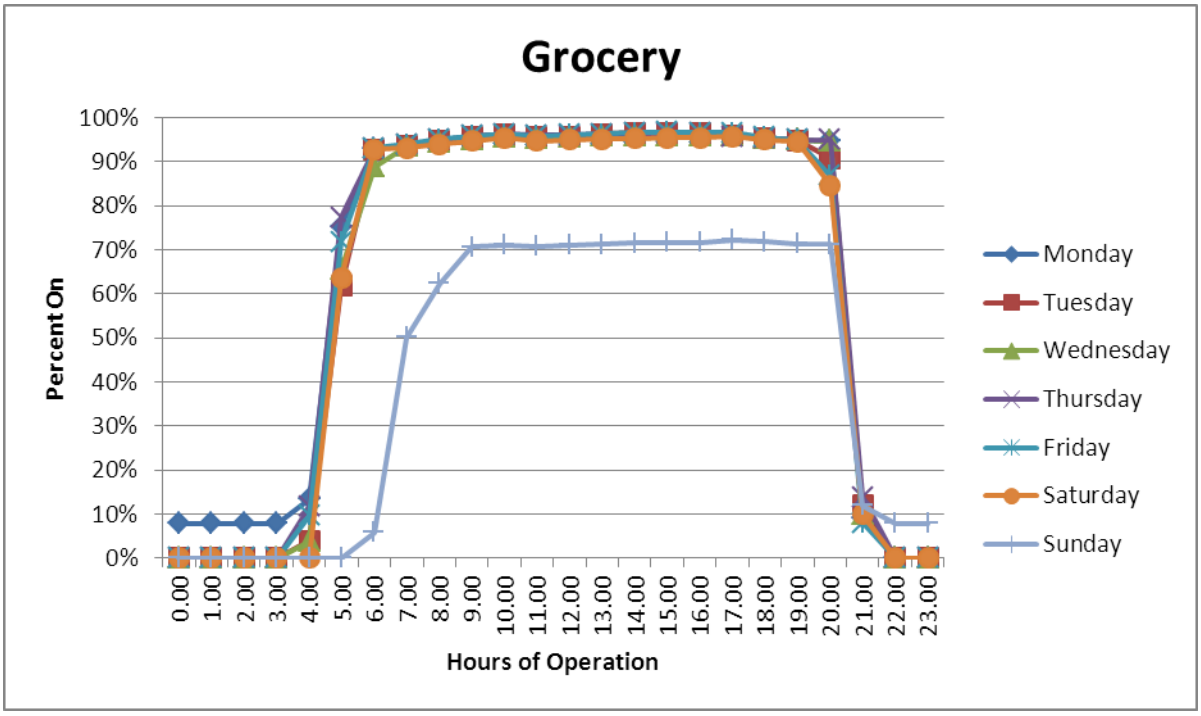
The kWh realization rate for OID-0147509 is 95.2% and the kW realization rate is 98.8%. The ex post calculations used higher hours of operation based on monitoring data than those used in ex ante estimates. The evaluator could not verify 68 fixtures—(12) 4’ 2-Lamp T8 fixtures, (18) 4’ 4-Lamp T8 fixtures, (6) 8’ 1-Lamp T8 fixtures, and (41) 8’ 2-Lamp T8 fixtures.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12 to 4' 2L T8 28W	3,196	0.70	96.3%	103.0%
4' 4L T12 to 4' 4L T8 28W	20,321	4.47	96.4%	103.0%
4' 2L T12 to 4' 1L T8 28W	10,566	2.32	96.4%	103.0%
8' 1L T12 to 8' 1L T8	2,992	0.54	86.9%	76.9%
8' 2L T12 to 8' 2L T8	2,988	0.00	71.0%	0.0%
8' 2L T12 to 8' 2L T8	77,441	17.02	96.3%	103.0%
Total	**117,504**	**25.05**	**95.2%**	**98.8%**

Appendix

Hours of Use



Project Number OID-1444391
Program Small Business Lighting

Project Background

The participant is a small office that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (3) 4' 2L 32W T8's, replacing 4' 2L 40W T12's;
- (64) 4' 4L 32W T8's, replacing 4' 4L 40W T12's;
- (2) 2W LED exit signs, replacing 40W incandescent exit signs; and
- (2) 8W LEDs, replacing 65W incandescent lamps;

The 8W LEDs were verified as being part of the same project. The contractor that filled out the paperwork did not include them in the application for savings, however. ADM has opted to credit those two fixtures to the program as spillover.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER Building Type	*CA DEER **Space Type***	*Annual Hours – Non-CFL*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Small Office	Small Office – Office (Open)	2,594	3,066	1.097	1.313	.81
	Exit Sign	8,760	8,760	1.097	1.313	1.00

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	3	3	94	60	2,594	2,594	347	290	1.097	83.6%
4' 4L T12 to 4' 4L T8	64	64	188	118	2,594	2,594	15,263	12,748	1.097	83.5%
65W Inc. to 8W LED - Int. Ballast	2	2	65	8	2,594	2,594	388	296	1.000	76.2%
1L 40W Inc. Exit to 1L 2W LED Exit	2	2	40	6	8,760	8,760	423	596	1.000	140.8%
						Total	**16,421**	**13,930**		**84.8%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	3	3	94	60	0.81	0.81	0.09	0.11	1.313	120.5%
4' 4L T12 to 4' 4L T8	64	64	188	118	0.81	0.81	4.06	4.76	1.313	117.4%
65W Inc. to 8W LED - Int. Ballast	2	2	65	8	0.81	0.81	0.10	0.09	1.000	92.3%
1L 40W Inc. Exit to 1L 2W LED Exit	2	2	40	6	1.00	1.00	0.12	0.07	1.000	56.7%
Total							**4.37**	**5.03**		**115.2%**

Results

The kWh realization rate for OID-1444391 is 84.8%. SPS ex ante estimates for offices use 3,435 hours annually. ADM applied CA DEER 2008 values of 2,594, which corresponded well with the facility's operating hours (open 42 hours per week).

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
4' 2L T12 to 4' 2L T8	290	0.11	83.6%	120.5%
4' 4L T12 to 4' 4L T8	12,748	4.76	83.5%	117.4%
65W Inc. to 8W LED - Int. Ballast	296	0.09	76.2%	92.3%
1L 40W Inc. Exit to 1L 2W LED Exit	596	0.07	140.8%	56.7%
Total	**13,930**	**5.03**	**84.8%**	**115.2%**

Project Number OID-1502727
Program Small Business Lighting Efficiency

Project Background

The participant is a mall office that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (21) 4' 4-Lamp 32W T8 fixture, replacing 4' 4-Lamp 40W T12 Fixtures; and
- (1) 4' 2-Lamp 32W T8 fixture, replacing 4' 2-Lamp 40W T12 Fixtures.

M&V Methodology

ADM found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Small Office	Small Office- Open	2,594	3,066	1.097	1.313	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures

HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 4L T12 to 4' 4L T8	21	21	188	118	2,594	2,594	N/A	4,183	1.097	N/A
4' 2L T12 to 4' 2L T8	1	1	94	60	2,594	2,594	N/A	97	1.097	N/A
						Total	**6,464**	**4,280**		**66.2%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 4L T12 to 4' 4L T8	21	21	188	118	2,594	2,594	N/A	1.56	1.313	N/A
4' 2L T12 to 4' 2L T8	1	1	94	60	2,594	2,594	N/A	0.04	1.313	N/A
Total							**2.37**	**1.60**		**67.5%**

Results

The kWh realization rate for OID-1502727 is 66.2% and the kW realization rate is 67.5%. The kWh realization rate is lower due to ADM finding a lower fixture count than listed in project documentation. In addition, ADM used lower operating hours in the space types receiving these fixtures, as per CA DEER 2008 guidelines, than the ex ante calculations.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
4' 4L T12 to 4' 4L T8	4,183	1.56	N/A	N/A
4' 2L T12 to 4' 2L T8	97	0.04	N/A	N/A
Total	**4,280**	**1.60**	**66.2%**	**67.5%**

Project Number OID-1530428
Program Small Business Lighting Efficiency

Project Background

The participant is a grocery store facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (28) 4' 1-Lamp 32W T8 fixtures, replacing 4' 1-Lamp 40W T12 fixtures;
- (27) 4' 2-Lamp 32W T8 fixtures, replacing 4' 2-Lamp 40W T12 fixtures;
- (83) 4' 3-Lamp 32W T8 fixtures, replacing 4' 4-Lamp 40W T12 fixtures;
- (40) 2-Lamp 13W CFL fixture, replacing 75W Incandescent fixtures.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Grocery	Retail Sales Area	4,964	3,942	1.110	1.339	0.70
	Exterior	4,312	4,312	1.000	1.000	0.00

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
4' 1L T12 to 4' 1L T8	28	28	47	28	4,964	4,964	3,366	2,931	1.110	87.1%
4' 2L T12 to 4' 2L T8	27	27	94	54	4,964	4,964	7,356	5,951	1.110	80.9%
4' 4L T12 to 4' 3L T8	83	83	188	81	4,964	4,964	46,557	48,935	1.110	105.1%
75W Inc. to 2L 13W CFL Multi 4-Pin	18	18	53	30	4,312	4,312	3,462	1,785	1.000	51.6%
75W Inc. to 2L 13W CFL Multi 4-Pin	22	22	53	30	3,942	3,942	4,231	2,214	1.110	52.3%
						Total	**64,971**	**61,816**		**95.1%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 1L T12 to 4' 1L T8	28	28	47	28	0.70	0.70	0.69	0.50	1.339	72.1%
4' 2L T12 to 4' 2L T8	27	27	94	54	0.70	0.70	1.51	1.01	1.339	66.9%
4' 4L T12 to 4' 3L T8	83	83	188	81	0.70	0.70	9.57	8.32	1.339	87.0%
75W Inc. to 2L 13W CFL Multi 4-Pin	18	18	53	30	0.00	0.00	0.71	0.00	1.000	0.0%
75W Inc. to 2L 13W CFL Multi 4-Pin	22	22	53	30	0.70	0.70	0.87	0.47	1.339	54.5%
Total							**13.36**	**10.31**		**77.2%**

Results

The kWh realization rate for OID-1530428 is 95.1% and the kW realization rate is 77.2%. The verified savings used a peak coincidence factor of 0.74 and the ex-ante calculations used a peak coincidence factor of 0.94, which lowered the kW realization rate. In addition, the ex-ante calculations did not account for the exterior CFL lighting having a peak coincidence factor of one.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 1L T12 to 4' 1L T8	2,931	0.50	87.1%	72.1%
4' 2L T12 to 4' 2L T8	5,951	1.01	80.9%	66.9%
4' 4L T12 to 4' 3L T8	48,935	8.32	105.1%	87.0%
75W Inc. to 2L 13W CFL Multi 4-Pin	1,785	0.00	51.6%	0.0%
75W Inc. to 2L 13W CFL Multi 4-Pin	2,214	0.47	52.3%	54.5%
Total	**61,816**	**10.31**	**95.1%**	**77.2%**

Project Number OID-1560485
Program Small Business Lighting Efficiency

Project Background

The participant is an Office Building that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (571) 4' 4-Lamp 32W T8 fixtures, replacing 4' 4-Lamp 40W T12 fixtures;
- (52) 4' 2-Lamp 32W T8 fixtures, replacing 4' 4-Lamp 40W T12 fixtures;
- (44) 8' 2L T8 fixtures, replacing 8' 2L T12 fixtures;
- (14) 13W CFL lamps, replacing 60W Incandescent lamps;
- (6) 2-Lamp 2W LED Exit Signs, replacing 2-Lamp 40W Incandescent Exit Signs.

M&V Methodology

ADM verified all fixtures listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Large Office	Large Office- Open	2,641	3,100	1.111	1.303	0.81
	Large Office- Restrooms	2,692	3,860	1.111	1.303	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
4' 4L T12 to 4' 4L T8	568	568	188	112	2,641	2,641	136,800	126,661	1.111	92.6%
4' 4L T12 to 4' 4L T8	3	3	188	112	2,641	2,641	723	669	1.111	92.6%
4' 2L T12 to 4' 2L T8	21	21	94	58	2,641	2,641	2,396	2,218	1.111	92.6%
4' 2L T12 to 4' 2L T8	49	49	94	58	2,641	2,641	5,590	5,176	1.111	92.6%
8' 2L T12 to 8' 2L T8	44	44	176	110	2,641	2,641	9,203	8,521	1.111	92.6%
60W Inc. to 13W CFL	14	14	60	13	3,860	3,860	2,085	2,822	1.111	135.3%
2L 40W Inc. Exit to 2L 2W LED Exit	6	6	80	9	8,760	8,760	1,350	4,146	1.111	307.1%
						Total	**158,147**	**150,213**		**95.0%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 4L T12 to 4' 4L T8	568	568	188	112	0.81	0.81	36.66	45.56	1.303	124.3%
4' 4L T12 to 4' 4L T8	3	3	188	112	0.81	0.81	0.19	0.24	1.303	124.3%
4' 2L T12 to 4' 2L T8	21	21	94	58	0.81	0.81	0.66	0.80	1.303	121.2%
4' 2L T12 to 4' 2L T8	49	49	94	58	0.81	0.81	1.54	1.86	1.303	121.2%
8' 2L T12 to 8' 2L T8	44	44	176	110	0.81	0.81	2.68	3.06	1.303	114.5%
60W Inc. to 13W CFL	14	14	60	13	0.81	0.81	0.61	0.69	1.303	114.5%
Total							**42.73**	**52.78**		**123.5%**

Results

The kWh realization rate for OID-1560485 is 95.0% and the kW realization rate is 123.5%. Deviations from parameters used in ex ante estimates (including hours of use and HCEF) caused slight changes in savings calculations.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 4L T12 to 4' 4L T8	126,661	45.56	92.6%	124.3%
4' 4L T12 to 4' 4L T8	669	0.24	92.6%	124.3%
4' 2L T12 to 4' 2L T8	2,218	0.80	92.6%	121.2%
4' 2L T12 to 4' 2L T8	5,176	1.86	92.6%	121.2%
8' 2L T12 to 8' 2L T8	8,521	3.06	92.6%	114.5%
60W Inc. to 13W CFL	2,822	0.69	135.3%	114.5%
2L 40W Inc. Exit to 2L 2W LED Exit	4,146	0.56	307.1%	141.3%
Total	**150,213**	**52.78**	**95.0%**	**123.5%**

Project Number OID-1560712
Program Small Business Lighting

Project Background

The participant is a large single-story retail facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (4) 4' 2L T8's, replacing 4' 2L T12's in the sales area;
- (3) 4' 4L T8's, replacing 4' 4L T12's in the sales area;
- (199) 8' 2L T8's, replacing 8' 2L T12's in the sales area;
- (29) 4' 4L T8's, replacing 4' 4L T12's in the offices; and
- (6) 8' 2L T8's, replacing 8' 2L T12's in the offices.

Some fixtures failed verification. Specifically, ADM found that

- (2) out of (6) 4' 2L T8's failed verification;
- (9) out of (41) 4' 4L T8's failed verification; and
- (24) out of (229) 8' 2L T8's failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER Building Type	*CA DEER **Space Type***	*Annual Hours – Non-CFL*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Large Single Story Retail	Sales Area	4,454	4,512	1.348	1.277	.81
	Office (General)	2,714	2,717.88	1.348	1.277	.88

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
4' 2L T12 to 4' 2L T8	4	4	94	60	4,454	4,454	369	672	1.109	182.1%
4' 4L T12 to 4' 4L T8	3	3	188	118	4,454	4,454	570	1,037	1.109	182.0%
8' 2L T12 to 8' 2L T8	199	199	173	110	4,454	4,454	34,036	61,926	1.109	181.9%
4' 4L T12 to 4' 4L T8	29	29	188	118	2,714	2,714	5,511	6,110	1.109	110.9%
8' 2L T12 to 8' 2L T8	6	6	173	110	2,714	2,714	1,026	1,138	1.109	110.9%
						Total	**41,512**	**70,883**		**170.8%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	4	4	94	60	0.88	0.88	0.14	0.16	1.348	115.2%
4' 4L T12 to 4' 4L T8	3	3	188	118	0.88	0.88	0.21	0.25	1.348	118.6%
8' 2L T12 to 8' 2L T8	199	199	173	110	0.88	0.88	12.50	14.87	1.348	119.0%
4' 4L T12 to 4' 4L T8	29	29	188	118	0.88	0.88	2.01	2.41	1.348	119.8%
8' 2L T12 to 8' 2L T8	6	6	173	110	0.88	0.88	0.38	0.45	1.348	118.0%
Total							**15.24**	**18.14**		**119.0%**

Results

The kWh realization rate for OID-1560712 is 170.8%. SPS ex ante estimates for retail use 3,068 hours annually. This represents a combination of small and large retail. ADM applied CA DEER 2008 values, which distinguish between small and large retail (with the elater having longer hours). For large retail, hours of use are 4,454 annually. This made up for shortfalls due to failed verification of 35 fixtures.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12 to 4' 2L T8	672	0.16	182.1%	115.2%
4' 4L T12 to 4' 4L T8	1,037	0.25	182.0%	118.6%
8' 2L T12 to 8' 2L T8	61,926	14.87	181.9%	119.0%
4' 4L T12 to 4' 4L T8	6,110	2.41	110.9%	119.8%
8' 2L T12 to 8' 2L T8	1,138	0.45	110.9%	118.0%
Total	**70,883**	**18.14**	**170.8%**	**119.0%**

Project Number OID-1560931
Program Small Business Lighting Efficiency

Project Background

The participant is an office building that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (7) 8' 2-Lamp 59W T8 fixtures, replacing 8' 2-Lamp 75W T12 fixtures;
- (2) 23W CFLs, replacing 60W Incandescent lamps.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Office	Office - Open	2,594	3,066	1.097	1.313	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	CEF	kWh Realization Rate
	Base	Post	Base	Post	Base	Post				
8' 2L T12 to 8' 2L T8	7	7	145	110	2,594	2,594	1,086	697	1.097	64.2%
60W Inc. to 23W CFL	2	2	60	23	3,066	3,066	328	249	1.097	75.9%
Total							**1,414**	**946**		**66.9%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	CDF	kW Realization Rate
	Base	Post	Base	Post	Base	Post				
8' 2L T12 to 8' 2L T8	7	7	145	110	0.81	0.81	0.30	0.26	1.313	87.0%
60W Inc. to 23W CFL	2	2	60	23	0.81	0.81	0.09	.08	1.313	87.0%
Total							**0.39**	**.34**		**87.0%**

Results

The kWh realization rate for OID-1560931 is 66.9% and the kW realization rate is 87.0%. The kWh realization rate is low because the ex-ante calculations used higher operating hours than the ex-post calculations.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
8' 2L T12 to 8' 2L T8	697	0.26	64.2%	87.0%
60W Inc. to 23W CFL	249	.08	75.9%	87.0
Total	**946**	**0.34**	**66.9%**	**87.0%**

Project Number OID-1561333
Program Small Business Lighting

Project Background

The participant is a medical facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (4) 4' 2L 32W T8's, replacing 4' 2L 40W T12's in the file room;
- (3) 4' 4L 32W T8's, replacing 4' 4L 40W T12's in exam rooms;
- (17) 4' 2L 32W T8's, replacing 4' 2L 40W T12's in exam rooms;
- (16) 23W CFLs, replacing a 60W incandescent lamp in restrooms;
- (17) 4' 1L 32W T8's, replacing 4' 1L 40W T12's in corridors;
- (6) 4' 2L 32W T8's, replacing 4' 2L 40W T12's in the reception area;

All fixtures listed in the application were verified on site.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER Building Type	*CA DEER **Space Type***	*Annual Hours – Non-CFL*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Hospital	Office	4,873	4,216	1.172	1.479	0.90
	Exam Rooms	5,193	4,317	1.172	1.479	0.75

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
4' 2L T12 to 4' 2L T8	4	4	86	60	4,873	4,873	608	562	1.108	92.4%
4' 4L T12 to 4' 4L T8	3	3	172	118	5,193	5,193	939	932	1.108	99.3%
4' 2L T12 to 4' 2L T8	17	17	86	60	5,193	5,193	2,584	2,543	1.108	98.4%
60W Inc. to 23W CFL	16	16	60	23	4,216	4,216	2,647	2,765	1.108	104.5%
4' 1L T12 to 4' 1L T8	17	17	43	32	4,873	4,873	1,140	1,010	1.108	88.6%
4' 2L T12 to 4' 2L T8	6	6	86	60	4,873	4,873	913	842	1.108	92.3%
						Total	**8,831**	**8,654**		**98.0%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	4	4	86	60	0.90	0.90	0.18	0.10	1.043	54.2%
4' 4L T12 to 4' 4L T8	3	3	172	118	0.75	0.75	0.28	0.13	1.043	45.3%
4' 2L T12 to 4' 2L T8	17	17	86	60	0.75	0.75	0.77	0.35	1.043	44.9%
60W Inc. to 23W CFL	16	16	60	23	0.90	0.90	0.79	0.56	1.043	70.3%
4' 1L T12 to 4' 1L T8	17	17	43	32	0.90	0.90	0.34	0.18	1.043	51.6%
4' 2L T12 to 4' 2L T8	6	6	86	60	0.90	0.90	0.26	0.15	1.043	56.3%
Total							**2.62**	**1.45**		**55.3%**

Results

The kWh realization rate for OID-1561333 is 98.0%. No significant realization issues.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12 to 4' 2L T8	562	0.10	92.4%	54.2%
4' 4L T12 to 4' 4L T8	932	0.13	99.3%	45.3%
4' 2L T12 to 4' 2L T8	2,543	0.35	98.4%	44.9%
60W Inc. to 23W CFL	2,765	0.56	104.5%	70.3%
4' 1L T12 to 4' 1L T8	1,010	0.18	88.6%	51.6%
4' 2L T12 to 4' 2L T8	842	0.15	92.3%	56.3%
Total	**8,654**	**1.45**	**98.0%**	**55.3%**

Project Number OID-1578547
Program Small Business Lighting Efficiency

Project Background

The participant is a retail facility that received incentives from SPS for implementing energy efficient lighting. On-site, the evaluators verified the participant had installed:

- (5) 4' 2-Lamp 32W T8, replacing 4' 2-Lamp 34W T12 fixtures;
- (11) 4' 4-Lamp 32W T8, replacing 4' 4-Lamp 34W T12 fixtures;
- (32) 8' 2-Lamp 32W T8, replacing 8' 2-Lamp 75W T12 fixtures;
- (10) 8' 2-Lamp 32W T8, replacing 8' 2-Lamp 75W T12 fixtures;
- (2) 4' 4-Lamp 32W T8, replacing 4' 4-Lamp 34W T12 fixtures;
- (2) 8' 2-Lamp 32W T8, replacing 8' 2-Lamp 75W T12 fixtures;
- (3) 8' 2-Lamp 32W T8, replacing 8' 2-Lamp 75W T12 fixtures.

M&V Methodology

The evaluators confirmed installation of all fixtures listed in the project application. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Small Retail	Sales Area	3,378	4,013	1.102	1.335	0.88
	Storage (conditioned)	2,753	2,550	1.102	1.335	0.88
Large Single Store Retail	Auto Repair Workshop	3,429	4,022	1.109	1.348	0.88

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, the evaluators calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = \left(kW_{base} - kW_{post}\right) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12ES to 4' 2L T8	5	5	72	58	3,378	3,378	178	261	1.102	146.3%
4' 3L T12ES to 4' 4L T8	11	11	144	112	3,378	3,378	1,045	1,310	1.102	125.4%
8' 2L T12 to 8' 2L T8	32	32	173	110	3,429	3,429	5,798	7,666	1.109	132.2%
8' 2L T12 to 8' 2L T8	10	10	173	110	3,429	3,429	1,870	2,160	1.000	115.5%
4' 3L T12ES to 4' 4L T8	2	2	144	112	3,378	3,378	190	238	1.102	125.4%
8' 2L T12 to 8' 2L T8	2	2	173	110	3,378	3,378	374	469	1.102	125.4%
8' 2L T12 to 8' 2L T8	3	3	173	110	2,753	2,753	561	573	1.102	102.2%
						Total	**10,016**	**12,678**		**126.6%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12ES to 4' 2L T8	5	5	72	58	0.88	0.88	0.07	0.08	1.335	125.7%
4' 3L T12ES to 4' 4L T8	11	11	144	112	0.88	0.88	0.38	0.41	1.335	107.7%
8' 2L T12 to 8' 2L T8	32	32	173	110	0.88	0.88	2.13	2.39	1.348	112.3%
8' 2L T12 to 8' 2L T8	10	10	173	110	0.88	0.88	0.69	0.55	1.000	80.7%
4' 3L T12ES to 4' 4L T8	2	2	144	112	0.88	0.88	0.07	0.08	1.335	107.7%
8' 2L T12 to 8' 2L T8	2	2	173	110	0.88	0.88	0.14	0.15	1.335	107.7%
4' 2L T12ES to 4' 2L T8	5	5	72	58	0.88	0.88	0.07	0.08	1.335	125.7%
Total							**3.41**	**3.58**		**105.1%**

Results

The kWh realization rate for OID-1578547 is 128.9% and the kW realization rate is 105.1%. The ex-post calculations used higher hours of use for the space types receiving the fixtures, as per CA DEER 2008 guidelines. The ex-post calculations used a lower peak coincidence factor for the space types receiving the fixtures, which lowered the kW realization rate. The ex-ante calculations did not differentiate between fixtures that were in different space types, especially between conditioned and unconditioned spaces, which increased realized savings. The Technical Assumptions for SB Lighting Efficiency is missing 59W T8s, so the ex-ante calculations miscalculated the post-retrofit fixture wattage. The evaluator verified a lower wattage for the baseline T12s than claimed.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12ES to 4' 2L T8	261	0.08	146.3%	125.7%
4' 3L T12ES to 4' 4L T8	1,310	0.41	125.4%	107.7%
8' 2L T12 to 8' 2L T8	7,666	2.39	132.2%	112.3%
8' 2L T12 to 8' 2L T8	2,160	0.55	115.5%	80.7%
4' 3L T12ES to 4' 4L T8	238	0.08	125.4%	107.7%
8' 2L T12 to 8' 2L T8	469	0.15	125.4%	107.7%
8' 2L T12 to 8' 2L T8	573	0.22	102.2%	107.7%
Total	**12,678**	**3.89**	**126.6%**	**105.3%**

Project Number OID-1579281
Program Small Business Lighting Efficiency

Project Background

The participant is a retail facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (130) 4' 2-Lamp T8 28W, replacing 4' 1-Lamp 40W T12 fixtures;
- (81) 4' 4-Lamp T8 28W, replacing 4' 4-Lamp 40W T12 fixtures;
- (4) 4' 2-Lamp T8 28W, replacing 4' 2-Lamp 40W T12 fixtures;
- (24) 4' 4-Lamp T8 28W, replacing 4' 4-Lamp 40W T12 fixtures;
- (16) 4' 4-Lamp T8 28W, replacing 4' 4-Lamp 40W T12 fixtures;
- (12) 4' 2-Lamp T8 28W, replacing 4' 2-Lamp 40W T12 fixtures;
- (16) 4' 3-Lamp T8 28W, replacing 4' 3-Lamp 40W T12 fixtures;
- (36) 4' 4-Lamp T8 28W, replacing 8' 2-Lamp 75W T12 fixtures.

M&V Methodology

ADM found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Large single Story Retail	Retail Sales Area	4,454	4,512	1.109	1.348	0.88
	Auto Repair Workshop	3,429	4,022	1.000	1.000	0.88
Storage	Storage (Unconditioned)	3,441	2,780	1.000	1.000	0.70

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8 28W	130	130	94	52	4,454	4,454	22,822	26,970	1.109	118.2%
4' 4L T12 to 4' 4L T8 28W	81	81	188	99	4,454	4,454	30,133	35,609	1.109	118.2%
4' 2L T12 to 4' 2L T8 28W	4	4	94	52	3,441	3,441	702	578	1.000	82.3%
4' 4L T12 to 4' 4L T8 28W	24	24	188	99	3,441	3,441	8,928	7,350	1.000	82.3%
4' 4L T12 to 4' 4L T8 28W	16	16	188	99	3,429	3,429	5,952	4,883	1.000	82.0%
4' 2L T12 to 4' 2L T8 28W	12	12	94	52	3,429	3,429	2,107	1,728	1.000	82.0%
4' 3L T12 to 4' 3L T8 28W	16	16	161	76	4,454	4,454	3,812	6,718	1.109	176.2%
8' 2L T12 to 4' 4L T8 28W	36	36	110	99	4,454	4,454	1,655	1,956	1.109	118.2%
						Total	**76,112**	**85,791**		**112.7%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8 28W	130	130	94	52	0.88	0.88	8.38	6.48	1.348	77.3%
4' 4L T12 to 4' 4L T8 28W	81	81	188	99	0.88	0.88	11.06	8.55	1.348	77.3%
4' 2L T12 to 4' 2L T8 28W	4	4	94	52	0.70	0.70	0.26	0.12	1.000	45.6%
4' 4L T12 to 4' 4L T8 28W	24	24	188	99	0.70	0.70	3.28	1.50	1.000	45.6%
4' 4L T12 to 4' 4L T8 28W	16	16	188	99	0.88	0.88	2.18	1.25	1.000	57.4%
4' 2L T12 to 4' 2L T8 28W	12	12	94	52	0.88	0.88	0.77	0.44	1.000	57.4%
4' 3L T12 to 4' 3L T8 28W	16	16	161	76	0.88	0.88	1.40	1.61	1.348	115.3%
8' 2L T12 to 4' 4L T8 28W	36	36	110	99	0.88	0.88	0.61	0.47	1.348	77.3%
Total							**27.94**	**20.42**		**73.1%**

Results

The kWh realization rate for OID-1579281 is 112.7% and the kW realization rate is 73.1%. The evaluator was unable to verify 12 4' 3-Lamp 28W T8 fixtures and 36 4' 4-Lamp fixtures. The ex-post calculations used higher hours of use for the space types receiving the fixtures, as per CA DEER 2008 guidelines. The ex-post calculations used a lower peak coincidence factor for the space types receiving the fixtures, which lowered the kW realization rate. The ex-ante calculations did not differentiate between fixtures that were in conditioned and unconditioned spaces, which lowered the kW realization rate. The Deemed Savings Technical Assumptions for SB Lighting Efficiency is missing 28W T8 fixtures, so the ex-ante calculations miscalculated the fixture wattage for the post-retrofit fixtures.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
4' 2L T12 to 4' 2L T8 28W	26,970	6.48	118.2%	77.3%
4' 4L T12 to 4' 4L T8 28W	35,609	8.55	118.2%	77.3%
4' 2L T12 to 4' 2L T8 28W	578	0.12	82.3%	45.6%
4' 4L T12 to 4' 4L T8 28W	7,350	1.50	82.3%	45.6%
4' 4L T12 to 4' 4L T8 28W	4,883	1.25	82.0%	57.4%
4' 2L T12 to 4' 2L T8 28W	1,728	0.44	82.0%	57.4%
4' 3L T12 to 4' 3L T8 28W	6,718	1.61	176.2%	115.3%
8' 2L T12 to 4' 4L T8 28W	1,956	0.47	118.2%	77.3%
Total	**85,791**	**20.42**	**112.7%**	**73.1%**

Project Number OID-1582524
Program Small Business Lighting Efficiency

Project Background

The participant is a small office that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (2) 4' 2-Lamp 32W T8 fixture, replacing 4' 4-Lamp 40W T12 fixtures; and
- (16) 4' 4-Lamp T8 32W, replacing 4' 4-Lamp 40W T12 fixtures.

M&V Methodology

ADM found some fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	*CA DEER 2008 Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Small Office	Small Office- Open	2,594	3,066	1.097	1.313	0.81

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW

$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	2	2	94	60	2,594	2,594	N/A	194	1.097	N/A
4' 4L T12 to 4' 4L T8	16	16	188	118	2,594	2,594	N/A	3,187	1.097	N/A
						Total	**5,220**	**3,381**		**64.8%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 4' 2L T8	2	2	94	60	2,594	2,594	N/A	0.07	1.313	N/A
4' 4L T12 to 4' 4L T8	16	16	188	118	2,594	2,594	N/A	1.19	1.313	N/A
Total							**1.42**	**1.26**		**89.0%**

Results

The kWh realization rate for OID-1582524 is 64.8% and the kW realization rate is 89.0%. The kWh realization rate is lower because the amount of fixtures used for the ex ante calculations are lower than the ADM's verified amount of installed fixtures. In addition, ADM used higher operating hours in the space types receiving these fixtures, as per CA DEER 2008 guidelines, than the ex ante calculations.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
4' 2L T12 to 4' 2L T8	194	0.07	N/A	N/A
4' 4L T12 to 4' 4L T8	3,187	1.19	N/A	N/A
Total	**3,381**	**1.26**	**64.8%**	**89.0%**

Project Number OID-1585063
Program Small Business Lighting

Project Background

The participant is a motel that received incentives from SPS for installing occupancy sensors. On-site, ADM verified the participant had installed:

- (4) occupancy sensors, controlling 16 4' 2L T8 fixtures in laundry, kitchen, and office areas.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	*Annual Hours*	*HCEF*	*HCDF*	*PCF*
Hotel/Motel	Laundry	4,154	1.148	1.566	0.79
Hotel/Motel	Kitchen	3,317	1.148	1.566	.71
Hotel/Motel	Office	4,524	1.148	1.566	.88

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (PCF_{base} - PCF_{post}) * HCDF * kW$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

PCF_{base}	% time on during peak period, pre.
PCF_{post}	% time on during peak period, with controls installed.
kW	Total connected load controlled by the sensors
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
Occ. Sensor on 4' 2L T8	10	10	59	59	4,154	2,908	513	844	1.148	164.5%
Occ. Sensor on 4' 2L T8	2	2	59	59	3,317	2,322	103	135	1.148	130.9%
Occ. Sensor on 4' 2L T8	1	1	59	59	4,154	2,908	51	84	1.148	165.5%
Occ. Sensor on 4' 2L T8	3	3	59	59	4,524	3,167	154	276	1.148	179.1%
						Total	**821**	**1,339**		**163.1%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
Occ. Sensor on 4' 2L T8	10	10	59	59	0.79	0.55	0.04	0.22	1.566	547.4%
Occ. Sensor on 4' 2L T8	2	2	59	59	0.71	0.50	0.01	0.04	1.566	393.6%
Occ. Sensor on 4' 2L T8	1	1	59	59	0.88	0.62	0.00	0.02	1.566	#DIV/0!
Occ. Sensor on 4' 2L T8	3	3	59	59	0.79	0.55	0.01	0.07	1.566	656.9%
Total							**0.06**	**0.35**		**580.7%**

Results

The kWh realization rate for OID-1585063 is 163.1%. Realization high due to a greater reduction in hours than anticipated in the low-use spaces.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
Occ. Sensor on 4' 2L T8	844	0.22	164.5%	547.4%
Occ. Sensor on 4' 2L T8	135	0.04	130.9%	393.6%
Occ. Sensor on 4' 2L T8	84	0.02	165.5%	N/A
Occ. Sensor on 4' 2L T8	276	0.07	179.1%	656.9%
Total	**1,339**	**0.35**	**163.1%**	**580.7%**

Project Number OID-1587068
Program Small Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (280) 13.5W LED lamps, replacing 75W incandescent lamps.

The project application included 310 LED lamps. On-site, ADM found 30 LEDs in storage as spares.

M&V Methodology

Savings were calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	***Annual Hours – Non-CFLs***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Motel	Motel – Guest Room	755	755	1.295	0.08	0.08

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*CEF*	*kWh Realization Rate*
	Base	**Post**	**Base**	**Post**	**Base**	**Post**				
75W Inc. to 13.5W - Int. Ballast	280	280	53	13.5	755	755	15,366	7,757	0.929	50.5%
Total							**15,366**	**7,757**		**50.5%**

Lighting Retrofit kW Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*PCF*		*Expected kW Savings*	*Realized kW Savings*	*CDF*	*kW Realization Rate*
	Base	**Post**	**Base**	**Post**	**Base**	**Post**				
75W Inc. to 13.5W - Int. Ballast	280	280	53	13.5	0.08	0.08	8.20	1.15	1.295	14.0%
	Total						**8.20**	**1.15**		**14.0%**

Results

The kWh realization rate for OID-1587068 is 50.5% and the kW realization rate is 14.0%. The kWh and kW realization rates are low because only 280 fixtures were verified out of the original 310 fixtures reported.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
75W Inc. to 13.5W - Int. Ballast	7,757	1.15	50.5%	14.0%
Total	**7,757**	**1.15**	**50.5%**	**14.0%**

Project Number OID-1587111
Program Small Business Lighting

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (152) 13.5W LED lamps, replacing 75W incandescent lamps in the guestrooms.
- (38) 16W LED lamps, replacing 65W incandescent lamps in guestrooms.

Initial project estimates were for 152 13.5W LEDs and 38 16W LEDs. A total of 133 LEDs failed verification.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	*Annual Hours – CFLs/LEDs*	*HCEF*	*HCDF*	*PCF*
Hotel/Motel	Guestroom	799	1.148	1.566	0.11

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
75W Inc. to 13.5W LED	38	38	53	13.5	799	799	2,833	1,377	1.148	48.6%
65W Inc. to 16W LED	152	152	65	16	799	799	14,060	6,832	1.148	48.6%
						Total	**16,893**	**8,208**		**48.6%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
75W Inc. to 13.5W LED	38	38	53	13.5	.11	.11	1.51	.26	1.566	17.1%
65W Inc. to 16W LED	152	152	65	16	.11	.11	7.51	1.28	1.566	17.1%
Total							**9.02**	**1.54**		**17.1%**

Results

The kWh realization rate for OID-1587111 is 48.6%. Realization is low due to a high verification failure rate. Only 190 out of 323 fixtures could be verified.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	*kW Savings*	*kWh Realization Rate*	*kW Realization Rate*
75W Inc. to 13.5W LED	1,377	.26	48.6%	17.1%
65W Inc. to 16W LED	6,832	1.28	48.6%	17.1%
Total	**8,208**	**1.54**	**48.6%**	**17.1%**

Project Number OID-1589481
Program Small Business Lighting

Project Background

The participant is a fast food restaurant that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (9) 8W LEDs, replacing 40W incandescent lamps; and
- (12) 8W LEDs, replacing 30W incandescent lamps.

All rebated fixtures were verified on-site.

M&V Methodology

After verified counts were determined, savings were then calculated using values for hours of use and Peak Coincident Factor (PCF) as stated in CA DEER 2008 along with a stipulated Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER Building Type	*CA DEER Space Type*	*Annual Hours – Non-CFL*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Fast Food	Dining Area	4,850	4,850	1.087	1.277	.81

Savings Calculations Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon an SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
40W Inc. to 8W LED - Int. Ballast	9	9	40	8	4,850	4,850	1,074	1,518	1.087	141.4%
30W Inc. to 8W LED - Int. Ballast	12	12	30	8	4,850	4,850	1,431	1,392	1.087	97.3%
						Total	**2,505**	**2,910**		**116.2%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
40W Inc. to 8W LED - Int. Ballast	9	9	40	8	0.81	0.81	0.29	0.30	1.277	102.7%
30W Inc. to 8W LED - Int. Ballast	12	12	30	8	0.81	0.81	0.39	0.27	1.277	70.0%
Total							**0.68**	**0.57**		**84.0%**

Results

The kWh realization rate for OID-1589481 is 116.2%. SPS ex ante estimates for offices use 4,156 hours annually. ADM applied CA DEER 2008 values of 4,850.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
40W Inc. to 8W LED - Int. Ballast	1,518	0.30	141.4%	102.7%
30W Inc. to 8W LED - Int. Ballast	1,392	0.27	97.3%	70.0%
Total	**2,910**	**0.57**	**116.2%**	**84.0%**

Project Number OID-1614399
Program Small Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (74) 13.5W LED lamps, replacing 75W incandescent lamps in corridors;
- (499) 13.5W LED lamps, replacing 75W incandescent lamps in guest rooms; and
- (55) 18W LED lamps, replacing 125W incandescent lamps.

The project application listed 624 13.5W LED lamps. 51 LEDs failed verification. Further, ADM found that the 18W LEDs replaced 125W incandescent fixtures in guest room bathrooms. The project application listed 75W incandescent lamps as the baseline for all fixtures.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	*CA DEER 2008 Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Motel	Guest Room	755	755	0.08	0.08	1.295
	Corridor	7,474	7,474	0.90	0.90	1.295

Savings Calculations

Using deemed values from the table above data, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

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Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***CEF***	***kWh Realization Rate***
	Base	**Post**	**Base**	**Post**	**Base**	**Post**				
75W Inc. to 13.5W LED - Int. Ballast	74	74	53	13.5	7,474	7,474	7,559	20,295	0.929	268.5%
75W Inc. to 13.5W LED - Int. Ballast	499	499	53	13.5	755	755	50,975	13,825	0.929	27.1%
125W Inc. to 18W LED - Int. Ballast	58	58	125	18	755	755	16,050	4,353	0.929	27.1%
						Total	**74,584**	**38,473**		**51.6 %**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	CDF	kW Realization Rate
	Base	Post	Base	Post	Base	Post				
75W Inc. to 13.5W LED - Int. Ballast	74	74	53	13.5	0.90	0.90	1.81	3.41	1.295	188.7%
75W Inc. to 13.5W LED - Int. Ballast	499	499	53	13.5	0.08	0.08	12.17	2.04	1.295	16.8%
125W Inc. to 18W LED - Int. Ballast	58	58	125	18	0.08	0.08	3.83	0.64	1.295	16.8%
						Total	**17.81**	**6.09**		**34.2%**

Results

The kWh realization rate for OID-1614399 is 51.6% and the kW realization rate is 34.2%. The ex-ante calculations are low for several reasons. Only 74 out of 125 fixtures were verified in the common room lighting. The number of guest room fixtures was also varied room-to-room, which may explain a discrepancy in the amount of fixtures replaced. The lighting found in some of the rooms had 125W incandescent lamps in the restroom, as opposed to the 75W lamps listed in the project application.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
75W Inc. to 13.5W LED - Int. Ballast	20,295	3.41	268.5%	188.7%
75W Inc. to 13.5W LED - Int. Ballast	13,825	2.04	27.1%	16.8%
125W Inc. to 18W LED - Int. Ballast	4,353	0.64	27.1%	16.8%
Total	**38,473**	**6.09**	**51.6 %**	**34.2%**

Project Number OID-1622750
Program Small Business Lighting Efficiency

Project Background

The participant is a Secondary School facility that received incentives from SPS for implementing energy efficient lighting in their gymnasium. On-site, ADM verified the participant had installed:

- (16) 4' 4-Lamp T5 54W fixtures, replacing 400W Metal Halide fixtures;
- (32) 4' 6-Lamp T5 54W fixtures, replacing 400W Metal Halide fixtures.

M&V Methodology

ADM confirmed installation of all fixtures listed in the project application. Savings were then calculated using annual hours of operation based on a facility schedule from facility staff interviews and CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Secondary School	Gymnasium	2,366	2,532	1.067	1.344	0.42

Savings Calculations

Using deemed values from the table above, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS-defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
400W MH to 4' 4L T5HO	16	16	453	234	2,366	2,366	8,433	8,846	1.067	104.9%
400W MH to 4' 6L T5HO	32	32	453	362	2,366	2,366	7,008	7,351	1.067	104.9%
						Total	**15,441**	**16,197**		**104.9%**

Lighting Retrofit kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
400W MH to 4' 4L T5HO	16	16	453	234	0.42	0.42	3.54	1.98	1.344	55.8%
400W MH to 4' 6L T5HO	32	32	453	362	0.42	0.42	2.95	1.64	1.344	55.8%
Total							**6.49**	**3.62**		**55.8%**

Results

The kWh realization rate for OID-1622750 is 104.9% and the kW realization rate is 55.8%. The ex-post calculations used higher hours of use for the space types receiving the fixtures, as per CA DEER 2008 guidelines, with the Gymnasium subspace having higher runtime than average Secondary School subspaces. The kW realization rate is low because the ex-post calculations used a lower peak coincidence factor of 0.42 for the space types receiving the fixtures and the ex-ante calculations used a peak coincidence factor of 0.73.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
400W MH to 4' 4L T5HO	8,846	1.98	104.9%	55.8%
400W MH to 4' 6L T5HO	7,351	1.64	104.9%	55.8%
Total	**16,197**	**3.62**	**104.9%**	**55.8%**

Project Number OID 1634102
Program Small Business Lighting Efficiency

Project Background

The participant is a motel facility that received incentives from SPS for implementing energy efficient lighting. On-site, ADM verified the participant had installed:

- (712) 13.5W LED lamps, replacing 60W incandescent lamps in the guest rooms;
- (26) 13.5W LED lamps, replacing 60W incandescent lamps in the corridors and lobby; and
- (4) 13.5W LED lamps, replacing 60W incandescent lamps in the lobby restrooms.

The initial project application listed 841 LEDs. 99 lamps failed verification.

M&V Methodology

ADM confirmed installation of all lamps listed in the project application. Savings were then calculated using CA DEER 2008 deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

CA DEER 2008 Building Type	***CA DEER 2008 Space Type***	***Annual Hours – Non-CFLs***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Motel	Guest Room	755	755	1.295	0.929	0.08
	Corridor	7,474	7,474	1.295	0.929	0.90
	Office	5,858	5,858	1.295	0.929	0.70

Savings Calculations

Using deemed values from the table above data, ADM calculated lighting savings as follows:

$$Annual\ kWh\ Savings = \left(kW_{base} * Hours_{base} - kW_{post} * Hours_{post}\right) * HCEF$$

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

Following this, ADM calculated peak kW savings. This is based upon a SPS -defined peak of 3:00 – 6:00 PM during summer weekdays. Peak kW savings are calculated as:

$$Peak\ kW\ Savings = (kW_{base} - kW_{post}) * HCDF * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x $W/Fixture_{base}$ / 1000 W/kW
kW_{post}	Total Installed fixtures x $W/Fixture_{post}$ / 1000 W/kW
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	CEF	kWh Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	472	472	60	13.5	755	755	231,484	15,394	0.929	6.7%
60W Inc. to 13.5W LED	240	240	60	13.5	755	755	117,704	7,828	0.929	6.7%
60W Inc. to 13.5W LED	11	11	60	13.5	7,474	7,474	5,395	3,552	0.929	65.8%
60W Inc. to 13.5W LED	15	15	60	13.5	7,474	7,474	7,356	4,843	0.929	65.8%
60W Inc. to 13.5W LED	4	4	60	13.5	5,858	5,858	1,962	1,012	1.097	51.6%
	Total						**363,901**	**32,629**		**9.0%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	CDF	kW Realization Rate
	Base	Post	Base	Post	Base	Post				
60W Inc. to 13.5W LED	472	472	60	13.5	0.08	0.08	16.15	2.27	1.295	14.1%
60W Inc. to 13.5W LED	240	240	60	13.5	0.08	0.08	8.21	1.16	1.295	14.1%
60W Inc. to 13.5W LED	11	11	60	13.5	0.90	0.90	0.38	0.60	1.295	156.9%
60W Inc. to 13.5W LED	15	15	60	13.5	0.90	0.90	0.51	0.81	1.295	159.4%
60W Inc. to 13.5W LED	4	4	60	13.5	0.81	0.81	0.14	0.17	1.313	120.4%
	Total						**25.39**	**5.01**		**19.7%**

Results

The kWh realization rate for OID 1634102 is 9.0% and the kW realization rate is 19.7%. There are several reasons why the realizations rates were so low. The surveyor only verified 742 fixtures out of the original 841 fixtures. The evaluators also found that that the expected savings were calculated using 8,760 hours annually, meaning that the lights were calculated to be on 24/7/365. ADM used DEER 2008 hours of operation based on facility type for the ex post calculations, which resulted in much lower realized savings.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
60W Inc. to 13.5W LED	15,394	2.27	6.7%	14.1%
60W Inc. to 13.5W LED	7,828	1.16	6.7%	14.1%
60W Inc. to 13.5W LED	3,552	0.60	65.8%	156.9%
60W Inc. to 13.5W LED	4,843	0.81	65.8%	159.4%
60W Inc. to 13.5W LED	1,012	0.17	51.6%	120.4%
Total	**32,629**	**5.01**	**9.0%**	**19.7%**