Southwestern Public Service Company

Energy Efficiency and Load Management Annual Report

2009

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

Case No. 08-00333-UT
August 1, 2010

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Glossary of Acronyms and Definition

Acronym/Defined Term	**Meaning**
2009 Plan	SPS's 2009 Energy Efficiency and Load Management Plan
2009 Report	SPS's 2009 Energy Efficiency and Load Management Annual Report
Annual Energy Savings	Equates to Customer savings as originally filed in the April 20, 2009 filing.
ASHP	Air-Source Heat Pump
CFL	Compact Fluorescent Light bulb
BSC	Business Solutions Center
CIL	Contract Interruptible Load
EUEA	New Mexico Efficient Use of Energy Act, as amended by Senate Bill 418 (2007) and House Bill 305 (2008), §§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.
Generator kW; Generator kWh	Demand and energy savings, respectively, measured at the generator, corrected for transmission line losses and free-rider/drivership.
HES	Home Energy Services
HID	High Intensity Discharge
HVAC	Heating, Ventilation and Air Conditioning
LIHEAP	Low-Income Home Energy Assistance Program
ICO	Interruptible Credit Option
MFA	Mortgage Finance Authority, a low-income community agency
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.
NMPRC	New Mexico Public Regulation Commission
O&M	Operations and Maintenance
Rule	Energy Efficiency Rule, 17.7.2 NMAC
SPS	Southwestern Public Service Company
TRC	Total Resource Cost, a test of cost-effectiveness as defined in the Efficient Use of Energy Act
VFD/ASD	variable frequency/adjustable speed drives
Xcel Energy	Xcel Energy Inc.

Document Layout

This 2009 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 2009, organized into the Residential, Business, and Planning & Research Segments.
- Appendix A provides the Measurement and Verification ("M&V") Report of SPS's 2009 program year prepared by ADM Associates Inc.

Section I. Executive Summary

Introduction

In accordance with the Efficient Use of Energy Act ("EUEA"), as amended by Senate Bill 418 (2007) and House Bill 305 (2008) (§§62-17-1 through 62-17-11 NMSA 1978, "EUEA"), and the New Mexico Public Regulation Commission's ("Commission" or "NMPRC") Energy Efficiency Rule ("17.7.2 NMAC", "Rule"), Southwestern Public Service Company ("SPS") respectfully submits for Commission review SPS's 2009 Energy Efficiency and Load Management Annual Report ("2009 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 by August 1 of each year, a report on its energy efficiency and load management programs during the prior calendar year[1]. The specific reporting requirements are discussed in Section II.

With this 2009 Annual Report, SPS provides the expenditures and savings results for 16 energy efficiency and load management direct impact programs in the Residential Segment (including Low-Income) and Business Segment (including Large Customer). In addition, the Report includes a summary of the Planning and Research Segment, which supports the direct impact programs. The M&V Report of SPS's 2009 savings is included as Appendix A.

[1] SPS's future reports will be filed by May 1 of each year, in accordance to 17.7.2.13.B NMAC (Final Order Repealing and Replacing 17.7.2 NMAC, Case No. 08-00024-UT, effective May 3, 2010).

Background

SPS filed its 2009 Energy Efficiency and Load Management Plan on October 31, 2008 and received final approval from the Commission on March 31, 2009 in Case No. 08-00333-UT. In compliance with the Commission's Final Order in this case, SPS filed a compliance filing on April 20, 2009 in accordance with the Commission's Recommended Decision, decretal paragraphs F, G, H, and I, to update the tariff rider value; revise a Rate title to "Interruptible Credit Option Rider"; include a letter from Mortgage Finance Authority regarding $500,000 funding commitment; correct a table in the Cooling Efficiency Program; and adjust the Plan budget and savings to reflect a partial-year implementation.

The 2009 Plan was SPS's second energy efficiency and load management portfolio to be presented to the Commission under the EUEA.

This report reflects costs that SPS incurred during 2009 to launch 8 new programs between April 1 and July 1 2009, and continue administration of 8 programs which were first launched in June 2008 through SPS's 2008 Energy Efficiency and Load Management Plan.

Summary of Results

In 2009, SPS achieved verified electric savings of 2,992 kW and 15,757,821 kWh at the generator, at a total cost of $2,945,987.

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 filed with the Commission on April 20, 2009 in Case No. 08-00333-UT.

Table 2 below, provides SPS's actual 2009 program achievements, expenditures, and TRC test ratios, verified by the Independent Program Evaluator, ADM Associates.

Table 1: 2009 Program Goals and Budgets (as filed in Compliance Filing April 20, 2009)

Program	Participants	Budget	Peak Demand Savings kW *	Annual Energy Savings kWh **	Loss Factor	Generator kW	Generator kWh	TRC Test
Residential Segment								
Air-Source Heat Pumps	200	$101,500	195	756,070	11%	219	849,517	4.14
Evaporative Cooling Rebates	100	$68,409	99	116,159	11%	111	130,516	6.97
Home Energy Services	420	$721,936	221	1,666,537	11%	248	1,872,513	2.44
Home Lighting & Recycling	12,500	$373,998	167	2,518,313	11%	187	2,829,565	3.04
Low-Income	5,100	$296,145	114	1,373,313	11%	128	1,543,048	4.01
Refrigerator Recycling	1,000	$217,820	125	919,659	11%	140	1,033,324	3.25
School Education Kits	3,018	$210,596	25	947,859	11%	28	1,065,010	2.86
Residential Energy Efficiency Subtotal	**22,338**	**$1,990,404**	**945**	**8,297,909**	**11%**	**1,062**	**9,323,493**	
Saver's Switch - Residential	945	$448,810	966	3,268	11%	1,085	3,672	2.57
Residential Load Management Subtotal	**945**	**$448,810**	**966**	**3,268**	**11%**	**1,085**	**3,672**	
Residential Segment Total	**23,283**	**$2,439,214**	**1,911**	**8,301,176**	**11%**	**2,147**	**9,327,164**	**3.06**
Business Segment								
Cooling Efficiency	32	$285,077	404	1,390,122	9%	444	1,527,606	3.29
Custom Efficiency	28	$1,155,242	836	4,551,672	9%	919	5,001,837	5.39
Large Customer	0	$0	0	0	9%	0	0	0.00
Lighting Efficiency	122	$619,710	1,068	4,012,666	9%	1,174	4,409,524	2.89
Motor & Drive Efficiency	54	$123,708	150	835,008	9%	165	917,591	5.84
Small Business Lighting	18	$282,145	107	388,738	9%	117	427,185	2.53
Business Energy Efficiency Subtotal	**254**	**$2,465,882**	**2,565**	**12,047,295**	**9%**	**2,819**	**12,283,743**	
Interruptible Credit Option	0	$3,000	0	0	9%	0	0	0.00
Saver's Switch - Business	200	$105,832	401	3,519	9%	441	3,867	7.01
Business Load Management Subtotal	**200**	**$108,832**	**401**	**3,519**	**9%**	**441**	**3,867**	
Business Segment Total	**454**	**$2,574,714**	**2,966**	**12,050,814**	**9%**	**3,260**	**12,287,610**	**3.86**
Planning & Research Segment								
Consumer Education		$125,902						
DSM Planning & Administration		$344,000						
Market Research		$53,900						
Measurement & Verification		$99,000						
Product Development		$24,500						
Planning & Research Segment Total		**$647,302**						
2009 TOTAL	**23,737**	**$5,661,230**	**4,877**	**20,351,990**		**5,406**	**21,614,775**	**3.25**

* Peak Demand Savings kW not included in compliance filing; derived from Generator kW and loss factor.

** Annual Energy Savings equates to the Customer kWh as filed in April 20, 2009 filing.

Table 2: 2009 Program Achievements and Expenditures (As Verified in M&V Report)

Program	Participants	Expenditures	Peak Demand Savings kW*	Annual Energy Savings kWh**	Loss Factor	Generator kW	Generator kWh	TRC Test
Residential Segment								
Air-Source Heat Pumps	46	$48,854	21	39,717	11%	24	44,626	0.88
Evaporative Cooling Rebates	255	$93,405	213	224,396	11%	239	252,130	6.87
Home Energy Services	1,386	$911,846	1,124	3,925,493	11%	1,262	4,410,666	3.73
Home Lighting & Recycling	79,311	$330,910	328	3,164,866	11%	369	3,556,029	3.74
Low-Income	14,070	$231,621	78	736,709	11%	87	827,763	1.88
Refrigerator Recycling	87	$37,933	17	92,015	11%	19	103,388	1.37
School Education Kits	3,502	$157,385	32	876,762	11%	36	985,126	2.65
Residential Energy Efficiency Subtotal	**98,657**	**$1,811,953**	**1,812**	**9,059,958**	**11%**	**2,036**	**10,179,728**	**3.48**
Saver's Switch - Residential	0	$0	0	0	11%	0	0	N/A
Residential Load Management Subtotal	**0**	**$0**	**0**	**0**	**11%**	**0**	**0**	**N/A**
Residential Segment Total	**98,657**	**$1,811,953**	**1,812**	**9,059,958**	**11%**	**2,036**	**10,179,728**	**3.48**
Business Segment								
Cooling Efficiency	4	$28,771	32	72,936	9%	35	80,149	2.70
Custom Efficiency	0	$21,441	0	0	9%	0	0	0.00
Large Customer	0	$0	0	0	9%	0	0	N/A
Lighting Efficiency	23	$268,945	710	4,384,067	9%	780	4,817,656	11.88
Motor & Drive Efficiency	2	$51,097	49	260,023	9%	54	285,740	4.86
Small Business Lighting	12	$285,396	78	359,039	9%	85	394,548	1.36
Business Energy Efficiency Subtotal	**41**	**$655,651**	**869**	**5,076,065**	**9%**	**955**	**5,578,093**	**5.75**
Interruptible Credit Option	0	$2,071	0	0	9%	0	0	0.00
Saver's Switch - Business	0	$0	0	0	9%	0	0	N/A
Business Load Management Subtotal	**0**	**$2,071**	**0**	**0**	**9%**	**0**	**0**	**0.00**
Business Segment Total	**41**	**$657,721**	**869**	**5,076,065**	**9%**	**955**	**5,578,093**	**5.74**
Planning & Research Segment								
Consumer Education		$101,305						
DSM Planning & Administration		$311,181						
Market Research		$23,960						
Measurement & Verification		$7,367						
Product Development		$32,501						
Planning & Research Segment Total		**$476,313**						
2009 TOTAL	**98,698**	**$2,945,987**	**2,682**	**14,136,023**		**2,992**	**15,757,821**	**3.52**

* Peak Demand Savings kW not included in compliance filing; derived from Generator kW and loss factor.

** Annual Energy Savings equates to the Customer kWh as filed in April 20, 2009 filing.

As can be derived from Tables 1 and 2, the overall 2009 energy efficiency and load management portfolio met 73% of the energy savings goal while spending 52% of the budget. The overall portfolio was cost-effective, achieving a TRC test ratio of 3.52. Despite this fact, 2009 was a challenging year for SPS. While the Residential Segment exceeded goals in 2009, the Business Programs continued to experience lower than forecasted participation and the segment as a whole achieved 45% of the energy savings goal, while spending 27% of its budget. The successes and shortfalls of the individual programs are discussed in Section III of this report. SPS will continue to improve its programs and increase customer awareness of them in the coming years. SPS is optimistic that as customer awareness grows, the programs will see increased participation, which will support cost-effective programs.

SPS worked in good faith to comply with the EUEA and to offer cost-effective energy efficiency and load management programs to all of its customers. SPS will continue to work going forward to meet the statutory goals to obtain all cost-effective and achievable energy efficiency and load management, but no less than a reduction of 5% of 2005 retail sales by 2014 and 10% by 2020.

Section II: 17.7.2.13 NMAC Reporting Requirements

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

(1) Independent Measurement and Verification Report

17.7.2.13.C(1) requires that utilities provide a M&V Report provided by an Independent Program Evaluator ("Evaluator") every year with its Annual Report. Because this was a new endeavor, the Commission formed an Evaluation Committee made up of the New Mexico utilities and other interested parties to develop and standardize a contract for an Evaluator. This contract was finalized and signed with ADM Associates Inc. August 20, 2009. ADM completed an M&V Report on SPS's 2009 programs in June 2010, which is included in Appendix A of this Report. In compliance with the reporting requirements, the M&V Report should include:

- 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
    - measures are operating correctly and are expected to generate the predicted savings

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

In 2009, SPS spent a total of $2,945,987 for its energy efficiency 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 Independent Program Evaluator, ADM Associates.

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

SPS provided a forecasted budget in its April 20, 2009 Compliance Filing. At that time, SPS anticipated that it would spend a total of $5,661,230. In 2009 SPS had actual expenditures of $2,945,987. As presented in Table 3, below, SPS had a total of $2,715,243 of unspent funds in 2009. SPS addresses the reasons for these unspent funds in the "Deviation from Goal" section of each program discussion. These unspent funds will not be carried over into 2010. Any over-collection above projected spending is returned to customers, with interest (discussed further in item (5) of this section).

Note that SPS filed a motion to increase the budget over 25%, pursuant to 17.7.2.14.C NMAC (from the previous Energy Efficiency Rule), for the Evaporative Cooling Rebate Program on 9/3/2010 through case No. 09-00324-UT. Commission approval was received on 2/3/2010. SPS attempted to keep the Home Energy Services ("HES") Program 2009 budget under 125% and thus did not file a motion to increase the budget over 25%, pursuant to

17.7.2.14.C NMAC (from the previous Energy Efficiency Rule). However, at the end of the 2009 year, final invoices from contractors caused the HES Program to slightly exceed the cap and have a budget variance of 126%.

Table 3: 2009 Forecasted Budget, Actual Expenditures and Variance by Program

Program	Budget	Actual Spend	Variance
Residential Segment			
Air-Source Heat Pumps	$101,500	$48,854	($52,646)
Evaporative Cooling Rebates	$68,409	$93,405	$24,996
Home Energy Services	$721,936	$911,846	$189,910
Home Lighting & Recylcing	$373,998	$330,910	($43,088)
Low-Income	$296,145	$231,621	($64,524)
Refrigerator Recycling	$217,820	$37,933	($179,887)
School Education Kits	$210,596	$157,385	($53,211)
Residential Energy Efficiency Subtotal	**$1,990,404**	**$1,811,953**	**($178,451)**
Saver's Switch - Residential	$448,810	$0	($448,810)
Residential Load Management Subtotal	**$448,810**	**$0**	**($448,810)**
Residential Segment Total	**$2,439,214**	**$1,811,953**	**($627,261)**
Business Segment			
Cooling Efficiency	$285,077	$28,771	($256,306)
Custom Efficiency	$1,155,242	$21,441	($1,133,801)
Large Customer	$0	$0	$0
Lighting Efficiency	$619,710	$268,945	($350,765)
Motor & Drive Efficiency	$123,708	$51,097	($72,611)
Small Business Lighting	$282,145	$285,396	$3,251
Business Energy Efficiency Subtotal	**$2,465,882**	**$655,651**	**($1,810,231)**
Interruptible Credit Option	$3,000	$2,071	($929)
Saver's Switch - Business	$105,832	$0	($105,832)
Business Load Management Subtotal	**$108,832**	**$2,071**	**($106,761)**
Business Segment Total	**$2,574,714**	**$657,721**	**($1,916,993)**
Planning & Research Segment			
Consumer Education	$125,902	$101,305	($24,597)
DSM Planning & Administration	$344,000	$311,181	($32,819)
Market Research	$53,900	$23,960	($29,940)
Measurement & Verification	$99,000	$7,367	($91,633)
Product Development	$24,500	$32,501	$8,001
Planning & Research Segment Total	**$647,302**	**$476,313**	**($170,990)**
2009 TOTAL	**$5,661,230**	**$2,945,987**	**($2,715,243)**

(5) Tariff Collections

During 2009, the tariff rider was set at 0.9604 % of bills from January 1 through May 14; 2.0881% from May 15 through October 7; and 1.1759% from October 8 through December

31. As of December 31, 2009, SPS had recovered $3,580,067. Actual expenditures recorded in 2009 were $2,945,987, resulting in an over-collection of $1,082,314, when taking into account interest applied on the over-recovery balance. The current over-collected balance (as of June 30, 2010) is $1,048,712. At this time, SPS does not propose to update its tariff rider, because the over-collection balance is likely to decrease as spending continues in the last two quarters of 2010. SPS continues to monitor its tariff rider collection on a monthly basis and will request a revision if the balance continues to grow. In addition, SPS will make an energy efficiency filing on October 1, 2010, at which time SPS will review its over- or under-collection balance.

(6) Program-Specific Metrics

The following table provides SPS's 2009 program expenditures by cost category.

Table 4: Energy Efficiency Program Costs by Cost Category

Program	Total Incentive	Internal Admin.	Third-Party Delivery	Promotion	M&V	Total Cost
Residential Segment						
Air-Source Heat Pumps	$22,726	$25,230	$0	$898	$0	$48,854
Evaporative Cooling Rebates	$52,400	$22,487	$0	$18,518	$0	$93,405
Home Energy Services	$324,769	$62,557	$524,110	$410	$0	$911,846
Home Lighting & Recycling	$40,816	$35,309	$78,130	$176,655	$0	$330,910
Low-Income	$151,840	$14,723	$64,190	$868	$0	$231,621
Refrigerator Recycling	$3,045	$4,317	$10,005	$20,565	$0	$37,933
School Education Kits	$0	$6,500	$150,885	$0	$0	$157,385
Residential Energy Efficiency Subtotal	**$595,596**	**$171,123**	**$827,320**	**$217,914**	**$0**	**$1,811,953**
Saver's Switch - Residential	$0	$0	$0	$0	$0	$0
Residential Load Management Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Residential Segment Total	**$595,596**	**$171,123**	**$827,320**	**$217,914**	**$0**	**$1,811,953**
Business Segment						
Cooling Efficiency	$7,997	$18,765	$0	$2,009	$0	$28,771
Custom Efficiency	$0	$18,402	$0	$3,039	$0	$21,441
Large Customer	$0	$0	$0	$0	$0	$0
Lighting Efficiency	$222,488	$41,869	$0	$4,588	$0	$268,945
Motor & Drive Efficiency	$19,500	$30,920	$0	$677	$0	$51,097
Small Business Lighting	$50,868	$29,454	$202,135	$2,938	$0	$285,396
Business Energy Efficiency Subtotal	**$300,853**	**$139,411**	**$202,135**	**$13,252**	**$0**	**$655,651**
Interruptible Credit Option	$0	$2,071	$0	$0	$0	$2,071
Saver's Switch - Business	$0	$0	$0	$0	$0	$0
Business Load Management Subtotal	**$0**	**$2,071**	**$0**	**$0**	**$0**	**$2,071**
Business Segment Total	**$300,853**	**$141,481**	**$202,135**	**$13,252**	**$0**	**$657,721**
Planning & Research Segment						
Consumer Education	$0	$18,653	$0	$82,652	$0	$101,305
DSM Planning & Administration	$0	$311,181	$0	$0	$0	$311,181
Market Research	$0	$23,960	$0	$0	$0	$23,960
Measurement & Verification	$0	$0	$0	$0	$7,367	$7,367
Product Development	$0	$32,501	$0	$0	$0	$32,501
Planning & Research Segment Total	**$0**	**$386,293**	**$0**	**$82,652**	**$7,367**	**$476,313**
2009 TOTAL	**$896,449**	**$698,898**	**$1,029,456**	**$313,818**	**$7,367**	**$2,945,987**

The following paragraphs and tables provide program-specific information by items a) through g) which correspond to the items listed in 17.7.2.13.C(6) NMAC.

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 broken down by program

Please refer to the 2009 M&V Report in Appendix A which contains these costs by program.

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

Table 5, below, shows the total avoided supply-side costs for each program broken down by type of avoided cost (generation, transmission, and distribution).

Table 5: Avoided Costs by Program and Type (As Verified in M&V Report)

Program	Avoided Generation* Costs (NPV)	Avoided Transmission and Distribution* Costs (NPV)	Avoided Marginal Energy Costs (NPV)	Non-Electric Acquisition Costs (NPV)	Total Avoided Supply-Side Costs (NPV)
Residential Segment					
Air-Source Heat Pumps	$37,740	$7,548	$25,400	$0	$70,687
Evaporative Cooling Rebates	$358,319	$71,664	$164,243	$0	$594,226
Home Energy Services	$2,244,652	$448,930	$2,763,851	$193,715	$5,651,148
Home Lighting & Recycling	$297,644	$59,529	$1,373,866	$0	$1,731,039
Low-Income	$95,923	$19,185	$320,348	$0	$435,455
Refrigerator Recycling	$15,010	$3,002	$29,857	$0	$47,869
School Education Kits	$32,036	$6,407	$320,086	$58,424	$416,953
Residential Energy Efficiency Subtotal	**$3,081,323**	**$616,265**	**$4,997,651**	**$252,139**	**$8,947,377**
Saver's Switch - Residential	$0	$0	$0	$0	$0
Residential Load Management Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**
Residential Segment Total	**$3,081,323**	**$616,265**	**$4,997,651**	**$252,139**	**$8,947,377**
Business Segment					
Cooling Efficiency	$67,613	$13,523	$54,725	$0	$135,861
Custom Efficiency	$0	$0	$0	$0	$0
Large Customer	$0	$0	$0	$0	$0
Lighting Efficiency	$1,019,917	$203,983	$2,364,360	$0	$3,588,260
Motor & Drive Efficiency	$129,268	$25,854	$233,061	$0	$388,182
Small Business Lighting	$162,515	$32,503	$270,145	$0	$465,163
Business Energy Efficiency Subtotal	**$1,379,313**	**$275,863**	**$2,922,291**	**$0**	**$4,577,466**
Interruptible Credit Option	$0	$0	$0	$0	$0
Saver's Switch - Business	$0	$0	$0	$0	$0
Business Load Management Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**
Business Segment Total	**$1,379,313**	**$275,863**	**$2,922,291**	**$0**	**$4,577,466**
Planning & Research Segment					
Consumer Education	N/A	N/A	N/A	N/A	N/A
DSM Planning & Administration	N/A	N/A	N/A	N/A	N/A
Market Research	N/A	N/A	N/A	N/A	N/A
Measurement & Verification	N/A	N/A	N/A	N/A	N/A
Product Development	N/A	N/A	N/A	N/A	N/A
Planning & Research Segment Total	**$0**	**$0**	**$0**	**$0**	**$0**
2009 TOTAL	**$4,460,635**	**$892,127**	**$7,919,942**	**$252,139**	**$13,524,843**

* M&V Report included only Avoided Capacity Costs, which combined avoided generation with transmission and distribution (T&D) avoided capacity costs as filed in the 2009 Plan. To disaggregate these Avoided Capacity Costs into Avoided Generation Costs and Avoided T&D Costs, the 2009 avoided costs assumptions as filed in the 2009 Plan for avoided generation and T&D capacity costs were used. The assumptions included generation capacity values approximately 5 times the avoided T&D capacity.

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: Lifetime Cost per Generator kW and kWh Saved (As Verified in M&V Report)

Program	Total Utility Costs	Total Lifetime Generator kWh	Cost per Generator kWh	Total Generator kW	Cost per Generator kW
Residential Segment					
Air-Source Heat Pumps	$48,854	535,510	$0.0912	24	$2,070
Evaporative Cooling Rebates	$93,405	2,521,303	$0.0370	239	$391
Home Energy Services	$911,846	60,528,455	$0.0151	1,262	$722
Home Lighting & Recycling	$330,910	29,198,371	$0.0113	369	$897
Low-Income	$231,621	6,457,073	$0.0359	87	$2,650
Refrigerator Recycling	$37,933	561,394	$0.0676	19	$1,998
School Education Kits	$157,385	6,069,043	$0.0259	36	$4,364
Residential Energy Efficiency Subtotal	**$1,811,953**	**105,871,149**	**$0.0171**	**2,036**	**$890**
Saver's Switch - Residential	$0	0	N/A	0	N/A
Residential Load Management Subtotal	**$0**	**0**	**N/A**	**0**	**N/A**
Residential Segment Total	**$1,811,953**	**105,871,149**	**$0.0171**	**2,036**	**$890**
Business Segment					
Cooling Efficiency	$28,771	1,202,258	$0.0239	35	$813
Custom Efficiency	$21,441	0	N/A	0	N/A
Large Customer	$0	0	N/A	0	N/A
Lighting Efficiency	$268,945	41,273,579	$0.0065	780	$345
Motor & Drive Efficiency	$51,097	5,714,791	$0.0089	54	$942
Small Business Lighting	$285,396	5,918,229	$0.0482	85	$3,342
Business Energy Efficiency Subtotal	**$655,651**	**54,108,857**	**$0.0121**	**955**	**$686**
Interruptible Credit Option	$2,071	0	N/A	0	N/A
Saver's Switch - Business	$0	0	N/A	0	N/A
Business Load Management Subtotal	**$2,071**	**0**	**N/A**	**0**	**N/A**
Business Segment Total	**$657,721**	**54,108,857**	**$0.0122**	**955**	**$689**
Planning & Research Segment					
Consumer Education	$101,305	0	N/A	0	N/A
DSM Planning & Administration	$311,181	0	N/A	0	N/A
Market Research	$23,960	0	N/A	0	N/A
Measurement & Verification	$7,367	0	N/A	0	N/A
Product Development	$32,501	0	N/A	0	N/A
Planning & Research Segment Total	**$476,313**	**0**	**N/A**	**0**	**N/A**
2009 TOTAL	**$2,945,987**	**159,980,007**	**$0.0184**	**2,992**	**$985**

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 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: Total Economic Benefits Derived from 2009 Programs (As Verified in M&V Report)

Program	Total TRC Net Benefits (NPV)	Lifetime (Years)	Total Economic Beneifts Reporting Period
Residential Segment			
Air-Source Heat Pumps	-$9,491	12	($791)
Evaporative Cooling Rebates	$507,783	10	$50,778
Home Energy Services	$4,135,565	14	$301,356
Home Lighting & Recycling	$1,267,730	8	$154,395
Low-Income	$203,834	8	$26,130
Refrigerator Recycling	$12,982	5	$2,391
School Education Kits	$259,568	6	$42,133
Residential Energy Efficiency Subtotal	**$6,377,971**		**$576,392**
Saver's Switch - Residential	$0		$0
Residential Load Management Subtotal	**$0**		**$0**
Residential Segment Total	**$6,377,971**		**$576,392**
Business Segment			
Cooling Efficiency	$85,584	15	$5,706
Custom Efficiency	-$21,441		($21,441)
Large Customer	$0		$0
Lighting Efficiency	$3,286,278	9	$383,591
Motor & Drive Efficiency	$308,307	20	$15,415
Small Business Lighting	$123,092	15	$8,206
Business Energy Efficiency Subtoal	**$3,781,820**		**$391,476**
Interruptible Credit Option	-$2,071		($2,071)
Saver's Switch - Business	$0		$0
Business Load Management Subtoal	**-$2,071**		**($2,071)**
Business Segment Total	**$3,779,749**		**$389,406**
Planning & Research Segment			
Consumer Education	-$101,305		($101,305)
DSM Planning & Administration	-$311,181		($311,181)
Market Research	-$23,960		($23,960)
Measurement & Verification	-$7,367		($7,367)
Product Development	-$32,501		($32,501)
Planning & Research Segment Total	**-$476,313**		**($476,313)**
2009 TOTAL	**$9,681,407**		**$489,486**

(7) Non-Energy Benefits

Non-energy benefits ("NEB") 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. SPS did not consider the value of any NEBs in the TRC Test in this Report or in the 2009 Plan.

The following table shows the emission reductions associated with SPS's 2009 energy efficiency portfolio. These values were estimated by applying the lifetime and annual energy savings from the 2009 program achievements to the emission rates for SPS's Cunningham Station - 2 Plant[2], which is believed to be a fair proxy for the generation avoided by the 2009 energy efficiency programs.

Table 8: Greenhouse Gas Emissions Avoided With 2009 Programs

Emission Type	Avoided Electric Emissions Rate (lbs/MWh)	Annual Avoided Emissions (tons)	Lifetime Avoided Emissions (tons)
CO_2	1,250.000000	19,697,277	199,975,008
SO_2	0.006319	100	1,011
NOx	2.490000	39,237	398,350

The following table shows the amount of water conserved by the 2009 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[3], which is believed to be a fair proxy for the energy generation avoided by the energy efficiency programs.

Table 9: Water Consumption Avoided With 2009 Programs

Non-Energy Benefit Type	Avoided Water Consumption Rate (gal/MWh)	Annual Avoided Water Consumption (gal)	Lifetime Avoided Water Consumption (gal)
Water Savings	840	13,236,570	134,383,206

(8) Self-Direct Programs

SPS's did not propose any goals for the Large Customer (Self-Direct) Program because it was unknown at the time of filing who might choose to participate. This program had no participants or spending in 2009. For more information about this program, please refer to the program discussion in Section III.

[2] Source: Southwestern Public Service Company's 2009 Integrated Resource Plan for New Mexico; Table 5-1: Emission Rates (p. 51).
[3] Ibid.

Section III: Segment and Program Descriptions

Residential Segment

SPS has approximately 85,000 customers in its Residential Segment in New Mexico. The service area is relatively rural, with only a few small cities, including Clovis, Roswell, and Hobbs. The climate in this part of New Mexico consists of winters with very little snow and hot, relatively dry summers.

SPS exceeded the goal for the Residential Segment in 2009 due to the strong performance from Evaporative Cooling Rebates, HES, and Home Lighting Programs. Other programs struggled to gain interest with customers such as Refrigerator Recycling and Air-Source Heat Pumps ("ASHP").

Customer interest in evaporative cooling exceeded expectations in its initial year in the portfolio. Customers learned about the rebates through their cooling contractors, retailers, and local advertising and newsletters. HES performed very well due to experienced contractors that set up offices within SPS's New Mexico service area. Home Lighting again performed above goal due to strong customer interest in reduced price CFLs available at several local home improvement and grocery stores.

Customers appeared to be reluctant to retire their still-operating secondary refrigerators in 2009. Marketing efforts were increased as the year progressed but the program achieved less than 10% of its participation goal. Customer and contractor interest remained low for ASHPs in 2009. As a result of the continued inactivity, the program was eliminated in early 2010 and heat pumps were added as an option within the HES Program to increase participation.

All programs within the Residential Segment were cost-effective except the ASHP Rebate Program. As stated earlier, this program was closed in early 2010 when the new 2010 programs and goals were approved.

Air-Source Heat Pumps

The ASHP Rebate Program provides equipment incentives to Heating, Ventilation, and Air Conditioning ("HVAC") contractors who install ASHPs with a Seasonal Energy Efficiency Ratio of 14.5 (ENERGY STAR-qualifying) or higher to replace an existing electric heating system for SPS's New Mexico residential customers.

Deviation from Goal

The ASHP Program did not meet its goal in 2009 due to the fact that SPS could not effectively engage HVAC contractors. Despite regular mailings and individual face-to-face meetings with contractors to explain the program, misconceptions about eligible equipment and rebate levels remained. Consequently, several contractors became discouraged.

Changes in 2009
Efforts to promote this program directly to customers in 2008 proved unsuccessful due to the difficulty in explaining to customers the requirement that rebates may only go towards the replacement of an electric heating system. Therefore, in 2009, the rebate program was re-directed to HVAC contractors and homebuilders.

As agreed to in the Stipulation in Case No. 09-00352-UT, in 2010, the ASHP Program was merged into the HES Program in order to improve program participation and simplify program implementation.

Evaporative Cooling Rebates
The Evaporative Cooling Rebate Program provides a cash rebate to electric customers who purchase and permanently install high-efficiency evaporative cooling equipment for residential use in New Mexico. The program goals are to incent customers to purchase evaporative coolers instead of using units with refrigerated air.

For homes in dry climates, such as New Mexico, evaporative cooling provides cooling like an air conditioner, but uses significantly less energy. This program launched in 2009 offering a tiered rebate of $200 (or the cost of the unit, which ever is less) for Tier 1 units with a Cubic Feet per Minute of 2,500 or greater, and $500 for Tier 2 units with a minimum media saturation effectiveness of 85%, a remote thermostat, and a periodic purge water control. The program promotes the use of evaporative coolers through consumer education and encouraging trade allies to stock high efficiency units.

Deviation from Goal
The Evaporative Cooling Program far exceeded budget and savings goals, but still remained cost-effective. These results were achieved by a combination of factors such as effective program promotion to retailers and contractors, the climate is well-suited for this cooling technology, and customers are looking for ways to save during a tough economic time. Note that SPS filed a motion to increase the budget over 25%, pursuant to 17.7.2.14.C NMAC (from the previous Energy Efficiency Rule), for the Evaporative Cooling Rebate Program on 9/3/2010 through Case No. 09-00324-UT. Commission approval was received on 2/3/2010.

Changes in 2009
This was a new program in 2009.

Home Energy Services
The HES Program provides incentives to energy efficiency service provider contractors for the installation of a range of upgrades that save energy and reduce costs for existing residential households. Qualifying customers will 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 homes. Additional objectives of the program are to:

- Encourage private sector delivery of energy efficiency products and services

- Utilize a whole-house approach to upgrade efficiently
- Significantly reduce barriers to participation by streamlining program procedures.

SPS partners with qualifying third-party contractors to deliver these services to residential households. 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.

Deviation from Goal
The program did very well and exceeded goal by year-end. Recruitment of two experienced contractors from Texas and intensive training of the New Mexico contractors contributed greatly to reducing the ramp-up time associated with most new programs. SPS attempted to keep the HES Program 2009 budget under 125% and thus did not file a motion to increase the budget over 25%, pursuant to 17.7.2.14.C NMAC (from the previous Energy Efficiency Rule). However, at the end of the 2009 year, final invoices from contractors caused the HES Program to slightly exceed the cap and have a budget variance of 126%.

Changes in 2009
This was a new program in 2009.

Home Lighting & Recycling
The Home Lighting and Recycling Program offers a low cost and easy way for customers to save energy and money. It provides two ways for customers to purchase energy saving compact fluorescent light bulbs ("CFL"), through mail order and instant rebates at retail stores. Customers can purchase a wide variety of CFLs via mail, telephone, or Internet through the mail order option. There are 20 different CFL models available for purchase. SPS also provides limited-time instant rebates at participating retailers for the purchase of CFLs. SPS works with retailers and manufacturers to buy down the price of the bulbs to roughly $1.00 each. SPS also participates in the ENERGY STAR Change-a-Light, Change-the-World campaign and local events to increase the sales and awareness of CFLs.

Deviation from Goal
The Home Lighting and Recycling Program was very successful in 2009. The program sold 79,311 CFLs and achieved over 150% of the sales goal and 126% of the energy savings goal. SPS continues to make strides by improving the effectiveness of the program. The cost per unit sold for 2009 was just over $4.00, which is nearly $2 less per unit than in 2008. These results were achieved by increasing advertising and marketing CFLs through large retail upstream incentive promotions with Home Depot, Sam's Club, Albertsons, and Ace Hardware, as well as local events such as the Clovis Home and Garden Show, and the Hobbs August Nights event.

The Home Lighting and Recycling Program spent less than was budgeted because SPS had included funds in its forecast for contingency plans in case the program did not perform as expected. Fortunately, SPS did not have to use the contingency funding and found some economies of scale by promoting our Colorado and New Mexico programs using similar advertising and two of the same national retail chains.

Changes in 2009
To help reduce the barriers for CFL disposal, SPS launched a CFL recycling component to the Home Lighting and Recycling Program in 2009, which offers free CFL recycling for residential customers at three Ace Hardware stores in the SPS service area. In 2009, SPS recycled 66 CFL bulbs. SPS continues to build awareness of CFL recycling and promotes the recycling of spent mercury bulbs in all of the program's materials.

Low-Income Program
The Low-Income Program serves residential customers with household incomes of less than 200 % of the federal poverty level. The purpose of this program is to provide low-income customers in SPS's New Mexico service area with the education and energy efficiency measures necessary to help lower energy costs and improve the comfort and safety of their dwellings.

In 2009 SPS partnered with New Mexico Mortgage Finance Authority ("MFA"), as well as local community agencies, such as the state Low-Income Home Energy Assistance Program ("LIHEAP"), to identify potential customers and administer the Low-Income Program offerings. In addition to the energy saving opportunities, customers receive educational materials on reducing their energy bills and information on other programs and services available.

There are four energy efficiency offerings that make up the Low-Income Program:

Multi-Family Weatherization - The Multi-Family Weatherization offering provides improvements to the shell and electrical components of electrically heated buildings. It starts with an audit of the building to identify opportunities followed by weatherization elements such as insulation, CFLs, a refrigerator upgrade, an evaporative cooling unit, and/or mechanical repairs to ensure safety before weatherization.

Home Lighting Giveaway - This is a CFL give-away that is coordinated through local community action programs. CFLs are distributed to low-income customers as they come in or call the office asking for bill payment assistance.

Refrigerator Upgrades - This component provides free upgrades of qualified refrigerators to ENERGY STAR models and recycles the old refrigerator. This is available for qualified low-income customers.

Evaporative Cooling Installation - This component provides a free evaporative cooling unit and installation to customers in need. This is available for qualified low-income customers.

Deviation from Goal
The Low-Income Program did not meet its goal for 2009 primarily due to the timing of the purchase and distribution of CFLs as well as limited opportunities with evaporative cooling and multi-family weatherization.

The LIHEAP community agencies start helping low-income customers in September of each year. In 2009, the CFL deliveries to the agencies were delayed because SPS and the

LIHEAP agencies worked to determine a valid method of tracking the customers who received the bulbs, which took longer than anticipated. When the tracking sheets were finalized, SPS shipped the CFL's. Most of the agencies received the shipments in late November. This left little time for distribution and tracking the bulbs in 2009. The agencies began distributing the CFL's in December 2009 and will conclude in 2010. As a result, SPS was not able to claim any energy savings in 2009 because the first tracking sheets did not reach SPS until January of 2010.

In addition, the Evaporative Cooling offering and the Multi-Family Weatherization were not fulfilled in 2009 because MFA did not have the ability to identify opportunities and install the energy saving equipment. MFA does not traditionally serve multi-family homes or evaporative cooling systems as part of their statewide weatherization efforts.

Changes in 2009

The Low-Income Program made the following changes for 2009:

- Transitioned from single-family to multi-family weatherizations to capture more participation. SPS found that there were very few single-family, electrically-heated homes in its service area, which were needed for the single-family weatherization.
- Modified how participation is counted in the Lighting Giveaway component such that each participant receives four bulbs; therefore the 20,000 bulbs that will be distributed will go to help 5,000 homes. In 2008, the Lighting Giveaway component tracked participation on a per bulb basis, although each family also received four bulbs. Under that tracking method, each bulb represented one participant. This variation in reporting causes the Low-Income Program participation goal to appear to have dropped from 2008 to 2009 when it has not.
- Added an evaporative cooling component to the program.

Refrigerator Recycling

The Refrigerator Recycling Program, which launched in June 2009, was designed to decrease the number of inefficient secondary refrigerators in use in the residential market. This program focuses on reducing energy usage by educating customers on how much energy secondary refrigerators are using and incenting them to dispose of their operable, inefficient secondary refrigerators in an environmentally safe and compliant manner. Residential customers with qualifying units will receive a rebate of $35 as an incentive for program participation in this prescriptive program and will not be directly responsible for any costs associated with pick-up, transportation, disposal, and proper recycling of their refrigerator.

Deviation from Goal

The Refrigerator Recycling Program did not meet its goal in 2009. There were several reasons for the lack of participation including a late start to the program and slow adoption. The program was launched on June 1, 2009 after the 2009 Plan was approved in the spring of 2009. In addition, customer responses to marketing and advertising efforts were well below projected levels.

Changes in 2009

This was a new program in 2009.

School Education Kits

School Education Kits is an educational program that combines energy efficiency curriculum for teachers with easy-to-install energy efficiency measures for students to implement at home. All materials are free of charge to participants. The following measures are included in the student kit:

- One CFL
- One electroluminescent night light
- Furnace air filter alarm
- High efficiency showerhead (1.5 gpm)
- Kitchen aerator (1.5 gpm)
- Flow rate test bag (for showerhead)
- Toilet leak detector tablets
- Air temperature ruler
- Water temperature check card
- Resource fact wheel

Deviation from Goal

The School Education Kits Program exceeded its goal in 2009. The filed goal was based on the projection of how many students were expected in 6^{th} grade classrooms in 2009 throughout our service area. The third-party vendor during the 2009 launch identified additional students above our goal. Based on this potential, we increased student participation by nearly 500 students to 3,500 and were able to obtain favorable kit and implementation pricing for the entire program.

Changes in 2009

None

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 their central air conditioners and electric water heaters 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 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, the program deploys switches utilizing an "adaptive algorithm" cycling strategy. This strategy allows the switches to "learn" how a customer's air conditioning is being operated in order to achieve a 50% reduction in load. For enrolled electric water heaters, the entire load is shed for the duration of the control period.

Deviation from Goal

The Saver's Switch program is dependent on the availability of communications signals for activating the switch on control days. The launch of the program, scheduled for 2009, was first put on hold and then redesigned in 2009 in response to the federal government's rules on narrow banding private communications frequencies. This rule caused SPS to look for new switch equipment that can handle the narrow banded frequencies. It also required SPS to modify its paging transmitters.

SPS worked closely with the Commission staff and other interested parties to do a full review of its communications options and switch equipment before proceeding with the redesign. The results of SPS's study were reviewed and then supported for a program launch with the new equipment in the fall of 2010. The project is on track for a fall 2010 launch.

Because the program was never launched in 2009, there are no expenditures for the year.

Changes in 2009
None

Business Segment

SPS has approximately 19,000 customers in its Business Segment in New Mexico, including commercial, industrial, and agricultural customers of all sizes. In 2009, SPS did not meet its goals in the business segment. The Business Segment continues to be slow to engage in energy efficiency. In the past, New Mexico businesses in the SPS service area have enjoyed relatively inexpensive energy, been resistant to environmental messaging, and had difficulty accepting the calculated benefits of energy efficiency. Additionally, economic and market conditions continue to drive customers to low first-cost purchases resulting in standard efficient equipment or repairing existing equipment. Many of the large customers utilize unique equipment for their industry necessitating study and evaluation of technologies prior to rebates, raising participation barriers. While SPS continues its efforts to show customers the value of lowering their operating cost through site visits, educational materials, and rebates, participation is sporadic. SPS had positive results in the Lighting Efficiency and Small Business Lighting Programs and continues to build on these successes in 2010.

The Custom Efficiency, Large Customer, Interruptible Credit Option, and Saver's Switch Business Programs had no participation in 2009, however all other Business Programs were cost-effective in 2009.

In 2009, the Business Segment spending was focused primarily on customer marketing efforts, preparing regulatory filings, reaching out to trade partners, developing communication and rebate tools, and creating promotional pieces for customer communications. The Business Segment spent 27% of its budget and achieved 45% of the energy savings goal.

Cooling Efficiency

The Cooling Efficiency Program offers prescriptive rebates for common high efficiency cooling equipment, and custom rebates for newer technologies and system-based high efficiency solutions. The program is designed to influence customers to select the most energy efficient option to meet their cooling requirements. The program directs its marketing efforts towards educating customers to make strategic decisions that will benefit their facilities as well as their bottom lines.

Deviation from Goal

The Cooling Efficiency Program did not meet its goal in 2009. The low savings and under spent budget was primarily due to much lower than planned customer participation. Only two of the six prescriptive categories of products were represented in 2009. There were no custom projects in 2009. Promotional pieces were aimed at increasing program awareness and educating customers. Customers were not easily influenced by SPS's efforts to inform them of the benefits of energy efficiency. To help mitigate this barrier, SPS is working more with the trade to educate them on the benefits of purchasing energy efficiency equipment. In turn, trade allies will educate their customers at the time of sale. SPS will continue to reach out to customers through direct mail literature, our account management team, and our Business Solutions Center ("BSC").

Changes in 2009

None

Custom Efficiency

The Custom Efficiency Program offers rebates up to $400 per kW saved for energy saving measures with efficiencies higher than the standard that are not covered by our prescriptive programs. The rebate reduces the incremental project cost of the high efficiency option resulting in faster paybacks on the energy efficiency investment. Marketing of this program is primarily done though account managers and their direct relationships with customers. Strategies and budget used to achieve goals in 2009 included customer visits, trade meetings, and direct mail. Technologies promoted included compressed air, energy management systems, and controls.

Deviation from Goal

This program did not have any completed projects in 2009. Lead times for this program tend to be long because rebates are not known up front and once rebates are determined customers must then budget for the project. It takes significant time for customers to understand this program because it can apply to any technology that offers energy savings. Preapproval is required prior to ordering equipment.

Changes in 2009

Increased rebate levels from $200 per kW to $400 per kW saved.

Large Customer

The Large Customer Program is a self-direct program that allows SPS customers with contiguous facilities that use over 7,000 MWh per year to identify and administer their own energy efficiency and load management projects. This program offers customers two options: 1) a bill credit, or 2) an exemption from the Energy Efficiency Tariff Rider for 24 months. Customers are eligible for a bill credit or an exemption from the Energy Efficiency Tariff Rider of up to 70% of the incremental expenditures made towards cost-effective energy efficiency or load management measures.

Deviation from Goal

No customers attempted to participate in 2009. This program had no expenditures and achievements.

Changes in 2009

None

Lighting Efficiency

The Lighting Efficiency Program, which began in 2008, offers cash rebates to offset the incremental, upfront costs of installing energy efficient lighting equipment. The program provides prescriptive rebates for both existing facilities and new construction projects, as well as custom rebates for new technologies or uncommon lighting solutions. Subject to pre-approval, rebates are available for lighting retrofit projects that do not qualify for prescriptive rebates but still reduce energy costs and usage, under SPS's Custom Efficiency Program. The Lighting Efficiency Program is marketed indirectly through lighting and electrical contractors, and directly to business customers through SPS account management staff and the BSC inbound and outbound calling center.

Strategies used to raise program awareness and stimulate program participation in 2009 included trade outreach, customer visits, Web content, and direct mail.

CFLs—hard-wired fixtures and screw-in lamps—represent 20% of energy savings in the 2009 Lighting Efficiency Program. SPS will continue to monitor and address its level of reliance on CFLs.

Deviation from Goal

The Lighting Efficiency Program exceeded its 2009 goal for energy savings, while spending only 54% of the approved budget due to SPS account management and the BSC having some success encouraging customer participation. Additionally one large, cost-effective project was completed in 2009 contributing much of the impact for Lighting Efficiency with low administrative cost.

Changes in 2009

Added or improved the following measures to stimulate participation:

- Added fluorescent T12 to T8, and T8 to T8 delamping – permanent removal of at least one 4-foot lamp as a result of a retrofit
- Added screw-based CFLs to hardwired CFL fixture category and adjusted blended rebates
- Added parking garage rebates for fluorescent fixtures replacing High Intensity Discharge (“HID”) fixtures
- Increased rebate for Low-Wattage Fluorescent T8 lamps from $0.75 to $1
- Expanded the category of High-Bay Fluorescent T8 Lamps replacing HID fixtures, and increased rebates from $75 to $85-$210
- Increased rebate for Occupancy Sensors from $15-$40 to $30-$50
- Increased rebates for Pulse-Start Metal Halide fixtures > 750 watts from $100 to $140
- Increased rebate for Industrial Multi-CFL fixtures from $25 to $45

Reduced or removed the following measures due to rebate target adjustments or low participation:

- Reduced 4-foot 3- and 4-lamp T8 and 5-8-foot 2-lamp T8 fluorescent rebates per fixture from $20 to $18; reduced 5-8-foot 1-lamp T8 fluorescent rebates per fixture from $15 to $10
- Reduced rebates for Pulse-Start Metal Halide fixtures < 750 watts from $40-$75 to $25-$45
- Removed rebates for Super T8 fluorescent replacing T12 fluorescent fixtures

Motor & Drive Efficiency

The Motor and Drive Efficiency Program is designed to reduce the barriers that prevent customers from purchasing high efficiency motors and variable frequency/adjustable speed drives (“VFD/ASD”). To overcome these barriers, SPS offers prescriptive rebates to customers who install National Electrical Manufacturers Association Premium Efficiency® motors (1-500 hp) and VFD/ASD drives (1-200 hp) that control motors used in fan and pump applications. A custom component of this program offers rebates for newer technologies or motors above 500 hp and VFD/ASDs above 200 hp. Customers outside the motor and drive program parameters may be eligible to participate in our Custom Efficiency Program which requires preapproval.

Deviation from Goal
In 2009, the program had two customers with a cumulative total of three prescriptive measures – two VFD measures and one motor measure. The program faced many challenges leading to it not meeting goals: a late program launch, due to a March 31st Commission approval; customer apprehension and skepticism because of a lack of program understanding and equipment eligibility; a level of restrained capital recourses by many customers because of a suppressed economy; and reluctant participation of motor vendors (trade) to embrace the advent of this program.

Changes in 2009
This was a new program in 2009.

Small Business Lighting
The Small Business Lighting Program, which began in June 2009, offers free lighting audits, energy saving recommendations, and attractive lighting retrofit prescriptive rebates for small business customers with peak demand of up to 400 kW. A custom component of this program offers rebates for new technologies or uncommon lighting solutions. Rebates are also available for small business lighting retrofit projects that do not qualify under the program, but still reduce energy costs and usage through SPS's Custom Efficiency Program, subject to pre-approval. The program addresses barriers that traditionally prevent small businesses from investing in energy efficiency products, limited financial resources and time, insufficient knowledge of lighting equipment, and lack of access to quality contractors. The Small Business Lighting Program is marketed primarily through trade outreach and customer contact with Franklin Energy—the lighting consultant implementing the program—and through the BSC inbound and outbound calling center.

Strategies used to raise program awareness and stimulate program participation in 2009 included an emphasis on Franklin Energy's small business lighting audits to fill the opportunity pipeline, trade outreach, Web content development, and direct mail.

CFLs – hard-wired fixtures and screw-in lamps – represented 3% of energy savings in the 2009 Small Business Lighting Program. SPS will continue to monitor and address its level of reliance on CFLs.

Deviation from Goal
The Small Business Lighting Program achieved slightly under its 2009 goal for energy savings and spent slightly under its approved budget. Spending was proportionately higher due to program set-up and launch, conducting initial lighting audits, and building general awareness among customers and trade. Although 2009 achievement was lower than anticipated, interest in the program from both small business customers and the lighting trade continues to build, and program growth is expected in 2010.

Changes in 2009
This was a new program in 2009.

Interruptible Credit Option
The New Mexico Interruptible Credit Option ("ICO") Program was approved in the spring of 2009. The ICO Program was developed to offer significant savings opportunities to our New Mexico 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. Due to the significant start-up time to install equipment, conduct education and marketing activities, and enroll customers, SPS did not anticipate, nor receive any savings in 2009.

Throughout the latter part of 2009, many marketing activities were implemented to promote the new ICO Program. These marketing activities included the development of new program collateral and the creation of an ICO web page at xcelenergy.com. To assist account managers in identifying eligible customers, contract interruptible load ("CIL") figures were computed for potential business customers in New Mexico. The ICO Program was then promoted to all eligible New Mexico customers with adequate CIL (minimum 500 kW). We also presented this program to business customers as part of the SPS-sponsored Energy Management sessions held in Amarillo, Roswell, and Lubbock in late July 2009. In addition, an SPS customer meeting was held in February 2010, and an article on the new program was run in the spring 2010 Energy Solutions Newsletter.

Deviation from Goal
There were no savings goals for this program in 2009.

Changes in 2009
This was a new program in 2009.

Saver's Switch (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 program is activated, a control signal is sent to interrupt the air conditioning load during peak periods, typically in the afternoons on weekdays. The program deploys switches utilizing an "adaptive algorithm" cycling strategy. This strategy allows the switches to "learn" how a customer's air conditioning is being operated in order to achieve a 50% reduction in load.

Deviation from Goal
The Saver's Switch Program is dependent on the availability of communications signals for activating the switch on control days. The launch of the program, scheduled for 2009, was first put on hold and then redesigned in 2009 in response to the federal government's rules on

narrow banding private communications frequencies. This rule caused SPS to look for new switch equipment that can handle the narrow banded frequencies. It also required SPS to modify its paging transmitters.

SPS worked closely with the Commission staff and other interested parties in 2009 to do a full review of its communications options and switch equipment before proceeding with the redesign. The results of SPS's study were reviewed and then supported as SPS asked to launch the program with new equipment in the fall of 2010. The project is on track for a fall 2010 launch.

Because the program was never launched in 2009, there are no expenditures or savings for the year.

Changes in 2009
The program was originally scheduled to launch in 2009, and, as mentioned above, was redesigned for a launch in 2010.

Planning & Research Segment

The Planning and Research Segment consists of internal functions (not customer-facing), which support the direct impact programs. The segment includes energy efficiency and load management-related expenses for Consumer Education, Planning and Administration, Market Research, M&V, and Product Development. 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 effective performance
- 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 of SPS's energy efficiency portfolio on customer usage and overall system peak demand and system energy usage
- Measure customer satisfaction with SPS's energy efficiency efforts
- Develop new conservation and load management programs

In 2009, the Market Research, Consumer Education, and Planning and Administration Programs slightly under spent their budgets, while Product Development exceeded its budget. Because of the late launch of the M&V contract and implementation, the M&V budget was under spent in 2009. The causes of these budget deviations are addressed in the individual program discussions below.

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 will also support the various energy efficiency and load management products SPS will offer to residential customers. The Consumer Education Program started in 2009, and replaced the General Advertising Program from the 2008 Energy Efficiency and Load Management Plan that SPS had used to educate customers about conservation. SPS employs a variety of resources and channels to communicate conservation and energy efficiency messages, including: the Xcel Energy website, bill inserts, events, radio, and online advertising.

The Consumer Education Program is targeted to all New Mexico residential electric customers. In the initial implementation of the program, primary emphasis was placed on:

- Web presence on ResponsibleByNature.com
- Community-based marketing events
- Messaging through local radio stations as well as online advertising
- Targeted communications to address seasonal usage challenges

- Conservation messaging through Xcel Energy's newsletters and bill inserts to residential customers
- Publication of reference education materials (in English and Spanish)

SPS has approximately 88,000 residential customers in its New Mexico service area. SPS plans to touch 80% of the residential customer base, or 70,000 customers, through bill inserts, community events, and conservation advertising.

Deviation from Goal
Consumer Education under spent the budget in 2009, yet reached 80,000 customers which was more than the internal goal of 70,000 customers. SPS's budget for this program was determined through estimates of material and labor and past activities in New Mexico and other states. The majority of the budget is driven by customer education, conservation promotion, and labor. As the year progressed, it was discovered that we were able to reach an additional 10,000 participants through bill inserts at a lower than projected cost.

Changes in 2009
The Consumer Education Program started in 2009 and replaced the General Advertising Program from the 2008 Energy Efficiency and Load Management Plan that SPS had used to educate customers about conservation.

DSM Planning & Administration
The Planning and Administration area manages all energy efficiency and load management regulatory filings (including this 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 energy and demand conservation 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 staff.

Deviation from Goal
In 2009, SPS's Planning and Administration area, including legal expenses, under spent its budget by about 10%. Specific activities that contributed to the 2009 expenditures included preparation of: various filings for program changes in 2009; the 2010/11 Plan and filings and the subsequent hearings held in February 2010; and coordination and responding to discovery requests related to the 2010/11 Plan.

Changes in 2009
None

Market Research
The Market Research area spearheads energy efficiency-related research efforts that are used to inform SPS's decision-making concerning energy efficiency and load management. In

2009, the Market Research group oversaw the New Mexico Vendor Qualitative Research Study, which consisted of three focus groups performed by Arundel Street Consulting.

The research was done so SPS can better understand the perspective and use of these programs by electrical, HVAC, and motor vendors in the New Mexico service area. Gauging this perspective helps SPS direct its energy efficiency and load management dollars and efforts.

Deviation from Goal
Market Research under spent its budget in 2009. The main reason for this deviation was the cost savings SPS was able to achieve through aligning the project scope to more accurately reflect current business information needs.

Changes in 2009
None

Measurement & Verification
Internal staff from the Planning and Administration area oversees M&V planning 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. NMAC 17.7.2.13.C.1 requires that utilities provide an M&V Report provided by an Evaluator every year with its Annual Report. All New Mexico utilities have contracted with ADM Associates, Inc. as their Evaluator for 2008, 2009, and 2010 programs.

In compliance with the reporting requirements, the M&V Report should include:

- 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
    - measures are operating correctly and are expected to generate the predicted savings

See Appendix A for ADM's M&V Report of SPS's 2009 programs.

Deviation from Goal
Because of the late launch of the M&V contract (signed August 20, 2009) and implementation, the budget was under spent in 2009. This line item budget contains both SPS labor and expenses to manage the M&V as well as charges from ADM which are general, such as report preparation, and are not directly related to individual programs. The actual field inspections and M&V reports for both 2008 and 2009 were undertaken and completed by ADM in 2010. Therefore, the majority of the expenses for M&V for 2009 will

be billed in 2010. The $7,367 that was spent in this category in 2009 consisted entirely of SPS internal labor and expenses working with ADM as well as the Evaluation Committee in launching M&V plans.

Changes in 2009
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 2009, the Product Development team launched new products as part of the 2009 Energy Efficiency and Load Management Plan. The list included: Small Business Lighting, Residential Evaporative Cooling, Residential Refrigerator Recycling, Low-Income Evaporative Cooling, Low-Income Multi-Family Weatherization, Residential Home Energy Services, and Business Motor & Drive Efficiency.

Deviation from Goal
In 2009, the Product Development area exceeded its budget. The overage is due to an unanticipated third-party contractor charge that should have been billed in 2008, but did not get invoiced to SPS until 2009.

Changes in 2009
None

Appendix A: Measurement & Verification Report: SPS 2009 program year

Provided by ADM Associates Inc., June 2010

DSM Portfolio Evaluation
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
June 2010

Prepared for:

Xcel ENERGY

Prepared by:

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1. Executive Summary

This report is to provide a summary of the evaluation effort of the 2009 Demand Side Management (DSM) portfolio by the Southwestern Public Service Company (SPS) in New Mexico. In 2009, the SPS portfolio consisted of 7 residential and 6 non-residential programs. Of these, ADM evaluated all residential and 4 of 6 non-residential programs, as Custom Efficiency and Large Customer Self-Direct programs had no participation. ADM estimated gross realization, net savings, and cost-effectiveness for the 10 evaluated programs.

Gross savings were estimated by engineering analysis, simulation modeling, participant surveying, and on-site monitoring where appropriate for the program and measure type. The gross impact summary is presented in Tables 1-1 and 1-2 below, disaggregated between residential and non-residential segments. The values presented in gross and net impacts are customer kWh savings, which do not incorporate line losses.

Table 1-1 Gross Impact Summary – Residential Segment

Program	Peak Demand Savings, kW		Annual Energy Savings, kWh		Lifetime Energy Savings, kWh		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Air Source Heat Pumps	44.8	44.8	89,000	94,504	1,068,000	1,014,048	95%
Evaporative Cooling	443.2	443.2	468,468	468,468	4,684,680	4,684,680	100%
Home Energy Services	1,208.7	1,208.7	4,221,837	4,221,837	57,942,600	57,942,600	100%
Home Lighting & Recycling	309.3	407.4	4502,911	3,912,222	29,764,239	32,119,345	81%
Low Income	63.3	77.8	904,820	736,709	6,009,067	5,746,795	81%
Refrigerator Recycling	13.1	24.1	86,043	131,451	628,114	714,360	153%
School Education Kits	28.6	32.1	1,066,505	876,762	6,507,320	5,401,448	82%
Total	2,111	2,238	11,339,584	10,431,953	106,604,020	107,623,276	92%

Table 1-2 Gross Impact Summary – Business Segment

Program	Peak Demand Savings, kW		Annual Energy Savings, kWh		Lifetime Energy Savings, kWh		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Cooling Efficiency	18.7	34.3	35,003	77,592	700,060	1,163,880	221%
Large Customer Self	-	-	-	-	-	-	-
Large Customer Self	-	-	-	-	-	-	-
Lighting Efficiency	1,265	1,214	3,684,241	5,528,184	57,919,404	48,620,112	147%
Motor Efficiency	74	74	388,095	388,095	7,761,900	7,761,900	100%
Small Business Lighting	197	83	370,995	382,771	5,833,299	5,741,565	103%
Total	1,554	1,405	4,478,334	6,376,642	72,214,663	63,287,457	142%

Additionally, ADM estimated free-ridership and associated net-to-gross ratios (NTGRs) for the 10 evaluated programs. They are detailed for the residential and business segments in Tables 1-3 and 1-4 below, respectively.

Table 1-3 Net Impact Summary – Residential Segment

Program	Peak Demand Savings, kW		Annual Energy Savings, kWh		Lifetime Energy Savings, kWh		NTGR
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Air Source Heat Pumps	44.8	21.0	89,000	39,717	1,068,000	476,604	47%
Evaporative Cooling	265.9	212.5	281,081	224,396	2,810,810	2,243,960	48%
Home Energy Services	1,124.1	927.0	3,926,308	3,238,149	53,886,648	44,441,974	77%
Home Lighting & Recycling	309.3	328.4	4,502,911	3,164,866	29,764,239	25,986,550	81%
Low Income	61.2	77.8	876,040	736,709	5,816,858	5,746,795	100%
Refrigerator Recycling	12.2	16.9	80,020	92,015	584,146	499,641	70%
School Education Kits	28.6	32.1	1,066,505	876,762	6,507,320	5,401,448	100%
Total	1,846	1,813	10,821,865	9,059,958	100,438,021	94,225,323	87%

Table 1-4 Net Impact Summary – Business Segment

Program	Peak Demand Savings, kW		Annual Energy Savings, kWh		Lifetime Energy Savings, kWh		NTGR
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Cooling Efficiency	17.6	32.2	32,932	72,936	658,620	1,094,055	94%
Large Customer Self	-	-	-	-	-	-	-
Large Customer Self	-	-	-	-	-	-	-
Lighting Efficiency	1,214	710	3,536,871	4,384,067	55,602,628	37,558,957	79%
Motor Efficiency	68	49	337,643	260,023	6,752,860	5,200,460	67%
Small Business Lighting	197	78	370,995	359,039	5,833,299	5,385,588	94%
Total	1,496	869	4,278,441	5,076,065	68,847,407	49,239,060	80%

Finally, ADM estimated cost-effectiveness of the 2009 programs and overall portfolio using the Total Resource Cost (TRC) test. The results are provided in Tables 1-5 and 1-6 below for the residential and non-residential segments, respectively. When calculating TRC, ADM used Generator kWh and kW savings, which incorporate line losses of 11% and 8% for residential and non-residential sectors, respectively.

Table 1-5 Cost-Effectiveness Testing of Residential Segment

Program	NPV of Benefits	NPV of Costs	TRC
Air Source Heat Pumps	$70,687	$80,178	.88
Evaporative Cooling	$516,989	$86,443	5.98
Home Energy Services	$4,660,655	$587,077	3.45
Home Lighting & Recycling	$1,731,039	$463,309	3.74
Low Income	$435,455	$231,621	1.88
Refrigerator Recycling	$47,869	$34,887	1.37
School Education Kits	$416,943	$157,385	2.65
Total, Residential Segment:	$8,870,130	$2,572,826	3.45

Table 1-6 Cost-Effectiveness Testing of Business Segment

Program	NPV of Benefits	NPV of Costs	TRC
Cooling Efficiency	$135,861	$50,277	2.70
Custom Efficiency	-	$21,441	-
Large Customer Self-Direct	-	-	-
Lighting Efficiency	$3,588,260	$524,270	6.84
Motor Efficiency	$388,182	$79,875	4.86
Small Business Lighting	$465,163	$342,071	1.36
Total, Business Segment:	$4,577,466	$1,017,934	4.50

2. Program Descriptions

The SPS 2009 DSM portfolio contained seven residential and six non-residential programs. These programs are detailed in the subsections below

2.1 RESIDENTIAL AIR SOURCE HEAT PUMP REBATES

The Residential Air Source Heat Pump Rebate Program (RASHP) is designed to help customers reduce their energy consumption by incenting the purchase of air source heat pumps that are more energy efficient than the standard efficiency equipment. Rebates are provided to customers based upon the results of the ENERGY STAR Calculator, incorporating unit capacity, SEER, HSPF, and Roswell, NM weather data.

The goal of the program is to increase the uptake of high efficiency air source heat pumps. The program is configured as a turnkey, stand-alone energy efficiency initiative. In 2008, the rebates were paid directly to customers. In 2009, the rebates were paid to HVAC contractors. This program modification has achieved a marked increase in participation, as the HVAC contractors are more effectively marketing the program. In 2009, the RASHP rebated a total of 46 heat pumps, an increase from the 9 rebates provided in 2008.

2.2 RESIDENTIAL EVAPORATIVE COOLING REBATES

The Residential Evaporative Cooling Rebate Program provides a rebate to SPS customers who purchase energy efficient evaporative cooling equipment for residential use. This program is intended to induce consumers to purchase evaporative coolers instead of using refrigerator air systems. Refrigerated air uses significantly more energy than evaporative cooling, and as such high savings can be realized by inducing SPS residential customers to use evaporative cooling via rebates. The REC program increases uptake of high efficiency cooling equipment by defraying some of the high upfront costs associated with the equipment. The program goals are to educate customers on the benefits of using an evaporative cooler, and to encourage retailers and contractors to stock high efficiency units. In 2009, the REC program issued 255 rebates.

2.3 RESIDENTIAL HOME ENERGY SERVICES

The Home Energy Services Program 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. In 2009, no central air conditioning replacements were rebated through the program, and total participation encompassed:

- 1,748 Duct Sealing Measures;
- 1,248 Home Infiltration Control Improvements; and

- 2 Ceiling Insulation Installations.

Technicians also test heating units and appliances for dangerous carbon monoxide emissions and gas leaks. Additionally, customers are educated on basic energy-efficiency practices and provided with free literature.

2.4 HOME LIGHTING & RECYCLING

The HLRP program provides upstream incentives to retailers for the sale of CFLs. The goal of the program is to buy down the retail price to $1-2 per bulb (varying by CFL type), in an effort to drive residential customers to replace incandescent lighting with high efficiency CFLs. Additionally, the program provides a mail-order option that allows for distribution to areas that may lack a participating retailer or a specialty bulb type. This program provides benefits to both retailers and customers in that:

- Retailers can achieve a higher sales volume without a reduction in profit margin, as the lost revenue from the price reduction is absorbed by SPS; and
- Customers can save money on their electric bills as well as in replacement costs, as typical lifetime for an incandescent bulb is roughly 1,000 hours, compared to an average lifetime of 8,000 hours for CFLs sold through this program.

The breakdown of sales by wattage is presented in Table 2-1 below.

Table 2-1 Summary of SPS CFL Sales

Wattage	***Total Sales***
9	2,724
10	1,303
11	278
13	12,597
14	43,530
15	1,966
17	1,444
19	455
20	5,036
23	3,476
26	4,355
27	24
42	74
Total	79,311

2.5 LOW INCOME PROGRAM

The Low-Income Program provides energy efficient lighting and refrigerators and CFLs to a New Mexico market segment that typically does not participate in energy efficiency programs. Due to higher upfront costs, the low income market is slow to adopt energy efficient technology. Through outreach and direct installation, the LIP reaches these customers, and along with providing energy saving equipment educates low income customers as to the potential benefits and cost savings associated with energy efficiency. In 2009, the program distributed 70 refrigerators and 13,350 CFLs. CFLs were distributed in four packs containing two 14W and two 19W CFLs.

2.6 RESIDENTIAL REFRIGERATOR RECYCLING PROGRAM

The Second Refrigerator Recycling Program (SRRP) is designed to help customers reduce their energy consumption by removing second refrigerators from their homes to recycle them. SPS benefits because the second refrigerator, which is generally more inefficient, will be permanently removed from the system. The recycling process also includes safe disposal of environmentally harmful material, providing collateral benefits from the SRR program.

The goal of the program is to reduce the number of old, inefficient refrigerators that customers have moved to their garages or other locations such as basements and patios. Many areas in which spare units are placed are not space conditioned, and most refrigerators used in that environment operate under a heavy thermal load during the summer. This is exacerbated by the fact the refrigerators are usually quite old and inefficient. Previous studies by the Environmental Protection Agency (EPA), the Department of Energy (DOE) and other utilities have determined that removing these refrigerators, and properly recycling them, performs an energy saving service.

In 2009, the program was configured as a turnkey, stand-alone energy efficiency initiative. The program was advertised to the public via ads, bill stuffers, point-of-sale flyers and media events. The program requires that refrigerators to be recycled be in working condition. The customer receives pick-up and removal service in addition to a $35 rebate per recycled unit.

Removing old, inefficient refrigerators prevents them from being resold or transferred to another SPS customer. The program provides annual electric energy savings for the remaining life of the unit by permanently removing the unit from service. As an added environmental benefit, 95% of the materials from these units are able to be recycled (metals, plastic, glass, oil, etc.) and disposed of in an environmentally responsible manner (hazardous materials), thus preventing the materials from reaching landfills and contaminating the environment. In 2009, a total of 87 refrigerators were recycled through the SRRP.

2.7 RESIDENTIAL SCHOOL EDUCATION KITS

The Residential School Education Kit Program is a fully implemented multi-resource efficiency/education program designed to facilitate installation of efficiency measures in homes and build knowledge of environmental issues in the SPS New Mexico service territory. The program yields a variety of measurable energy and water savings results by assigning students to bring educational materials and information to their home, discussing the information with their parents and installing measures included in the kit. The program delivered a proven blend of 140 teacher-designed classroom activities with hands-on home projects to install high efficiency devices and introduce resource-conscious behavior to 3,362 students and their families.

In 2009, the SEK program distributed 3,502 kits. Seventy-four percent of participants installed CFLs, 61% installed low-flow showerheads, and 57% installed the faucet aerator. The overall installed totals are presented in Table 2-1 below.

Table 2-2 Summary of Installations

Measure	***CFL***	***Showerhead***	***Aerator***
Quantity	5,007	2,136	1,996

2.8 BUSINESS COOLING EFFICIENCY

The Business Cooling Efficiency Program (BCEP) 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. However, the BCEP had no custom projects in 2009. The BCEP had a total of 4 participants in 2009, all installing prescriptive measures..

2.9 BUSINESS CUSTOM EFFICIENCY

The Business Custom Efficiency Program (BCEP) 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, beginning in 2010 SPS is 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.

The Business Custom Efficiency Program had no participants in 2009.

2.10 LARGE CUSTOMER SELF-DIRECT

SPS is offering the Large Customer Self Direct Program in New Mexico to encourage SPS' largest customers to self-direct their own energy efficiency projects. Qualifying businesses must have consumption exceeding 7,000 MWh per year. These facilities account for 47% of the peak kW and 55% of the annual consumption of all SPS commercial and industrial customers but account for only 0.2% of all commercial and industrial facilities. Participants of this program are still eligible for other Business Segment programs offered by SPS.

There is no stated restriction as to the measure types that qualify for this program, with the caveat that any measure must be cost-effective, which SPS defines as having a payback period greater than one year but less than seven years. Lighting, HVAC, compressed air, motors & drives, processes improvements, refrigeration, and other categories are all eligible under this program. Participants have two options for rebates. They can apply for either:

- A bill of credit up to 70% of the energy efficiency tariff rider charges for approved incremental expenditures made towards cost-effective energy efficiency or load management; or

- An exemption of up to 70% of the energy efficiency tariff rider charges for 24 months if the customer demonstrates that is has exhausted all cost-effective energy efficiency or load management projects at its facility.

The Large Customer Self-Direct program had no participants in 2009.

2.11 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
- 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.

In 2009, the BLEP had 23 participants installing a total of 26 projects.

2.12 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. In 2009, the BMEP had two participants installing a total of three projects.

2.13 SMALL BUSINESS LIGHTING

SPS is offering the Small Business Lighting Program to facilitate the implementation of cost-effective efficient lighting in non-residential facilities with peak demand of up to 400 kW. This program is available to existing nonresidential customers and offers prescriptive and custom incentives. In addition, customers receive a free energy audit, with recommendations for lighting as well as other measures, including heating, cooling, ventilation, motors, and recommissioning of their existing equipment. The program provides outreach to small businesses, who traditionally have lower participation rates in utility-sponsored energy efficiency rebate programs than larger businesses.

- 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

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. In 2009, the SBLP had 12 participants.

2.14 M&V METHODOLOGIES

The methodologies used in evaluation of each program are detailed in the Appendix to this report, which contains each of the individual program reports.

3. Evaluation Results & Recommendations

This chapter provides a summary of the evaluation results for each program and recommendations by ADM for the 2010 program year.

3.1 RESIDENTIAL AIR SOURCE HEAT PUMPS

To evaluate savings from the 2009 RASHP rebate program, ADM

- Validated deemed savings methodologies; and
- Conducted verification surveys.

Savings for the heat pumps are calculated using the ENERGY STAR heat pump calculator. ADM revised the calculator to use an equivalent full load hours value of 1,057, in line with the residential cooling demand figure used by SPS in other cooling programs.

ADM verified installation of heat pumps through telephone surveys with program participants. The required sample for 90/10 precision would have been 27 surveys. This was not reachable, however, due to the small participation population. ADM was able to complete 15 surveys, which provides precision of +/- 18%. However, the Net-to-Gross ratio determined for this program was different to such a magnitude that even with +/- 18% precision, the results allow for the rejection of the null hypothesis of 100% NTGR used by SPS in ex ante estimates.

There were issues with the available tracking data, as all needed information was not included in a format that was easy to assemble into a tracing data spreadsheet. Particularly, the available information did not include ex ante savings estimates, specifications on the rebated equipment, or participant contact numbers. Participant contact information was eventually provided in a database, but specifications of the rebated heat pumps, including capacity, efficiency, incremental cost, and ex ante savings estimates needed to be assembled manually by ADM into a database from SPS paper documentation. This marred the evaluation effort, adding time and expense. For the 2010 evaluation, ADM would recommend that data on the specific rebated units be provided in a complete tracking database along with customer names and contact information.

The program failed cost-effectiveness testing in 2009, and should the NTGR for 2010 be similar in value to that estimated in 2009, the program will require very high participation in order to pass TRC testing. However, given that ADM could not provide 90/10 precision due to the limited pool of participants to survey, another year of evaluation, perhaps with increased participation, is warranted in order to determine the viability of the program

3.2 RESIDENTIAL EVAPORATIVE COOLING REBATES

ADM reviewed the deemed savings estimates for measures rebated through the program in 2009. A key assumption for measures in this program was the Equivalent Full Load Hours (EFLH) of operation. The deemed savings estimates call for EFLH of 1,057 per year, which after running simulation models of typical Roswell, NM housing stock, ADM determined to be a reasonable estimate of annual residential cooling demand for the Southwestern Public Service Company territory in New Mexico. Annual savings estimates by ADM for this measure were within 5% of deemed savings values and as such ADM did not revise the deemed amount for kWh savings; the level of savings estimated by ADM was within a reasonable error margin of the level claimed by SPS.

ADM did revise the peak kW reduction claimed for one measure class, however. Based upon the results of our simulation review, ADM revised kW reduction estimates as follows:

Table 3-1 Revisions to Ex Ante kW Reduction Values

Measure	***Ex Ante***	***Ex Post***
AC to Tier I Evap	1.74	1.74
AC to Tier II Evap	1.98	1.98
Tier I Evap to Tier II Evap	.17	.24

This change did not affect savings for the 2009 program as there were no Tier I to Tier II evaporative cooling retrofits.

We then conducted verification surveys with program participants. With a population of 255, the required sample to meet 90/10 precision was 55 surveys. ADM completed these surveys, verifying installation and addressing free-ridership and net-to-gross issues. Additionally, ADM conducted 15 onsite verifications, inspecting the units to verify that they were appropriately classified and rebated.

In summary, ADM recommends that for 2010, the RECP have the following changes:

- Revise the peak kW deemed savings estimate from .17 to .24 kW; and
- Apply a NTGR of 50%.

3.3 RESIDENTIAL HOME ENERGY SERVICES

ADM reviewed the deemed savings estimates for measures rebated through the program in 2009. 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).

ADM tested the deemed savings assumptions applying similar residential simulation models incorporating Roswell, NM weather data. Results for the applicable measures were within 5% of values applied by SPS and as such ADM has determined that the deemed savings methodologies provide reasonable estimates of savings for measures rebated through the HESP in 2009.

ADM 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. At 90% confidence and 10% required precision (RP), this calls for a sample of 68. ADM completed 70 surveys with program participants, verifying inputs for deemed savings methodologies as well as for evaluation of the 2009 HESP net-to-gross ration in order to provide net savings estimates for the program.

There were issues with the available tracking data, as all needed information was not initially included in the dataset provided to ADM. Particularly, data initially lacked contact phone numbers, full detail of the rebated equipment, and incremental cost. Much of this was eventually corrected, however. ADM confirmed the validity of the gross savings estimates used by SPS, determining them to be reasonable estimates of the savings associated with weatherization measures in the SPS New Mexico service territory.

In 2010, ADM will be able to do a more thorough review of the deemed savings estimates as at that point there will be post-retrofit billing data available from the 2009 participant pool. ADM will apply this to the 2010 evaluation, potentially causing changes in gross savings.

3.4 HOME LIGHTING & RECYCLING

Verification of the quantity of CFLs purchased was done in two steps;

- Review of the tracking; and
- Surveys of lighting purchasers.

3.4.1 Database Review

ADM first examined the database for systemic entry errors, i.e., duplicate entries and/or erroneous entries (such as data entered into improper columns). We found many instances of the tracking data assigning incorrect wattages or quantities to different CFL SKU numbers. We researched each individual SKU type sold through the program and provided the results of our research to SPS, and the database was updated and corrected accordingly.

3.4.2 Surveys of Lighting Purchasers

Typically, upstream lighting rebate programs are evaluated via recruitment of lighting purchasers for intercept and follow-up surveys. In this method, lighting purchases are approached following completion of their selection of lighting and asked a brief (1-2 minute) survey. They are then recruited for a follow-up survey to take place 1-2 months later in which they are asked

- How much of the purchased lighting was installed;
- Where in the home purchased lighting was installed; and
- If they would have purchased the same type and quantity of lighting without the discount.

This evaluation is occurring after implementation is complete, and as such, survey results from customers recruited in-store may not accurately reflect the behavior of customers during the applicable program year. As such, ADM determined that the evaluation would be best served by surveying customers from the applicable program year. One participating retailer tracked customer-specific information via in-store coupons, which ADM drew a sample from for needed participant surveying. Lacking cause to believe that customers who purchase CFLs at this differ significantly from those that purchased CFLs at other participating retailers, ADM determined that a random sample of customers from the three participating stores that tracked customer-specific information would suffice. In accordance with 90/10 sampling precision requirements, ADM surveyed a sample of 68 participants.

3.4.3 Verification of Deemed Savings Estimates

Deemed savings estimates for CFLs are dependent upon two factors:

- Baseline incandescent fixture wattage; and
- Hours of operation.

Through these two figures, deemed savings estimates for a CFL are calculated as:

Annual kWh Savings = (CFL Wattage – Incandescent Wattage) * Hours of Operation / 1000 W/kW

3.4.4 Baseline Wattage

Baseline wattage is determined by the type of bulb providing equivalent lumens. The CFLs sold through this program provide a guideline on the packaging indicating the equivalent incandescent wattage in order for customers to properly size their CFL purchase. The equivalent CFL wattages are detailed in Table 3-1 below.

Table 3-2 Baseline Wattages by CFL Size

CFL Wattage	***Ex Ante Baseline Wattage***	***Ex Post Baseline Wattage***

9	40	40
10	40	40
11	40	40
13	60	60
14	60	60.15
15	60	60
17	75	75
19	75	75
20	75	75
23	100	100.49
26	100	100
27	100	100
42	150	150

It should be noted that some baseline wattages do not directly correspond to an incandescent size. For 14W and 23W bulbs, the baseline wattage depends upon the bulb type (spiral, globe, flood, etc.), as each bulb type has a different baseline incandescent wattage. The baseline established for these two CFL wattages are weighted averages of the baseline wattages by bulb type. For 14W bulbs, the baseline lighting consisted of 60W and 65W incandescent lighting. For 23W bulbs, baseline lighting consisted of 90W, 100W, and 120W lighting. All baseline lighting values provided by ADM were taken from the lighting equivalence as stated on the individual lamp's packaging.

3.4.5 Hours of Operation

SPS determined hours of operation based on the following factors:

- Number of lamps available by room type
- Hours of use by room type
- Number of lamps purchased per customer

The assumption was that CFLs would enter highest-us areas first. This assumption does not always hold, however, as in many cases customers may install in lower-use areas first. This can occur for a variety of reasons, but two common reasons are:

- Lack of eligible fixtures in higher-use rooms; and
- Incandescent lighting burning out in low-use rooms.

It is common for residential customers to wait until burnout to replace lighting, and it is not always the high-use areas which burn out first. ADM determined an appropriate hours of use estimate based upon the room of installation as indicated by survey respondents.

In a 2005 study of California by KEMA[1], CFL use was monitored in statistically significant samples by room type, with the resulting average daily hours of operation by room type summarized in Table 3-2 below.

Table 3-3 Daily Hours of Operation by Room Type – KEMA Study

Room Type	CFL Hours Per Day
Kitchen	3.5
Living Room	3.3
Outdoor	3.1
Family Room	2.5
Garage	2.5
Bedroom	1.6
Bathroom	1.5
Hall/Entry	1.5
Laundry Room	1.2

The hours of use by room type that SPS applied in their deemed savings estimates was based upon a DOE study conducted by Navigant[2]. The KEMA study is the more recent study and is based upon a significant amount of residential monitored lighting runtime data. However, there are room types from the Navigant study that are not covered in the KEMA study. ADM has applied hours of use from the KEMA study where available and those from Navigant for room types that the KEMA study did not cover. These hours are displayed in Table 3-3 below.

Table 3-4 Daily Hours of Operation by Room Type – Navigant Study

Room Type	CFL Hours Per Day
Utility Room	2.4
Dining Room	2.3
Office	1.9
Closet	1.4
Other	1.2

The results from these two studies provide an up-to-date depiction of hours of use by room type for a wide array of residential end-uses.

3.4.6 HL&R Annual Savings Estimates

Annual savings estimates are calculated by summing the wattage reduction multiplied by the daily hours of operation, adjusted by the percent of CFLs used to replace other CFLs. The equation is summarized as:

[1] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2005

[2] US DOE, US Lighting Market Characterization, Navigant Consulting, 2002

Annual kWh Savings = (Incandescent Wattage – CFL Wattage) * Quantity * Hours of Operation / 1000 W/kW

As stated prior, baseline wattages were collected from individual model's packaging, and a weighted average was calculated for wattage levels that featured more than one possible baseline wattage (due to the same CFL wattage covering more than one lamp type). Hours of use were calculated at a weighted average of 2.7 hours per day (985 hours/yr), based upon survey results with lighting purchasers.

3.4.7 HL&R Peak Savings Estimates

Peak savings estimates are calculated in the following manner:

Peak kW Savings = (Incandescent Wattage – CFL Wattage) * Quantity * Peak Coincident Factor / 1000 W/kW

SPS used a peak coincident factor of .08 when estimating peak kW. Based upon a peak period of 4:00 – 6:00 PM in summer, ADM has determined a peak coincident factor of .10166667, as per the results of the 2005 KEMA residential lighting monitoring study. This results in increased realization for the peak kW reduction associated with residential CFLs in the SPS territory.

3.4.8 HL&R Program Recommendations

For the next program-year, ADM suggests a downward revision of hours of operation in the tech assumptions for the HL&R program. Additionally, with the peak period defined as from 3:00 – 6:00 PM, ADM suggests that the deemed peak coincident factor be revised upward from .08 to .1016667. This is the result of a recent monitoring effort of residential lighting by KEMA for the California Public Utilities Commission.

In future program years, ADM will again examine the specific CFL models rebated through the program and modify baseline wattages to match the values listed on the CFL packaging, resulting in weighted average baselines for some CFL wattages. ADM will reassess operating hours in 2010, using in-store intercept surveys at a cross-section of participating retailers, with a revision to be made to the 2009 operating hours value should the 2010 value differ by more than 10%.

3.5 RESIDENTIAL LOW INCOME PROGRAM

The Low Income Program provided CFLs and refrigerators to qualifying SPS customers. The methodology for assessing the impact is detailed in the subsections below.

3.5.1 Gross Estimations for Low Income CFLs

SPS assumed 1,210 hours of operation in their kWh savings estimates. ADM revised this to 1,022 based upon prior evaluation experience with CFL outreach programs as well as the information from the distributing agencies that they had given multiple packs to program participants. ADM reviewed the baseline wattages used by SPS and determined them to be accurate figures. As a result of the downward revision of hours of operation, measure life was lengthened, and as such lifetime kWh savings were not significantly affected though annual kWh savings were.

With hours of operation and baseline wattage, deemed savings estimates for a CFL are calculated as:

Annual kWh Savings = (CFL Wattage – Incandescent Wattage) * Hours of Operation / 1000 W/kW

3.5.1.1 Baseline Wattage

Baseline wattage is determined by the type of bulb providing equivalent lumens. The CFLs installed through this program provide a guideline on the packaging indicating the equivalent incandescent wattage in order for customers to properly size their future CFL purchases. The equivalent CFL wattages are detailed in Table 3-1 below.

Table 3-5 Baseline Wattages by CFL Size

CFL Wattage	Baseline Incandescent Wattage
14	60
19	75

3.5.1.2 CFL Hours of Operation

For the analysis of energy savings, the results of the regression analysis are used along with engineering analysis to assess the *ex ante* estimates of energy savings from installed measures for a sample of participants. The input assumptions used to determine the *ex ante* savings estimates are reviewed to determine the appropriateness of these assumptions.

Based on this review, ADM has revised the savings estimates that SPS has stated for CFLs downward as hours of use were higher than observed by ADM in CFL outreach programs. In a 2005 study of California by KEMA[3], CFL use was monitored in statistically significant samples by room type. Based upon room of installation data that ADM had collected in prior evaluations, we determined an average hours of operation figure of 2.8 hour per day, for 1,012 hours per year.

3.5.2 Gross Estimations for Low Income Refrigerators

ADM reviewed the technical assumptions behind the savings for refrigerator replacements for the LIP. Savings were calculated based upon the Energy Data Sourcebook for the U.S. Residential Sector by the Lawrence Berkley National Laboratory. ADM determined kWh

[3] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2005

savings to be reasonable estimates but revised peak kW savings downward. Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[4]. Resultantly, ADM calculated kW factors of .000127 for conditioned space.

3.5.3 Low Income Program Recommendations

From the results of this analysis, ADM recommends that:

- The deemed savings estimate for CFLs be decreased to 1,022 hours per year.
- That deemed savings estimates for refrigerators be based upon the remaining useful life of the replaced refrigerator. This results in higher annual savings but reduced lifetime savings for refrigerator replacements.

3.6 SECOND REFRIGERATOR RECYCLING PROGRAM

ADM estimated savings from the RRP by surveying a sample of program participants and by using available data on the removed refrigerators to calculate unit-specific savings, using a regression methodology developed by Cadmus in 2009. With the population of 87, the required sample for 90/10 precision was 40 surveys. ADM completed these surveys, verifying recycling and addressing net-to-gross issues. ADM then examined the tracking data and calculated unit-specific savings.

3.6.1 Refrigerator Recycling Annual Savings Estimates

The implementer for SPS Refrigerator Recycling Program estimated ex ante savings for recycled units by taking the at-manufacture estimate of annual kWh usage for a recycled unit and degrading by methodologies outlined in the Lawrence Berkley National Laboratory Residential Energy Databook. ADM determined that a more precise methodology is that outlined by The Cadmus Group in a 2009 study on refrigerator degradation for the California Public Utilities Commission.[5] For its study, Cadmus used data on refrigerator energy use obtained through two in situ monitoring efforts:

- A dual monitoring study that ADM conducted in support of the evaluation of the (California) 2004-2005 Statewide Residential Appliance Recycling Program; and
- Additional in situ monitoring that Cadmus conducted as part of its study.

[4] NREL, "Technical Support Document: Development of the Advanced Energy Design Guide for Grocery Stores", September, 2008

[5] The Cadmus Group, Inc. "Residential Retrofit High Impact Measure Evaluation Report", prepared for the California Public Utilities Commission. December 7, 2009

The product of these efforts was a database that contained energy use obtained through both DOE testing and in situ monitoring for a sample of 321 units, 184 of which were from the 2004-2005 evaluation and 137 from the 2006-2008 evaluation. Cadmus used the data from this dual monitoring sample to develop regression models that relate in situ energy use to energy use as determined from the DOE test procedure and modification factors based on weather and household size. These modification factors are summarized in Table 3-1.

Table 3-6. In Situ Monitoring Adjustments to DOE Testing Values

Primary	**Household Size**	**Climate Zone**	**n**	**% In Situ Delta[6]**
Yes	1-2	Cool	29	-30.8%
		Warm	18	-19.2%
	3+	Cool	50	-16.0%
		Warm	32	-6.4%
No	1-2	Cool	86	-21.3%
		Warm	42	-15.8%
	3+	Cool	59	-6.8%
		Warm	31	1.3%

For this M&V study, the SPS New Mexico territory is treated as a Warm Climate. Because distribution of household sizes is not known for the population of customers participating in the RRP, the distribution observed in the Cadmus study was used. As this program focuses on second refrigerator recycling, the figures used in the calculations to follow are drawn from Table 3-1 where Primary = "No". There were 86 households with 1-2 people and 59 with 3+. Weighting the "% In Situ Delta" by these values, we get an adjustment factor of:

[(42/73) x -15.8%] + [(31/73) x 1.3%] = -8.54%

Additionally, annual kWh use is estimated via a regression model based upon the unit size, configuration (side-by-side vs. top-bottom), and defrost type (manual vs. frost free). The variable coefficients are detailed in Table 3-2 below.

Table 3-7 Regression Model Coefficients

Variable	**Coefficient**
Intercept	491.83
Side-by-Side Configuration Dummy	98.96
Size (Cubic Feet)	35.3
Age	25.25
Side-by-Side * Age (interactive	19.98

[6] A negative in situ delta represents an in situ UEC that is lower than the DOE UEC

The outputted results from this regression were then reduced by 8.54% in order to account for the climate correction for secondary refrigerators.

3.6.2 Refrigerator Recycling Peak Demand Reduction Estimates

Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[7]. Resultantly, ADM calculated kW factors of .000127 and .000247 for conditioned and unconditioned space, respectively. Our survey results indicated that 53% of the recycled refrigerators were used in conditioned space, with 47% used in unconditioned space. Weighting the kW factors by these proportions, the weighted average kW factor is .000183. Multiplying this by the ex post kWh savings estimate provides gross peak demand reduction of 24.1 kW.

3.6.3 RRP Recommendations

Currently, the program does not allow for the recycling of secondary freezers. Numerous survey respondents indicated that they would like to be able to recycle their freezer through the program, and it is an option that ADM has seen available in other service territories. SPS could increase participation by allowing for the recycling of dedicated freezers.

With the data collected by the program implementer, it is easy and cost-effective for ADM to calculate savings for a specific unit, using regression modeling based upon unit capacity, age, defrost type, and configuration, and as such ADM intends to calculate savings in subsequent program years by a similar methodology, so that annual kWh savings and the remaining useful life of the recycled refrigerators is accurately accounted for.

3.7 SCHOOL EDUCATION KITS

ADM reviewed the deemed savings estimates for the measures included in the package and informed savings calculations with data provided from the participant survey data. The results of these reviews were as follows:

- CFLs: ADM calculated a weighted-average baseline for the two CFL sizes included (13W and 18W), based upon survey responses from program participants in which they indicate the wattage of the CFL they had replaced. The result was a weighted baseline wattage of 72.1W and 74.3W for 13W and 18W CFLs, respectively. This increased savings from 13W CFLs but decreased savings from 18W CFLs. Peak kW was higher than claimed by SPS as due to the peak period being defined from 3:00-6:00 PM, ADM

[7] NREL, "Technical Support Document: Development of the Advanced Energy Design Guide for Grocery Stores", September, 2008

revised the peak coincident factor from the 8% figure used by SPS to 10.6%, as determined from the 2005 KEMA Residential CFL Monitoring Study[8].

- Low Flow Showerheads: ADM determined the savings estimate of 398 kWh per year to be a reasonable estimate and in line with other evaluation efforts. Gross savings were revised downward, however, based upon installation rates and the percentage of homes with electric water heating. Installation rates and the proportion of homes with electric water heating were lower than anticipated and as such overall savings from showerheads were reduced, though the per-unit savings matched SPS estimates.

Faucet Aerators: Similarly to low-flow showerheads, ADM revised savings based upon installation rates and the percentage of homes with electric water heating, but did not revise the per-unit deemed savings estimate of 79 kWh per year. This value is a reasonable estimate and in line with other evaluation efforts.

Verification of the items installed within the Residential School Education Kit program was unable to be completed due to cards returned displayed personal information that could not be redacted. As such, ADM was required to use the installation rates stated in the survey results in calculating savings.

ADM recommends the following changes to tech assumptions for the SEK program:

- 52% of homes receiving the kit have electric water heating;
- 63% installation rate for showerheads;
- 60% installation rate for faucet aerators;
- 74% installation rate for 13W CFL;
- 69% installation rate for 18W CFL; and
- Peak coincident factor of 10.67% for CFLs.

3.8 BUSINESS COOLING EFFICIENCY

A first aspect of conducting measurements of program activity is to conduct a thorough review of deemed savings estimates and their underlying assumptions. The two measures reviewed in the 2009 evaluation are:

1. Roof-Top Units (RTUs)
2. Packaged Terminal Air Conditioners (PTACs)

[8] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2005

The review of deemed savings estimates for the applicable measures is detailed in the subsections below.

3.8.1 Roof-Top Units

Savings associated with RTUs are a function of baseline efficiency, as-built efficiency, and estimated Equivalent Full Load Hours (ELFH) for the facility type, as determined by Roswell, NM Typical Meteorological Year (TMY) weather data. Annual kWh savings are calculated using Seasonal Energy Efficiency Ratio (SEER), which is the efficiency of the RTU over the average cooling season weather. Peak demand reduction is calculated using Energy Efficiency Ratio (EER), which is the efficiency rating of the RTUs at 95 deg F. Savings for RTUs are calculated as follows:

$$\text{Annual kWh Savings} = \text{Size (Tons)} \times \text{EFLH} \times (12/\text{SEER}_{\text{Standard}} - 12/\text{SEER}_{\text{Efficient}})$$

$$\text{Peak kW Savings} = \text{Size (Tons)} \times (12/\text{EER}_{\text{Standard}} - 12/\text{EER}_{\text{Efficient}})$$

The primary assumption associated with the deemed savings estimates was EFLH. The 2009 program year had RTUs installed in retail facilities, for which the estimated EFLH was 1,670/yr. ADM reviewed the methodologies used to determine EFLH[9], and determined that the methodologies were valid and were properly applied to Roswell, NM TMY weather data. Baseline efficiencies used in savings calculations for RTUs are based upon IECC 2006 standards and were accurately applied in the 2009 BCEP.

3.8.2 Packaged Terminal Air Conditioners

Savings from PTACs are calculated in a manner similar to that of RTUs. Where they differ in deemed the savings estimate is in the assumed EFLH. They are heat pumps, and as such provide both heating and cooling season electric savings. Savings calculations for this equipment class are performed similarly to those done for RTU's, with EFLH differing as PTACs are used in hotel rooms, which are subject to limited occupancy. ADM did find that PTACs rebated in 2009 had major errors in annual kWh savings calculations; ADM recalculated savings using the stated methodologies from the SPS Tech Assumptions, and the result was 237% realization for PTACs.

3.8.3 EUL Summary

SPS applied an effective useful life (EUL) of 20 years for RTUs and PTACs rebated through the program in 2009. ADM has revised these values to 15 years in accordance with California DEER estimates, as the 15 year value is more consistent with what is applied in other service territories for these equipment classes.

[9] Arkansas Deemed savings Quick Star Program Draft Report Commercial Measures Final Report

3.8.4 Business Cooling Efficiency Program Recommendations

Only two equipment classes were rebated in 2009. ADM would recommend that SPS review their rebate calculators for other equipment classes to ensure that savings and the associated rebates are calculated properly for other equipment classes rebated in 2010.

Additionally, ADM suggests revision of the EUL of RTUs and PTACs from 20 to 15 years.

Due to limited participation in 2009, ADM cannot provide a recommendation for revision of the NTGR, so we conclude that the 94% value should be used in ex ante estimations in 2010.

3.9 BUSINESS CUSTOM EFFICIENCY

There were no participants in the 2009 Business Custom Efficiency Program.

3.10 LARGE CUSTOMER SELF-DIRECT

There were no participants in the 2009 Large Customer Self-Direct Program.

3.11 BUSINESS LIGHTING EFFICIENCY

A first aspect of conducting measurements of program activity is to conduct a thorough review of deemed savings estimates and their underlying assumptions. For the 2009 program year, this included a review of:

- Wattage reductions for various lighting fixtures (T8, Pulse Start MH, CFLs)
- Deemed hours of operation by facility type
- Peak Coincident Factor
- HVAC interactive factors

After reviewing the above components, deemed savings were revised as described in the subsections below.

3.11.1 Deemed Wattage Reduction

ADM made no revisions to deemed wattage reductions. We reviewed the wattage tables and determined them to accurately depict fixture wattages.

3.11.2 Deemed Hours of Operation

ADM found several instances where facility hours of operation differed significantly from the deemed estimate. For industrial facilities, SPS stipulates 12 hours a day of operation. ADM found industrial facilities with savings calculated using this hours of operation figure to actually operate from 7,900 – 8,760 hours per year. By applying facility specific hours of operation, realization from lighting in this application was very high.

In contrast, lighting occupancy sensors had savings significantly reduced at one facility, as ADM verified on site that the assumptions of the wattage controlled by the occupancy sensors were incorrect; the sensors controlled a significantly lower wattage than assumed in deemed estimates.

3.11.3 Peak Coincident Factors

As with hours of operation, ADM developed site-specific peak coincident factors based upon facility-provided lighting schedules and on-site monitoring. For industrial facilities, this resulted in an increase in the peak coincident factor. For educational facilities and offices, the peak coincident factor was revised down as SPS has defined their peak period from 3:00 – 6:00 PM, which occurs after peak usage for office facilities.

3.11.4 HVAC Interactive Factors

After reviewing the energy and demand interactive factors used in SPS deemed savings calculations for lighting, ADM determined that the energy interactive factors were over conservative and demand factors were too high, both out of line with values ADM has seen applied in other service territories. ADM developed energy and demand interactive factors specific to the SPS service territory by facility type through DOE-2 simulation of typical facilities using Roswell, NM weather. A summary of ADM's revisions to HVAC interactive factors is presented in Table 3-1 below.

Table 3-8 Business Lighting Efficiency - Revisions to Energy & Demand Interactive Factors

Facility Type	Energy (kWh)		Demand (kW)	
	Ex Ante Interactive Factor	Ex Post Interactive Factor	Ex Ante Interactive Factor	Ex Post Interactive Factor
Office	1.11	1.11	1.33	1.19
Single Story Retail	1.11	1.11	1.33	1.38
Education - University	1.11	1.17	1.33	1.49
Industrial	1.11	1.05	1.33	1.30

3.11.5 Effective Useful Life

SPS applied Effective Useful Life (EUL) values of 18 years for linear fluorescent and metal halide lighting, as well as for lighting controls. ADM calculated facility specific EULs using the CA DEER guideline of the rated life of the ballast (70,000 hours) divided by annual hours of use, or 15 years, whichever is less. Due to several facilities operating for high amounts of hours per year, the EUL of lighting rebated in the program was lower than used in SPS ex ante estimations. IN addition, in accordance with DEER guidelines, ADM applied an EUL of 8 years for lighting occupancy sensor controls; ADM concluded that the 18 year figure applied in ex ante estimations was uncharacteristically high, based upon the EUL applied in other program evaluations conducted.

3.11.6 Measurement & Verification of Savings

The BLE Program totaled 22 participants in 2009. ADM visited a sample of seven facilities, encompassing 90% of program savings. ADM installed monitoring equipment at facilities where claimed savings were high and hours of operation were in question, and in many instances found hours of operation to be significantly higher than the deemed value for the facility type. Additionally, the same participant pool was surveyed to address program satisfaction and net-to-gross issues.

3.11.7 Business Lighting Efficiency Program Recommendations

ADM would recommend that for future program years, SPS make the following revisions to deemed savings assumptions:

- Revise EUL of lighting fixtures from 18 years to 70,000 hrs/ hrs per year, or 15 years, whichever is less;
- Revise EUL of lighting occupancy sensors from 18 to 8 years;
- Apply HCIF's developed for specific facility types, rather than one value for all facilities with lighting in conditioned space;
- Revise ex ante NTGR from 96% to 80%; and
- Examine facility-specific hours for deemed projects with sufficiently high savings.

Point #5 was a key factor in the high realization observed for the 2009 BLEP. ADM discovered that many participating facilities had far higher hours of operation than determined by the SPS deemed savings estimates. SPS currently has in place procedures to have senior engineering staff review savings from custom projects over a certain size, and ADM would suggest a similar review of high-savings sites that are installing prescriptive measures. For large projects, deemed hours may be less likely to accurately depict the hours of operation, as observed in the 2009 BLEP.

3.12 BUSINESS MOTOR & DRIVE EFFICIENCY

ADM reviewed the deemed savings estimates for the measure types listed. Deemed savings estimates were based upon assumed values for:

- Hours of operation
- Motor load factor
- Efficiency of pre-existing equipment (for cases of motor controls)

Hours of operation and load factor were estimated based on application and facility type, i.e., if the motor was used for process or cooling loads, and in the case of cooling, for what type of facility. ADM determined the hours of use estimates to be adequate and in line with figured observed in prior evaluation efforts, and as such did not revise gross savings for rebated measures in the BMEP.

The 2009 BME Program had limited participation, with only two customers receiving rebates. As such, on-site verifications were not cost effective for this evaluation. However, ADM was able to visit one site as a 2009 participant had a custom application in place for 2010, so an on-site verification was performed for the 2009 measure installation during the site visit for installation of monitoring equipment for the 2010 measures. The measures installed by the other program participant were verified by telephone.

The motors rebated in the 2009 BMEP were in oil drilling applications, as this is a large industry in the SPS New Mexico service territory. ADM would suspect that the hours of operation for motors in this application would be higher than the deemed amount of 5,239 hours currently used for motors in process loads, as oil wells operate continuously. However, lacking sufficient metered data at this time, ADM has not revised the deemed hours of operation. It could be stated though that the gross savings estimates for the 2009 BMEP are conservative, and that with a sufficient monitoring effort, a separate deemed hours of operation value for motors in oil pumping applications could be developed in 2010.

3.13 SMALL BUSINESS LIGHTING

ADM reviewed the deemed savings estimates for the measure rebated at participating facilities. Deemed savings estimates were based upon assumed values for:

- Hours of operation
- Baseline wattage
- Peak coincident factor

Hours of operation and coincident factor were estimated based on application and facility type. ADM determined that the peak coincident factor applied for elementary and secondary schools was inappropriate. SPS uses a peak coincident factor of 73% for elementary and secondary schools, and ADM concluded that elementary schools should have a peak coincident factor separate from secondary schools. The reasoning behind this was that secondary schools typically have a summer session, so they are at least partially occupied during peak periods. Elementary schools typically do not have a summer session, and thus would not have a 73% peak coincident factor. This issue is aggravated by how late the peak period occurs in SPS territory; with the peak period occurring from 3:00 – 6:00 PM, ADM determined the peak coincident factor for elementary school lighting to be 0%. Schools constituted 84% of ex ante kW savings estimates, and as such realization for kW was exceedingly low for the 2009 SBLP, despite high realization for annual kWh savings.

Additionally, ADM verified installation of rebated measures through onsite verification of three participating facilities. The fieldwork effort focused on the larger participants, as the top two facilities constituted 67% of ex ante kWh savings estimates. The remaining participants had verification conducted via telephone, in order to allow for a cost-effective evaluation effort of the 2009 SBLP.

ADM recommends that SPS disaggregate elementary and secondary schools in their deemed savings estimates. They differ greatly in their summer use profile, and as such the same peak coincident factor (or hours of use) cannot be applied to both facility types. In summary, ADM would recommend the following changes to SPS Small Business Lighting Tech Assumptions:

- Apply a NTGR of 95% to ex ante estimates;
- Change peak coincident factor for elementary schools to 0%; and
- Keep the current peak coincident factor for education facilities for middle and high schools.

4. COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

4.1 PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD);
- Non-Electric Acquisition Cost Decrease (NEACD); and
- Utility Generation Capacity Credit (UGCC).

Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for each program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year. ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, and program-specific NTGR and EUL.

ADM used projected gas cost values per MMBtu to calculate NEACD. These projections capture costs per MMBtu over the next 20 years. ADM took the NPV of the avoided costs, using a discount rate of 5%, and program-specific NTGR and EUL.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 20 years, encompassing both generation costs and transmission & distribution (T&D) costs. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC.

4.2 PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the measures without the program, so the costs faced by the participant are not considered to be program-generated. The second component, UAC, is a fixed number reported from SPS for the total cost of administering the program in 2009. With these figures, Total Resource Cost is then calculated as:

$$TRC = \frac{UEPCD + NEACD + UGCC}{NCI + UAC}$$

Appendix A. Program Reports

This appendix provides the program-level evaluation reports.

Residential Air Source Heat Pump Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

Prepared for:

Xcel Energy

Prepared by:

ADM Associates, Inc.

3239 Ramos Circle
Sacramento, CA 95827
916-363-8383

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Executive Summary

This report provides the results of the measurement and verification (M&V) of Southwestern Public Service Company (SPS) Residential Air-Source Heat Pump Rebate Program (ASHP) that was implemented in New Mexico in 2009. This program provides rebates for residential customers for purchasing air-source heat pumps rated at a minimum 14 SEER and 8.3 HSPF.

Participants of the project implemented a total of 46 air-source heat pumps within SPS's New Mexico service territory during the 2009 program year. Gross electric impacts were 84,504 kWh saved annually, which represents a realization rate of 95%; 1,014,048 kWh saved over the life of the measures installed; and coincident peak demand reduction of 44.8 kW.

This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the Residential Air Source Heat Pump Rebate Program in New Mexico. Ex post gross electric savings were determined through a review of the deemed savings assumptions and a test of the assumptions for cooling loads via simulations of typical Roswell, NM housing stock using Roswell, New Mexico Typical Meteorological Year (TMY) weather data.

Additionally, ADM evaluated net savings of the Residential Air-Source Heat Pump Rebate Program, providing estimated free-ridership rates of 53% for program participants, with an associated Net-to-Gross Ration (NTGR) of 47%. This is less than the 100% NTGR used in ex ante estimations. As such, net annual savings totaled 39,717 kWh annually; 476,604 kWh over the life of the measures installed; and 21 kW in peak demand reduction. Table 1-1 below summarizes gross impacts. Net impacts are presented in Table 1-2.

Table 0-1 Gross Impact Summary

Measure Category	**Peak Demand Reduction (kW)**		**Annual Energy Savings (kWh)**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Air-Source Heat Pumps	44.8	44.8	89,000	84,504	12	1,068,000	1,014,048

Table 0-2 Net Impact Summary

Measure Category	**Peak Demand Reduction (kW)**		**Annual Energy Savings (kWh)**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Air Source Heat Pumps	44.8	21	89,000	39,717	12	1,068,000	476,604

Project Background

The Residential Air Source Heat Pump Rebate Program (RASHP) is designed to help customers reduce their energy consumption by incenting the purchase of air source heat pumps that are more energy efficient than the standard efficiency equipment.

The goal of the program is to increase the uptake of high efficiency air source heat pumps. The program is configured as a turnkey, stand-alone energy efficiency initiative. In 2008, the rebates were paid directly to customers. In 2009, the rebates were paid to HVAC contractors. This program modification has achieved a marked increase in participation, as the HVAC contractors are effectively marketing the program. In 2009, the RASHP rebated a total of 46 heat pumps, an increase from the 9 rebates provided in 2008.

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the Residential Air-Source Heat Pump Rebate Program. The M&V approach for the Residential Air-Source Heat Pump Rebate Program is aimed at the following:

- Verifying counts of air-source heat pumps installed as a result of the project;
- Specification and the extent to which installed air-source heat pumps are used;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the ASHP Program in 2009.

Review of Deemed Savings Estimates

ADM reviewed the deemed savings estimates for measures rebated through the program in 2009. A key assumption for measures in this program was the Equivalent Full Load Hours (EFLH) of operation. For other residential cooling programs in this service territory, EFLH for cooling totaled 1,057 hours per year. The Energy Star Heat Pump savings calculator used to provide ex ante savings estimates used a higher value than this, so ADM revised the cooling EFLH to correspond with residential cooling program offerings in SPS and other New Mexico service territories in a similar weather zone.

ADM had validated the 1,057 EFLH figure through simulations of typical Roswell NM housing stock, and the resultant annual savings estimates by ADM for this measure were within 5% of deemed savings values and as such ADM did not revise the deemed amount for kWh savings; the level of savings estimated by ADM was within a reasonable error margin of the level claimed by SPS.

After reviewing the calculation methodology, ADM did not revise peak kW calculations; the only part of the calculations warranting revision was the EFLH, which does not affect peak demand reduction.

Verification of Installed Measures

Verification of the cooling systems installed was done in two steps;

- Review of the tracking data presented; and
- Surveys of customers who installed air-source heat pumps.

ADM's first aspect of conducting measurements of program activity was to verify the numbers of efficient air-source heat pumps installed. Verification work is based on using detailed program tracking data. To begin the verification effort, we reviewed the tracking system data on reported rebated units to determine that all reported units were eligible for the program.

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, which is assumed at .5 based on our previous experience with air-source heat pump rebate programs. Coefficient of Variation (CV) is defined as:

$$CV(x) - \frac{Standard\ Deviation\ (x)}{Mean(x)}$$

Using a CV of .5, sample size is estimated at:

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

With 10% required precision (RP), this calls for a sample of 68. However, the above formula provides a sample for very large populations. For this program, ADM 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.

Applying the finite population correction factor, the required sample is reduced to 27. Due to the limited participant pool, ADM could not achieve 27 surveys. ADM was able to complete 15 surveys, which provided a precision level of +/- 18% at 90% confidence. However, the NTGR estimated through these surveys was 47%, and the difference in magnitude from the ex ante assumption of 100% NTGR is enough to state that the survey data has rejected the null hypothesis of 100% NTGR. As a result, ADM has applied the 47% NTGR value estimated from participant surveying.

This sample was contacted via telephone for verification and net-to-gross surveying. ADM did not conduct on-site verifications due to the low amount of equipment implementation, kWh savings, and program budget.

Analysis of Net Savings

As part of this evaluation, we also determined net savings attributable to this program. 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 cooling equipment without a utility-provided 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 net savings methodology is described in further detail in Section 4.2.

SUMMARY OF KEY ISSUES

The most significant issue to arise for this M&V pertains to the NGTR being significantly below what anticipated. ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 100% NTGR, and ADM estimated NTGR of 47%.

Participants emphasized participating in the program due to the need of replacing broken heat pump units rather than for the rebate itself. 80% of respondents indicated that if SPS had not provided a rebate, they still would have installed the same equipment within one year of when they had actually purchased and installed it.

Impact Evaluation Findings

Verified gross electric savings were 84,504 kWh annually, which represents a realization rate of 95%; 1,014,048 kWh saved during the life of the measures; and coincident peak demand reduction of 44.8 kW. Verified net savings were 39,717 kWh/yr; 476,604 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 21 kW.

The following subsections contain detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-3 Gross Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Air-Source Heat Pumps	89,000	84,504	-4,496	95%

Table 4-2 below summarizes the net savings associated with the SPS Residential Air Source Heat Pump Rebate Program.

Table 0-4 Net Energy Impact Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Air-Source Heat Pumps	21	39,717	12	476,604

ANALYSIS OF NET SAVINGS

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability

- Prior planning
- Importance of the rebate in the decision making process
- Likelihood of equipment installation without rebate

These four components were addressed in the telephone surveys, with the questions directed at them detailed in the subsections to follow.

Financial Ability

For Part 1, customers were asked:

> Question 13: Would you have been able to purchase the high efficiency heat pump if the rebates offered through the program were not available?

If the customer answered No to this, then they are assigned 0% free-ridership, as without the financial ability to purchase high efficiency air-source heat pump equipment, other factors in the decision making process are moot.

Prior Planning

Following this, customers are asked as to any plans they had to install the high efficiency air-source heat pump. This is addressed in the following questions:

> Question 4: Did you have specific plans to install the efficient heat pump <u>before</u> you talked with anyone about the Residential Air Source Heat Pump Rebate Program?

> Question 14: If SPS had not paid a portion of the equipment cost, would you have purchased the same equipment <u>within one year of when it was installed</u>?

If the respondent answers “Yes” to both of the above questions, then the respondent is considered to have been planning to install higher efficiency heat pump equipment and is thus a partial-free rider. Additionally, the respondent is asked:

> Question 6: When did you become aware of the rebate SPS offered for purchasing higher efficiency heat pumps?

To this question, respondents are asked to indicate if they learned of the available rebate before, at the same time, or after deciding to purchase the high efficiency air-source heat pump. If the respondent indicates that they became aware of the rebate only after having decided to purchase high efficiency heat pump equipment, then they are scored a partial free-rider on this component in the same manner as if they had answered “Yes” to both Questions 4 and 14.

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 air-source heat pump. To address this, we examined responses to the following two questions:

> Question 5: What factors motivated you to install the high efficiency air-source heat pump through this program in 2009?

> Question 9: How important was SPS's rebate in your decision to buy the high efficiency air-source heat pump?

Question 5 does not prompt answers. If the respondent indicates unprompted that the rebate was a motivating factor for their installation of high efficiency air-source heat pump then they are not considered a partial free-rider in this component of net-to-gross analysis. Additionally, the respondent is scored in the same manner of on Question 9 they indicate that the rebate was "Very Important".

Likelihood of Installing Similar Equipment without Rebate

Finally, customers are asked whether they would have installed high efficiency air-source heat pump equipment if the rebate were not available. This is addressed with two questions:

> Question 11: Did you have to change the quantity of equipment or the efficiency level of equipment you installed in order to qualify for the program's available rebate?

> Question 12: If you had not been able to receive the rebate through the Residential Air-Source Heat Pump Rebate Program, how likely is it that you would have installed the same equipment anyway?

If the respondent answered "Yes" to Question 11, then it can be safely asserted that they would not have purchased the same equipment without the program. Additionally, if the respondent indicates that they "Definitely would have installed" high efficiency heat pump equipment without the rebate, then they can be considered to be a partial free-rider in this aspect of net-to-gross analysis.

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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-5 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

Based upon this analysis, ADM estimates a free-ridership rate of 53% for participants in the Residential Air-Source Heat Pump Rebate Program. This provides a Net-to-Gross ratio of 47% which gross savings for participants is multiplied by to determine net savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS residential customers.

Survey Results for Individual Participants

As part of the net-to-gross surveying, respondents were asked to indicate how they had learned about the program. Participants had learned of the program through the following channels:

- 87% learned of the program by being contacted by a HVAC contractor.
- 13% learned of the program through SPS bill message.

Respondents were also asked as to their financial ability to purchase air-source heat pump equipment.

- 87% of respondents could have afforded high efficiency heat pump equipment without the rebate. 13% could not have afforded high efficiency cooling equipment without the rebate. Those 13% were assigned 0% free-ridership
- 67% of respondents indicated that if they had not been able to purchase high efficiency heat pump equipment, they would have installed standard efficiency equipment instead.

Prior planning was addressed with three separate questions, the results of which were:

- 60% of respondents indicated that they had prior plans to install high efficiency cooling equipment prior to hearing about the program
- 20% of respondents learned of the rebate prior to deciding to purchase high efficiency heat pump equipment, 7% learned of the rebate after having already decided to buy high efficiency heat pump equipment, and 73% learned of the program at the same time as deciding to purchase high efficiency heat pump equipment. The latter value is higher than normally seen in this sort of program, but corresponds well with the large number of participants that learned of the rebate through their contractor.
- 80% of respondents indicated that if SPS had not provided a rebate, they still would have installed the same equipment within one year of when they had actually purchased and installed it.

The significance of the rebate in the decision making process was addressed with two separate questions:

- When asked an open-ended question related to their motivation for participating in the program, 73% of respondents indicated that the rebate was a motivating factor. 53% were replacing a broken unit.

- 13% of respondents indicated that the rebate was "Very Important" to their decision to purchase high efficiency heat pump equipment. 7% indicated that it was "Somewhat Important" in this regard. 73% indicated that it was "only slightly important".

Finally, what the respondent would have done absent the rebate was addressed with two questions:

- 7% of respondents indicated that they had to change the type of equipment purchased after learning of the rebate in order to qualify for the program

- 67% of participants indicated that they "Definitely would have installed" high efficiency heat pump equipment without a rebate. 20% indicated that they "Probably would have installed" without the rebate.

Finally, customers satisfaction issues with the program were addressed, with

- 87% of respondents indicated that they were "Very Satisfied" with the Residential High Efficiency Cooling Program. 13% indicated that they were "Somewhat Satisfied".

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTRs of 47%, and a measure life of 12 years. The resultant UEPCD was calculated at $25,400.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 15 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 23.7, the UGCC was calculated at $45,288.

With these two factors, total benefits of the program were calculated at $70,687.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the

high efficiency heat pumps without the program, so the costs faced by those participants are not considered to be program-generated. Average marginal cost was $2,500 for heat pumps rebated through the program. As discussed in the program summary, a total of 46 heat pumps were rebated through the REC program in 2009. With a NTGR of 47%, this leads to NCI of:

NCI = (46 x $2,500 x 0.47) = $54,050

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the RASHP in 2009. Administrative costs for the 2009 RASHP rebate program were $26,128. The resulting total cost of the program was

$54,050 + $26,128 = 80,178

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $70,687 / $80,178 = .88

As such, ADM concludes that the RASHP program in 2009 failed cost-effectiveness testing by a significant margin. The failure to pass cost-effectiveness testing is attributable to two factors:

1. Lower participation than projected
2. Lower NTGR than used in ex ante assumptions

Using the ex ante assumption of 100% NTGR, ADM estimates that the program would need 90 participants annually to pass cost effectiveness testing. With the NTGR of 47% as determined through participant surveys, the program would require an estimated 200 participants to pass cost-effectiveness testing.

Discussion of Key Findings

Overall, the 2009 Residential Air-Source Heat Pump Rebate Program provided net savings of:

- 39,717 kWh Savings/yr;
- 476,604 Lifetime kWh Savings; and
- 21 kW in Peak Demand Savings.

ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 100% NTGR, and ADM estimated NTGR of 47% for 2009 program participants.

ADM revised the cooling EFLH assumptions used in kWh savings calculations for heat pumps rebated through the RASHP. The value was revised down in accordance with other residential cooling programs in this climate zone. ADM did not revise deemed values for peak kW reduction downward, however, as the EFLH revision does not affect peak kW reduction.

Recommendations

There were issues with the available tracking data, as all needed information was not included in a format that was easy to assemble into a tracing data spreadsheet. Particularly, the available information did not include ex ante savings estimates, specifications on the rebated equipment, or participant contact numbers. Participant contact information was eventually provided in a database, but specifications of the rebated heat pumps, including capacity, efficiency, incremental cost, and ex ante savings estimates needed to be assembled manually by ADM into a database from SPS paper documentation. This marred the evaluation effort, adding time and expense. For the 2010 evaluation, ADM would recommend that data on the specific rebated units be provided in a complete tracking database along with customer names and contact information.

The program failed cost-effectiveness testing in 2009, and should the NTGR for 2010 be similar in value to that estimated in 2009, the program will require very high participation in order to pass TRC testing. However, given that ADM could not provide 90/10 precision due to the limited pool of participants to survey, another year of evaluation, perhaps with increased participation, is warranted in order to determine the viability of the program.

Appendix A. Survey Forms

Appendix A contains the surveys used in evaluation of the Residential High Efficiency Cooling Program.

Southwestern Public Service Company

Residential Air Source Heat Pumps Rebate Program

Verification & Net-to-Gross Survey Questionnaire

ID No. ____

Customer Name: ____________________________________

Date of interview: __________________________________

Date data entered ___________________________________

Hello, my name is _________________. I am calling on behalf of Southwestern Public Service Company (SPS), your electric service provider.

May I please speak to __________________________ *(Contact Person)?*

Address: ____ ZIP: __________________

Phone: ( ) ____________________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is ________________________. I am calling from ADM Associates, Inc. on behalf of Southwestern Public Service Company (SPS). Through the Residential Air Source Heat Pumps Rebate Program, SPS offered rebates for buying high efficiency Heat Pumps. Because you purchased a high efficiency heat pump and received a rebate through the program, we would appreciate your taking about 5 minutes to answer some questions about your participation in the program. The information you provide will help SPS to improve the program.

Did you receive a rebate for installation of a high efficiency heat pump through SPS's Residential Air Source Heat Pump Rebate Program?

- ❑ No. Thank you for your time in assisting with this survey. (END CALL)
- ❑ Yes. *Continue interview with this person.*

Q.1 How did you first hear about SPS's Residential Air Source Heat Pump Rebate Program and the rebate for buying high efficiency heat pumps?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Received information in mail
- o Read newspaper or magazine article
- o Was contacted by an HVAC contractor
- o SPS bill message
- o SPS web site
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.2 How did you choose the contractor you used to install the heat pump?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Contractor contacted me first
- o Found contractor through SPS web site or by calling SPS
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.3 Why did you decide to purchase a more efficient heat pump?
- o Wanted a more efficient heat pump
- o Wanted to reduce my monthly electric bill
- o Contractor recommended
- o First Heat Pump
- o Replacing a Broken Unit
- o Other (Specify: ______________________________**)**

Q.4 Did you have specific plans to install the efficient heat pump <u>before</u> you talked with anyone about the Residential Air Source Heat Pump Rebate Program?
- o Yes
- o No
- o Don't know

Q.5 What factors motivated you to install the heat pump through the program in 2009?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Rebate / Incentive payment that program provided
- o Wanted energy efficient heat pump because it is good for environment
- o Recommendation of a friend/relative
- o Recommendation of retailer/dealer
- o Utility sponsorship of the program
- o First Heat Pump
- o Replacing a Broken Unit
- o Other (Describe: ______________________________)
- o Don't know

Q.6 When did you become aware of the rebate SPS offered for purchasing higher efficiency heat pumps?

- o Before deciding to buy high efficiency equipment
- o After already deciding to buy high efficiency equipment
- o Same time as made decision to buy high efficiency equipment
- o Don't know

Q.7 In your decision to buy the high efficiency heat pump, how important was information, advice and / or recommendations from your contractor?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.8 How important in your decision was information, advice and / or recommendations from SPS?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.9 How important was SPS's rebate in your decision to buy the high efficiency heat pump?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.10 How was the decision to apply for the rebate on the heat pump made?

- o We (home owner) made the decision.
- o Contractor made the decision.
- o Decision was made jointly between us and the contractor
- o Other ________________________________
- o Don't Know

Q.11 Did you have to change the quantity of equipment or the efficiency level of the heat pump you installed in order to qualify for the program incentive/rebate?

- o Yes
- o No
- o Don't know

Q.12 If you had not been able to receive the rebate through the Residential Air Source Heat Pump Rebate Program, how likely is it that you would have installed the high efficiency heat pump anyway?

- o Definitely would not have installed
- o Probably would not have installed
- o Probably would have installed
- o Definitely would have installed
- o Don't know (DON'T READ)

Q.13 Would you have been able to purchase the high efficiency heat pump if the rebates offered through the program were not available?

- o Yes
- o No
- o Don't know

Q.14 If SPS had not paid a portion of the equipment cost, would you have purchased the same equipment <u>within one year of when it was installed</u>?

- o Yes
- o No
- o Don't know

Q.15 If you had not been able to install the higher efficiency heat pump, would you have installed standard efficiency equipment instead?

- o Yes
- o No
- o Don't know

Q.16 Please think about your <u>overall</u> experience with the Residential Air Source Heat Pump Rebate Program. Considering all aspects of your experience with the program, how would you rate your overall satisfaction with the program. Would you say you were:
Very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied?

Very Satisfied	*Somewhat Satisfied*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Would not answer*
o	o	o	o	o

Ask only if person answers that he/she was somewhat dissatisfied or very dissatisfied:

Why were you dissatisfied with the service?

____
____

Q.17 Do you have any comments about the Residential Air Source Heat Pump Rebate Program, or any suggestions with regard to how it might be improved?
Comments (if any): ____
____
____
____

Thank you for your help! SPS will use your ideas to improve its programs for its residential customers.

Residential Evaporative Cooling Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

Prepared for:

Prepared by:

ADM Associates, Inc.™

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Executive Summary

This report provides the results of the measurement and verification (M&V) of Southwestern Public Service Company (SPS) Residential Evaporative Cooling Rebate Program (REC) that was implemented in New Mexico in 2009. This program strives to increase energy efficiency in residential homes by encouraging consumers to purchase evaporative coolers rather than central air conditioning.

Participants of the project implemented a total of 255 evaporative cooling systems within SPS's New Mexico service territory during the 2009 program year. Gross electric impacts were 468,468 kWh saved annually, which represents a realization rate of 100%; 4,684,680 kWh saved over the life of the measures installed; and coincident peak demand reduction of 443.18 kW.

This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the Residential High Efficiency Cooling Program in New Mexico. Ex post gross electric savings were determined through a review of the deemed savings assumptions and a test of the assumptions for cooling loads via simulations of typical Roswell, NM housing stock using Roswell, New Mexico Typical Meteorological Year (TMY) weather data.

Additionally, ADM evaluated net savings of the Residential Evaporative Cooling Rebate Program, providing estimated free-ridership rates of 52.1% for program participants. As such, net annual savings totaled 224,396 kWh annually; 2,243,960 kWh over the life of the measures installed; and 212.5 in peak kW reduction. Table 1-1 below summarizes gross impacts. Net impacts are presented in Table 1-2

Table 0-6 Gross Impact Summary

Measure Category	**Peak Demand Reduction (kW)**		**Annual Energy Savings (kWh)**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Evaporative Cooling	443.2	443.2	468,468	468,468	10	4,684,680	4,684,680

Table 0-7 Net Impact Summary

Measure Category	**Peak Demand Reduction (kW)**		**Annual Energy Savings (kWh)**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Evaporative Cooling	265.9	212.5	281,081	224,396	10	2,810,810	2,243,960

Project Background

The Residential Evaporative Cooling Rebate Program provides a rebate to SPS customers who purchase energy efficient evaporative cooling equipment for residential use. This program strives to increase energy efficiency in residential homes by encouraging consumers to purchase evaporative coolers instead of using refrigerator air. Refrigerated air uses significantly more energy than evaporative cooling, and as such high savings can be realized by inducing SPS residential customers to use evaporative cooling via rebates. The REC program increases uptake of high efficiency cooling equipment by defraying some of the high upfront costs associated with the equipment. Because not all local retailers and contractors carry high efficiency evaporative cooling units, the program goals are to educate customers on the benefits of using an evaporative cooler, and to encourage retailers and contractors to stock high efficiency units. In 2009, the REC program issued 255 rebates.

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the Residential Evaporative Cooling Rebate Program. The M&V approach for the Residential Evaporative Cooling Rebate Program is aimed at the following:

- Verifying counts of evaporative cooling installed as a result of the project;
- Specification and the extent to which installed cooling systems are used;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the REC program in 2009.

Review of Deemed Savings Estimates

ADM reviewed the deemed savings estimates for measures rebated through the program in 2009. A key assumption for measures in this program was the Equivalent Full Load Hours (EFLH) of operation. The deemed savings estimates call for EFLH of 1,057 per year, which after running simulation models of typical Roswell, NM housing stock, ADM determined to be a reasonable estimate of annual residential cooling demand for the Southwestern Public Service Company territory in New Mexico. Annual savings estimates by ADM for this measure were within 5% of deemed savings values and as such ADM did not revise the deemed amount for kWh savings; the level of savings estimated by ADM was within a reasonable error margin of the level claimed by SPS.

ADM did revise the peak kW reduction claimed for one measure class, however. Based upon the results of our simulation review, ADM revised kW reduction estimates as follows:

Table 0-8 Revisions to Ex Ante kW Reduction Values

Measure	***Ex Ante***	***Ex Post***
AC to Tier I Evap	1.74	1.74
AC to Tier II Evap	1.98	1.98
Tier I Evap to Tier II Evap	.17	.24

This change did not affect savings for the 2009 program as there were no Tier I to Tier II evaporative cooling retrofits.

Verification of Installed Measures

Verification of the cooling systems installed was done in two steps;

- Review of the tracking data presented; and
- Surveys of customers who installed cooling equipment.

ADM's first aspect of conducting measurements of program activity was to verify the numbers of efficient coolers installed. Verification work is based on using detailed program tracking data. To begin the verification effort, we reviewed the tracking system data on reported rebated units to determine that all reported units were eligible for the program.

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, which is assumed at .5 based on our previous experience with AC rebate programs. Coefficient of Variation (CV) is defined as:

$$CV(x) = \frac{Standard\ Deviation\ (x)}{Mean(x)}$$

Using a CV of .5, sample size is estimated at:

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

With 10% required precision (RP), this calls for a sample of 68. However, the above formula provides a sample for very large populations. For this program, ADM 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.

Applying the finite population correction factor, the required sample is reduced to 55. This sample was contacted via telephone for verification and net-to-gross surveying. Following this, ADM conducted a number of on-site verifications. ADM conducted on-site verification for 15 participants. These on-site verifications allowed ADM to confirm that the stated measures were installed and that the participant received the appropriate rebate amount.

Analysis of Net Savings

As part of this evaluation, we also determined net savings attributable to this program. 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 cooling equipment without a utility-provided 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 net savings methodology is described in further detail in Section 4.2.

Summary of Key Issues

The most significant issue to arise for this M&V pertains to the NGTR being below what anticipated. ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 60% NTGR, and ADM estimated NTGR of 47.9%.

Participants emphasized wanting a more efficient cooling system primarily based on decreasing monthly electric bills. 80.77% of respondents indicated that the rebate program ultimately made the decision in implementing the new cooling system, though 76.92% voiced that even if SPS had not paid a portion of the equipment cost they would have purchased the same equipment within one year of when it was installed.

Impact Evaluation Findings

Verified gross electric savings were 468,468 kWh annually, which represents a realization rate of 100%; 7,027,020 kWh saved during the life of the measures; and coincident peak demand reduction of 443.2 kW. Verified net savings were 224,396 kWh/yr; 3,365,940 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 212.5 kW.

The following subsections contain detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-9 Gross Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Evaporative Cooling	468,468	468,468	0	100%

Table 4-2 below summarizes the net savings associated with the SPS Residential Evaporative Cooling Rebate Program.

Table 0-10 Net Energy Impact Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Evaporative Cooling	212.5	224,396	15	3,365,940

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability

- Prior planning
- Importance of the rebate in the decision making process
- Likelihood of equipment installation without rebate

These four components were addressed in the telephone surveys, with the questions directed at them detailed in the subsections to follow.

Financial Ability

For Part 1, customers were asked:

> Question 13: Would you have been able to purchase the high efficiency cooling equipment if the rebates offered through the program were not available?

If the customer answered No to this, then they are assigned 0% free-ridership, as without the financial ability to purchase high efficiency cooling equipment, other factors in the decision making process are moot.

Prior Planning

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

> Question 4: Did you have specific plans to install any of the high efficiency cooling equipment before you talked with anyone about the Residential Evaporative Cooling Rebate Program?

> Question 14: If SPS had not paid a portion of the equipment cost, would you have purchased the same equipment within one year of when it was installed?

If the respondent answers "Yes" to both of the above questions, then the respondent is considered to have been planning to install higher efficiency cooling equipment and is thus a partial-free rider. Additionally, the respondent is asked:

> Question 6: When did you become aware of the rebate SPS offered for purchasing higher efficiency cooling equipment?

To this question, respondents are asked to indicate if they learned of the available rebate before, at the same time, or after deciding to purchase high efficiency cooling equipment. If the respondent indicates that they became aware of the rebate only after having decided to purchase high efficiency cooling equipment, then they are scored a partial free-rider on this component in the same manner as if they had answered "Yes" to both Questions 4 and 14.

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 cooling equipment. To address this, we examined responses to the following two questions:

> Question 5: What factors motivated you to install high efficiency cooling equipment through this program in 2009?
>
> Question 9: How important was SPS's rebate in your decision to buy high efficiency cooling equipment?

Question 5 does not prompt answers. If the respondent indicates unprompted that the rebate was a motivating factor for their installation of high efficiency cooling equipment then they are not considered a partial free-rider in this component of net-to-gross analysis. Additionally, the respondent is scored in the same manner of on Question 9 they indicate that the rebate was "Very Important".

Likelihood of Installing Similar Equipment without Rebate

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

> Question 11: Did you have to change the quantity of equipment or the efficiency level of equipment you installed in order to qualify for the program's available rebate?
>
> Question 12: If you had not been able to receive the rebate through the Residential Evaporative Cooling Rebate program, how likely is it that you would have installed the same equipment anyway?

If the respondent answered "Yes" to Question 11, then it can be safely asserted that they would not have purchased the same equipment without the program. Additionally, if the respondent indicates that they "Definitely would have installed" high efficiency cooling equipment without the rebate, then they can be considered to be a partial free-rider in this aspect of net-to-gross analysis.

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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-11 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

Based upon this analysis, ADM estimates a free-ridership rate of 52.10% for individual participants in the Residential Evaporative Cooling Rebate Program. This provides a Net-to-Gross ratio of 47.9% which gross savings for participants is multiplied by to determine net savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS residential customers.

As part of the net-to-gross surveying, respondents were asked to indicate how they had learned about the program. Participants had learned of the program through the following channels:

- 84.6% learned of the program through a local retailer
- 3.9% of participants learned of the program through SPS advertising, including print ads, mailers, bill inserts, and the SPS website

Respondents were also asked as to their financial ability to purchase evaporative cooling equipment.

- 84.6% of respondents could have afforded high efficiency cooling equipment without the rebate. 15.4% could not have afforded high efficiency cooling equipment without the rebate. Those 15.4% were assigned 0% free-ridership
- 59.6% of respondents indicated that if they had not been able to purchase high efficiency cooling equipment, they would have installed standard efficiency equipment instead.

Prior planning was addressed with three separate questions, the results of which were:

- 72.6% of respondents indicated that they had prior plans to install high efficiency cooling equipment prior to hearing about the program
- 15.4% of respondents learned of the rebate prior to purchasing high efficiency cooling equipment, 11.5% learned of the rebate after having already decided to buy high efficiency cooling equipment, and 73.1% learned of the program at the same time as deciding to purchase high efficiency cooling equipment. The latter value is higher than normally seen in this sort of program, but corresponds well with the large number of participants that learned of the rebate through their retailer.
- 76.9% of respondents indicated that if SPS had not provided a rebate, they still would have installed the same equipment within one year of when they had actually purchased and installed it.

The significance of the rebate in the decision making process was addressed with two separate questions:

- When asked an open-ended question related to their motivation for participating in the program, 80.8% of respondents indicated that the rebate was a motivating factor
- 69.21% of respondents indicated that the rebate was "Very Important" to their decision to purchase high efficiency cooling equipment. 15.4% indicated that it was "Somewhat Important" in this regards.

Finally, what the respondent would have done absent the rebate was addressed with two questions:

- 11.5% of respondents indicated that they had to change the type of equipment purchased after learning of the rebate in order to qualify for the program
- 63.5% of participants indicated that they "Definitely would have installed" high efficiency cooling equipment without a rebate. 25% indicated that they "Probably would have installed" without the rebate.

Finally, customers satisfaction issues with the program were addressed, with

- 92.3% of respondents indicated that they were "Very Satisfied" with the Residential High Efficiency Cooling Program. 7.7% indicated that they were "Somewhat Satisfied".
- Recommendations from customers include improving advertisement of rebate program, SPS increasing total amount of rebate programs offered, and the continuation of the program so that others can take part in it.
- Customer complaints focused on customer service and the amount of time that it took to receive the rebates in mail.

5. COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTRs of 47.9%, and a measure life of 10 years. The resultant UEPCD was calculated at $123,520.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 10 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 240.3, the UGCC was calculated at $396,469.

With these two factors, total benefits of the program were calculated at $516,989.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the

high efficiency evaporative coolers without the program, so the costs faced by those participants are not considered to be program-generated. Average marginal cost was $372 for evaporative coolers rebated through the program. As discussed in the program summary, a total of 255 evaporative coolers were rebated through the REC program in 2009. With a NTGR of 47.9%, this leads to NCI of:

NCI = (255 x $372 x 0.479) = $45,438

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the REC in 2009. Administrative costs for the 2009 REC rebate program were $41,005. The resulting total cost of the program was

$45,438 + $41,005 = $89,863

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $516,989 / $89,863 = 5.98

As such, ADM concludes that the REC program in 2009 passed cost-effectiveness testing by a significant margin.

Discussion of Key Findings

Overall, the 2009 Residential Evaporative Cooling Rebate Program provided net savings of:

- 224,396 kWh Savings/yr;
- 3,365,940 lifetime kWh Savings; and
- 212.5 On-Peak kW Savings.

ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 60% NTGR, and ADM estimated NTGR of 47.9% for individual program participants.

ADM confirmed that gross kWh savings estimates were reasonable based upon simulation models of typical Las Cruces, NM housing stock. ADM did revise deemed values for peak kW reduction downward, however, based upon these simulation models as well as a validation of deemed savings estimates for other utilities in the same climate zone.

Recommendations

There were issues with the available tracking data, as all needed information was not initially included in the dataset provided to ADM. Particularly, data initially lacked contact phone numbers, full detail of the rebated equipment, and incremental cost. Much of this was eventually corrected, however. ADM confirmed the validity of the gross savings estimates used by SPS, determining them to be reasonable estimates of the savings associated with evaporative cooling.

Appendix A. Survey Form

Appendix A contains the surveys used in evaluation of the Residential High Efficiency Cooling Program.

Southwestern Public Service Company
Residential Evaporative Cooling Rebate Program
Verification & Net-to-Gross Survey Questionnaire

Customer Name: ____

Date of interview: ____

Date data entered ____

....

Hello, my name is _________________. I am calling on behalf of Southwestern Public Service Company (SPS), your electric service provider.

May I please speak to _________________________ *(Contact Person)?*

Address: ____ ZIP: _________________

Phone: ( ) __________________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is _______________________. I am calling from ADM Associates, Inc. on behalf of Southwestern Public Service Company (SPS). Through the Residential Evaporative Cooling Rebate Program, SPS offered rebates for buying high efficiency Evaporative Coolers. Because you purchased a high efficiency Evap Cooler and received a rebate through the program, we would appreciate your taking about 5 minutes to answer some questions about your participation in the program. The information you provide will help SPS to improve the program.

Did you receive a rebate for installation of a high efficiency evaporative cooler or air conditioner through SPS's Residential Evaporative Cooler Rebate Program?

- ❑ No. Thank you for your time in assisting with this survey. (END CALL)
- ❑ Yes. *Continue interview with this person.*

Q.1 How did you first hear about SPS's Residential Evaporative Cooler Rebate Program and the rebate for buying high efficiency Evap Coolers?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)

- o Received information in mail
- o Read newspaper or magazine article
- o Was contacted by an HVAC contractor
- o SPS bill message
- o SPS web site
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.2 How did you choose the contractor you used to install the Evap Cooler?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)

- o Contractor contacted me first
- o Found contractor through SPS web site or by calling SPS
- o Personal Reference
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.3 Why did you decide to purchase a more efficient Evap Cooler?

- o Wanted a more efficient Evap Cooler
- o Wanted to reduce my monthly electric bill
- o Contractor recommended
- o First Evap Cooler
- o Replacing Broken Unit
- o Other (Specify: ______________________________**)**

Q.4 Did you have specific plans to install the efficient Evap Cooler <u>before</u> you talked with anyone about the Residential Evaporative Cooler Rebate Program?

- o Yes
- o No
- o Don't know

Q.5 What factors motivated you to install the evap cooler through the program in 2009?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)

- o Rebate / Incentive payment that program provided
- o Wanted energy efficient evap cooler because it is good for environment
- o Recommendation of a friend/relative
- o Recommendation of retailer/dealer
- o Utility sponsorship of the program
- o First Evap Cooler
- o Replacing Broken Unit
- o Other (Describe: ______________________________)
- o Don't know

Q.6 When did you become aware of the rebate SPS offered for purchasing higher efficiency evap coolers?

- o Before deciding to buy high efficiency equipment
- o After already deciding to buy high efficiency equipment
- o Same time as made decision to buy high efficiency equipment
- o Don't know

Q.7 In your decision to buy the high efficiency evap cooler, how important was information, advice and / or recommendations from your contractor?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.8 How important in your decision was information, advice and / or recommendations from SPS?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.9 How important was SPS's rebate in your decision to buy the high efficiency evap cooler?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don't Know

Q.10 How was the decision to apply for the rebate on the evap cooler made?

- o We (home owner) made the decision.
- o Contractor made the decision.
- o Decision was made jointly between us and the contractor
- o Other ________________________________
- o Don't Know

Q.11 Did you have to change the quantity of equipment or the efficiency level of the evap cooler you installed in order to qualify for the program incentive/rebate?

- o Yes
- o No
- o Don't know

Q.12 If you had not been able to receive the rebate through the Residential Evaporative Cooler Rebate Program, how likely is it that you would have installed the high efficiency evap cooler anyway?

- o Definitely would not have installed
- o Probably would not have installed
- o Probably would have installed
- o Definitely would have installed
- o Don't know (DON'T READ)

Q.13 Would you have been able to purchase the high efficiency evap cooler if the rebates offered through the program were not available?

- o Yes
- o No
- o Don't know

Q.14 If SPS had not paid a portion of the equipment cost, would you have purchased the same equipment <u>within one year of when it was installed</u>?

- o Yes
- o No
- o Don't know

Q.15 If you had not been able to install the higher efficiency evap cooler, would you have installed standard efficiency equipment instead?

- o Yes
- o No
- o Don't know

Q.16 Please think about your <u>overall</u> experience with the Residential Evaporative Cooler Rebate Program. Considering all aspects of your experience with the program, how would you rate your overall satisfaction with the program? Would you say you were:
Very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied?

Very Satisfied	*Somewhat Satisfied*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Would not answer*
o	o	o	o	o

Ask only if person answers that he/she was somewhat dissatisfied or very dissatisfied:

Why were you dissatisfied with the service?

____

____

Q.17 Do you have any comments about the Residential Evaporative Cooler Rebate Program, or any suggestions with regard to how it might be improved?
Comments (if any): ____
____
____
____

Thank you for your help! SPS will use your ideas to improve its programs for its residential customers.

Residential Home Energy Services Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

Prepared for:

Prepared by:

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Executive Summary

This report provides the results of the measurement and verification (M&V) of Southwestern Public Service Company (SPS) Residential Home Energy Services Program (HESP) that was implemented in New Mexico in 2009. This program is designed to increase energy efficiency in residential homes by providing rebates for installation of ceiling insulation, infiltration control, and duct sealing measures.

The 2009 HESP totaled 1,386 participants in 2009, installing a total of 2,428 measures. Gross electric impacts were 4,221,837 kWh saved annually, which represents a realization rate of 100%; 57,942,600 kWh saved over the life of the measures installed; and coincident peak demand reduction of 1,208.7 kW.

This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the Residential Home Energy Services Program in New Mexico. Ex post gross electric savings were determined through a review of the deemed savings assumptions and a test of the assumptions for cooling loads via simulations of typical Roswell, NM housing stock using Roswell, New Mexico Typical Meteorological Year (TMY) weather data.

Additionally, ADM evaluated net savings of the Residential Home Energy Services Program, providing estimated free-ridership rates of 23.3% for program participants, with an associated Net-to-Gross-Ration (NTGR) of 76.7%. ADM applied this NTGR to the insulation measures but not to duct efficiency and infiltration control measures, as prior to the HESP, there were no contractors in the territory that were certified to perform these measures. SPS trained and certified contractors who then marketed the program, and with SPS' involvement in certifying onctractors to perform these measures, along with survey responses indicating that customers learned of the measures through such contractors, ADM has not revised the ex ante figure of 93% used for the NTGR for duct efficiency and infiltration control measures.

Table 0-12 Gross Impact Summary

Measure Category	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Effective Useful Life (EUL), years	Lifetime Energy Savings, kWh	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Duct Efficiency	856.5	856.5	3,134,850	3,134,850	15	47,022,750	47,022,750
Infiltration Control	351.7	351.7	1,081,989	1,081,989	10	10,819,890	10,819,890
Ceiling Insulation	.46	.46	4,998	4,998	20	99,960	99,960
Total	1,208.7	1,208.7	4,221,837	4,221,837	-	57,942,600	57,942,600

Table 0-13 Net Impact Summary

Measure Category	**Peak Demand Reduction (kW)**		**Annual Energy Savings (kWh)**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Duct Efficiency	796.5	796.5	2,915,411	2,915,411	15	43,731,158	43,731,158
Infiltration Control	327.1	327.1	1,006,250	1,006,250	10	10,062,498	10,062,498
Ceiling Insulation	.4	.3	4,648	3,833	20	92,963	76,669
Total	1,124.1	1,124	3,926,308	3,925,493	-	53,886,648	53,870,325

Project Background

The Home Energy Services Program 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. In 2009, no central air conditioning replacements were rebated through the program, and total participation encompassed:

- 1,748 Duct Sealing Measures;
- 1,248 Home Infiltration Control Improvements; and
- 2 Ceiling Insulation Installations.

Technicians also test heating units and appliances for dangerous carbon monoxide emissions and gas leaks. Additionally, customers are educated on basic energy-efficiency practices and provided with free literature.

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the Residential Home Energy Services Program. The M&V approach for the Residential Home Energy Services Program is aimed at the following:

- Verifying measures installed as a result of the project;
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the HES program in 2009.

Review of Deemed Savings Estimates

ADM reviewed the deemed savings estimates for measures rebated through the program in 2009. 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).

ADM tested the deemed savings assumptions applying similar residential simulation models incorporating Roswell, NM weather data. Results for the applicable measures were within 5% of values applied by SPS and as such ADM has determined that the deemed savings methodologies provide reasonable estimates of savings for measures rebated through the HESP in 2009.

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.

ADM 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.

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, which is assumed at .5 based on our previous experience with residential weatherization rebate programs. Coefficient of Variation (CV) is defined as:

$$CV(x) = \frac{Standard\ Deviation\ (x)}{Mean(x)}$$

Using a CV of .5, sample size is estimated at:

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

With 10% required precision (RP), this calls for a sample of 68. ADM completed 70 surveys with program participants, verifying inputs for deemed savings methodologies as well as for evaluation of the 2009 HESP net-to-gross ration in order to provide net savings estimates for the program.

Analysis of Net Savings

As part of this evaluation, we also determined net savings attributable to this program. 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 weatherized their home without a utility-provided 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 net savings methodology is described in further detail in Section 4.2.

Summary of Key Issues

There were issues with the available tracking data, as all needed information was not initially included in the dataset provided to ADM. Particularly, data initially lacked contact phone numbers, full detail of the rebated equipment, and incremental cost. Much of this was eventually corrected, however.

ADM confirmed the validity of the gross savings estimates used by SPS, determining them to be reasonable estimates of the savings associated with weatherization measures in the SPS New Mexico service territory.

Impact Evaluation Findings

Verified gross electric savings were 4,221,837 kWh annually, which represents a realization rate of 100%; 57,942,600 kWh saved during the life of the measures; and coincident peak demand reduction of 1,208.7 kW. Verified net savings were 3,295,493 kWh/yr; 53,870,325 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 1,124 kW.

The following subsections contain detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-14 Gross Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Duct Efficiency	3,134,850	3,134,850	0	100%
Infiltration Control	1,081,989	1,081,989	0	100%
Ceiling Insulation	4,998	4,998	0	100%
Total	4,221,837	4,221,837	0	100%

Table 4-2 below summarizes the net savings associated with the SPS Home Energy Services Program.

Table 0-15 Net Energy Impact Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Duct Efficiency	796.5	2,915,411	15	43,731,158
Infiltration Control	327.1	1,006,250	10	10,062,498
Ceiling Insulation	.3	3,833	20	76,669
Total	1,124	3,925,493	-	53,870,325

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability
- Prior planning
- Importance of the rebate in the decision making process
- Likelihood of equipment installation without rebate

These four components were addressed in the telephone surveys, with the questions directed at them detailed in the subsections to follow.

Financial Ability

For Part 1, customers were asked:

> Question 13: Would you have been able to purchase the high efficiency equipment if the rebates offered through the program were not available?

If the customer answered No to this, then they are assigned 0% free-ridership, as without the financial ability to weatherize their home, other factors in the decision making process are moot.

Prior Planning

Following this, customers are asked as to any plans they had to weatherize their home. This is addressed in the following questions:

> Question 4: Did you have specific plans to install any of the equipment before you talked with anyone about the Residential Home Energy Services Program?

> Question 14: If SPS had not paid a portion of the equipment cost, would you have purchased the same equipment within one year of when it was installed?

If the respondent answers "Yes" to both of the above questions, then the respondent is considered to have been planning to install higher efficiency equipment and is thus a partial-free rider. Additionally, the respondent is asked:

> Question 6: When did you become aware of the rebate SPS offered for purchasing higher efficiency equipment?

To this question, respondents are asked to indicate if they learned of the available rebate before, at the same time, or after deciding to purchase high efficiency equipment. If the respondent indicates that they became aware of the rebate only after having decided to purchase high efficiency equipment, then they are scored a partial free-rider on this component in the same manner as if they had answered "Yes" to both Questions 4 and 14.

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 equipment. To address this, we examined responses to the following two questions:

> Question 5: What factors motivated you to install high efficiency equipment through this program in 2009?

> Question 9: How important was SPS's rebate in your decision to buy high efficiency equipment?

Question 5 does not prompt answers. If the respondent indicates unprompted that the rebate was a motivating factor for their installation of high efficiency equipment then they are not considered a partial free-rider in this component of net-to-gross analysis. Additionally, the respondent is scored in the same manner of on Question 9 they indicate that the rebate was "Very Important".

Likelihood of Installing Similar Equipment without Rebate

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

> Question 11: Did you have to change the quantity of equipment or the efficiency level of equipment you installed in order to qualify for the program's available rebate?

> Question 12: If you had not been able to receive the rebate through the Residential Home Energy Services program, how likely is it that you would have installed the same equipment anyway?

If the respondent answered "Yes" to Question 11, then it can be safely asserted that they would not have purchased the same equipment without the program. Additionally, if the respondent indicates that they "Definitely would have installed" high efficiency equipment without the rebate, then they can be considered to be a partial free-rider in this aspect of net-to-gross analysis.

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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-16 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

Based upon this analysis, ADM estimates a free-ridership rate of 23.3% for individual participants in the Residential Home Energy Services Program. This provides a Net-to-Gross ratio of 76.7% which gross savings for participants is multiplied by to determine net savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS residential customers.

As part of the net-to-gross surveying, respondents were asked to indicate how they had learned about the program. Participants had learned of the program through the following channels:

- 51% of respondents learned of the program through word of mouth from friends and family

- 28% of participants learned of the program through SPS advertising, including print ads, mailers, bill inserts, and the SPS website

Respondents were also asked as to their financial ability to weatherize their home.

- 44% of respondents could have afforded to the installed measures without the rebate. 45% could not have afforded to do so. Thomas 45% were assigned 0% free-ridership

Prior planning was addressed with three separate questions, the results of which were:

- 26% of respondents indicated that they had prior plans to weatherize their home prior to hearing about the program

- 36% of respondents learned of the rebate prior to deciding to weatherize their home, 16% learned of the rebate after having already decided to weatherize their home, and 34% learned of the program at the same time as deciding to weatherize their home.

- 37% of respondents indicated that if SPS had not provided a rebate, they still would have installed the same equipment within one year of when they had actually purchased and installed it.

The significance of the rebate in the decision making process was addressed with two separate questions:

- When asked an open-ended question related to their motivation for participating in the program, 51% of respondents indicated that the rebate was a motivating factor

- 77% of respondents indicated that the rebate was “Very Important” to their decision to purchase high efficiency equipment. 9% indicated that it was “Somewhat Important” in this regards.

Finally, what the respondent would have done absent the rebate was addressed with two questions:

- 4% of respondents indicated that they had to change the type of equipment purchased after learning of the rebate in order to qualify for the program

- 19% of participants indicated that they “Definitely would have installed” the same equipment without the rebate. 29% indicated that they “Probably would have installed” without the rebate. 42% stated that they “probably would not have installed” the same equipment, and 10% indicated that they “Definitely would not have installed” the same equipment” without the rebate.

Finally, customers satisfaction issues with the program were addressed, with

- 93% of respondents indicated that they were “Very Satisfied” with the Residential Home Energy Services Program. 3% indicated that they were “Somewhat Satisfied”, and 4% stated that they were “Somewhat Dissatisfied” with the program.

- Recommendations from customers include improving advertisement of rebate program, SPS increasing total amount of rebate programs offered, and the continuation of the program so that others can take part in it.

- Customer complaints focused on customer service and the amount of time that it took to receive the rebates.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD);
- Non-Electric Acquisition Cost Decrease (NEACD); and
- Utility Generation Capacity Credit (UGCC).

Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTR of 93%, and a weighted average measure life for rebated of 13.73 years. The resultant UEPCD was calculated at $2,763,851.

ADM used projected gas cost values per MMBtu to calculate NEACD. This was calculated by taking the kWh savings associated with weatherization measures converted into MMBtu values. ADM then calculated the NPV of the annual costs using a weighted average measure life for gas-saving measures of 13.73 years and a NTGR of 93%. The resultant NEACD was valued at $193,715.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 20 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net kW reduction of 1,124, the UGCC was calculated at $2,693,582.

With these three factors, total benefits of the program were calculated at $5,651,148.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). This subtracts off free-riders as they would have incurred the cost of installing weatherization measures absent the program. Using incremental cost data provided by SPS, ADM estimated total NCI of $928,506.

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the HESP in 2009. Administrative costs for the 2009 HESP rebate program were $587,077. Total costs for the 2009 HESP are thus $1,515,583.

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $5,651,148 / $1,515,583 = 3.73

As such, ADM concludes that the HES program in 2009 passed cost-effectiveness testing.

Discussion of Key Findings

Overall, the 2009 Residential Home Energy Services Program provided net savings of:

- 3,925,493 kWh Savings/yr;
- 53,870,325lifetime kWh Savings; and
- 1,124 On-Peak kW Savings.

ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 93% NTGR, and ADM estimated NTGR of 76.7% for program participants.

ADM confirmed that gross kWh and kW savings estimates were reasonable based upon simulation models of typical Roswell, NM housing stock. Savings calculated for the HESP examine resident-specific baseline characteristics for insulation type and duct leakage, and as a result provide very accurate savings estimates for program participants.

Recommendations

There were issues with the available tracking data, as all needed information was not initially included in the dataset provided to ADM. Particularly, data initially lacked contact phone numbers, full detail of the rebated equipment, and incremental cost. Much of this was eventually corrected, however.

ADM confirmed the validity of the gross savings estimates used by SPS, determining them to be reasonable estimates of the savings associated with weatherization measures in the SPS New Mexico service territory.

Appendix A. Survey Forms

Appendix A contains the surveys used in evaluation of the Residential Home Energy Services Program.

Southwestern Public Service Company
Residential Home Energy Services Program
Verification & Net-to-Gross Survey Questionnaire

ID No. ____

Customer Name: ________________________________

Date of interview: ______________________________

Date data entered ______________________________

Hello, my name is _________________. I am calling on behalf of Southwestern Public Service Company (SPS), your electric service provider.

May I please speak to __________________________ *(Contact Person)?*

Address: ____ ZIP: __________________

Phone: ( ) ____________________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is _______________________. I am calling from ADM Associates, Inc. on behalf of Southwestern Public Service Company (SPS). Through the Residential Home Energy Services Program, SPS offered rebates for installing insulation and weatherization measures. Because you purchased insulation/weatherization and received a rebate through the program, we would appreciate your taking about 5 minutes to answer some questions about your participation in the program. The information you provide will help SPS to improve the program.

Did you receive a rebate for installation of insulation or weatherization through SPS's Home Energy Services Program?

- ❑ No. Thank you for your time in assisting with this survey. (END CALL)
- ❑ Yes. *Continue interview with this person.*

Q.1 How did you first hear about SPS's Residential Home Energy Services Program and the rebate for installing high efficiency insulation/weatherization?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Received information in mail
- o Read newspaper or magazine article
- o Was contacted by an HVAC contractor
- o SPS bill message
- o SPS web site
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.2 How did you choose the contractor you used to install the high efficiency insulation/weatherization?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Contractor contacted me first
- o Found contractor through SPS web site or by calling SPS
- o Other *(Specify)* ______________________________
- o Don't know (*DO NOT READ)*

Q.3 Why did you decide to purchase high efficiency insulation/weatherization?
- o Wanted more efficient insulation/weatherization
- o Wanted to reduce my monthly electric bill
- o Contractor recommended
- o Other (Specify: ______________________________**)**

Q.4 Did you have specific plans to install any of this efficient insulation/weatherization <u>before</u> you talked with anyone about the Residential Home Energy Services Program?
- o Yes
- o No
- o Don't know

Q.5 What factors motivated you to install high efficiency insulation/weatherization through the program in 2009?
(DO NOT READ. Check all mentioned. Prompt only if necessary.)
- o Rebate / Incentive payment that program provided
- o Wanted to make my home more energy efficient because it is good for environment
- o Recommendation of a friend/relative
- o Recommendation of retailer/dealer
- o Utility sponsorship of the program
- o Other (Describe: ______________________________)
- o Don't know

Q.6 When did you become aware of the rebate SPS offered for purchasing high efficiency insulation/weatherization?

- o Before deciding to buy insulation/weatherization
- o After already deciding to buy insulation/weatherization
- o Same time as made decision to buy insulation/weatherization
- o Don’t know

Q.7 In your decision to buy the high efficiency insulation/weatherization, how important was information, advice and / or recommendations from your contractor?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don’t Know

Q.8 How important in your decision was information, advice and / or recommendations from SPS?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don’t Know

Q.9 How important was SPS’s rebate in your decision to buy the high efficiency insulation/weatherization equipment?

- o Very important
- o Somewhat important
- o Only slightly important
- o Not important at all
- o Don’t Know

Q.10 How was the decision to apply for the rebate on the high efficiency insulation/weatherization made?

- o We (home owner) made the decision.
- o Contractor made the decision.
- o Decision was made jointly between us and the contractor
- o Other ________________________________
- o Don’t Know

Q.11 Did you have to change the quantity of equipment or the efficiency level of the equipment you installed in order to qualify for the program incentive/rebate?

- o Yes
- o No
- o Don’t know

Q.12 If you had not been able to receive the rebate through the Residential Home Energy Services Program, how likely is it that you would have installed the high efficiency insulation/weatherization anyway?

- o Definitely would not have installed
- o Probably would not have installed
- o Probably would have installed
- o Definitely would have installed
- o Don't know (DON'T READ)

Q.13 Would you have been able to purchase the high efficiency insulation/weatherization if the rebates offered through the program were not available?

- o Yes
- o No
- o Don't know

Q.14 If SPS had not paid a portion of the equipment cost, would you have purchased the same insulation/weatherization <u>within one year of when it was installed</u>?

- o Yes
- o No
- o Don't know

Q.15 If you had not been able to install the higher efficiency insulation/weatherization, would you have installed standard efficiency insulation/weatherization?

- o Yes
- o No
- o Don't know

Q.16 Please think about your <u>overall</u> experience with the Residential Home Energy Services Program. Considering all aspects of your experience with the program, how would you rate your overall satisfaction with the program. Would you say you were:
Very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied?

Very Satisfied	*Somewhat Satisfied*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Would not answer*
o	o	o	o	o

Ask only if person answers that he/she was somewhat dissatisfied or very dissatisfied:

Why were you dissatisfied with the service?

____
____

Q.17 Do you have any comments about the Residential Home Energy Services Program, or any suggestions with regard to how it might be improved?
Comments (if any): ____
____
____
____

Thank you for your help! SPS will use your ideas to improve its programs for its residential customers.

2009 Residential Home Lighting & Recycling
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
June 2010

Prepared for:

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Executive Summary

This report provides the results of the measurement and verification (M&V) of the Southwestern Public Service Company's (SPS') Residential Home Lighting & Recycling Program (HLRP) demand side management (DSM) program that was implemented in New Mexico in 2008 and 2009. This is a market-based DSM project that reaches SPS residential customers through the retail channel and via mail order. For the retail channel, upstream incentives are provided to retailers for sales of Compact Fluorescent Lighting (CFL), who then pass on the savings to customers via a lower, subsidized price.

The 2009 HLRP was primarily directed at distributing high-efficiency lighting to the residential sector, through retailers including Home Depot, Ace Hardware, and Sam's Club. The HLRP also had a mail-order component which allowed for the sale of specialty CFL bulbs to SPS residential customers, with the goal being the implementation of CFLs in non-standard residential applications. Overall, the program rebated 79,311CFLs in 2009.

Verified gross electric impacts were 3,912,222 kWh saved annually, which represents a realization rate of 87%; 32,119,345 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 407.4 kW.

Variances between ex post and ex ante savings estimates are attributable to a revision in hours of operation and of baseline wattages. Hours of operation were revised based upon the survey results with customers that had filled out coupon information. The respondents were asked what rooms they had installed the CFLs in and ADM used their responses along with the results from the 2005 KEMA CFL monitoring study for the California Public Utilities Commission to assign hours of use based upon room type. The result was a reduction in annual hours from 1,210 to 975 per year. For baseline wattages, ADM determined that the SPS baseline wattage classifications were accurate for standard CFLs but required revision for certain non-standard CFLs, such as flood or globe lamps. These revisions resulted in an increase in savings, counteracting some of the effect in the reduction in operating hours.

Results of the measurement and verification are presented in Table 1-1.

Table 0-17 Gross Impact Summary

Measure	***Demand Savings, kW***		***Annual Energy Savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
CFLs	309.3	407.4	4,502,911	3,912,222	6.6	8.21	29,764,239	32,119,345

Additionally, ADM estimated net savings for the HLRP. Net savings were estimated through interviews with participating customers that purchased discounted lighting.

Table 0-18 Net Impact Summary

Measure	***Demand Savings, kW***		***Annual Energy Savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
CFLs	309.3	328.4	4,502,911	3,164,866	6.6	8.21	29,764,239	25,986,550

Project Background

The HLRP program provides upstream incentives to retailers for the sale of CFLs. The goal of the program is to buy down the retail price to $1-2 per bulb (varying by CFL type), in an effort to drive residential customers to replace incandescent lighting with high efficiency CFLs. Additionally, the program provides a mail-order option that allows for distribution to areas that may lack a participating retailer or a specialty bulb type. This program provides benefits to both retailers and customers in that:

- Retailers can achieve a higher sales volume without a reduction in profit margin, as the lost revenue from the price reduction is absorbed by SPS; and
- Customers can save money on their electric bills as well as in replacement costs, as typical lifetime for an incandescent bulb is roughly 1,000 hours, compared to an average lifetime of 8,000 hours for CFLs sold through this program.

The breakdown of sales by wattage is presented in Table 2-1 below.

Table 0-19 Summary of SPS CFL Sales

Wattage	***Total Sales***
9	2,724
10	1,303
11	278
13	12,597
14	43,530
15	1,966
17	1,444
19	455
20	5,036
23	3,476
26	4,355
27	24
42	74
Total	79,311

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the 2009 HLRP. The M&V approach for the HLRP is aimed at the following:

- Verifying the numbers of CFLs purchased as a result of the project;
- Determining the percentage of purchased CFLs that are actually installed; and
- Estimating the extent to which installed CFLs are used.

Verification of CFLs Purchased

Verification of the quantity of CFLs purchased was done in two steps;

- Review of the tracking; and
- Surveys of lighting purchasers.

Database Review

ADM first examined the database for systemic entry errors, i.e., duplicate entries and/or erroneous entries (such as data entered into improper columns). We found many instances of the tracking data assigning incorrect wattages or quantities to different CFL SKU numbers. We researched each individual SKU type sold through the program and provided the results of our research to SPS, and the database was updated and corrected accordingly.

Surveys of Lighting Purchasers

Typically, upstream lighting rebate programs are evaluated via recruitment of lighting purchasers for intercept and follow-up surveys. In this method, lighting purchases are approached following completion of their selection of lighting and asked a brief (1-2 minute) survey. They are then recruited for a follow-up survey to take place 1-2 months later in which they are asked

- How much of the purchased lighting was installed;
- Where in the home purchased lighting was installed; and
- If they would have purchased the same type and quantity of lighting without the discount.

This evaluation is occurring after implementation is complete, and as such, survey results from customers recruited in-store may not accurately reflect the behavior of customers during the applicable program year. As such, ADM determined that the evaluation would be best served by surveying customers from the applicable program year. One participating retailer tracked customer-specific information via in-store coupons, which ADM drew a sample from for needed participant surveying. Lacking cause to believe that customers who purchase CFLs at this differ significantly from those that purchased CFLs at other participating retailers, ADM determined that a random sample of customers from the three participating stores that tracked customer-specific information would suffice. In accordance with 90/10 sampling precision requirements, ADM surveyed a sample of 68 participants.

Verification of Deemed Savings Estimates

Deemed savings estimates for CFLs are dependent upon two factors:

- Baseline incandescent fixture wattage; and
- Hours of operation.

Through these two figures, deemed savings estimates for a CFL are calculated as:

Annual kWh Savings = (CFL Wattage – Incandescent Wattage) * Hours of Operation / 1000 W/kW

Baseline Wattage

Baseline wattage is determined by the type of bulb providing equivalent lumens. The CFLs sold through this program provide a guideline on the packaging indicating the equivalent incandescent wattage in order for customers to properly size their CFL purchase. The equivalent CFL wattages are detailed in Table 3-1 below.

Table 0-20 Baseline Wattages by CFL Size

CFL Wattage	***Ex Ante Baseline Wattage***	***Ex Post Baseline Wattage***
9	40	40
10	40	40
11	40	40
13	60	60
14	60	60.15
15	60	60
17	75	75
19	75	75
20	75	75
23	100	100.49
26	100	100
27	100	100
42	150	150

It should be noted that some baseline wattages do not directly correspond to an incandescent size. For 14W and 23W bulbs, the baseline wattage depends upon the bulb type (spiral, globe, flood, etc.), as each bulb type has a different baseline incandescent wattage. The baseline established for these two CFL wattages are weighted averages of the baseline wattages by bulb type. For 14W bulbs, the baseline lighting consisted of 60W and 65W incandescent lighting. For 23W bulbs, baseline lighting consisted of 90W, 100W, and 120W lighting. All baseline lighting values provided by ADM were taken from the lighting equivalence as stated on the individual lamp's packaging.

Hours of Operation

SPS determined hours of operation based on the following factors:

- Number of lamps available by room type
- Hours of use by room type
- Number of lamps purchased per customer

The assumption was that CFLs would enter highest-us areas first. This assumption does not always hold, however, as in many cases customers may install in lower-use areas first. This can occur for a variety of reasons, but two common reasons are:

- Lack of eligible fixtures in higher-use rooms; and
- Incandescent lighting burning out in low-use rooms.

It is common for residential customers to wait until burnout to replace lighting, and it is not always the high-use areas which burn out first. ADM determined an appropriate hours of use estimate based upon the room of installation as indicated by survey respondents.

In a 2005 study of California by KEMA[10], CFL use was monitored in statistically significant samples by room type, with the resulting average daily hours of operation by room type summarized in Table 3-2 below.

Table 0-21 Daily Hours of Operation by Room Type – KEMA Study

Room Type	***CFL Hours Per Day***
Kitchen	3.5
Living Room	3.3
Outdoor	3.1
Family Room	2.5
Garage	2.5
Bedroom	1.6
Bathroom	1.5
Hall/Entry	1.5
Laundry Room	1.2

The hours of use by room type that SPS applied in their deemed savings estimates was based upon a DOE study conducted by Navigant[11]. The KEMA study is the more recent study and is based upon a significant amount of residential monitored lighting runtime data. However, there

[10] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2005

[11] US DOE, US Lighting Market Characterization, Navigant Consulting, 2002

are room types from the Navigant study that are not covered in the KEMA study. ADM has applied hours of use from the KEMA study where available and those from Navigant for room types that the KEMA study did not cover. These hours are displayed in Table 3-3 below.

Table 0-22 Daily Hours of Operation by Room Type – Navigant Study

Room Type	***CFL Hours Per Day***
Utility Room	2.4
Dining Room	2.3
Office	1.9
Closet	1.4
Other	1.2

The results from these two studies provide an up-to-date depiction of hours of use by room type for a wide array of residential end-uses.

Calculating Annual Savings Estimates

Annual savings estimates are calculated by summing the wattage reduction multiplied by the daily hours of operation, adjusted by the percent of CFLs used to replace other CFLs. The equation is summarized as:

Annual kWh Savings = (Incandescent Wattage – CFL Wattage) * Quantity * Hours of Operation / 1000 W/kW

As stated prior, baseline wattages were collected from individual model's packaging, and a weighted average was calculated for wattage levels that featured more than one possible baseline wattage (due to the same CFL wattage covering more than one lamp type). Hours of use were calculated at a weighted average of 2.7 hours per day (985 hours/yr), based upon survey results with lighting purchasers.

Calculating Peak Savings Estimates

Peak savings estimates are calculated in the following manner:

Peak kW Savings = (Incandescent Wattage – CFL Wattage) * Quantity * Peak Coincident Factor / 1000 W/kW

SPS used a peak coincident factor of .08 when estimating peak kW. Based upon a peak period of 4:00 – 6:00 PM in summer, ADM has determined a peak coincident factor of .10166667, as per the results of the 2005 KEMA residential lighting monitoring study. This results in increased realization for the peak kW reduction associated with residential CFLs in the SPS territory.

Analysis of Net Savings

As part of this evaluation, we also determined net savings attributable to this program. 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 cooling equipment without a utility-provided 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 net savings methodology is described in further detail in Section 4.2.

Summary of Key Issues

The most significant issue to arise for this M&V pertains to daily hours of operation for CFLs sold in the SPS service territory. As discussed prior, preliminary survey results would indicate that a downward revision of the three-hour figure for daily use is warranted, as 64% of customers surveyed indicated that at least some of their CFLs were going to be placed in low-traffic areas. Based upon the locations of installation determined through follow-up surveys, ADM estimated hours of operation of 2.7 per day (985 per year).

M&V Impact Findings

Verified gross electric impacts were 3,529,480 kWh saved annually, which represents a realization rate of 86%; 28,977,113 kWh saved over the life of the measures; and coincident peak demand reduction of 371.2 kW. Verified net electric impacts were 3,164,866kWh per year; 25,986,550 kWh saved over the life of the measures; and 328.4 kW in peak demand reduction.

The following subsections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post gross energy savings, along with program-year realization rates.

Table 0-23 Gross Energy Impact Summary

Measure	***Ex ante energy savings, kWh***	***Ex post energy savings, kWh***	***Variance***	***Realization Rate***
CFLs	4,502,911	3,912,222	-590,689	87%

Net savings are presented in table 4-2 below.

Table 0-24 Net Energy Impact Summary

Program Phase	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Total	328.4	3,164,866	-	25,986,550

Variances between ex post and ex ante savings estimates were caused by a revision of the hours of operation as well a lower NTGR than assumed for the program.

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability
- Prior planning
- Importance of the rebate in the decision making process
- Likelihood of equipment installation without rebate

These four components were addressed in the telephone surveys, with the questions directed at them detailed in the subsections to follow.

Financial Ability

For Part 1, customers were asked:

> Question 9: Would you have been able to purchase the CFLs if the rebates offered through the program were not available?

If the customer answered No to this, then they are assigned 0% free-ridership, as without the financial ability to purchase high efficiency cooling equipment, other factors in the decision making process are moot.

Prior Planning

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

> Question 6: Were you aware of the available discount from SPS prior to deciding to purchase CFLs?

If the respondent indicates that they were not aware of the rebate until after deciding to buy CFLs, then it indicates that they had prior plans to purchase absent the program, and that they are 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. To address this, we examined responses to the following two questions:

> Question 8: How important was SPS's rebate in your decision to buy high CFLs?

> Question 12: Prior to learning of the program, how many CFLs did you have in your home?

If the respondent had no CFLs purchased prior, or indicates that the rebate is "Very Important", then the rebate was important to their decision-making process regarding CFLs. If it was not important, then they can be considered a partial free-rider on this component.

Likelihood of Installing Similar Equipment without Rebate

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

Question 10: After learning of the discount, did you purchase more CFLs than you otherwise would have?

Question 11: After learning of SPS' discount, have you since purchased more CFLs through the program?

Question 13: Would you purchase CFLs if they cost $2 per bulb?

Question 14: Would you purchase as many CFLs as you did if they cost $2 per bulb?

If the respondent indicates that their purchasing would not change at $2 per bulb, or that the program did not cause them to purchase more CFLs, then it is likely that they would have made similar purchases absent the program, and thus can be considered a partial free-rider on this component.

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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-25 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

Additionally, based upon prior evaluations, ADM is applying 14% spillover for retailers with a wider selection of CFLs, as outreach materials from SPS influence purchase of non-rebated CFL models. This does not affect the NTGR at supermarkets or other retailers, as the number of available CFL types is limited, with the rebated models constituting most of the available inventory. Finally, CFLs given through outreach channels are assigned NTGR of 100%. Based upon this analysis, ADM estimates a free-ridership rate of 20% for participants in the Residential Home lighting & Recycling Program. This provides a Net-to-Gross ratio of 80% which gross savings for participants is multiplied by to determine net savings

PARTICIPANT SURVEY RESULTS

Our in-store surveys provided some insight into the current state of market saturation for CFLs. Some key results from our surveys include the following:

- Placement in the household:
  - 64% of respondents indicated that at least some of the CFLs would be installed in low-traffic areas
  - The remaining 35% indicated that the CFLs would be installed in high-traffic areas only.
- Lighting Type Replaced:
  - 98% of respondents indicated that the CFLs would replace incandescent lighting only
  - 2% indicated that the CFLs would replace a mix of burnt out incandescent and CFL lighting
- Consumer Replacement Strategies for Incandescent Lighting:
  - 58% of respondents indicated that they were replacing incandescent lighting that was still operational.
  - 42% indicated that they were replacing lighting on burnout.
- Consumer Response to CFL Price:
  - 91% of respondents surveyed indicated that they would be willing to spend up to $2 per bulb for CFLs. None indicated that they would be willing to spend $3 per bulb.
  - 43% of respondents stated that they purchased more CFLs than they otherwise would have because of the discounted price
- Importance of Rebate:
  - 87% of respondents indicated that the rebate for CFLs was "Very Important" to their decision-making process
  - The remaining 13% indicated that the rebate was "Somewhat Important"
  - 49% of respondents were not aware of the rebate when they decided to purchase CFLs. 51% were aware of the rebate prior to deciding to purchase CFLs.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTR of 80%, and a measure life of 8.21 years. The resultant UEPCD was calculated at $1,373,866.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 7 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net kW reduction of 328.4, the UGCC was calculated at $357,173.

With these two factors, total benefits of the program were calculated at $1,731,039.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have s without the purchased CFLs without the program, so the costs faced by those participants are not considered to be program-generated. Average marginal cost was $2.73 for CFLs rebated through the program. As discussed in the program summary, a total of 79,311 CFLs were rebated through the REC program in 2009. With a NTGR of 80%, this leads to NCI of:

NCI = (79,311 x $2.73 x 0.8) = $173,215

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the REC in 2009. Administrative costs for the 2009 HLR program were $290,094. The resulting total cost of the program was

$173,215+ $290,094 = 463,309

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $1,731,039 / $463,309 = 3.74

As such, ADM concludes that the HLR program in 2009 passed cost-effectiveness testing.

Discussion of Key Findings

Savings for this program have been revised downwards due to two factors:

- Lower operating hours per day for CFLs
- Lower NTGR than assumed by SPS

ADM revised savings based upon reduced operating hours (1,210 to 985 per year) and a and a lower NTGR than used by SPS (from 100% to 80%) Through the M&V effort, ADM has estimated net impacts of:

- 3,164,866kWh savings/yr;
- 25,986,550 lifetime kWh savings; and
- 328.4 peak kW Savings.

Recommendations

For the next program-year, ADM suggests a downward revision of hours of operation in the tech assumptions for the HL&R program. Additionally, with the peak period defined as from 3:00 – 6:00 PM, ADM suggests that the deemed peak coincident factor be revised upward from .08 to .1016667. This is the result of a recent monitoring effort of residential lighting by KEMA for the California Public Utilities Commission.

In future program years, ADM will again examine the specific CFL models rebated through the program and modify baseline wattages to match the values listed on the CFL packaging, resulting in weighted average baselines for some CFL wattages. ADM will reassess operating hours in 2010, using in-store intercept surveys at a cross-section of participating retailers, with a revision to be made to the 2009 operating hours value should the 2010 value differ by more than 10%.

In summary, the revisions to technical assumptions that ADM would suggest are as follows:

- Revise Peak Coincident Factor from 8% to 10.67%;
- Use hours of operation of 975 per year; and
- Revise EUL from 6.61 to 8.21 years for CFLs rated at 8,000 hours.
- Apply a NTGR of 80%

APPENDIX A. SURVEY FORMS

This appendix contains the survey form used in this evaluation.

SPS New Mexico
Home Lighting & Recycling
Participant Survey Questionnaire

Interviewer: ______________________ Date of Interview: _____/_____/_____

Respondent: _____________________ Address: _________________________

Hello. My name is _____, and I am calling on behalf of SPS. We are contacting customers that received rebates for purchasing CFL bulbs at Ace Hardware stores in 2009 for a brief survey questionnaire.

1. We have it in our records that you purchased [x] CFL bulbs that day. Of the CFL bulbs you had purchased that day, about how many have you installed?

2. (If some are left) How many do you plan to install in the next month?

3. Where in your home did you install the CFLs?

4. What type of bulb did the CFLs replace? (IF NECESSARY: Did they replace incandescent bulbs? Other CFLs?)

5. (IF THEY REPLACED INCANDESCENT BULBS): Were the incandescent bulbs still operating when you removed them or were they burnt out?

6. Were you aware of the available discount from SPS prior to deciding to purchase CFLs?

7. How did you become aware of SPS' discount for CFLs?

8. How important was the discount in your decision to purchase CFLs that day?

   a. Very Important
   b. Somewhat Important
   c. Slightly Important
   d. Not at all Important

9. Would you have been able to purchase the CFLs if the discount offered through the program was not available?

10. After learning of the discount, did you purchase more CFLs than you otherwise would have? How many more?

11. After learning of SPS' discount, have you since purchased more CFLs through the program?

12. Prior to learning of the program, how many CFLs did you have in your home? Where were they installed?

13. Would you purchase CFLs if they cost $2 per bulb?

14. Would you purchase as many CFLs as you did that day if they cost $2 per bulb?

15. Have you ever recycled burnt-out CFLs at your hardware store?

16. Have you participated in any other SPS residential energy efficiency programs?

Low-Income Program
Southwestern Public Service Company

Measurement & Verification Report
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Executive Summary

This report provides the results of the measurement and verification (M&V) of the South Western Public Service Company (SPS) Low-Income Program (LIP) that was implemented in New Mexico in 2009. This income qualified project reaches NM low-income residential customers, providing CFLs and refrigerator replacements for qualifying participants. In 2009, the LIP provided 70 refrigerator replacements and 14,000 CFLs, distributed through participating non-profit agencies.

Verified electric impacts were 736,709 kWh saved annually, which represents a realization rate of 81%; 5,746,795 kWh saved over the life of the measures; and coincident peak demand reduction of 77.8 kW.

Variances between ex post and ex ante savings estimates are attributable to the following factors:

- For the CFL component, ADM determined that hours of operation estimates were excessively high. Through surveys of distributing non-profits, ADM determined that many gave several of the CFL four packs to individual customers. SPS' hours of use estimation is based upon the assumption of four CFLs to each recipient. ADM revised the peak coincident factor from 8% to 10.7% based upon the results from the 2005 KEMA CFL Metering study and the determination that SPS' peak period is from 3:00 – 6:00 PM. Additionally, ADM confirmed with the distributing non-profits that only 13,350 of the 14,000 CFLs given have been installed.

- For the Refrigerator component, ADM lowered kW realization based upon.

Summary results of the measurement and verification are presented in Table 1-1. This is a low income program so the ex ante NTGR of 100% is valid; SPS assumed 93% for CFLs and 97% for refrigerators but ADM has determined that this is conservative based upon evaluation of similar outreach programs. The equipment is provided free of charge in homes specifically designated as needed CFLs or a refrigerator replacement, and as such savings from the measures are considered program-induced.

Table 0-26 Gross Impact Summary

Measure	***Peak Demand Savings (kW)***		***Annual Energy Savings (kWh)***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Refrigerators	6.2	5.2	40,880	40,880	7.3	7.3	298,424	298,424
CFLs	57.1	72.6	863,940	695,829	6.61	7.83	5,710,643	5,448,341
Total	63.3	77.8	904,820	736,709	-		6,009,067	5,746,795

Table 0-27 Net Impact Summary

Measure	***Peak Demand***	***Annual Energy***	***Effective***	***Lifetime Energy***

	Savings (kW)		Savings (kWh)		Useful Life		Savings, kWh	
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Refrigerators	5.8	5.2	38,018	40,880	7.3	7.3	277,534	298,424
CFLs	55.4	72.6	838,022	695,829	6.61	7.83	5,539,324	5,448,341
Total	61.2	77.8	876,040	736,709	-		5,816,858	5,746,795

Project Background

The Low-Income Program provides energy efficient lighting and refrigerators and CFLs to a New Mexico market segment that typically does not participate in energy efficiency programs. Due to higher upfront costs, the low income market is slow to adopt energy efficient technology. Through outreach and direct installation, the LIP reaches these customers, and along with providing energy saving equipment educates low income customers as to the potential benefits and cost savings associated with energy efficiency. In 2009, the program distributed 70 refrigerators and 13,350 CFLs. CFLs were distributed in four packs containing two 14W and two 19W CFLs.

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the Low-Income Program. The M&V approach for the Low-Income Program is aimed at the following:

- Verifying counts of installed refrigerators and the numbers of CFLs installed as a result of the project;
- Specifications of installed refrigerators and estimating the extent to which installed CFLs are used;

Providing estimates of net-to-gross savings and free-ridership; and

Estimating cost effectiveness of the LIP in 2009.

Verification of Refrigerators and CFLs Installed

Verification of the Refrigerators and CFLs installed was done in two steps;

- Review of the tracking data presented; and
- Surveys of customers receiving refrigerators/CFLs,

Tracking Data Review

ADM first examined the database for systemic entry errors, i.e., duplicate entries and/or erroneous entries (such as data entered into improper columns). Having satisfactorily examined the database for systemic errors, ADM then conduct verification surveys with all participating agencies distributing CFLs. Through this, ADM confirmed the count of CFLs distributed to SPS customers in 2009. ADM could not conduct verification surveys with participants that had received refrigerators as customer contact information was not maintained in the tracking database.

VERIFICATION OF DEEMED SAVINGS ESTIMATES

SPS assumed 1,210 hours of operation in their kWh savings estimates. ADM revised this to 1,022 based upon prior evaluation experience with CFL outreach programs as well as the information from the distributing agencies that they had given multiple packs to program participants. ADM reviewed the baseline wattages used by SPS and determined them to be accurate figures. As a result of the downward revision of hours of operation, measure life was lengthened, and as such lifetime kWh savings were not significantly affected though annual kWh savings were.

With hours of operation and baseline wattage, deemed savings estimates for a CFL are calculated as:

Annual kWh Savings = (CFL Wattage – Incandescent Wattage) * Hours of Operation / 1000 W/kW

Baseline Wattage

Baseline wattage is determined by the type of bulb providing equivalent lumens. The CFLs installed through this program provide a guideline on the packaging indicating the equivalent incandescent wattage in order for customers to properly size their future CFL purchases. The equivalent CFL wattages are detailed in Table 3-1 below.

Table 0-28 Baseline Wattages by CFL Size

CFL Wattage	***Baseline Incandescent Wattage***
14	60
19	75

CFL Hours of Operation

For the analysis of energy savings, the results of the regression analysis are used along with engineering analysis to assess the *ex ante* estimates of energy savings from installed measures for a sample of participants. The input assumptions used to determine the *ex ante* savings estimates are reviewed to determine the appropriateness of these assumptions.

Based on this review, ADM has revised the savings estimates that SPS has stated for CFLs downward as hours of use were higher than observed by ADM in CFL outreach programs. In a 2005 study of California by KEMA[12], CFL use was monitored in statistically significant samples by room type, with the resulting average daily hours of operation by room type summarized in Table 3-2 below.

Table 0-29 Daily Hours of Operation by Room Type

Room Type	***CFL Hours Per Day***
Kitchen	3.5
Living Room	3.3
Outdoor	3.1
Family Room	2.5
Garage	2.5
Bedroom	1.6
Bathroom	1.5
Hall/Entry	1.5
Laundry Room	1.2

[12] KEMA, “CFL Metering Study”, prepared for the California Public Utilities Commission, 2005

Average	2.3

Based upon room of installation data that ADM had collected in prior evaluations, we determined an average hours of operation figure of 2.8 hour per day, for 1,012 hours per year.

Deemed Savings for Refrigerator Replacement

ADM reviewed the technical assumptions behind the savings for refrigerator replacements for the LIP. Savings were calculated based upon the Energy Data Sourcebook for the U.S. Residential Sector by the Lawrence Berkley National Laboratory. ADM determined kWh savings to be reasonable estimates but revised peak kW savings downward. Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[13]. Resultantly, ADM calculated kW factors of .000127 for conditioned space.

Summary of Key Issues

The most significant issue to arise for this M&V pertains to daily hours of operation for CFLs installed in the New Mexico service territory. The review of the *ex ante* savings estimates included reviewing the analyses and calculations that were used to develop deemed or stipulated savings values for the measures that are rebated through the program. The analysis for each measure was assessed according to the degree to which the savings calculations are supported and defensible and documentation is adequate with respect to the 2005 California study of KEMA. A checklist was used to record (1) whether the methodology used for the calculation was appropriate, (2) whether assumptions used were reasonable and appropriate, and (3) whether savings calculations were done correctly. As discussed prior, ADM has revised the annual savings for CFLs downward as SPS estimates were used what ADM determined to be too high of a deemed hours of use figure. Peak demand estimates were revised upward based upon the determination that the SPS peak period occurs form 3:00 – 6:00 PM using data from the 2005 KEMA CFL Metering Study.

[13] NREL, "Technical Support Document: Development of the Advanced Energy Design Guide for Grocery Stores", September, 2008

M&V Impact Findings

Verified electric impacts were 736,709 kWh saved annually, which represents a realization rate of 81%; 5,746,795 kWh saved over the life of the measures; and coincident peak demand reduction of 77.8 kW. NTGR for this program is 100% so gross impacts equal net impacts.

The following subsections containing detailed results pertaining to:

Energy and demand impacts and variances (section 4.1).

Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated between measures as well as the aggregated totals.

Table 0-30 Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Refrigerators	40,880	40,880	+0	100%
CFLs	863,940	695,829	-168,111	80%
Total	904,820	736,709	-168,111	81%

Table 4-2 below summarizes the first-year kWh impact of the Low-income Refrigerator and CFL Replacement Program in New Mexico.

Table 0-31 Life Time Energy savings Summary (Ex Post)

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Refrigerators	5.2	40,880	7.3	298,424
CFLs	72.6	695,829	7.83	5,448,341
Total	77.8	736,709	-	5,746,795

Analysis of Net Savings

ADM surveyed program participants to verify installation of the measures listed in the tracking data. Through this, ADM also confirmed that the participants could not have afforded the equipment without the program. As such, the NTGR for the program is 100%.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD);
- Non-Electric Acquisition Cost Decrease (NEACD); and
- Utility Generation Capacity Credit (UGCC).

NEACD was not calculated for this program as there are no measures that provide Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. ADM calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTR of 100%, and a weighted average measure life for installed measures from the kits of 7.85 years. The resultant UEPCD was calculated at $320,348.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 8 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 87.4, the UGCC was calculated at $115,107.

With these three factors, total benefits of the program were calculated at $435,455.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). NCI is not applicable to the Low Income Program because there is no cost for the customer to participate and receive the lighting and refrigerator.

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the Energy Wise Program in 2009. Administrative costs for the 2009 LIP program were $231,621.

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $435,455 / $231,621 = 1.88

As such, ADM concludes that the Low Income Program passes cost effectiveness testing.

Discussion of Key Findings

Annual savings for this program have been revised due to two factors:

- Lower operating hours for CFLs
- Higher peak coincident factor for CFLs
- Lower peak kW factor for refrigerators

This resulted in 81% realization for annual savings in the LIP. However, lifetime savings had higher realization as the reduction in annual operating hours for CFLs results in a longer Effective Useful Life.

Overall, the 2009 Low Income Program provided net savings of:

- 736,709 kWh Savings/yr;
- 5,746,795 Lifetime kWh Savings; and
- 77.8 kW in Peak Demand Savings.

RECOMMENDATIONS

From the results of this analysis, ADM recommends that:

- The deemed savings estimate for CFLs be increased, using hours of operation data from the 2005 KEMA CFL Metering Study, as installation of CFLs is tracked by room type by the implementer.

- That deemed savings estimates for refrigerators be based upon the remaining useful life of the replaced refrigerator. This results in higher annual savings but reduced lifetime savings for refrigerator replacements.

2009 Refrigerator Recycling Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

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Executive Summary

The Refrigerator Recycling Program (SRR) was a demand side management (DSM) program that offered residential customers $35 rebates for the recycling of secondary refrigerators during the 2009 program year. This program was designed to decrease the number of inefficient secondary refrigerators in residential households, focus on educating customers on how much energy secondary refrigerators are using, and encourage them to dispose of their operable, inefficient secondary refrigerators in an environmentally safe and compliant manner. This measurement and verification (M&V) report provides final estimates of energy impacts achieved by the RRP in New Mexico.

In 2009, a total of 87 refrigerators were recycled through the program. Verified gross electric impacts were 131,451 kWh saved annually, which represents a realization rate of 153%; 712,738 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 24.1 kW.

Variances between ex post and ex ante savings estimates for the annual kWh saved are attributable to the following factors:

- The annual kWh per unit in the ex ante estimates assumes a specific weighted average age. The units actually recycled were older than anticipated, resulting in higher per-unit savings. ADM calculated savings using a regression model developed by Cadmus using monitored data from 2009 as well as monitored data from a 2005 ADM study to develop a annual energy use figure based upon unit age, configuration, and defrost type.
- Consequently, the Remaining Useful Life (RUL) of the recycled refrigerators was lower, resulting in a reduced Effective Useful Life (EUL) of the recycling measure. EUL was reduced from 7.3 to 6.03 years.
- ADM estimated peak kW reduction by simulating the performance of the typical recycled unit in both conditioned and unconditioned space, weighting the two results based upon survey responses indicating where in the home the refrigerator was placed when in use.

Table 0-32 Gross Impact Summary

Unit Type	***Peak demand reduction (2009), kWh***		***Annual energy savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Refrigerators	13.1	24.1	86,043	131,451	7.3	5.43	628,114	714,360

ADM evaluated Free-Ridership for individual customers. From our surveys, ADM estimated free-ridership of 30% for program participants, with an associated Net-to-Gross Ration (NTGR) of 70%, lower than the 93% NTGR used in ex ante estimates. The resulting net savings are presented in Table 1-2 below.

Table 0-33 Net Impact Summary

Unit Type	***Peak demand reduction (2009), kWh***		***Annual energy savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Refrigerators	12.2	16.9	80,020	92,015	7.3	5.43	584,146	499,641

Project Background

The Second Refrigerator Recycling Program (SRR) is designed to help customers reduce their energy consumption by removing second refrigerators from their homes to recycle them. SPS benefits because the second refrigerator, which is generally more inefficient, will be permanently removed from the system. The recycling process also includes safe disposal of environmentally harmful material, providing collateral benefits from the SRR program.

The goal of the program is to reduce the number of old, inefficient refrigerators that customers have moved to their garages or other locations such as basements and patios. Many areas in which spare units are placed are not space conditioned, and most refrigerators used in that environment operate under a heavy thermal load during the summer. This is exacerbated by the fact the refrigerators are usually quite old and inefficient. Previous studies by the Environmental Protection Agency (EPA), the Department of Energy (DOE) and other utilities have determined that removing these refrigerators, and properly recycling them, performs an energy saving service.

In 2009, the program was configured as a turnkey, stand-alone energy efficiency initiative. The program was advertised to the public via ads, bill stuffers, point-of-sale flyers and media events. The program requires that refrigerators to be recycled be in working condition. The customer receives pick-up and removal service in addition to a $35 rebate per recycled unit. A total of 87 refrigerators were recycled.

Removing old, inefficient refrigerators prevents them from being resold or transferred to another SPS customer. The program provides annual electric energy savings for the remaining life of the unit by permanently removing the unit from service. As an added environmental benefit, 95% of the materials from these units are able to be recycled (metals, plastic, glass, oil, etc.) and disposed of in an environmentally responsible manner (hazardous materials), thus preventing the materials from reaching landfills and contaminating the environment. In 2009, a total of 87 refrigerators were recycled through the SRR.

M&V Methodology

This chapter provides a description of the M&V methodologies applied by ADM in the evaluation of the 2009 SRR Program. The M&V approach for the SRR Program is aimed at measuring the following:

- Numbers of refrigerators collected and recycled;
- Average annual kWh savings per collected appliance; and
- Average kW reduction per collected appliance.
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the SRR program in 2009

Verification of Units Recycled

Verification of the evaporative cooling systems installed was done in two steps;

- Review of the tracking data presented; and
- Surveys of customers who recycled refrigerators.

ADM's first aspect of conducting measurements of program activity was to verify the numbers of refrigerators recycled. Verification work is based on using detailed program tracking data. To begin the verification effort, we reviewed the tracking system data on reported recycled units to determine that all reported units were eligible for the program.

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, which is assumed at .5 based on our previous experience with AC rebate programs. Coefficient of Variation (CV) is defined as:

$$CV(x) = \frac{Standard\ Deviation\ (x)}{Mean(x)}$$

Using a CV of .5, sample size is estimated at:

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

With 10% required precision (RP), this calls for a sample of 68. However, the above formula provides a sample for very large populations. For this program, ADM 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

Applying the finite population correction factor, the required sample is reduced to 40. This sample was contacted via telephone for verification and net-to-gross surveying.

Calculating Annual kWh Savings per Appliance

The implementer for SPS Refrigerator Recycling Program estimated ex ante savings for recycled units by taking the at-manufacture estimate of annual kWh usage for a recycled unit and degrading by methodologies outlined in the Lawrence Berkley National Laboratory Residential Energy Databook. ADM determined that a more precise methodology is that outlined by The Cadmus Group in a 2009 study on refrigerator degradation for the California Public Utilities Commission.[14] For its study, Cadmus used data on refrigerator energy use obtained through two in situ monitoring efforts:

- A dual monitoring study that ADM conducted in support of the evaluation of the (California) 2004-2005 Statewide Residential Appliance Recycling Program; and
- Additional in situ monitoring that Cadmus conducted as part of its study.

The product of these efforts was a database that contained energy use obtained through both DOE testing and in situ monitoring for a sample of 321 units, 184 of which were from the 2004-2005 evaluation and 137 from the 2006-2008 evaluation. Cadmus used the data from this dual monitoring sample to develop regression models that relate in situ energy use to energy use as determined from the DOE test procedure and modification factors based on weather and household size. These modification factors are summarized in Table 3-1.

Table 0-34. In Situ Monitoring Adjustments to DOE Testing Values

Primary	Household Size	Climate Zone	n	% In Situ Delta[15]
Yes	1-2	Cool	29	-30.8%
		Warm	18	-19.2%
	3+	Cool	50	-16.0%
		Warm	32	-6.4%
No	1-2	Cool	86	-21.3%

[14] The Cadmus Group, Inc. "Residential Retrofit High Impact Measure Evaluation Report", prepared for the California Public Utilities Commission. December 7, 2009

[15] A negative in situ delta represents an in situ UEC that is lower than the DOE UEC

Primary	Household Size	Climate Zone	n	% In Situ Delta[15]
		Warm	42	-15.8%
	3+	Cool	59	-6.8%
		Warm	31	1.3%

For this M&V study, the SPS New Mexico territory is treated as a Warm Climate. Because distribution of household sizes is not known for the population of customers participating in the RRP, the distribution observed in the Cadmus study was used. As this program focuses on second refrigerator recycling, the figures used in the calculations to follow are drawn from Table 3-1 where Primary = "No". There were 86 households with 1-2 people and 59 with 3+. Weighting the "% In Situ Delta" by these values, we get an adjustment factor of:

[(42/73) x -15.8%] + [(31/73) x 1.3%] = -8.54%

Additionally, annual kWh use is estimated via a regression model based upon the unit size, configuration (side-by-side vs. top-bottom), and defrost type (manual vs. frost free). The variable coefficients are detailed in Table 3-2 below.

Table 0-35 Regression Model Coefficients

Variable	Coefficient
Intercept	491.83
Side-by-Side Configuration Dummy	98.96
Size (Cubic Feet)	35.3
Age	25.25
Side-by-Side * Age (interactive	19.98

The outputted results from this regression were then reduced by 8.54% in order to account for the climate correction for secondary refrigerators.

Demand Reduction (kW) Analysis

Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[16]. Resultantly, ADM calculated kW factors of .000127 and .000247 for conditioned and unconditioned space, respectively. Our survey results indicated that 53% of the recycled refrigerators were used in conditioned space, with 47% used in unconditioned space. Weighting

[16] NREL, "Technical Support Document: Development of the Advanced Energy Design Guide for Grocery Stores", September, 2008

the kW factors by these proportions, the weighted average kW factor is .000183. Multiplying this by the ex post kWh savings estimate provides gross peak demand reduction of 24.1 kW.

Analysis of Net Savings

As part of this evaluation, we also determine net savings attributable to this program. 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 cooling equipment without a utility-provided 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.

Summary of Key Issues

ADM's results deviated from ex ante estimates due to several key factors. First, ADM applied a different methodology to estimate unit-specific annual consumption using a regression model based on unit size, age, configuration, and defrost type. Additionally, from examining the tracking data, ADM determined that the ex ante savings estimates were based on assumptions of unit age that were not reflected in the participant data. The result was increased annual kWh savings, with reduced persistence as the older units had a lower RUL than presumed in the vintage mixture assumed in ex ante estimates. Furthermore, ADM estimated peak kW reduction for both conditioned and unconditioned space, and used survey response data to weight these two factors based upon respondent's answers when asked of the location of the refrigerator while it was in use. Finally, ADM determined a NTGR of 70.01%, lower than the 96% figure used in ex ante estimates. The result of these figures was that overall, net annual kWh savings and peak kW reduction increased as the increase in gross savings outweighed the losses due to a lower NTGR. However, lifetime kWh savings were reduced as ADM adjusted the RUL of the units recycled in 2009 based upon the actual age and the RUL tables provided by SPS.

Impact Evaluation Findings

Verified gross electric impacts for the Refrigerator Recycling Program in New Mexico were 131,451 kWh saved annually, which represents a realization rate of 153%; 714,360 kWh saved during the lifetime of the measures; and coincident peak demand reduction of 24.1 kW. Verified net electric impacts were 92,015 kWh saved annually; 499,641 kWh saved during the lifetime of the measures; and peak demand reduction of 16.9 kW

The following sections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 presents ex ante and ex post gross energy savings, along with the program-year realization rate.

Table 0-36 Gross Energy Impact Summary

Unit Type	***Ex ante energy savings, kWh***	***Ex post energy savings, kWh***	***Variance***	***Realization Rate***
Refrigerators	86,043	131,451	+45,408	153%

Table 4-2 summarizes verified net impacts.

Table 0-37 Net Energy Impact Summary

Unit Type	***Peak Demand Reduction kW***	***Annual energy savings, kWh***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings, kWh***
Refrigerators	16.9	92,015	5.43	499,641

Variances between ex post and ex ante savings estimates were primarily caused by recycled refrigerators being older than assumed in ex ante estimates, resulting in higher annual kWh savings but lower lifetime kWh savings.

ANALYSIS OF NET SAVINGS

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability
- Prior planning

- Importance of the rebate in the decision making process
- Likelihood of recycling without an available rebate

These components were addressed in the telephone surveys, with the questions directed at them detailed in the subsections to follow.

Financial Ability

Refrigerator recycling differs from rebates for purchase of high efficiency equipment as no customer investment is required. As such, all participants have financial ability to participate, i.e., cost is not a barrier to recycling of the secondary refrigerator.

Prior Planning

Following this, customers are asked as to any plans they had to recycle their refrigerators. This is addressed in the following question:

> Question 9: Did you have specific plans to recycle the refrigerator prior to learning of the SPS Refrigerator Recycling Program?

If the respondent answers "Yes" to the above question, then the respondent is considered to have been planning to recycle their refrigerator and is thus a partial-free rider. Additionally, the respondent is asked:

> Question 5: When did you learn about the SPS Refrigerator Recycling program and the available rebate?

To this question, respondents are asked to indicate if they learned of the available rebate before, at the same time, or after deciding to purchase high efficiency cooling equipment. If the respondent indicates that they became aware of the rebate only after having decided to recycle their refrigerator then they are scored a partial free-rider on this component in the same manner as if they had answered "Yes" to Question 9.

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 recycle their refrigerator. To address this, we examined responses to the following two questions:

> Question 6: What factors motivated you to recycle your refrigerator through the program in 2009?

> Question 14: How important was the rebate in your decision to recycle the refrigerator?

Question 6 does not prompt answers. If the respondent indicates unprompted that the rebate was a motivating factor for the recycling of their refrigerator then they are not considered a partial free-rider in this component of net-to-gross analysis. Additionally, the respondent is scored in the same manner of on Question 14 they indicate that the rebate was "Very Important".

Likelihood of Recycling Refrigerator without Rebate

Finally, customers are asked whether they would have recycled their refrigerators if the rebate were not available. This is addressed with two questions:

> Question 13: If SPS had not offered a rebate for recycling the refrigerator, how likely would you have been to recycle the refrigerator anyway?

If the respondent answered "Definitely would not have recycled" to Question 11, then it can be safely asserted that they would have not recycled their refrigerator without the rebate program. Additionally, if the respondent indicates that they "Definitely would have recycled" their refrigerator without the rebate, then they can be considered to be a partial free-rider in this aspect of net-to-gross analysis. Additionally, respondents are asked as to their behavior in prior cases of appliance disposal. They are first asked:

> Question 11: Have you ever needed to replace a major appliance before?

If they answer "Yes", they are then asked:

> Question 12: When replacing a major appliance, what do you typically do with the old unit? (Prompt only if necessary)

If the respondent indicates unprompted that they recycled appliances in the past, this answer is then examined in concert with their answer to Question 13. If the respondent indicated that they "Probably would have recycled" absent the rebate in addition to indicating that they had recycled appliances in the past, they are then scored as a free-rider in this component in the same manner as if they indicated that they "Definitely would have recycled" absent the rebate in Question 13.

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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-38 Free-Ridership Scoring

Financial	***Prior***	***Rebate Was***	***Likely to Install***	***Aggregated***	***Free-***

Ability	***Planning***	***Important***	***w/o Rebate***	***Category***	***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

Based upon this analysis, ADM estimates a free-ridership rate of 30% for individual participants in the Refrigerator Recycling Program. This provides a Net-to-Gross ratio of 70% which gross savings for participants is multiplied by to determine net savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS residential customers.

Survey Results for Individual Participants

As part of the net-to-gross surveying, respondents were asked to indicate how they had learned about the program. Participants had learned of the program through the following channels:

- 47.5% of participants learned of the program through SPS bill inserts.
- 22.5% of participants learned of the program through radio and T.V. advertisements.
- 20% learned of the program through the newspaper.

Prior planning was addressed with two separate questions, the results of which were:

- 20% of respondents indicated that they had prior plans to recycle their refrigerator prior to learning of the program
- 65% of respondents learned of the rebate prior to deciding to recycle their refrigerator, 15% learned of the rebate after having already decided to recycle their refrigerator, and 20% learned of the program at the same time as deciding to purchase recycle their refrigerator.

The significance of the rebate in the decision making process was addressed with two separate questions:

- When asked an open-ended question related to their motivation for participating in the program, 42.5% of respondents indicated that the rebate was a motivating factor. 20% said it was good for the environment.
- 47.5% of respondents indicated that the rebate was “Very Important” to their decision to recycle refrigerators. 30% indicated that it was “Somewhat Important” in this regards.

Finally, what the respondent would have done absent the rebate was addressed with two questions:

- 25 of participants indicated that they “Definitely would have recycled” refrigerator without a rebate. 17.5% indicated that they “Probably would have recycled” without the rebate. 30% indicated that they “Probably would have not recycled” without the rebate. 20% indicated that they “Definitely would not have recycled” without the rebate.

Finally, customers satisfaction issues with the program were addressed, with

- 85% of respondents indicated that they were “Very Satisfied” with the Residential Refrigerator Recycling Program. 15% indicated that they were “Somewhat Satisfied”.
- Suggestions from customers included widening the range of appliances to recycle, advertising of the program more, and continuing the program so that others may participate.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTRs of 47.9%, and a measure life of 5.43 years. The resultant UEPCD was calculated at $29,857.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 6 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 19, the UGCC was calculated at $18,012.

With these two factors, total benefits of the program were calculated at $47,869.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). There is no participant cost for the RRP as it is the removal of an existing appliance.

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the REC in 2009. Administrative costs for the 2009 RRP were $34,888.

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $47,869 / $34,888 = 1.37

ADM concludes that the SRR program in 2009 passed cost-effectiveness testing. The TRC would have been significantly higher if the program had met its implementation goals, as benefits would have grown faster than costs with a higher total of recycled units by spreading fixed program costs across a larger number of participants.

Discussion of Key Findings

There were several key findings in this evaluation.

The first and foremost key finding pertains to ADM applying a different methodology to estimate unit-specific annual consumption using a regression model based on unit size, age, configuration, and defrost type. Additionally, from examining the tracking data, ADM determined that the ex ante savings estimates were based on assumptions of unit age that were not reflected in the participant data. The result was increased annual kWh savings, with reduced persistence as the older units had a lower RUL than presumed in the vintage mixture assumed in ex ante estimates.

Furthermore, ADM estimated peak kW reduction for both conditioned and unconditioned space, and used survey response data to weight these two factors based upon respondent's answers when asked of the location of the refrigerator while it was in use. Finally, ADM determined a NTGR of 70%, lower than the 96% figure used in ex ante estimates. The result of these figures was that overall, net annual kWh savings and peak kW reduction increased as the increase in gross savings outweighed the losses due to a lower NTGR. However, lifetime kWh savings were reduced as ADM adjusted the RUL of the units recycled in 2009 based upon the actual age and the RUL tables provided by SPS.

The final result was a realization rate of 153%, with results of:

- 131,451 kWh Savings/yr;
- 714,360 Lifetime kWh Savings; and
- 24.1 Peak Demand Reduction kW Savings.

Our survey provided some insight into the patterns of use of secondary refrigerators prior to recycling. Overall, 47.5% of secondary refrigerators were used in unconditioned space. This provides a great deal of stress on the equipment during peak summer months, increasing total kWh consumption. Overall, 70% of all respondents were still using the equipment "All of the time" when they had made the decision to recycle.

Recommendations

Currently, the program does not allow for the recycling of secondary freezers. Numerous survey respondents indicated that they would like to be able to recycle their freezer through the program, and it is an option that ADM has seen available in other service territories. SPS could increase participation by allowing for the recycling of dedicated freezers.

With the data collected by the program implementer, it is easy and cost-effective for ADM to calculate savings for a specific unit, using regression modeling based upon unit capacity, age, defrost type, and configuration, and as such ADM intends to calculate savings in subsequent program years by a similar methodology, so that annual kWh savings and the remaining useful life of the recycled refrigerators is accurately accounted for.

ADM would recommend making the following changes to the Refrigerator Recycling Tech Assumptions:

- Revise measure life to 5.43 years;
- Revise annual customer kWh savings to 1,500 kWh/yr;
- Revise demand reduction to .27 per unit; and
- Apply a NTGR of 75%.

Appendix A. Survey Form

This appendix provides a copy of the survey form used in the telephone surveys.

South Western Public Service Company (SPS)
Refrigerator Recycling

Interviewer: _____________________ Date of Interview: _____/_____/_____
Respondent: ____________________ Address: ________________________

Hello. My name is _____, and I am calling on behalf of SPS. I am conducting a brief survey regarding SPS' Refrigerator Recycling Program. May I ask you a few questions?

1. Do you recall having one of your old refrigerators picked up for recycling?

   ___ Yes
   ___ No (if no, thank the respondent and terminate the interview)

2. How did you first hear about the SPS Refrigerator Recycling Program?

   a. Retailer
   b. Newspaper or magazine ad/article
   c. Friend or relative
   d. SPS website
   e. SPS bill insert
   f. Don't Know (Don't Read)
   g. Other (Specify)

3. When was the old refrigerator picked up?

   _______________ (month and year)

4. Was the old refrigerator still in working condition when it was picked up?

   ___ Yes
   ___ No (skip to #5)

5. When did you learn about the SPS Refrigerator Recycling program and the available rebate?

   a. Before deciding to recycle the refrigerator
   b. After deciding to recycle the refrigerator

c. At the same time as deciding to recycle the refrigerator
d. Don't Know (Don't read)

6. What factors motivated you to recycle your refrigerator through the program in 2009 (Do not read options)?

   a. The SPS rebate
   b. Energy cost savings
   c. Good for the environment
   d. Refrigerator no longer worked properly
   e. Purchased new refrigerator
   f. Don't Know (Don't read)
   g. Other (Specify)

7. Was the old refrigerator still being used when it was picked up? (If respondent says no, ask probing question, i.e., "Was it in use prior to calling SPS for recycling?", "When did you stop using the refrigerator (month/yr)?"

   ___ Yes, all of the time
   ___ Yes, some of the time
   ___ No

   5b. If "Some of the time" – Approximately how many months out of the year was the refrigerator in use?

8. What month/year was the refrigerator last plugged in?

   _______________ (month and year)

9. Did you have specific plans to recycle the refrigerator prior to learning of the SPS Refrigerator Recycling Program?

   ___ Yes
   ___ No

10. When the refrigerator was in use, where in the house was it set up? (Prompt only if necessary)

    a. Kitchen
    b. Den/Lounge
    c. Garage
    d. Basement
    e. Other (specify) _______________

11. Have you ever needed to replace a major appliance before?

___ Yes
___ No (skip to #10)

12. When replacing a major appliance, what do you typically do with the old unit (Prompt only if necessary)?

a. Take for recycling
b. Dispose at a dump
c. Give to friend/family
d. Donate to Charity
e. Sell the appliance
f. Other (Explain)

13. If SPS had not offered a rebate for recycling the refrigerator, how likely would you have been to recycle the refrigerator anyway?

a. Definitely would have recycled
b. Probably would have recycled
c. Definitely would not have recycled
d. Definitely would not have recycled
e. Don’t know

14. How important was the rebate in your decision to recycle the refrigerator?

a. Very Important
b. Somewhat Important
c. Slightly Important
d. Not at All Important
e. Don’t Know (Don’t Read)

15. How satisfied were you with the recycling of your old refrigerator?

a. Very Satisfied
b. Somewhat Satisfied
c. Somewhat Unsatisfied
d. Very Unsatisfied
e. Don’t Know

16. (If Unsatisfied) Why were you unsatisfied with the recycling of your old refrigerator?

17. Do you have any specific comments or suggestions about how to improve the Refrigerator Recycling Program?

Residential School Education Kits
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

Prepared for:

Xcel Energy

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Executive Summary

This report provides the results of the measurement and verification (M&V) of Southwestern Public Service Company (SPS) Residential School Education Kit Program (SEK) that was implemented in New Mexico in 2009. This program is a turnkey educational program that combines energy efficiency curriculum for teachers with easy-to-install energy efficiency and water-saving measures for students to install at home. SPS intends to reach all fifth grade students in its New Mexico service area with this annual program which provides a kit with two CFLs, a low-flow showerhead, and a kitchen aerator, along with educational materials for the families of the participating students on how to best use the provided equipment as well as suggestions for behavioral changes to save energy. Participants of the 2009 program consisted of 3,362 students and 140 teachers.

Verified electric impacts were 876,762 kWh saved annually, which represents a realization rate of 82%; 5,401,448 kWh saved over the life of the measures; and coincident peak demand reduction of 32.1 kW. The program provides the energy efficiency measures for free, and accordingly, the installed measures have a Net-to-Gross Ration (NTGR) of 100%, as if the equipment was not present in the home prior, then the installation is program-induced.

This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the Residential School Education Kits Program in New Mexico. Ex post electric savings were determined from detailed analyses project of deemed savings estimates as well as survey results for program participants. Gross impacts are presented in Table 1-1.

Table 0-39 Energy Impact Summary

Measure Category	**Peak Demand Reduction, kW**		**Annual energy savings, kWh**		**Effective Useful Life (EUL), years**	**Lifetime Energy Savings, kWh**	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
CFLs	28.6	32.1	309,035	362,778	6.61	2,042,721	2,397,963
Showerheads	0	0	677,249	433,565	6	4,063,494	2,601,390
Kitchen Aerators	0	0	80,221	80,419	5	401,105	402,095
Total	28.6	32.1	1,066,505	876,762	-	6,507,320	5,401,448

Project Background

The Residential School Education Kit Program is a fully implemented multi-resource efficiency/education program designed to facilitate installation of efficiency measures in homes and build knowledge of environmental issues in the SPS New Mexico service territory. The program yields a variety of measurable energy and water savings results by assigning students to bring educational materials and information to their home, discussing the information with their parents and installing measures included in the kit. The program delivered a proven blend of 140 teacher-designed classroom activities with hands-on home projects to install high efficiency devices and introduce resource-conscious behavior to 3,362 students and their families.

In 2009, the SEK program distributed 3,502 kits. Seventy-four percent of participants installed CFLs, 61% installed low-flow showerheads, and 57% installed the faucet aerator. The overall installed totals are presented in Table 2-1 below.

Table 0-40 Summary of Installations

Measure	***CFL***	***Showerhead***	***Aerator***
Quantity	5,007	2,136	1,996

M&V Methodology

This chapter provides a description of the methodologies applied by ADM for the measurement and verification of the Residential School Education Kit program. The M&V approach for the Residential School Education Kit program is aimed at the following:

- Specification and the extent to which installed items are used;
- Providing estimates of net-to-gross savings; and
- Estimating cost effectiveness of the SEK program in 2009

Review of Deemed Savings Estimates

ADM reviewed the deemed savings estimates for the measures included in the package and informed savings calculations with data provided from the participant survey data. The results of these reviews were as follows:

- CFLs: ADM calculated a weighted-average baseline for the two CFL sizes included (13W and 18W), based upon survey responses from program participants in which they indicate the wattage of the CFL they had replaced. The result was a weighted baseline wattage of 72.1W and 74.3W for 13W and 18W CFLs, respectively. This increased savings from 13W CFLs but decreased savings from 18W CFLs. Peak kW was higher than claimed by SPS as due to the peak period being defined from 3:00-6:00 PM, ADM revised the peak coincident factor from the 8% figure used by SPS to 10.6%, as determined from the 2005 KEMA Residential CFL Monitoring Study[17].

- Low Flow Showerheads: ADM determined the savings estimate of 398 kWh per year to be a reasonable estimate and in line with other evaluation efforts. Gross savings were revised downward, however, based upon installation rates and the percentage of homes with electric water heating. Installation rates and the proportion of homes with electric water heating were lower than anticipated and as such overall savings from showerheads were reduced, though the per-unit savings matched SPS estimates.

- Faucet Aerators: Similarly to low-flow showerheads, ADM revised savings based upon installation rates and the percentage of homes with electric water heating, but did not revise the per-unit deemed savings estimate of 79 kWh per year. This value is a reasonable estimate and in line with other evaluation efforts.

[17] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2005

Verification of Installed Measures

Verification of the items installed within the Residential School Education Kit program was unable to be completed due to cards returned displayed personal information that could not be redacted. As such, ADM was required to use the installation rates stated in the survey results in calculating savings.

Analysis of Net Savings

The SEK Program is determined to have a NTGR of 100%, as for the measures installed, the savings can be considered program induced as the participating families would not have had the equipment to install without the SPS outreach and distribution.

Summary of Key Issues

As stated in Section 3.1, savings were revised for the SEK Program due to installation rates, the proportion of homes with electric water heating, the lighting baseline wattage, and the peak period defined by SPS. Overall, 51% of participating homes had electric water heating, and savings for installed faucet aerators and low-flow showerheads were revised accordingly.

Impact Evaluation Findings

Verified electric savings were 876,762 kWh annually, which represents a realization rate of 82%; 5,401,448 kWh saved during the life of the measures; and coincident peak demand reduction of 32.1 kW.

The following subsections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-41 Energy Variance Summary

Unit Type	Ex Ante Energy Savings (kWh)	Ex Post Energy Savings (kWh)	Variance	Realization Rate
CFLs	309,035	362,778	+53,743	117%
Showerheads	677,249	433,565	-243,684	64%
Kitchen Aerators	80,221	80,419	+198	100%
Total	1,066,505	876,762		

Table 4-2 below summarizes the net energy impact of the 2009 SEK Program in New Mexico.

Table 0-42 Net Impact Summary

Unit Type	Peak Demand Reduction (kW)	Annual Energy Savings (kWh)	Effective Useful Life (EUL), years	Lifetime Energy Savings (kWh)
CFLs	32.1	362,778	6.61	2,397,963
Showerheads	0	433,565	6	2,601,390
Kitchen Aerators	0	80,419	5	402,095
Total	32.1	876,762	-	5,401,448

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD);
- Non-Electric Acquisition Cost Decrease (NEACD); and
- Utility Generation Capacity Credit (UGCC).

Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NGTR of 100%, and a weighted average measure life for installed measures from the kits of 6.16 years. The resultant UEPCD was calculated at $320,086.

ADM used projected gas cost values per MMBtu to calculate NEACD. This was calculated by taking the kWh savings associated with low-flow showerheads and faucet aerators and converted into MMBtu values. ADM then calculated the NPV of the annual costs using a weighted average measure life for gas-saving measures of 5.85 years and a NTGR of 100%. The resultant NEACD was valued at $58,424.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 7 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 36.1, the UGCC was calculated at $38,443.

With these three factors, total benefits of the program were calculated at $416,943.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). NCI is not applicable to the School Educational Kits Program because there is no cost for the customer to participate and receive the kit.

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the SKEP in 2009. Administrative costs for the 2009 SEK program were $157,385.

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $416,943 / $157,385 = 2.65

As such, ADM concludes that the SEK program in 2009 passed cost-effectiveness testing.

Discussion of Key Findings

Overall, the 2009 Residential School Education Kit Program provided net savings of :

- 876,762 kWh Savings/yr;
- 5,401,448 in kWh savings over the life of the measures; and
- 32.1 On-Peak kW Savings.

ADM revised the peak coincident factor used for CFLs from 8% to 10.6% based upon receipt of the peak period definition from SPS and the 2005 KEMA Residential CFL Monitoring Study. Additionally, savings were revised due to a mixed baseline of incandescent lighting replaced, resulting in an increase in the baseline for 13W CFLs but a lowering of the baseline for 18W CFLs. Finally, savings attributable to faucet aerators and low-flow showerheads were reduced based upon reported installation rates from the participant surveys.

Recommendations

ADM recommends that SPS anticipate similar installation rates and proportions of homes with electric water heating in upcoming program years. This would likely result in higher realization for showerhead and aerator measures, and better planning for implementation. According to the participant surveying, 51% of homes receiving the kit had electric water heating. This number should be applied in future program planning. In summary, ADM suggests that SPS make the following changes to the program technical assumptions, based upon results of both the 2008 and 2009 program years:

- 52% of homes receiving the kit have electric water heating;
- 63% installation rate for showerheads;
- 60% installation rate for faucet aerators;
- 74% installation rate for 13W CFL;
- 69% installation rate for 18W CFL; and
- Peak coincident factor of 10.67% for CFLs.

Business Cooling Efficiency Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final Report
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Prepared for:

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Executive Summary

The Business Cooling Efficiency Program (BCEP) was a demand side management (DSM) program that offered non-residential customers rebates for replacing major cooling system components with high efficient options. Additionally, rebates are available for new construction applications. This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the BCE Program in New Mexico.

In the 2009 program year, the BCE Program had four participants, all constituting prescriptive measures. There were no custom measures installed through the BCE Program in 2009.

Ex post electric savings were determined from detailed analyses project documentation for all program participants. This included a review of assumptions used in deemed savings estimates, engineering algorithms, and final calculations of annual kWh and peak kW savings.

Verified gross electric impacts were 77,592 kWh saved annually, which represents a realization rate of 221 %; 1,551,870 kWh over the life of the measures; and coincident peak demand reduction of 34.3 kW. The high gross realization was due to ADM discovering that deemed savings estimates for rebated measures were severely underestimated and did not follow SPS' stated methodologies. The revised calculations apply SPS' methodologies, which ADM determined to be reasonable estimates for the classes of equipment rebated in the 2009 BCEP.

Table 0-43 Gross Impact Summary

Unit Type	***Peak Demand Savings (kW)***		***Annual energy savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Rooftop Units	3.3	3.3	4,678	5,503	20	15	93,560	82,545
PTACs	15.4	31.0	30,355	72,089	20	15	607,100	1,081,335
Total	18.7	34.3	35,003	77,592	20	15	700,060	1,163,880

ADM surveyed participants to evaluate the Net-to-Gross Ration (NTGR) for the 2009 BCEP. Since their were only four program participants, in order to meet 90/10 requirements a census would have been required. One participant was not reachable and another participant declined to survey over current complaints with SPS, and as a result ADM could only conduct two surveys. The two respondents both scored 0% free-ridership, as they had indicated that they could not have afforded the high efficiency cooling equipment without the rebate. These results do not meet 90/10 requirements, however, and as such ADM is deferring to the ex ante assumed NTGR of 94%. The resultant net savings are presented in Table 1-2 below.

Table 0-44 Net Impact Summary

Unit Type	***Peak Demand Savings (kW)***		***Annual energy savings, kWh***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Rooftop Units	3.1	3.1	4,397	5,173	20	15	87,946	77,595
PTACs	14.5	29.1	28,534	67,764	20	15	570,674	1,016,460
Total	17.6	32.2	32,932	72,936	20	15	658,620	1,094,055

Project Background

The Business Cooling Efficiency Program (BCEP) is designed to help 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. However, the BCEP had no custom projects in 2009.

Businesses participating in the Cooling efficiency Program benefit from installing new, more reliable equipment, reduced maintenance costs, and lower utility bills. The BCEP induces retrofits to more efficient cooling equipment by shortening the payback period needed through financial incentives.

M&V Methodology

This chapter provides a description of the EM&V methodologies applied by ADM in the evaluation of the 2009 BCEP. The EM&V approach for the BCEP is aimed at measuring the following:

- Validating deemed savings estimates for rebated measures;
- Verifying installation of rebated measures;
- Determining an appropriate program net-to-gross ratio
- Estimating cost-effectiveness of the program

Validating Deemed Savings Estimates for Rebated Measures

A first aspect of conducting measurements of program activity is to conduct a thorough review of deemed savings estimates and their underlying assumptions. The two measures reviewed in the 2009 evaluation are:

- Roof-Top Units (RTUs)
- Packaged Terminal Air Conditioners (PTACs)

The review of deemed savings estimates for the applicable measures is detailed in the subsections below.

Roof-Top Units

Savings associated with RTUs are a function of baseline efficiency, as-built efficiency, and estimated Equivalent Full Load Hours (ELFH) for the facility type, as determined by Roswell, NM Typical Meteorological Year (TMY) weather data. Annual kWh savings are calculated using Seasonal Energy Efficiency Ratio (SEER), which is the efficiency of the RTU over the average cooling season weather. Peak demand reduction is calculated using Energy Efficiency Ratio (EER), which is the efficiency rating of the RTUs at 95 deg F. Savings for RTUs are calculated as follows:

$$\text{Annual kWh Savings} = \text{Size (Tons)} \times \text{EFLH} \times (12/\text{SEER}_{\text{Standard}} - 12/\text{SEER}_{\text{Efficient}})$$

$$\text{Peak kW Savings} = \text{Size (Tons)} \times (12/\text{EER}_{\text{Standard}} - 12/\text{EER}_{\text{Efficient}})$$

The primary assumption associated with the deemed savings estimates was EFLH. The 2009 program year had RTUs installed in retail facilities, for which the estimated EFLH was 1,670/yr. ADM reviewed the methodologies used to determine EFLH[18], and determined that the methodologies were valid and were properly applied to Roswell, NM TMY weather data. Baseline efficiencies used in savings calculations for RTUs are based upon IECC 2006 standards and were accurately applied in the 2009 BCEP.

[18] Arkansas Deemed savings Quick Star Program Draft Report Commercial Measures Final Report

Packaged Terminal Air Conditioners

Savings from PTACs are calculated in a manner similar to that of RTUs. Where they differ in deemed the savings estimate is in the assumed EFLH. They are heat pumps, and as such provide both heating and cooling season electric savings. Savings calculations for this equipment class are performed similarly to those done for RTU's, with EFLH differing as PTACs are used in hotel rooms, which are subject to limited occupancy.

EUL Summary

SPS applied an effective useful life (EUL) of 20 years for RTUs and PTACs rebated through the program in 2009. ADM has revised these values to 15 years in accordance with California DEER estimates, as the 15 year value is more consistent with what is applied in other service territories for these equipment classes.

Verification of Installation of Rebated Measures

The 2009 BCEP had limited participation, with only four customers receiving rebates. As such, on-site verifications were not cost effective for this evaluation. ADM conducted telephone verification with three of theparticipating facilities, and confirmed installation of all rebated measures. These telephone surveys were also used to ask net-to-gross survey questions of the 2009 program participants. These values are not applied in this year's evaluation, however, due to limited participation. The value would not be representative of future program years that are likely to display increased participation.

Net Savings Estimates

As part of this evaluation, we also determined net savings attributable to this program. 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 motors and drives without a utility-provided 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 net savings methodology is described in further detail in Section 4

Summary of Key Issues

Three key issues arose from this evaluation:

- Ex ante savings estimates did not follow SPS' stated methodologies;
- One participant indicated that they have not received their rebate; and
- ADM revised the EUL of rebated measures from 20 to 15 years.

The result of these issues is that ADM calculated a very high gross realization rate, and also that we could not survey enough participants to revise the NTGR used in ex ante estimations.

Impact Evaluation Findings

Verified gross electric impacts for the Business Cooling Efficiency Program in New Mexico were 77,592 kWh saved annually, which represents a realization rate of 221%; 1,163,880 kWh saved over the life of the measures; and coincident peak demand reduction of 34.3 kW. Verified Net electric impacts were 72,936 kWh saved annually; 1,094,055 saved over the life of the measures; and peak demand savings of 32.2 kW

The following sections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated between refrigerators and freezers as well as the aggregated totals.

Table 0-45 Gross Energy Impact Summary

Unit Type	***Ex ante energy savings, kWh***	***Ex post energy savings, kWh***	***Variance***	***Realization Rate***
RTUs	4,678	5,503	+825	117%
PTACs	30,355	72,089	+41,734	237%
Total	35,003	77,592	+42,559	221%

Table 4-2 below summarizes the net savings associated with the SPS Business Cooling Efficiency Program.

Table 0-46 Lifetime Energy savings Summary (Ex Post)

Unit Type	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Refrigerators	3.1	5,173	20	103,456
Freezers	29.1	67,764	20	1,355,273
Total	32.2	72,936	20	1,094,055

Variances between ex post and ex ante savings estimates were primarily caused by errors in savings calculations for PTACs.

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability;
- Prior planning;
- Importance of the rebate in the decision making process; and
- Likelihood of equipment installation without rebate.

These four components were addressed in the telephone surveys, with the questions directed at them 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 motors and drives, other factors in the decision making process cannot contribute to the decision making absent the available rebate.

Prior Planning

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

> Question 36: When did you learn of the cooling 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 cooling equipment. To address this, we examined responses to the following two questions:

> Question 5: How important was SPSs' rebate in your decision to buy high efficiency cooling equipment?
>
> Question 14: Before participating in the cooling 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 cooling equipment if the rebate were not available. This is addressed with four questions:

> Question 19: If the financial incentive from the cooling 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 cooling 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 cooling 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 cooling 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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-47 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

Based upon this analysis, ADM estimates a free-ridership rate of 0% for the 2009 Business Cooling Efficiency program, with an associate NTGR of 100%. However, ADM could not survey enough participants to meet 90/10 requirements due to the limited participant pool, and as such ADM is applying the ex ante NTGR estimate of 94% in the evaluation of the 2009 BCEP.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS commercial customers. Surveys were conducted with both of the two program participants, accounting for all program savings.

Survey Results for Individual Participants

As part of the net-to-gross surveying, respondents were asked to indicate how they make decisions about energy efficiency for their facility. Participants emphasized the importance of energy efficient improvements by saying:

- One respondent indicated that energy efficiency is “very important” in planning operations for their facility. The other respondent indicated it was “somewhat important”.
- Both respondents indicated that they used SPS sources, including SPS energy specialists, account reps, and the SPS website, for information on energy efficiency improvements.
- Both respondents stated that incentive payments from SPS were “very important” in their decision making regarding installation of high efficiency cooling equipment.
- Both respondents indicated that when replacing equipment at their facility, they “usually” try to purchase and install energy efficient equipment.
- Both of respondents have purchased and installed energy efficient equipment at their facilities in the past.
- Both respondents indicated that they have not installed energy efficient equipment in the last year without a rebate.

Respondents were asked how they had learned about the program. Participants had learned of the program through the following channels:

- Both participants learned of the program in part from SPS channels, including account reps, brochures, and the SPS website

Respondents were also asked as to their financial ability to purchase high efficiency motor equipment.

- Both respondents indicated that they would not have been financially able to purchase high efficiency equipment without the rebate

Prior planning was addressed with three separate questions, the results of which were:

- Both of respondents indicated that they had prior plans to install high efficiency motor equipment prior to hearing about the program
- Both respondents indicated that they learned of the program during their planning for the replacement of their cooling equipment.

Finally, what the respondent would have done absent the rebate was addressed with four questions:

- Both respondents indicated that if SPS had not provided a rebate, they "Probably would not have" installed the same equipment.
- One of the respondents indicated that the available rebate caused them to install sooner than they otherwise would have.

Finally, customers satisfaction issues with the program were addressed by asking to rate a series of factors 1-5 in terms of their satisfaction:

- Across the board, respondents scored the program overall at 5, indicating that they were "very satisfied".

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NTGR of 94%, and a measure life of 15 years. The resultant UEPCD was calculated at $54,725.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 20 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 35.4, the UGCC was calculated at $81,136.

With these two factors, total benefits of the program were calculated at $135,861.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the high efficiency motors and drives without the program, so the costs faced by the participant are not considered to be program-generated. Average marginal cost was $7,847.50 per participant. As discussed in the program summary, there were a total of 4 participants in the 2009 BCEP. With a NTGR of 94%, this leads to NCI of:

NCI = (4 x $7,847.50 x 0.94) = $29,503

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the BCEP in 2009. Administrative costs for the 2009 BCE rebate program were $20,774. The resulting total cost of the program was

$29,503 + $20,774 = $50,277

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $135,861/50,277 = 2.70

As such, ADM concludes that the 2009 BCEP passes cost-effectiveness testing.

Discussion of Key Findings

There were several key findings in this evaluation. First, ADM discovered that savings calculations were severely underestimated, particularly for PTACs. Having vetted the deemed savings methodologies applied by SPS, ADM then recalculated the savings from the rebated measures, resulting in 221% realization for the 2009 BCEP. However, ADM did revise the EUL for these measures from 20 to 15 years, in accordance with CA DEER guidelines as well as the values applied for similar measures in other service territories. Finally, ADM discerned through surveys with respondents that one respondent stated that they have not yet received their rebate. ADM has not been able to verify this, so it could potentially be a misunderstanding on the part of the customer.

Overall, ADM estimates net electric impacts for the 2009 BCEP of:

- 72,936 kWh saved annually;
- 1,094,055 kWh saved over the life of the measures; and
- 32.2 kW in peak demand reduction.

Recommendations

Only two equipment classes were rebated in 2009. ADM would recommend that SPS review their rebate calculators for other equipment classes to ensure that savings and the associated rebates are calculated properly for other equipment classes rebated in 2010. Additionally, ADM suggest revision of the EUL of RTUs and PTACs from 20 to 15 years. Due to limited participation in 2009, ADM cannot provide a recommendation for revision of the NTGR, so we conclude that the 94% value should be used in ex ante estimations in 2010.

Appendix A. Survey Form

This appendix provides a copy of the survey form used in the telephone surveys.

Southwestern Public Service Company

2009 Business Cooling Efficiency Program

DECISION-MAKER SURVEY QUESTIONNAIRE

ID No. ________________________________

Customer Name: ________________________________

Date of interview: ________________________________

Date data entered ________________________________

....

Hello, my name is ________________. I am calling on behalf of **Southwestern Public Service Company**

.

May I please speak to ________________________ *(Contact Person)?*

Title: ________________________ Company: ________________________

Address: ________________________________ ZIP: ______________

Phone: ( ) ________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is ______________________. I am calling on behalf of Southwestern Public Service Company. Through its Cooling Efficiency Program, SPS has been working with firms and building owners to help them improve the energy efficiency of their operations. Because your company participated in the Cooling Efficiency Program during 2009, we are interested in receiving feedback from you regarding your experience with the program.

SECTION ONE - INTERVIEWEE SCREENING

SCRN-Q.1 According to our records your company participated in the Cooling Efficiency for one or more projects at the following facility:

(Name of facility ____

You are shown as the contact person for that facility. Is that correct?
(If contact seems confused, ask if they remember the Cooling Efficiency Program.
If necessary, describe program and distinguish from other programs.)

- ❑ Yes (GO TO SCRN-Q.2)
- ❑ No (GO TO SCRN-Q.2)

SCRN-Q.2 Many of our questions focus on your company's decision to participate in the program and on your decisions to purchase and install energy efficient equipment for your facility. Are you the best person to talk to?

- ❑ No. Is there someone else who would be better for us to contact?

Who is that?

Name: ____

Title: ____

Phone Number: __________________________________

(You are finished with this person.)
Thank you very much for your time

- *(START SHEET FOR NEW CONTACT PERSON ABOVE)*

CALL THIS PERSON AND GO TO BEGINNING OF INTRODUCTION.

- ❑ Yes. "I am the best person to talk to". *Continue interview.*

*SCRN-Q.*3. Our records give the following as the address for the facility(s) where you installed equipment for which you received financial incentives through the Lighting Efficiency Program.

(Address(es) from cover sheet)

Is this/Are these address(es) correct?

- ❑ Yes
- ❑ No

If No: Could you please give us the correct address?

TO BEGIN, I HAVE SOME QUESTIONS REGARDING HOW ***DECISIONS ABOUT ENERGY EFFICIENCY*** *IMPROVEMENTS ARE MADE FOR YOUR FACILITY.*

1. Compared to all other factors, how important is energy efficiency as a factor in planning your operations for this facility? (READ) Is it…
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (READ) Is it.. (*Check all that are mentioned.)*
   - ❑ An energy management plan
     - 2a. (If YES), Does your energy management plan have numerical goals?
       - ❑ Yes ➔ 2b. (IF YES) What are the goals?___________________________________
       - ❑ No
       - ❑ Don't know
   - ❑ A Staff member responsible for energy and energy efficiency
   - ❑ Corporate Policies that incorporate energy efficiency in operations and procurement
   - ❑ Any Others, such as active training of staff or something else.

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision (READ ALL. CAN BE MULTIPLE RESPONSE):
   - ❑ Made by one or two key people?
     - 3a. What are their titles? ____
   - ❑ Based on staff recommendations to a decision maker?
     - 3b. What is that decision maker's title? ______________________________________
   - ❑ Made by a group or committee?
     - 3c. What is the group or committee name? ___________________________________
   - ❑ Made in some other way?
     - 3d. How are energy efficiency improvement decisions made? ________________
       ____
       ____

4. What are the **sources** your organization relies on for **information** about energy efficient equipment, materials and design features? Please answer yes or no for each one. (READ EACH; YES, NO, OR DK FOR EACH)
   - ❑ An SPS Energy Specialist

- ❑ An SPS Account Representative
- ❑ The SPS website
- ❑ Brochures or advertisements
- ❑ Trade associations or business groups you belong to
- ❑ Trade journals or magazines
- ❑ Friends and colleagues
- ❑ An architect, engineer or energy consultant
- ❑ Equipment vendors or building contractors
- ❑ Any others IF YES: What other sources? ___________________________________

4a. Which sources are your top three? (READ LIST AGAIN ONLY IF NEEDED TO PROMPT. OK IF FEWER THAN THREE)

For each of the following, tell me if it is “very important,” “somewhat important,” “only slightly important,” or “not important at all” for your decision making regarding energy efficiency improvements.

5. **incentive payments from SOS**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

6. **past experience with energy efficient equipment**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

7. **your organization’s policies**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

8. **advice and/or recommendations received from SPS**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important

- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

9. **advice and/or recommendations from equipment vendors**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

10. Which financial methods does your organization typically use to evaluate energy efficiency improvements for your facility? (READ ALL. YES, NO OR DK FOR EACH.) (CAN BE MULTIPLE RESPONSES)
- ❑ Initial Cost
- ❑ Simple payback *(Go to question 10.**a**)*
- ❑ Internal rate of return *(Go to question 10.**b**)*
- ❑ Life cycle cost *(Go to question 10.**c**)*
- ❑ Other (Please Explain) ______________________________ *(Go to question 13)*
- ❑ Don't know *(Go to question 11)*

10.a What **payback** *length of time* do you normally require in order to consider an energy investment cost effective?
______ Years *(Go to question 11.)*

10.b What **rate of return** do you normally require in order to consider an energy investment cost effective? ______%
(Expect answers 10 to 30 %.) *(Go to question 11.)*

10.c What **discount rate** do you normally use in determining the life-cycle costs of various equipment options?______%
(Expect answers 3 to 30 %.) *(Go to question 11.)*

11. When you have to replace equipment at this facility, **how often** do you try to purchase and install **energy efficient equipment**? (READ) Would you say…
- ❑ Always
- ❑ Usually
- ❑ Sometimes
- ❑ Occasionally
- ❑ Never
- ❑ Don't know *(DON'T READ)*

12. Before you knew about the Business Cooling Efficiency Program, had you purchased and installed any energy efficient equipment at this facility?
- ❑ Yes

- ❑ No
- ❑ Don't know *(DON'T READ)*

13. Has your organization purchased any energy efficient equipment in the last three years for which you did **not** apply for a financial incentive through the Lighting Efficiency Program? (IF RESPONDENT SAYS, "No" CLARIFY IF "No equipment purchased" OR IF "No, have applied for financial incentives.")
    - ❑ Yes, Purchased energy efficient equipment but did not apply for financial incentive.

      ↓

      IF YES: 13a. Why didn't you apply for a financial incentive on that equipment?
      (DO NOT READ LIST. PROMPT IF NECESSARY)
      - ❑ Didn't know whether equipment qualified for financial incentives
      - ❑ Didn't know about financial incentives until after equipment was purchased
      - ❑ Didn't have time to complete paperwork for financial incentive application
      - ❑ Paperwork for the financial incentive application was too much
      - ❑ Financial incentive wasn't enough to bother with
      - ❑ Other 1 (Specify) ____
      - ❑ Other 2 (Specify) ____
    - ❑ No, Applied for financial incentives on all of the energy efficient equipment purchased.

      IF NO: 13b. Did you receive all of your incentives?
      Yes
      No
      Don't know
    - ❑ Has NOT purchased equipment
    - ❑ Don't know (*DO NOT READ)*

QUESTIONS 14 through 22 ASKED FOR EACH TYPE OF END USE EQUIPMENT OR MEASURE FOR WHICH CUSTOMER RECEIVED A FINANCIAL INCENTIVE. LISTED FROM PROGRAM RECORDS.:

I now have some questions about particular types of equipment for which you received financial incentives.

According to EPEs records, you received incentives for (insert Equipment/Measure____________

14. Before participating in the Business Cooling Efficiency Program, had you installed any equipment or measure similar to [Rebated Equipment/Measure] at your facility?
    - ❑ Yes
    - ❑ No

15. Did you have plans to install [Equipment/Measure] before participating in the program?
    - ❑ No
    - ❑ Yes

      If Yes:15aWould you have gone ahead with this planned installation even if you had not participated in the program?

- ❑ Yes
- ❑ No

16. How important was previous experience with the SPS Business Cooling Efficiency Program in making your decision to install [Equipment/Measure]? Is it… (READ LIST)
    - ❑ Very important
    - ❑ Somewhat important
    - ❑ Only slightly important
    - ❑ Not important at all
    - ❑ Or you did not have previous experience with the program
    - ❑ Don't know *(DON'T READ)*

17. Did an SPS Energy Specialist or Account Representative recommend that you install [Equipment/Measure]?
    - ❑ No
    - ❑ Yes

    If Yes:17aIf the Lighting Efficiency Program representative had not recommended installing [Equipment/Measure], how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

18. Would you have been financially able to install [Equipment/Measure] without the financial incentive from the Business Cooling Efficiency Program?
    - ❑ Yes
    - ❑ No
    - ❑ Don’t know

19. If the **financial incentive** from the Business Cooling Efficiency Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

20. How did the availability of information and financial incentives through the Lighting Efficiency Program affect the <u>quantity</u> (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?
- ❑ Yes
  IF YES: 20b How much more? ______________________
- ❑ No, Did not affect quantity purchased and installed

21. How did the availability of information and financial incentives through the Lighting Efficiency Program affect the level of energy efficiency you chose for [Equipment/Measure]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
- ❑ Yes
  IF YES: 21b How much more efficient? (could be expressed in different ways. Ask for percentage: e.g., 10% more efficient) ______________________
- ❑ No, program did not affect level of efficiency that we chose for equipment

22. How did the availability of information and financial incentives through the Business Cooling Efficiency Program affect the timing of your purchase and installation of [Equipment/Measure]? Did you purchase and install [equipment/measure] earlier than you otherwise would have without the program?
- ❑ Yes

  ↓

  IF YES: 22a When would you otherwise have installed the equipment? (READ IF NEEDED)
  - ❑ In less than 6 months later
  - ❑ In 6-12 months later
  - ❑ In 1-2 years later
  - ❑ In 3-5 years later
  - ❑ In more than 5 years later
- ❑ No, did not affect timing of purchase and installation

23. Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?
- ❑ (1) Bidding process *(go to Q23a)*
- ❑ (2) One firm *(go to Q23a)*
- ❑ (3) Self installed/No vendor used *(go to Q24)*
- ❑ (9) Don't know *(go to Q23a)*

23a. Did more then one vendor promote the program?
- ❑ (0) No
- ❑ (1) Yes
- ❑ (9) Don't know

23b. Did you select a firm that promoted the program?
- ❑ (0) No (*go to Q23c)*
- ❑ (1) Yes *(go to Q24)*

❑ (9) Don't know *(go to Q24)*

23c. Did you tell the firm about the program?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24. Did the vendor/contractor you learned of the program from install the measures?
❑ (0) No (*go to Q25)*
❑ (1) Yes *(go to Q24a)*
❑ (9) Don't know *(go to Q25)*

24a. Had you previously worked with this vendor/contractor?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24b. Did the fact that the energy efficiency program was part of the project influence your decision on what vendor/contractor to use?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

25. Did the implementation go smoothly?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

26. Did the energy efficiency measure meet your expectation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (3) Exceeded my expectations
❑ (9) Don't know

27. Do you feel you got a quality installation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

28. Did the incentive agreement that you received meet your expectations?
❑ (0) No, Explain___________________________
❑ (1) Yes
❑ (9) Don't know

29. Did anyone from SPS come to your facility to do a pre-inspection?
   - ❑ (0) No (go to Q30)
   - ❑ (1) Yes (go to Q29a)
   - ❑ (9) Don't know (go to Q30)

   29a. Who performed the inspection?
   29b. What did the pre-inspection consist of?
   29c. Did anything change in the design as a result of the pre-inspection?
      - ❑ (0) No
      - ❑ (1) Yes, Explain______________
      - ❑ (9) Don't know

30. Did anyone from SPS come to your facility to do a post-inspection?
   - ❑ (0) No (go to Q31)
   - ❑ (1) Yes (go to Q30a)
   - ❑ (9) Don't know (go to Q31)

   30a. Who performed the inspection?
   30b. What did the post-inspection consist of?
   30c. Did anything change in the incentive amount as a result of the post-inspection?
      - ❑ (0) No
      - ❑ (1) Yes, Explain______________
      - ❑ (9) Don't know

31. Did you provide SPS copies of purchase orders and invoices that document the final costs or did the vendor/contractor?
   - ❑ (1) Someone within firm
   - ❑ (2) Vendor/Contractor
   - ❑ (3) Someone else (specify)_______________
   - ❑ (9) Don't know

32. Were there any issues getting the paperwork approved?
   - ❑ (0) No
   - ❑ (1) Yes, Explain_________________________
   - ❑ (9) Don't know

33. Were there any issues receiving the incentive check?
   - ❑ (0) No
   - ❑ (1) Yes, Explain_________________________
   - ❑ (9) Don't know

34. Was the incentive check the amount you expected?
   - ❑ (0) No, Explain_________________________
   - ❑ (1) Yes
   - ❑ (9) Don't know

I now have some questions about your experience with the Business Cooling Efficiency Program overall.

35. How did you learn of the Business Cooling Efficiency Program? (READ. MULTIPLE OKAY)

- ❑ Approached directly by SPS Energy Specialist or Account Representative of Lighting Efficiency Program
- ❑ Received an information brochure on the Business Cooling Efficiency Program
- ❑ An SPS representative mentioned it
- ❑ The SPSwebsite
- ❑ Friends or colleagues (i.e., word of mouth)
- ❑ An architect, engineer or energy consultant
- ❑ An equipment vendor or building contractor
- ❑ Past experience with the program
- ❑ Or some other way (please explain) ___________________________________

36. When did you learn of the Business Cooling Efficiency Program? (READ. ONE ONLY)

- ❑ You had participated in other energy efficiency incentive programs
- ❑ Before planning for replacing the equipment began
- ❑ During your planning to replace the equipment
- ❑ Once equipment had been specified but not yet installed
- ❑ After equipment was installed
- ❑ Some other time (When? _____)

- ❑ Don't know *(Don't Read)*

37. Has your experience with the Business Cooling Efficiency Program led you to buy any energy efficient equipment for which you did not apply for a financial incentive?

- ❑ Yes

  ➔

  If Yes: 37a What type of equipment? _______________________________________
- ❑ No
- ❑ Don't know *(DON'T READ)*

38. Given your experience with the Business Cooling Efficiency Program, would you buy energy efficient equipment in the future even if financial incentives for such equipment were not being offered through the Business Cooling Efficiency Program?

- ❑ Yes
- ❑ No
- ❑ Don't know *(DON'T READ)*

39. On a scale of 1 to 5, where "5" is very satisfied and "1" is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following? (ROTATE. H ALWAYS LAST)

	1 Very Dissatisfied	*2*	*3*	*4*	*5 Very Satisfied*	*Don't know or no answer*
A. Performance of the equipment installed	❑	❑	❑	❑	❑	❑
B. Savings on your monthly bill	❑	❑	❑	❑	❑	❑
C. Incentive amount	❑	❑	❑	❑	❑	❑
D. The effort required for the application process	❑	❑	❑	❑	❑	❑
E. Information provided by your contractor	❑	❑	❑	❑	❑	❑
F. Quality of the work conducted by your contractor	❑	❑	❑	❑	❑	❑
G. Information provided by SPS Account Representative	❑	❑	❑	❑	❑	❑
H. Overall program experience	❑	❑	❑	❑	❑	❑
I. The elapsed time until you received the incentive	❑	❑	❑	❑	❑	❑

40. *ASK FOR EACH IF ANSWERED 1 or 2 FOR ANY ASPECT IN QUESTION 28:*

Why were you not satisfied with the (ASPECT)? ______________________________

____

____

41. That concludes my questions. Do you have any other comments that you would like me to relay to SPS about energy efficiency in commercial facilities or about their programs? *RECORD ANY CUSTOMER QUESTIONS OR CONCERNS:*

____

____

____

(IF NEEDED OR CUSTOMER SEEMS TO HAVE AN ISSUE OR PROBLEM THAT SPS MIGHT ADDRESS) If you wish to speak with an SPS representative, Mr. Neil Cowen may be reached at: (303) 294-2115.

Thanks for your help!
SPS will use your ideas to improve
its programs for commercial customers.

Business Lighting Program
Southwestern Public Utility Company
Program Year 2009

Measurement & Verification Report
Final Report
May 2010

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Executive Summary

The Business Lighting Efficiency Program (BLEP) was a demand side management (DSM) program that offered non-residential customers rebates for replacing older lighting systems with high efficiency lighting. Additionally, rebates are available for new construction applications. This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the BLE Program in New Mexico.

In the 2009 program year, the BLE Program had 23 participants with 25 total projects. One project was custom, with all other projects receiving fully-deemed rebates. Verified gross impacts were 5,528,184 kWh saved annually, which represents a realization rate of 150%; 48,620m112 saved over the life of the measures installed; and coincident peak demand reduction of 1,214 kW.

Ex post gross savings were determined through documentation reviews of savings calculations and onsite verification and monitoring of a sample of participating facilities. ADM visited seven facilities, encompassing 10 projects and 90% of ex ante kWh savings.

Variances in gross savings estimates were caused largely by a revision of the hours of operation used in deemed savings assumptions. ADM determined facility-specific hours of operation for the sample, and for many participants, particularly industrial customers, deemed savings methodologies applied an hours of operation figure that was significantly lower than actually observed at the facility.

Additionally, ADM evaluated net savings of the BLE Program through a series of participant questionnaires. In the program design, a Net-to-Gross Ratio (NGTR) of 96% was assumed. ADM estimated an overall weighted average NTGR of 64%. We applied facility-specific NTGRs for high savings sites, followed by extrapolating the weighted average NTGR of 64% to sample strata. Doing so resulted in an overall NTGR of 79%, as several of the larger participants displayed high NTGR, indicating in their participant survey that either they would not have been financially able to implement the lighting measures without the incentive or that they just would have been unlikely to do so. Gross impacts are presented in Table 1-1.

Table 0-48 Gross Impact Summary

Unit Type	***Demand Savings (kW)***		***Annual Energy Savings (kWh)***		***Effective Useful Life***		***Lifetime Energy Savings, kWh***	
	Ex Ante	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***	***Ex Ante***	***Ex Post***
Lighting	1,265	1,214	3,684,241	5,528,184	18	9.47	57,919,404	48,620,112

Table 1-2 below presents the net impacts of the 2009 BLEP.

Table 0-49 Net Impact Summary

Unit Type	Demand Savings (kW)		Annual Energy Savings (kWh)		Effective Useful Life		Lifetime Energy Savings, kWh	
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post
Lighting	1,214	710	3,536,871	4,384,067	18	9.47	55,602,628	37,558,957

Project Background

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
- 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 BLE Program benefit from installing new, more reliable equipment, reduced maintenance costs, and lower utility bills. The BLE Program induces retrofits to more efficient lighting and controls by shortening the payback period needed through financial incentives.

M&V Methodology

This chapter provides a description of the EM&V methodologies applied by ADM in the evaluation of the 2009 BLEP. The EM&V approach for the BLEP is aimed at measuring the following:

- Validating deemed savings estimates for rebated measures;
- Verifying installation of rebated measures;
- Calculating Gross Savings
- Estimating net savings
- Estimating cost-effectiveness of the program

Validating Deemed Savings Estimates for Rebated Measures

A first aspect of conducting measurements of program activity is to conduct a thorough review of deemed savings estimates and their underlying assumptions. For the 2009 program year, this included a review of:

- Wattage reductions for various lighting fixtures (T8, Pulse Start MH, CFLs)
- Deemed hours of operation by facility type
- Peak Coincident Factor
- HVAC interactive factors

After reviewing the above components, deemed savings were revised as described in the subsections below.

Deemed Wattage Reduction

ADM made no revisions to deemed wattage reductions. We reviewed the wattage tables and determined them to accurately depict fixture wattages.

Deemed Hours of Operation

ADM found several instances where facility hours of operation differed significantly from the deemed estimate. For industrial facilities, SPS stipulates 12 hours a day of operation. ADM found industrial facilities with savings calculated using this hours of operation figure to actually operate from 7,900 – 8,760 hours per year. By applying facility specific hours of operation, realization from lighting in this application was very high.

In contrast, lighting occupancy sensors had savings significantly reduced at one facility, as ADM verified on site that the assumptions of the wattage controlled by the occupancy sensors were incorrect; the sensors controlled a significantly lower wattage than assumed in deemed estimates.

Peak Coincident Factors

As with hours of operation, ADM developed site-specific peak coincident factors based upon facility-provided lighting schedules and on-site monitoring. For industrial facilities, this resulted in an increase in the peak coincident factor. For educational facilities and offices, the peak coincident factor was revised down as SPS has defined their peak period from 3:00 – 6:00 PM, which occurs after peak usage for office facilities.

HVAC Interactive Factors

After reviewing the energy and demand interactive factors used in SPS deemed savings calculations for lighting, ADM determined that the energy interactive factors were over conservative and demand factors were too high, both out of line with values ADM has seen applied in other service territories. ADM developed energy and demand interactive factors specific to the SPS service territory by facility type through DOE-2 simulation of typical facilities using Roswell, NM weather. A summary of ADM's revisions to HVAC interactive factors is presented in Table 3-1 below.

Table 0-50 Revisions to Energy & Demand Interactive Factors

Facility Type	***Energy (kWh)***		***Demand (kW)***	
	Ex Ante Interactive Factor	***Ex Post Interactive Factor***	***Ex Ante Interactive Factor***	***Ex Post Interactive Factor***
Office	1.11	1.11	1.33	1.19
Single Story Retail	1.11	1.11	1.33	1.38
Education - University	1.11	1.17	1.33	1.49
Industrial	1.11	1.05	1.33	1.30

Effective Useful Life

SPS applied Effective Useful Life (EUL) values of 18 years for linear fluorescent and metal halide lighting, as well as for lighting controls. ADM calculated facility specific EULs using the CA DEER guideline of the rated life of the ballast (70,000 hours) divided by annual hours of use, or 15 years, whichever is less. Due to several facilities operating for high amounts of hours per year, the EUL of lighting rebated in the program was lower than used in SPS ex ante estimations. IN addition, in accordance with DEER guidelines, ADM applied an EUL of 8 years for lighting occupancy sensor controls; ADM concluded that the 18 year figure applied in ex ante estimations was uncharacteristically high, based upon the EUL applied in other program evaluations conducted.

Verification of Rebated Measures

The BLE Program totaled 22 participants in 2009. ADM's sample covered 90% of all ex ante estimated savings.

On site, ADM field staff verified that

(1) The measures rebated were installed

(2) Installed measures were operating correctly

(3) Assumptions of hours of use were valid

If the facility failed verification on any of the above inputs then savings were revised accordingly.

Calculating Gross Savings

We use the data collected on-site and the monitored data in analyses to estimate the energy savings of the various measures installed.

For analysis of lighting measures, we use per-fixture baseline demand, retrofit demand, and appropriate post-retrofit operating hours to calculate peak capacity savings and annual energy savings for sampled fixtures of each usage type. The on-off profile and the fixture wattages are used to calculate post-retrofit kWh usage. We calculate annual energy savings for each sampled fixture per the following formula:

> Annual kWh Savings = (kW_{base} – kW_{post}) x Hours of Operation x Energy Interactive Factor

We calculated demand for a fixture by dividing the total kWh usage calculated for SPS's peak period of the day by the number of hours in the peak period. In particular, we calculate Peak Period Demand Savings as the difference between peak period baseline demand and post-installation peak period demand of the affected lighting equipment, per the following formula:

> Peak Demand Reduction = (kW_{base} – kW_{post}) x Demand Interactive Factor x Peak Coincident Factor

The values for insertion in this formula are determined through the following steps:

- To determine baseline (pre-retrofit) demand values for the lighting efficiency measures, we use the data in the project files on the wattages of the pre-retrofit lighting fixtures and ballasts.
- For post-retrofit values, we use the data on types and quantities of fixtures, lamps and ballasts that we collect on-site.
- We obtain hours of operation either from deemed savings estimates or monitored hours of use, depending on the facility’s amount of savings and the types of equipment installed.

ADM developed gross realization rates for each sample stratum, and then applied the realization rate to the non-sampled facilities within the appropriate stratum to estimate program-level savings.

Net Savings Estimates

As part of this evaluation, we also determined net savings attributable to this program. 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 motors and drives without a utility-provided 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 net savings methodology is described in further detail in Section 4.

Summary of Key Issues

Variances in savings from ex ante estimates for the 2009 BLE Program were due to two factors:

- Revisions to deemed values for hours of use, peak coincident factors, and cooling interactive factors

- Estimation of a NTGR lower than the 96% used in program planning

The NTGR was calculated as a weighted average of the score assigned to individual participants, with weighting determined by the proportion of the program level kWh savings that the participant constituted. As a result of our participant surveys, we would recommend that the

NTGR assumed for program planning be reduced from the 96% estimated to 80% for future program years.

Impact Evaluation Findings

Verified gross electric impacts for the Business Lighting Efficiency Program in New Mexico were 5,528,184 kWh saved annually, which represents a realization rate of 150%; 48,620,112 kWh saved over the life of the measures; and coincident peak demand reduction of 1,214 kW. Verified net electric impacts were 4,384,067 kWh saved annually; 37,558,957 kWh saved over the life of the measures; and 710 kW in peak demand reduction.

The following sections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post net energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-51 Gross Impact Summary

Measure	***Ex ante energy savings, kWh***	***Ex post energy savings, kWh***	***Variance***	***Realization Rate***
Total	3,684,241	5,528,184	+1,843,943	150%

Table 4-2 below summarizes the net impact of the BLE program in New Mexico.

Table 0-52 Net Energy Savings Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Total	710	4,384,067	-	37,558,957

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability;
- Prior planning;
- Importance of the rebate in the decision making process; and

- Likelihood of equipment installation without rebate.

These four components were addressed in the telephone surveys, with the questions directed at them 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.

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 SPSs' 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. For respondents that indicated “Yes” on financial ability, free-ridership scoring is as follows:

Table 0-53 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

Based upon this analysis, ADM estimates a free-ridership rate of 21% for the 2009 Business Lighting Efficiency program, with an associate NTGR of 79%. This result is derived by taking the free-ridership scores of all program participants and weighting them by the proportion of the kWh savings that the participant constitutes. As such, free-ridership for the 2009 BLE program is largely determined the largest participants, as the upper-stratum accounts for 85% of ex ante estimate savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS commercial customers. Surveys were conducted with nine program participants, accounting for 94% of total program savings.

As part of the net-to-gross surveying, respondents were asked to indicate how they make decisions about energy efficiency for their facility. Participants emphasized the importance of energy efficient improvements by indicating the following:

- 56% of respondent indicated that energy efficiency is “very important” in planning operations for their facility. 33% respondent indicated it was “somewhat important”. The remaining 11% stated that it was “only slightly important”.
- 89% of respondents indicated that SPS sources, including energy specialists, account reps, and the SPS website, are used for information regarding energy efficiency.
- 56% of respondents stated that incentive payments from SPS were “very important”, 22% stated that it was “somewhat important”, and 22% stated that they were “only slightly important”.
- 67% of respondents indicated that when replacing equipment at their facility, they “always” try to purchase and install energy efficient equipment; the remaining 33% stated that they “sometimes” try to.
- 86% of respondents have purchased and installed energy efficient equipment at their facilities in the past.
- 56% of respondents have installed energy efficient equipment in the last three years without a rebate.

Respondents were asked how they had learned about the program. Participants had learned of the program through the following channels:

- 56% of participants learned of the program in part from SPS channels, including account reps, brochures, and the SPS website
- Other sources included equipment vendors and business colleagues

Respondents were also asked as to their financial ability to purchase high efficiency cooling equipment.

- 67% of respondents indicated that they would have been financially able to purchase high efficiency equipment without the rebate. The remaining 33% indicated that they would not have been financially able to implement the measure without the rebate.

Prior planning was addressed with three separate questions, the results of which were:

- 56% of respondents indicated that they had prior plans to install high efficiency lighting equipment prior to hearing about the program

- 22% of respondents learned of the program after having already chosen the equipment for the project

Finally, what the respondent would have done absent the rebate was addressed with four questions:

- 22% of Respondents indicated that if EPE had not provided a rebate, they “definitely would have” installed the same equipment; 11% indicated that they “probably would have” installed the same equipment; 33% stated that they “probably would not have installed the same equipment”; and 22% “definitely would not have installed the same equipment”.

- 44% of respondents indicated that the available rebate caused them to change the quantity, efficiency level, or timeline of installation.

Finally, customers satisfaction issues with the program were addressed by asking to rate a series of factors 1-5 in terms of their satisfaction:

- When asked to rate their program satisfaction on a scale of 1-5, respondents scored an average of 4.63.

- Lowest satisfaction scores were given to “savings on my monthly bill” and “incentive amount”, scored at 4 and 4.13, respectively.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NTGRs of 79%, and a measure life of 9.61 years. The resultant UEPCD was calculated at $2,364,360.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 10 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net generator kW reduction of 774, the UGCC was calculated at $1,223,900.

With these two factors, total benefits of the program were calculated at $3,588,260.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the

high efficiency motors and drives without the program, so the costs faced by the participant are not considered to be program-generated. Average marginal cost was $14,063 per participant. As discussed in the program summary, there were a total of 26 participants in the 2009 BLEP. With a NTGR of 79%, this leads to NCI of:

NCI = (23 x $14,063 x 0.79) = $255,525

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the BME in 2009. Administrative costs for the 2009 BLE rebate program were $268,945. The resulting total cost of the program was

$255,525+ 268,945 = $524,470

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $3,588,260/524,270 = 6.84

As such, ADM concludes that the 2009 BLEP passes cost-effectiveness testing by a significant margin.

Discussion of Key Findings

Overall, the 2009 Business Lighting Efficiency Program provided net savings of:

- 4,376,486 kWh Savings/yr;
- 37,445,236 lifetime kWh Savings; and
- 705 On-Peak kW Savings.

ADM concluded that the NTGR for individual program participants was lower than assumed in ex ante calculations. The program was implemented assuming 96% NTGR, and ADM estimated NTGR of 79% for the overall program.

ADM revised gross savings estimates for peak coincident cooling interactive factors by developing factor specific to the SPS New Mexico service territory through DOE-2 simulation of typical buildings types, using Roswell, NM weather. ADM has also revised the EUL of rebated measures in accordance with CA DEER guidelines, as the EULs used were far longer than ADM has seen applied to the same equipment in other utility service territories.

Recommendations

ADM would recommend that for future program years, SPS make the following revisions to deemed savings assumptions:

- Revise EUL of lighting fixtures from 18 years to 70,000 hrs/ hrs per year, or 15 years, whichever is less;
- Revise EUL of lighting occupancy sensors from 18 to 8 years;
- Apply HCIF's developed for specific facility types, rather than one value for all facilities with lighting in conditioned space;
- Revise ex ante NTGR from 96% to 80%; and
- Examine facility-specific hours for deemed projects with sufficiently high savings.

Point #5 was a key factor in the high realization observed for the 2009 BLEP. ADM discovered that many participating facilities had far higher hours of operation than determined by the SPS deemed savings estimates. SPS currently has in place procedures to have senior engineering staff review savings from custom projects over a certain size, and ADM would suggest a similar review of high-savings sites that are installing prescriptive measures. For large projects, deemed hours may be less likely to accurately depict the hours of operation, as observed in the 2009 BLEP.

Appendix A. Survey Form

This appendix provides a copy of the survey form used in the telephone surveys.

Southwestern Public Service Company

2009 Business Lighting Efficiency Program

DECISION-MAKER SURVEY QUESTIONNAIRE

ID No. ____

Customer Name: ____________________________________

Date of interview: __________________________________

Date data entered __________________________________

....

Hello, my name is __________________. I am calling on behalf of Southwestern Public Service Company. May I please speak to ___________________________ *(Contact Person)?*

Title: __________________________ Company: ________________________________

Address: ____ ZIP: __________________

Phone: ( ) ____________________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is ________________________. I am calling on behalf of Southwestern Public Service Company. Through its Lighting Efficiency Program, SPS has been working with firms and building owners to help them improve the energy efficiency of their operations. Because your company participated in the Lighting Efficiency Program during 2009, we are interested in receiving feedback from you regarding your experience with the program.

SECTION ONE - INTERVIEWEE SCREENING

SCRN-Q.1 According to our records your company participated in the Lighting Efficiency Program for one or more projects at the following facility:

(Name of facility ____

You are shown as the contact person for that facility. Is that correct?

(If contact seems confused, ask if they remember the Lighting Efficiency Program. If necessary, describe program and distinguish from other programs.)

- ❑ Yes (GO TO SCRN-Q.2)
- ❑ No (GO TO SCRN-Q.2)

SCRN-Q.2 Many of our questions focus on your company's decision to participate in the program and on your decisions to purchase and install energy efficient equipment for your facility. Are you the best person to talk to?

- ❑ No. Is there someone else who would be better for us to contact?

Who is that?

Name: ____

Title: ____

Phone Number: ________________________________

(You are finished with this person.)

Thank you very much for your time

(START SHEET FOR NEW CONTACT PERSON ABOVE)
CALL THIS PERSON AND GO TO BEGINNING OF INTRODUCTION.

- ❑ Yes. "I am the best person to talk to". *Continue interview.*

*SCRN-Q.*3. Our records give the following as the address for the facility(s) where you installed equipment for which you received financial incentives through the Lighting Efficiency Program.

(Address(es) from cover sheet)

Is this/Are these address(es) correct?

- ❑ Yes
- ❑ No

  If No: Could you please give us the correct address?

*TO BEGIN, I HAVE SOME QUESTIONS REGARDING HOW **DECISIONS ABOUT ENERGY EFFICIENCY** IMPROVEMENTS ARE MADE FOR YOUR FACILITY.*

1. Compared to all other factors, how important is energy efficiency as a factor in planning your operations for this facility? (READ) Is it…
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (READ) Is it.. (*Check all that are mentioned.)*
   - ❑ An energy management plan

     2a. (If YES), Does your energy management plan have numerical goals?
     - ❑ Yes ➔ 2b. (IF YES) What are the goals?________________________________
     - ❑ No
     - ❑ Don't know
   - ❑ A Staff member responsible for energy and energy efficiency
   - ❑ Corporate Policies that incorporate energy efficiency in operations and procurement
   - ❑ Any Others, such as active training of staff or something else.

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision (READ ALL. CAN BE MULTIPLE RESPONSE):
   - ❑ Made by one or two key people?

     3a. What are their titles? ____
   - ❑ Based on staff recommendations to a decision maker?

     3b. What is that decision maker's title? __________________________________
   - ❑ Made by a group or committee?

     3c. What is the group or committee name? ________________________________
   - ❑ Made in some other way?

     3d. How are energy efficiency improvement decisions made? _______________

     ____

     ____

4. What are the **sources** your organization relies on for **information** about energy efficient equipment, materials and design features? Please answer yes or no for each one. (READ EACH; YES, NO, OR DK FOR EACH)

   - ❑ An SPS Energy Specialist

- ❑ An SPS Account Representative
- ❑ The SPS website
- ❑ Brochures or advertisements
- ❑ Trade associations or business groups you belong to
- ❑ Trade journals or magazines
- ❑ Friends and colleagues
- ❑ An architect, engineer or energy consultant
- ❑ Equipment vendors or building contractors
- ❑ Any others IF YES: What other sources? ___________________________________

4a. Which sources are your top three? (READ LIST AGAIN ONLY IF NEEDED TO PROMPT. OK IF FEWER THAN THREE)

For each of the following, tell me if it is "very important," "somewhat important," "only slightly important," or "not important at all" for your decision making regarding energy efficiency improvements.

5. **incentive payments from SPS**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

6. **past experience with energy efficient equipment**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

7. **your organization's policies**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important
- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

8. **advice and/or recommendations received from SPS**?
- ❑ Very important
- ❑ Somewhat important
- ❑ Only slightly important

- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

9. **advice and/or recommendations from equipment vendors**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

10. Which financial methods does your organization typically use to evaluate energy efficiency improvements for your facility? (READ ALL. YES, NO OR DK FOR EACH.) (CAN BE MULTIPLE RESPONSES)
    - ❑ Initial Cost
    - ❑ Simple payback *(Go to question 10.**a**)*
    - ❑ Internal rate of return *(Go to question 10.**b**)*
    - ❑ Life cycle cost *(Go to question 10.**c**)*
    - ❑ Other (Please Explain) ______________________________ *(Go to question 13)*
    - ❑ Don't know *(Go to question 11)*

    10.a What **payback** *length of time* do you normally require in order to consider an energy investment cost effective?
    ______ Years *(Go to question 11.)*

    10.b What **rate of return** do you normally require in order to consider an energy investment cost effective? ______%
    (Expect answers 10 to 30 %.) (Go to question 11.)

    10.c What **discount rate** do you normally use in determining the life-cycle costs of various equipment options?______%
    (Expect answers 3 to 30 %.) (Go to question 11.)

11. When you have to replace equipment at this facility, **how often** do you try to purchase and install **energy efficient equipment**? (READ) Would you say…
    - ❑ Always
    - ❑ Usually
    - ❑ Sometimes
    - ❑ Occasionally
    - ❑ Never
    - ❑ Don't know *(DON'T READ)*

12. Before you knew about the Lighting Efficiency Program, had you purchased and installed any energy efficient equipment at this facility?
    - ❑ Yes

- ❑ No
- ❑ Don't know *(DON'T READ)*

13. Has your organization purchased any energy efficient equipment in the last three years for which you did **not** apply for a financial incentive through the Lighting Efficiency Program? (IF RESPONDENT SAYS, "No" CLARIFY IF "No equipment purchased" OR IF "No, have applied for financial incentives.")
    - ❑ Yes, Purchased energy efficient equipment but did not apply for financial incentive.
      ↓
      IF YES: 13a. Why didn't you apply for a financial incentive on that equipment? *(DO NOT READ LIST. PROMPT IF NECESSARY)*
      - ❑ Didn't know whether equipment qualified for financial incentives
      - ❑ Didn't know about financial incentives until after equipment was purchased
      - ❑ Didn't have time to complete paperwork for financial incentive application
      - ❑ Paperwork for the financial incentive application was too much
      - ❑ Financial incentive wasn't enough to bother with
      - ❑ Other 1 (Specify) ____
      - ❑ Other 2 (Specify) ____
    - ❑ No, Applied for financial incentives on all of the energy efficient equipment purchased.
      IF NO: 13b. Did you receive all of your incentives?
      Yes
      No
      Don't know
    - ❑ Has NOT purchased equipment
    - ❑ Don't know (*DO NOT READ)*

QUESTIONS 14 through 22 ASKED FOR EACH TYPE OF END USE EQUIPMENT OR MEASURE FOR WHICH CUSTOMER RECEIVED A FINANCIAL INCENTIVE. LISTED FROM PROGRAM RECORDS.:

I now have some questions about particular types of equipment for which you received financial incentives.

According to EPEs records, you received incentives for (insert Equipment/Measure____________

14. Before participating in the Lighting Efficiency Program, had you installed any equipment or measure similar to [Rebated Equipment/Measure] at your facility?
    - ❑ Yes
    - ❑ No

15. Did you have plans to install [Equipment/Measure] before participating in the program?
    - ❑ No
    - ❑ Yes
      If Yes:15aWould you have gone ahead with this planned installation even if you had not participated in the program?

- ❑ Yes
- ❑ No

16. How important was previous experience with the SPS Lighting Efficiency Program in making your decision to install [Equipment/Measure]? Is it… (READ LIST)
    - ❑ Very important
    - ❑ Somewhat important
    - ❑ Only slightly important
    - ❑ Not important at all
    - ❑ Or you did not have previous experience with the program
    - ❑ Don't know *(DON'T READ)*

17. Did an SPS Energy Specialist or Account Representative recommend that you install [Equipment/Measure]?
    - ❑ No
    - ❑ Yes

    If Yes:17aIf the Lighting Efficiency Program representative had not recommended installing [Equipment/Measure], how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

18. Would you have been financially able to install [Equipment/Measure] without the financial incentive from the Lighting Efficiency Program?
    - ❑ Yes
    - ❑ No
    - ❑ Don’t know

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? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

20. How did the availability of information and financial incentives through the Lighting Efficiency Program affect the <u>quantity</u> (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?

- ❑ Yes
  IF YES: 20b How much more? ______________________
- ❑ No, Did not affect quantity purchased and installed

21. How did the availability of information and financial incentives through the Lighting Efficiency Program affect the <u>level</u> of energy efficiency you chose for [Equipment/Measure]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?

- ❑ Yes
  IF YES: 21b How much more efficient? (could be expressed in different ways. Ask for percentage: e.g., 10% more efficient) ______________________
- ❑ No, program did not affect level of efficiency that we chose for equipment

22. How did the availability of information and financial incentives through the Lighting Efficiency Program affect the <u>timing</u> of your purchase and installation of [Equipment/Measure]? Did you purchase and install [equipment/measure] earlier than you otherwise would have without the program?

- ❑ Yes
  ↓
  IF YES: 22a When would you otherwise have installed the equipment? (READ IF NEEDED)
  - ❑ In less than 6 months later
  - ❑ In 6-12 months later
  - ❑ In 1-2 years later
  - ❑ In 3-5 years later
  - ❑ In more than 5 years later
- ❑ No, did not affect timing of purchase and installation

23. Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?

- ❑ (1) Bidding process *(go to Q23a)*
- ❑ (2) One firm *(go to Q23a)*
- ❑ (3) Self installed/No vendor used *(go to Q24)*
- ❑ (9) Don't know *(go to Q23a)*

23a. Did more then one vendor promote the program?

- ❑ (0) No
- ❑ (1) Yes
- ❑ (9) Don't know

23b. Did you select a firm that promoted the program?

- ❑ (0) No (*go to Q23c)*
- ❑ (1) Yes *(go to Q24)*

❑ (9) Don't know *(go to Q24)*

23c. Did you tell the firm about the program?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24. Did the vendor/contractor you learned of the program from install the measures?
❑ (0) No (*go to Q25)*
❑ (1) Yes *(go to Q24a)*
❑ (9) Don't know *(go to Q25)*

24a. Had you previously worked with this vendor/contractor?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24b. Did the fact that the energy efficiency program was part of the project influence your decision on what vendor/contractor to use?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

25. Did the implementation go smoothly?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

26. Did the energy efficiency measure meet your expectation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (3) Exceeded my expectations
❑ (9) Don't know

27. Do you feel you got a quality installation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

28. Did the incentive agreement that you received meet your expectations?
❑ (0) No, Explain___________________________
❑ (1) Yes
❑ (9) Don't know

29. Did anyone from SPS come to your facility to do a pre-inspection?
- ❑ (0) No (go to Q30)
- ❑ (1) Yes (go to Q29a)
- ❑ (9) Don't know (go to Q30)

29a. Who performed the inspection?
29b. What did the pre-inspection consist of?
29c. Did anything change in the design as a result of the pre-inspection?
- ❑ (0) No
- ❑ (1) Yes, Explain______________
- ❑ (9) Don't know

30. Did anyone from SPS come to your facility to do a post-inspection?
- ❑ (0) No (go to Q31)
- ❑ (1) Yes (go to Q30a)
- ❑ (9) Don't know (go to Q31)

30a. Who performed the inspection?
30b. What did the post-inspection consist of?
30c. Did anything change in the incentive amount as a result of the post-inspection?
- ❑ (0) No
- ❑ (1) Yes, Explain______________
- ❑ (9) Don't know

31. Did you provide SPS copies of purchase orders and invoices that document the final costs or did the vendor/contractor?
- ❑ (1) Someone within firm
- ❑ (2) Vendor/Contractor
- ❑ (3) Someone else (specify)_______________
- ❑ (9) Don't know

32. Were there any issues getting the paperwork approved?
- ❑ (0) No
- ❑ (1) Yes, Explain_________________________
- ❑ (9) Don't know

33. Were there any issues receiving the incentive check?
- ❑ (0) No
- ❑ (1) Yes, Explain_________________________
- ❑ (9) Don't know

34. Was the incentive check the amount you expected?
- ❑ (0) No, Explain_________________________
- ❑ (1) Yes
- ❑ (9) Don't know

I now have some questions about your experience with the Lighting Efficiency program overall.

35. How did you learn of the Lighting Efficiency Program? (READ. MULTIPLE OKAY)
- ❑ Approached directly by SPS Energy Specialist or Account Representative of Lighting Efficiency Program
- ❑ Received an information brochure on the Lighting Efficiency Program
- ❑ An SPS representative mentioned it
- ❑ The SPS website
- ❑ Friends or colleagues (i.e., word of mouth)
- ❑ An architect, engineer or energy consultant
- ❑ An equipment vendor or building contractor
- ❑ Past experience with the program
- ❑ Or some other way (please explain) ___________________________________

36. When did you learn of the Lighting Efficiency Program? (READ. ONE ONLY)
- ❑ You had participated in other energy efficiency incentive programs
- ❑ Before planning for replacing the equipment began
- ❑ During your planning to replace the equipment
- ❑ Once equipment had been specified but not yet installed
- ❑ After equipment was installed
- ❑ Some other time (When? _____)
- ❑ Don't know *(Don't Read)*

37. Has your experience with the Lighting Efficiency Program led you to buy any energy efficient equipment for which you did not apply for a financial incentive?
- ❑ Yes

  ➜

  If Yes: 37a What type of equipment? _______________________________________
- ❑ No
- ❑ Don't know *(DON'T READ)*

38. Given your experience with the Lighting Efficiency Program, would you buy energy efficient equipment in the future even if financial incentives for such equipment were not being offered through the Lighting Efficiency Program?
- ❑ Yes
- ❑ No
- ❑ Don't know *(DON'T READ)*

39. On a scale of 1 to 5, where "5" is very satisfied and "1" is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following? (ROTATE. H ALWAYS LAST)

	1 Very Dissatisfied	*2*	*3*	*4*	*5 Very Satisfied*	*Don't know or no answer*
A. Performance of the equipment installed	❑	❑	❑	❑	❑	❑
B. Savings on your monthly bill	❑	❑	❑	❑	❑	❑
C. Incentive amount	❑	❑	❑	❑	❑	❑
D. The effort required for the application process	❑	❑	❑	❑	❑	❑
E. Information provided by your contractor	❑	❑	❑	❑	❑	❑
F. Quality of the work conducted by your contractor	❑	❑	❑	❑	❑	❑
G. Information provided by SPS Account Representative	❑	❑	❑	❑	❑	❑
H. Overall program experience	❑	❑	❑	❑	❑	❑
I. The elapsed time until you received the incentive	❑	❑	❑	❑	❑	❑

40. *ASK FOR EACH IF ANSWERED 1 or 2 FOR ANY ASPECT IN QUESTION 28:*

Why were you not satisfied with the (ASPECT)? ________________________________

____

____

41. That concludes my questions. Do you have any other comments that you would like me to relay to SPS about energy efficiency in commercial facilities or about their programs? *RECORD ANY CUSTOMER QUESTIONS OR CONCERNS:*

____

____

____

(IF NEEDED OR CUSTOMER SEEMS TO HAVE AN ISSUE OR PROBLEM THAT SPS MIGHT ADDRESS) If you wish to speak with an SPS representative, Mr. Neil Cowen may be reached at: (303) 294-2115.

Thanks for your help!
SPS will use your ideas to improve
its programs for commercial customers.

Project Number 1-6C61F
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 58%.

CUSTOMER PROJECT AND DESCRIPTION

The facility installed a multitude of lighting efficiency retrofits, which included three 175W metal halide fixtures and thirteen 4'4L T5HO was installed.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site visit only 13 4L T5HO fixtures were able to be verified compared to the 14 listed. ADM was informed by the customer that none of the three 175W metal halides had been installed. One time power measurements were taken of the 4L T5HO fixtures and the business operating hours were obtained through interviews with staff. ADM was informed that the facility is open 8:00 a.m. till 5 p.m., Monday through Friday, resulting in an annual operation of 2,086 hours. These data collection points were then used to calculate the annual energy savings due to the efficient lighting install. ADM calculated the light savings as:

$$kWh_{savings} = \left(\# \ fixt_{base} \times Watts \ / \ fixt_{base} \times hours_{base} - \# \ fixt_{as-built} \times Watts \ / \ fixt_{as-built} \times hours_{as-built}\right) \times HCIF \ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The lighting interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
4'4L T5HO	13	13	458	203	2086	2086	11,447	7,268	3.3	1.051	63%
175W MH	0	0	295	209	2086	2086	1,138	0	0	1.051	0%
Total							**13,496**	**7,268**	**3.3**		**58%**

RESULTS

ADM obtained the annual operational hours from monitoring equipment and used one time power measurements to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 7,268 kWh and a demand reduction of 3.3 kW resulting in a realization rate of 58%.

Verified Gross Savings/Realization rates

	Claimed		Realized		
Measure Description	**Electric Savings (kWh)**	**Demand Savings (kW)**	**Electric Savings (kWh)**	**Demand Savings (kW)**	**kWh Realization Rate**
4'4L T5HO	11,447	2.9	7,268	3.315	63%
175 W Metal Halide	1,138	0.3	0	0	0%
Total	**13,496**	**3.2**	**7,268**	**3.315**	**58%**

ADM attributes the low realization rate due to the ex-ante calculations overestimating the annual operating hours. This is in conjunction with the facility not installing the 175W metal halides, therefore no savings can be claimed for this particular measure and thus lowering the overall realization rate.

Project Number 1-6GJ4V
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing the use of occupancy sensors. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 7%.

CUSTOMER PROJECT AND DESCRIPTION

The customer installed 675 occupancy sensors in the dorms located on base. 450 of these occupancy sensors serve the private vanity area of the dorm room and control a single fixture with two 34W T12 bulbs. The remaining 225 occupancy sensors control a common shower area that is located between each pair of dorm rooms and are lit by a single 13W CFL.

MEASUREMENT AND VERIFICATION EFFORT

ADM confirmed the installation of 675 occupancy sensors which serve a combination of two lamp T12 and CFL fixtures. Photo-sensitive monitoring equipment was used to establish a typical operating schedule for which the occupancy sensors control. The HOBO lighting loggers were installed in a sample of locations and were used to calculate an average operating schedule for all of the lights. The pre-operational hours used to calculate the energy savings was acquired from DEER which used 1,145 ADM calculated the occupancy sensor savings as:

$$kWh_{savings} = \left(\# \ fixt_{base} \times Watts \ / \ fixt_{base} \times hours_{base} - \# \ fixt_{as-built} \times Watts \ / \ fixt_{as-built} \times hours_{as-built}\right) \times HCIF \ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Sensors)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	**New**	**Old**	**New**	**Old**	**New**					
Shower Occ. Sensor	0	225	13	13	1,145	934	-	712	0.4	1.154	-
Vanity Occ. Sensor	0	450	76	76	1,145	738	-	16,063	5.2	1.154	-
						Total	**228,744**	**16,775**	**5.6**		**7%**

RESULTS

ADM obtained the annual lighting operational hours from data collecting using photo-sensitive monitoring equipment and manufacturer specifications to determine the annual savings. It was calculated that the occupancy sensors have an annual energy savings of 16,775 kWh and a demand reduction of 5.5 kW resulting in a realization rate of 7%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	**Demand Savings (kW)**	**Electric Savings (kWh)**	**Demand Savings (kW)**	
Occupancy Sensors	228,744	54.0	**16,775**	**5.6**	**7%**
Total	**228,744**	**54.0**	**16,775**	**5.6**	**7%**

ADM attributes the low realization rate due to a deemed savings method being used to determine the overall savings due to the installation of the occupancy sensors. The deemed savings method does not take into consideration the connected load of each occupancy sensor and the typical annual hours of operation. In the case of this customer, the vanity occupancy sensors have a connected load of 46 Watts and the shower occupancy sensors have a connect load of 13 Watts. These loads are quite low and would only meet the deemed energy savings if the reduction of hours was close to 6,000 hours.

Project Number 1-6C5HE
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 96%.

CUSTOMER PROJECT AND DESCRIPTION

The customer converted a claimed 7 two lamp T12 fixtures to more efficient four lamp T8 fixtures and 82 400W metal halides to six lamp T8 fixtures.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site visit only 7 four lamp T8 fixtures were able to be verified while all 82 of the six lamp T8s were accounted for. One time power measurements were taken of the six lamp T8 fixtures and the business operating hours were obtained through interviews with staff. ADM was informed that the facility is open 5:30 a.m. till 8 p.m., Monday through Friday, resulting in an annual operation of 3,510 hours. These data collection points were then used to calculate the annual energy savings due to the efficient lighting install. ADM calculated the light savings as:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}\right) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
8' 2L T12 to 4' 4L T8	7	7	168	111	3,510	3,510	1,440	1,400	0.4	1.000	97%
400W MH to 6L T8	82	82	448	220.2	3,510	3,510	68,081	65,565	18.7	1.000	96%
						Total	**69,521**	**66,966**	**19.1**		**96%**

RESULTS

ADM obtained the annual operational hours from interviews with site contacts and used one time power measurements to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 66,966 kWh and a demand reduction of 19.1 kW resulting in a realization rate of 96%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
8’ 2L T12 to 4’ 4L T8	1,440	0.3	1,400	0.4	97%
400W MH to 6L T8	68,081	16.1	65,565	18.7	96%
Total	**69,521**	**16.4**	**66,966**	**19.1**	**96%**

Project Number 1-6MUA1
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 81%.

CUSTOMER PROJECT AND DESCRIPTION

The customer converted 664 four lamp T12 fixtures to more efficient two lamp T8 fixtures which were installed throughout the entire college campus.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site it was verified that all of the four lamp T12 fixtures had been converted to two lamp T8s. In order to determine the average annual operating hours of the new fixture photosensitive lighting loggers were installed throughout a large array of operational hours. By using two weeks of monitoring data ADM was able to calculate and average annual operating schedule, which was determined as 2,791 hours. ADM used these hours and manufacturer specifications to calculate the annual energy savings due to the energy efficient lighting retrofit. ADM calculated the light savings as:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}\right) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
4L T12 to 2L T8	664	664	179.2	56	2,791	2,791	331,962	268,712	50.0	1.177	81%
						Total	**331,962**	**268,712**	**50.0**		**81%**

RESULTS

It was calculated that the high efficiency lighting has an annual energy savings of 268,712 kWh and a demand reduction of 50.0 kW resulting in a realization rate of 81%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
4L T12 to 2L T8	331,962	79.4	268,712	50.0	81%
Total	**331,962**	**79.4**	**268,712**	**50.0**	**81%**

ADM attributes the low realization rate due to the overestimation of annual operating hours. This over estimation has a tremendous impact on the classroom areas as this operational area has a large amount of the retrofitted lighting and has an average annual operation of 400 hours.

Project Number 1-6J67N
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 0%.

CUSTOMER PROJECT AND DESCRIPTION

The customer claimed a rebate for the conversion of 49 400W metal halide fixtures to 320W pulse start metal halides.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site visit it was informed by the customer that none of the pulse start metal halides had been installed. ADM was able to verify this claim as the customer had all of the lights to be installed, stage in the back of the complex. ADM was informed that the facility is open 4:00 a.m. till 5 p.m., Monday through Friday, in the areas served by the existing metal halide fixtures, resulting in an annual operation of 3,380 hours. These data collection points were then used to calculate the annual energy savings due to the efficient lighting install, by using the equation below:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}\right) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
400W MH to 320W PS MH	0	0	448	370	3,380	3,380	25,787	0	0	1.100	0%
Total							**25,787**	**0**	**0**		**0%**

RESULTS

ADM calculated that the 320W pulse start metal halides save no energy as they have yet to be installed, thus resulting in a realization rate of 0%.

Verified Gross Savings/Realization Rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
400W MH to 320W PS MH	25,787	4.4	0	0	0%
Total	**25,787**	**4.4**	**0**	**0**	**0%**

The 0% realization rate is attributed to the fact that none of the 49 pulse start metal halides were installed during the time of ADMs site visit. Due to these fixtures not being installed no savings can be claimed for the retrofits.

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Project Number 1-6L7CK
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 226%.

CUSTOMER PROJECT AND DESCRIPTION

The customer converted 1,226 400W high pressure sodium fixtures to 1,164 four lamp T5 fixtures and the remaining 62 to six lamp T8 fixtures.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site it was verified that all of the high pressure sodium fixtures had been replaced with the energy efficient lights. One time power measurements were taken of the four lamp T5 fixtures and the business operating hours were obtained through interviews with staff. ADM was informed that the facility is operates 24 hours per day resulting in an annual operation of 8,760 hours. These data collection points were then used to calculate the annual energy savings due to the efficient lighting install. ADM calculated the light savings as:

$$kWh_{savings} = \left(\# fixt_{base} \times Watts / fixt_{base} \times hours_{base} - \# fixt_{as-built} \times Watts / fixt_{as-built} \times hours_{as-built}\right) \times HCIF / 1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
400W HPS to 4L T5	1,164	1,164	460	188.8	8,760	8,760	1,301,706	2,906,361	315.7	1.051	223%
400W HPS to 6L T8	62	62	460	224	8,760	8,760	51,476	134,713	14.6	1.051	262%
						Total	**1,353,182**	**3,041,074**	**330.3**		**225%**

RESULTS

ADM obtained the annual operational hours from interviews with site contacts and used one time power measurements to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 3,041,074 kWh and a demand reduction of 330.3 kW resulting in a realization rate of 226%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
400W HPS to 4L T5	1,301,706	307.3	2,906,361	315.7	223%
400W HPS to 6L T8	51,476	12.2	134,713	14.6	262%
Total	**1,353,182**	**319.5**	**3,041,074**	**330.3**	**225%**

ADM attributes the high realization rate to the underestimation of annual operating hours at the facility. According to the annual operating hours provided by the 2009 Tech Assumptions; a manufacturing facility is assumed to operate for 5,913 hours compared to the 8,760 hours discovered by ADM.

Project Number 1-6770B, 1-6KDE7
Program Non Res – Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 199%.

CUSTOMER PROJECT AND DESCRIPTION

The facility installed a multitude of lighting efficiency retrofits including the installation of occupancy sensors in the warehouse. 181 1000W metal halide fixtures were converted to 16 lamp T8s and of those new fixtures, 86 of them had independent occupancy sensors installed on them. The remaining lighting retrofits consisted of converting T12 fixtures to a reduced wattage T8 fixture.

MEASUREMENT AND VERIFICATION EFFORT

During ADMs site it was verified that all of the lighting retrofits had been completed and the occupancy sensors were installed and in good working order. In order to determine the average annual operating hours of the new fixtures, photosensitive lighting loggers were installed throughout a large array of operational hours. By using two weeks of monitoring data ADM was able to calculate the average annual operating schedule for both the production and office areas, which was determined as 7,908 and 5,927 hours accordingly. It was also determined that the occupancy sensors installed on the 16 lamp T8 fixtures reduced their operating hours down to 3,693. ADM used these hours and in conjunction with one time power measurements to calculate the annual energy savings due to the energy efficient lighting retrofit. ADM calculated the light savings as:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}\right) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
1000W MH to 16L T8	181	181	1160	569.3	7,908	7,908	499,100	888,618	106.9	1.051	178%
4' 2L T12 to 4' 2L T8	25	25	76	49	5,927	5,927	1,694	4,205	0.7	1.051	248%
4' 4L T12 to 4' 4L T8	235	235	152	99	7,908	7,908	33,846	103,517	12.5	1.051	306%
8' 2L T12 to 4' 4L T8	36	36	134	99	5,927	5,927	5,185	7,849	1.3	1.051	151%
400 W MH to 6L T8	3	2	448	221	7,908	7,908	1,661	7,497	0.9	1.051	451%
Occupancy Sensors	0	86	569.3	569.3	7,908	3,693	76,502	216,890	37.9	1.051	284%
Total							**617,988**	**1,228,576**	**160.1**		**199%**

RESULTS

ADM obtained the annual operational hours from monitoring equipment and used one time power measurements to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 1,228,576 kWh and a demand reduction of 160.1 kW resulting in a realization rate of 199%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
1000W MH to 16L T8	499,100	88.9	888,618	106.9	178%
4' 2L T12 to 4' 2L T8	1,694	0.4	4,205	0.7	248%
4' 4L T12 to 4' 4L T8	33,846	8.0	103,517	12.5	306%
8' 2L T12 to 4' 4L T8	5,185	1.2	7,849	1.3	151%
400 W MH to 6L T8	1,661	0.4	7,497	0.9	451%
Occupancy Sensors	76,502	18.1	216,890	37.9	284%
Total	**617,988**	**116.9**	**1,228,576**	**160.1**	**199%**

ADM attributes the high realization rate to the underestimation of annual operating hours at the facility. The rebate application uses an annual operation of 5,616 hours for the 16 lamp T8 fixtures and 4,235 hours for the remaining fixtures. Through monitoring, ADM concluded that the production facility operates for 7,908 hours while the office lights operate for 5,927. These operational hours are significantly higher than the claimed hours in the rebate form thus leading to the higher realization rate.

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Motor and Drive Efficiency Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
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Executive Summary

The Motor and Drive Efficiency Program (MDEP) was a demand side management (DSM) program that offered non-residential customers rebates for replacing major motor system components with high efficient options. This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the program in New Mexico.

In the 2009 program year, the program had two customers with a cumulative total of three prescriptive measures – two VFD measures and one motor measure. There were no custom measures installed through the program in 2009.

Ex post electric savings were determined from detailed analyses project documentation for all program participants. This included a review of assumptions used in deemed savings estimates, engineering algorithms, and final calculations of annual kWh and peak kW savings.

Verified electric impacts were 388,095 kWh saved annually, which represents a realization rate of 100%; 7,761,900 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 73.8 kW.

Table 0-54 Gross Impact Summary

Measure Type	*Peak Demand Savings, kW*		*Annual Energy Savings, kWh*		*Effective Useful Life (EUL), years*	*Lifetime Energy Savings, kWh*	
	Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*		*Ex Ante*	*Ex Post*
Motors	.5	.5	2,569	2,569	20	51,380	51,380
Drives	73.3	73.3	385,526	385,526	20	7,710,520	7,710,520
Total	73.8	73.8	388,095	388,095	-	7,761,900	7,761,900

Additionally, ADM evaluated net savings associated with the program through surveys with program participants. Through participant surveys, ADM estimates free-ridership of 33%, with an associated Net-to-Gross Ratio of 67%. The resultant net savings are presented in Table 1-2 below.

Table 0-55 Net Impact Summary

Measure Type	*Peak Demand Savings, kW*		*Annual Energy Savings, kWh*		*Effective Useful Life (EUL), years*	*Lifetime Energy Savings, kWh*	
	Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*		*Ex Ante*	*Ex Post*
Motors	.4	.34	2,235	1,721	20	44,700	34,420
Drives	63.8	49.1	335,408	258,302	20	6,708,160	5,166,040
Total	68.2	49.35	337,643	260,023	-	6,752,860	5,200,460

Project Background

SPS is offering the 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 and offers prescriptive and custom incentives.

- Prescriptive incentives are offered on a per HP basis for the following measure types:
  - 1-500 HP motors meeting or exceeding NEMA Premium Efficiency standards
  - Variable frequency drives (VFDs) controlling fans or pumps in the 1-200 hp range
- Custom incentives are determined based on the estimated amount of electrical energy and peak (kW) 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

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.

M&V Methodology

This chapter provides a description of the EM&V methodologies applied by ADM in the evaluation of the 2009 Motor and Drive Efficiency Program. The EM&V approach for the program is aimed at measuring the following:

- Validating deemed savings estimates for measures that received a rebate;
- Verifying installation of measures that received a rebate;
- Determining an appropriate program net-to-gross ratio;
- Estimating cost-effectiveness of the program.

Validating Deemed Savings Estimates for Rebated Measures

ADM reviewed the deemed savings estimates for the measure types listed. Deemed savings estimates were based upon assumed values for:

- Hours of operation
- Motor load factor
- Efficiency of pre-existing equipment (for cases of motor controls)

Hours of operation and load factor were estimated based on application and facility type, i.e., if the motor was used for process or cooling loads, and in the case of cooling, for what type of facility. ADM determined the hours of use estimates to be adequate and in line with figured observed in prior evaluation efforts, and as such did not revise gross savings for the eligible measures in the program.

Verification of Installation of Rebated Measures

The 2009 Motor and Drive Efficiency Program had limited participation, with only two customers receiving rebates. As such, on-site verifications were not cost effective for this evaluation. However, ADM was able to visit one site as a 2009 participant had a custom application in place for 2010 through SPS' Business Custom Efficiency Program, so an on-site verification was performed for the 2009 measure installation during the site visit for installation of monitoring equipment for the 2010 measures. The measures installed by the other program participant were verified by telephone.

Net Savings Estimates

As part of this evaluation, we also determined net savings attributable to this program. 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 motors and drives without a utility-provided 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 net savings methodology is described in further detail in Section 4.

5.1 Summary of Key Issues

The measures rebated in 2009 all passed verification and the deemed savings estimates are reasonable for the application type. However, the NTGR for the program was estimated at 67%, less than the 87% figure provided by SPS. It should be note though that this value is based on a very small participant pool and thus is not useful for future program planning. Therefore, ADM is not recommending a revision to the NTGR used in the program tech assumptions.

Impact Evaluation Findings

Verified gross electric impacts for the Motor and Drive Efficiency Program in New Mexico were 388,095 kWh saved annually, which represents a realization rate of 100%; 7,761,900 kWh saved over the life of the measures; and coincident peak demand reduction of 73.8 kW.

The following sections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, along with program-year realization rates, both disaggregated by measure type as well as the aggregated totals.

Table 0-56 Gross Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Motors	2,569	2,569	0	100%
Drives	385,526	385,526	0	100%
Total	388,095	388,095	0	100%

Table 4-2 below summarizes the net savings associated with the SPS Motor and Drive Efficiency Program.

Table 0-57 Net Energy Impact Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Motors	.34	1,721	20	34,420
Drives	49.1	258,302	20	5,166,040
Total	49.35	260,023	20	5,200,460

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability;

- Prior planning;
- Importance of the rebate in the decision making process; and
- Likelihood of equipment installation without rebate.

These four components were addressed in the telephone surveys, with the questions directed at them 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 motors and drives, other factors in the decision making process cannot contribute to the decision making absent the available rebate.

Prior Planning

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

> Question 36: When did you learn of the motor 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 motor equipment. To address this, we examined responses to the following two questions:

> Question 5: How important was SPSs' rebate in your decision to buy high efficiency motor equipment?

> Question 14: Before participating in the motor 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 project.

Likelihood of Installing Similar Equipment without Rebate

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

> Question 19: If the financial incentive from the motor 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 motor 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 motor 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 motor 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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-58 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

Based upon this analysis, ADM estimates a free-ridership rate of 33% for the 2009 program, with an associate NTGR of 67%. This result is derived by taking the free-ridership scores of all program participants and weighting them by the proportion of the kWh savings that the participant constitutes. The resulting NTGR is applicable to this program year but not useful for future program planning as it is based upon a very limited participant pool.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS commercial customers. Surveys were conducted with both of the two program participants, accounting for all program savings.

As part of the net-to-gross surveying, respondents were asked to indicate how they make decisions about energy efficiency for their facility. Participants emphasized the importance of energy efficient improvements by saying:

- One respondent indicated that energy efficiency is “very important” in planning operations for their facility. The other respondent indicated it was “only slightly important”.
- Both respondents indicated that they used SPS sources, including SPS energy specialists, account reps, and the SPS website, for information on energy efficiency improvements.
- Both respondents stated that incentive payments from SPS were “very important”.
- One of respondents indicated that when replacing equipment at their facility, they “usually” try to purchase and install energy efficient equipment; the other respondent stated that they “sometimes” try to.
- Both of respondents have purchased and installed energy efficient equipment at their facilities in the past.
- Both respondents indicated that they have installed energy efficient equipment in the last year without a rebate.

Respondents were asked how they had learned about the program. Participants had learned of the program through the following channels:

- Both participants learned of the program in part from SPS channels, including account reps, brochures, and the SPS website

Respondents were also asked as to their financial ability to purchase high efficiency motor equipment.

- Both respondents indicated that they would have been financially able to purchase high efficiency equipment without the rebate

Prior planning was addressed with three separate questions, the results of which were:

- Both of respondents indicated that they had prior plans to install high efficiency motor equipment prior to hearing about the program
- One respondent indicated that they had learned of the program during the planning to replace the equipment. The other respondent indicated that they had learned of the program once equipment had been specified but not yet installed.

Finally, what the respondent would have done absent the rebate was addressed with four questions:

- One respondent indicated that if SPS had not provided a rebate, they "Definitely would have" installed the same equipment; the other respondent indicated that they "Probably would have" done so.
- One of the respondents indicated that the available rebate caused them to change the quantity, efficiency level, or timeline of installation.

Finally, customers satisfaction issues with the program were addressed by asking to rate a series of factors 1-5 in terms of their satisfaction:

- Across the board, respondents scored the program overall at 5, indicating that they were "very satisfied".
- Areas that received lower scores (as low as three) included information from the contractor, and savings observed on the monthly bills following the retrofit.

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NTGRs of 67%, and a measure life of 20 years. The resultant UEPCD was calculated at $212,085.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 20 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net kW reduction of 14.0, the UGCC was calculated at $141,123.

With these two factors, total benefits of the program were calculated at $353,209.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment that received a rebate through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the high efficiency motors and drives without the program, so the costs faced by the participant are not considered to be program-generated. Average marginal cost was $24,939 per participant. As discussed in the program summary, there were a total of 2 participants in the 2009 program. With a NTGR of 67%, this leads to NCI of:

NCI = (2 x $24,939 x 0.67) = $33,418

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the program in 2009. Administrative costs for the 2009 were $31,597. The resulting total cost of the program was

$33,418 + $31,597 = $65,015

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $353,209/65,015 = 5.43

As such, ADM concludes that the 2009 Motor and Drive Efficiency Program passes cost-effectiveness testing by a significant margin.

Discussion of Key Findings

The measures through this program were determined to have reasonable deemed savings estimates and all passed verification. The resultant gross realization was 100%. However, ADM estimated the NTGR to be 67%; less than the 87% figure used in ex ante estimations. This value is not usable for future program planning purposes though as it is based upon a limited participant pool. The 2009 program had net savings of:

- 260,023 kWh saved annually;
- 5,200,460 kWh saved over the life of the measures; and
- 49.35 kW in peak demand reduction.

Recommendations

The equipment in the 2009 Motor and Drive Efficiency Program were in oil drilling applications, as this is a large industry in the SPS New Mexico service territory. ADM would suspect that the hours of operation for motors in this application would be higher than the deemed amount of 5,239 hours currently used for motors in process loads, as oil wells operate continuously. However, lacking sufficient metered data at this time, ADM has not revised the deemed hours of operation. It could be stated though that the gross savings estimates for the 2009 program are conservative, and that with a sufficient monitoring effort, a separate deemed hours of operation value for motors in oil pumping applications could be developed in 2010.

Appendix A. Survey Form

This appendix provides a copy of the survey form used in the telephone surveys.

Southwestern Public Service Company

2009 Business Motor Efficiency Program

DECISION-MAKER SURVEY QUESTIONNAIRE

ID No. ______________________________

Customer Name: ______________________________

Date of interview: ______________________________

Date data entered ______________________________

....

Hello, my name is ________________. I am calling on behalf of **Southwestern Public Service Company**

.

May I please speak to ________________________ *(Contact Person)?*

Title: ______________________ Company: ______________________

Address: ______________________________ ZIP: ______________

Phone: (   ) ______________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is ______________________. I am calling on behalf of Southwestern Public Service Company. Through its Motor Efficiency Program, SPS has been working with firms and building owners to help them improve the energy efficiency of their operations. Because your company participated in the Motor Efficiency Program during 2009, we are interested in receiving feedback from you regarding your experience with the program.

SECTION ONE - INTERVIEWEE SCREENING

SCRN-Q.1 According to our records your company participated in the Motor Efficiency for one or more projects at the following facility:

(Name of facility ______________________________

You are shown as the contact person for that facility. Is that correct?
(If contact seems confused, ask if they remember the Motor Efficiency Program.
If necessary, describe program and distinguish from other programs.)

- ❑ Yes (GO TO SCRN-Q.2)
- ❑ No (GO TO SCRN-Q.2)

SCRN-Q.2 Many of our questions focus on your company's decision to participate in the program and on your decisions to purchase and install energy efficient equipment for your facility. Are you the best person to talk to?

- ❑ No. Is there someone else who would be better for us to contact?

Who is that?

Name: ______________________________

Title: ______________________________

Phone Number: ______________________________

(You are finished with this person.)
Thank you very much for your time

- *(START SHEET FOR NEW CONTACT PERSON ABOVE)*

CALL THIS PERSON AND GO TO BEGINNING OF INTRODUCTION.

- ❑ Yes. "I am the best person to talk to". *Continue interview.*

SCRN-Q.3. Our records give the following as the address for the facility(s) where you installed equipment for which you received financial incentives through the Motor Efficiency Program.

(Address(es) from cover sheet)

Is this/Are these address(es) correct?

- ❑ Yes
- ❑ No

If No: Could you please give us the correct address?

TO BEGIN, I HAVE SOME QUESTIONS REGARDING HOW ***DECISIONS ABOUT ENERGY EFFICIENCY*** *IMPROVEMENTS ARE MADE FOR YOUR FACILITY.*

1. Compared to all other factors, how important is energy efficiency as a factor in planning your operations for this facility? (READ) Is it…
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don’t know

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (READ) Is it.. (*Check all that are mentioned.)*
   - ❑ An energy management plan
     2a. (If YES), Does your energy management plan have numerical goals?
     - ❑ Yes ➔ 2b. (IF YES) What are the goals?__________________________________
     - ❑ No
     - ❑ Don’t know
   - ❑ A Staff member responsible for energy and energy efficiency
   - ❑ Corporate Policies that incorporate energy efficiency in operations and procurement
   - ❑ Any Others, such as active training of staff or something else.

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision (READ ALL. CAN BE MULTIPLE RESPONSE):
   - ❑ Made by one or two key people?
     3a. What are their titles? ____
   - ❑ Based on staff recommendations to a decision maker?
     3b. What is that decision maker's title? _____________________________________
   - ❑ Made by a group or committee?
     3c. What is the group or committee name? _________________________________
   - ❑ Made in some other way?

     3d. How are energy efficiency improvement decisions made? _________________
     ____
     ____

4. What are the **sources** your organization relies on for **information** about energy efficient equipment, materials and design features? Please answer yes or no for each one. (READ EACH; YES, NO, OR DK FOR EACH)

   - ❑ An SPS Energy Specialist

- ❑ An SPS Account Representative
- ❑ The SPS website
- ❑ Brochures or advertisements
- ❑ Trade associations or business groups you belong to
- ❑ Trade journals or magazines
- ❑ Friends and colleagues
- ❑ An architect, engineer or energy consultant
- ❑ Equipment vendors or building contractors
- ❑ Any others IF YES: What other sources? ___________________________________

4a. Which sources are your top three? (READ LIST AGAIN ONLY IF NEEDED TO PROMPT. OK IF FEWER THAN THREE)

For each of the following, tell me if it is “very important,” “somewhat important,” “only slightly important,” or “not important at all” for your decision making regarding energy efficiency improvements.

5. **incentive payments from SPS**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

6. **past experience with energy efficient equipment**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

7. **your organization’s policies**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

8. **advice and/or recommendations received from SPS**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important

- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

9. **advice and/or recommendations from equipment vendors**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

10. Which financial methods does your organization typically use to evaluate energy efficiency improvements for your facility? (READ ALL. YES, NO OR DK FOR EACH.) (CAN BE MULTIPLE RESPONSES)
    - ❑ Initial Cost
    - ❑ Simple payback *(Go to question 10.**a**)*
    - ❑ Internal rate of return *(Go to question 10.**b**)*
    - ❑ Life cycle cost *(Go to question 10.**c**)*
    - ❑ Other (Please Explain) ______________________________ *(Go to question 13)*
    - ❑ Don't know *(Go to question 11)*

    10.a What **payback** *length of time* do you normally require in order to consider an energy investment cost effective?
    ______ Years *(Go to question 11.)*

    10.b What **rate of return** do you normally require in order to consider an energy investment cost effective? ______%
    (Expect answers 10 to 30 %.) (Go to question 11.)

    10.c What **discount rate** do you normally use in determining the life-cycle costs of various equipment options?______%
    (Expect answers 3 to 30 %.) (Go to question 11.)

11. When you have to replace equipment at this facility, **how often** do you try to purchase and install **energy efficient equipment**? (READ) Would you say…
    - ❑ Always
    - ❑ Usually
    - ❑ Sometimes
    - ❑ Occasionally
    - ❑ Never
    - ❑ Don't know *(DON'T READ)*

12. Before you knew about the Business Motor Efficiency Program, had you purchased and installed any energy efficient equipment at this facility?
    - ❑ Yes

- ❑ No
- ❑ Don't know *(DON'T READ)*

13. Has your organization purchased any energy efficient equipment in the last three years for which you did **not** apply for a financial incentive through the Motor Efficiency Program? (IF RESPONDENT SAYS, "No" CLARIFY IF "No equipment purchased" OR IF "No, have applied for financial incentives.")
    - ❑ Yes, Purchased energy efficient equipment but did not apply for financial incentive.
      ↓
      IF YES: 13a. Why didn't you apply for a financial incentive on that equipment?
      (DO NOT READ LIST. PROMPT IF NECESSARY)
      - ❑ Didn't know whether equipment qualified for financial incentives
      - ❑ Didn't know about financial incentives until after equipment was purchased
      - ❑ Didn't have time to complete paperwork for financial incentive application
      - ❑ Paperwork for the financial incentive application was too much
      - ❑ Financial incentive wasn't enough to bother with
      - ❑ Other 1 (Specify) ____
      - ❑ Other 2 (Specify) ____
    - ❑ No, Applied for financial incentives on all of the energy efficient equipment purchased.
      IF NO: 13b. Did you receive all of your incentives?
      Yes
      No
      Don't know
    - ❑ Has NOT purchased equipment
    - ❑ Don't know (*DO NOT READ)*

QUESTIONS 14 through 22 ASKED FOR EACH TYPE OF END USE EQUIPMENT OR MEASURE FOR WHICH CUSTOMER RECEIVED A FINANCIAL INCENTIVE. LISTED FROM PROGRAM RECORDS.:

I now have some questions about particular types of equipment for which you received financial incentives.

According to EPEs records, you received incentives for (insert Equipment/Measure____________

14. <u>Before participating</u> in the Business Motor Efficiency Program, had you installed any equipment or measure similar to [Equipment receiving a rebate/Measure] at your facility?
    - ❑ Yes
    - ❑ No

15. Did you have plans to install [Equipment/Measure] before participating in the program?
    - ❑ No
    - ❑ Yes
      If Yes:15aWould you have gone ahead with this planned installation even if you had not participated in the program?

- ❑ Yes
- ❑ No

16. How important was previous experience with the SPS Business Motor Efficiency Program in making your decision to install [Equipment/Measure]? Is it… (READ LIST)
    - ❑ Very important
    - ❑ Somewhat important
    - ❑ Only slightly important
    - ❑ Not important at all
    - ❑ Or you did not have previous experience with the program
    - ❑ Don't know *(DON'T READ)*

17. Did an SPS Energy Specialist or Account Representative recommend that you install [Equipment/Measure]?
    - ❑ No
    - ❑ Yes

    If Yes:17aIf the Motor Efficiency Program representative had not recommended installing [Equipment/Measure], how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

18. Would you have been financially able to install [Equipment/Measure] without the financial incentive from the Business Motor Efficiency Program?
    - ❑ Yes
    - ❑ No
    - ❑ Don’t know

19. If the **financial incentive** from the Business Motor Efficiency Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

20. How did the availability of information and financial incentives through the Motor 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?

- ❑ Yes
  IF YES: 20b How much more? ______________________
- ❑ No, Did not affect quantity purchased and installed

21. How did the availability of information and financial incentives through the Motor Efficiency Program affect the <u>level</u> of energy efficiency you chose for [Equipment/Measure]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
   - ❑ Yes
     IF YES: 21b How much more efficient? (could be expressed in different ways. Ask for percentage: e.g., 10% more efficient) ______________________
   - ❑ No, program did not affect level of efficiency that we chose for equipment

22. How did the availability of information and financial incentives through the Business Motor Efficiency Program affect the <u>timing</u> of your purchase and installation of [Equipment/Measure]? Did you purchase and install [equipment/measure] earlier than you otherwise would have without the program?
   - ❑ Yes
     ↓
     IF YES: 22a When would you otherwise have installed the equipment? (READ IF NEEDED)
     - ❑ In less than 6 months later
     - ❑ In 6-12 months later
     - ❑ In 1-2 years later
     - ❑ In 3-5 years later
     - ❑ In more than 5 years later
   - ❑ No, did not affect timing of purchase and installation

23. Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?
   - ❑ (1) Bidding process *(go to Q23a)*
   - ❑ (2) One firm *(go to Q23a)*
   - ❑ (3) Self installed/No vendor used *(go to Q24)*
   - ❑ (9) Don't know *(go to Q23a)*

23a. Did more then one vendor promote the program?
   - ❑ (0) No
   - ❑ (1) Yes
   - ❑ (9) Don't know

23b. Did you select a firm that promoted the program?
   - ❑ (0) No (*go to Q23c)*
   - ❑ (1) Yes *(go to Q24)*

❑ (9) Don't know *(go to Q24)*

23c. Did you tell the firm about the program?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24. Did the vendor/contractor you learned of the program from install the measures?
❑ (0) No (*go to Q25)*
❑ (1) Yes *(go to Q24a)*
❑ (9) Don't know *(go to Q25)*

24a. Had you previously worked with this vendor/contractor?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24b. Did the fact that the energy efficiency program was part of the project influence your decision on what vendor/contractor to use?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

25. Did the implementation go smoothly?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

26. Did the energy efficiency measure meet your expectation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (3) Exceeded my expectations
❑ (9) Don't know

27. Do you feel you got a quality installation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

28. Did the incentive agreement that you received meet your expectations?
❑ (0) No, Explain___________________________
❑ (1) Yes
❑ (9) Don't know

29. Did anyone from SPS come to your facility to do a pre-inspection?
- ❑ (0) No (go to Q30)
- ❑ (1) Yes (go to Q29a)
- ❑ (9) Don't know (go to Q30)

29a. Who performed the inspection?
29b. What did the pre-inspection consist of?
29c. Did anything change in the design as a result of the pre-inspection?
- ❑ (0) No
- ❑ (1) Yes, Explain______________
- ❑ (9) Don't know

30. Did anyone from SPS come to your facility to do a post-inspection?
- ❑ (0) No (go to Q31)
- ❑ (1) Yes (go to Q30a)
- ❑ (9) Don't know (go to Q31)

30a. Who performed the inspection?
30b. What did the post-inspection consist of?
30c. Did anything change in the incentive amount as a result of the post-inspection?
- ❑ (0) No
- ❑ (1) Yes, Explain______________
- ❑ (9) Don't know

31. Did you provide SPS copies of purchase orders and invoices that document the final costs or did the vendor/contractor?
- ❑ (1) Someone within firm
- ❑ (2) Vendor/Contractor
- ❑ (3) Someone else (specify)_______________
- ❑ (9) Don't know

32. Were there any issues getting the paperwork approved?
- ❑ (0) No
- ❑ (1) Yes, Explain_________________________
- ❑ (9) Don't know

33. Were there any issues receiving the incentive check?
- ❑ (0) No
- ❑ (1) Yes, Explain_________________________
- ❑ (9) Don't know

34. Was the incentive check the amount you expected?
- ❑ (0) No, Explain_________________________
- ❑ (1) Yes
- ❑ (9) Don't know

I now have some questions about your experience with the Business Motor Efficiency Program overall.

35. How did you learn of the Business Motor Efficiency Program? (READ. MULTIPLE OKAY)
- ❑ Approached directly by SPS Energy Specialist or Account Representative of Motor Efficiency Program
- ❑ Received an information brochure on the Business Motor Efficiency Program
- ❑ An SPS representative mentioned it
- ❑ The SPSwebsite
- ❑ Friends or colleagues (i.e., word of mouth)
- ❑ An architect, engineer or energy consultant
- ❑ An equipment vendor or building contractor
- ❑ Past experience with the program
- ❑ Or some other way (please explain) ___________________________________

36. When did you learn of the Business Motor Efficiency Program? (READ. ONE ONLY)
- ❑ You had participated in other energy efficiency incentive programs
- ❑ Before planning for replacing the equipment began
- ❑ During your planning to replace the equipment
- ❑ Once equipment had been specified but not yet installed
- ❑ After equipment was installed
- ❑ Some other time (When? _____)
- ❑ Don't know *(Don't Read)*

37. Has your experience with the Business Motor Efficiency Program led you to buy any energy efficient equipment for which you did not apply for a financial incentive?
- ❑ Yes

  ↓

  If Yes: 37a What type of equipment? _______________________________________
- ❑ No
- ❑ Don’t know *(DON’T READ)*

38. Given your experience with the Business Motor Efficiency Program, would you buy energy efficient equipment in the future even if financial incentives for such equipment were not being offered through the Business Motor Efficiency Program?
- ❑ Yes
- ❑ No
- ❑ Don’t know *(DON’T READ)*

39. On a scale of 1 to 5, where “5” is very satisfied and “1” is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following? (ROTATE. H ALWAYS LAST)

	1 Very Dissatisfied	*2*	*3*	*4*	*5 Very Satisfied*	*Don't know or no answer*
A. Performance of the equipment installed	❑	❑	❑	❑	❑	❑
B. Savings on your monthly bill	❑	❑	❑	❑	❑	❑
C. Incentive amount	❑	❑	❑	❑	❑	❑
D. The effort required for the application process	❑	❑	❑	❑	❑	❑
E. Information provided by your contractor	❑	❑	❑	❑	❑	❑
F. Quality of the work conducted by your contractor	❑	❑	❑	❑	❑	❑
G. Information provided by SPS Account Representative	❑	❑	❑	❑	❑	❑
H. Overall program experience	❑	❑	❑	❑	❑	❑
I. The elapsed time until you received the incentive	❑	❑	❑	❑	❑	❑

40. *ASK FOR EACH IF ANSWERED 1 or 2 FOR ANY ASPECT IN QUESTION 28:*

Why were you not satisfied with the (ASPECT)? ______________________________

____

____

41. That concludes my questions. Do you have any other comments that you would like me to relay to SPS about energy efficiency in commercial facilities or about their programs? *RECORD ANY CUSTOMER QUESTIONS OR CONCERNS:*

____

____

____

(IF NEEDED OR CUSTOMER SEEMS TO HAVE AN ISSUE OR PROBLEM THAT SPS MIGHT ADDRESS) If you wish to speak with an SPS representative, Mr. Bob Zaragoza may be reached at: (612) 318-4795.

Thanks for your help!
SPS will use your ideas to improve
its programs for commercial customers.

Small Business Lighting Program
Southwestern Public Service Company
Program Year 2009

Measurement & Verification Report
Final
May 2010

Prepared for:

Prepared by:

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TABLE OF CONTENTS

Executive Summary

The Small Business Lighting Program (SBLP) was a demand side management (DSM) program that offered free energy audits and rebates for installation of recommended measures to small businesses, who traditionally have low rates of participation in utility-sponsored rebate programs. This evaluation, measurement and verification (EM&V) report provides final estimates of energy impacts achieved by the SBLP in New Mexico.

In the 2009 program year, the SBLP had 12 participants, all constituting prescriptive measures. There were no custom measures installed through the SBLP in 2009.

Ex post electric savings were determined from detailed analyses project documentation and onsite verification and monitoring for a sample of facilities. This included a review of assumptions used in deemed savings estimates, engineering algorithms, collection of on-site metered data, and final calculations of annual kWh and peak kW savings.

Verified electric impacts were 382,771 kWh saved annually, which represents a realization rate of 103%; 5,741,565 kWh saved over the lifetime of the measures; and coincident peak demand reduction of 82.9 kW.

Table 0-59 Gross Impact Summary

Measure Type	*Peak Demand Savings, kW*		*Annual Energy Savings, kWh*		*Effective Useful Life (EUL), years*	*Lifetime Energy Savings, kWh*	
	Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*		*Ex Ante*	*Ex Post*
Lighting	196.5	82.9	370,995	382,771	Mixed	5,833,299	5,741,565

Additionally, ADM evaluated net savings associated with the 2009 SBLP. Through surveys with decision makers at participating facilities, ADM estimated free-ridership of 6.7%. ADM also confirmed 1,212 kWh in spillover savings at a participating facility that expanded the scope of their project without claiming the added lighting, so the associated overall Net-to-Gross-Ratio (NTGR) is 93.8%, less than the 100% NTGR used in ex ante estimates. The resulting net savings are presented in Table 1-2 below.

Table 0-60 Net Impact Summary

Measure Type	*Peak Demand Savings, kW*		*Annual Energy Savings, kWh*		*Effective Useful Life (EUL), years*	*Lifetime Energy Savings, kWh*	
	Ex Ante	*Ex Post*	*Ex Ante*	*Ex Post*		*Ex Ante*	*Ex Post*
Lighting	196.5	77.7	370,995	359,039	Mixed	5,833,299	5,385,588

Project Background

SPS is offering the Small Business Lighting Program to facilitate the implementation of cost-effective efficient lighting in non-residential facilities with peak demand of up to 400 kW. This program is available to existing nonresidential customers and offers prescriptive and custom incentives. In addition, customers receive a free energy audit, with recommendations for lighting as well as other measures, including heating, cooling, ventilation, motors, and recommissioning of their existing equipment. The program provides outreach to small businesses, which traditionally have lower participation rates in utility-sponsored energy efficiency rebate programs than larger businesses.

- 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
- 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.

M&V Methodology

This chapter provides a description of the EM&V methodologies applied by ADM in the evaluation of the 2009 SBLP. The EM&V approach for the SBLP is aimed at measuring the following:

- Validating deemed savings estimates for rebated measures;
- Verifying installation of rebated measures;
- Determining an appropriate program net-to-gross ratio; and
- Estimating cost-effectiveness of the program.

Validating Deemed Savings Estimates for Rebated Measures

ADM reviewed the deemed savings estimates for the measure rebated at participating facilities. Deemed savings estimates were based upon assumed values for:

- Hours of operation
- Baseline wattage
- Peak coincident factor

Hours of operation and coincident factor were estimated based on application and facility type. ADM determined that the peak coincident factor applied for elementary and secondary schools was inappropriate. SPS uses a peak coincident factor of 73% for elementary and secondary schools, and ADM concluded that elementary schools should have a peak coincident factor separate from secondary schools. The reasoning behind this was that secondary schools typically have a summer session, so they are at least partially occupied during peak periods. Elementary schools typically do not have a summer session, and thus would not have a 73% peak coincident factor. This issue is aggravated by how late the peak period occurs in SPS territory; with the peak period occurring from 3:00 – 6:00 PM, ADM determined the peak coincident factor for elementary school lighting to be 0%. Schools constituted 84% of ex ante kW savings estimates, and as such realization for kW was exceedingly low for the 2009 SBLP, despite high realization for annual kWh savings.

Verification of Installation of Rebated Measures

ADM verified installation of rebated measures through onsite verification of three participating facilities. The fieldwork effort focused on the larger participants, as the top two facilities constituted 67% of ex ante kWh savings estimates. The remaining participants had verification conducted via telephone, in order to allow for a cost-effective evaluation effort of the 2009 SBLP.

Net Savings Estimates

As part of this evaluation, we also determined net savings attributable to this program. 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 equipment without a utility-provided 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 net savings methodology is described in further detail in Section 4.

Summary of Key Issues

As stated prior, ADM reviewed deemed savings estimates for the participating facilities and determined that the peak coincident factor used for elementary schools was inappropriate, given SPS' definition of their peak period. Additionally, ADM estimated a NTGR of 93.8%, less than the 100% figure applied by SPS in ex ante estimates.

Impact Evaluation Findings

Verified gross electric impacts for the SBLP in southern New Mexico were 382,771 kWh saved annually, which represents a realization rate of 103%; 5,741,565 kWh saved over the life of the measures; and coincident peak demand reduction of 82.9 kW. Verified net savings were 359,039 kWh saved annually; 5,385,588 kWh saved over the life of the measures; and peak demand savings of 77.7 kW.

The following sections containing detailed results pertaining to:

- Energy and demand impacts and variances (section 4.1).
- Findings associated with participant surveys (section 4.2).

Energy and Demand Impacts and Variances

Table 4.1 below presents ex ante and ex post energy savings, summarizing variance from ex ante estimates and overall gross realization.

Table 0-61 Gross Energy Impact Summary

Measure	***Ex Ante Energy Savings (kWh)***	***Ex Post Energy Savings (kWh)***	***Variance***	***Realization Rate***
Lighting	370,995	382,771	+11,776	103%

Table 4-2 below summarizes the net savings associated with the SPS Small Business Lighting Program.

Table 0-62 Net Energy Impact Summary

Measure	***Peak Demand Reduction (kW)***	***Annual Energy Savings (kWh)***	***Effective Useful Life (EUL), years***	***Lifetime Energy Savings (kWh)***
Lighting	77.7	382,771	Mixed	5,385,588

Analysis of Net Savings

Analysis of net savings focused on four main aspects of free-ridership:

- Financial ability;
- Prior planning;
- Importance of the rebate in the decision making process; and

- Likelihood of equipment installation without rebate.

These four components were addressed in the telephone surveys, with the questions directed at them 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.

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 SPSs' 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. For respondents that indicated "Yes" on financial ability, free-ridership scoring is as follows:

Table 0-63 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

Based upon this analysis, ADM estimates a free-ridership rate of 6.7% for the 2009 Lighting SBLP, with an associate NTGR of 93.3%. This result is derived by taking the free-ridership scores of all program participants and weighting them by the proportion of the kWh savings that the participant constitutes. As such, free-ridership for the 2009 SBLP is largely driven by the top two participants, who constitute 67% of total program savings.

PARTICIPANT SURVEY RESULTS

This section will provide a narrative discussion of the survey results for program participants. Though not all of the questions affect net savings, this information can be significant in understanding what participants think of the program and how effectively the program is in reaching SPS commercial customers. Surveys were conducted with participants that totaled 78% of ex ante kWh savings.

Survey Results for Individual Participants

As part of the net-to-gross surveying, respondents were asked to indicate how they make decisions about energy efficiency for their facility. Participants emphasized the importance of energy efficient improvements by saying:

- 80% respondent indicated that energy efficiency is “very important” in planning operations for their facility. The other 20% respondent indicated it was “only slightly important”.

- 100% of respondents indicated that SPS sources, including energy specialists, account reps, and the SPS website, are used for information regarding energy efficiency.

- 60% of respondents stated that incentive payments from SPS were “very important”. 40% stated that it was “somewhat important”.

- 80% of respondents indicated that when replacing equipment at their facility, they “always” try to purchase and install energy efficient equipment; the remaining 20% stated that they “sometimes” try to.

- 20% of respondents have installed energy efficient equipment in the last three years without a rebate.

Respondents were asked how they had learned about the program. Participants had learned of the program through the following channels:

- 80% of participants learned of the program in part from SPS channels, including account reps, brochures, and the SPS website.

- Other sources included business colleagues and equipment vendors.

Respondents were also asked as to their financial ability to purchase high efficiency lighting.

- 80% of respondents indicated that they would have been financially able to purchase high efficiency lighting without the rebate. 20% would not have been financially available to afford the lighting.

Prior planning was addressed with one question, the results of which were:

- 20% of respondents indicated that they had prior plans to install high efficiency lighting equipment prior to hearing about the program.

Finally, what the respondent would have done absent the rebate was addressed with two questions:

- 60% of Respondents indicated that if SPS had not provided a rebate, they "Probably would not have" installed the same equipment; 20% indicated they "Definitely would not have" installed and 20% indicated that they "Probably would have" done so.

- 80% of respondents indicated that the available rebate caused them to change the quantity, efficiency level, or timeline of installation.

Finally, customers satisfaction issues with the program were addressed by asking to rate a series of factors 1-5 in terms of their satisfaction:

- Across the board, respondents scored the program at 5, indicating that they were "very satisfied".

COST-EFFECTIVENESS EVALUATION

As part of this evaluation, ADM conducted cost-effectiveness testing of the program. ADM provided estimates using the Total Resource Cost (TRC) test, incorporating costs and benefits attributable to both SPS and the program participants. The inputs to the TRC calculations are detailed in the subsections below.

PROGRAM BENEFITS

The benefits generated by the program are twofold:

- Utility Electric Production Cost Decrease (UEPCD); and
- Utility Generation Capacity Credit (UGCC).

TRC calculations typically include Non-Electric Acquisition Cost Decrease (NEACD), but that is not applicable to this program as there are no measures that generate Therms savings. Using marginal production costs per MWh provided by SPS, ADM estimated the avoided UEPCD for this program. SPS marginal cost figures were measure-specific and accounted for measure load shape, and as such the annual values provided accurately depict avoided costs over the course of a year.

ADM then calculated the Net Present Value (NPV) of the UEPCD using a discount rate of 5%, NTGRs of 93.8%, and a measure life of 15 years. The resultant UEPCD was calculated at $270,145.

ADM then calculated the UGCC using data provided by SPS on the marginal cost per kW of capacity expansion over the coming 15 years. The cost per kW forecasted for each year was multiplied by the verified net kW reduction, then by calculating the NPV in the same manner as performed for the UGCC. With net kW reduction of 77.7, the UGCC was calculated at $195,018.

With these two factors, total benefits of the program were calculated at $465,163.

PROGRAM COSTS

Program costs are divided between two components:

- Net Customer Investment (NCI)
- Utility Administrative Costs (UAC)

NCI is defined as the marginal cost of equipment rebated through the program, multiplied by the Net-to-Gross Ratio (NGTR). The input uses net costs as free-riders would have implemented the

high efficiency lighting fixtures without the program, so the costs faced by the participant are not considered to be program-generated. Average marginal cost was $9,595 per participant. As discussed in the program summary, there were a total of 12 participants in the 2009 SBLP. With a NTGR of 93.8%, this leads to NCI of:

NCI = (12 x $7,707 x 0.934) = $107,543

The second component, UAC, is a fixed number reported from SPS for the total cost of administering the BCE in 2009. Administrative costs for the 2009 BCE rebate program were $234,528. The resulting total cost of the program was

$107,543 + $234,528 = 342,071

With total benefits and total costs, TRC for the 2009 program year is calculated as:

TRC = $465,163/342,071 = 1.36

As such, ADM concludes that the 2009 SBLP passed cost-effectiveness testing..

Discussion of Key Findings

In this evaluation, ADM determined that peak demand reduction was severely overestimated for elementary schools, which constituted the bulk of the savings of the 2009 SBLP. Additionally, ADM estimated a NTGR of 93.8%, lower than the 100% figure applied by SPS in ex ante estimates. As a result of this, ADM's estimates of the net electric impacts of the 2009 SBLP are:

- 382,771 kWh saved annually;
- 5,385,588 kWh saved over the life of the measures; and
- 77.7 kW in peak demand savings.

Recommendations

ADM recommends that SPS disaggregate elementary and secondary schools in their deemed savings estimates. They differ greatly in their summer use profile, and as such the same peak coincident factor (or hours of use) cannot be applied to both facility types. In summary, ADM would recommend the following changes to SPS Small Business Lighting Tech Assumptions:

- Apply a NTGR of 95% to ex ante estimates;
- Change peak coincident factor for elementary schools to 0%; and
- Keep the current peak coincident factor for education facilities for middle and high schools.

Appendix A. Survey Form

This appendix provides a copy of the survey form used in the telephone surveys.

Southwestern Public Service Company

2009 Small Business Lighting Program

DECISION-MAKER SURVEY QUESTIONNAIRE

ID No. ______________________________

Customer Name: ______________________________

Date of interview: ______________________________

Date data entered ______________________________

....

Hello, my name is _________________. I am calling on behalf of **Southwestern Public Service Company**

.
May I please speak to _________________________ *(Contact Person)?*

Title: _________________________ Company: _________________________

Address: ____ ZIP: _________________

Phone: ( ) ___________________________________

Interviewer: If contact person is not available, schedule a callback.
If interview is successfully completed, confirm mailing address above for interviewee.
If contact person is available:

Hello, my name is _______________________. I am calling on behalf of Southwestern Public Service Company. Through its Small Business Lighting Program, SPS has been working with firms and building owners to help them improve the energy efficiency of their operations. Because your company participated in the Small Business Lighting Program during 2009, we are interested in receiving feedback from you regarding your experience with the program.

SECTION ONE - INTERVIEWEE SCREENING

SCRN-Q.1 According to our records your company participated in the Small Business Lighting Program for one or more projects at the following facility:

(Name of facility ____

You are shown as the contact person for that facility. Is that correct?

(If contact seems confused, ask if they remember the Small Business Lighting Program. If necessary, describe program and distinguish from other programs.)

- ❑ Yes (GO TO SCRN-Q.2)
- ❑ No (GO TO SCRN-Q.2)

SCRN-Q.2 Many of our questions focus on your company's decision to participate in the program and on your decisions to purchase and install energy efficient equipment for your facility. Are you the best person to talk to?

- ❑ No. Is there someone else who would be better for us to contact?

Who is that?

Name: ____

Title: ____

Phone Number: ______________________________________

(You are finished with this person.)

Thank you very much for your time

(START SHEET FOR NEW CONTACT PERSON ABOVE)
CALL THIS PERSON AND GO TO BEGINNING OF INTRODUCTION.

- ❑ Yes. "I am the best person to talk to". *Continue interview.*

SCRN-Q.3. Our records give the following as the address for the facility(s) where you installed equipment for which you received financial incentives through the Small Business Lighting Program.

(Address(es) from cover sheet)

Is this/Are these address(es) correct?

- ❑ Yes
- ❑ No

If No: Could you please give us the correct address?

TO BEGIN, I HAVE SOME QUESTIONS REGARDING HOW ***DECISIONS ABOUT ENERGY EFFICIENCY*** *IMPROVEMENTS ARE MADE FOR YOUR FACILITY.*

1. Compared to all other factors, how important is energy efficiency as a factor in planning your operations for this facility? (READ) Is it…
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know

2. Which of the following policies or procedures does your organization have in place regarding energy efficiency improvements at this facility? (READ) Is it.. (*Check all that are mentioned.)*
   - ❑ An energy management plan
     2a. (If YES), Does your energy management plan have numerical goals?
     - ❑ Yes ➔ 2b. (IF YES) What are the goals?___________________________________
     - ❑ No
     - ❑ Don't know
   - ❑ A Staff member responsible for energy and energy efficiency
   - ❑ Corporate Policies that incorporate energy efficiency in operations and procurement
   - ❑ Any Others, such as active training of staff or something else.

3. How does your organization decide to make energy efficiency improvements for this facility? Is the decision (READ ALL. CAN BE MULTIPLE RESPONSE):
   - ❑ Made by one or two key people?
     3a. What are their titles? ____
   - ❑ Based on staff recommendations to a decision maker?
     3b. What is that decision maker's title? ________________________________
   - ❑ Made by a group or committee?
     3c. What is the group or committee name? ___________________________________
   - ❑ Made in some other way?

     3d. How are energy efficiency improvement decisions made? _________________
     ____
     ____

4. What are the **sources** your organization relies on for **information** about energy efficient equipment, materials and design features? Please answer yes or no for each one. (READ EACH; YES, NO, OR DK FOR EACH)

   - ❑ An SPS Energy Specialist

- ❑ An SPS Account Representative
- ❑ The SPS website
- ❑ Brochures or advertisements
- ❑ Trade associations or business groups you belong to
- ❑ Trade journals or magazines
- ❑ Friends and colleagues
- ❑ An architect, engineer or energy consultant
- ❑ Equipment vendors or building contractors
- ❑ Any others IF YES: What other sources? ___________________________________

4a. Which sources are your top three? (READ LIST AGAIN ONLY IF NEEDED TO PROMPT. OK IF FEWER THAN THREE)

For each of the following, tell me if it is "very important," "somewhat important," "only slightly important," or "not important at all" for your decision making regarding energy efficiency improvements.

5. **incentive payments from SPS**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

6. **past experience with energy efficient equipment**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

7. **your organization's policies**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

8. **advice and/or recommendations received from SPS**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important

- ❑ Not important at all
- ❑ Don't know *(DON'T READ)*

9. **advice and/or recommendations from equipment vendors**?
   - ❑ Very important
   - ❑ Somewhat important
   - ❑ Only slightly important
   - ❑ Not important at all
   - ❑ Don't know *(DON'T READ)*

10. Which financial methods does your organization typically use to evaluate energy efficiency improvements for your facility? (READ ALL. YES, NO OR DK FOR EACH.) (CAN BE MULTIPLE RESPONSES)
    - ❑ Initial Cost
    - ❑ Simple payback *(Go to question 10.**a**)*
    - ❑ Internal rate of return *(Go to question 10.**b**)*
    - ❑ Life cycle cost *(Go to question 10.**c**)*
    - ❑ Other (Please Explain) ______________________________ *(Go to question 13)*
    - ❑ Don't know *(Go to question 11)*

    10.a What **payback** *length of time* do you normally require in order to consider an energy investment cost effective?
    ______ Years *(Go to question 11.)*

    10.b What **rate of return** do you normally require in order to consider an energy investment cost effective? ______%
    (Expect answers 10 to 30 %.) *(Go to question 11.)*

    10.c What **discount rate** do you normally use in determining the life-cycle costs of various equipment options?______%
    (Expect answers 3 to 30 %.) *(Go to question 11.)*

11. When you have to replace equipment at this facility, **how often** do you try to purchase and install **energy efficient equipment**? (READ) Would you say…
    - ❑ Always
    - ❑ Usually
    - ❑ Sometimes
    - ❑ Occasionally
    - ❑ Never
    - ❑ Don't know *(DON'T READ)*

12. Before you knew about the Small Business Lighitng Program, had you purchased and installed any energy efficient equipment at this facility?
    - ❑ Yes

- ❑ No
- ❑ Don't know *(DON'T READ)*

13. Has your organization purchased any energy efficient equipment in the last three years for which you did **not** apply for a financial incentive through the Small Business Lighting Program? (IF RESPONDENT SAYS, "No" CLARIFY IF "No equipment purchased" OR IF "No, have applied for financial incentives.")
    - ❑ Yes, Purchased energy efficient equipment but did not apply for financial incentive.

      ➔

      IF YES: 13a. Why didn't you apply for a financial incentive on that equipment?
      (DO NOT READ LIST. PROMPT IF NECESSARY)
      - ❑ Didn't know whether equipment qualified for financial incentives
      - ❑ Didn't know about financial incentives until after equipment was purchased
      - ❑ Didn't have time to complete paperwork for financial incentive application
      - ❑ Paperwork for the financial incentive application was too much
      - ❑ Financial incentive wasn't enough to bother with
      - ❑ Other 1 (Specify) ____
      - ❑ Other 2 (Specify) ____
    - ❑ No, Applied for financial incentives on all of the energy efficient equipment purchased.

      IF NO: 13b. Did you receive all of your incentives?

      Yes
      No
      Don't know
    - ❑ Has NOT purchased equipment
    - ❑ Don't know (*DO NOT READ)*

QUESTIONS 14 through 22 ASKED FOR EACH TYPE OF END USE EQUIPMENT OR MEASURE FOR WHICH CUSTOMER RECEIVED A FINANCIAL INCENTIVE. LISTED FROM PROGRAM RECORDS.:

I now have some questions about particular types of equipment for which you received financial incentives.

According to SPS' records, you received incentives for (insert Equipment/Measure ____________

14. Before participating in the Small Business Lighting Program, had you installed any equipment or measure similar to [Rebated Equipment/Measure] at your facility?
    - ❑ Yes
    - ❑ No

15. Did you have plans to install [Equipment/Measure] before participating in the program?
    - ❑ No
    - ❑ Yes

      If Yes:15aWould you have gone ahead with this planned installation even if you had not participated in the program?

- ❑ Yes
- ❑ No

16. How important was previous experience with the SPS Small Business Lighting Program in making your decision to install [Equipment/Measure]? Is it… (READ LIST)
    - ❑ Very important
    - ❑ Somewhat important
    - ❑ Only slightly important
    - ❑ Not important at all
    - ❑ Or you did not have previous experience with the program
    - ❑ Don't know *(DON'T READ)*

17. Did an SPS Energy Specialist or Account Representative recommend that you install [Equipment/Measure]?
    - ❑ No
    - ❑ Yes

    If Yes:17a If the Lighting Efficiency Program representative had not recommended installing [Equipment/Measure], how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

18. Would you have been financially able to install [Equipment/Measure] without the financial incentive from the Small Business Lighting Program?
    - ❑ Yes
    - ❑ No
    - ❑ Don’t know

19. If the **financial incentive** from the Small Business Lighting Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway? You… (READ LIST)
    - ❑ Definitely would have installed
    - ❑ Probably would have installed
    - ❑ Probably would not have installed
    - ❑ Definitely would not have installed
    - ❑ Don't know *(DON'T READ)*

20. How did the availability of information and financial incentives through the Small Business Lighting Program affect the <u>quantity</u> (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?

- ❑ Yes
  IF YES: 20b How much more? ______________________
- ❑ No, Did not affect quantity purchased and installed

21. How did the availability of information and financial incentives through the Small Business Lighting Program affect the level of energy efficiency you chose for [Equipment/Measure]? Did you choose equipment that was more energy efficient than you otherwise would have chosen because of the program?
- ❑ Yes
  IF YES: 21b How much more efficient? (could be expressed in different ways. Ask for percentage: e.g., 10% more efficient) ______________________
- ❑ No, program did not affect level of efficiency that we chose for equipment

22. How did the availability of information and financial incentives through the Small Business Lighting Program affect the timing of your purchase and installation of [Equipment/Measure]? Did you purchase and install [equipment/measure] earlier than you otherwise would have without the program?
- ❑ Yes
  ↓
  IF YES: 22a When would you otherwise have installed the equipment? (READ IF NEEDED)
  - ❑ In less than 6 months later
  - ❑ In 6-12 months later
  - ❑ In 1-2 years later
  - ❑ In 3-5 years later
  - ❑ In more than 5 years later
- ❑ No, did not affect timing of purchase and installation

23. Was there an open bidding process for choosing a vendor who did your installation, or did you only offer it to one firm?
- ❑ (1) Bidding process *(go to Q23a)*
- ❑ (2) One firm *(go to Q23a)*
- ❑ (3) Self installed/No vendor used *(go to Q24)*
- ❑ (9) Don't know *(go to Q23a)*

23a. Did more then one vendor promote the program?
- ❑ (0) No
- ❑ (1) Yes
- ❑ (9) Don't know

23b. Did you select a firm that promoted the program?
- ❑ (0) No (*go to Q23c)*
- ❑ (1) Yes *(go to Q24)*

❑ (9) Don't know *(go to Q24)*

23c. Did you tell the firm about the program?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24. Did the vendor/contractor you learned of the program from install the measures?
❑ (0) No (*go to Q25)*
❑ (1) Yes *(go to Q24a)*
❑ (9) Don't know *(go to Q25)*

24a. Had you previously worked with this vendor/contractor?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

24b. Did the fact that the energy efficiency program was part of the project influence your decision on what vendor/contractor to use?
❑ (0) No
❑ (1) Yes
❑ (9) Don't know

25. Did the implementation go smoothly?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

26. Did the energy efficiency measure meet your expectation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (3) Exceeded my expectations
❑ (9) Don't know

27. Do you feel you got a quality installation?
❑ (0) No, Explain___________________________
❑ (1) For the most part, Explain_______________
❑ (2) Yes
❑ (9) Don't know

28. Did the incentive agreement that you received meet your expectations?
❑ (0) No, Explain___________________________
❑ (1) Yes
❑ (9) Don't know

29. Did anyone from SPS come to your facility to do a pre-inspection?
  - ❑ (0) No (go to Q30)
  - ❑ (1) Yes (go to Q29a)
  - ❑ (9) Don't know (go to Q30)

  29a. Who performed the inspection?
  29b. What did the pre-inspection consist of?
  29c. Did anything change in the design as a result of the pre-inspection?
    - ❑ (0) No
    - ❑ (1) Yes, Explain_______________
    - ❑ (9) Don't know

30. Did anyone from SPS come to your facility to do a post-inspection?
  - ❑ (0) No (go to Q31)
  - ❑ (1) Yes (go to Q30a)
  - ❑ (9) Don't know (go to Q31)

  30a. Who performed the inspection?
  30b. What did the post-inspection consist of?
  30c. Did anything change in the incentive amount as a result of the post-inspection?
    - ❑ (0) No
    - ❑ (1) Yes, Explain_______________
    - ❑ (9) Don't know

31. Did you provide SPS copies of purchase orders and invoices that document the final costs or did the vendor/contractor?
  - ❑ (1) Someone within firm
  - ❑ (2) Vendor/Contractor
  - ❑ (3) Someone else (specify)________________
  - ❑ (9) Don't know

32. Were there any issues getting the paperwork approved?
  - ❑ (0) No
  - ❑ (1) Yes, Explain___________________________
  - ❑ (9) Don't know

33. Were there any issues receiving the incentive check?
  - ❑ (0) No
  - ❑ (1) Yes, Explain___________________________
  - ❑ (9) Don't know

34. Was the incentive check the amount you expected?
  - ❑ (0) No, Explain___________________________
  - ❑ (1) Yes
  - ❑ (9) Don't know

I now have some questions about your experience with the Small Business Lighting Program overall.

35. How did you learn of the Small Business Lighting Program? (READ. MULTIPLE OKAY)
- ❑ Approached directly by SPS Energy Specialist or Account Representative of Lighting Efficiency Program
- ❑ Received an information brochure on the Small Business Lighting Program
- ❑ An SPS representative mentioned it
- ❑ The SPS website
- ❑ Friends or colleagues (i.e., word of mouth)
- ❑ An architect, engineer or energy consultant
- ❑ An equipment vendor or building contractor
- ❑ Past experience with the program
- ❑ Or some other way (please explain) ___________________________________

36. When did you learn of the Small Business Lighting Program? (READ. ONE ONLY)
- ❑ You had participated in other energy efficiency incentive programs
- ❑ Before planning for replacing the equipment began
- ❑ During your planning to replace the equipment
- ❑ Once equipment had been specified but not yet installed
- ❑ After equipment was installed
- ❑ Some other time (When? _____)
- ❑ Don't know *(Don't Read)*

37. Has your experience with the Small Business Lighting Program led you to buy any energy efficient equipment for which you did not apply for a financial incentive?
- ❑ Yes

  ➔

  If Yes: 37a What type of equipment? _______________________________________
- ❑ No
- ❑ Don’t know *(DON’T READ)*

38. Given your experience with the Small Business Lighting Program, would you buy energy efficient equipment in the future even if financial incentives for such equipment were not being offered through the Business Motor Efficiency Program?
- ❑ Yes
- ❑ No
- ❑ Don’t know *(DON’T READ)*

39. On a scale of 1 to 5, where “5” is very satisfied and “1” is very dissatisfied, and a 3 is neither satisfied nor dissatisfied, how would you rate your satisfaction with the following? (ROTATE. H ALWAYS LAST)

	1 Very Dissatisfied	*2*	*3*	*4*	*5 Very Satisfied*	*Don't know or no answer*
A. Performance of the equipment installed	❑	❑	❑	❑	❑	❑
B. Savings on your monthly bill	❑	❑	❑	❑	❑	❑
C. Incentive amount	❑	❑	❑	❑	❑	❑
D. The effort required for the application process	❑	❑	❑	❑	❑	❑
E. Information provided by your contractor	❑	❑	❑	❑	❑	❑
F. Quality of the work conducted by your contractor	❑	❑	❑	❑	❑	❑
G. Information provided by SPS Account Representative	❑	❑	❑	❑	❑	❑
H. Overall program experience	❑	❑	❑	❑	❑	❑
I. The elapsed time until you received the incentive	❑	❑	❑	❑	❑	❑

40. *ASK FOR EACH IF ANSWERED 1 or 2 FOR ANY ASPECT IN QUESTION 28:*

Why were you not satisfied with the (ASPECT)? ______________________________

____

____

41. That concludes my questions. Do you have any other comments that you would like me to relay to SPS about energy efficiency in commercial facilities or about their programs? *RECORD ANY CUSTOMER QUESTIONS OR CONCERNS:*

____

____

____

(IF NEEDED OR CUSTOMER SEEMS TO HAVE AN ISSUE OR PROBLEM THAT SPS MIGHT ADDRESS) If you wish to speak with an SPS representative, Mr. Mark Schoenheider may be reached at: (303) 294-2866.

Thanks for your help! SPS will use your ideas to improve its programs for commercial customers.

APPENDIX B: SITE REPORTS

This appendix contains the site reports for reviewed facilities.

B.1 PROJECT 1-6RDE2

Project Number 1-6RDE2
Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 103%.

CUSTOMER PROJECT AND DESCRIPTION

ADM verified the facility's 59 T8 and T5 High Output upgrades at the elementary school during its site visit.

MEASUREMENT AND VERIFICATION EFFORT

ADM confirmed the installation of the T8 and T5HOs during the site visit and obtained business operating hours. It was informed that a typical school year consists of 187 days, which averages to 1,621 annual operating hours. ADM calculated the light savings as:

$$kWh_{savings} = (\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
T12 to T8 Re-Lamping	59	59	179	99.2	1,621	1,621	8,173	8,983	0	1.177	110%

400W MH to T5HO	12	12	448	346	1,621	1,621	2,771	2,335	0	1.177	84%
						Total	**10,944**	**11,318**	**0**		**103%**

RESULTS

ADM obtained the annual operational hours and one time power measurements obtained from a nearby school with the same lighting retrofits to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 11,318 kWh and a demand reduction of 0 kW resulting in a realization rate of 103%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
T12 to T8 Re-Lamping	8,173	4.7	**8,983**	**0**	**110%**
400W MH to T5HO	2,771	1.6	**2,335**	**0**	**84%**
Total	**10,944**	**6.3**	**11,318**	**0**	**103%**

During ADM's site visit it was noticed that 6 addition T5HO fixtures were installed in the multipurpose room alongside the 12 rebated fixtures. The installation of these 6 additional fixtures results in a spillover savings of 1,212 kWh and a demand reduction of 0 kW.

B.2 PROJECT 1-6VMHD

Project Number 1-6VMHD
Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis resulting in an overall project realization rate of 87%.

CUSTOMER PROJECT AND DESCRIPTION

The facility is an elementary school that converted 81 four lamp T12 fixtures to T8 fixtures. By converting the fixtures from T12 to T8 reduces the overall demand of each fixture thus reducing energy consumption.

MEASUREMENT AND VERIFICATION EFFORT

ADM used one time power measurements and monitoring data from another school with the same lighting retrofit to determine annual energy savings. Upon extrapolation of the monitoring data it was concluded that the lights operate approximately 1,621 hours during the typical school year. ADM used the following equation to determine the annual energy savings due to the lighting retrofit:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts / fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts / fixt_{as-built} \times hours_{as-built}\right) \times HCIF / 1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
T12 to T8 Re-Lamping	81	81	179	99.2	1,621	1,621	14,213	12,332	0	1.177	87%
						Total	**14,213**	**12,332**	**0**		**87%**

RESULTS

ADM obtained the annual operational hours and one time power measurements obtained from a nearby school with the same lighting retrofits to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 12,332 kWh and a demand reduction of 0 kW resulting in a realization rate of 87%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
T12 to T8 Re-Lamping	14,213	8.8	**12,332**	**0**	**87%**
Total	**14,213**	**8.8**	**12,332**	**0**	**87%**

B.3 PROJECT 1-6T6AK

Project Number 1-6T6AK
Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 65%.

CUSTOMER PROJECT AND DESCRIPTION

The facility converted 70 four lamp T12 fixtures to more efficient two lamp T8 fixtures. This count involved 37 fixtures in the facility's offices on the second floor of the building while the remaining 33 fixtures were installed on the first floor inside of a dentist office. A claimed 16 60W incandescent bulbs in the entrance and stair well were converted to 14W CFLs; however ADM was only able to verify the installation of 12 CFLs.

MEASUREMENT AND VERIFICATION EFFORT

ADM confirmed the installation of the T8 and screw in CFLs during the site visit and also obtained business operating hours. It was informed that Llano land Exploration is open Monday through Friday 8 a.m. till 5 p.m.; while the dentist office is only open Tuesday through Friday 6 a.m. till 5 p.m. ADM was also informed that the stairwell lights are only turned on for approximately two hours per day in the evening. These schedules result in annual runtimes of 2,340, 2,288, and 520 hours for the facility, the dentist office, and the stairwell accordingly. ADM calculated the light savings as:

$$kWh_{savings} = \left(\# \ fixt_{base} \times Watts \ / \ fixt_{base} \times hours_{base} - \# \ fixt_{as-built} \times Watts \ / \ fixt_{as-built} \times hours_{as-built}\right) \times HCIF \ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
4L T12 to 2L T8	37	37	179	56	2,340	2,340	16,506	11,693	4.6	1.098	71%
4L T12 to 2L T8	33	33	179	56	2,288	2,288	14,721	10,197	4.1	1.098	69%
60W Incn. To 14W CFL	12	12	60	14	520	520	2,806	315	0.6	1.098	11%
						Total	**34,033**	**22,205**	**9.3**		**65%**

RESULTS

ADM obtained the annual operational hours from interviews with site contacts and manufacturers specifications to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 22,205 kWh and a demand reduction of 9.3 kW resulting in a realization rate of 65%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
4L T12 to 2L T8 (2nd Floor)	16,506	5.8	11,693	4.6	71%
4L T12 to 2L T8 (1st Floor)	14,721	5.1	10,197	4.1	69%
60W Incn. To 14W CFL	2,806	1.0	315	0.6	11%
Total	**34,033**	**11.9**	**22,205**	**9.3**	**65%**

ADM attributes the low realization rate to the overestimation of operating hours claimed by the implementer. The claimed hours of operation is stated as 2,866 hours annually for all lighting types and all operational areas.

B.4 PROJECT 1-6RDO8

Project Number 1-6RDO8
Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 109%.

CUSTOMER PROJECT AND DESCRIPTION

The facility is an elementary school that converted 831 four lamp T12 fixtures to more efficient four lamp T8 fixtures. A claimed 15 six lamp T5HO were installed in the multipurpose room; however ADM was only able to verify the installation of 14 T5HO fixtures.

MEASUREMENT AND VERIFICATION EFFORT

ADM confirmed the installation of the T8 and T5HOs during the site visit and installed photosensitive monitoring equipment. The business operating hours were obtained through the installation of lighting loggers across a sample of occupancy zones. These monitoring data was then used to create a weighted annual operating schedule, based upon fixture count locations and the length of a typical school year. It was informed that a typical school year consists of 187 days, in which ADM calculated 1,621 hours of annual operation for the lights. The energy savings due to the installation of the high efficiency lighting was calculated as seen below:

$$kWh_{savings} = \left(\# fixt_{base} \times Watts / fixt_{base} \times hours_{base} - \# fixt_{as-built} \times Watts / fixt_{as-built} \times hours_{as-built}\right) \times HCIF / 1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
4L T12 to 4L T8	831	831	179.2	99.2	1,621	1,621	115,117	126,838	0	1.177	110%
400W MH to T5HO	14	14	448	346	1,621	1,621	3,463	2,725	0	1.177	79%
						Total	**118,580**	**129,563**	**0**		**109%**

RESULTS

Using the weight annual operating hours derived from monitoring data it was calculated that the high efficiency lighting has an annual energy savings of 129,563 kWh and a demand reduction of 0 kW resulting in a realization rate of 109%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
4L T12 to 4L T8	115,117	48.4	126,838	0	**110%**
400W MH to T5HO	3,463	1.5	2,725	0	**79%**
Total	**118,580**	**49.9**	**129,563**	**0**	**109%**

The low realization rate for the T5HO conversion is due to ADM not being able to verify all 15 of the claimed fixtures. During ADM's site visit only 14 fixtures were able to be verified.

B.5 PROJECT 1-6SB5W

Project Number 1-6SB5W
Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from SPS for implementing energy efficient lighting. ADM performed project savings through engineering analysis and review of the rebate application. The overall project realization rate is 129%.

CUSTOMER PROJECT AND DESCRIPTION

The customer converted a single 7 two lamp T12 fixture to a two lamp, 19 two lamp T12s were converted to four lamp T8s and 20 400W metal halides to six lamp T8 fixtures.

MEASUREMENT AND VERIFICATION EFFORT

One time power measurements were taken of an identical six lamp T8 fixtures at sister location and the business operating hours were obtained through interviews with staff at that location. ADM was informed that the facility is open 5:30 a.m. till 8 p.m., Monday through Friday, resulting in an annual operation of 3,510 hours. These data collection points were then used to calculate the annual energy savings due to the efficient lighting install. ADM calculated the light savings as:

$$kWh_{savings} = \left(\#\ fixt_{base} \times Watts\ /\ fixt_{base} \times hours_{base} - \#\ fixt_{as-built} \times Watts\ /\ fixt_{as-built} \times hours_{as-built}\right) \times HCIF\ /1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Lamps)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	Realized kW Reduction	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New					
4' 2L T12 to 4' 1L T8	1	1	90	25	3,510	3,510	92	228	0.1	1.000	248%
8' 2L T12 to 4' 4L T8	19	19	168	114	3,510	3,510	12,991	3,601	1.0	1.000	28%
400W MH to 6L T8	20	20	448	220.2	3,510	3,510	2,223	15,992	4.6	1.000	719%
						Total	**15,306**	**19,821**	**5.7**		**129%**

RESULTS

ADM obtained the annual operational hours from interviews with site contacts and used one time power measurements from a sister location to determine the annual savings. It was calculated that the high efficiency lighting has an annual energy savings of 19,821 kWh and a demand reduction of 5.7 kW resulting in a realization rate of 129%.

Verified Gross Savings/Realization rates

Measure Description	Claimed		Realized		kWh Realization Rate
	Electric Savings (kWh)	Demand Savings (kW)	Electric Savings (kWh)	Demand Savings (kW)	
4' 2L T12 to 4' 1L T8	92	0.04	228	0.1	248%
8' 2L T12 to 4' 4L T8	12,991	5.4	3,601	1.0	28%
400W MH to 6L T8	2,223	0.9	15,992	4.6	719%
Total	**15,306**	**6.4**	**19,821**	**5.7**	**129%**

ADM attributes the high realization rate to an underestimation in operating hours in the ex-ante calculations. The ex-ante calculations assume that the facility is open for approximately 2,400 hours compared to ADMs informed 3,510 hours. ADM also concluded that the method used to calculate energy savings in the ex-ante method is inconsistent from measure to measure as the 8' two lamp T12 conversion could never save 12,991 kWh even if the lights operated for 8,750 hours per year.

Program Non Res – Small Business Lighting

EXECUTIVE SUMMARY

The customer received incentives from PNM for implementing energy efficient lighting. ADM performed project savings through engineering analysis and site inspection. The overall project realization rate is 105%.

CUSTOMER PROJECT AND DESCRIPTION

The facility is a church in Hobbs. Throughout the facility, they have replaced (612) 4' 4L T12 with (612) 4' 4L T8, (35) 8' 2L T12 with (35) 8' 2L T8, (26) Incandescent Exit Signs with (26) LED Exit Signs, and (81) Incandescent Bulbs with (81) Screw-in CFLs.

MEASUREMENT AND VERIFICATION EFFORT

ADM calculated the light savings as:

$$kWh_{savings} = (\# fixt_{base} \times Watts / fixt_{base} \times hours_{base} - \# fixt_{as-built} \times Watts / fixt_{as-built} \times hours_{as-built}) \times HCIF / 1000$$

Where:

$kWh_{savings}$ = annual energy savings

$hours_{base}$ = baseline annual operation hours of the fixtures

$hours_{as\text{-}built}$ = as-built annual operation hours of the fixtures including impact of lighting controls

$HCIF_t$ = heating/cooling interaction factor

The heating cooling interaction factor was determined through energy simulation for like buildings in the same climate zone. The table below shows the energy savings calculations for this lighting project.

Lighting Savings Calculations

Item	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCIF Factor	Realization Rate
	Old	New	Old	New	Old	New				
High Efficiency 4' 4L T8	612	612	188	118	2,530	2,530	117,609	119,332	1.101	101%
High Efficiency 8' 2L T8	35	35	173	104	2,530	2,530	9,629	6,743	1.101	70%
LED Exit Sign	26	26	40	2	8,760	8,760	2,498	9,529	1.101	381%
Screw-in CFLs	81	81	75	16	2,530	2,530	12,084	13,312	1.101	110%
						Total	**141,810**	**148,916**		**105%**

RESULTS

The higher realization comes from the LED exit sign. ADM used 8,760 hours of annual operating hours with the manufacturer's documentation to calculate the annual kWh.

The realization rate of this project is 105%.

Verified Gross Savings/Realization rates

Type	Verified			
	kWh Savings	**kW Savings**	**Realization Rate kWh**	**Realization Rate kW**
Total	148,916	67.9	105%	88%