Southwestern Public Service Company

2015 Energy Efficiency and Load Management Annual Report

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

May 2, 2016

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Glossary of Acronyms and Definition

Acronym/Defined Term	Definition
2015 Annual Report	SPS's 2015 Energy Efficiency and Load Management Annual Report
2014 Plan	SPS's 2015 Energy Efficiency and Load Management Plan
ADM	ADM Associates – 2015 independent program evaluator for the State of New Mexico
CFL	Compact Fluorescent Light
Commission	New Mexico Public Regulation Commission
DSM	Demand-Side Management – refers to the energy efficiency and load management programs collectively
EE Rider	Energy Efficiency Rider
EUEA	New Mexico Efficient Use of Energy Act, as amended by Senate Bill 418 (2007), House Bill 305 (2008), and House Bill 267 (2013) §§62-17-1 through 62-17-11 NMSA 1978
Evaluator	Independent Program Evaluator, the third-party contractor that will conduct all measurement & verification of the programs
kW	Kilowatt
kWh	Kilowatt hour
LED	Light Emitting Diode
Net Generator kW; Net Generator kWh	Demand and energy savings, respectively, measured at the generator, corrected for transmission line losses and free-rider/drivership
ICO	Interruptible Credit Option

Acronym/Defined Term	Definition
M&V	Measurement and Verification
NEB	Non-Energy Benefits -the benefits of the energy efficiency and load management programs that are unrelated to the generation, transmission, distribution, or cost of energy
Rule	Energy Efficiency Rule (17.7.2 NMAC)
SPS	Southwestern Public Service Company, a New Mexico Corporation
Stipulation	Settlement Agreement between the parties to Case No. 13-00286-UT
UCT	Utility Cost Test - the cost-effectiveness standard implemented on July 1, 2013. Also known as the Program Administrator Test
Xcel Energy	Xcel Energy Inc.

Document Layout
Southwestern Public Service Company's ("SPS") 2015 Energy Efficiency and Load Management Annual Report ("2015 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 17.7.2.14 NMAC;
- Section III provides the program descriptions including an explanation of deviations from goal and changes during 2015, organized into the Residential, Business, and Planning & Research Segments;
- Section IV provides compliance requirements set forth in the Stipulation Agreement in Case No. 13-00286-UT; and
- Appendix A provides the Measurement and Verification ("M&V") Report of SPS's 2015 program year prepared by ADM Associates, Inc. ("ADM").

Section I. Executive Summary

Introduction
In accordance with the Efficient Use of Energy Act ("EUEA"), as amended by Senate Bill 418 (2007), House Bill 305 (2008), and House Bill 267 (2013), and the New Mexico Public Regulation Commission's ("Commission") Energy Efficiency Rule ("17.7.2 NMAC", "Rule"), SPS respectfully submits for Commission review its 2015 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, 17.7.2.8.A NMAC requires SPS to file with the Commission on May 1 of each year, a report on its energy efficiency and load management programs during the prior calendar year. The specific reporting requirements of the Rule and Revised Rule are discussed in Section II.

With this 2015 Annual Report, SPS provides the expenditures and savings results for 10 energy efficiency and load management direct impact programs in the Residential Segment (including Low-Income) and Business Segment (including Large Customer). In addition, the 2015 Annual Report includes a summary of the Planning and Research Segment, which supports the direct impact programs. The M&V Report for SPS's 2015 savings is included as Appendix A.

Background
SPS filed its 2014 Energy Efficiency and Load Management Plan ("2014 Plan") on August 29, 2013 (Case No. 13-00286-UT).[1] SPS, the Commission's Utility Division Staff ("Staff"), and the other parties to the case agreed to a stipulation ("Stipulation") or did not oppose the Stipulation, which was approved by the Commission on June 25, 2014. The Stipulation

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[1] *In the Matter of Southwestern Public Service Company's Application for Approval of its (a) 2014 Energy Efficiency and Load Management Plan and Associated Programs, (b) Request for Financial Incentives for 2013-2015; (c) Cost Recovery Tariff Rider, and (d) Request to Establish Lower Minimum Savings Requirements for 2014 under the Efficient Use of Energy Act*, Case No. 13-00286-UT, Final Order Adopting Certification of Stipulation (Jun. 25, 2014).

included the following revisions to the originally proposed 2014 Plan: the addition of a low-income kit to the Home Energy Services program, measurement and evaluation efforts to improve the savings in the Home Lighting program, and increased marketing and promotion of various programs – especially to Spanish-speaking audiences.

Summary of Results

In compliance with 17.7.2.14.C NMAC, Table 1 below shows SPS's program goals, budgets, and Utility Cost Test ("UCT") ratios approved by the Commission on June 25, 2014.

In 2015, SPS achieved verified net electric savings of 10,716 kilowatts ("kW") and 35,225,196 kilowatt-hours ("kWh") at the customer, at a total cost of $10,027,519 (see Table 1 below.) This equals 118% of SPS's 2015 approved energy goal, while spending 102% of the approved budget. The portfolio was cost-effective with a UCT ratio of 2.39.

As shown in Table 2, most of the direct impact energy efficiency programs were cost-effective under the UCT. Four of the programs did not pass the UCT test in 2015. While each of the products listed below is discussed in more detail later in the Status Report, a summary of the primary reasons for individual programs falling below 1.0 on the UCT follows.

- Evaporative Cooling Rebates: For 2015, the program received a UCT of 0.11. This was due to a lack of participation driven by a preference for air conditioning systems and lack of distributor and retailer interest in stocking the more expensive, higher efficiency models.
- Refrigerator Recycling: For 2015, the program received a UCT of 0.78. This was primarily due to lower than forecasted participation in the program.
- Interruptible Credit Option ("ICO"): ICO didn't have any participants in 2015, and therefore achieved a UCT ratio of 0.0. Increasing participation will continue to be a challenge in the current economic climate, but given that it has a relatively small budget, offering the program is a valuable option for customers if economic conditions do change.
- Business Saver's Switch: For 2015, this program achieved a UCT of 0.33. As discussed below, further enrolling customers was problematic which increased costs but did not result in significant savings.

SPS works in good faith to comply with the EUEA and to offer cost-effective energy efficiency and load management programs to all of its customers. Each year, SPS evaluates the performance and progress of each of its programs to determine whether they are in the best interests of the portfolio and customers.

Table 1: Estimated and Actual Program Data for 2015

Program	2015 Estimated								2015 Reported and Verified							
	Participants	Budget	Peak Demand Savings (Customer kW)	Annual Energy Savings (Customer kWh)	Peak Demand Savings (Generator kW)	Annual Energy Savings (Generator kWh)	Utility Avoided Cost	Utility Cost Test	Participants	Expenditures	Peak Demand Savings (Net Customer kW)	Annual Energy Savings (Net Customer kWh)	Peak Demand Savings (Net Generator kW)	Annual Energy Savings (Net Generator kWh)	Utility Avoided Cost	Utility Cost Test
Residential Segment																
Energy Feedback Pilot	13,565	$272,876	916	3,669,295	1,093	4,160,198	$ 358,359	1.64	20,334	$202,863	649	2,412,165	775	2,734,881	$ 208,678	1.03
Evaporative Cooling Rebates	385	$316,011	334	173,444	398	196,648	$ 782,983	3.10	2	$102,049	3	4,462	4	5,059	$ 11,247	0.11
Home Energy Services: Residential & Low Income	1,300	$2,122,310	380	2,260,600	454	2,563,039	$ 2,217,937	1.31	2,426	$1,825,926	545	4,210,226	650	4,773,499	$ 3,695,627	2.02
Home Lighting & Recyling	7,900	$1,733,175	1,134	8,161,008	1,353	9,252,844	$ 3,008,430	2.17	266,998	$1,934,414	1,583	11,671,787	1,889	13,233,319	$ 5,837,115	3.02
Refrigerator Recycling	650	$167,203	54	506,735	64	574,529	$ 182,825	1.37	530	$150,914	38	360,262	45	408,460	$ 118,040	0.78
Residential Saver's Switch	945	$540,799	678	21,600	809	24,490	$ 1,223,461	2.83	3,926	$522,406	3,184	7,091	3,800	8,040	$ 531,946	1.02
School Education Kits	2,500	$146,064	12	691,054	14	783,508	$ 304,988	2.61	13,560	$120,702	17	794,484	21	900,776	$ 679,908	5.72
Residential Segment Total	**98,345**	**$5,298,438**	**3,508**	**15,483,735**	**4,186**	**17,555,255**	**$ 8,078,984**	**1.91**	**307,776**	**$4,859,273**	**6,020**	**19,460,477**	**7,184**	**22,064,033**	**$ 11,082,561**	**2.28**
Business Segment																
Business Comprehensive	444	$3,586,753	2,120	14,419,374	2,366	15,622,290	$ 11,990,807	4.18	1,808	$4,298,075	4,312	15,763,755	4,812	17,078,824	$ 12,806,496	2.98
Interruptible Credit Option	2	$37,495	789	7,000	881	7,584	$ 297,252	9.92	0	$2,470	0	0	0	0	$ -	0.00
Saver's Switch for Business	82	$162,144	78	517	87	560	$ 129,874	1.00	484	$184,302	385	964	429	1,044	$ 61,546	0.33
Business Segment Total	**528**	**$3,786,392**	**2,986**	**14,426,891**	**3,333**	**15,630,434**	**$ 12,417,933**	**4.10**	**2,292**	**$4,484,847**	**4,696**	**15,764,719**	**5,241**	**17,079,869**	**$ 12,868,042**	**2.87**
Planning & Research Segment																
Consumer Education		$190,313								$219,766						
Market Research		$56,461								$36,978						
Measurement & Verification		$24,793								$41,656						
Planning & Administration		$274,235								$304,195						
Product Development		$232,343								$80,804						
Planning & Research Segment Total		**$778,145**								**$683,398**						
2015 TOTAL	**98,873**	**$9,937,145**	**6,494**	**29,910,625**	**7,519**	**33,185,689**	**20,496,917**	**2.60**	**310,068**	**$10,027,519**	**10,716**	**35,225,196**	**12,425**	**39,143,902**	**23,950,603**	**2.39**

Table 2: Variance Comparison of 2015 Estimated and Reported/Verified Data

Program	2015 Estimated and Reported/Verified Variances							
	Participants	Expenditures	Peak Demand Savings (Net Customer kW)	Annual Energy Savings (Net Customer kWh)	Peak Demand Savings (Net Generator kW)	Annual Energy Savings (Net Generator kWh)	Utility Avoided Cost	Utility Cost Test
Residential Segment								
Energy Feedback Pilot	150%	74%	71%	66%	71%	66%	58%	63%
Evaporative Cooling Rebates	1%	32%	1%	3%	1%	3%	1%	4%
Home Energy Services: Residential & Low Income	187%	86%	143%	186%	143%	186%	167%	155%
Home Lighting & Recyling	3380%	112%	140%	143%	140%	143%	194%	139%
Refrigerator Recycling	82%	90%	71%	71%	71%	71%	65%	57%
Residential Saver's Switch	415%	97%	470%	33%	470%	33%	43%	36%
School Education Kits	542%	83%	147%	115%	147%	115%	223%	219%
Residential Segment Total	313%	92%	172%	126%	172%	126%	137%	119%
Business Segment								
Business Comprehensive	407%	120%	203%	109%	203%	109%	107%	71%
Interruptible Credit Option	0%	7%	0%	0%	0%	0%	0%	0%
Saver's Switch for Business	590%	114%	494%	187%	494%	187%	47%	33%
Business Segment Total	434%	118%	157%	109%	157%	109%	104%	70%
Planning & Research Segment								
Consumer Education		115%						
Market Research		65%						
Measurement & Verification		168%						
Planning & Administration		111%						
Product Development		35%						
Planning & Research Segment Total		88%						
2015 TOTAL	314%	101%	165%	118%	165%	118%	117%	92%

As shown in Tables 1 and 2 (above), SPS met or exceeded most of its program forecasts for 2015. Notably, SPS exceeded its energy and demand savings forecasts while remaining within its Commission-approved funding level. While program performance varied, the reasons for which are discussed further in Section III of this report, the majority of programs were within 25% of their budgets. The Home Energy Services and Home Lighting programs far exceeded their savings forecasts. SPS also controlled its indirect spending costs primarily by focusing its spending on the Consumer Education program that improves customer awareness and education.

Section II: 17.7.2.14 NMAC Reporting Requirements

17.7.2.14.C NMAC requires that annual reports include specific details on the programs offered during the report year. Specifically, 17.7.2.14.C states:

C. Annual reports shall include the following for each measure and program:
(1) documentation of program expenditures;
(2) estimated and actual customer participation levels;
(3) estimated and actual energy savings;
(4) estimated and actual demand savings;
(5) estimated and actual monetary costs of the public utility;
(6) estimated and actual avoided monetary costs of the public utility;
(7) an evaluation of its cost-effectiveness; and
(8) an evaluation of the cost-effectiveness and pay-back periods of self-directed programs.

In addition, 17.7.2.14.D NMAC requires that the annual report also include:

(1) the most recent M&V report of the independent program evaluator, which includes documentation, at both the portfolio and individual program levels, of expenditures, savings, and cost-effectiveness of all energy efficiency measures and programs and load management measures and programs, expenditures, savings and cost-effectiveness of all self-direct programs, and all assumptions used by the evaluator;
(2) a listing of each measure or program expenditure not covered by the independent measurement and verification report and related justification as to why the evaluation was not performed;
(3) a comparison of estimated energy savings, demand savings, monetary costs, and avoided monetary costs to actual energy savings, demand savings, actual monetary costs, and avoided monetary costs for each of the utility's approved measure or programs by year;
(4) a listing of the number of program participants served for each of the utility's approved measures of programs by year;
(5) a listing of the calculated economic benefits for each of the utility's approved measures or programs by year;
(6) information on the number of customers applying for and participating in self-direct programs, the number of customers applying for and receiving exemptions, measurement and verification of self-direct program targets, payback periods and achievements, customer expenditures on qualifying projects, oversight expenses incurred by the utility representative or administrator; and
(7) any other information required by the commission.

The following table provides direction as to where the supporting data and narratives for each of these requirements can be found in this report.

Table 3: Location of Reporting Requirements

Reporting Requirement	Location in Annual Report
17.7.2.14.C(1)	Table 2
17.7.2.14.C(2)	Table 2
17.7.2.14.C(3)	Table 2
17.7.2.14.C(4)	Table 2
17.7.2.14.C(5)	Table 2
17.7.2.14.C(6)	Table 2
17.7.2.14.C(7)	Table 2
17.7.2.14.C(8)	N/A
17.7.2.14.D(1)	Appendix A
17.7.2.14.D(2)	Appendix A and Section III
17.7.2.14.D(3)	Table 2
17.7.2.14.D(4)	Table 2
17.7.2.14.D(5)	Table 2
17.7.2.14.D(6)	N/A
17.7.2.14.D(7)	N/A

Section III: Segment and Program Descriptions

Residential Segment

SPS has approximately 95,000 customers in its Residential Segment in New Mexico. The service area is relatively rural, with only a few small cities, including Clovis, Roswell, Artesia, Carlsbad, Portales, and Hobbs.

In 2015, SPS offered seven residential programs with opportunities for all residential customers, including low-income customers, to participate. In total, SPS spent $4,857,419 on these programs and achieved 6,020 kW and 19,460,477 kWh net savings at the customer level.

Overall, the Residential Segment of programs was cost-effective with a UCT of 2.28. The segment achieved 119% of the annual kWh goal with significant contributions from the Home Lighting and Home Energy Services programs. All of the programs under the Residential Segment are discussed in more detail below.

Energy Feedback Pilot

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

In late June 2015, the Energy Feedback Pilot participation was expanded with the addition of approximately 4,900 new customers ("Refill Group"). For the period January through June, program participation averaged 11,700 customers ("Legacy Group") and for period July through December total participation for both the Legacy and the Refill Groups averaged 15,900 customers. Legacy Group participants received a Home Energy Report four times in 2015, while the New Group received five reports. Each report provides information on the customer's energy usage and benchmarks their energy consumption behavior with that of 100 similar customers.

Table 4: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Energy Feedback Pilot	20,334	13,565	$ 202,863	$ 272,876	649	916	2,412,165	3,669,295	1.03

Deviations from Goal
The Energy Feedback Pilot did not achieve its estimated savings impact goals in 2015, yet it was still cost-effective under the UCT. The program fell short of its goals for several reasons. Participants in the Legacy Group saved a lower than expected amount of energy. This decline was attributed in part to a reduction in the number of reports provided to this group, which had been reduced from six in 2014 to four in 2015. Additionally, average monthly energy savings for the 4,900 participants in the Refill Group was much lower than the Legacy Group. This was attributed to several factors including the short time frame in which reports were received and the small size of this group. Energy and demand program savings were lower than forecast due to natural attrition in the program, which is primarily the result of customers moving from their homes. Thirty-nine customers elected to opt-out of the program, which was significantly lower than 2014 when eighty-four customers elected to opt-out.

Changes in 2015
Approximately 4,900 new participants (Refill Group) were added starting in July.

Evaporative Cooling

The Evaporative Cooling Program provides a cash rebate to electric customers who purchase and permanently install high-efficiency evaporative cooling equipment for residential use in New Mexico. A $700 rebate is offered for Premium System units with a minimum media saturation[2] effectiveness of 85%, a remote thermostat, and a periodic purge water control.

Table 5: 2014 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Evaporative Cooling	2	385	$ 102,049	$ 316,011	3	334	4,462	173,444	0.11

Deviations from Goal
In 2015, SPS spent less than 75% of its forecasted budget primarily due to lack of participation in the program. However, SPS continued to conduct outreach, including on-line media ads, bill inserts, and radio ads. Weaker than expected participation is likely attributable to the following issues:

1. The elimination of Tier 1 Evaporative Coolers through M&V;
2. The HVAC contractor community tends to recommend central air conditioning over evaporative cooling;
3. Homeowner's Associations place restrictions on roof-mounted evaporative coolers;
4. New home construction uses refrigerated air systems, which makes retrofitting for evaporative coolers costly and technically difficult; and
5. Premium systems are not stocked by any retailers or contractors in the service territory.

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

In an effort to increase participation in 2016, SPS plans to:

- utilize available marketing and advertising dollars;
- continue trade incentives;
- meet with local distributors that stock the Tier 2 units; and
- coordinate with local retailers to further increase participation.

Changes in 2015
None.

Home Energy Services

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

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

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

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

Table 6: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Home Energy Services: Residential & Low Income	2,426	1,300	$ 1,825,926	$ 2,122,310	545	380	4,210,226	2,260,600	2.02

Deviations from Goal
The Home Energy Services program exceeded its participation and energy savings goals for 2015. The program was also highly cost-effective. SPS attributes this to an increased emphasis on multi-family facilities by new contractors in the program. Additionally, 569 income-qualified customers received a free energy savings kit. SPS spent $715,514 on the Low Income portion of the program, which is approximately 7% of the total portfolio spend and in excess of the minimum requirement. The Residential portion of the program also performed well, reaching 1,183 customers and achieving savings of 3,236,751 customer kWh.

Changes in 2015
None.

Home Lighting and Recycling

The Home Lighting and Recycling Program helps customers save energy and money by offering energy efficient compact fluorescent light ("CFL") and light emitting diode ("LED") bulbs at discounted prices at participating retailers. SPS works with retailers and manufacturers to buy down the prices of bulbs. The price of a general purpose CFL bulb is bought down to approximately $1.00 each. LED bulbs receive a buy down discount up to $5 but unit prices vary. This provides an inexpensive way for customers to reduce their energy usage and impact on the environment.

SPS marketed the program extensively through a variety of advertising and promotions, including television, radio, on-line, publications, bill inserts, community events, and point of purchase displays. Some of the specific promotions included:

- SPS participated in many community events and implemented bulb giveaways at the Eastern New Mexico State Fair and the Clovis Christmas Lights Parade.
- SPS continued to partner with Domino's Pizza to deliver free energy efficient bulbs with each pizza order for a limited time period. This was a unique promotion in that it delivered bulbs directly to customers' homes and was an extremely low-cost way to reach consumers.
- SPS leveraged the Refrigerator Recycling program and installed CFLs in customers' homes during the Refrigerator Recycling visit.
- SPS used GreenWorks (a local contractor) to install CFLs in customers' homes; this tactic focused on reaching income-qualified customers.

Table 7: 2015 Program Achievements[3]

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Home Lighting & Recyling	266,998	7,900	$ 1,934,414	$ 1,733,175	1,583	1,134	11,671,787	8,161,008	3.02

[3] In its report, the Independent Evaluator recorded the total number of measures issued through the program. SPS does not forecast the number of measures in its plans, only the number of forecasted participants.

Deviations from Goal
In 2015, the Home Lighting and Recycling Program exceeded its energy savings goals. A large part of this success can be attributed to the increased promotional efforts in the community. SPS made the promotion of LED bulbs a focus of its 2015 program and will continue to increase this promotion in the future.

Changes in 2015
In 2015, the Domino's promotion offered LED bulbs rather than CFLs.

Refrigerator Recycling

The Refrigerator Recycling Product is designed to decrease the number of inefficient secondary refrigerators, primary refrigerators, and freezers in residential households. The product reduces energy usage by allowing customers to dispose of their operable, inefficient appliances in an environmentally safe and convenient manner. Customers receive a $50 incentive and free pick up and recycling of their old freezer or refrigerator. This product is primarily marketed by bill inserts, direct mailers, radio, and on-line/social media efforts.

Table 8: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Refrigerator Recycling	530	650	$ 150,914	$ 167,203	38	54	360,262	506,735	0.78

Deviations from Goal
Despite significant outreach efforts, the Refrigerator Recycling Product did not achieve its energy savings goal in 2015. Outreach efforts included direct mailers, print advertising, bill inserts and a promotional incentive during the second half of the year. More than 75% of the program participation was achieved while the promotional incentive was offered.

Changes in 2015
None.

Residential Saver's Switch

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

When the program is activated, a control signal is sent to interrupt the air conditioning load during peak periods, typically in the afternoons on weekdays. For air conditioners, SPS utilizes a cycling strategy to achieve a 50% reduction in load. For enrolled electric water heaters, the entire load is shed for the duration of the control period. Due to limitations in available over-the-air control systems, the program is currently available only in the cities of Portales, Hobbs, Clovis, Roswell, Artesia, and Carlsbad.

The 2015 program year was the fifth operational year for the Saver's Switch program. In 2015, there were only two control events; each activated half the Saver's Switch population.

Table 9: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Residential Saver's Switch	3,926	945	$ 522,406	$ 540,799	3,184	678	7,091	21,600	1.02

Deviations from Goal
While the program received approximately 1,600 new program signups, about half of those did not materialize into installations as customers later changed their minds, had ineligible equipment, or had AC units that were not up to code. As a result, the program did not reach its installation target and did not spend its full budget for the year.

Changes in 2015
None.

School Education Kits

The School Education Kits program provides classroom and in-home activities that enable students and parents to install energy efficiency and water conservation products in their homes. The program is targeted at fifth grade students. A third-party contractor fully implemented the School Education Kits program, including recruiting and training teachers, providing all materials, and tracking participation by schools and teachers. Energy savings are based on the number of measures that are installed in the homes of the students. Students complete surveys to determine the measure installation rates.

Table 10: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
School Education Kits	13,560	2,500	$ 118,847	$ 146,064	17	12	794,484	691,054	5.72

Deviations from Goal
The product exceeded its savings goals for 2015 by providing more kits than originally anticipated while coming in under budget. The program continues to be very popular with teachers in the SPS service territory. More than 95% of the teachers continue to participate in the program each year it is offered.

Changes in 2015
SPS added a bathroom aerator in the student kits.

Business Segment

SPS's Business Segment in New Mexico consists of nearly 23,000 commercial, industrial, and agricultural customer premises. In 2015, SPS offered three business programs with opportunities for all commercial and industrial customers to participate.

In total, SPS spent $4,484,847 on these programs and achieved 4,696 kW and 15,764,719 kWh savings at the net customer level.

Overall, the Business Segment of programs was cost-effective with a UCT of 2.87. Achievements were 109% of the annual kWh goal. All of the programs under the Business Segment are discussed in more detail below.

Business Comprehensive

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

Table 11: 2014 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Business Comprehensive	1,808	444	$ 4,298,075	$ 3,586,753	4,312	2,120	15,763,755	14,419,374	2.98

Deviations from Goal

The Business Comprehensive program achieved 109% of its savings goal, which was 73% greater than in 2014. The program also enjoyed a greater breadth of participation, as non-energy sector customers represented more than two-thirds of the product's savings. Schools, municipalities, and hospitals were strong performers. Projects for various small businesses and large natural gas midstream operators also helped to offset a sharp decline in participation among oil producers.

Program expenditures were substantially driven by SPS's third and fourth quarter bonus, which helped accelerate project installation schedules.

Changes in 2015

SPS introduced Building Tune-Up as an indirect product to provide recommissioning studies to discover and prompt installation of measures and drive participation in other products.

The Lighting Efficiency program updated rebate levels and added the DesignLights Consortium's qualified product list requirement for LED products that are not certified by ENGERY STAR. The Lighting Efficiency program also added new prescriptive retrofit rebates for LED wall packs, LED screw-in down light retrofit kit, bi-level stairwell fixtures with integrated sensors, LED parking garage fixtures, and fluorescent delamping rebates.

For customers with electric water heating systems, SPS introduced the direct installation of flow control aerators for restroom and kitchen faucets and kitchen pre-rinse spray valves.

Interruptible Credit Option

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

Table 12: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Interruptible Credit Option	0	2	$ 2,470	$ 37,495	0	789	0	7,000	0.00

Deviations from Goal
The ICO programs did not have any participants during 2015. The ICO program is best suited for SPS's largest customers, most of whom are in the oil and gas industries. Due to the current economic conditions, most of these large customers have not seen a benefit to the program as they either continue production or cease operations entirely due to depressed market prices. SPS had conversations with some customers about participation which will continue in 2016 as economic conditions evolve.

Changes in 2015:
None.

Saver's Switch for Business

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

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

The 2015 program year was the fifth operational year for the Saver's Switch program. In 2015, there were only two control events; each activated half of the Saver's Switch population.

Table 12: 2015 Program Achievements

Program	Actual Participants	Forecasted Participants	Actual Spend	Budgeted Spend	Peak Demand Savings kW (Net Customer)	Peak Demand Goal kW (Net Customer)	Annual Energy Savings kWh (Net Customer)	Energy Savings Goal kWh (Net Customer)	Utility Cost Test
Saver's Switch for Business	484	82	$ 184,302	$ 162,144	385	78	964	517	0.33

Deviations from Goal
Similar to the Residential Saver's Switch program, this Business program struggled with switch installations. More than half of the customers who sign up for the program ended up not having a switch installed due to changing their minds or having ineligible equipment.

Changes in 2015
None.

Planning & Research Segment

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

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

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

Consumer Education

Consumer Education is an indirect program that focuses primarily on creating public awareness of energy efficiency while providing residential customers with information on what they can do in their daily lives to reduce their energy usage. The program also supports the various energy efficiency and load management products. SPS employs a variety of resources and channels to communicate conservation and energy efficiency messages, including: the Xcel Energy Inc. ("Xcel Energy") website, community outreach events, customer feedback surveys, social media channels, digital kiosks, public library partnerships, and seasonal bill inserts.

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

- web presence on xcelenergy.com;
- social media (Facebook, Twitter, blogs, etc.)
- digital kiosks featuring "How to" energy efficiency videos;
- Power Check meters and materials placed in public libraries;
- community-based marketing events;
- sponsorship of community events supporting residential conservation and energy efficiency;
- customer feedback surveys and customized post-event emails following outreach events;
- targeted communications to address seasonal usage challenges;
- conservation messaging through newsletters and bill inserts to residential customers; and
- publication of reference education materials (in English and Spanish).

Deviations from Goal
None.

Changes in 2015
None.

Planning & Administration

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

In 2015, SPS worked with the parties to its 2016 Plan to agree to settlement. SPS received approval of this Plan on December 23, 2015.

Deviations from Goal
None.

Changes in 2015
None.

Market Research

The Market Research group spearheads energy efficiency-related research efforts that are used to inform SPS's decision-making concerning energy efficiency and load management. In 2015, the Market Research group oversaw the SPS portion of several Xcel Energy-wide projects such as the Awareness, Attitude & Usage Study, E-Source Membership, and the Dun & Bradstreet list purchase.

Deviations from Goal
SPS spent less than the forecasted budget due to negotiated cost savings and the restructuring of the Company's Dun & Bradstreet list purchase contract.

Changes in 2015
None.

Measurement & Verification

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

17.7.2.14.D(1) NMAC requires that utilities submit the most recent M&V Report conducted by the approved Evaluator with its Annual Report. All New Mexico utilities have contracted with ADM Associates, Inc. as their Evaluator for 2015 programs. The 2015 M&V Report is provided as Appendix A of this document. In compliance with the reporting requirements, the 2015 M&V Report includes:

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

Deviations from Goal
SPS spent more than the forecasted budget due to an update to the Technical Reference Manual in 2015.

Changes in 2015
The independent evaluator, in concert with another third-party contractor, developed an update to the New Mexico Technical Reference Manual for use in future program years. Costs for this effort were captured under the Measurement and Verification program.

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 SPS staff. These ideas are then carefully screened and only ideas with the most potential are selected for the development process.

Deviations from Goal
SPS spent less than the forecasted budget due to a temporary reduction in staff availability and lower than expected consulting costs.

Changes in 2015
At the suggestion of SPS's third-party implementer for its Business Comprehensive program, SPS added two new measures (low-flow aerators and pre-rinse valves) to the program. These measures are directly installed at the customer's premise, providing immediate and cost-effective savings at no additional cost to the customer. The planning assumptions used for these measures reflect the deemed savings from the New Mexico Technical Reference Manual ("TRM").

Section IV: Compliance with Stipulation Agreement in Case No. 13-00286-UT

Paragraph (m) of Section 1.2 of the Stipulation Agreement requires that SPS provide the value of incentives issued in 2015 by rate class. The following table provides the value of incentives by rate class for programs in which participants rate classes are tracked. This list includes the Business Comprehensive (excluding Computer Efficiency measures), Saver's Switch for Business, Home Energy Services – Residential and Low-Income (excluding Low-Income lighting giveaways), Residential Saver's Switch, Refrigerator Recycling, and Evaporative Cooling programs. Other programs, such as Home Lighting, do not track participants by rate class due to the nature of the incentive process. Excluded programs include Home Lighting and Recycling, School Education Kits, and Energy Feedback Pilot (no incentives provided).

Table 13: 2015 Incentives by Rate Class

Program & Rate Class		Rebate Amount
Business Comprehensive: Lighting Efficienc	**$**	**154,432**
Large General - Trans	$	1,658
Large Muni & School Serv	$	19,935
Primary General Serv	$	2,615
Residential General Serv	$	2,110
Secondary General Serv	$	121,450
Small General Serv	$	6,185
Small Muni & School Serv	$	480
Business Comprehensive: Motors & Drives	**$**	**549,670**
Irrigation Power Serv	$	13,520
Large General - Trans	$	20,465
Large Muni & School Serv	$	13,500
Primary General Serv	$	206,545
Secondary General Serv	$	81,660
(blank)	$	213,980
Business Comprehensive: Cooling Efficienc	**$**	**139,592**
Large Muni & School Serv	$	44,416
Primary General Serv	$	14,962
Residential General Serv	$	4,400
Secondary General Serv	$	66,230
Small General Serv	$	9,584
Custom Efficiency - NM	$	1,233,190
Large General - Trans	$	166,386
Large Muni & School Serv	$	571,971
Primary General Serv	$	99,721
Secondary General Serv	$	285,388
Small General Serv	$	30,644
Small Muni & School Serv	$	79,080
Evaporative Cooling	**$**	**900**
Residential General Serv	$	900
Home Energy Services: Residential	**$**	**513,381**
Residential General Serv	$	155,223
Residential Heating Serv	$	351,352
Secondary General Serv	$	931
Small General Serv	$	5,399
(blank)	$	476
Home Energy Services: Low-Income	**$**	**314,900**
Residential General Serv	$	144,470
Residential Heating Serv	$	168,079
Secondary General Serv	$	1,213
Small General Serv	$	778
Small Muni & School Serv	$	361
Home Energy Services: Low-Income EE Kits	**$**	**6,422**
Residential General Serv	$	4,565
Residential Heating Serv	$	1,822
Small General Serv	$	11
(blank)	$	23
Refrigerator Recycling	**$**	**26,500**
Residential General Serv	$	15,250
Residential Heating Serv	$	11,150
Small General Serv	$	100
Residential Saver's Switch	**$**	**-**
Residential General Serv	$	-
Residential Heating Serv	$	-
Small General Serv	$	-
Saver's Switch for Business	**$**	**25**
Secondary General Serv	$	-
Small General Serv	$	-
(blank)	$	25
Total	**$**	**1,705,822**

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Appendix A: Measurement & Verification Report:

SPS 2015 Program Year

Provided by ADM Associates, Inc., April 2016

Southwestern Public Service Company DSM Portfolio Program Year 2015

Prepared for:

Xcel Energy

April 2016

Final

Prepared by:

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1. Executive Summary

This report is to provide a summary of the evaluation effort of the 2014 Demand Side Management (DSM) portfolio by the Southwestern Public Service Company (SPS, a division of Xcel Energy).

1.1 Summary of SPS Energy Efficiency Programs

New Mexico Investor-Owned Utilities (IOUs) are required to develop cost-effective DSM programs, using ratepayer funds to reduce energy demand and consumption. IOUs submit their portfolios to the New Mexico Public Regulatory Commission (NMPRC) for approval. In 2015, the SPS DSM portfolio contained the following programs:

- Residential Evaporative Cooling
- Residential Home Energy Services
- Low Income Home Energy Services;
- Energy Feedback Pilot
- Home Lighting & Recycling
- School Education Kits
- Residential Refrigerator Recycling
- Business Comprehensive
- Large Customer Self-Direct[4]
- Residential Saver's Switch
- Business Saver's Switch
- Interruptible Credit Option[5]

For 2015, ADM Associates, Inc. (the Evaluators) evaluated a subset of the portfolio. The programs evaluated for this program year include:

- Business Comprehensive;
- Energy Feedback Pilot;
- Residential Saver's Switch; and
- Business Saver's Switch.

[4] No participants in 2015
[5] No participants in 2015

1.2 Evaluation Objectives

The objectives of this evaluation include:

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

1.3 Summary of Findings

Gross savings were estimated by engineering analysis, simulation modeling, participant surveying, and on-site monitoring where appropriate for the program and measure type. The Evaluators then estimated free-ridership and associated net-to-gross ratios (NTGRs) for the evaluated programs Table 1-1 and 1-2 below present the gross and net impact by program[6]. It should be noted that these tables include both evaluated and non-evaluated programs. Non-evaluated programs are shown as having 100% gross and net realization rates.

[6] Savings in Table 1-1 and Table 1-2 both reflect customer kWh savings; no line-losses are included in these values.

Table 1-1 Gross Impact Summary

Program	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Lifetime Energy Savings (kWh)		Gross Realization Rate
	Expected	Realized	Expected	Realized	Expected	Realized	
Home Energy Services	401.5	401.5	3,069,692	3,069,692	54,732,608	50,901,333	100.0%
Home Lighting	1,874.40	1,874.40	13,819,486	13,819,486	107,038,964	107,038,964	100.0%
Business Comprehensive	2,970.90	2,385.60	15,186,217	18,318,467	205,013,930	247,299,305	120.6%
Energy Feedback Pilot	401	649.29	2,336,122	2,412,165	2,336,122	2,412,165	103.3%
Evaporative Cooling Rebates	5.2	5.2	6,761	6,761	101,415	101,415	100.0%
Low Income Home Energy Services	171.7	171.7	1,355,412	1,355,412	19,246,850	19,246,850	100.0%
Refrigerator Recycling	56.6	56.6	535,309	535,309	2,676,545	2,676,545	100.0%
School Education Kits	35.3	35.3	1,624,283	1,624,283	154,631,747	15,463,175	100.0%
Total	5,916.60	4,930.30	37,933,282	41,141,575	545,778,181	445,139,752	108.5%

Table 1-2 Net Impact Summary

Program	Peak Demand Savings (kW)		Annual Energy Savings, (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Expected	Realized	Expected	Realized	Expected	Realized	
Home Energy Services	373.4	373.4	2,854,814	2,854,814	47,338,247	47,338,247	100.0%
Home Lighting	1,583.10	1,583.10	11,671,787	11,671,787	90,403,940	90,403,940	100.0%
Business Comprehensive	4,067.60	1,957.20	14,441,664	15,763,755	206,914,647	226,335,516	109.2%
Energy Feedback Pilot	401	649.29	2,336,122	2,412,165	2,336,122	2,412,165	103.3%
Evaporative Cooling Rebates	3.4	3.4	4,462	4,462	66,934	66,934	100.0%
Low Income Home Energy Services	171.7	171.7	1,355,412	1,355,412	19,246,850	19,246,850	100.0%
Refrigerator Recycling	38.1	38.1	360,262	360,262	1,801,312	1,801,312	100.0%
School Education Kits	17.2	17.2	794,484	794,484	7,563,488	7,563,488	100.0%
Total	6,655.50	4,793.39	33,819,007	35,217,141	375,671,540	395,168,452	104.1%

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

Table 1-3 Saver's Switch Evaluation Results

Sector	Peak kW Factor	# Units	Available Demand Reduction	kWh Savings
Residential	0.811	3,926	3,183.99	7,091
Business	0.795	484	384.78	964
Total	0.809	4,410	3,568.77	8,055

Finally, the Evaluators estimated cost-effectiveness of the 2015 programs and overall portfolio using the Total Resource Cost (TRC) test and Utility Cost (UCT) test. The results are provided in Table 1-4[7].

Table 1-4 Cost Effectiveness Testing by Program

Program	NPV of TRC Benefits	NPV of UCT Benefits	NPV of TRC Costs	NPV of UCT Costs	TRC	UCT
Home Energy Services (Res & LI)	$3,695,627	$3,695,627	$1,863,831	$1,825,926	1.98	2.02
Home Lighting	$5,837,115	$5,837,115	$2,699,116	$1,934,414	2.16	3.02
Business Comprehensive	$12,806,496	$12,806,496	$6,576,940	$4,298,075	1.95	2.98
Energy Feedback Pilot	$206,678	$208,678	$202,863	$202,863	1.02	1.02
Evaporative Cooling	$11,247	$11,247	$101,280	$102,049	0.11	0.11
Refrigerator Recycling	$118,040	$118,040	$104,589	$150,914	1.13	0.78
School Education Kits	$679,908	$679,908	$101,338	$118,848	6.71	5.72
Residential Saver's Switch	$531,946	$531,946	$359,463	$522,406	1.48	1.02
Business Saver's Switch	$61,546	$61,546	$138,285	$184,302	0.45	0.33
Interruptible Credit Option	$0	$0	$2,470	$2,470	0.0	0.0
Consumer Education	$0	$0	$219,766	$219,766	0.0	0.0
Market Research	$0	$0	$36,978	$36,978	0.0	0.0
Measurement & Verification	$0	$0	$41,656	$41,656	0.0	0.0
Planning & Administration	$0	$0	$304,195	$304,195	0.0	0.0
Product Development	$0	$0	$80,804	$80,804	0.0	0.0
Total:	$23,948,603	$23,950,603	$12,833,574	$10,025,666	1.87	2.39

1.4 Conclusions

1.4.1 Business Comprehensive

- **Performance has returned to historic levels.** After a 46% decline in verified net savings in 2014 compared to 2013, savings have increased back to historic norms in 2015.

[7] Benefits calculations incorporate line losses for energy and demand; TRC and UCT scores reflect net-at-generator savings.

- **Industrial customers are interested in increased technical assistance.** Industrial customers that responded to the participant survey all indicated high interest in technical assistance in identifying projects.
- **Few issues noted by customers.** Most customers reported that they were satisfied with their experience with the program and few reported problems with different aspects of the participation process including completing and submitting application materials. Most participants who completed the application paperwork found it to be clear and few had issues getting the paperwork approved or receiving the incentive check. Additionally, assessments of the inspector performing inspections were positive.
- **Guest Room Energy Management continues to have measure retention concerns.** Similar to prior years, the Evaluators have found that GREM systems are often removed by Business Comprehensive participants.
- **Moving lighting projects to the custom channel has had mixed results.** The Evaluators found that the new program implementation contractor has been inclined to process lighting rebates under the Custom Efficiency channel. This has had mixed (though overall, positive) results. The increased use of the custom channel has significantly increased the extent of lighting optimization (incorporating delamping into more projects). However, the Evaluators found that in moving lighting projects to the custom channel, program implementation staff often entered custom hours that were not based on end-use metering and were based mores so on interviews with facility staff.

1.5 Recommendations

1.5.1 Residential & Business Saver's Switch

- **Move these programs to low priority for evaluation.** The Saver's Switch programs are small (combined 7.0% of total program budget), and in the last two years there has only been one full-system event. This event was run in 2015 to get a test data value due to their having been no events in 2014. Since Xcel only uses this program for emergency load reduction (and does not use it to generate demand reduction for capacity markets), EM&V of this program can be a lower priority and move to once per cycle. This would change if Xcel begins using the Saver's Switch system for capacity trading market bids.

1.5.2 Business Comprehensive

- **Consider ending program relationship with current GREM trade ally.** The Evaluators have found multiple projects over multiple program years from this trade ally that have resulted in removal of the installed equipment. This is not an issue seen elsewhere in New Mexico. The Evaluators conclude this is likely driven by the different installing contractor typically seen for Xcel projects, and Xcel should consider initiating probation or removal of this contractor from the program.

- **Only use custom hours if it can be supported by end-use metering.** The Evaluators found that many prescriptive-type projects used custom hours of operation based on interviews with facility staff. To the extent feasible, these projects should use NM TRM hours unless overridden by lighting runtime metering.

2. General Methodology

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

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

2.1 Glossary of Terminology

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

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

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

2.2 Overview of Methodology

The Evaluators' methodology in the evaluation of the 2015 SPS DSM Portfolio is intended to provide:

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

In doing so, this evaluation will provide the NMPRC with verified net savings results, provide the sponsoring utilities with recommendations for program improvement, and ensure cost-effective use of ratepayer funds.

2.3 Sampling

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

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

2.3.1 Census of Participants

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

2.3.2 Simple Random Sampling

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

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

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

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

Where,

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

CV = Coefficient of Variation

RP = Required Precision, 10% in this evaluation

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

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

Where

n_0 = Sample Required for Large Population

N = Size of Population

n = Corrected Sample

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

2.3.3 Stratified Random Sampling

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

For example, the 2015 SPS Business Comprehensive Program had a CV of 4.19 at year’s end. Using the base simple random sample function, this would call for a sample of 4,751. This program had 156 participating facilities, and as such, a finite population adjustment is needed. Adjusting for the population, the required simple random sample is 151, which would be prohibitively expensive.

To address this situation, we use a sample design for selecting projects for the M&V sample that takes such skewness into account. With this approach, we select a number of sites with large savings for the sample with certainty and take a random sample of the remaining sites. To further improve the precision, non-certainty sites are selected for the sample through systematic random sampling. That is, a random sample of sites remaining after the certainty sites have been selected is selected by ordering them according to the magnitude of their savings and using systematic random sampling. Sampling systematically from a list that is ordered according to the magnitude of savings ensures that any sample selected will have some units with high savings, some with moderate savings, and some with low savings. Samples cannot result that have concentrations of sites with atypically high savings or atypically low savings. As a result of this methodology, the required sample for this component of the Small Business Lighting program was reduced to 29, with one certainty stratum and 4 sample strata.

2.3.4 Free-Ridership

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

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

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

(3) Prior planning to purchase high efficiency equipment

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

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

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

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

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

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

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

NTGR = 1 – % Free-Ridership

2.4 Data Collection

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

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

2.4.1 Telephone Surveying

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

- Verification of installation of rebated equipment;
- Parameters used in gross savings calculations (room of installation for residential CFLs, whether a refrigerator was used indoors vs. outdoors, etc.);

- Data on decision-making to be used in determining program free-ridership; and
- Feedback from participants from their experiences with the program.

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

2.4.2 Onsite Surveys

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

2.5 Cost Effectiveness Testing

The Evaluators performed the Total Resource Cost (TRC) and Utility Cost (UCT) tests as part of the 2015 EM&V effort.

2.5.1 Total Resource Cost Test

The TRC value is defined as:

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

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

Table 2-1 Parameters for Cost-Effectiveness Testing

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

2.5.2 Utility Cost Test

The UCT test is defined as:

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

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

3. Residential Saver's Switch

3.1 Program Description

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

3.2 M&V Methodology

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

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

Where,

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

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

This is then translated to the entire population. What comes from these two methodologies is an "availability analysis", in which the in-season performance is multiplied by the number of installations at the end of the 2015 program year. This provides estimates of the value of the resource developed by the program implementation staff.

3.3 Impact Evaluation Results

Table 3-1 and Table 3-2 summarize the kW load during the test event for each of the two groups. Differences are shown only for hours that occur either during the event or during the two-hour snapback period after. The peak reduction used as program kW factor is highlighted.

Table 3-1 Residential Group A Event Performance

Hour	Baseline	Adjusted Baseline	Event kW	Difference
0:00	0.476	0.460	0.592	
1:00	0.399	0.386	0.385	
2:00	0.307	0.297	0.352	
3:00	0.303	0.294	0.328	
4:00	0.228	0.220	0.204	
5:00	0.190	0.184	0.219	
6:00	0.183	0.177	0.148	
7:00	0.289	0.279	0.336	
8:00	0.446	0.432	0.492	
9:00	0.567	0.549	0.704	
10:00	0.900	0.871	1.123	
11:00	1.229	1.190	1.451	
12:00	1.657	1.604	1.964	
13:00	2.000	1.935	2.243	
14:00	2.242	2.169	2.169	
15:00	2.331	2.256	1.639	0.616
16:00	2.350	2.274	1.880	0.394
17:00	2.336	2.261	2.574	-0.314
18:00	2.289	2.215	2.427	-0.212
19:00	1.985	1.921	1.991	
20:00	1.550	1.500	1.709	
21:00	1.123	1.087	1.201	
22:00	0.899	0.870	0.987	
23:00	0.734	0.710	0.801	

Table 3-2 Residential Group B Event Performance

Hour	***Baseline***	***Adjusted Baseline***	***Event kW***	***Difference***
0:00	0.76	0.82	0.80	
1:00	0.70	0.74	0.80	
2:00	0.60	0.64	0.62	
3:00	0.54	0.58	0.58	
4:00	0.45	0.49	0.51	
5:00	0.48	0.51	0.48	
6:00	0.45	0.48	0.49	
7:00	0.51	0.55	0.54	
8:00	0.60	0.64	0.73	
9:00	0.84	0.90	0.86	
10:00	1.04	1.11	1.10	
11:00	1.36	1.46	1.46	
12:00	1.57	1.68	1.82	
13:00	1.95	2.08	2.19	
14:00	2.05	2.19	2.25	
15:00	2.20	2.36	2.36	
16:00	2.22	2.37	1.91	
17:00	2.10	2.25	1.44	0.811
18:00	1.95	2.09	1.86	0.233
19:00	1.75	1.88	2.21	-0.336
20:00	1.47	1.57	1.74	-0.172
21:00	1.34	1.44	1.40	
22:00	1.12	1.19	1.18	
23:00	1.02	1.10	1.05	

Figure 3-1 and Figure 3-2 present the test event performance of the two curtailment groups. Group A (serial numbers ending with an odd digit) had anomalous performance due to load beginning to drop in the hour prior to the test event beginning. This behavior was not observed in Group B.

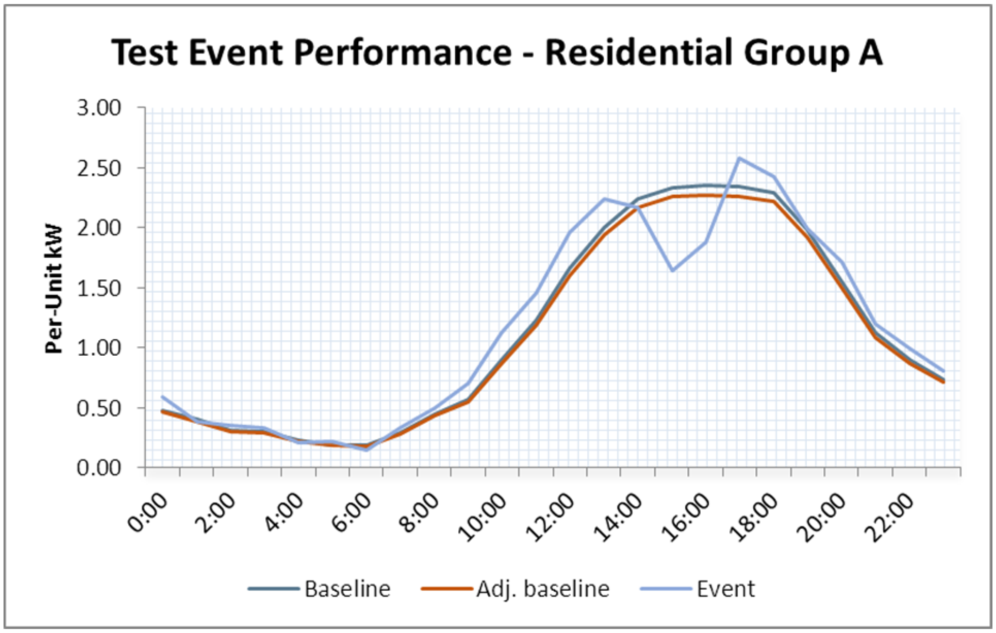

Figure 3-1 Test Event Performance – Residential Group – Odd Units

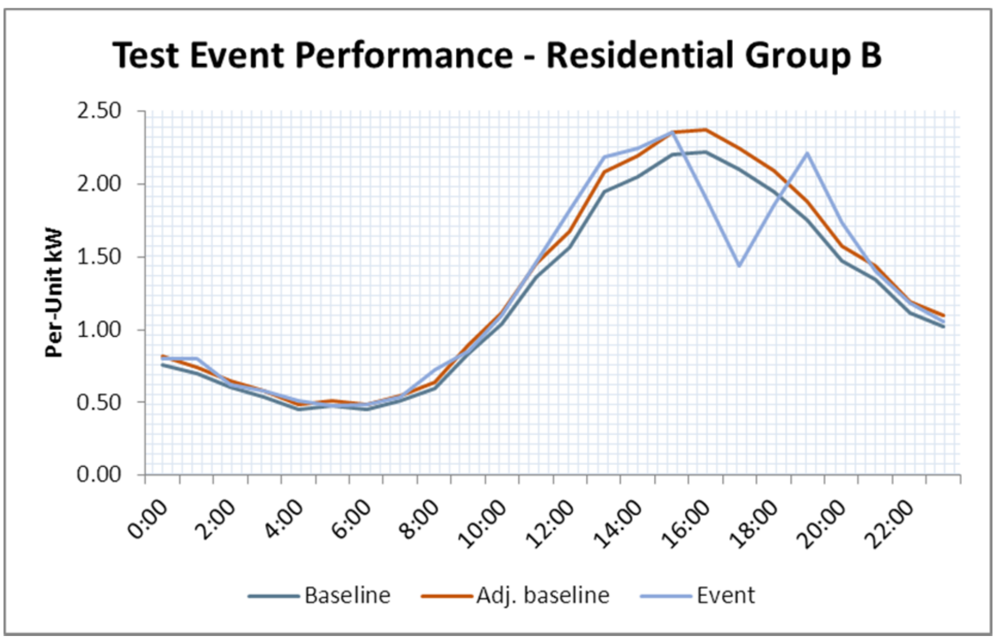

Figure 3-2 Test Event Performance – Residential Group – Even Units

The Evaluators credited the program with the highest achieved kW reduction in a group during this test event. This occurred from 5:00-6:00 PM in Group B. This resulted in a kW factor of .811 per unit.

- kW Factor: .811

- Unit count: 3,926 active switches
- Total system kW: 3,183.99
- Further, this test event provided 7,091 kWh savings.

4. Business Saver's Switch

4.1 Program Description

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

4.2 M&V Methodology

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

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

Where,

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

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

1) This is then translated to the entire population. What comes from these two methodologies is an "availability analysis", in which the in-season performance is multiplied by the number of installations at the end of the 2015 program year. This provides estimates of the value of the resource developed by the program implementation staff.

4.3 Impact Evaluation Results

Table 4-1 and Table 4-2summarize the kW load during the test event for each of the two groups. Differences are shown only for hours that occur either during the event or during the two-hour snapback period after. The peak reduction used as program kW factor is highlighted.

Table 4-1 Business Group A Event Performance

Hour	Baseline	Adjusted Baseline	Event kW	Difference
0:00	0.583	0.680	0.716	
1:00	0.383	0.447	0.623	
2:00	0.354	0.413	0.534	
3:00	0.252	0.294	0.518	
4:00	0.253	0.295	0.365	
5:00	0.559	0.653	0.712	
6:00	0.637	0.743	0.882	
7:00	0.763	0.889	0.954	
8:00	1.273	1.485	1.240	
9:00	1.490	1.737	1.992	
10:00	1.962	2.289	2.333	
11:00	2.238	2.610	2.397	
12:00	2.405	2.806	2.611	
13:00	2.318	2.704	2.704	
14:00	2.689	3.136	2.559	
15:00	2.773	3.235	2.439	0.795
16:00	2.712	3.163	2.479	0.685
17:00	2.549	2.974	2.811	0.163
18:00	2.109	2.460	2.112	0.348
19:00	1.681	1.961	1.469	
20:00	1.236	1.441	1.097	
21:00	0.984	1.148	0.663	
22:00	0.688	0.803	0.288	
23:00	0.590	0.688	0.181	

Table 4-2 Business Group B Event Performance

Hour	Baseline	Adjusted Baseline	Event kW	Difference
0:00	0.483	0.486	0.555	
1:00	0.442	0.444	0.501	
2:00	0.421	0.423	0.467	
3:00	0.358	0.359	0.433	
4:00	0.361	0.363	0.444	
5:00	0.313	0.314	0.461	
6:00	0.396	0.398	0.585	
7:00	0.917	0.922	1.294	
8:00	1.166	1.172	1.350	
9:00	1.347	1.354	1.535	
10:00	1.657	1.665	2.211	
11:00	1.886	1.895	2.416	
12:00	1.988	1.997	2.404	
13:00	2.172	2.183	2.583	
14:00	2.321	2.333	2.453	
15:00	2.433	2.445	2.445	
16:00	2.346	2.357	2.038	0.319
17:00	2.156	2.166	1.575	0.591
18:00	1.919	1.928	1.720	0.208
19:00	1.603	1.611	1.688	-0.077
20:00	1.271	1.277	1.400	
21:00	0.697	0.700	0.612	
22:00	0.616	0.619	0.484	
23:00	0.532	0.535	0.489	

Figure 4-1 and Figure 4-2 present the test event performance of the two curtailment groups.

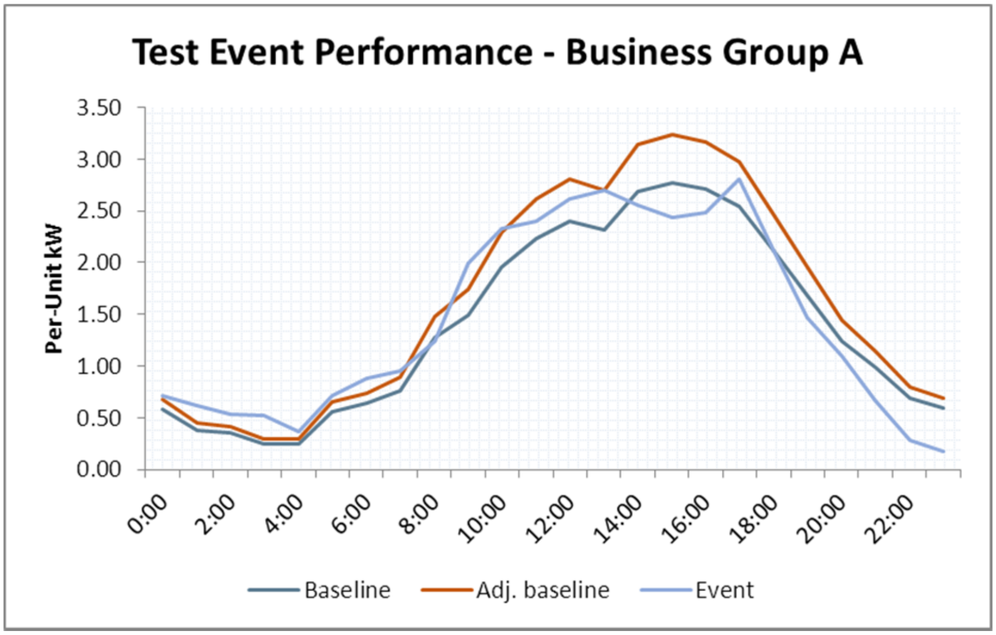

Figure 4-1 Test Event Performance – Business Group – Odd Units

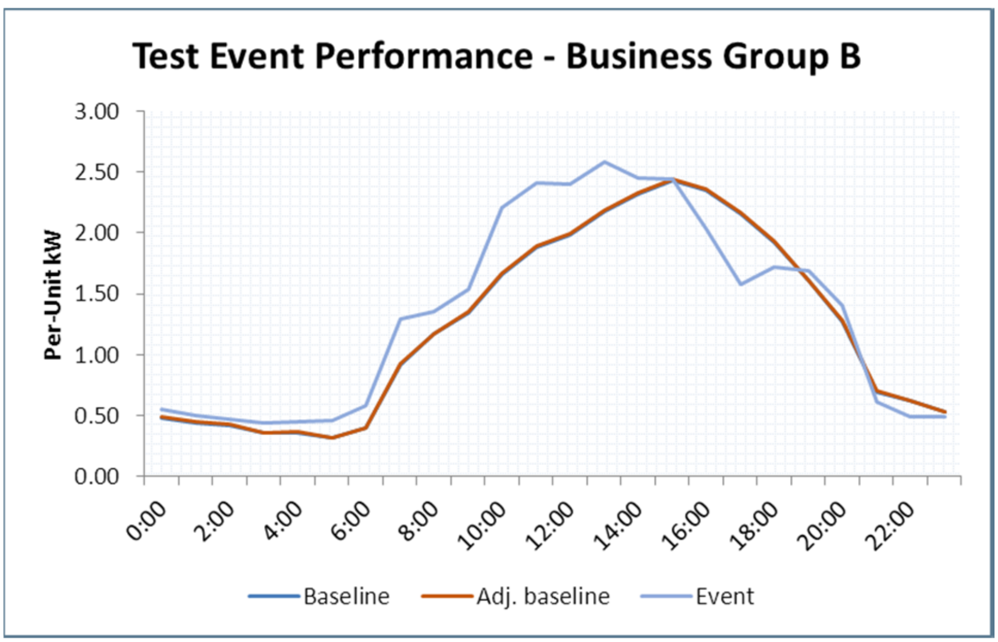

Figure 4-2 Test Event Performance – Business Group – Even Units

The Evaluators credited the program with the highest achieved kW reduction in a group during this test event. This occurred from 3:00-4:00 PM in Group A. This resulted in a kW factor of .811 per unit.

- kW Factor: .795
- Unit count: 484 active switches

- Total system kW: 384.78
- Further, this test event provided 964 kWh savings.

5. Energy Feedback Pilot

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

The program began with a first wave launched in March 2013. A second supplementary wave was launched in June 2015.

5.1 Control Group Validity Testing

In prior program years, the Evaluators tested the Wave 1 recipient and control group of the Energy Feedback Pilot program for statistically significant differences in the pre-delivery period in order to ensure the validity of the comparison. This testing examined the data for a statistical difference in mean kWh usage by month. Each month has a resulting T-Stat and p-Value to check for any difference. This analysis is repeated here for Wave 2. The resulting calculations are detailed in Table 5-1.

Table 5-1 Control Group Validity Testing Results – Wave 2

Baseline Month	Control kWh	Control Standard Error	Treatment kWh	Treatment Standard Error	T-Stat (Control - Trt)	PR >T
Jun 14	58.30	0.41	58.259	0.40	0.0698	0.9444
Jul 14	60.92	0.39	60.390	0.38	0.9825	0.3259
Aug 14	58.64	0.38	58.533	0.37	0.2022	0.8398
Sep 14	43.88	0.30	43.866	0.30	0.0424	0.9662
Oct 14	38.76	0.25	38.893	0.25	-0.3870	0.6987
Nov 14	64.31	0.38	64.067	0.39	0.4538	0.6500
Dec 14	78.19	0.57	78.675	0.60	-0.5893	0.5557
Jan 15	85.50	0.64	85.329	0.66	0.1900	0.8493
Feb 15	75.91	0.54	75.785	0.57	0.1590	0.8736
Mar 15	54.58	0.42	54.745	0.44	-0.2698	0.7873
Apr 15	39.17	0.27	39.422	0.30	-0.6204	0.5350
May 15	42.54	0.34	41.974	0.34	1.1904	0.2340

The control group was found to be valid at 95% confidence for all baseline months.

5.2 Data Cleaning Procedures

All screening procedures exist to reduce variability in the model and ensure an accurate savings estimate. The procedure to remove duplicate observations consists of checking for duplicate observations for each customer that appear on the same date, and ensuring only one of those observations remains. This does not remove any customers from the sample, but will remove observations as necessary. Further, Observations with abnormally short or long meter read cycles were filtered from the model. This procedure removed observations where the meter read length was less than 10 or greater than 70 days.

5.3 Regression Model Specification & Results

The Evaluators utilized a post-only model with pre-usage controls. Other model specifications were tested (including fixed effects), but the post-only model was found to provide the highest precision level in results. The model specification applied uses one year of pre-treatment data to construct control variables which capture the primary drivers of a household's energy use.

The model specification is as follows:

$$
\begin{aligned}
Usage_{it} = \alpha_0 + \beta * treatment_i \\
&+\alpha_1 * PreUsage_i \\
&+\alpha_2 * PreSummer_i \\
&+\alpha_3 * PreWinter_i \\
&+\gamma * mm_t \\
&+\delta_1 * mm_t * PreUsage_i \\
&+\delta_2 * mm_t * PreSummer_i \\
&+\delta_3 * mm_t * PreWinter_i \\
&+\varepsilon_{it}
\end{aligned}
$$

Where

- *i* denotes the *i*th customer
- *t* denotes the first, second, third, etc. month of the post-treatment period
- $Usage_{it}$ is the average daily use for read *t* for household *i* during the post-treatment period
- $PreUsage_i$ is the average daily usage across households *i's* available pre-treatment billing reads.
- $PreWinter_i$ is the average daily usage over the months of December January, February, and March over household *i's* available pre-treatment meter reads.
- $PreSummer_i$ is the average daily usage over the months of June, July, August, and September over household *i's* available pre-treatment meter reads.

- mm_t is a vector of month-year dummies

And parameter definitions are:

- α_0 is an intercept term
- α_1, α_2 , α_3 are effects of control variables $PreUsage_i$, $PreWinter_i$, $PreSummer_i$ on $Usage_{it}$ in the reference month.
- $\delta_1, \delta_2, \delta_3$ are the effect of the control variables in each month-year (mm_t) of the post period.
- ε_{it} is an error term.

The results of the regression model for Wave 1 and Wave 2 are listed in Table 5-2 and .Table 5-3 respectively.

Table 5-2 Regression Coefficients & Model Details - Wave 1

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	6.51482	0.4059	16.24	<.0001
AVG_PREUSAGE	0.53452	0.0282	23.24	<.0001
AVG_PREUSAGE_SUMMER	-0.20525	0.0154	-17.32	<.0001
AVG_PREUSAGE_WINTER	0.55185	0.0092	53.26	<.0001
TREATMENT	-0.41568	0.0715	-9.9	<.0001
Jan	-1.59795	0.5514	-1.05	0.2951
Feb	-2.81383	0.583	-2.92	0.0036
Mar	-2.13103	0.5626	-2.14	0.0324
Apr	-4.28027	0.554	-4.96	<.0001
May	-4.69873	0.74986	8.69	<.0001
Jun	-0.92835	0.05663	9.44	<.0001
Jul	2.06391	0.02845	-7.22	<.0001
Aug	2.23308	0.01832	30.12	<.0001
Sep	-0.42525	0.06873	-6.05	<.0001
Oct	-2.59859	0.83664	-1.91	0.0561
Nov	-0.14491	0.84175	-3.34	0.0008
Jan_Pre	0.10813	0.83329	-2.56	0.0105
Feb_Pre	0.41618	0.83248	-5.14	<.0001
Mar_Pre	-0.33859	0.83537	-5.62	<.0001
Apr_Pre	0.41562	0.83804	-1.11	0.268
May_Pre	0.49733	0.83342	2.48	0.0133
Jun_Pre	0.38078	0.83517	2.67	0.0075

Variable Description	*Regression Coefficient*	*Standard Error*	*T-Stat*	*PR > |T|*
Jul_Pre	0.18627	0.83275	-0.51	0.6096
Aug_Pre	-0.03963	0.83218	-3.12	0.0018
Sep_Pre	0.06445	0.83824	-0.17	0.8628
Oct_Pre	0.20404	0.06225	1.74	0.0824
Nov_Pre	0.4195	0.06245	6.66	<.0001
Jan_Summer_ Pre	-0.09409	0.06206	-5.46	<.0001
Feb_Summer_ Pre	-0.23159	0.06199	6.7	<.0001
Mar_Summer_ Pre	0.24592	0.06214	8	<.0001
Apr_Summer_ Pre	-0.00336	0.06233	6.11	<.0001
May_Summer_ Pre	0.09716	0.06202	3	0.0027
Jun_Summer_ Pre	0.38893	0.06214	-0.64	0.5236
Jul_Summer_ Pre	0.59017	0.062	1.04	0.2986
Aug_Summer_ Pre	0.67416	0.06196	3.29	0.001
Sep_Summer_ Pre	0.45624	0.06231	6.73	<.0001
Oct_Summer_ Pre	0.1211	0.03177	-2.96	0.0031
Nov_Summer_ Pre	-0.18066	0.03189	-7.26	<.0001
Jan_Winter_ Pre	0.16859	0.03165	7.77	<.0001
Feb_Winter_ Pre	-0.0502	0.03161	-0.11	0.9155
Mar_Winter_ Pre	-0.15172	0.0317	3.06	0.0022
Apr_Winter_ Pre	-0.66515	0.03181	12.23	<.0001
May_Winter_ Pre	-0.7681	0.03163	18.66	<.0001
Jun_Winter_ Pre	-0.8001	0.0317	21.27	<.0001
Jul_Winter_ Pre	-0.74813	0.03163	14.43	<.0001
Aug_Winter_ Pre	-0.67523	0.0316	3.83	0.0001
Sep_Winter_ Pre	-0.6817	0.0318	-5.68	<.0001
Oct_Winter_ Pre	-0.62742	0.02015	8.37	<.0001
Nov_Winter_ Pre	-0.35292	0.02023	-2.48	0.0131

Table 5-3 Regression Coefficients & Model Details - Wave 2

Variable Description	*Regression Coefficient*	*Standard Error*	*T-Stat*	*PR > |T|*
Intercept	5.27422	0.73094	7.22	<.0001
AVG_PREUSAGE	0.51974	0.04398	11.82	<.0001
AVG_PREUSAGE_SUMMER	-0.12152	0.02284	-5.32	<.0001
AVG_PREUSAGE_WINTER	0.69829	0.0153	45.64	<.0001
TREATMENT	-0.07535	0.16969	-0.44	0.657
Jun	-0.66432	1.01325	-0.66	0.5121
Jul	2.36849	1.00118	2.37	0.018
Aug	2.51264	1.00454	2.5	0.0124
Sep	-1.07249	0.9986	-1.07	0.2828
Oct	-2.22039	0.99766	-2.23	0.026
Nov	1.67982	1.01167	1.66	0.0968
Jun_Pre	0.289	0.06166	4.69	<.0001
Jul_Pre	0.26974	0.0608	4.44	<.0001
Aug_Pre	0.43011	0.06111	7.04	<.0001
Sep_Pre	0.5258	0.06076	8.65	<.0001
Oct_Pre	0.75087	0.06084	12.34	<.0001
Nov_Pre	-0.09147	0.06157	-1.49	0.1374
Jun_Summer_ Pre	0.49689	0.03191	15.57	<.0001
Jul_Summer_ Pre	0.58621	0.0315	18.61	<.0001
Aug_Summer_ Pre	0.46822	0.03164	14.8	<.0001
Sep_Summer_ Pre	0.27445	0.03147	8.72	<.0001
Oct_Summer_ Pre	-0.11865	0.03147	-3.77	0.0002
Nov_Summer_ Pre	0.07323	0.03191	2.29	0.0218
Jun_Winter_ Pre	-0.90103	0.02153	-41.86	<.0001
Jul_Winter_ Pre	-0.88456	0.02124	-41.64	<.0001
Aug_Winter_ Pre	-0.93081	0.02132	-43.65	<.0001
Sep_Winter_ Pre	-0.94784	0.02121	-44.69	<.0001
Oct_Winter_ Pre	-0.95084	0.02123	-44.78	<.0001
Nov_Winter_ Pre	-0.33608	0.02146	-15.66	<.0001

5.4 kWh Savings Results

The Evaluators were provided a summary of monthly opt-outs and active accounts for the EFP. Regression results from Table 5-2 and Table 5-3 were converted to kWh savings on a monthly basis using past savings load shapes and monthly recipient tallies. The resulting monthly savings are summarized in Table 5-4.

The Evaluators verified that the weighted average monthly participants by wave were as follows:

- Wave 1: 15,371
- Wave 2: 4,963

These program savings are summarized in Table 5-4.

Table 5-4 Energy Feedback Pilot Savings Summary

Group	***2015 kWh Savings (Per Participant)***	***2015 Participants***	***2015 Program kWh Savings***	***kW Savings***
Wave 1	151.72	15,371	2,332,137	627.75
Wave 2	27.5	4,963	80,028	21.54
Total	118.63	20,334	2,412,165	649.29

6. Business Comprehensive

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

6.1 Business Comprehensive Program

SPS' business portfolio was disaggregated into separate programs by measure category. Beginning in 2012, these programs were aggregated into Business Comprehensive. In 2014, Small Business Lighting was aggregated into Business Lighting, and no longer identified as a discrete program channel. As presently constituted, this aggregated the following programs:

6.1.1 Business Lighting Efficiency

SPS is offering the Lighting Efficiency product 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

In addition, the Business Lighting channel provides technical assistance and increased

6.1.2 Business Cooling Efficiency

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

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

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

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

6.1.3 Business Custom Efficiency

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

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

Businesses can receive rebates of up to $400 per kW saved. Participants must receive pre-approval for a measure before installation. SPS targets customers with aggregated annual consumption greater than 7 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.

6.1.4 Business Motor and Drive 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; and
  - 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.

6.1.5 Business Computer Efficiency

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

- High efficiency desktop PCs;

- High efficiency servers;
- Network PC management software; and
- Virtual Desktop Infrastructure.

6.2 M&V Methodologies

6.2.1 Business Lighting Efficiency

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

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

Parameters required for evaluation of the BLEP are presented in Table 6-1.

Table 6-1 Data Sources for Gross Impact Parameters – Business Lighting Efficiency Program

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

6.2.1.1 Business Lighting Efficiency Gross Savings Estimates

The 2015 BLEP encompassed lighting retrofits, occupancy sensors retrofits, and installation of high efficiency lighting as part of new construction projects. The subsections below present the savings calculation methodology for each of these measure types.

6.2.1.2 Gross Savings Methodology for High Efficiency Lighting Retrofits

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

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

Parameters for this equation are defined in Table 6-2.

Table 6-2 Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

Parameters for this equation are defined in *Table 6-3*.

Table 6-3 Parameters for Peak Demand (kW) Savings Calculation of Lighting Retrofit Measures

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

6.2.1.3 Gross Savings Methodology for High Efficiency Lighting in New Construction Applications

The 2015 BLEP provided rebates to participating facilities for energy efficient lighting in new construction applications. Calculations of savings for lighting in new construction applications differs from retrofits in that the baseline is denominated in W/ft^2 for the space type. This is to capture the reduction in Lighting Power Density (LPD) generated by the project. Annual savings from an LPD reduction are calculated as:

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

Parameters for this equation are defined in Table 6-4.

Table 6-4 Parameters for kWh Savings Calculation of Lighting New Construction Measures

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

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

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

The parameters for this equation are defined in Table 6-5.

Table 6-5 Parameters for Peak Demand (kW) Savings Calculation of Lighting New Construction Measures

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

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

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

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

The methodology for this measure does not differ between retrofit and new construction applications as in a new construction application, the measure is considered as a retrofit to the installed lighting. Annual kWh savings from lighting controls are calculated as follows:

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

When occupancy sensors and interior daylighting controls are present, post operating hours are derived with the following equation:

$$\text{OperatingHours}_{\text{POST}} = \text{OperatingHours}_{\text{BASE}} * (1 - \text{ControlFactor})$$

Lighting Controls Reduction in Operating Hours

Occupancy Sensor	30%
Daylighting, continuous dimming	30%
Daylighting, multi-step dimming	20%
Daylighting, On/Off	10%

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

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

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

6.2.2 Business Cooling Efficiency

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

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

Parameters required for evaluation of the BCEP are presented in Table 6-6

Table 6-6 Data Sources for Gross Impact Parameters – Business Cooling Efficiency Program

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

6.2.2.1 Business Cooling Efficiency Gross Savings Estimates

As stated above, gross savings estimates for facilities participating in the 2015 BCEP are evaluated by one of two methodologies:

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

6.2.2.2 DOE-2 Simulation Modeling

In evaluating the 2015 BCP, the Evaluator performed DOE-2 simulation modeling of large cooling retrofits for a range of facility types using eQuest software. Before making the analytical runs for each sample site with HVAC measures, we prepare a Model Calibration Run. This is a base case simulation to ensure that the energy use estimates from the simulations have been reconciled against actual data on the building's energy use. This run is based on the information collected in an on-site visit pertaining to types of equipment, their efficiencies and capacities, and their operating profiles. Current operating schedules are used for this simulation, as are local weather data covering the study period. The Model Calibration Run is made using actual weather data for a time period corresponding to the available billing data for the site.

The goal of the model calibration effort is to have the results of the DOE-2 simulation come within approximately 10% of the patterns and magnitude of the energy use observed in the billing data history. In some cases, it may not be possible to achieve this calibration goal because of idiosyncrasies of particular facilities (e.g., multiple buildings, discontinuous occupancy patterns, etc.).

Once the analysis model has been calibrated for a particular facility, there are three steps in our procedure for calculating estimates of energy savings for HVAC measures installed or to be installed at the facility.

- First, we perform an analysis of energy use at a facility under the assumption that the energy efficiency measures are not installed.
- Second, we analyze energy use at the facility with all conditions the same but with the energy efficiency measures now installed.
- Third, we compare the results of the analyses from the preceding steps to determine the energy savings attributable to the energy efficiency measure.

Following this, the Evaluator determines peak kW savings by examining the reduction observed in the summer peak provided in the Typical Meteorological Year (TMY) dataset. The time picked is set to match the conditions under which PNM observes its typical system peaks.

6.2.2.3EFLH Calculations

For simpler cooling measures, including Package Terminal Heat Pumps (PTHPs) and Roof Top Units (RTUs), the Evaluators applied deemed EFLH values along with specifications of installed capacity and efficiency in evaluating savings. Parameters for EFLH calculations are defined in Table 6-7.

Table 6-7 Parameters for kWh Savings Calculation of HVAC Retrofits

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

EFLH values are provided in SPS's technical assumptions for business cooling measures. The Evaluators tested these values via DOE-2 simulation modeling of archetypical building types using Roswell NM TMY weather data, and revises EFLH by facility type where appropriate.

6.2.3 Business Custom Efficiency

Projects in Business Custom Efficiency have site-specific measurement and verification (M&V) plans developed, in a manner appropriate for the specific project's level of uncertainty and expected savings. One large custom project was selected for M&V in 2015, due to particularly high expected savings. The project was a retrofit of chillers, VFDs, and lighting at an industrial facility. This project's expected savings is almost 4 GWH. The methodology for this project is detailed in the site-level report provided in Appendix A.

6.2.4 Business Motor & Drive Efficiency

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

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

Parameters required for evaluating savings from the BMEP are detailed in Table 6-8.

Table 6-8 Data Sources for Gross Impact Parameters – Business Motor & Drive Efficiency Program

Parameter	Source
Project Details	Program Tracking Data
Load Factor	SPS deemed values & one-time readings for simple applications, power metering for larger, complicated applications.
Equipment Specifications (Size, Efficiency, etc.)	Manufacturer's Literature
Equivalent Full-Load Hours for HVAC Pumps & Ventilation Fans (EFLH)	SPS Deemed values, reviewed by the Evaluators through simulation of archetypical facilities with Roswell NM TMY Weather Data
Hours of Operation for Industrial Motors & Drives	SPS deemed values for simple applications, end-use metering & facility staff interviews for complicated applications
Effective Useful Life	Comparison against CA DEER values
Net-to-Gross Ratio (NTGR)	Participant Surveying

6.2.4.1 Business Motor & Drive Efficiency Gross Savings Estimates

The 2015 BMEP provided rebates to participating facilities for projects including:

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

6.2.4.2 Gross Savings for NEMA Premium Efficiency Motors

Savings from NEMA Premium Efficiency Motors are calculated as:

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

Parameters for this equation are detailed in Table 6-9.

Table 6-9 Parameters for kWh Savings Calculation of Premium Efficiency Motor Retrofits

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

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

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

6.2.4.3 Gross Savings for HVAC VFDs

Savings from VFDs are calculated as:

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

Parameters for this equation are detailed in Table 6-10.

Table 6-10 Parameters for kWh Savings Calculation of Premium Efficiency Motor Retrofits

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

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

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

6.2.4.4 Gross Savings for VFDs in Industrial Applications

The 2015 BMEP had numerous participants install VFDs on industrial pumps. These applications included mining, oil pumping, and food processing. Typically, the Evaluators treated these projects as custom, in that savings were calculated from end-use monitoring. Such sites were large savers, and in the sample frame were certainty sites, making the analysis constitute a one-off “case study”.

6.3 Impact Evaluation Results

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

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

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

Gross savings were estimated using proven techniques, including engineering calculations using industry standards and verification of computer simulations developed by program contractors to determine energy savings. Table 6-11 summarizes the total participation in the 2015 BCP.

Table 6-11 2015 BCP Participation Summary

Program	# Projects	Expected kWh	Expected kW
Cooling	29	417,034	194.44
Custom	119	8,705,278	1,992.90
Lighting	130	1,506,447	107.47
Motors	38	4,557,458	636.85
Computers	-	301,995	39.19
Total	316	15,488,212	2,790.85

Data provided by SPS showed that during 2015, there were 316 projects in total for all program components, which were initially expected to provide gross savings of 15,488,212 kWh. The resulting overall sample is presented in Table 6-12.

Table 6-12 BCP Sample Summary

Component	# Sites in Population	M&V Sample Size	# Interviews	# Sites Represented in Interviews
Business Lighting	130	4	9	9
Business Cooling	29	3	3	5
Business Custom	119	9	14	22
Business Motors & Drives	38	8	6	19
Business Computers	-	-	0	0
Total	316	24	24[8]	55

[8] Total does not match sum of values above as some interviewees gave responses for multiple measure categories

6.3.1 BCP Gross Savings Estimates

Sampling for evaluation of SPS's BCP was developed using the Stratified Random Sampling procedure detailed in Section 2.3.3. This procedure provides 90% confidence and +/- 10% precision with a significantly reduced sample than random sampling would require, by selecting the highest saving facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results.

Due to the diversity of participation in the BCP, the Evaluators opted to develop samples stratified first by measure category and then by expected kWh savings. This approach constrains the extrapolation of results from a sampled project only to non-sampled projects for the same or similar technology.

All measure-level samples provided for 90% confidence and +/- 15% precision. When aggregated to the program-level, achieved precision is +/- 6%.

6.3.1.1 Sample Design

Table 6-13 summarizes the sample Business Comprehensive downstream rebates.

Table 6-13 Business Comprehensive Sample Design

	Stratum 1	Stratum 2	Stratum 3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	<25,000	25,000 – 75,000	75,000-150,000	150,000-400,000	> 400,000	
Number of sites	215	55	25	13	8	316
Total kWh savings	1,573,505	42,286	2,493,775	2,816,310	5,976,883	15,186,217
Average kWh	7,319	16,410	99,751	216,639	747,110	48,058
Standard deviation of kWh savings	6,318	2,325,744	21,327	63,925	185,551	126,345
Coefficient of variation	1,573,505	.39	.21	.30	.25	2.63
Final sample	4	7	3	4	6	24

In addition to this, there was 301,995 kWh and 39.19 kW from Business Computer Efficiency.

The on-site sample represented 43.7% of program expected gross kWh. The survey sample represented 47.1% of program expected gross kWh.

6.3.1.2 Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. Table 6-14 presents results at the site level.

Table 6-14 Expected and Realized Savings by Project

Project ID(s)	Facility Type	Program Category	Expected kWh Savings	Realized kWh Savings
OID2285775	Industrial	Custom	1,134,915	1,134,915
OID2137805	Industrial	Motors	888,735	888,621
OID2044452	Industrial	Motors	751,142	1,125,026
OID2403177	Industrial	Custom	741,068	741,068
OID2044449	Industrial	Motors	635,651	826,561
OID1896685	Government	Custom	594,331	586,605
OID2142473	Industrial	Motors	308,614	342,601
OID2257028	Industrial	Motors	198,297	205,148
OID2044444	Industrial	Motors	170,494	198,709
OID2044453	Industrial	Motors	150,685	162,355
OID2250534	Government	Cooling	134,225	111,893
OID2094334	School/K-12	Custom	106,808	308,577
OID1896742	Government	Custom	106,390	107,986
OID2050596	College/University	Custom	69,002	83,656
OID2230706	Office	Custom	68,094	36,766
OID2090461	School/K-12	Custom	64,584	142,301
OID2242759	Hotel/Motel	Lighting	49,473	134,526
OID2119504	School/K-12	Lighting	47,972	34,422
OID2033290	Hotel/Motel	Cooling	33,138	0
OID2242569	Restaurant	Lighting	29,540	50,393
OID2147070	Restaurant	Lighting	20,367	14,627
OID2252073	Hotel/Motel	Custom	4,376	10,008
OID2257397	Retail/Service	Cooling	3,540	3,250
OID2244335	School/K-12	Motors	722	722

From these site-level analyses, realization rates by stratum were developed. These are summarized in Table 6-15 and

Table 6-16 for kWh and kW, respectively.

Table 6-15 Gross kWh Realization by Stratum

Stratum	Expected kWh Savings	Realized kWh Savings	Realization Rate
5	5,976,883	6,481,666	108.4%
4	2,816,310	3,090,870	109.7%
3	2,493,775	3,793,216	152.1%
2	2,325,744	3,098,806	133.2%
1	1,573,505	1,551,914	98.6%
Business Computers	301,995	301,995	100.0%
Total	15,186,217	18,318,467	118.3%

Table 6-16 Gross kW Realization by Measure Category

Stratum	Expected kW Savings	Realized kW Savings	Realization Rate
5	638.96	628.13	98.3%
4	537.21	848.62	158.0%
3	681.80	2,684,.25	393.7%
2	784.44	664.26	84.7%
1	289.26	205.43	70.9%
Business Computers	39.19	39.19	100.0%
Total	2,970.9	2,385.6	80.30%

6.3.1 Business Comprehensive Net Savings Estimates

In evaluating the 2015 BCP, the Evaluators were tasked with providing net savings estimates. The net savings attributable to a program may differ from gross savings because of free-ridership. Free ridership impacts are the energy savings impact attributable to the installation of energy efficiency measures by participants who would have installed the energy efficient measures without the SPS rebate.

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

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

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

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

6.3.1.1 Financial Ability

For Part 1, customers were asked:

> Question 14: 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 equipment, other factors in the decision making process cannot contribute to the decision making absent the available rebate. This value essentially serves as a free-ridership “gateway”. Respondents that lacked financial ability are definitely not free-riders, but being financially able to install a measure is not sufficient to label as a free-rider.

6.3.1.2 Prior Planning

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

> Question 19: When did you learn of SPS’s energy efficiency program?
>
> Question 9: 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.

6.3.1.3 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: How important was SPS' rebate in your decision to buy high efficiency equipment?
>
> Question 8: Before participating in the energy 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 8 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

6.3.1.4 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 four questions:

> Question 17: 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 18: 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 22: How did availability of information and financial incentives through the Business Comprehensive 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 17 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 18 and 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.

6.3.1.5 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 Quartiles, with scores of 0%, 33%, 67%, and 100% Free-Ridership. The scoring is based upon all possible interactions between the four questions. Part 1 of free-ridership, Financial Ability, essentially serves as a gateway; if it does not equal “Yes” then other aspects of free-ridership are irrelevant. Table 6-17 presents the associated free-ridership score for each permutation of answers in the four free-ridership components. The table provides scoring at the individual participant level. Program-level free-ridership is then derived by aggregating the participant-level scores.

Table 6-17 Free-Ridership Scoring

Financial Ability	Prior Planning	Rebate Was Important	Likely to Install w/o Rebate	Aggregated Category	Free-Ridership Score
Y	N	Y	N	YNYN	0
N	N	Y	N	NNYN	0
N	N	Y	N	NNYN	0
Y	N	Y	N	YNYN	0
Y	Y	N	N	YYNN	0.67
Y	N	Y	N	YNYN	0
N	N	Y	Y	NNYY	0
Y	N	N	Y	YNNY	0.67
Y	N	Y	N	YNYN	0
Y	N	Y	N	YNYN	0
Y	N	Y	N	YNYN	0
Y	N	Y	Y	YNYY	0.33
N	N	N	Y	NNNY	0
Y	Y	N	N	YYNN	0.67
Y	N	N	N	YNNN	0.33
N	N	Y	N	NNYN	0
Y	N	Y	N	YNYN	0
Y	N	Y	N	YNYN	0
Y	N	N	N	YNNN	0.33
N	N	Y	N	NNYN	0
N	N	Y	N	NNYN	0
N	N	N	N	NNNN	0

Y	N	N	Y	YNNY	0.67
Y	N	N	Y	YNNY	0.67
N	Y	N	N	NYNN	0
Y	N	N	N	YNNN	0.33
Y	N	Y	N	YNYN	0
N	N	Y	N	NNYN	0
Y	Y	N	N	YYNN	0.67
Y	N	N	Y	YNNY	0.67
Y	N	Y	N	YNYN	0
Y	Y	N	Y	YYNY	1
N	N	Y	N	NNYN	0
Y	N	N	Y	YNNY	0.67
N	N	Y	Y	NNYY	0

6.3.2 Business Comprehensive Net Savings Estimates

The Evaluators estimated net savings for all SPS business programs via detailed participant surveying of a representative sample of decision makers from each program. These questionnaires were used to provide estimates of free-ridership, with a separate estimate developed for each measure category. The subsections to follow will present the Evaluators' NTGR estimates by measure category for each program component, and the associated net savings. With verified savings compiled by stratum and by measure, the Evaluators then applied measure-category NTGRs to estimate program net savings. These are summarized in Table 6-18. For this table, the Custom Efficiency projects were calculated with the NTGRs associated with the larger measure category, but then separated into the Custom Efficiency line item.

Table 6-18 Verified Net Savings by Component

Program	Expected NTGR	Verified NTGR	Verified Gross kWh	Verified Net kWh	Verified Gross kW	Verified Net kW
Cooling	87.50%	54.4%	545,479	296,741	173.1	94.2
Custom - Motors	80.00%	100.0%	1,230,765	1,230,765	127.4	127.4
Custom – Lighting	80.00%	90.5%	9,435,356	8,538,997	3,878.4	3,510.0
Lighting	75.00%	83.7%	1,724,464	1,443,376	83.8	70.1
Motors	80.00%	78.5%	5,080,408	3,988,120	767.7	602.7
Computers	88.00%	88.0%	301,995	265,756	39.2	34.5
Total	80.79%	86.1%	18,318,467	15,763,755	5,069.6	4,438.8

After evaluating the program components, the Evaluators compiled net savings to provide an overall net realization rate. These results are summarized in Table 6-19.

Table 6-19 SPS Business Comprehensive Net Realization Summary

Component	Peak Demand Reduction (kW)	Annual Energy Savings (kWh)	Lifetime Energy Savings (kWh)	Net Realization

	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	Rate
Cooling	151.5	94.2	477,294	296,741	6,732,000	4,185,384	62.17%
Custom	3204.6	3510	8,532,897	9,769,762	127,993,449	146,546,430	114.50%
Lighting	62.9	70.1	1,379,571	1,443,376	14,068,225	14,718,880	104.62%
Motors	614.2	602.7	3,810,306	3,988,120	57,154,591	59,821,800	104.67%
Computers	34.5	34.5	241,596	265,756	966,382	1,063,022	110.00%
Total	4067.6	1,957.20	14,441,664	15,763,755	206,914,647	226,335,516	109.15%

6.4 Process Evaluation Findings

This chapter presents the results of the process evaluation of the Business Comprehensive Program.[9] The process evaluation focuses on aspects of program policies and organization, as well as the program delivery framework.

The process chapter begins with an overview of the program and the key program changes that occurred during the 2015 program year. This is followed by a discussion of the overall progress of the program and potential for meeting its goals. The chapter also includes discussion relating to certain issues that are critical to the future success of the program. This discussion is followed by an analysis of strategic planning and process recommendations, and concludes by highlighting key findings from the surveys of trade partners and customer participants.

6.4.1 Program Overview

The Business Comprehensive Program offers rebates and incentives for the following types of equipment:

Computers

Incentives for efficient computers are provided through rebates to end-users as well as upstream incentives to manufacturers. End-users can receive rebates for desktop virtualization software and remote PC power management. Specifically, rebates of $60 per thin or zero client installed are available for desktop virtualization and rebates of $5 per controlled workstation are offered. These rebate offers are managed by SPS staff.

For the upstream component, the program contributes incentives to Ecova, who implements a program called 80 Plus. The 80 Plus program is funded by three other utility partners, EnergyTrust of Oregon, Efficiency Vermont, and New Jersey’s Clean Energy Program. The 80 Plus program works with electronics manufacturers to provide

[9] “Business Comprehensive” is an aggregation of Business Lighting, Business Cooling, Business Custom, and Business Motors & Drives programs.

more efficient technologies. The computers component that SPS funds, encourages computer power supply manufacturers to develop more efficient power supplies and to encourage PC manufacturers to incorporate the efficient power supplies in their products and to make them available to consumers. Savings for this program component are based on sales of PCs with qualifying power supplies in the SPS service territory.

The equipment incentives for the program are segmented into three components: cooling efficiency, lighting efficiency, and motor and drive efficiency.

Cooling

The cooling efficiency component offers prescriptive rebates for a variety of HVAC and refrigeration equipment including chillers, direct evaporative cooling units, direct expansion units, electrically commutated motors for use on refrigerated display cases, freezer display cases, and walk-in refrigerators, and walk-in-freezers, and hotel room controllers.

Lighting

The lighting efficiency component includes prescriptive and custom lighting incentives. Incentives are available for retrofit and new construction projects. Additionally, the programs provide prescriptive incentives for the replacement of incandescent signals with LED signals. This channel was expanded in 2015 to encompass direct installation of low flow devices such as aerators, showerheads, and pre-rinse spray valves.

Motors & Drives

The motors and drives component of the program offers incentives for NEMA and enhanced NEMA premium motors, prescriptive incentives for VFDs on 200 hp motors or smaller and custom incentives on motors greater than 200hp, electronically commutated motors (ECM) installed on refrigeration equipment for constant speed motor controllers, air compressor equipment, and oil pump off controllers.

Custom

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.

Technical Assistance

In addition to incentives, the SPS also provides other services to help customers identify energy saving opportunities. These services include a new building tune-up program and funding assessments of large commercial and industrial study sites, and free lighting assessments through the Lighting Efficiency component. Additionally, the program website contains a variety of information energy saving technologies.

6.4.2 Overall Program Success

The SPS business portfolio saw an increase in program activity in 2015, similar to historical levels. Savings declined in 2014 due to a mid-year change in program implementation contractor. This transition period was marked by slower program activity, but program activity has subsequently returned to historical norms.

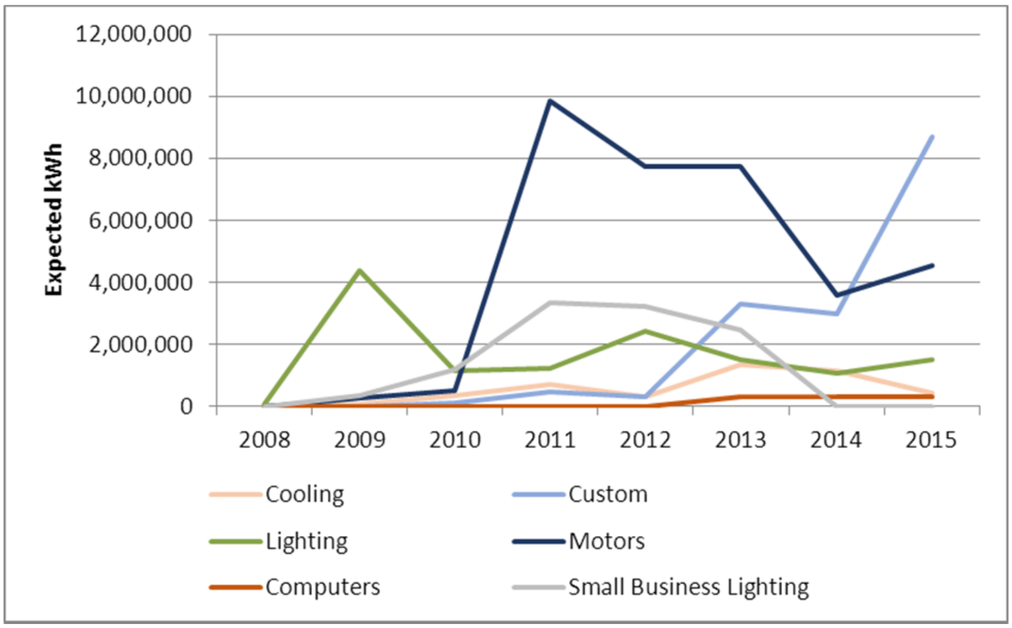

Figure 6-1 Business Comprehensive Historical Savings by Program Component

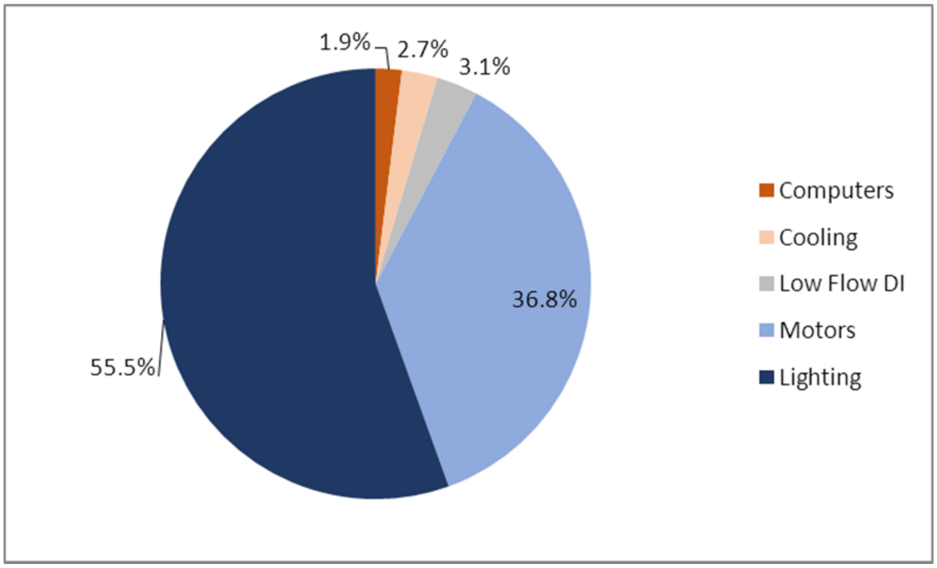

Figure 6-2 Business Comprehensive kWh by Technology Type

The Business Comprehensive Program had 249 participating facilities in 2015.[10] Figure 6-3 presents the distribution of participants by facility type.

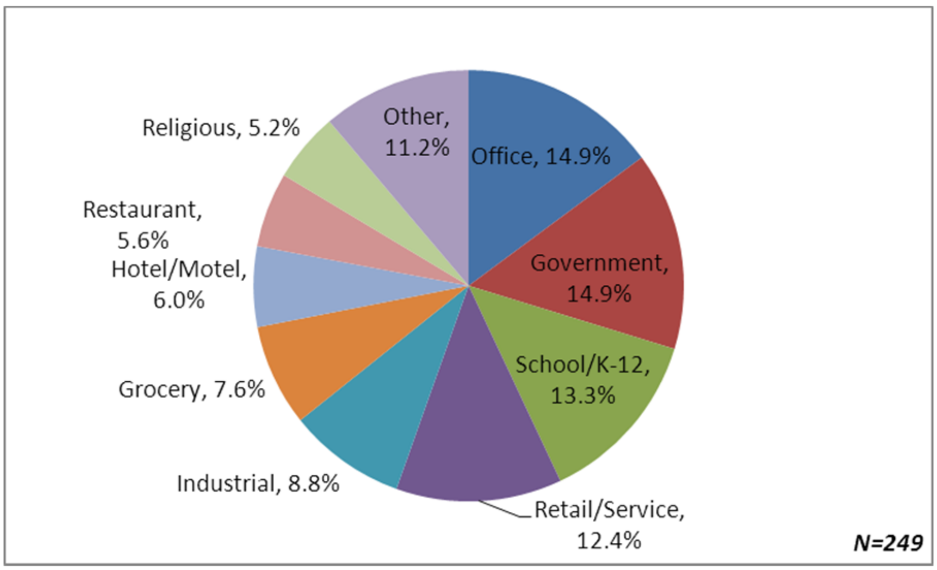

Figure 6-3 Business Comprehensive Distribution of Projects by Facility Type

The distribution of savings did not match the distribution of facilities, in that industrial facilities displayed exceedingly high savings per-project. Figure 6-4 summarizes the distribution of expected savings by facility type.

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[10] Based on the number of unique premise IDs in the program tracking data.

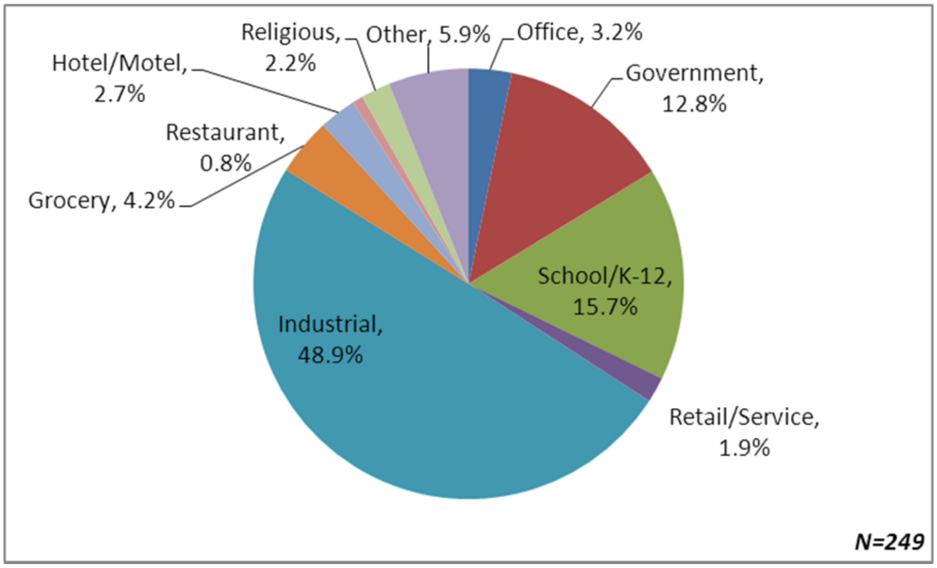


Figure 6-4 Business Comprehensive Distribution of Expected Savings by Facility Type

Electric kWh savings are shown by measure type in Table 6-20. Custom lighting accounted for the largest share of program savings followed by VFDs (for which over 90% were serving process loads).

Table 6-20 kWh Savings by Measure Type

Measure Type	kWh Savings	Percent of kWh Savings
Custom Lighting	7,570,363	49.1%
VFDs	2,715,731	17.6%
Pump Off Controller	1,796,565	11.6%
Custom Motors	1,134,915	7.4%
Exterior LEDs	593,375	3.8%
Aerators	461,008	3.0%
PC Power Supplies	301,995	2.0%
Linear Fluorescent	192,256	1.2%
Interior LEDs	177,410	1.2%
Chillers	134,225	0.9%
DX Units	102,155	0.7%
Hotel Room Controller	56,080	0.4%
High Efficiency Motors	45,162	0.3%
PTACs	35,966	0.2%
CFLs	28,204	0.2%
Heat Pumps	24,231	0.2%
Pre-Rinse Spray Valve	18,064	0.1%
LED Exit Signs	14,668	0.1%
Metal Halide	9,264	0.1%
Lighting Controls	8,924	0.1%
Refrigerated Case Lighting	3,274	0.0%

6.4.3 Quality Assurance & Verification Procedures

Quality assurance and verification processes (QA) are split between SPS and CLEAResult. Generally, SPS staff defines what information is to be collected during verification visits and CLEAResult staff performs the site visits. The specific QA procedures used are:

- The first five projects associated with a new contractor receive a post-inspection. CLEAResult treated all contractors as “new” during the program year regardless of prior activity in the program.
- All projects coming from managed accounts (electric load of more than 400kW) receive pre- and post-inspections for custom projects and post-inspection for standard projects.

- Problem contractors identified in the prior year's evaluation are banned from the program. CLEAResult performs checks on the limited liability corporation name and the person's name.

CLEAResult utilized staff that work on other utility programs to complete the verification visits during the program year to complete the verifications.

The contract with CLEAResult is structured such that the performance dollars are based on verified savings as opposed to program estimated savings. This structure brings CLEAResult's and SPS's objectives into alignment and reduces the risk of the program verification lapses that occurred during program year 2013.

6.4.4 Program Marketing

The Business Comprehensive Program is marketed through multiple channels. A key component of the strategy is for trade partners to promote the programs. To assist and encourage trade partners to promote the incentives, SPS provides materials to promote the program, a phone number for trade partners to receive assistance, and trade partner incentives. Table 6-21 displays the trade partner incentives offered.

Table 6-21 Trade Partner Incentives

Program Component	***Trade Partner Incentives***
Cooling Efficiency	25% of customer rebate for all qualifying equipment
Custom Efficiency	$100 for submitting Custom Efficiency pre approval applications
Lighting Efficiency	$25 per kW of approved customer rebate
Motors Efficiency	$5 to $2,500 depending on motor size

Additionally, part of CLEAResult's role is to promote the program face-to-face with customers. During staff interviews, CLEAResult staff noted that this type of contact and the process of building relationships with SPS customers are particularly important for engaging small businesses. Additionally, CLEAResult has been building relationships with Chambers of Commerce to promote the programs among their membership.

SPS program staff also promotes the program through a variety of channels targeted direct mailings, email campaigns, and newsletters. Mass-market media, including radio and newspaper placements, is another strategy that SPS has used promote its efficiency programs. Another component of program outreach that SPS staff engaged in was "neighborhood sweeps" to promote lighting technologies.

Overall the program marketing strategy is robust with trade partners and CLEAResult, and SPS staff each playing a role in promoting the incentives available.

The program website and associated materials are also key materials for promoting the program offerings and energy efficiency more generally. The website includes a number of informational materials including:

- Descriptions of the incentive offerings including the benefits of installing each type of equipment, program details, and as site and measure qualifications.
- Business Energy Advisor which provides information for different types of business on end-use consumptions and suggestions for how to save energy.
- Webinars about business efficiency.
- Cooling Efficiency, Lighting Efficiency, Motor Efficiency, and VFD sheets that provide information on the incentives available, the improved efficiency of new equipment, non-energy benefits of equipment, and tips for planning a project. Additionally, the VFD sheet discusses applications that are not likely to result in energy savings.
- A motor maintenance guide that also promotes motor and drive incentives.
- A case study for pump off controllers for use on oil wells that includes the amount of the rebate received and the cost and energy savings realized.
- Information on motor efficiency standards that only references rebate options for 2010 and 2011.
- Information on ENERGY STAR® computers that discusses the benefits of more efficiency computers.
- Information on the incentives available for PC Power Management and Desktop Virtualization a well as the energy and non-energy benefits of these measures.

Overall, the promotional materials and website have a number of strengths. These include:

- Multiple forms of messaging including information about cost savings, energy savings, and non-energy benefits such as reduced maintenance costs and comfort.
- Information on incentives and measure types;
- The rebate applications are easy to locate; and
- Telephone numbers for additional assistance are easy to identify.

In addition to these strengths, some potential areas for improving the program website and promotional material were identified:

- Lighting incentives for trade partners can be found on the Lighting Efficiency page, but this is not the case for Cooling Efficiency or Motor Efficiency. Additional consistency may be beneficial.
- The contact information provided for customers to get additional information is inconsistent across the program components. For example, the Business Solution Center Email address is not provided on the Lighting Efficiency page or the Motor and Drive Efficiency page, but is included on the Cooling Efficiency page.
- None of the informational materials address refrigeration equipment as an end-use despite the addition of these prescriptive incentives this year.
- Most of the informational materials are present information about different measure types rather than the types of measures applicable to a type of business. A business trying to learn more about energy efficiency would not find much material that would speak directly to the opportunities in his or her type of business.

6.4.5 Customer Outcomes

A survey was conducted during September and October 2015 to collect data about customer decision-making, preferences, and perspective of the Business Comprehensive Program. In total, telephone information was available for 56 decision makers. Of these decision makers, 35 completed the survey. As shown in Table 6-22, survey respondents represented a variety of business types. The most common type was hotel and lodging. Additionally, 86% of survey respondents indicated that their organizations owned the participating facility(s).

Table 6-22 Survey Respondent Self-Reported Organization Types

Organization Type	Percent of Respondents (n=35)
Industrial	14%
Restaurant (not fast food)	6%
Fast food restaurant	0%
Retail	14%
Office	3%
Grocery and convenience	0%
School	0%
Lodging	29%
Warehouse	3%
Farm	3%
Bowling Alley	3%
Library	3%
Movie theater	3%
Municipal government	3%
Dry cleaning/laundry	3%
Oil & gas	6%
Church	3%
Golfing facility	3%
Food manufacturing	3%

As shown in Table 6-23, survey respondents participated in all of the Business Comprehensive Program components.

Table 6-23 Program Components for Respondents

Program Component	Percent of Survey Respondents
Cooling Efficiency	29%
Custom Efficiency	23%
Motors Efficiency	17%
Lighting Efficiency	25%
Custom Efficiency and Lighting Efficiency	3%
Cooling Efficiency and Custom Efficiency	3%

6.4.5.1 Program Awareness

SPS uses varied channels to promote the Business Comprehensive Program equipment incentives including trade partners (vendors and contractors), direct outreach, email communications, targeted mailings, and the utility website. As is typical for a business program, contractors and vendors are key drivers of program activity. As shown in Figure 6-5, the most common ways respondents first learned about the program was through Xcel staff (33%), friends or colleagues (i.e. word of mouth) (25%), an equipment vendor or building contractor (17%), an information brochure (13%), and the Xcel website (13%). Fifty percent of respondents reported visiting the PNM website for information on energy efficiency programs, while 50% never had.

Overall these findings suggest that direct personal contact methods seem to be driving awareness of the program.

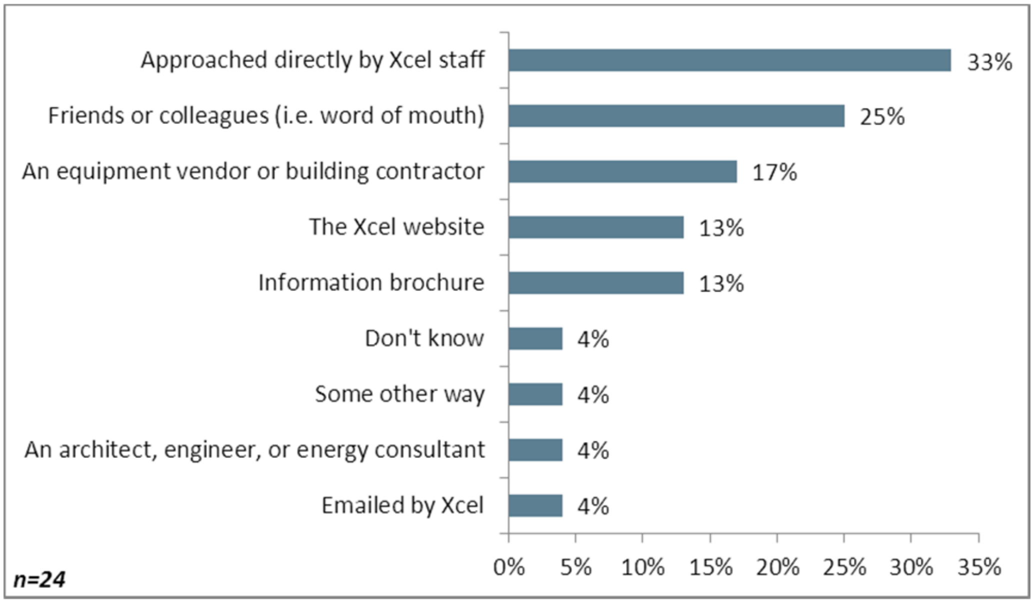


Figure 6-5 BCP Participant Sources of Program Awareness

Respondents were also asked to rate the level of influence of various sources of information. Their responses are summarized in Figure 6-6.

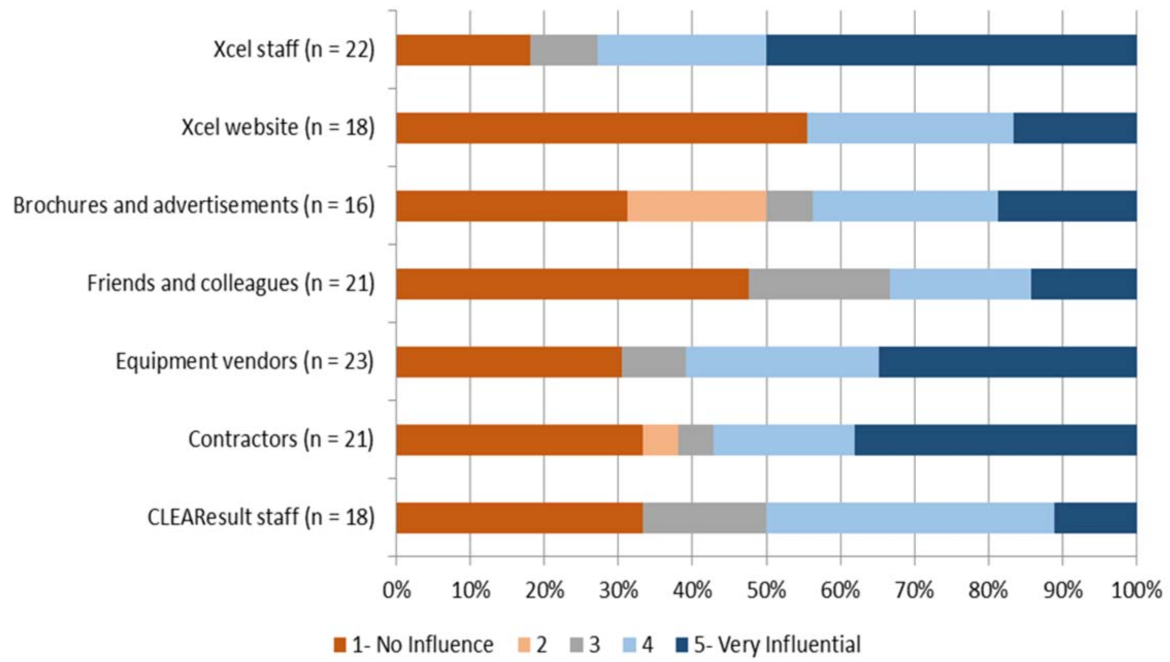


Figure 6-6 Level of Influence of Information Sources

6.4.5.1.1 Decisions to Participate

Respondents were asked about the importance of various factors to their decision-making process. Nearly all respondents (96%) said that incentive payments from Xcel were important, while a majority thought that past experience with energy efficient equipment, advice from vendors, appearing environmentally friendly, and advice from Xcel were quite important.

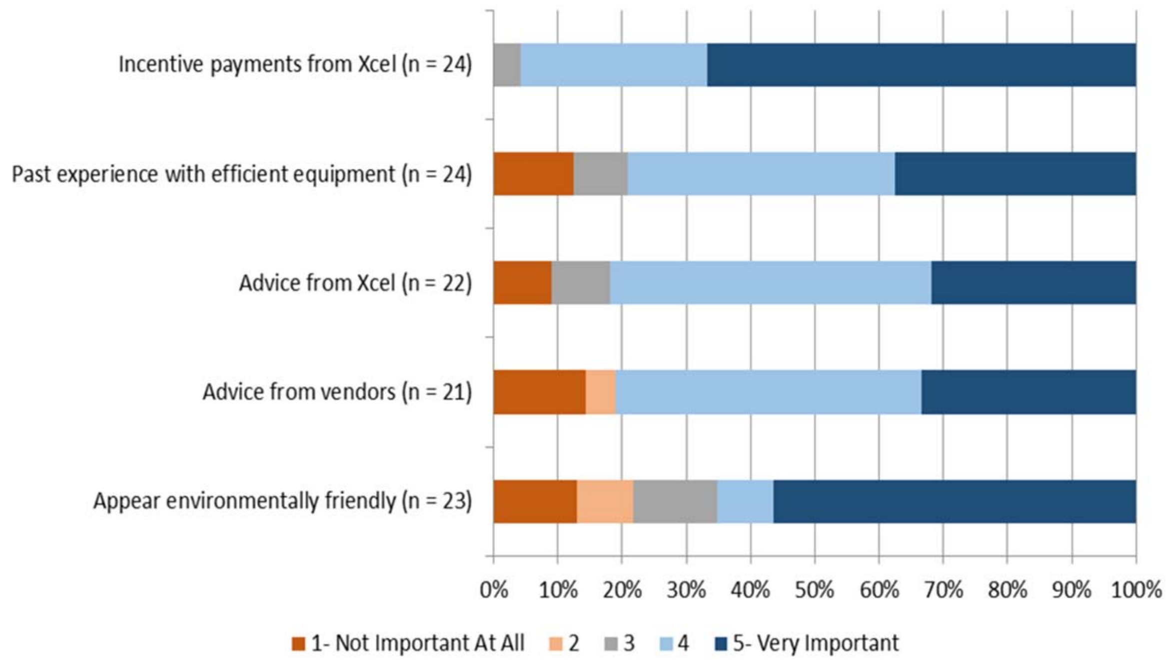


Figure 6-7 Factors Involved in Decision-Making

An important question is when respondents learned about the program. As shown in Table 6-24, the majority of respondents (67%) learned about the program before planning to replace the equipment, while 33% learned about it at a later stage. In addition, 58% had installed similar energy efficient equipment at their facility before, while 42% never had*"*.

Table 6-24 When Customer Decision Makers Learned about the Program

When did you learn of the Business Comprehensive Program?	***Percent of Respondents (n=24)***
Before planning for replacing the equipment had begun	67%
During planning to replace the equipment	13%
Once equipment had been specified but not yet installed	4%
After equipment was installed	17%

Forty-two percent of respondents had prior experience with Xcel's energy efficiency programs prior to participating in the program. Of these respondents, 90% thought this experience was an important factor in their decision to install the measure.

Table 6-25 Importance of Prior Experience with Xcel Programs

How important was previous experience with the Xcel energy efficiency programs in making your decision to install the measure? Was it…	***Percent of Respondents (n = 10)***
Very important	70%
Somewhat important	20%
Only slightly important	0%
Not important at all	10%
Don't know	0%
Refused	0%

Sixty-three percent of respondents had plans to install the equipment before participating in the program, while 38% had no plans. Of those that had plans (15 respondents), 80% would have gone ahead with the installation without the program rebates, while 20% would not have. In addition, 53% of the same respondents would have had the same equipment installed without the program rebates. Finally, 71% percent of respondents said they would not have been able to install the equipment without the financial incentive, while 29% said they would have.

Respondents were also asked how likely they would have been to install the equipment without the financial incentive. Sixty-three percent of respondents probably or definitely would have installed, while 13% probably would not have installed, and 21% definitely would not have installed.

Table 6-26 Likelihood of Installation without Financial Incentive

If the financial incentive had not been available, how likely is it that you would have installed the measure anyway? Would you…	***Percent of Respondents (n = 24)***
Definitely have installed	38%
Probably have installed	25%
Probably not have installed	13%
Definitely not have installed	21%
Don't know	4%
Refused	0%

Respondents were also asked what they would have done differently if the rebate had not been available. Only 33% would have done nothing differently, while 21% would have delayed the project, 17% would not have done the project, and 16% would have installed lower cost equipment or a lower quantity of equipment.

Table 6-27 Action Taken if Rebate Unavailable

If the rebate were not available, what would you have done differently?	***Percent of Respondents (n = 24)***
Would have done nothing differently	33%
Would have installed a lower quantity of equipment	4%
Would have installed a lower efficiency of equipment	8%
Would have installed lower cost equipment	8%
Would have installed lower quality equipment	0%
Would have repaired rather than replaced equipment	0%
Would have delayed the project	21%
Would not have done the project	17%
Other	0%
Don't know	8%
Refused	0%

6.4.5.1.2 Participation Process

According to respondents, they were the most common person involved in completing the program application (58%). In addition, a contractor was involved 33% of the time, another member of their company 8% of the time, and someone else was involved 21% of the time.

Table 6-28 People Involved in the Program Application

Which of the following people worked on completing your application for the program incentive?	***Percent of Respondents (n = 24)***
Yourself	58%
Another member of your company	8%
A contractor	33%
An equipment vendor	4%
A designer or architect	0%
Someone else	21%
Don't know	0%
Refused	0%

Seventy-one percent of respondents who worked on completing the program application thought the information was completely clear, while 14% thought it was mostly clear, and 7% thought it was somewhat clear. In addition, 79% thought the overall application process was completely acceptable, while 14% thought it was somewhat acceptable, and 7% did not know.

A number of respondents (40%) received recommendations for the installed equipment from an electrical contractor. Other common equipment recommendations came from a measure specific (i.e. lighting or HVAC) distributor (25%), a general contractor (20%), a measure specific contractor (15%), and Xcel or CLEAResult staff.

Table 6-29 People or Businesses Involved in Recommending the Equipment Installed

What types of businesses or individuals were involved in specifying or recommending the types of equipment you installed?	***Percent of Respondents (n = 20)***
Electrical contractor	40%
Measure specific distributor	25%
General contractor	20%
Measure specific contractor	15%
Xcel/CLEAResult staff	15%
Measure specific manufacturer representative	10%
Measure specific designer or architect	5%
Engineer	5%
Other	5%
Refused	0%

For the majority of respondents (52%), it took less than two months to complete the equipment specification or design process portion of the project, while 13% saw it completed within three to six months, and 26% saw it completed after six months.

Fifty-seven percent of respondents planned for the entire installation to take less than months, while 4% thought it would take three to four months, and 30% thought it would take longer than six months. In fact, the installation took two months or less for 65% of respondents, while 8% saw it completed within three to six months, and 13% saw it completed after six months. This suggests that the installations were done within most respondents' timeline.

Table 6-30 Time to Complete Installation

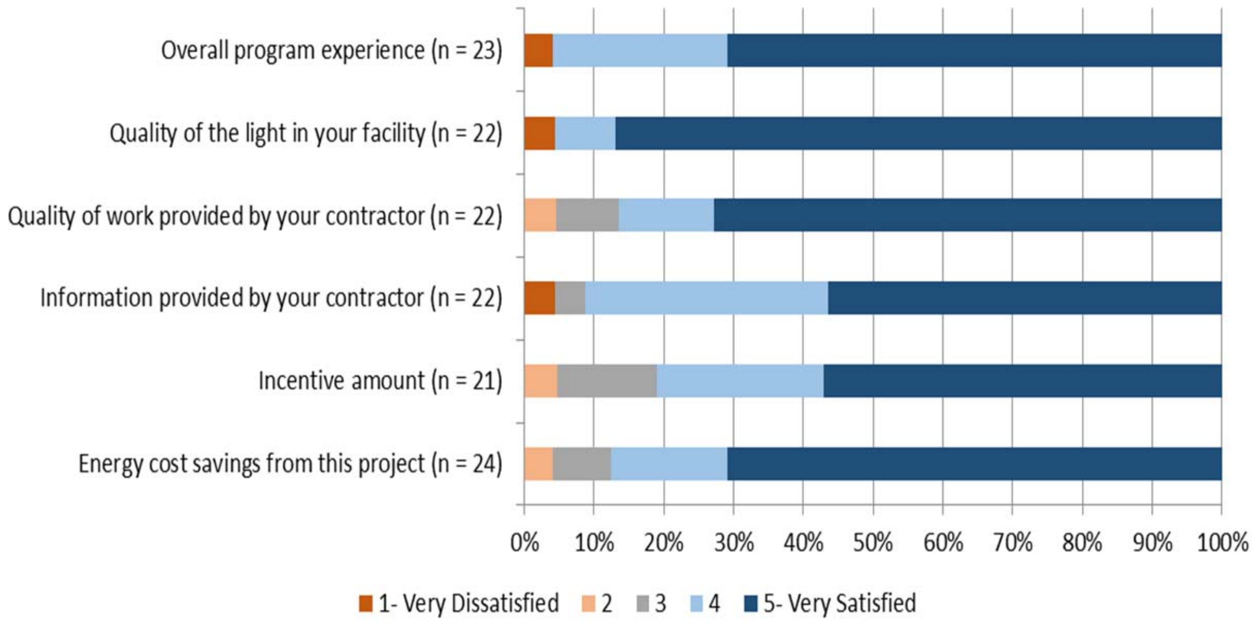
How long did it take to complete the installation?	***Percent of Respondents (n = 23)***
Less than 1 week	26%
1-2 weeks	0%
3-4 weeks	4%
1-2 months	35%
3-4 months	4%
5-6 months	4%
More than 6 months	13%

Other	0%
Don't know	13%
Refused	0%

6.4.5.1.3 Participant Satisfaction

Respondents were very satisfied with the program. At least 81% of respondents were satisfied with each of the program elements, and at least 57% were very satisfied.

Figure 6-8 Participant Satisfaction Scores



6.4.5.1.4 Individual Measure Summary

Lighting

For 73% of respondents, the brightness of the new lighting met their expectations, while 27% said the change in brightness was not as intended.

Process Load

Two of the respondents engaged with an outside firm to design the retrofit and one did not. None of the respondents reported receiving any assistance from Xcel staff during the design or specification phase of the project, although two respondents would have been interested in receiving assistance from Xcel during this phase. In addition, two of the three respondents said the project increased production capability for the facility.

Finally, one respondent was dissatisfied with the incentive amount and the energy cost savings from the project, however, none of the respondents reported any difficulties in completing the project.

HVAC Measure

All respondents noted that the change in the average temperature during summer months met their expectations.

Guest Room Energy Management

Only one participant provided a survey for the program. This respondent indicated a high level of dissatisfaction with the information provided by the contractor, the performance of the installed equipment, and the overall program experience. They also provided the following explanation:

> *"[Person] who installed said Xcel never came and no courtesy call until 150 days after installation. We had already taken GREM system out. We were hit hard with guest complaints."*

6.5 Conclusions & Recommendations

6.5.1 Conclusions

The Evaluators' conclusions for the Business Comprehensive Program are as follows:

- **Performance has returned to historic levels.** After a 46% decline in verified net savings in 2014 compared to 2013, savings have increased back to historic norms in 2015.
- **Industrial customers are interested in increased technical assistance.** Industrial customers that responded to the participant survey all indicated high interest in technical assistance in identifying projects.
- **Few issues noted by customers.** Most customers reported that they were satisfied with their experience with the program and few reported problems with different aspects of the participation process including completing and submitting application materials. Most participants who completed the application paperwork found it to be clear and few had issues getting the paperwork approved or receiving the incentive check. Additionally, assessments of the inspector performing inspections were positive.
- **Guest Room Energy Management continues to have measure retention concerns.** Similar to prior years, the Evaluators have found that GREM systems are often removed by Business Comprehensive participants.

- **Moving lighting projects to the custom channel has had mixed results.** The Evaluators found that the new program implementation contractor has been inclined to process lighting rebates under the Custom Efficiency channel. This has had mixed (though overall, positive) results. The increased use of the custom channel has significantly increased the extent of lighting optimization (incorporating delamping into more projects). However, the Evaluators found that in moving lighting projects to the custom channel, program implementation staff often entered custom hours that were not based on end-use metering and were based mores so on interviews with facility staff.

6.5.2 Recommendations

The Evaluators' recommendations are as follows:

- **Consider ending program relationship with current GREM trade ally.** The Evaluators have found multiple projects over multiple program years from this trade ally that have resulted in removal of the installed equipment. This is not an issue seen elsewhere in New Mexico. The Evaluators conclude this is likely driven by the different installing contractor typically seen for Xcel projects, and Xcel should consider initiating probation or removal of this contractor from the program.
- **Only use custom hours if it can be supported by end-use metering.** The Evaluators found that many prescriptive-type projects used custom hours of operation based on interviews with facility staff. To the extent feasible, these projects should use NM TRM hours unless overridden by lighting runtime metering.

7. Appendix A: Tables for SPS Annual Report

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

Program	Participants or Units	Annual Savings (kWh)	Annual Savings (kW)	Lifetime Savings (kWh)	Total Program Costs
Home Energy Services (Res & LI)	2,426	4,210,226	545.1	66,585,097	$1,825,926
Home Lighting	266,998	11,671,787	1,583.10	90,403,940	$1,934,414
Business Comprehensive	1,808	15,763,755	1,957.20	226,335,516	$4,298,075
Energy Feedback Pilot	20,334	2,412,165	649.29	2,412,165	$202,863
Evaporative Cooling	2	4,462	3.4	66,934	$102,049
Refrigerator Recycling	530	360,262	38.1	1,801,312	$150,914
School Education Kits	13,560	794,484	17.2	7,563,488	$118,847
Residential Saver's Switch	3,926	7,091	3,183.99	7,091	$522,406
Business Saver's Switch	484	964	384.78	964	$184,302
Interruptible Credit Option	-	-	-	-	$2,470
Consumer Education	-	-	-	-	$219,766
Market Research	-	-	-	-	$36,978
Measurement & Verification	-	-	-	-	$41,656
Planning & Administration	-	-	-	-	$304,195
Product Development	-	-	-	-	$80,804
Total	310,068	35,225,196	8,362.16	395,176,507	$10,025,664

Program	Verified NTGR
Home Energy Services (Res & LI)	95.1%
Home Lighting	84.5%
Business Comprehensive	86.1%
Energy Feedback Pilot	100.0%
Evaporative Cooling	66.0%
Refrigerator Recycling	67.3%
School Education Kits	100.0%
Residential Saver's Switch	100.0%
Business Saver's Switch	100.0%

Program	Participants or Units	Participant Costs	Cost per kWh Saved	2015 Economic Benefits	Total Economic Benefits
Home Energy Services (Res & LI)	2,426	$0	$0.03	$314,805	$6,043,417
Home Lighting	266,998	$1,904,653	$0.02	$942,399	$8,383,482
Business Comprehensive	1,808	$4,391,763	$0.02	$1,130,378	$20,046,488
Energy Feedback Pilot	20334	$0	$0.08	$206,678	$206,678
Evaporative Cooling	2	$131	$1.52	$962	$17,970
Refrigerator Recycling	530	$0	$0.08	$25,297	$135,303
School Education Kits	13,560	$0	$0.02	$87,885	$696,917
Residential Saver's Switch	3,926	$0	$73.67	$531,946	$531,946
Business Saver's Switch	484	$0	$191.18	$61,546	$61,546
Interruptible Credit Option	-	$0	N/A	$0	$0
Consumer Education	-	$0	N/A	$0	$0
Market Research	-	$0	N/A	$0	$0
Measurement & Verification	-	$0	N/A	$0	$0
Planning & Administration	-	$0	N/A	$0	$0
Product Development	-	$0	N/A	$0	$0
Total	310,068	$6,296,547	$0.03	$3,095,218	$36,123,747

Program	Avoided Production Costs	Avoided Capacity Expansion Costs	Net Incremental Cost	Administration Costs	Incentives
Home Energy Services (Res & LI)	$2,536,812	$1,158,815	$485,801	$1,378,030	$447,896
Home Lighting	$3,751,905	$2,085,210	$1,904,653	$794,463	$1,139,951
Business Comprehensive	$8,991,468	$3,815,028	$4,391,763	$2,185,177	$2,112,898
Energy Feedback Pilot	$133,211	$73,467	$0	$202,863	$0
Evaporative Cooling	$4,817	$6,430	$131	$101,149	$900
Refrigerator Recycling	$85,006	$33,034	$0	$104,589	$46,325
School Education Kits	$630,938	$48,970	$16,764	$84,573	$34,274
Residential Saver's Switch	$354	$531,592	$0	$359,463	$162,943
Business Saver's Switch	$46	$61,500	$0	$46,017	$138,285
Interruptible Credit Option	$0	$0	$0	$2,470	$0
Consumer Education	$0	$0	$0	$219,766	$0
Market Research	$0	$0	$0	$36,978	$0
Measurement & Verification	$0	$0	$0	$41,656	$0
Planning & Administration	$0	$0	$0	$304,195	$0
Product Development	$0	$0	$0	$80,804	$0
Total	$16,001,346	$7,814,046	$6,799,112	$5,942,192	$4,083,472

8. Appendix B: Site Reports

This appendix contains the site reports for evaluation of the SPS 2015 Business Portfolio.

Project Number OID2250534
Program Business Cooling Efficiency

EXECUTIVE SUMMARY

The participant is an institutional campus that received incentives from SPS for the installation of a high efficiency 280-Ton centrifugal chiller. On site ADM verified installation of the chiller and that the chiller specifications matched project documentation. Gross kWh realization for this project is 83%.

M&V METHODOLOGY

During the site visit, ADM verified the installation of the 280-HP Daikin centrifugal chiller. The Evaluators used the technical assumptions for cooling efficiency to calculate the savings for this project because this facility operates similar to college and university in technical assumption.

SAVINGS CALCULATIONS

ADM verified this facility operates similar to college and universities in technical assumptions based on interviews.

The deemed savings calculation listed on the technical assumptions for cooling efficiency is as follows,

$$kWh_{Savings} = Ton \times EFLH \times (IPLV_{Baseline} - IPLV_{New})$$

$$kW_{Reduction} = Ton \times [(FLV_{Baseline} \times OA_{Correction}) - FLV_{New}]$$

Where,

Ton = *Rated cooling capacity in tons, 280 HP*

EFLH = *Equivalent full load hours for college and universities, 1,691 hours*

$IPLV_{Baseline}$ = *Baseline integrated part load value, 0.596 kW/tons*

$IPLV_{New}$ = *New integrated part load value, 0.360 kW/tons*

$FLV_{Baseline}$ = *Baseline full load value, 0.634 kW/tons*

FLV_{New} = *New full load value, 0.646 kW/tons*

$OA_{correction}$ = *Rated outside air correction term, 1.139425*

Compute all parameters, the savings is

Chiller Energy Savings

Tons	EFLH	$IPLV_{Baseline}$	$IPLV_{New}$	kWh Savings
280	1,691	0.596	0.360	111,893

Chiller Peak Demand Reduction

Tons	$FLV_{Baseline}$	FLV_{New}	$OA_{Correction}$	kW Reduction
280	0.634	0.646	0.646	21.39

RESULTS

The Evaluators calculated energy savings of 111,893 kWh and a demand reduction of 21.39 kW, resulting in a realization rate of 83%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
High Efficiency Chiller	134,225	5.69	111,893	21.39	83%	376%
Total	**134,225**	**5.69**	**111,893**	**21.39**	**83%**	**376%**

The Evaluators used the same parameters as shown in the ex ante calculations and used the cooling efficiency technical assumption method. The realization rate should be 100% but for unknown reason the realization rate is lower. The ex ante savings calculation did not follow the deemed savings technical assumptions or made an error in the calculation.

Project Number OID2257397
Program Business Cooling Efficiency

Project Background

The participant is a retail facility that received incentives from SPS for implementing energy efficiency measures. On-site, the evaluators verified the participants had installed:

- (4) High efficiency 4.58 Ton Packaged AC Units

M&V Methodology

The evaluators verified the installation of high efficiency air conditioning units. Savings from the HVAC measures were calculated using DNVGL's work papers New Mexico's Technical Resource Manual (TRM) for ex ante calculations of energy efficient HVAC equipment. The EFLH and PCF were calculated for the building type "Retail" in the Roswell climate zone.

Building Type	*Weather Zone*	*EFLH*	*PCF*
Small Retail	Roswell	1,438	0.0005

Savings Calculations

The following prescriptive method was used to calculate this portion of the savings. Savings for units under 5.4 tons are determined with the following equation,

$$kWh\ Savings = Capacity \times EFLH \times Conversion\ Constant \times \left(\frac{1}{SEER_{Base}} - \frac{1}{SEER_{Post}}\right)$$

$$kW\ Savings = Capacity \times Conversion\ Constant \times \left(\frac{1}{EER_{Base}} - \frac{1}{EER_{Post}}\right)$$

Parameters for kWh Savings Calculation of HVAC Measures

Capacity	Nominal rating of packaged system, in tons
EFLH	Effective full load hours, see table below
$SEER_{base}$	Minimum required HVAC efficiency, per IECC2009. Seasonal energy efficiency ratio, nominal rating of packaged system, Btu/Wh
$SEER_{post}$	HVAC efficiency as installed. Energy efficiency ratio, nominal rating of packaged system, Btu/Wh
EER_{base}	Minimum required HVAC efficiency, per IECC2009 Energy efficiency ratio, nominal rating of packaged system, Btu/Wh
EER_{post}	HVAC efficiency as installed. Energy efficiency ratio, nominal rating of packaged system, Btu/Wh
Conversion Constant	12,000 Btuh/ton x 1/1000 kW/W

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

$$Peak\ kW\ Savings = \left(\frac{1}{(S)EER_{base}} - \frac{1}{(S)EER_{post}}\right) * PCF$$

Parameters for Peak Demand (kW) Savings Calculation of HVAC Measures

ERP_{base}	Minimum required HVAC efficiency, per IECC2009
ERP_{post}	HVAC efficiency as installed
PCF	Peak Coincident Factor

HVAC kWh Savings Calculations

Measure	Quantity	Tons	EFLH	SEER		Expected kWh Savings	Realized kWh Savings	Realization Rate
				Base	Post			
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps: < 65,000 Btu/h (5.4 tons)	4	4.58	1,438	13.00	15.00	3,540	3,250	91.8%

Total	**3,540**	**3,250**	**91.8%**

HVAC kW Savings Calculations

Measure	Quantity	Tons	PCF	SEER		Expected kW Savings	Realized kW Savings	Realization Rate
				Base	Post			
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps: < 65,000 Btu/h (5.4 tons)	4	4.58	0.0005	13.00	15.00	2.90	1.63	56.2%
Total						**2.90**	**1.63**	**56.2%**

Results

The realization rate for OID-2257397 is savings is 91.8% for kWh savings and 56.2% for kW savings. The lower kWh savings is due to the ex post calculations using a lower Peak Coincidence value for the HVAC units than the ex ante calculations.

Verified Gross Savings/Realization Rates

Measure	Verified			
	kWh	Peak kW	kWh	kW
(4) Packaged AC Units	3,250	1.63	91.8%	56.2%
Total	**3,250**	1.63	**91.8%**	**56.2%**

Project Number OID-1896685, OID1896740, OID1896742
Program Business Custom Efficiency

Project Background

The participant is a city building facility that received incentives from SPS for implementing energy efficient outdoor lighting. On-site, the evaluators verified the participant had installed:

- (34) 40W LED Integrated Ballast lamps, replacing (42) 100W Metal Halide lamps;
- (54) 160W Non-integrated Ballast lamps, replacing (54) 400W Metal Halide lamps;
- (41) 150W Non-integrated Ballast lamps, replacing (41) 400W Metal Halide lamps;
- (3) 57W LED Non-integrated Ballast lamps, replacing (3) 250W High Pressure Sodium lamps;
- (4) 150W LED Non-integrated Ballast lamps, replacing (4) 400W High Pressure Sodium lamps;
- (12) 20W LED Non-integrated Ballast lamps, replacing (12) 70W High Pressure Sodium lamps.
- (338) 78W Non-Integrated Ballast lamps, replacing (338) 150 Metal Halide lamps.
- (1) 60W LED- Non-Int. Ballast lamps, replacing (1) 150W High Pressure Sodium lamps;
- (3) 150W LED Non-integrated Ballast lamps,(3) replacing 400W High Pressure Sodium lamps;
- (1) 37W LED Non-integrated Ballast lamps, replacing (1) 150W High Pressure Sodium lamps.

M&V Methodology

The Evaluators found some lighting fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings for the lighting measures were calculated using New Mexico TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and PNM peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	Space Type	Annual Hours – Non-CFLs	Annual Hours – CFLs	HCEF	HCDF	PCF
Assembly-Whole Building	Outdoor-DA Office	Dusk till Dawn	4,312	1.000	1.000	0.00
Assembly-Whole Building	Outdoor- Del Norte Park	Dusk till Dawn	3,696	1.000	1.000	0.00
Assembly-Whole Building	Outdoor-N. Lovington Hwy	3,847	3,847	1.000	1.000	0.00
Assembly-Whole Building	Outdoor-Green Acre Park	4,312	4,312	1.000	1.000	0.00
Assembly-Whole Building	Outdoor- City Hall	Dusk till Dawn	3,954	1.000	1.000	0.00

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Total savings calculation:

*Real Life Savings = Expected Savings * Realization Rate*

Site: OID-1896685

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
100W MH to 40W LED - Int. Ballast	42	34	124	40	3,954	3,954	12,611	15,215	1.000	120.7%
400W MH to 160W LED - Non-Int. Ballast	54	54	453	160	3,954	3,954	69,862	62,560	1.000	89.5%
400W MH to 150W LED - Non-Int. Ballast	41	41	453	150	3,696	3,696	54,854	45,915	1.000	83.7%
250W HPS to 57W LED - Non-Int. Ballast	3	3	295	57	3,696	3,696	3,153	2,639	1.000	83.7%
400W HPS to 150W LED - Non-Int. Ballast	4	4	465	150	4,312	4,312	5,564	5,433	1.000	97.7%
70W HPS to 20W LED - Non-Int. Ballast	12	12	95	20	4,312	4,312	3,974	3,881	1.000	97.7%
						Total	**150,017**	**135,643**		**90.4%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
100W MH to 40W LED - Int. Ballast	42	34	124	40	0.00	0.00	0.00	0.00	1.000	-
400W MH to 160W LED - Non-Int. Ballast	54	54	453	160	0.00	0.00	0.00	0.00	1.000	-
400W MH to 150W LED - Non-Int. Ballast	41	41	453	150	0.00	0.00	0.00	0.00	1.000	-
250W HPS to 57W LED - Non-Int. Ballast	3	3	295	57	0.00	0.00	0.00	0.00	1.000	-

400W HPS to 150W LED - Non-Int. Ballast	4	4	465	150	0.00	0.00	0.00	0.00	1.000	-
70W HPS to 20W LED - Non-Int. Ballast	12	12	95	20	0.00	0.00	0.00	0.00	1.000	-
						Total	**0.00**	**0.00**		**-**

Site: OID-1896740

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
150W MH to 78W LED - Non-Int. Ballast	338	338	183	78	3,847	3,847	138,458	136,530	1.000	98.6%
						Total	**138,458**	**136,530**		**98.6%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
150W MH to 78W LED - Non-Int. Ballast	338	338	183	78	0.00	0.00	0.00	0.00	1.000	-
						Total	**0.00**	**0.00**		**-**

Site: OID-1896742

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
150W HPS to 60W LED - Non-Int. Ballast	1	1	188	60	4,312	4,312	544	552	1.000	101.5%
400W HPS to 150W LED - Non-Int. Ballast	3	3	465	150	4,312	4,312	4,014	4,075	1.000	101.5%
150W HPS to 37W LED - Non-Int. Ballast	1	1	188	37	4,312	4,312	641	651	1.000	101.5%
						Total	**5,199**	**5,278**		**101.5%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
150W HPS to 60W LED - Non-Int. Ballast	1	1	188	60	0.00	0.00	0.00	0.00	1.000	-
400W HPS to 150W LED - Non-Int. Ballast	3	3	465	150	0.00	0.00	0.00	0.00	1.000	-
150W HPS to 37W LED - Non-Int. Ballast	1	1	188	37	0.00	0.00	0.00	0.00	1.000	-
						Total	**0.00**	**0.00**		**-**

Results

Expected kWh savings in the customer proposal for OID-1896685, OID1896740, and OID1896742 is 594,331 kWh with a realization rate of 98.7%. The wattages of many lamps are different from our wattage table, which calculated a different expected kWh savings number. For this project we verified a sample of fixtures, which are shown above and extrapolated the savings to the total population to find real life savings.

Project Number OID2094334
Program Business Custom Efficiency

Project Background

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

- (798) 2-lamp LEDs, replacing 4' 4-lamp T12 fixtures.

M&V Methodology

The evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	*Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Secondary School	Classroom	2,445	2,608	1.346	1.344	0.64
	Kitchen	1,168	1,354	1.067	1.344	0.64
	Dining Area	2,365	2,493	1.067	1.344	0.64

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 4L T12 to 36W LED - Non-Int. Ballast	750	750	156	36	2,445	2,445	100,383	296,187	1.346	295.1%
4' 4L T12 to 36W LED - Non-Int. Ballast	14	14	156	36	1,168	1,168	1,874	2,094	1.067	111.8%
4' 4L T12 to 36W LED - Non-Int. Ballast	34	34	156	36	2,365	2,365	4,551	10,296	1.067	226.3%
						Total	**106,808**	**308,577**		**288.9%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 4L T12 to 36W LED - Non-Int. Ballast	750	750	156	36	0.64	0.64	19.43	77.41	1.344	398.5%
4' 4L T12 to 36W LED - Non-Int. Ballast	14	14	156	36	0.64	0.64	0.36	1.45	1.344	399.9%
4' 4L T12 to 36W LED - Non-Int. Ballast	34	34	156	36	0.64	0.64	0.88	3.51	1.344	398.6%
						Total	**20.67**	**82.37**		**398.5%**

Results

The kWh realization rate for OID2094334 is 288.9% and the kW realization rate is 398.5%. The verified kWh savings are increased because the ex post calculations used higher hours of operation, according to the NM TRM, rather than the custom hours used in the ex ante calculations. The ex ante hours of operation did not account for after school activities or teachers using the classrooms longer than the students. The ex ante calculations used a lower wattage (133W) for the baseline fixture than the evaluators verified on site. The SPS technical assumptions use a coincidence factor (CF) of 0.73 while the NM TRM assumes 0.64. In addition, the HCIF assumptions in NM TRM differ from technical assumption used in ex ante savings calculations and the ex post used HCIF according the weather zone.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
4' 4L T12 to 36W LED - Non-Int. Ballast	296,187	77.41	295.1%	398.5%
4' 4L T12 to 36W LED - Non-Int. Ballast	2,094	1.45	111.8%	399.9%
4' 4L T12 to 36W LED - Non-Int. Ballast	10,296	3.51	226.3%	398.6%
Total	**308,577**	**82.37**	**288.9%**	**398.5%**

Project Number OID2090461
Program Business Custom Efficiency

Project Background

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

- (595) 2-lamp LEDs, replacing 4' 4-lamp T8 fixtures.

M&V Methodology

The evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	*Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Primary School	Classroom	2,445	2,660	1.346	1.393	0.64
	Dining Area	1,347	1,530	1.346	1.393	0.64
	Kitchen	1,669	1,846	1.346	1.393	0.64
	Office	2,323	2,452	1.346	1.344	0.64

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*HCEF*	*Realization Rate*
	Base	*Post*	*Base*	*Post*	*Base*	*Post*				
4' 4L T8 to 36W LED - Non-Int. Ballast	516	516	112	36	2,445	2,445	56,009	129,059	1.346	230.4%
4' 4L T8 to 36W LED - Non-Int. Ballast	42	42	112	36	1,347	1,347	4,559	5,787	1.346	126.9%
4' 4L T8 to 36W LED - Non-Int. Ballast	20	20	112	36	1,669	1,669	2,171	3,415	1.346	157.3%
4' 4L T8 to 36W LED - Non-Int. Ballast	17	17	112	36	2,323	2,323	1,845	4,040	1.346	218.9%
						Total	**64,584**	**142,301**		**220.3%**

Lighting Retrofit kW Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*PCF*		*Expected kW Savings*	*Realized kW Savings*	*HCDF*	*Realization Rate*
	Base	*Post*	*Base*	*Post*	*Base*	*Post*				
4' 4L T8 to 36W LED - Non-Int. Ballast	516	516	112	36	0.64	0.64	50.78	34.96	1.393	68.8%
4' 4L T8 to 36W LED - Non-Int. Ballast	42	42	112	36	0.64	0.64	4.13	2.85	1.393	68.9%
4' 4L T8 to 36W LED - Non-Int. Ballast	20	20	112	36	0.64	0.64	1.97	1.36	1.393	69.1%
4' 4L T8 to 36W LED - Non-Int. Ballast	17	17	112	36	0.64	0.64	1.67	1.11	1.344	66.3%
						Total	**58.56**	**40.28**		**68.8%**

Results

The kWh realization rate for OID2090461 is 220.3% and the kW realization rate is 68.8%. The verified kWh savings are increased because the ex post calculations used higher hours of operation, according to the NM TRM, rather than the custom hours used in the ex ante calculations. The ex ante hours of operation did not account for after school activities or teachers using the classrooms longer than the students. The SPS technical assumptions use a coincidence factor (CF) of 0.73 while the NM TRM assumes 0.64. In addition, the HCIF assumptions in NM TRM differ from technical assumption used in ex ante savings calculations and the ex post used HCIF according the weather zone.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
4' 4L T8 to 36W LED - Non-Int. Ballast	129,059	34.96	230.4%	68.8%
4' 4L T8 to 36W LED - Non-Int. Ballast	5,787	2.85	126.9%	68.9%
4' 4L T8 to 36W LED - Non-Int. Ballast	3,415	1.36	157.3%	69.1%
4' 4L T8 to 36W LED - Non-Int. Ballast	4,040	1.11	218.9%	66.3%
Total	**142,301**	**40.28**	**220.3%**	**68.8%**

Project Number OID2050596
Program Business Custom Efficiency

Project Background

The participant is a university building that received incentives from SPS for installing energy efficient lighting as part of a 42,920 $ft.^2$ new construction project. On-site, the evaluators verified the participant had installed:

- (45) 28W LED fixtures;
- (228) 18W LED fixtures;
- (65) 47W LED fixtures;
- (6) 40W LED fixtures;
- (185) 24W LED fixtures;
- (112) 36W LED fixtures;
- (164) 24W LED fixtures;
- (49) 31W LED fixtures;
- (20) 18W LED fixtures;
- (10) 36W LED fixtures;
- (27) 48W LED fixtures; and
- (8) 108W LED fixtures.

M&V Methodology

Savings from the lighting measures were calculated using New Mexico Technical Resource Manual for lighting power density.

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and PNM peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Measure	*Building Type*	*Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*	*Lighting Power Density*
1	University	Classrooms	2,522	2,716	1.172	1.169	0.70	1.20 (w/ft2)
2	University	Exterior	4,312	4,312	1.000	1.000	0.00	5.0 W/linear foot

Savings Calculations

Measure 1: Lighting Power Density Reduction

Using values from the Deemed Savings Parameters table above, the evaluators calculated lighting savings as follows:

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPDpost	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square footage of the specific lighting area
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

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

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

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

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPD_{post}	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square foot area of the specific lighting area
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Savings from the various energy efficient measures are shown in the tables below.

LPD_{post} Calculations

Measure 1

Space Type	New Fixture	Wattage	Quantity	Total Wattage	Building Square Footage	Total Facility LPDbase	Total Facility LPDpost
Classroom	LED028-FIXT	28	45	25,466	49,920	1.20	0.59
Classroom	LED018-FIXT	18	228				
Classroom	LED047-FIXT	47	65				
Classroom	LED040-FIXT	40	6				
Classroom	LED024-FIXT	24	185				
Classroom	LED036-FIXT	36	112				
Classroom	LED024-FIXT	24	164				
Classroom	LED031-FIXT	31	49				
Classroom	LED018-FIXT	18	20				
Classroom	LED036-FIXT	36	10				
Classroom	LED048-FIXT	48	27				
Classroom	LED108-FIXT	108	8				
		Total	919	25,466	49,920	1.20	0.59

Measure 2

Space Type	New Fixture	Quantity	Wattage	Building Linear Footage	Total Facility LPDbase (W/Linear ft)	Total Facility LPDpost (W/Linear ft)
Exterior	LED047-FIXT	2	47	280	5.00	2.69
Exterior	LED055-FIXT	12	55			
	Total	**14**	**754**	**280**	**5.00**	**2.69**

LPD kWh Savings Calculations

Measure	Total Wattage	LPD		Area	Hours	HCEF	Expected kWh Savings	Realized kWh Savings	Realization Rate
		Base	Base						
1	25,466	1.20	0.59	49,920 sq. ft.	2,578	1.172	67,171	79,090	117.74%

2	754	5.00	2.69	280 linear ft.	4,312	1.000	1,831	2,789	152.36%
						Total	**69,002**	**81,879**	**118.7%**

LPD kW Savings Calculations

Measure	**LPD**		**Area**	**PCF**		**HCDF**	**Realized kW Savings**	**Expected kW Saving**	**Realization Rate**
	Base	**Post**		**Base**	**Post**				
1	1.20	0.59	49,920 sq. ft.	0.70	0.70	1.169	33.51	42.15	125.77%
2	5.00	2.69	280 linear ft.	0.00	0.00	1.000	0.00	0.00	N/A
						Total	**33.51**	**42.15**	**125.8%**

Results

The overall kWh realization rate for OID2050596 is 118.7% and the kW realization rate is 125.8%. The kWh savings are higher for the LPD improvement due to the ex post calculations using higher operating hours for these space type, as per NM TRM.

Verified Gross Savings & Realization Rates

Measure	**Verified**			
	kWh Savings	**kW Savings**	**kWh Realization Rate**	**kW Realization Rate**
LPD Improvement	81,879	42.15	118.7%	125.8%
Total	**81,879**	**42.15**	**118.7%**	**125.8%**

Project Number OID2230706
Program Business Custom Efficiency

Project Background

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

- (114) 2-lamp LED fixtures, replacing 4' 4-lamp T8 fixtures;
- (5) 2-lamp LED fixtures, replacing 4' 3-lamp T8 fixtures;
- (78) 2-lamp LED fixtures, replacing 48" 2-lamp T8 fixtures;
- (74) 12W LED fixtures, replacing 26W CFLs;
- (6) 9W LED fixtures, replacing 13W CFLs; and
- (1) 3W LED exit sign, replacing 25W incandescent exit sign.

M&V Methodology

The evaluators found some lighting fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	*Space Type*	*Annual Hours – Non-CFLs*	*Annual Hours – CFLs*	*HCEF*	*HCDF*	*PCF*
Large Office	Office (Open)	2,641	3,100	1.254	1.303	0.70
	Conference Room	2,692	1,647	1.254	1.303	0.70
	Corridor	2,641	3,860	1.254	1.303	0.70
	Lobby	2,692	3,860	1.254	1.303	0.70
	Restrooms	2,692	3,860	1.254	1.303	0.70
Storage	Storage (Unconditioned)	3,441	2,780	1.000	1.000	0.70

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*HCEF*	*Realization Rate*
	Base	*Post*	*Base*	*Post*	*Base*	*Post*				
4' 4L T8 to 38W LED - Non-Int. Ballast	69	69	112	38	2,641	2,641	33,382	16,910	1.254	50.7%
4' 4L T8 to 38W LED - Non-Int. Ballast	9	9	112	38	2,692	2,692	4,354	2,248	1.254	51.6%
4' 3L T8 to 38W LED - Non-Int. Ballast	5	5	85	38	2,641	2,641	1,536	778	1.254	50.6%
1L 26W CFL Multi 4-Pin to 12W LED - Non-Int. Ballast	74	74	29	12	3,860	3,860	8,224	6,089	1.254	74.0%
1L 13W CFL Multi to 9W LED - Non-Int. Ballast	6	6	13	9	3,860	3,860	157	116	1.254	73.9%
4' 4L T8 to 57W LED - Non-Int. Ballast	12	12	112	57	2,641	2,641	4,315	2,186	1.254	50.7%
4' 4L T8 to 57W LED - Non-Int. Ballast	24	24	112	57	3,441	3,441	8,630	4,542	1.000	52.6%

4' 2L T8 to 38W LED - Non-Int. Ballast	25	25	58	38	3,441	3,441	3,269	1,721	1.000	52.6%
2' 1L T8 to 10W LED - Non-Int. Ballast	78	78	18	10	2,641	2,641	4,080	2,067	1.254	50.7%
25W Inc. to 2.5W LED - Int. Ballast	1	1	25	3	3,860	3,860	147	109	1.254	74.1%
						Total	**68,094**	**36,766**		**54.0%**

Lighting Retrofit kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
4' 4L T8 to 38W LED - Non-Int. Ballast	69	69	112	38	0.70	0.70	10.68	4.66	1.303	43.6%
4' 4L T8 to 38W LED - Non-Int. Ballast	9	9	112	38	0.70	0.70	1.39	0.61	1.303	43.8%
4' 3L T8 to 38W LED - Non-Int. Ballast	5	5	85	38	0.70	0.70	0.49	0.21	1.303	42.7%
1L 26W CFL Multi 4-Pin to 12W LED - Non-Int. Ballast	74	74	29	12	0.70	0.70	2.63	1.15	1.303	43.7%
1L 13W CFL Multi to 9W LED - Non-Int. Ballast	6	6	13	9	0.70	0.70	0.05	0.02	1.303	39.8%
4' 4L T8 to 57W LED - Non-Int. Ballast	12	12	112	57	0.70	0.70	1.38	0.60	1.303	43.5%
4' 4L T8 to 57W LED - Non-Int. Ballast	24	24	112	57	0.70	0.70	2.76	0.92	1.000	33.3%
4' 2L T8 to 38W LED - Non-Int. Ballast	25	25	58	38	0.70	0.70	1.05	0.35	1.000	33.5%
2' 1L T8 to 10W LED - Non-Int. Ballast	78	78	18	10	0.70	0.70	1.31	0.57	1.303	43.7%
25W Inc. to 2.5W LED - Int. Ballast	1	1	25	3	0.70	0.70	0.05	0.02	1.303	42.5%
						Total	**21.79**	**9.11**		**41.8%**

Results

The kWh realization rate for OID2230706 is 54.0% and the kW realization rate is 41.8%. The verified kWh and kW savings are lower than expected due to the ex post calculations using lower operating hours for the space type, according to the NM TRM. The SPS technical assumptions assume the building type operates 3,425 annually and the ex post calculations used space-specific hours of operation based on the site visit. In addition, the ex post calculations used a lower coincidence factor of 0.70, according to the NM TRM, than the SPS technical assumptions assumed higher coincidence factor (CF) of 0.78. Lastly, the evaluators were unable to verify (14) 2.5W LED lamps.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
4' 4L T8 to 38W LED - Non-Int. Ballast	16,910	4.66	50.7%	43.6%
4' 4L T8 to 38W LED - Non-Int. Ballast	2,248	0.61	51.6%	43.8%
4' 3L T8 to 38W LED - Non-Int. Ballast	778	0.21	50.6%	42.7%
1L 26W CFL Multi 4-Pin to 12W LED - Non-Int. Ballast	6,089	1.15	74.0%	43.7%
1L 13W CFL Multi to 9W LED - Non-Int. Ballast	116	0.02	73.9%	39.8%
4' 4L T8 to 57W LED - Non-Int. Ballast	2,186	0.60	50.7%	43.5%
4' 4L T8 to 57W LED - Non-Int. Ballast	4,542	0.92	52.6%	33.3%
4' 2L T8 to 38W LED - Non-Int. Ballast	1,721	0.35	52.6%	33.5%
2' 1L T8 to 10W LED - Non-Int. Ballast	2,067	0.57	50.7%	43.7%
25W Inc. to 2.5W LED - Int. Ballast	109	0.02	74.1%	42.5%
Total	**36,766**	**9.11**	**54.0%**	**41.8%**

Project Number OID2252073
Program Business Custom Efficiency

Project Background

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

- (15) 2-lamp LED fixtures, replacing 4' 2-lamp T12 fixtures.

M&V Methodology

The Evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use as well as facility staff interviews, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	Space Type	Annual Hours – Non-CFLs	Annual Hours – CFLs	HCEF	HCDF	PCF
Motel	Corridor	8,760	8,760	1.437	1.295	1.00

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Hours		Expected kWh Savings	Realized kWh Savings	HCEF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 33W LED - Non-Int. Ballast	15	15	86	33	8,760	8,760	4,376	10,008	1.437	228.7%
						Total	**4,376**	**10,008**		**228.7%**

Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		PCF		Expected kW Savings	Realized kW Savings	HCDF	Realization Rate
	Base	Post	Base	Post	Base	Post				
4' 2L T12 to 33W LED - Non-Int. Ballast	15	15	86	33	1.00	1.00	0.60	1.03	1.295	171.7%
						Total	**0.60**	**1.03**		**171.7%**

Results

The kWh realization rate for OID2252073 is 228.7% and the kW realization rate is 171.7%. The verified kWh and kW savings were higher than expected because the ex ante calculations used lower hours of operation, HCIF, and coincidence factor (CF) than the ex post calculations. The SPS technical assumptions use a coincidence factor (CF) of 0.51 for motels, NM TRM assumes 0.90, and evaluators adjusted the CF to 1.00 taking into account verified operating hours.

Verified Gross Savings & Realization Rates

Measure	*Verified*			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
4' 2L T12 to 33W LED - Non-Int. Ballast	10,008	1.03	228.7%	171.7%
Total	**10,008**	**1.03**	**228.7%**	**171.7%**

Project Number OID2242759
Program Business Lighting Efficiency

Project Background

The participant is a motel that received incentives from SPS for installing energy efficient lighting as part of a 45,432 ft^2 new construction project.

M&V Methodology

Savings from the lighting measures were calculated using New Mexico Technical Resource Manual for lighting power density.

The evaluators found some lighting fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings for the lighting measures were calculated using New Mexico TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	Space Type	Annual Hours – Non-CFLs	Annual Hours – CFLs	HCEF	HCDF	PCF
Motel	Guest Room	755	755	1.437	1.295	0.08
	Office	5,858	6,132	1.437	1.295	0.70
	Laundry	4,709	4,709	1.437	1.295	0.60
	Corridor	7,474	6,132	1.437	1.295	0.90

Savings Calculations

Measure 1: Lighting Power Density Reduction

Using values from the Deemed Savings Parameters table above, the evaluators calculated lighting savings as follows:

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPDpost	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square footage of the specific lighting area
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

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

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

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

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPD_{post}	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square foot area of the specific lighting area
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Savings from the various energy efficient measures are shown in the tables below.

LPD_{post} Calculations

Space Type	***New Fixture***	***Wattage***	***Quantity***	***Total Wattage***	***Building Square Footage***	***Total Facility LPDbase***	***Total Facility LPDpost***
Motel - Guest Room	LED015-FIXT	15	379	N/A	N/A	N/A	N/A
Motel - Corridor	LED015-FIXT	15	107	N/A	N/A	N/A	N/A
Motel - Office	LED015-FIXT	15	16	N/A	N/A	N/A	N/A
Motel -	LED015-	15	10	N/A	N/A	N/A	N/A

Laundry	FIXT						
		Total	**502**	**13,130.00**	**45,432**	**1.10**	**0.29**

LPD kWh Savings Calculations

Space	***Total Wattage***	***LPDbase***	***LPDpost***	***Sq. Ft.***	***Hours***	***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
Motel	7,770	1.10	0.29	45,432	2,544	49,473	134,526	1.437	271.92%
Total	**7,770**	**1.10**	**0.29**	**45,432**	**2,544**	**49,473**	**134,526**	**1.437**	**271.92%**

LPD kW Savings Calculations

Space	***LPD***		***Sq. Ft.***	***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***		***Base***	***Post***				
Motel	1.10	0.29	45,432	0.30	0.30	21.51	19.24	1.295	89.44%
Total	1.10	0.29	45,432	0.30	0.30	21.51	19.24	1.295	89.44%

Results

The overall kWh realization rate for OID2242759 is 271.92% and overall kW realization rate is 89.44%. The evaluator used LPD method to calculate ex post savings for new construction projects. The ex ante savings uses the fixture-to-fixture method.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
LPD Improvement	134,526.00	19.24	271.92%	89.44%
Total	**134,526.00**	**19.24**	**271.92%**	**89.44%**

Project Number OID2119504
Program Business Lighting Efficiency

Project Background

The participant is a primary school that received incentives from SPS for implementing energy efficient lighting for a new construction building. On-site, the evaluators verified the participant had installed:

- (9) 4' 6-lamp T18 fixtures
- (9) 4' 6-lamp T18 fixtures
- (59) 1-lamp 42W CF fixtures
- (3) 35W LED fixtures
- (1) 14W LED fixture
- (5) 15W LED fixtures
- (5) 30W LED fixtures

M&V Methodology

The evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using New Mexico TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and PNM peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – Non-CFLs***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Primary School	Gymnasium	2,051	2,434	1.346	1.393	0.42
	Dining Area	1,347	1,530	1.346	1.393	0.42
	Classroom	2,445	2,660	1.346	1.393	0.42
	Exterior	4,313	4,313	1.000	1.000	0.00

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

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

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	*Quantity (Fixtures)*		*Wattage*		*Hours*		*Expected kWh Savings*	*Realized kWh Savings*	*HCEF*	*Realization Rate*
	Base	*Post*	*Base*	*Post*	*Base*	*Post*				
400W MH to 4' 6L T8	9	9	453	170	2,051	2,051	10,734	7,031	1.346	65.5%
400W MH to 4' 6L T8	9	9	453	170	1,347	1,347	10,734	4,618	1.346	43.0%
100W MH to 1L 42W CFL Multi	59	59	124	42	2,660	2,660	20,389	17,322	1.346	85.0%
100W MH to 35W LED - Non-Int. Ballast	3	3	124	35	2,445	2,445	1,125	879	1.346	78.1%
75W Inc. to 14W LED - Non-Int. Ballast	1	1	53	14	2,445	2,445	164	128	1.346	77.9%
150W Inc. to 15W LED - Non-Int. Ballast	5	5	150	15	2,660	2,660	2,845	2,417	1.346	85.0%
100W MH to 30W LED - Non-Int. Ballast	5	5	124	30	4,313	4,313	1,981	2,027	1.000	102.3%

Total	**47,972**	**34,422**		**71.8%**

Lighting Retrofit kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
400W MH to 4' 6L T8	9	9	453	170	0.42	0.42	2.93	1.49	1.393	50.8%
400W MH to 4' 6L T8	9	9	453	170	0.42	0.42	2.93	1.49	1.393	50.8%
100W MH to 1L 42W CFL Multi	59	59	124	42	0.42	0.42	5.57	2.83	1.393	50.8%
100W MH to 35W LED - Non-Int. Ballast	3	3	124	35	0.42	0.42	0.31	0.16	1.393	52.1%
75W Inc. to 14W LED - Non-Int. Ballast	1	1	53	14	0.42	0.42	0.04	0.02	1.393	44.6%
150W Inc. to 15W LED - Non-Int. Ballast	5	5	150	15	0.42	0.42	0.78	0.39	1.393	50.2%
100W MH to 30W LED - Non-Int. Ballast	5	5	124	30	0.00	0.00	0.54	0.00	1.000	0.0%
						Total	**13.10**	**6.38**		**48.7%**

Results

The kWh realization rate for OID2119504 is 71.8% and the kW realization rate is 48.7%.

The decrease in kW savings is due to the ex post calculations using a smaller PCF values compared to the ex ante calculations.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
400W MH to 4' 6L T8	7,031	1.49	65.5%	50.8%
400W MH to 4' 6L T8	4,618	1.49	43.0%	50.8%
100W MH to 1L 42W CFL Multi	17,322	2.83	85.0%	50.8%
100W MH to 35W LED -	879	0.16	78.1%	52.1%

Non-Int. Ballast				
75W Inc. to 14W LED - Non-Int. Ballast	128	0.02	77.9%	44.6%
150W Inc. to 15W LED - Non-Int. Ballast	2,417	0.39	85.0%	50.2%
100W MH to 30W LED - Non-Int. Ballast	2,027	0.00	102.3%	0.0%

Project Number OID2119504
Program Business Comprehensive

Project Background

The participant is a fast food restaurant that received incentives from SPS for installing energy efficient lighting as part of a 4,050 ft.^{2} new construction and 50,490 ft.^{2} of parking lot project.

M&V Methodology

Savings from the lighting measures were calculated using New Mexico Technical Resource Manual for lighting power density.

The evaluators confirmed installation of all fixtures listed in the project application. Savings for the lighting measures were calculated using deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and PNM peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	Space Type	Annual Hours – Non-CFLs	Annual Hours – CFLs	HCEF	HCDF	PCF
Fast Food	Dining Area	4,850	4,850	1.243	1.277	0.81
	Restrooms	4,677	4,677	1.243	1.277	0.81
	Exterior	4,312	4,312	1.000	0.00	1.000

Savings Calculations

Measure 1: Lighting Power Density Reduction

Using values from the Deemed Savings Parameters table above, the evaluators calculated lighting savings as follows:

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPDpost	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square footage of the specific lighting area
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures
HCEF	Heating/Cooling Energy Interactive Factor

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

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

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

LPD_{base}	Allowed ASHRAE 90.1 LPD (w/ft^2)
LPD_{post}	Total Wattage for fixtures / square footage / 1000 W/kW
Sqft	Square foot area of the specific lighting area
PCF	Peak Coincident Factor, % Time During the Peak Period in Which Lighting is Operating
HCDF	Heating Cooling Demand Interactive Factor

Savings from the various energy efficient measures are shown in the tables below.

LPD_{post} Calculations

Space Type	***New Fixture***	***Wattage***	***Quantity***	***Total Wattage***	***Building Square Footage***	***Total Facility LPDbase***	***Total Facility LPDpost***
Fast Food -	12.5W LED -	13	43	N/A	N/A	N/A	N/A

Dining Area	Int. Ballast						
Fast Food - Restrooms	12.5W LED - Int. Ballast	13	11	N/A	N/A	N/A	N/A
Total			25	54	0	4,050	1.40

LPD kWh Savings Calculations

Space	*Total Wattage*	*LPDbase*	*LPDpost*	*Sq. Ft.*	*Hours*	*Expected kWh Savings*	*Realized kWh Savings*	*HCEF*	*Realization Rate*
Small Retail - Sales Area	6,154	1.50	1.23	5,000	8,760	4,213	13,033	1.102	309.35%
Total	**6,154**	**1.50**	**1.23**	**5,000**	**8,760**	**4,213**	**13,033**	**-**	**309.35%**

LPD kW Savings Calculations

Space	***LPD***		***Sq. Ft.***	***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***		***Base***	***Post***				
Small Retail - Sales Area	1.50	1.23	5,000	0.88	0.88	2.13	1.4	1.117	66.80%
Total	**1.50**	**1.23**	**5,000**	**0.88**	**0.88**	**2.13**	**1.4**	**-**	**66.80%**

Results

The overall kWh realization rate for OID is 309.35% and the kW realization rate is 137.43%. The increase in kWh savings is due to the hours of operation used in the ex ante calculations were less than the hours (8,760) verified by the evaluator and used in the ex post calculations. The evaluator used the LPD method to calculate ex post kWh and kW savings, while the ex ante calculations used fixture-to-fixture method.

Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
LPD Improvement	13,033	1.4	309.35%	66.80%
Total	**13,033**	**1.4**	**309.35%**	**66.80%**

Project Number OID2147070
Program Business Lighting Efficiency

Project Background

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

- (101) 8W LED lamps, replacing 30W incandescent lamps; and
- (8) 12W LED lamps, replacing 50W halogen lamps.

M&V Methodology

The evaluators found some lighting fixture counts deviated from those listed in the project application. Verified fixture counts were used in ex post savings calculations. Savings for the lighting measures were calculated using NM TRM deemed values by space type for hours of use, along with a stipulated Peak Coincident Factor (PCF), Heating Cooling Energy Factor (HCEF) and Heating Cooling Demand Factor (HCDF) determined using local weather data and SPS peak parameters. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Building Type	***Space Type***	***Annual Hours – Non-CFLs***	***Annual Hours – CFLs***	***HCEF***	***HCDF***	***PCF***
Sit Down Restaurant	Dining Area	4,836	4,836	1.243	1.274	0.81
	Kitchen	4,804	4,804	1.243	1.274	0.81
	Restrooms	4,606	4,606	1.243	1.274	0.81
	Exterior	4,313	4,313	1.000	1.000	0.00

Savings Calculations

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

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

Parameters for kWh Savings Calculation of Lighting Retrofit Measures

kW_{base}	Total Baseline fixtures x W/Fixture$_{base}$ / 1000 W/kW
kWpost	Total Installed fixtures x W/Fixture$_{post}$ / 1000 W/kW
$Hours_{base}$	Annual Hours of Operation of Baseline Fixtures
$Hours_{post}$	Annual Hours of Operation of Installed Fixtures

HCEF	Heating/Cooling Energy Interactive Factor

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

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

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

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

Lighting Retrofit kWh Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***Hours***		***Expected kWh Savings***	***Realized kWh Savings***	***HCEF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
30W Inc. to 8W LED - Int. Ballast	79	79	30	8	4,836	4,836	14,013	10,447	1.243	74.6%
30W Inc. to 8W LED - Int. Ballast	18	18	30	8	4,804	4,804	3,193	2,365	1.243	74.1%
30W Inc. to 8W LED - Int. Ballast	4	4	30	8	4,606	4,606	710	504	1.243	71.0%
50W 1L Halogen to 12W LED - Int. Ballast	8	8	50	12	4,313	4,313	2,451	1,311	1.000	53.5%
						Total	**20,367**	**14,627**		**71.8%**

Lighting Retrofit kW Savings Calculations

Measure	***Quantity (Fixtures)***		***Wattage***		***PCF***		***Expected kW Savings***	***Realized kW Savings***	***HCDF***	***Realization Rate***
	Base	***Post***	***Base***	***Post***	***Base***	***Post***				
30W Inc. to 8W LED - Int. Ballast	79	79	30	8	0.81	0.81	2.48	1.79	1.274	72.1%
30W Inc. to 8W LED - Int. Ballast	18	18	30	8	0.81	0.81	0.57	0.41	1.274	72.4%
30W Inc. to 8W LED - Int. Ballast	4	4	30	8	0.81	0.81	0.13	0.09	1.274	71.6%

50W 1L Halogen to 12W LED - Int. Ballast	8	8	50	12	0.00	0.00	0.43	0.00	1.000	0.0%
						Total	**3.61**	**2.29**		**63.4%**

Results

The kWh realization rate for OID2147070 is 71.8% and the kW realization rate is 63.4%. Verified kWh and kW savings were lower than expected due to the several reasons. The evaluators were unable to verify (4) 12W exterior LED lamps and (11) 8W interior LED lamps.

Verified Gross Savings & Realization Rates

Measure	***Verified***			
	kWh Savings	***kW Savings***	***kWh Realization Rate***	***kW Realization Rate***
30W Inc. to 8W LED - Int. Ballast	10,447	1.79	74.6%	72.1%
30W Inc. to 8W LED - Int. Ballast	2,365	0.41	74.1%	72.4%
30W Inc. to 8W LED - Int. Ballast	504	0.09	71.0%	71.6%
50W 1L Halogen to 12W LED - Int. Ballast	1,311	0.00	53.5%	0.0%
Total	**14,627**	**2.29**	**71.8%**	**63.4%**

Project Number OID2137805
Program Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site the Evaluators verified the participant installed:

- (6) POC on a 15 HP 1200 RPM pump;
- (2) POC on a 25 HP 1200 RPM pump;
- (3) POC's on 30 HP 1200 RPM pumps;
- (5) POC's on 40 HP 1200 RPM pumps;
- (4) POC's on 50 HP 1200 RPM pumps;
- (8) POC's on 60 HP 1200 RPM pumps; and
- (3) POC's on 75 HP 1200 RPM pumps.

M&V Methodology

The Evaluators verified the installation of the 31 POC's on the pumps used to extract oil. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

The evaluators used New Mexico TRM protocols to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between the evaluators and SPS, which is informed by extensive monitoring performed by the evaluators at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left(\left[8{,}760 \times \left\{8.366 + .956 \times Pump_{eff} \times TC \times 100\right\}\right] - [8{,}760 * TC]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting , deemed 70%

The summary of the evaluators' findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	TEFC	25	1200	88.9%	20%	70%	23,442	2.68
Conventional	TEFC	50	1200	89.9%	23%	70%	44,319	5.06
Conventional	TEFC	50	1200	89.9%	43%	70%	31,642	3.61
Conventional	ODP	60	1200	89.5%	71%	70%	15,953	1.82
Conventional	TEFC	15	1200	87.2%	10%	70%	16,253	1.86
Conventional	TEFC	60	1200	90.4%	62%	70%	23,338	2.66
Conventional	TEFC	40	1200	89.7%	35%	70%	29,181	3.33
Conventional	TEFC	40	1200	89.7%	31%	70%	31,525	3.60
Conventional	TEFC	40	1200	89.7%	31%	70%	31,498	3.60
Conventional	TEFC	40	1200	89.7%	92%	70%	220	0.03
Conventional	TEFC	15	1200	87.2%	69%	70%	4,548	0.52
Conventional	TEFC	15	1200	87.2%	66%	70%	5,202	0.59
Conventional	TEFC	15	1200	87.2%	58%	70%	6,663	0.76
Conventional	TEFC	15	1200	87.2%	33%	70%	11,630	1.33
Conventional	TEFC	60	1200	90.4%	26%	70%	50,527	5.77
Conventional	TEFC	15	1200	87.2%	19%	70%	14,511	1.66
Conventional	ODP	75	1200	90.9%	14%	70%	73,974	8.44
Conventional	TEFC	60	1200	88.0%	50%	70%	33,410	3.81
Conventional	TEFC	60	1200	90.4%	41%	70%	38,665	4.41
Conventional	TEFC	75	1200	90.9%	52%	70%	38,413	4.39
Conventional	TEFC	75	1200	90.9%	70%	70%	20,954	2.39
Conventional	TEFC	30	1200	88.0%	20%	70%	28,178	3.22
Conventional	TEFC	60	1200	90.4%	59%	70%	25,453	2.91
Conventional	TEFC	50	1200	89.9%	26%	70%	42,275	4.83
Conventional	TEFC	30	1200	89.4%	10%	70%	31,646	3.61
Conventional	ODP	40	1200	88.5%	23%	70%	35,709	4.08
Conventional	TEFC	25	1200	88.9%	19%	70%	23,598	2.69
Conventional	TEFC	30	1200	89.4%	16%	70%	29,242	3.34
Conventional	TEFC	60	1200	88.0%	55%	70%	28,725	3.28
						Total	**868,621**	**99.16**

Results

The Evaluators calculated annual energy savings of 868,621 kWh and a demand reduction of 99.16 kW. OID2137805 had a realization rate of 97.7% for kWh and 98.3% for kW.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	888,735	100.90	868,621	99.16	97.7%	98.3%
Total	**888,735**	**100.90**	**868,621**	**99.16**	**97.7%**	**98.3%**

Project Number OID2044444
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is a natural gas processing facility that received incentives from SPS for the installation of VFDs on (1) 15 HP cooler fan motor, (2) 30 HP aftercooler fan motors, and (4) 30 HP condenser cooling fan motors. All six 30 HP fan motors have identical size single speed fan motor that runs at all time and the VFD fan is set to run at minimum speed of 30 Hz and throttles based on the demand. On site ADM verified installation of the VFD. Gross kWh realization for this project is 117%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of (1) 15 HP cooler fan motor, (2) 30 HP aftercooler fan motors, and (4) 30 HP condenser cooling fan motors. These equipment are installed in the line of natural gas refining process. IPMVP option A, retrofit isolation with key parameter measurement, is used to calculate the savings from this project. The evaluator used the facility trend data of key parameters.

SAVINGS CALCULATIONS

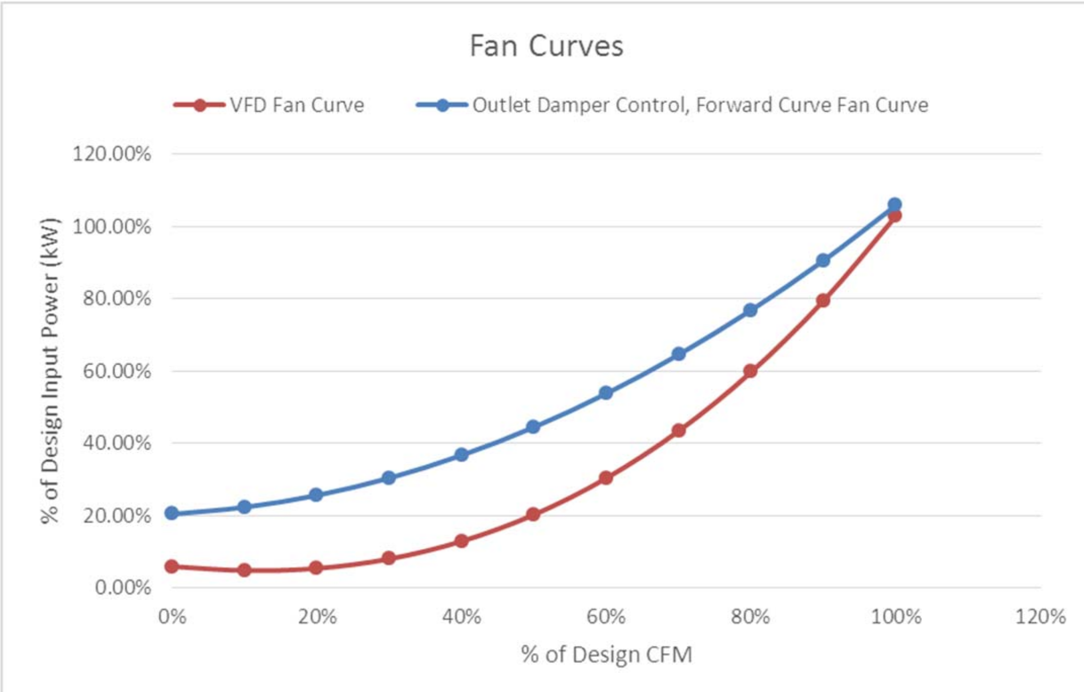
The Evaluators calculated the savings based on trend data of sample equipment from the facility. The trend data starts from August 15th, 2015 until December 5th 2015. The facility went through various testing period during that time and slowly increased the production rate. At the end of the trend data, the facility was at 81% of its production capacity.

The Evaluators requested facility trend data of one 30 HP aftercooler fan motor and one condenser cooling fan motor. The trend data consists of the running status of paired single speed fan motor, amperage of the VFD fan motor in single phase, and the drive frequency of VFD fan motor. The Evaluators verified the drive frequency recorded during the site visit matches with the trend data during the same time period. The Evaluators attempted to use amperage data, however, the data was not reliable as amperage data was not consistent with its drive frequency data. In the Evaluators' savings calculation, frequency trend data and a generic fan curve are used.

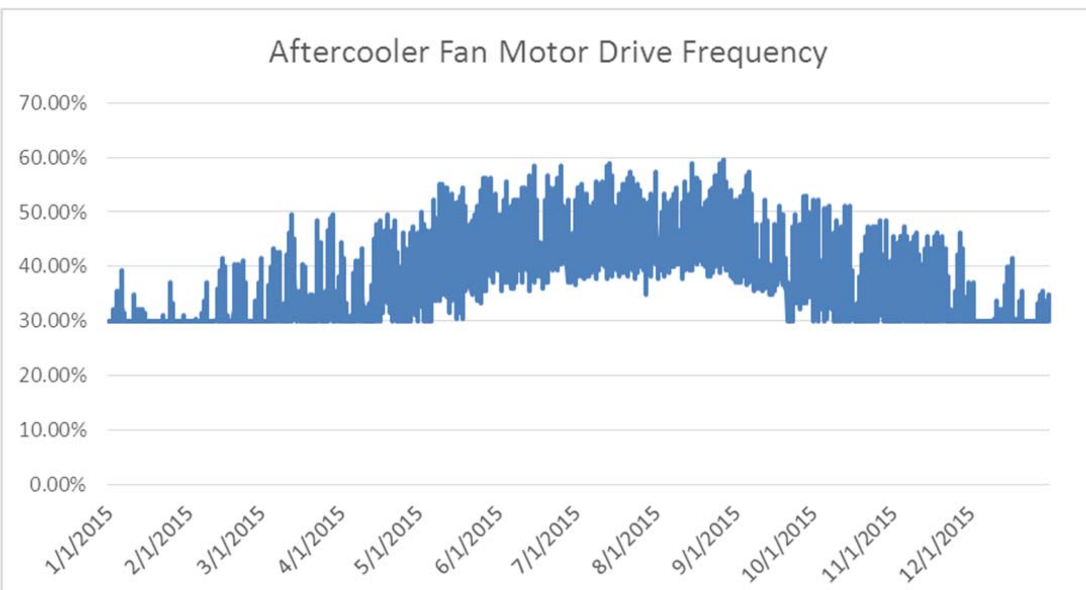
The baseline control is assumed with outlet damper as the evaluator found out damper controls on cooling fans in other natural gas refineries.

The Evaluators compared drive frequencies on VFDs with the facility production output but it did not show apparent relationship. It is suspected that that having a single speed fan and VFD fan running at a minimum of 30 Hz supplies enough cooling at current production level. These fans are used for cooling process therefore the outside air temperature has to be related with outside air temperature. The Evaluators calculated the estimated fan drive speed based on TMY3 weather data of Carlsbad Cavern City Airport.

Cooling Fan Curve



Aftercooler Fan Motor Drive Frequency Profile



The 15 HP cooler fan motor was running at fixed drive frequency of 60 Hz, therefore there is no savings from this motor.

Unit Savings per VFD Fan Motor

	Cooler Fan Motor	Aftercooler Fan Motor	Condenser Cooling Fan Motor
HP	15	30	30
Quantity	1	2	4
kWh Savings/Unit	0	33,096	33,129
kW Reduction/Unit	0.00	4.53	3.85

RESULTS

The Evaluators calculated energy savings of 198,709 kWh and a demand reduction of 24.45 kW resulting in a realization rate of 117%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
VFD Fan Motor	170,494	26.39	198,709	24.45	117%	93%
Total	**170,494**	**26.39**	**198,709**	**24.45**	**117%**	**93%**

The high realization rate can be attributed to the ex-ante calculations assuming the facility would operate at its full production capacity. The facility is still expanding its production capacity but it is still at 81% level. The current operating strategy provides more than enough cooling for current production rate, and there is no set date the facility will produce at its full capacity, therefore the savings for this project is reported at current level of production.

Project Number OID2044449
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is a natural gas processing facility that received incentives from SPS for the installation of VFDs on (17) 40 HP cooling fan motors, and (1) 15 HP circulation pump motor. All 17 fan motors have identical size single speed fan motor that runs at all time and the VFD fan is set to run at minimum speed of 30 Hz and throttles based on the demand. On site ADM verified installation of the VFD. Gross kWh realization for this project is 130%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of (17) 40 HP cooling fan motors, and (1) 15 HP circulation pump motor. This equipment is installed in the line of natural gas refining process. IPMVP option A, retrofit isolation with key parameter measurement, is used to calculate the savings from this project. The Evaluators used the facility trend data of key parameters.

SAVINGS CALCULATIONS

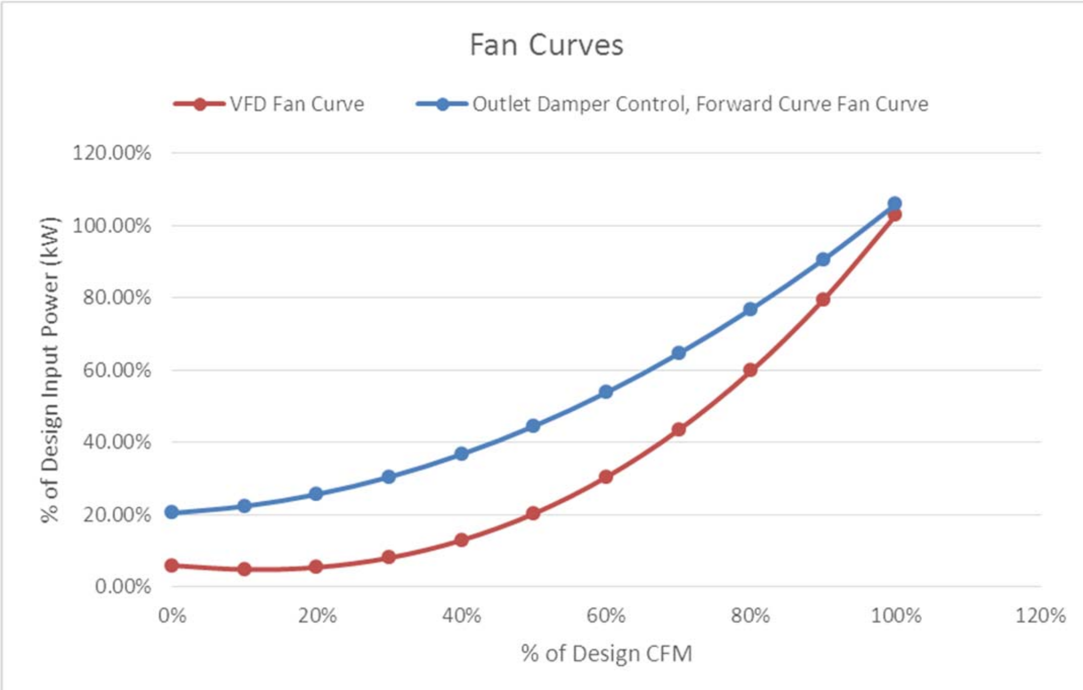
The Evaluators calculated the savings based on trend data of sample equipment from the facility. The trend data starts from August 15th, 2015 until December 5th 2015. The facility went through various testing period during that time and slowly increased the production rate. At the end of the trend data, the facility was at 81% of its production capacity.

The evaluator requested facility trend data of four sampled 40 HP cooling fan motors from different process cooling. The trend data consists of the running status of paired single speed fan motor, amperage of VFD fan motor in single phase, and the drive frequency of VFD fan motor. The Evaluators verified the drive frequency recorded during the site visit matches with the trend data during the same time period. The evaluator attempted to use amperage data, however, the data was not reliable as amperage data was not consistent with its drive frequency data. In evaluator’s savings calculation, frequency trend data and a generic fan curve are used.

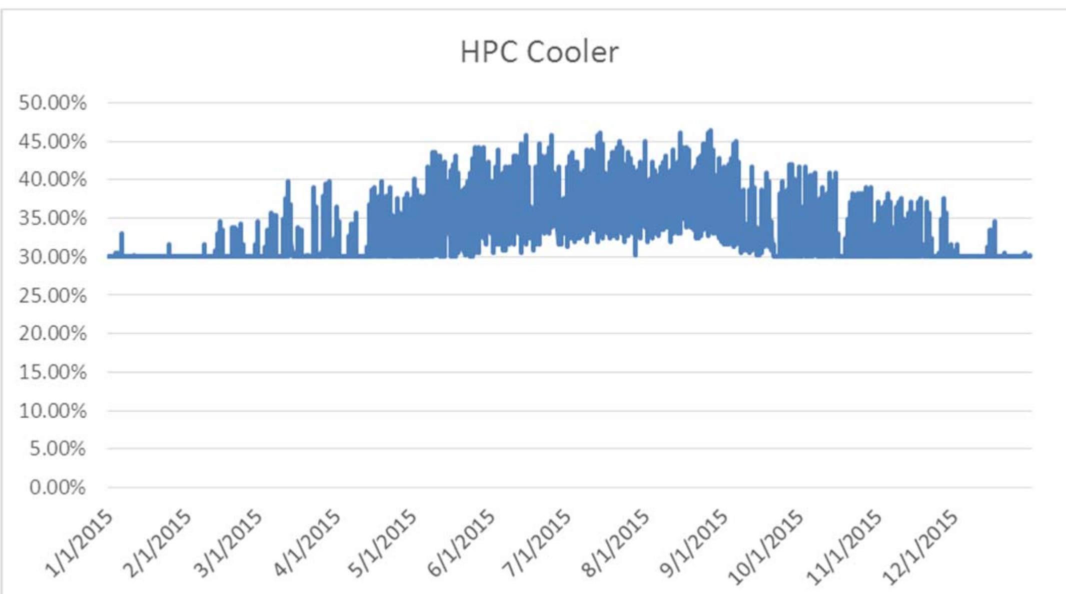
The baseline control is assumed with outlet damper as the evaluator found out damper controls on cooling fans in other natural gas refineries.

The Evaluators compared drive frequencies on VFDs with the facility production output but it did not show apparent relationship, the evaluator suspects that having single speed fan and VFD fan running minimum of 30 Hz supplies enough cooling at current production level. These fans are used for cooling process therefore the outside air temperature has to be related with outside air temperature. The Evaluators calculated the estimated fan drive speed based on TMY3 weather data of Carlsbad Cavern City Airport.

Cooling Fan Curve



High Pressure Compressor Cooling Fan Motor Drive Frequency Profile



The above plot is one of four sampled cooling fan profile. Its minimum drive frequency is 30 Hz and the outdoor temperature determines the frequency it should run to meet the cooling demand. 15 HP circulation pump is assumed to run at 45 Hz for all time.

Unit Savings per VFD Fan Motor

Measure	High Pressure Compressor Cooling Fan	Low Pressure Compressor Cooling Fan	Refrigeration Condenser Fan	Lean Amine Cooler Fan	Glycol Circulation Pump
HP	40	40	40	40	15
Quantity	6	1	4	6	1
kWh Savings/Unit	43,586	39,588	43,784	43,854	87,195
kW Reduction/Unit	3.29	5.05	4.92	4.92	9.95

RESULTS

The Evaluators calculated energy savings of 826,561 kWh and a demand reduction of 83.94 kW resulting in a realization rate of 130%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
VFD Motors	635,651	97.46	826,561	83.94	130%	86%
Total	**635,651**	**97.46**	**826,561**	**83.94**	**130%**	**86%**

The high realization rate can be attributed to the ex-ante calculations assuming the facility would operate at its full production capacity. The facility is still expanding its production capacity but it is still at 81% level. The current operating strategy provides more than enough cooling for current production rate, and there is no set date the facility will produce at its full capacity, therefore the savings for this project is reported at current level of production.

Project Number OID2044452
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is a natural gas processing facility that received incentives from SPS for the installation of VFDs on (6) 125 HP process pump motors. The facility has a parallel pipe setting having two identical setups of 4 pumps but only 3 pumps per setup run at any given time. Both setup runs together in parallel so total 6 pumps run at any given time. On site the Evaluators verified installation of the VFD. Gross kWh realization for this project is 150%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of (6) 125 HP process pump motors. This equipment is installed in the line of natural gas refining process. IPMVP option A, retrofit isolation with key parameter measurement, is used to calculate the savings from this project. The evaluator used the facility trend data of key parameters.

SAVINGS CALCULATIONS

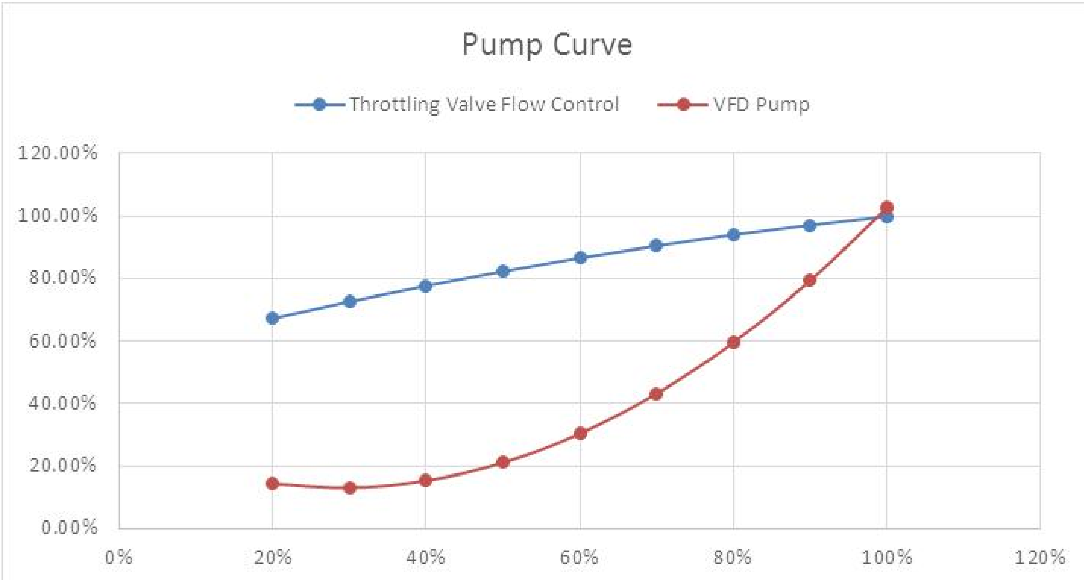
The Evaluators calculated the savings based on trend data of sample equipment from the facility. The trend data starts from August 15th, 2015 until December 5th 2015. The facility went through various testing period during that time and slowly increased the production rate. At the end of the trend data, the facility was at 81% of its production capacity.

The Evaluators requested facility trend data of one set of four 125 HP pump motors and assume the other set runs identical as this is a parallel setup. The trend data consists of the amperage of VFD pump motor in single phase and the drive frequency of VFD pump motor. The evaluator verified the drive frequency recorded during the site visit matches with the trend data during the same time period. The evaluator attempted to use amperage data, however, the data was not reliable as amperage data was not consistent with its drive frequency data. In evaluator's savings calculation, frequency trend data and a generic pump curve are used.

The baseline control is assumed with throttling valve flow control as the evaluator found out throttling valve controls on process cooling pump in other natural gas refineries.

The Evaluators compared drive frequencies on VFDs with the facility production output but it did not show apparent relationship, the evaluator suspects that three VFD pumps running nearly at 50 Hz supply enough cooling at current production level.

Pump Curve



The savings from this project is the area between the throttling valve flow control curve and the VFD pump curve.

Unit Savings per VFD Fan Motor

Drive Frequency	% GPM	Qty	Operating Hours	Baseline kW	As Built kW	kW Savings	kWh Savings
50.150	83.58%	6	8,760	70.41	49.01	21.40	1,125,026

RESULTS

The Evaluators calculated energy savings of 1,125,026 kWh and a demand reduction of 21.40 kW resulting in a realization rate of 150%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
VFD Pump Motors	751,142	114.3	1,125,026	128.43	150%	112%
Total	**751,142**	**114.3**	**1,125,026**	**128.43**	**150%**	**112%**

The high realization rate can be attributed to the ex-ante calculations assuming the facility would operate at its full production capacity. The facility is still expanding its production capacity but it is still at 81% level. The current operating strategy provides more than enough cooling for current production rate, and there is no set date the facility will produce at its full capacity, therefore the savings for this project is reported at current level of production.

Project Number OID2044453
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is a natural gas processing facility that received incentives from SPS for the installation of VFDs on (1) 150 HP blower fan motor. The flare stack has two blower fans: one single speed and one VFD. The VFD blower fan runs first until its maximum capacity, and then the single speed blower fan turns on so VFD blower fan can throttle on additional demand. On site, the Evaluators verified installation of the VFD. Gross kWh realization for this project is 108%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of (1) 150 HP blower fan motor. This is installed on acid gas flare stack. IPMVP option A, retrofit isolation with key parameter measurement, is used to calculate the savings from this project. The evaluator used the facility trend data of key parameters.

SAVINGS CALCULATIONS

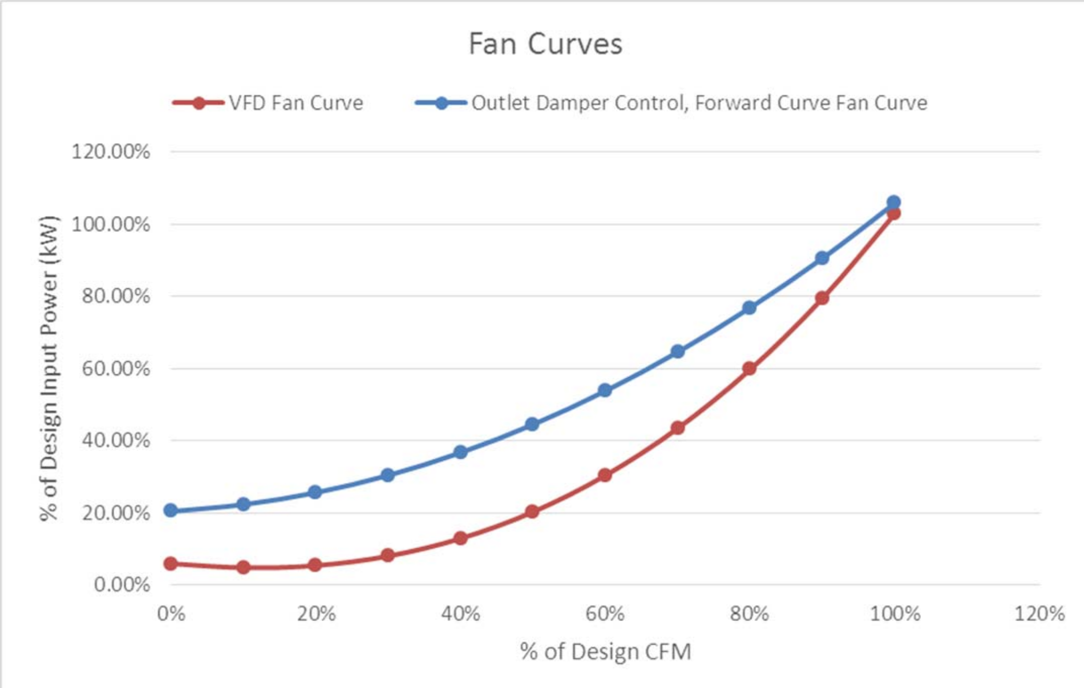
The Evaluators calculated the savings based on trend data of sample equipment from the facility. The trend data starts from August 15th, 2015 until December 5th 2015. The facility went through various testing period during that time and slowly increased the production rate. At the end of the trend data, the facility was at 81% of its production capacity.

The Evaluators requested facility trend data of 150 HP blower fan motors and its paired single speed blower fan motor. The trend data consists of status of the single speed blower fan, amperage of VFD fan motor in single phase and the drive frequency of VFD fan motor. The evaluator verified the drive frequency recorded during the site visit matches with the trend data during the same time period. The Evaluators attempted to use amperage data; however, the data was not reliable as amperage data was not consistent with its drive frequency data. In evaluator's savings calculation, frequency trend data and a generic fan curve are used.

The baseline control is assumed with outlet damper control as the evaluator found out outlet damper controls on process cooling fan in other natural gas refineries.

The evaluator compared drive frequencies on VFDs with the facility production output but it did not show apparent relationship, the evaluator suspects that VFD blower fan running nearly at 30 Hz supply enough air for combustion at current production level.

Fan Curve



The savings from this project is the area between the outlet damper control curve and the VFD fan curve.

Unit Savings per VFD Fan Motor

Drive Frequency	% CFM	Qty	Operating Hours	Baseline kW	As Built kW	kW Savings	kWh Savings
30.2	50.33%	1	8,760	34.29	15.75	18.53	162,355

RESULTS

The Evaluators calculated energy savings of 162,355 kWh and a demand reduction of 18.53 kW resulting in a realization rate of 108%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
VFD Blower Fan Motor	150,685	19.71	162,355	18.53	108%	94%
Total	**150,685**	**19.71**	**162,355**	**18.53**	**108%**	**94%**

The high realization rate can be attributed to the ex-ante calculations assuming the facility would operate at its full production capacity. The facility is still expanding its production capacity but it is still at 81% level. The current operating strategy provides more than enough cooling for current production rate, and there is no set date the facility will produce at its full capacity, therefore the savings for this project is reported at current level of production.

Project Number OID2142473
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is a natural gas refinery that received incentives from SPS for the installation of VFDs on multiple cooling fan motors. On site, the Evaluators verified installation of the VFD and monitored sampled fan motors. Gross kWh realization for this project is 111%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of (2) 50 HP VFDs on cryo-process cooling fan motors and (10) 25 HP VFDs on jacket cooling fan motors. These fans are used to support cooling in natural gas refining process. Based on the interview, the cryo fans alternate and rarely operates together and the jacket fans operates 5 to 6 fans at a time and rotate them. After installation of VFDs on jacket fans, the facility didn't find a need for running two fans so they only use 8 fans and rotate them to balance the annual operating hours.

The Evaluators monitored sampled VFDs for two weeks period and measured fan motor power consumption at different drive frequency to create fan power curve. The baseline fan motors ran at its full load and now the fans are manually set at lower drive frequency to save energy.

SAVINGS CALCULATIONS

A sample number of fan motors was monitored using WattNode data loggers. The loggers were set to record the kW demand at 1 minute intervals. The loggers were left in place for approximately 2 weeks and the facility was operating in normal condition.

During the on-site visit, the Evaluators measured fan power at different drive frequency to find the baseline kW demand as well as current kW demand at various drive frequency.

Fan Motor Power Curve

Frequency Hz	*Cryo Cooling Fan kW*	*Jacket Cooling Fan kW*
30	4.145	2.011
40	8.895	4.265
50	15.640	8.113
60	24.467	12.080

Without VFD, fan motors operate at 60 Hz, hence it's the baseline kW demand for those fans. After 2 weeks of monitoring sampled fan motors, ADM found fans operate at following average kW:

Average Fan Motor Power

Cryo Cooling Fan kW	Jacket Cooling Fan kW
10.132	3.822

The facility rotates cryo cooling fans so each fan motors get similar annual operating hours. The jacket fans are similar; however, the facility decided to put two fans as back up and operating 8 fans out of 10 and operate 5 to 6 fans at a time. This increases the annual operating hours of the fan after VFDs because they are rotating 8 fans instead of 10.

The total annual savings from this VFD project is as follows,

VFD Energy Savings

	kW Consumption		Operating Hours		Savings	
Qty	Baseline	Post	Baseline	Post	kWh	kW
10	12.080	3.8218	2,628	3,285	217,025.11	82.58
2	24.467	10.1319	4,380	4,380	125,575.91	28.67
				Total	342,601.01	111.25

The annual energy savings is 342,601 kWh and peak demand reduction of 111.25 kW.

RESULTS

The Evaluators calculated energy savings of 342,601 kWh and a demand reduction of 111.25 kW resulting in a realization rate of 111%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
Fan Motor VFDs	308,614.00	47.19	342,601.01	111.25	111%	236%
Total	**308,614.00**	**47.19**	**342,601.01**	**111.25**	**111%**	**236%**

This project has high realization because all fan motors are running at much lower drive frequency than originally estimated. The technical assumptions estimates about 33% demand reduction but the Evaluators found during the on-site verification and logger data that the facility is running these fans at much lower drive frequency than they intended and reduced over 50% demand.

Project Number OID2244335
Program Business Motor and Drive Efficiency

EXECUTIVE SUMMARY

The participant is an institutional campus that received incentives from SPS for the installation of an energy efficient 15-HP pump motor on a primary chilled water loop. On site the Evaluators verified installation of the pump motor and that the motor specifications matched project documentation. Gross kWh realization for this project is 100%.

M&V METHODOLOGY

During the site visit, the Evaluators verified the installation of the 15-HP pump motor on the primary chilled water loop. ADM used the technical assumptions for motor and drives to calculate the savings for this project because this facility operates similar to college and university in technical assumptions.

SAVINGS CALCULATIONS

The Evaluators verified this facility operates similar to college and universities in technical assumptions based on interviews.

The deemed savings calculation listed on the technical assumptions for motors and drives is as follows,

$$kWh_{Savings} = HP \times LF \times 0.746 \times \left(\frac{1}{Eff_{Standard}} - \frac{1}{Eff_{High}}\right) \times Hrs$$

$$kW_{Reduction} = HP \times LF \times 0.746 \times \left(\frac{1}{Eff_{Standard}} - \frac{1}{Eff_{High}}\right)$$

Where,

HP	*= Rated horsepower of the pump motor, 15 HP*
LF	*= Load factor of the pump motor, 0.75*
0.746	*= Conversion factor from horsepower to kW*
$Eff_{Standard}$	*= Efficiency of a standard motor, 91% based on EPACT*
Eff_{High}	*= Efficiency of the high efficiency motor, 93%*
Hrs	*= Typical pump operating hours for college and universities, 3,641 hours*

Compute all parameters, the savings is detailed in the table below.

Energy & Demand Savings

HP	LF	$Eff_{Standard}$	Eff_{High}	Hrs	kW Reduction	kWh Savings
15	0.75	91.0%	93%	3641	0.20	722

RESULTS

The Emulators calculated energy savings of 722 kWh and a demand reduction of 0.20 kW resulting in a realization rate of 100%.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
Pump Motor	722	0.16	722	0.20	100%	124%
Total	**722**	**0.16**	**722**	**0.20**	**100%**	**124%**

Project Number OID2257028
Program Business Motor and Drive Efficiency

Executive Summary

The participant is an oil company that received incentives from SPS for the installation of Pump-Off Controllers (POC) on above ground oil well pumps. On site the Evaluators verified the participant installed:

- (1) POC on a 40 HP 1200 RPM pump;
- (1) POC on a 50 HP 1200 RPM pump; and
- (3) POC's on 100 HP 1200 RPM pumps.

M&V Methodology

The Evaluators verified the installation of 5 out of 5 POC's on the pumps used to extract oil from the ground. The POC is designed to allow the oil depth of the well to reach an optimum depth before allowing the pump to start. Once the pump has been engage the controller only allows pumping if the oil depth is above the optimum pumping depth and once the level falls below this depth the pump is shut off. The original control strategy involved the use of an adjustable timer that would simply turn the pump on and off based on the set position of the timer.

Savings Calculations

The evaluators used NM TRM protocols to determine the annual energy savings of the installed POC's. The calculator was developed as a joint venture between the evaluators and SPS, which is informed by extensive monitoring performed by the evaluators at an earlier date. The deemed calculator uses the following equation:

$$kWh_{Savings} = \left(\frac{Hp \times .746 \times LF}{Eff \times Mech}\right) \times \left(\left[8{,}760 \times \left\{8.366 + .956 \times Pump_{eff} \times TC \times 100\right\}\right] - \left[8{,}760 * TC\right]\right)$$

Parameters for kWh Savings Calculation of POC

$kWh_{Savings}$	Annual kWh Savings for the installation of a POC
Hp	Motor Horsepower
LF	Motor Load Factor
Eff	Motor Efficiency
Mech	Mechanical Efficiency of the pump jack.
$Pump_{eff}$	Volumetric pump efficiency
TC	Time Clock setting , deemed 70%

The summary of the evaluators' findings can be found in the following table:

Ex-Post POC Calculated Savings

Unit Type	Motor Enclosure	HP	RPM	Motor Eff	Pump Eff	Baseline Time Clock	kWh Savings	Peak kW Reduction
Conventional	TEFC	40	1200	93.0%	49%	70%	21,334	2.44
Conventional	TEFC	100	1200	90.5%	58%	70%	43,364	4.95
Conventional	TEFC	100	1200	90.5%	51%	70%	52,266	5.97
Conventional	TEFC	50	1200	89.9%	34%	70%	37,189	4.25
Conventional	TEFC	100	1200	90.5%	52%	70%	50,994	5.82
Total							**205,148**	**23.42**

Results

The Evaluators calculated energy savings of 205,148 kWh and a demand reduction of 23.42 kW. OID2257028 had a realization rate of 103% for kWh and 124% for kW.

The slightly high realization rate can be attributed to the SPS deemed calculator assuming lower motor efficiencies than verified.

Verified Gross Savings & Realization Rates

Type	Claimed		Verified			
	kWh Savings	kW Savings	kWh Savings	kW Savings	Realization Rate kWh	Realization Rate kW
POC's	198,297	18.94	205,148	18.94	103%	124%
Total	198,297	18.94	205,148	18.94	103%	124%