Evaluation of 2014
Public Service Company of New Mexico
Energy Efficiency & Demand Response Portfolio

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. Executive Summary

This report is to provide a summary of the evaluation effort of the 2014 Demand Side Management (DSM) portfolio by the Public Service Company of New Mexico (PNM). In 2014, the PNM portfolio consisted of 11 residential and four non-residential programs. ADM Associates, Inc. (the Evaluators) estimated gross realization, net savings, and cost-effectiveness for the eight programs evaluated in 2014.

1.1 Summary of PNM 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 2014, the PNM DSM portfolio contained the following programs:

- Residential Lighting;
- Residential Refrigerator Recycling;
- Market Transformation;
- Low Income Easy Savings;
- Low Income CFL & Refrigerator Replacement;
- Whole House;
- Residential Stay Cool;
- Low Income Home Efficiency;
- Student Efficiency Kits;
- Home Energy Reports;
- PNM Peak Saver;
- PNM Power Saver;
- Large Customer Self-Direct
- Community CFL; and
- Commercial Comprehensive (Encompassing Retrofit Rebates, New Construction Rebates, QuickSaver Direct Install, and Building Tune-Up components).

For 2014, EM&V was conducted for a subset of the portfolio. The programs evaluated for this program year include:

- Commercial Comprehensive;
- Large Customer Self-Direct

- Whole House;
- Residential Stay Cool;
- Low Income Home Efficiency;
- Student Efficiency Kits;
- Home Energy Reports;
- PNM Peak Saver; and
- PNM Power Saver.

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 net-to-gross ratios (NTGRs) for the reviewed programs. Table 1-1 and 1-2 present gross and net impacts by program.

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	
Residential Lighting	3,608.3	3,608.3	31,343,203	31,343,203	244,366,853	244,366,853	100.0%
Refrigerator Recycling	1,814.2	1,814.2	10,607,937	10,607,937	51,978,891	51,978,891	100.0%
Low Income Easy Savings	130.6	130.6	1,168,266	1,168,266	10,502,711	10,502,711	100.0%
LI CFL & Refrigerator	47.6	47.6	309,840	309,840	4,171,254	4,171,254	100.0%
Whole House	136.0	51.4	614,884	374,846	5,879,069	3,412,502	61.0%
LI Home Efficiency	107.4	90.3	1,003,115	950,212	14,132,253	14,088,454	94.7%
Residential Stay Cool	3,683.0	3,339.3	2,492,203	3,974,492	26,915,792	59,365,487	159.5%
Student Efficiency Kits	51.4	37.9	727,558	815,448	4,074,322	7,516,068	112.1%
Home Energy Reports	780.0	789.1	4,290,000	4,340,262	4,290,000	4,340,262	101.2%
Community CFL	17.3	17.3	148,119	148,119	1,036,833	1,036,833	100.0%
Commercial Comprehensive	6,756.3	7,259.6	41,862,528	40,748,360	463,533,191	460,296,653	97.3%
Large C&I Self-Direct	64.0	66.8	227,240	234,947	4,401,472	3,524,205	103.4%
Total	17,196.1	17,252.4	94,794,893	95,015,932	835,282,641	864,600,173	100.2%

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	
Residential Lighting	2,641.3	2,641.3	22,932,889	22,932,889	178,876,536	178,876,536	100.0%
Refrigerator Recycling	1,182.9	1,182.9	6,916,375	6,916,375	33,890,237	33,890,237	100.0%
Low Income Easy Savings	130.5	130.5	1,168,266	1,168,266	10,502,711	10,502,711	100.0%
LI CFL & Refrigerator	47.5	47.5	309,840	309,840	4,171,254	4,171,254	100.0%
Whole House	109.0	48.0	522,584	367,586	4,703,255	3,289,913	70.3%
LI Home Efficiency	107.4	90.3	1,003,115	950,212	14,132,253	14,088,454	94.7%
Residential Stay Cool	1,898.0	1,090.7	1,271,024	1,316,600	13,727,054	19,517,078	103.6%
Student Efficiency Kits	51.4	37.9	727,558	815,448	4,074,322	7,516,068	112.1%
Home Energy Reports	780.0	789.1	4,290,000	4,340,262	4,290,000	4,340,262	101.2%
Community CFL	10.6	10.6	90,353	90,353	632,468	632,468	100.0%
Commercial Comprehensive	5,672.5	5,970.5	34,507,005	34,330,508	402,849,871	388,461,540	99.5%
Large C&I Self-Direct	64.0	66.8	227,240	234,947	4,401,472	3,524,205	103.4%
Total	12,695.1	12,106.1	73,966,249	73,773,286	676,251,433	668,810,726	99.7%

Additionally, PNM Peak Saver and Power Saver 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 and

Table 1-4.

Table 1-3 PNM Power Saver Evaluation Results

Sector	kW Factor	# Units	Available Demand Reduction	kWh Savings
Residential	0.98	35,894	35,176.1	481,590
Small Commercial	0.58	4,404	2,554.3	

Medium Commercial	10.96 (per premise)	465	5,096.4	NA
	Total	48,002	42,826.8	481,590

Table 1-4 PNM Peak Saver Evaluation Results

Month	*Nominated kW*	*Verified kW*	*kWh Savings*
June	15,270	19,254	530,584
July	15,120	15,652	194,500
August	13,860	NA	NA
September	15,260	NA	NA
Total:	14,878	18,054	725,084

Finally, the Evaluators estimated cost-effectiveness of the 2014 programs and overall portfolio using the Total Resource Cost (TRC) test and Utility Cost Test (UCT). The results are provided in Table 1-5 below.

Table 1-5 Cost Effectiveness Testing by Program

Program	*NPV of TRC Benefits*	*NPV of UCT Benefits*	*NPV of TRC Costs*	*NPV of UCT Costs*	*TRC*	*UCT*
Residential Lighting	$6,819,265	$6,819,265	$2,899,775	$1,808,435	2.35	3.77
Refrigerator Recycling	$1,450,962	$1,450,962	$894,812	$1,317,576	1.62	1.10
Low Income Easy Savings	$1,376,707	$436,061	$399,826	$399,826	3.44	1.09
LI CFL & Refrigerator	$209,489	$209,489	$150,027	$150,027	1.40	1.40
Whole House	$231,008	$127,424	$731,458	$775,898	0.32	0.16
LI Home Efficiency	$652,357	$557,802	$509,386	$914,610	1.28	0.61
Residential Stay Cool	$1,269,400	$1,269,400	$333,244	$773,650	3.81	1.64
Student Efficiency Kits	$538,429	$221,339	$289,942	$289,942	1.86	0.76
Home Energy Reports	$361,889	$189,385	$511,199	$511,199	0.71	0.37
Community CFL	$23,580	$23,580	$7,676	$11,448	3.07	2.06
Commercial Comprehensive	$16,381,014	$16,381,014	$9,860,759	$5,573,705	1.66	2.94
Large Customer Self-Direct	$192,090	$192,090	$0	$0	NA	NA
Market Transformation	$0	$0	$316,229	$316,229	0	0
Load Management						
Power Saver	$5,577,361	$5,577,361	$4,898,051	$6,720,369	1.14	0.83
Peak Saver	$2,364,613	$2,364,613	$1,075,400	$1,695,400	2.2	1.39
Aggregate Portfolio:	$37,448,164	$35,819,785	$22,877,784	$21,258,314	1.64	1.68

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 Evaluator provides 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 by the Evaluator 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 Evaluator verifies 300 kWh per showerhead, Gross Realization Rate = 300/398 = 75%)
- *Free-Ridership* – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program
- *Net Savings* – Gross savings factoring off free-ridership, (e.g., if Free-Ridership for low-flow showerheads = 50%, net savings = 398 kWh x 50% = 199 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*[1] – Total Resource Cost Test, taking the ratio of net benefits over net costs, including both participant and utility costs
- *UC – Utility Cost Test, taking the ratio of net benefits to the utility divided by net costs to the utility.*

2.2 Overview of Methodology

The Evaluator's methodology in the evaluation of the 2014 PNM 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, the Evaluator's evaluation will provide the NMPRC with verified net savings results, provide the sponsoring utilities with recommendations for program improvement, and ensure cost-effective use of ratepayer funds. By leveraging experience and lessons learned from impact evaluation of prior program years, the Evaluator has been able to expand upon the 2014 evaluation effort, in order to use the results of this impact evaluation to better inform PNM of methods by which program and portfolio performance could be improved.

2.3 Sampling

Sampling is necessary to evaluate savings for the PNM 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

2.4 Census of Participants

A census of participant data was used for select programs where such review is feasible. No PNM programs incorporated a census approach in their entirety, but some programs had a census approach to a subset of the analysis. For example, Residential

[1] TRC and UCT tests are explained in greater detail in Section 2.6

Lighting was evaluated by reviewing the deemed savings calculations for a census of line items in the provided tracking data, ensuring that energy and demand savings for each rebated CFL were calculated appropriately.

2.4.1 Simple Random Sampling

For programs with relatively homogenous measures (largely in the residential portfolio), the Evaluator 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:

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

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 Evaluator 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 Evaluator applied finite

population correction factors in instances of low participation in determining samples required for surveying or onsite verification.

2.4.2 Stratified Random Sampling

For the PNM 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 2014 PNM Commercial Comprehensive Program had a CV of 3.63 at year's end for the Retrofit Rebates component. This would have required a census of participants, and would have been 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 the CCP was reduced to 27, with one certainty stratum and 4 sample strata.

2.4.3 Free-Ridership

In determining ex post net savings for the PNM DSM portfolio, the Evaluator provides 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 Evaluator 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, the Evaluator then examines 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 to the decision-making process. 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, a sponsoring utility provides assistance for a large commercial retrofit project by offering energy efficiency measure recommendations or by providing a 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, he Evaluator then estimates the Net-to-Gross Ratio (NTGR), calculated as:

$$NTGR = 1 - \% \text{ Free-Ridership}$$

2.5 Data Collection

This subsection provides descriptions of the Evaluator's data collection procedures, including:

- Telephone Surveying;
- Residential On-Site Verification; and

- Business On-Site Verification & Metering.

2.5.1 Telephone Surveying

The Evaluators conducted a large volume of telephone surveys in evaluating the 2014 PNM DSM portfolio. These surveys were designed to collect a variety of data needed in the evaluation effort, including:

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

Table 2-1 below presents the total surveys conducted by program.

Table 2-1 Telephone Surveys by Program

Program	***Surveys***
Whole House	68
LI Home Efficiency	40
Residential Stay Cool	199
Student Efficiency Kits (Teacher Surveys)	31
Commercial Comprehensive	112
Total Surveys:	450

Surveys with business program participants, PNM staff, 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.

2.5.2 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 Evaluator conducted onsite metering at facilities where factors contributing to energy savings, including lighting schedule and motor load factors, were subject to high uncertainty. Table 2-2 below provides a summary of on-site visits by program.

Table 2-2 Summary of Site Visits by Program

Program	***# Site Visits***
Commercial Comprehensive – Retrofit	27
Commercial Comprehensive – New Construction	9
Commercial Comprehensive – QuickSaver	23
Whole House	42
Low Income Home Efficiency	19
Total	120

2.6 Cost-Effectiveness Testing

In evaluating the 2014 PNM DSM Portfolio, the Evaluator performed cost-effectiveness testing at the program and portfolio levels. The Evaluator performed the Total Resource Cost (TRC) and Utility Cost (UC) test.

2.6.1 Total Resource Cost Test

The TRC value is defined as:

$$TRC = \frac{Electric\ Cost\ Decrease + Capacity\ Credit + Non - Electric\ Cost\ Decrease}{Net\ Customer\ Investment + Utility\ Administrative\ Cost}$$

The parameters for this equation are defined in

Table 2-3.

Table 2-3 Parameters for TRC Testing

Parameter	Definition
UEPCD	Utility Electric Cost Decrease: The Net Present Value (NPV) of avoided production costs. Estimated by taking NPV of net kWh savings multiplied by $/kWh production costs over the life of the measure.
UGCC	Utility Generation Capacity Credit: The NPV of avoided capacity expansion costs. Estimated by taking NPV of net demand reduction multiplied by $/kW capacity expansion costs over the life of the measure.
NEACD	Non-Electric Acquisition Cost Decrease: NPV of gas savings created incidentally by electric DSM programs (from measures such as weatherization, low-flow showerheads, etc.). Estimated by taking NPV of net Therms savings multiplied by $/Therm of gas production/distribution by gas utilities serving the PNM 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 PNM 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 PNM to program participants.

2.6.2 Utility Cost Test

The UC test is defined as:

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

Most terms in this equation are defined and calculated in the same manner as the components of the TRC test. Where the UC 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 on TRC is neutral. The UC 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 Low Income CFL & Refrigerator 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 PNM.

3. PNM Power Saver

3.1 Program Description

The PNM Power Saver program (PPSP) is a direct load control program in which participants agree to have a Smart Switch attached to their refrigerated air unit. When PNM 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 $25 incentive for their participation.

3.2 M&V Methodology

The PNM Power Saver Program (PPSP) provides incentives to residential, small commercial (<50kW) and medium commercial (<150 kW) customers to have control switches installed on their air conditioning units, allowing PNM to curtail these units as needed during system critical peaks.

3.2.1 Evaluation of PSP Residential Component

The residential component of the PSP was evaluated through use of a control group. The Evaluator developed a sample for metering, weighted to be sufficiently representative of the Albuquerque and Santa Fe regions. The sample is metered for the length of the control season (June 1 – September 30). After each curtailment event, 20% of the curtailment group and control group are rotated, in order to ensure non-biased comparisons between the groups. In order to qualify for M&V purposes, the event must have at least one hour in which the temperature in Albuquerque, NM exceeds 97 degrees. Determining the total peak demand reduction provided by the PSP is done through the following steps:

(1) Comparison of kW/Ton values of curtailment and control groups over the range of the events;

(2) Calculating the highest kW reduction over a 15-minute rolling average of 5-minute intervals;

(3) Multiplying the resulting kW/Ton by total residential population tonnage

3.2.2 Evaluation of PSP Commercial Component

For the medium commercial component, demand reductions are evaluated using metered data for a curtailed group with a baseline determined from adjusting usage on prior days. The calculation utilizes the same 15-minute rolling average of 5-minute interval data as the Residential & Small Commercial component. However, the baseline is determined by the following equation:

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

Where

Baseline Days = Three of the previous 10 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 converted to a per-unit reduction, which is then translated to the entire medium commercial 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 2014 program year. This provides estimates of the value of the resource developed by the program implementation staff.

3.3 PNM Power Saver Impact Findings

The Evaluator estimated the available critical peak reduction from the PPSP by analysis of metered data from the curtailment group on the M&V Events in 2014.

3.3.1 Sample Design

Table 3-1 describes the final sample. Following a similar stratification to 2013, the 2014 plan adds the addition of strata differentiating residence type (MDU vs. non-MDU). In addition, small commercial devices have been split from residential and the medium commercial MDUs have been added to the residential population. For this proposal, the South region has been absorbed into the Central region. For the *Residential* and *Small Commercial* segment the proposed plan for 2014 is to distribute the M&V population as shown.

Table 3-1 M&V Sample Received

Strata	Participant Type	Region	MDU	Tonnage	# Sample Points	% of M&V Count
1	Residential + Small *& Medium Commercial MDUs	North	NO	≤ 3.0	3	1.0%
2				≥ 2.0	3	1.0%
3			YES	All	7	2.4%
4		Central	No	≤ 2.0	13	4.4%
5				2.0 ≤ … ≤3.5	47	15.8%
6				≥ 3.5	45	15.2%
7			Yes	≤ 1.5	54	18.2%
8				1.5 ≤ … ≤ 2.0	64	21.5%
9				> 2.0	20	6.7%
10		South NM	NO	All	4	1.0%
11			YES	All	3	1.0%
12	Small Commercial	North	No	All	14	4.7%
13		Central	No	> 4.5	13	4.4%
14				≥ 4.0	3	1.0%
15		South NM	No	All	2	.7%
				Total	297	100%

3.3.2 Residential & Small Commercial kW Factor Definition

For the residential and small-commercial Power Saver program, event performance is measured by the residential kW factor, as defined in the Comverge M&V Plan. The kW factor is defined as the largest average difference – where the averaging is done over a rolling 15-minute window, or over three 5-minute intervals – between the averaged loads of a control group and a treatment group (whose load serves as the baseline), which also occurs during a qualified M&V hour. An event hour qualifies as an M&V hour if the average temperature, as recorded at KABQ (Albuquerque International Sunport) is greater than or equal to 97 degrees Fahrenheit.

3.3.3 kW Factor Calculation

In the 2014 cooling season, there were nine total events, with three events having at least one qualifying M&V Event hour. The events and associated kW Factor performance are summarized in Table 3-2.

Table 3-2 2014 Event Summary

Event Date	*Event Start (MDT)*	*Event End (MDT)*	*# Qualifying M&V Hours*	*Peak 15 Minute Reduction*	*Eligible Peak 15 Minute Reduction*
6/3/2014	2:00 PM	6:00 PM	1	0.683	0.526
6/4/2014	2:00 PM	6:00 PM	0	0.733	
6/5/2014	2:00 PM	6:00 PM	0	1.074	
6/25/2014	2:00 PM	6:00 PM	0	0.965	
6/26/2014	2:00 PM	6:00 PM	1	0.733	0.733
6/30/2014	2:00 PM	6:00 PM	3	0.822	0.93
7/22/2014	2:00 PM	6:00 PM	0	0.797	
7/24/2014	2:00 PM	6:00 PM	0	0.803	
7/25/2014	2:00 PM	6:00 PM	0	1.038	

3.3.1 Net kWh Savings

The **reduction factor** for an event is defined as the sum of the kWh reductions across all hours of the event. The **snapback factor** is the sum of the kWh differences (which are sometimes negative, due to higher-than-normal cooling demand after the end of an event), for the three hours following the conclusion of the event. Although unusual, positive savings during the snapback period are considered valid by virtue of the control group methodology used, whereas, they are not for the commercial segment, which uses a heuristic baseline methodology).

Table 3-3 Hourly kWh Reductions

Date	Hour 1	Hour 2	Hour 3	Hour 4	Snap 1	Snap 2	Snap 3	Reduction Factor (kWh)	Snapback Factor (kWh)	Net kWh Difference
6/3/2014	0.41	0.41	0.42	0.43	-0.37	-0.52	-0.35	1.68	-1.25	0.43
6/4/2014	0.49	0.58	0.67	0.51	-0.36	-0.41	-0.27	2.25	-1.04	1.21
6/5/2014	0.53	0.80	0.78	0.58	-0.14	-0.07	0.07	2.69	-0.15	2.55
6/25/2014	0.68	0.60	0.53	0.62	-0.13	-0.31	-0.30	2.43	-0.73	1.70
6/26/2014	0.54	0.53	0.61	0.53	-0.25	-0.25	-0.20	2.21	-0.71	1.50
6/30/2014	0.61	0.67	0.74	0.55	-0.51	-0.44	-0.49	2.57	-1.44	1.13
7/22/2014	0.43	0.66	0.46	0.44	-0.42	-0.34	-0.30	2.00	-1.06	0.94
7/24/2014	0.37	0.58	0.57	0.64	-0.25	-0.16	-0.14	2.17	-0.55	1.61
7/25/2014	0.52	0.70	0.75	0.90	-0.12	-0.17	-0.16	2.87	-0.44	2.42

Table 3-4 Net Per-Device kWh Savings

Event Date	Per-Unit kWh	Number of Units	MWh Savings
6/3/2014	0.43	35126	15.110
6/4/2014	1.21	35126	42.477
6/5/2014	2.55	35126	89.416
6/25/2014	1.70	35126	59.619
6/26/2014	1.50	35126	52.690
6/30/2014	1.13	35126	39.690
7/22/2014	0.94	36670	34.542
7/24/2014	1.61	36670	59.147
7/25/2014	2.42	36670	88.896
Average	1.50	35640.67	53.51 (Total: 481.59 MWh)

3.3.2 Residential & Small Commercial Event Load Profiles

The load profiles of the curtailment and control groups are displayed in Figure 3-1 to Figure 3-9 to follow.

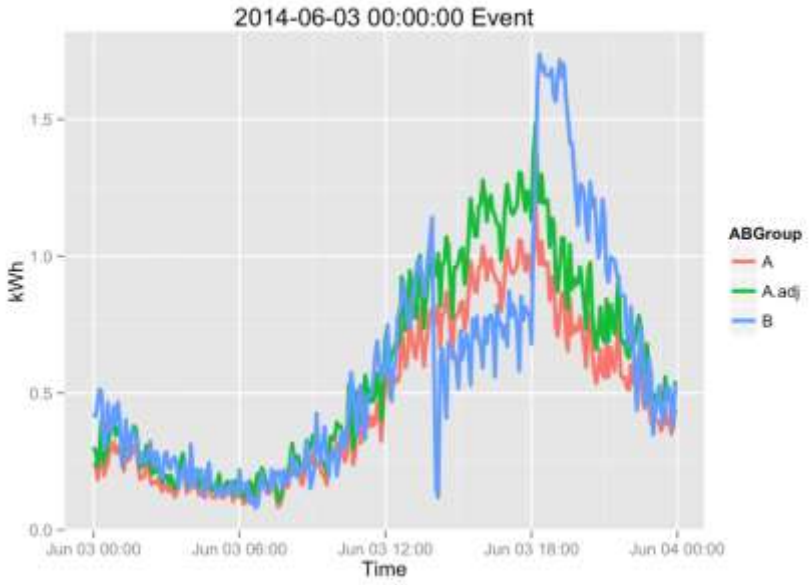

Figure 3-1 June 3rd – Res/Small Commercial Load Profile

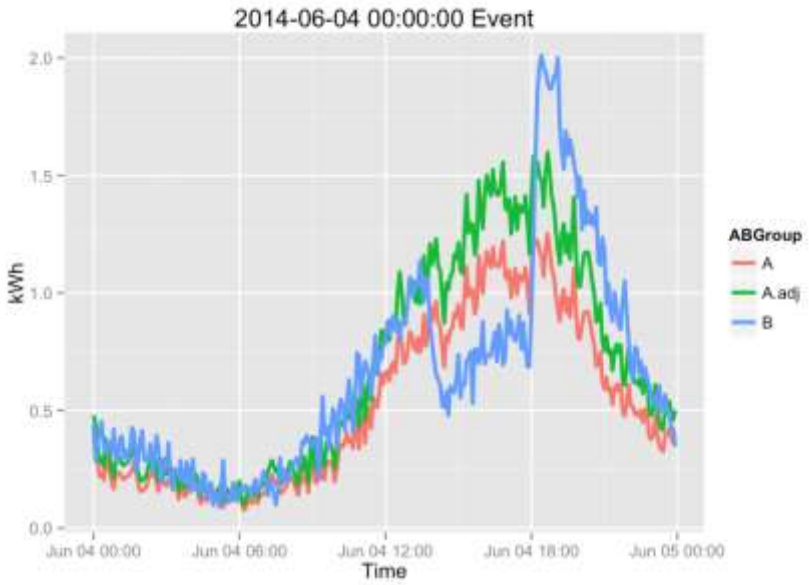

Figure 3-2 June 4th - Res/Small Commercial Load Profile

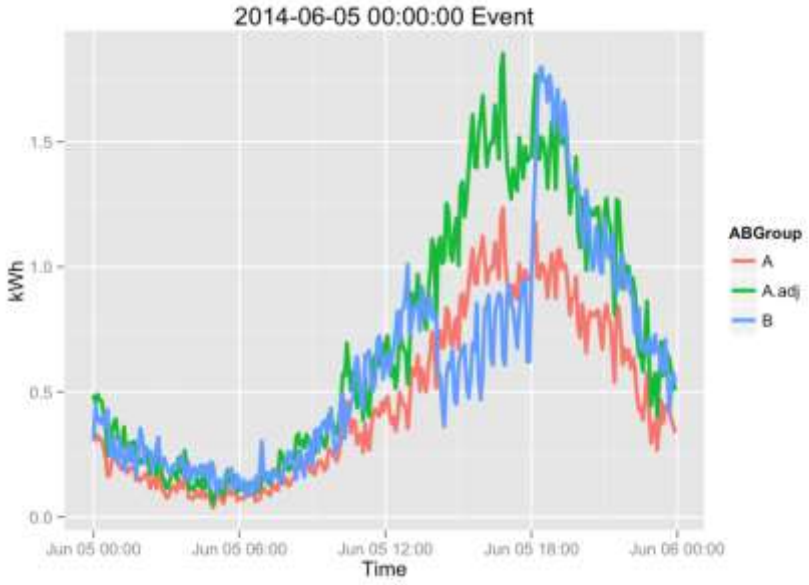

Figure 3-3 June 5th – Res/Small Commercial Load Profile

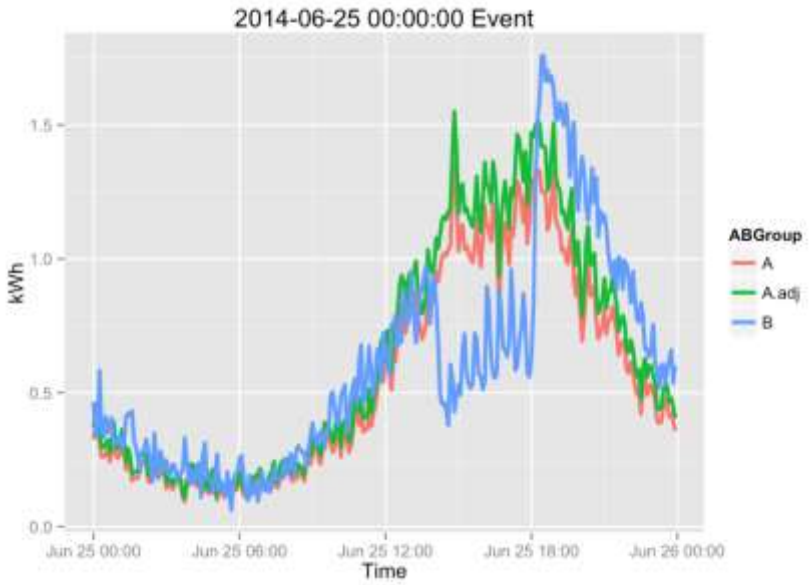

Figure 3-4 June 25th - Res/Small Commercial Load Profile

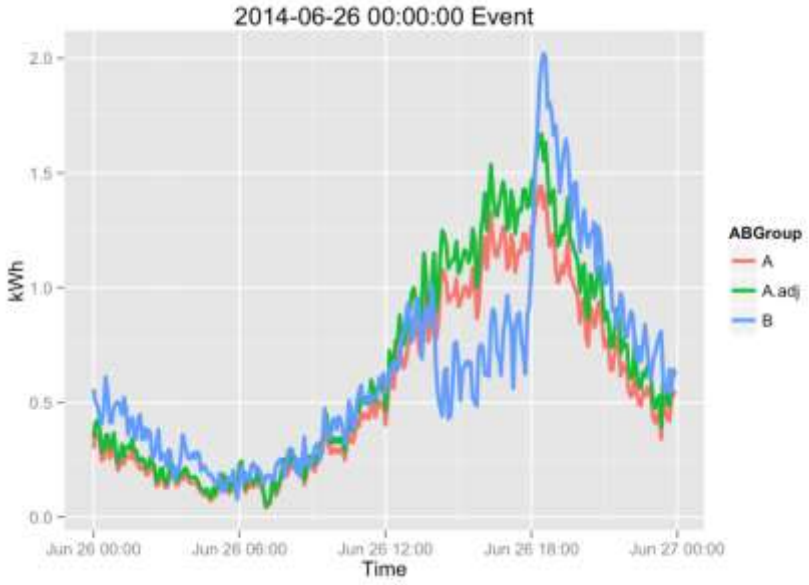

Figure 3-5 June 26th - Res/Small Commercial Load Profile

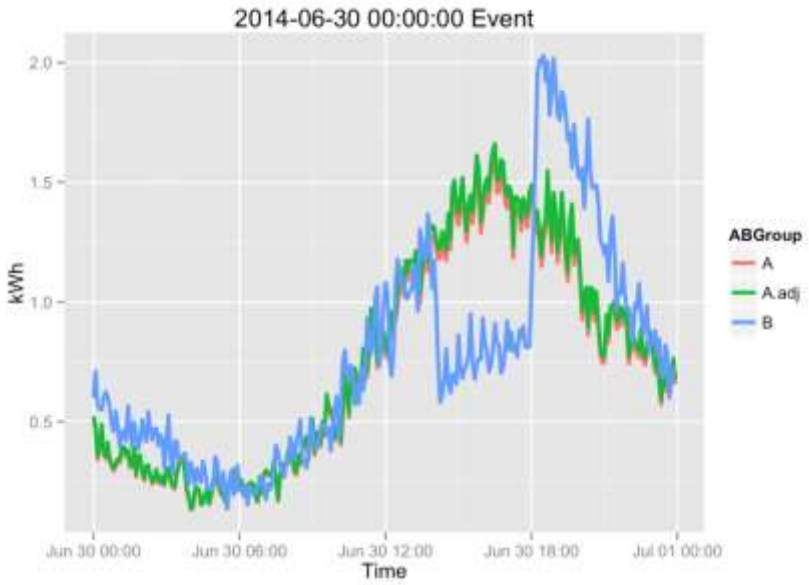

Figure 3-6 June 30th - Res/Small Commercial Load Profile

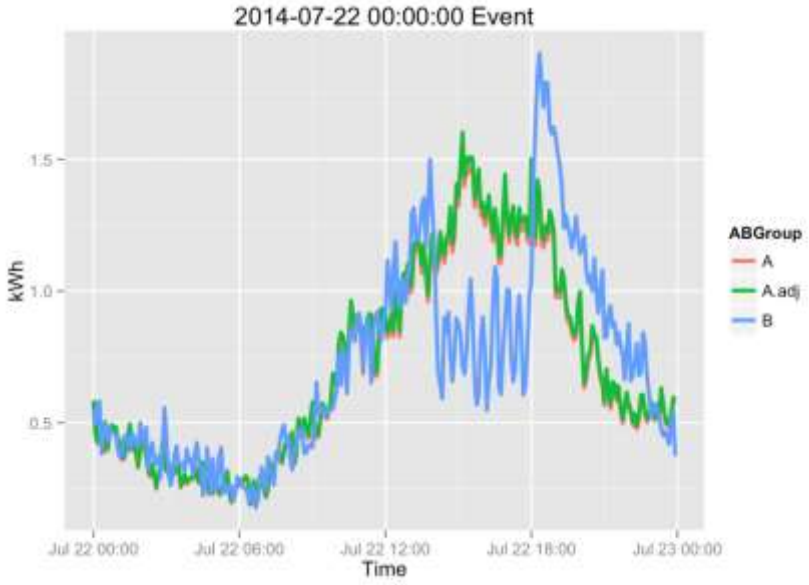

Figure 3-7 July 22nd - Res/Small Commercial Load Profile

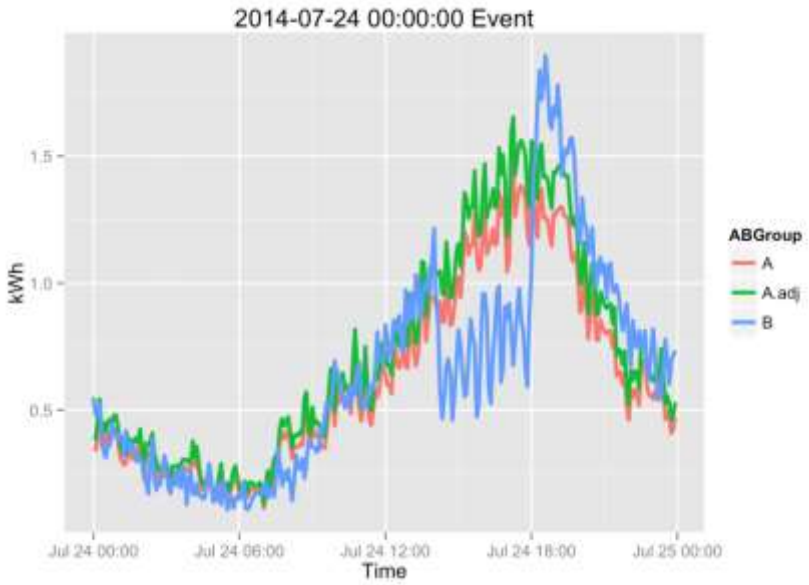

Figure 3-8 July 24th - Res/Small Commercial Load Profile

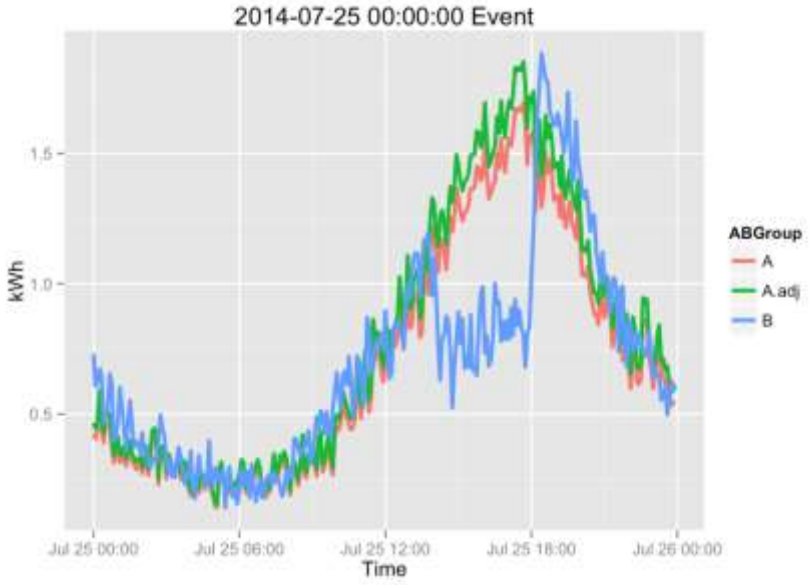

Figure 3-9 July 25th - Res/Small Commercial Load Profile

3.3.3 Power Saver Medium Commercial

The Evaluators found that there was insufficient load data to support analysis of the medium commercial component. As a result, a proxy value of 10.96 kW/facility was applied after removal of the MDU's.

3.4 Total Demand Reductions

For the 2014 curtailment season the reduction calculations yielded a result of 0.93 kW per device for the Residential segment and 0.58 kW per device for the Small Commercial segment. For the Commercial segment, there was a reduction of 10.96 kW per facility. This leads to an average total estimated load reduction of 37.62 MW based on the total installed capacity. Table 3-6 summarizes the load reduction results for 2014. The load reduction estimates were calculated from the qualifying load reduction event hours initiated by PNM during the summer.

As of Sept 30, 0214, the total verified load reductions are summarized in Table 3-5.

Table 3-5 Settlement Calculations for PNM Power Saver Program

Sector	***kW Factor***	***# Units***	***Available Demand Reduction (MW)***	***kWh Savings***
Residential	0.98	35,894	35.18	481,590
Small Commercial	0.58	4,404	2.55	
Medium Commercial	10.96 (per premise)	465	5.1	NA
		Total	42.83	481,590

4. PNM Peak Saver

4.1 Program Description

The PNM Peak Saver Program is a load management program for larger commercial and industrial customers with peak loads of 150 kW or greater per month. This program targets non-essential electric loads that can be reduced during periods of peak system demand. PNM has hired a third-party contractor, EnerNOC, Inc., to manage and market this program

4.2 M&V Methodology

The PNM Peak Saver Program (PKSP) provides incentives to large commercial and industrial customers (load > 150 kW) to curtail loads at their facility when called upon by PNM. Facilities nominate a load reduction and are then paid by performance following a load management event.

4.2.1 Verifying Per-Event Load Reduction

To verify load reduction in a specific event, the Evaluator reviews results from a census of program participants. Load reductions are then calculated according to the contractual method agreed upon between PNM and the program implementer, EnerNOC. This involves calculating:

- Customer Baseline;
- Weather Adjustment;
- 10-Minute Capacity Performance;
- Average Capacity Performance; and
- Verified Capacity Performance.

4.2.1.1 Customer Baseline

The baseline methodology for Peak Saver curtailment is such that for a given customer, the initial baseline for the season is calculated as the average kWh load on each 5-minute interval for the (5) days preceding the first eligible day of the control season. For a day to be eligible as a Baseline Day, it must be a non-event, non-holiday weekday in which there was not a blackout or interruption to electric service.

When there are multiple consecutive events without eligible baseline days in between, the same baseline is used. When a qualifying baseline day next occurs, the Customer Baseline is then adjusted, equaling for each 5-minute interval:

*New Baseline = .9 * Baseline kWh + .1 * kWh on New Event Day*

This is repeated until a new event day occurs.

4.2.1.2 Weather Adjustment

On an event day, a determination is made to see whether the baseline should be adjusted to weather. This is performed by tracking the average hourly load for the two hours preceding the beginning of the event on the event day, and dividing by the load observed over that same interval on the baseline. If this ratio is > 1 (implying that the load on the Event Day is higher due to weather), the baseline is multiplied by the Weather Adjustment Factor to create the Adjusted Baseline.

4.2.1.3 Capacity Performance

There are three forms of capacity performance calculated in the M&V effort of Peak Saver:

- 10-Minute Capacity Performance;
- Average Capacity Performance; and
- Verified Capacity Performance.

They are calculated as follows:

10-Minute Capacity Performance = Adjusted Baseline kWh – Event Day kWh, for the 5-minute interval that occurs 10 minutes into an event.

Average Capacity Performance = Mean Value of Adjusted Baseline kWh – Event Day kWh for all 5-minute intervals occurring after the 5-minute interval comprising the 10-Minute Capacity Performance measurement.

Verified Capacity Performance = .6 * 10-Minute Capacity Performance + .4 * Average Capacity Performance.

4.3 Impact Findings

The Evaluator estimated the available critical peak reduction from the Peak Saver Program (PKSP) by analysis of metered data from a census of participants. This was used to calculate kW reductions according to PNM's contractually agreed methodology with EnerNOC, as well as providing hourly reductions for each event in 2014.

4.3.1 Nominated kW

The PKSP recruits participants with connected loads exceeding 150 kW, who then nominate an amount of available kW reduction each month of the summer cooling season (June 1st – September 30th). If there are no events that month, the participant is paid based upon their nomination. If there are events, they are paid on the basis of verified kW reduction

Table 4-1 summarizes the participation and nomination values and the average event performance in the affected period.

Table 4-1 2014 Peak Saver Nomination Summary

Month	Total Nominated kW	Number of Events	Average Event Performance
June	15,270	6	19,254
July	15,120	3	15,652
August	13,860	0	NA
September	15,260	0	NA

Though any facility exceeding 150 kW in connected load is eligible for the PKSP, most of the participation comes from a few facility types: Industrial, Entertainment, and Education/K-12 facilities accounted for 46% of total participating facilities and 14% of nominated kW. Snapshots of participation by Nominated kW and by facility counts are presented in Figure 4-1 and Figure 4-2 below.

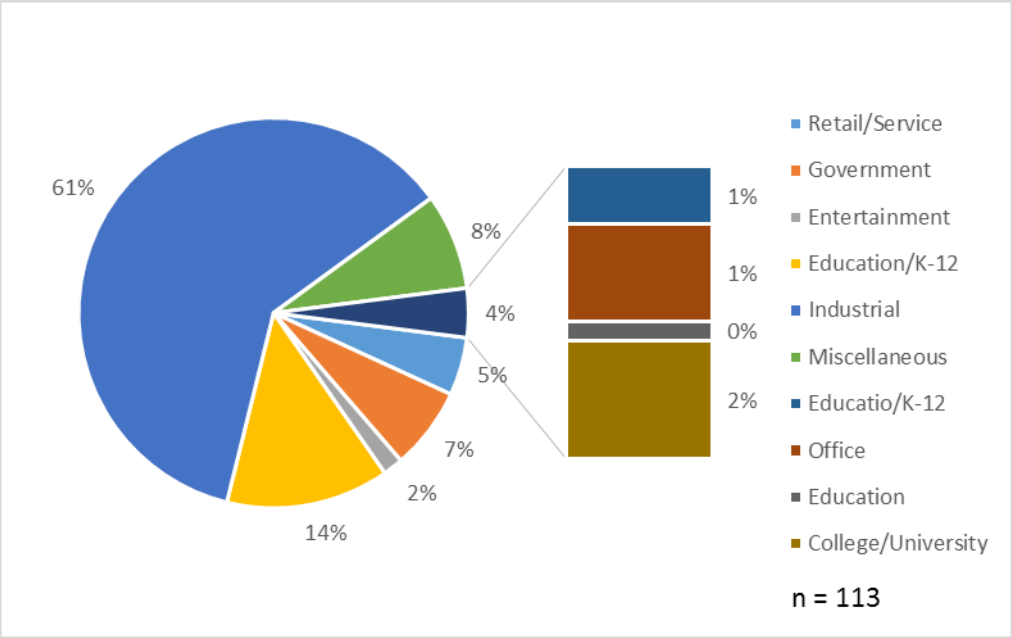

Figure 4-1 Peak Saver Nominations by Facility Type

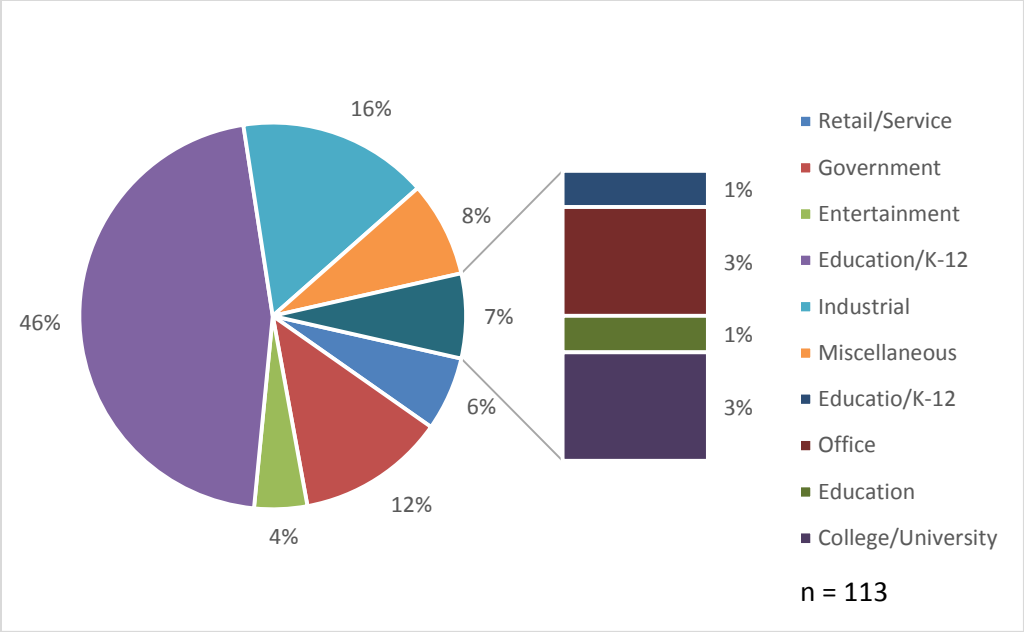

Figure 4-2 Peak Saver Participation by Facility Type

4.3.1 Event Performance

The Evaluator then calculated event performance by each of the criteria detailed in Section 4.2.1. These are summarized in Table 4-2.

Table 4-2 Peak Saver Event Performance Summary

Date	Event Start (MDT)	Event End (MDT)	10-Minute Capacity (kW)	Average Capacity (kW)	Verified Capacity (kW)	kWh Savings
6/03/2014	1:00 PM	5:00 PM	16,863	24,132	19,771	96,528
6/04/2014	1:00 PM	5:00 PM	17,398	24,047	20,058	96,188
6/05/2014	1:00 PM	5:00 PM	16,995	20,380	18,349	81,520
6/25/2014	1:00 PM	5:00 PM	17,671	22,576	19,633	90,304
6/26/2014	1:00 PM	5:00 PM	16,779	20,699	18,347	82,796
6/30/2014	1:00 PM	5:00 PM	18,404	20,812	19,367	83,248
7/22/2014	1:00 PM	5:00 PM	15,226	16,501	15,736	66,004
7/24/2014	1:00 PM	5:00 PM	14,296	11,325	13,108	45,300
7/25/2014	1:00 PM	5:00 PM	16,322	20,799	18,113	83,196

4.3.2 Event Load Profiles

Figure 4-3 through Figure 4-11 present the load profiles for each Peak Saver event. Since the data was reported as kWh consumption in 5-minute intervals, they are rescaled by 12 in these graphs, to represent the combined instantaneous load (in kW) of all Peak Saver participants.

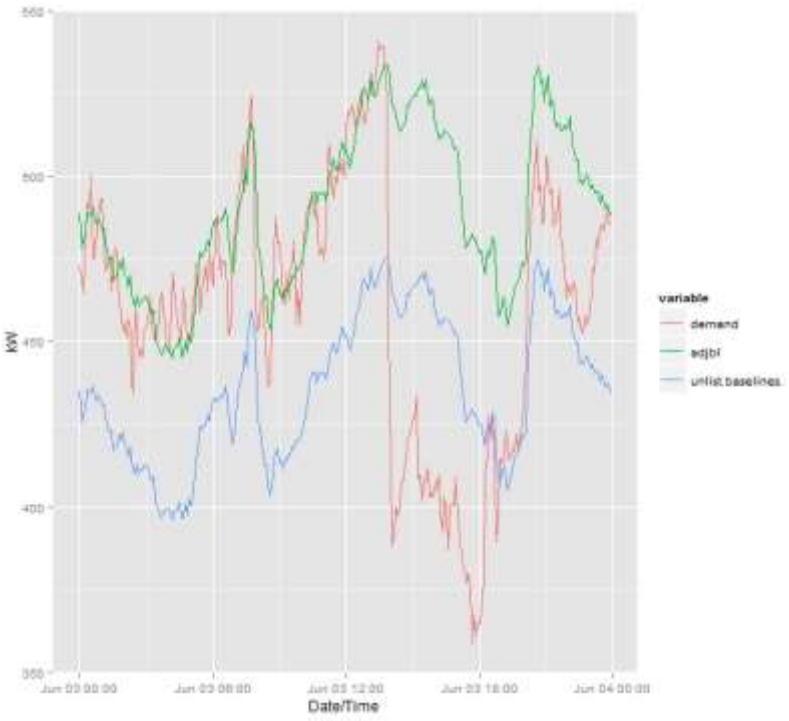

Figure 4-3 June 3rd Peak Saver Event Load Profile

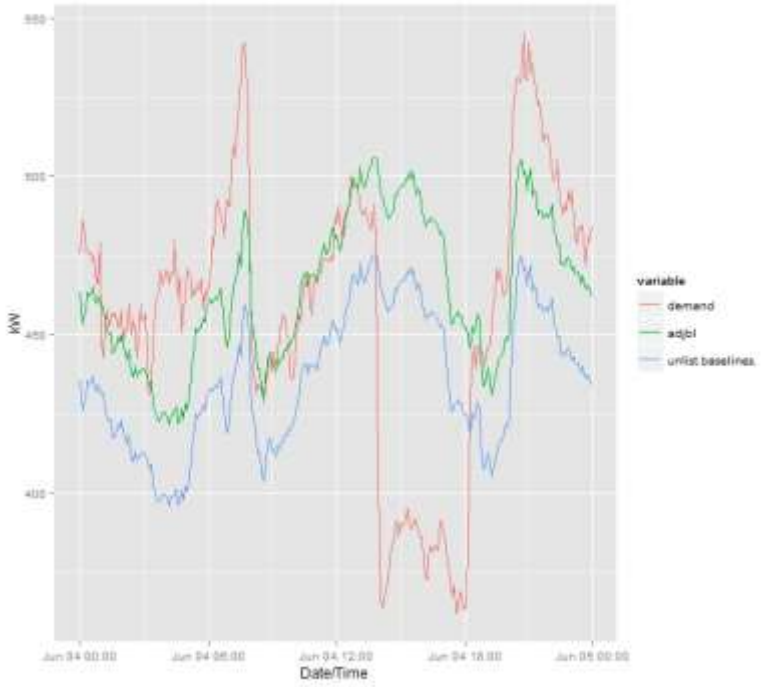

Figure 4-4 June 4th Peak Saver Event Load Profile

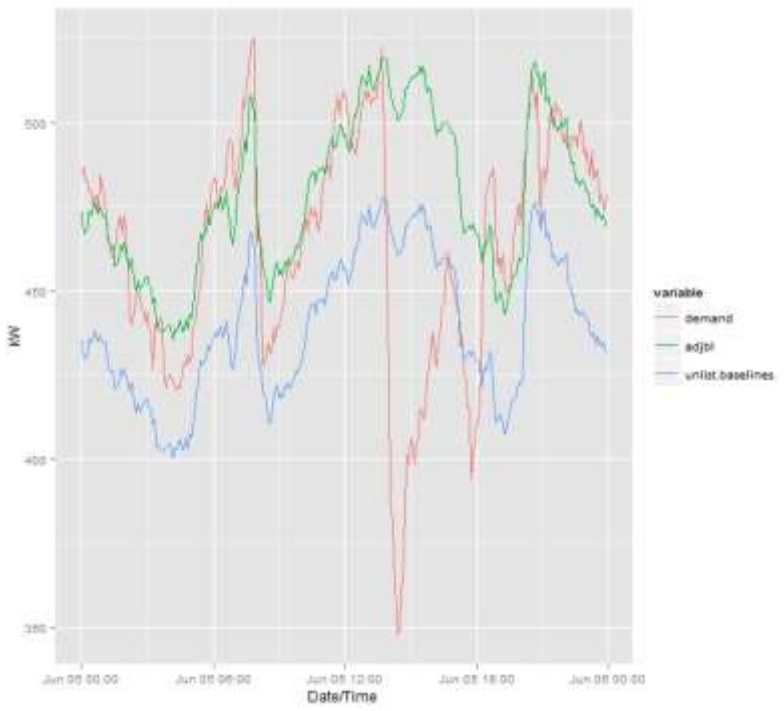

Figure 4-5 June 5th Peak Saver Event Load Profile

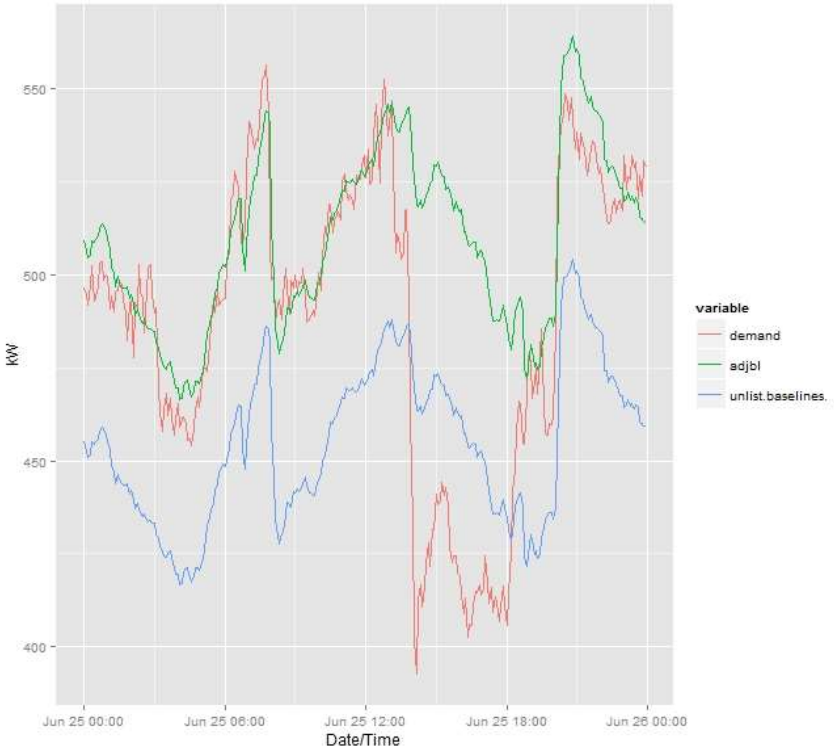

Figure 4-6 June 25th Peak Saver Event Load Profile

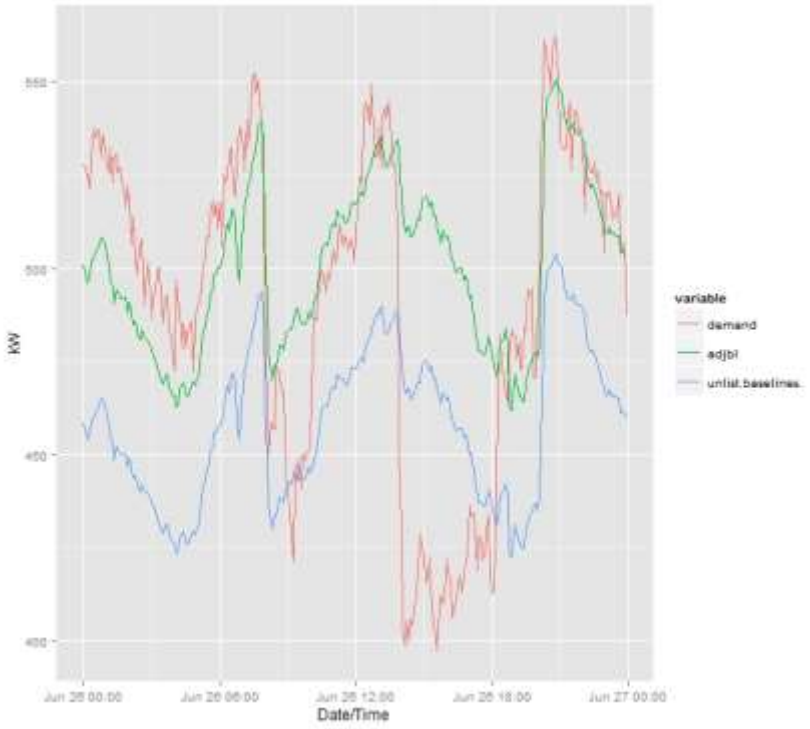

Figure 4-7 June 26th Peak Saver Event Load Profile

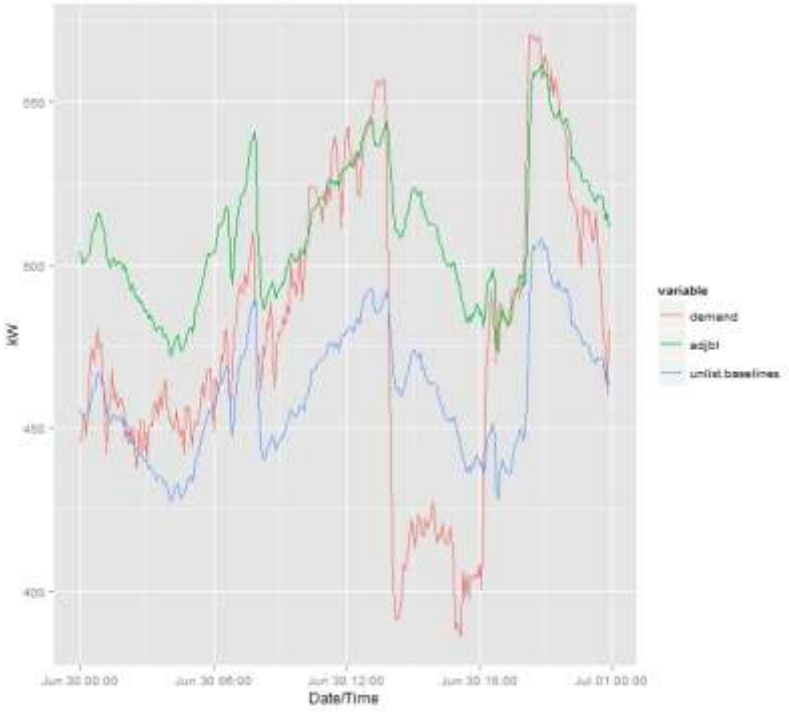

Figure 4-8 June 30h Peak Saver Event Load Profile

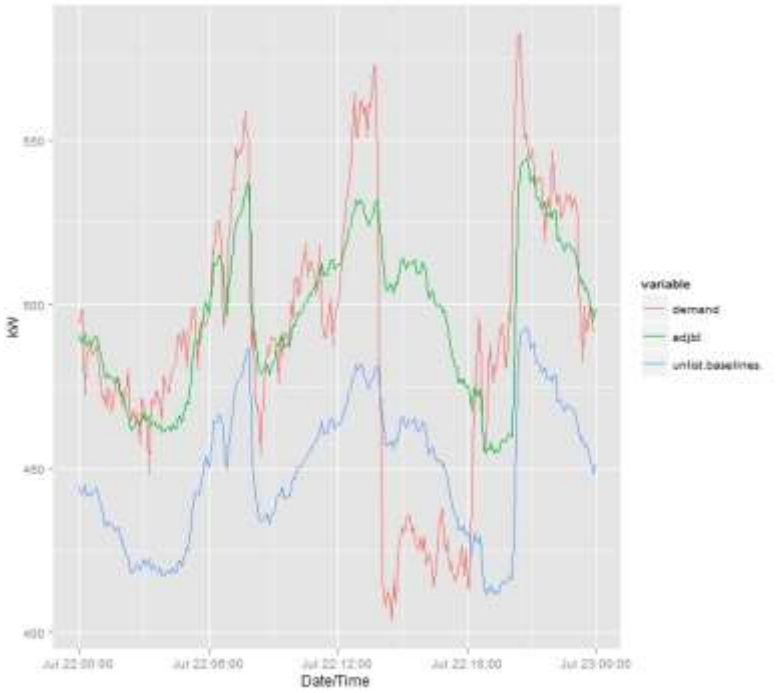

Figure 4-9 July 22nd Peak Saver Event Load Profile

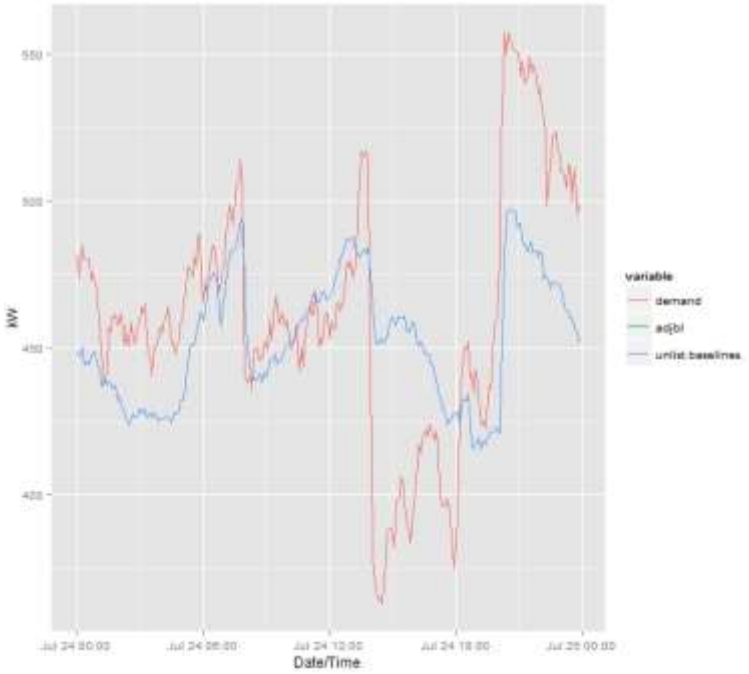

Figure 4-10 July 24th Peak Sever Event Load Profile

*Event 8 had a weather adjustment < 1, no adjusted baseline

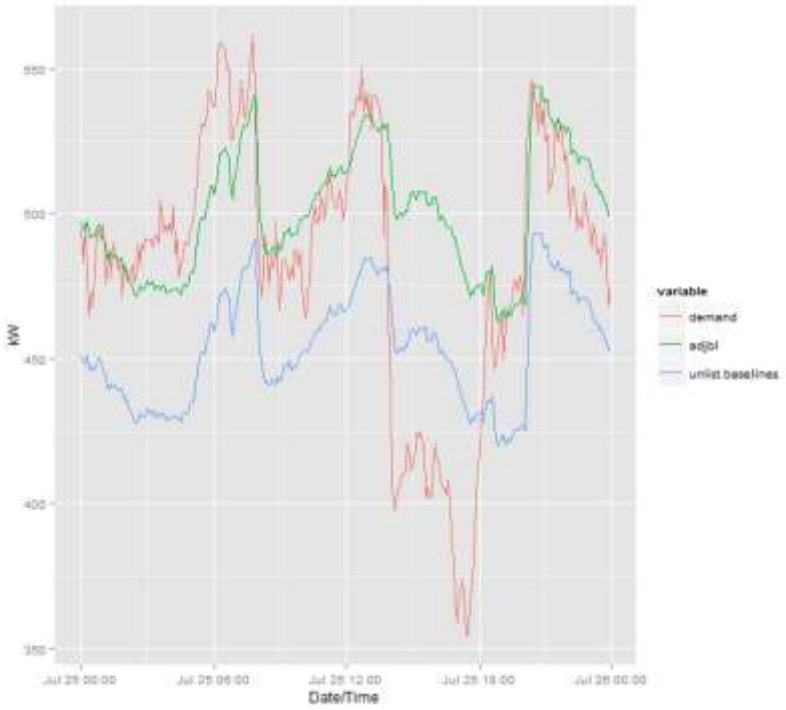

Figure 4-11 July 25th Peak Saver Event Load Profile

5. Whole House

5.1 Program Description

The Whole House Program offers PNM residential customers an in-home energy assessment and direct installation of low cost measures, along with incentives for other improvements.

The program is implemented by Ecova, Inc. (Ecova). Participants pay $40 for an energy assessment and for a direct installation package that includes up to 20 CFLs, low-flow showerheads, faucet aerators, and programmable thermostats. During the energy assessment, Ecova staff identifies eligible measures in the home for which the customer can receive a rebate. Eligible measures include:

- Refrigerator replacement;
- Clothes washers;
- Dishwashers;
- Advanced evaporative cooling;
- HVAC early replacement;
- HVAC normal replacement; and
- Window AC units.

In the process of implementing the home energy audits, Ecova will identify income-qualified customers to participate in the Low Income Home Efficiency Program, to be detailed in Chapter 6

5.2 M&V Methodologies

The M&V approach for the Whole House Program is aimed at measuring the following:

- Verifying the installation and retention of direct install measures;
- Verifying energy savings from rebated measures; and
- Estimating cost effectiveness.

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

Table 5-1 Data Sources for Gross Impact Parameters – Whole House Program

Parameter	Source
Number of Units Installed	Program Tracking Data
Unit Energy Consumption	ENERGY STAR®
Location of Installation	Program Tracking Data
Measure Retention	On-site verification
NTGR	Participant Surveying

5.2.1 Direct Install Energy Savings

Program staff provided direct installation of CFLs, low flow showerheads, programmable thermostats and faucet aerators. These measures are included in the New Mexico TRM, and this was used as the basis for unit energy savings.

5.2.1.1 CFLs

Energy savings for CFLs require baseline wattage and hours of use. These parameters are collected from program tracking data and current EISA guidelines. Gross energy savings for CFLs were evaluated as:

$$Annual\ kWh\ Savings = \left(W_{base} - W_{post} * HOU * ISR\right)/1000$$

Where:

W_{base} = Baseline wattage (see Table 5-2)

W_{post} = Actual wattage of new CFL (Table 5-2)

HOU = Hours of use as determined by installed location room type (Table 5-3)

ISR = In-service rate or installation rate, 98.4%

1000 = Conversion factor from W to kW

5.2.1.2 Baseline Wattage

The Evaluators researched the size and configuration of CFLs installed through the Whole House Program. These results are presented in Table 5-2.

Table 5-2 CFL Baseline Wattage Table

CFL Wattage	CFL Configuration	Baseline Wattage
9	Globe	29
13	Spiral	43
14	Spiral	43
14	A-lamp	43

5.2.1.3 Hours of Use

The Evaluators applied deemed savings by room type as specified in the New Mexico TRM. These values are summarized in Table 5-3 below.

Table 5-3 Daily Hours of Operation by Room Type – NM TRM

Room Type	CFL Hours Per Day
Kitchen	3.5
Living Room	3.3
Outdoor	3.1
Family Room	2.5
Garage	2.5
Utility Room	2.4
Dining Room	2.3
Office	1.9
Bedroom	1.6
Bathroom	1.5
Hall/Entry	1.5
Laundry Room	1.2
Closet	1.4
Other	1.2

These hours were applied to the room types listed in the tracking data for the Whole House Program.

5.2.1.4 Low Flow Devices

Verification of savings from low flow devices was completed as follows:

1) Measure retention rates were determined through on-site verification and participant surveying;
2) Percent of participants with electric water heating was determined through on-site verification and participant surveys; and
3) These two parameters were used to scale usage and savings in accordance with New Mexico TRM procedures.

5.2.1.5 Rebate Measure Savings

The Whole House Program provides recommendations for appliance replacements in participating homes. This includes pre-qualification for measures that constitute early replacement. Measures offered include:

- ENERGY STAR clothes washers;
- ENERGY STAR dishwashers;
- ENERGY STAR refrigerators;
- Air conditioning early replacement; and
- Evaporative coolers.

A total of 76 rebates were processed in 2014. Rebate quantities are summarized in Figure 5-1.

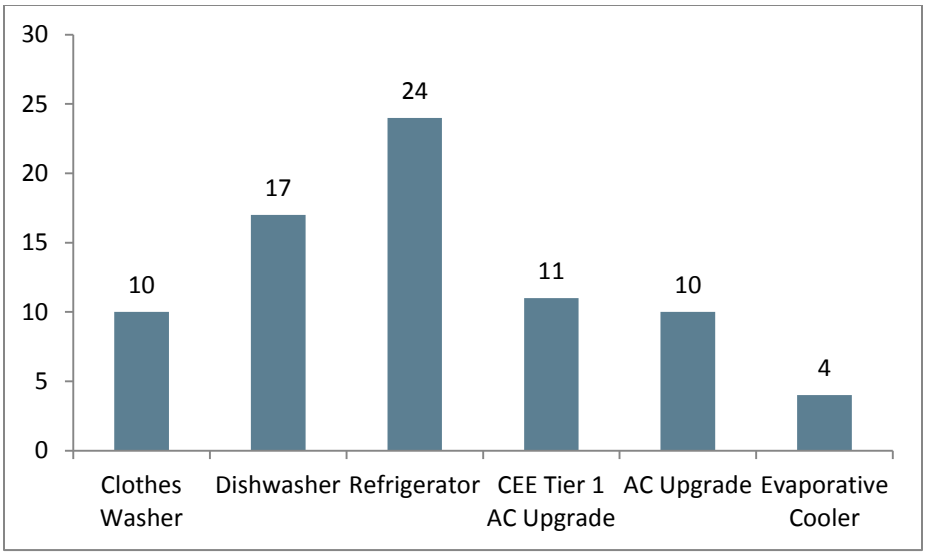

Figure 5-1 Whole House Rebated Equipment

Rebate measures accounted for only 6.0% of program savings, and as a result the Evaluators' review of these measures was limited to a review of deemed documentation provided by Ecova. This was completed early in the 2014 program year and the deemed values provided were found to be in accordance with ENERGY STAR standards for appliances and the New Mexico TRM values for residential cooling savings.

The Evaluators modified Effective Useful Lives. EULs applied included:

- Clothes washer: 11 years
- Dishwasher: 11 years
- Refrigerator: 20 years
- CEE Tier 1 AC / AC Upgrade: 15 years

5.2.2 Net Savings Estimation

All customers that received an onsite verification visit from an ADM staff member or were surveyed by telephone were asked some variant of the following questions regarding program awareness, prior planning and influence of the program on decisions to purchase new energy efficient equipment. 'Influence of the program' was assessed for measures that had been recommended by the energy auditor to the customer, and also for measures that the customer installed after the audit. This was done in order to assess if the energy auditor's recommendations and the potential for equipment rebates from PNM have any influence on future customer behavior. Savings for measures that were listed as 'recommended' in the tracking data were not claimed in ex ante calculations.

For rebate measures, the population in the 2014 program year was insufficient to support a NTGR analysis. As a result, the Evaluators adopted the ex ante assumed NTGR of 80%, and will revisit NTGR in the 2015 program year when participation is increased.

5.3 Impact Findings

5.3.1 Direct Install Parameter Collection

Key drivers of direct install savings are:

1) Measure retention rates; and
2) Electric water heating rates.

5.3.1.1 In-Service Rates

Measure retention was addressed through on-site verification and telephone surveys. ADM conducted 42 on-site verification visits and 68 telephone surveys to measure retention rates, otherwise known as installation rates or in-service rates (ISR). ISRs were calculated for the measures that Ecova representatives directly installed in customers' homes. Customers were asked if they had removed any of the following equipment since installation:

- CFLs
- Faucet aerators
- Low flow showerheads
- Programmable thermostats

ADM staff verified counts of measures on-site at the customers' homes during site visits according to information that was given in the tracking data. Further, those customers that were surveyed by telephone were asked, *"did you remove any of the measures, and if so, how many of them did you remove?"* These quantities were compared against quantities listed as installed in the tracking data. The ISRs for the Whole House Program are summarized in Table 5-4.

Table 5-4 In-Service Rates for Direct Install Measures

Measure	*ISR*
CFLs	98.4%
Faucet Aerator	91.4%
Low-Flow Showerhead	92.2%
Programmable Thermostat	98.4%

The values in Table 5-4 were used to scale the savings for each measure.

5.3.1.2 Electric Water Heating Rate

Through the same sample of on-site and telephone surveying, the Evaluators confirmed the percent of participants which have electric water heating. Overall, 7.58% of sampled participants were found to have electric water heating.

5.3.2 CFL Savings

The Evaluators had intended to verify energy savings from CFLs using the room of installation to apply the subspace hours from the New Mexico TRM. This approach was taken in prior years with the Low Income CFL & Refrigerator Program implemented by the Mortgage Finance Authority. However, this data was not collected by Ecova. CFLs were marked as either being installed "Interior" or "Exterior". Without sufficient data to support further analysis, the overall average hours of use from the New Mexico TRM was applied (2.24 per day).

Table 5-5 Verified CFL Savings

Measure	# Units Installed	Ex Ante kWh	Gross Ex Post kWh	Realization
9W Globe	3,047	168,593	49,027	29.1%
13W Spiral	4,785	149,438	115,416	77.2%
13W Exterior	25	848	603	71.2%
14W A-Lamp	3,627	139,993	84,622	60.4%
14W Reflector	1,855	71,667	43,279	60.4%
Total	13,336	530,548	292,947	55.2%

Gross realization for CFLs was exceedingly low. The Evaluators found that savings estimates listed in Ecova tracking data were highly overstated. For example, for 9W Globe CFLs, EISA requires a baseline of 29W. To produce the savings estimates shown in Ecova tracking data, CFLs would require 2,772 hours of operation annually.

The overall verified gross savings from CFLs are:

- 292,947 kWh;
- 36.44 kW; and
- 2,343,576 lifetime kWh.

5.3.3 Low Flow Device Savings

Low flow devices had savings scaled by the 91.4% in-service rate and 7.58% electric water heating rate.

Table 5-6 Low Flow Device Savings

Measure	Expected	Verified	
	kWh	kWh	Therms
Faucet Aerator – Bathroom	7,276	9,652	6,585
Faucet Aerator – Kitchen	2,338	4,153	1,716
Showerhead	19,781	17,054	9,275

5.3.4 Programmable Thermostat Savings

Programmable thermostats were installed in most participating homes. The deemed savings listed was scaled by the retention rate verified through on-site inspection and telephone surveying. Further, after reviewing the program tracking, the Evaluators found that one unit was listed but did not have savings credited. This was corrected. Total savings from programmable thermostats were:

- 16,950 kWh;
- 0.0 kW; and
- 169,500 lifetime kWh.

5.3.5 Verified Savings

Ex post gross impact and net savings are given in Table 5-7.

Table 5-7 Net Savings by Measure

Measure	# Units Installed	Ex Ante Savings	Gross Ex Post Savings	NTGR	Net Ex Post Savings
CFL	13,336	530,548	292,947	100%	292,947
Faucet Aerator	1,028	9,663	10,216	100%	10,216
Low-flow Showerhead	467	19,781	17,054	100%	17,054
Programmable Thermostat	529	17,213	16,950	100%	17,226
ENERGY STAR Clothes Washer	10	1,190	1,190	80%	952
ENERGY STAR Dishwasher	17	731	731	80%	585
Evaporative Cooler	4	5,360	5,360	80%	4,288
ENERGY STAR Refrigerator	24	13,845	13,845	80%	11,076
AC Upgrade	10	6,950	6,950	80%	5,560
CEE Tier 1 AC Upgrade	11	9,603	9,603	80%	7,682
Total:	15,436	614,884	374,846	98.1%	367,586

Table 5-8 summarizes the gross and net savings estimates by measure for the 2014 Whole House Program.

Table 5-8 2014 Whole House Verified Savings Summary

	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Gross	136.0	51.4	614,884	374,846	5,879,069	3,412,502	61.0%
Net	109.0	48.0	522,584	367,586	4,703,255	3,289,913	70.3%

5.4 Process Findings

The evaluators conducted a process evaluation of the Whole House Program in order to address a range of issues:

- What measures are participants following the completion of the in-home assessment?
- Is the assessment useful to program participants?
- Are participants satisfied with their experience with the program?

5.4.1 Data Collection Activities

The process evaluation of Whole House included the following data collection activities:

- *PNM Program Staff Interviews*. The evaluators interviewed staff at PNM involved in the administration of the program. These interviews collected initial background information on program history and implementation, as well as capturing any operational changes or new developments in the program.
- *Ecova Program Staff Interviews*. Ecova implements the program. The Evaluators collected information from this interview as to the implementation process and lessons learned in the first year of program implementation.
- *On-site Visits.* The Evaluators staff verified counts and operation of measures claimed as installed by the program.

Participant Surveying. The Evaluators surveyed a sample of program participants to participants to obtain feedback.

Table 5-9 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 5-9 PNM Whole House Program Data Collection Summary

Target	Component	Activity	N	Role
PNM Program Staff	Senior Program Developer	Interview	1	Overall administration of EPE DSM programs. This manager is involved in the larger strategic decisions associated with the DSM portfolio, and is involved with the overall coordination of utility resources.
Ecova Staff	Program Manager	Interview	1	Administration of program. Oversight of outreach and installation.
Program Participants	-	On-site Visit	40	Verify installation and retention of measures given in the tracking database. Survey participants on program.
Program Participants	-	Survey	68	Residential participants in the Whole House Program were surveyed for impact and process data collection.

5.4.2 Market Description

This section presents key background data on the target market for the Whole House Program. Data for this section are provided by the Energy Efficiency Potential Study for the State of New Mexico[2] and the American Community Survey (ACS)[3], and surveys with participating market actors.

5.4.2.1 Market Characteristics

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

- Bernalillo
- Valencia
- Sandoval
- Santa Fe

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

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

- Grant
- Hidalgo
- Lincoln
- Luna
- Otero
- San Miguel
- Sierra
- Union

Data from the most recent available ACS indicates that there were a total of 537,365 residences in PNM-served counties as of 2011. Of these, 87.5% are occupied, and of that, 32.9% are low income[4]. Figure 5-2 summarizes a comparison of housing stock of program participants vs. the housing stock of PNM's service territory overall.

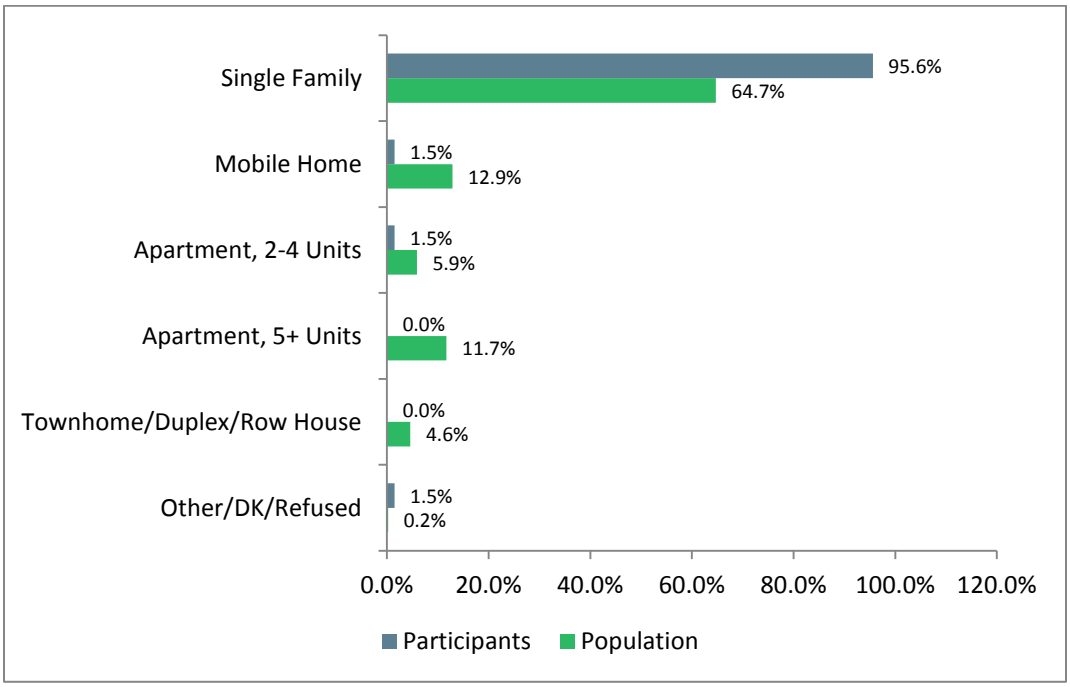

Figure 5-2 Distribution of Residential Buildings Types in PNM Service Territory

A key difference is in the percent of participants in single family homes. Ninety-six percent of program participants occupied single family homes, though single family homes constitute 64.7% of housing stock. This is reflective of the program's targeting of home owners rather than landlords or renters. One hundred percent of survey

[4] The evaluators set a cutoff of $35,000 when determining if a household is "low income".

respondents indicated owning their home, compared to PNM's overall home ownership rate of 68.8%.

5.4.2.2 Market Barriers

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

- **High share of gas space heating and water heating.** Eighty-four percent of survey respondents indicated having natural gas space heating. Ninety-six percent of survey respondents indicated having natural gas water heating. In addition, PNM's service territory has a relatively mild cooling season and high use of evaporative cooling. This adds significant difficulty to programs with a whole-house approach in that there are limited opportunities to produce kWh savings in a manner that will pass the Utility Cost Test.
- **Difficulty in inducing early replacement.** Most of the program recommendations pertain to the replacement of functioning equipment. In particular, the program attempts to induce early replacement of central air conditioning systems and refrigerators. Participants often do not feel compelled to replace functioning equipment unless it is part of a larger remodel.
- **High share of evaporative cooling.** This, combined with gas space heating, limits the opportunities for the types of building envelope improvements that typically drive savings in whole-house programs.

5.4.2.3 Program Administration

The Whole House Program is overseen by a Senior Program Developer at PNM. The manager's responsibilities are focused primarily on verifying invoices from Ecova and ensuring proper payment based on project costs. Other activities associated with program delivery (marketing, QA/QC, etc.) are handled by the Ecova.

5.4.2.4 Program Implementation and Delivery

The participation process is as follows:

- *Customer Recruitment*. The outreach efforts by Ecova are targeted at residential single-family homeowners. This has included bill inserts, online advertising, and mass media advertising including television, radio, and print media advertisements.
- *In-Home Assessments*. Ecova uses internal staff to complete in-home assessments. At this time, the Ecova staffer identifies qualifying equipment for the rebate component of the program.

- *Installation*. During the in-home assessment, the Ecova staffer then identifies fixtures eligible for installation of CFLs, faucet aerators, and low flow showerheads. With the homeowner's permission, these are then installed.
- *Assessment Summary*. Once direct installation is complete, the homeowner is later provided a brief report summarizing their eligibility for rebates for HVAC and appliance replacements.
- *Application Submittal*. Participants purchase qualifying equipment at their discretion once they have been pre-qualified for a rebate. Their application and associated rebate coupon are submitted to PNM and Ecova.
- *Application Review & Payment*. Staff at Ecova reviews the application and after verifying that measures installed meet program criteria, payment is remitted to the participant. Summaries of payments are sent to PNM for their internal review on a monthly basis.

5.4.3 Program Marketing & Outreach Efforts

PNM markets the Whole House Program through their general mass-market channels. Activities in support of the Whole House Program have included:

- Bill inserts;
- Television advertisements;
- Radio advertisements; and
- Print media.

Survey respondents were asked to identify how they became aware of the Whole House Program. Their responses are summarized in Figure 5-3.

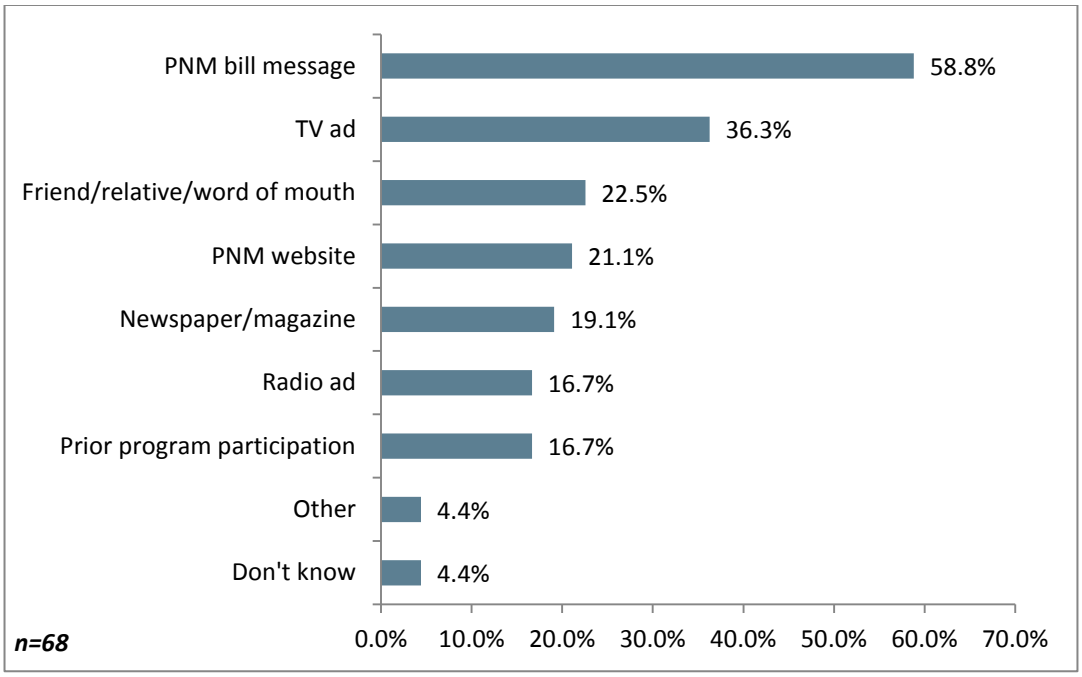

Figure 5-3 Whole House Sources of Program Awareness

Most respondents (58.8%) learned of the program through a PNM bill message. Other common sources included TV advertisements (36.3%), the PNM website (21.1%), and newspaper or magazine advertisements (19.1%).

5.4.4 Application Process

Participants in the Whole House Program can sign up by telephone, through the PNM website, and by filling out and mailing a form sent along with a bill insert. Figure 5-4 summarizes how survey respondents signed up for the program.

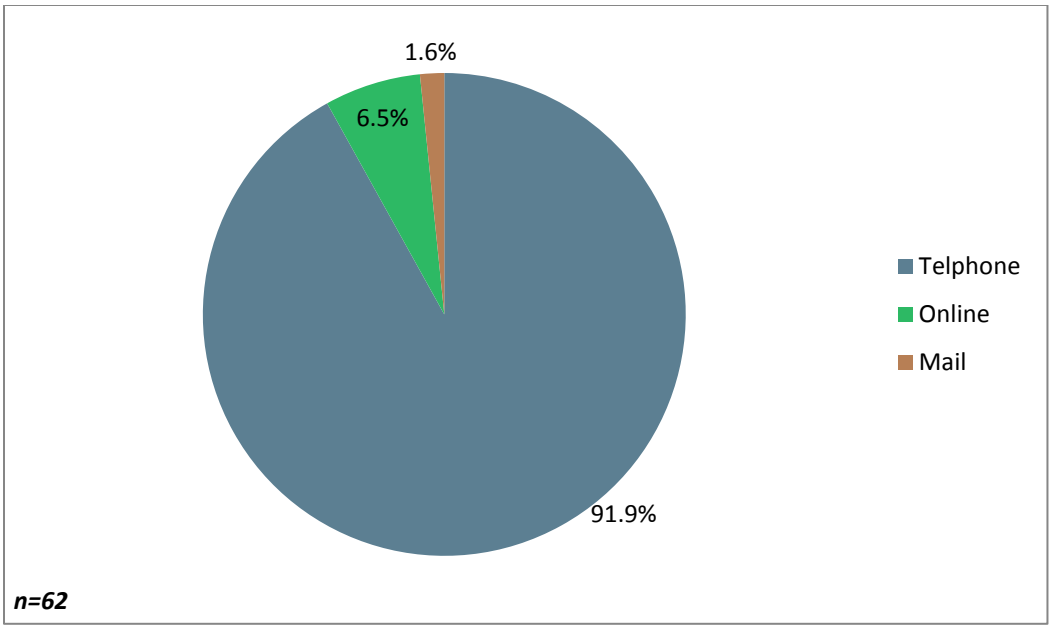

Figure 5-4 Whole House Program – Methods of Sign-up

Ninety-two percent of survey respondents signed up by telephone. Further, 6.5% signed up online and 1.6% signed up by mail. When asked to rate their satisfaction with the application process, respondents that applied via telephone scored their satisfaction at 9.05 out of 10 and online applicants scored their satisfaction at 9.00 out of 10.

5.4.5 Motivations for Participation

Marketing materials for the Whole House Program use "reducing waste" as the primary message encouraging participation. Survey respondents were asked to identify the reason for their participation. The answers provided were unprompted and were coded into larger categories. Respondents' answers are summarized in Figure 5-5.

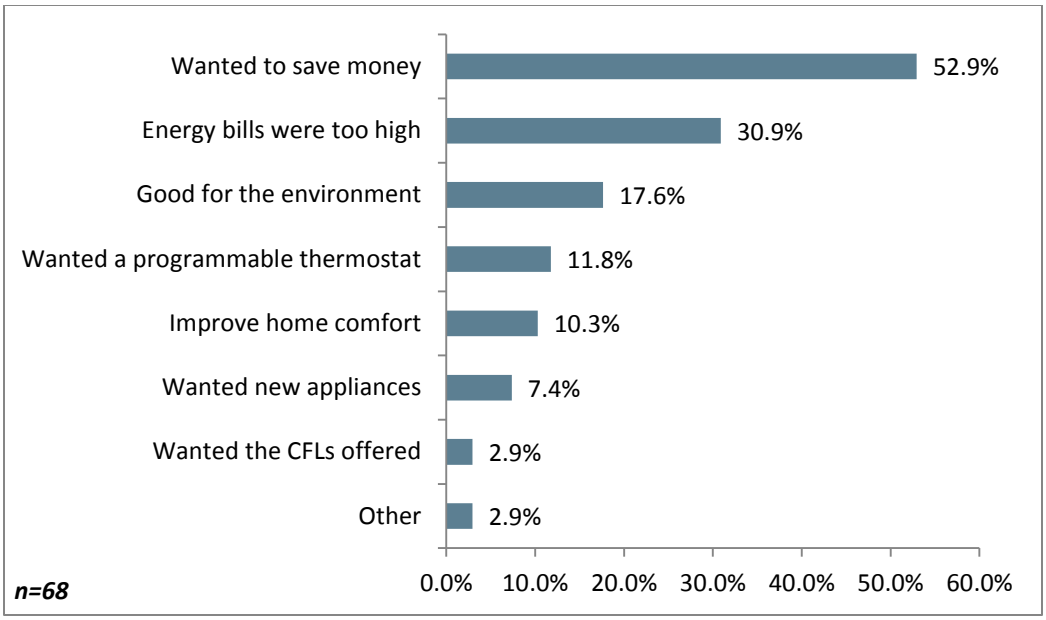

Figure 5-5 Whole House Program – Reasons for Participation

Respondents most commonly indicated financial concerns such as "wanted to save money" (52.9%) and "energy bills were too high" (30.9%) as their primary motivation for participation. Twelve percent of survey respondents indicated that the installation of a programmable thermostat through the program was of primary interest.

5.4.6 Interactions with Home Assessor

Home assessors from Ecova provide the direct installation of CFLs and water saving measures as well as recommendations and pre-qualification for potential rebates. Respondents were asked to identify their satisfaction with their interactions with the home assessor as well as with any written summary of recommendations provided by the assessor. Satisfaction with the assessor was rated at 8.99 out of 10 by survey respondents.

However, in reviewing verbatim responses by survey respondents asking them to detail their reasoning behind scoring (as well as a final question asking respondents to identify any suggestions they would like to forward to PNM), some respondents indicated having concerns about their assessor. Twelve percent of respondents stated specific issues with the Ecova assessor staff member that serviced their home. Issues included:

- 7.35% of respondents specifically stated that they had concerns that their assessor was not sufficiently knowledgeable to help them improve the efficiency of their home;
- 4.4% indicated other issues with their assessor such as leaving the direct install equipment for the participant to install themselves, neglecting to install

showerheads, or not adequately listening to or addressing the participant's concerns.

5.4.7 Home Assessment Report

Sixty-eight percent of respondents recalled receiving recommendations for other improvements to their home after direct installation was completed. Of these, 93.5% recalled receiving a written report summarizing the recommendations. These respondents were asked to identify whether this written summary was useful to them. Of those that received a written summary, 67.4% identified it as "useful" and 30.2% indicated that it was "not useful".

All respondents were asked to explain why they found the report useful or not useful, and their responses were recorded verbatim. Sample responses from those that found it useful include:

"It helped ease my mind about a few things about the house."

"I was better off than I thought, but it was good to know for sure about the house's condition"

"Yes, because I wouldn't have changed the CFLs, aerator, or showerhead. I also learned about the rebates of an old refrigerator I have."

Verbatim responses explaining dissatisfaction with the report included:

"It was less specific than I hoped for. I wanted it to be more specific by model."

"They want me to replace my air conditioner. Why would I replace something that is still working?"

"I asked about insulation for the crawl space. She didn't know, she was supposed to get back with us but never did."

"Didn't tell us anything really that we didn't already know."

Responses from those indicating satisfaction were largely focused on two areas:

1) The report was useful in prequalifying them for rebates (regardless of whether they acted on these recommendations); and
2) The report was useful in providing reassurances to the participant on the status of the efficiency of their home.

Reasons for dissatisfaction included:

1) The participant having no interest in replacing functioning appliances; and
2) The participant not learning anything new from the assessment or report.

The survey results suggest that the program is perceived to have more value among customers that have lower awareness of their energy use or of the existing efficiency of their homes.

5.4.8 Response to Assessment Recommendations

At the time of the survey, 80.4% of respondents had not installed any recommended measures. Of those that had installed recommended measures, installations included:

- Two central air conditioners;
- Two clothes washers; and
- One dishwasher.

Seventy-four percent of respondents indicated having no plans to install any recommended measures. Of those that stated that they are likely to install recommended measures, the measures with highest interest were as follows:

- Central air conditioning (8.8%);
- Refrigerator (8.8%);
- Clothes washer (5.9%);
- Evaporative cooler (4.4%); and
- Dishwasher (2.9%).

5.4.9 Participant Satisfaction

Respondents were asked to rate their satisfaction on a scale of 0-10, with 10 meaning "very satisfied" and 0 meaning "not at all satisfied". Their responses are summarized in Table 5-10.

Table 5-10 Whole House Participant Satisfaction

Component	***Mean Score***	***% Don't Know***
Interactions with the home assessor	8.99	0%
Program application process	9.02	2.9%
Rebate amounts	7.61	58.8%
Wait-time to receive rebates	7.43	66.2%
Range of equipment covered by the program	8.31	1.5%
The quality of the home assessment report	8.66	5.9%
Overall program experience	8.79	0.%
n=68		

5.4.9.1 Tracking Data Review

The Evaluators received a tracking database developed by Ecova. The initial gathering and compiling of tracking data is crucial in facilitating a smooth evaluation effort, and as such the evaluators reviewed this tracking data in order to verify that it contained the required data to:

(1) Recreate energy savings calculations;

(2) Contact participants and trade allies; and

(3) Ensure proper rebate payment amounts.

It took numerous attempts to obtain program tracking data. The Evaluator's initial request for tracking took three months to be fulfilled by Ecova. Further, program tracking was often disaggregated and difficult to follow, with conflicting savings numbers in each version of the data. Ecova and PNM should work to develop a program tracking system that is uniform in capturing all direct install and rebate activity to support deemed savings calculations.

5.4.9.2 New Measure Review

For 2015, Ecova will be adding three new measures to the Whole House Program:

1) Advanced power strips;
2) Exterior CFLs; and
3) LED nightlights.

The Evaluators reviewed workpapers for these measures with Ecova and PNM and provided the following feedback:

1. **Advanced Power Strips.** Deemed savings values provided by Ecova had assumed 7-plug use and cited savings from the Pennsylvania TRM. It has been the Evaluators experience that for 7-plug strips, a number of plugs go unused. The Evaluators recommended that Ecova and PNM use the 5-plug deemed savings value. Three months of data is to be collected by Ecova in 2015 to assess the extent of power strip use.
2. **LEDs.** The Evaluators supported the deemed savings used for this measure. Recommendations for measure implementation included (1) a requirement that an LED replace an existing nightlight (as opposed to adding one to an empty socket) and (2) allowing Ecova to install as many nightlights as there are existing in the home provided they photograph the removed nightlight.
3. **Exterior CFLs.** This was accepted by the Evaluators without comment.

5.5 Conclusions & Recommendations

Based on the EM&V effort of the 2014 Whole House Program, the Evaluator's conclusions and recommendations are as follows:

5.5.1 Conclusions

1. **The program has high participant satisfaction.** Program participants responded very positively when asked to rate their satisfaction with the application process, rebate amounts, and overall satisfaction.
2. **Energy savings impacts of CFLs were grossly overstated by program staff.** The Evaluators found that savings indicated by Ecova were exceedingly high (such as 55.4 kWh for a 9W CFL). These need to be corrected in future program years.
3. **Home assessment reports demonstrated limited usefulness.** Thirty percent of respondents stated that they did not find the home assessment report useful. Many respondents hoped for opportunities for insulation and other envelope improvements which are not covered by the program (nor can they be done so in cost-effective manner, due to high prevalence of evaporative cooling and gas space heating).
4. **Some participants indicated that they did not perceive the home assessor as knowledgeable.** Twelve percent of survey respondents indicated dissatisfaction with their home assessor due to lack of confidence in the assessor's knowledge and expertise.
5. **Tracking data is disorganized and inconsistent.** Tracking data requests took longer to fulfill than for other PNM programs, and tracking was provided in multiple disaggregated databases with inconsistent savings estimates.
6. **The new measure additions should assist program performance.** Advanced power strips, higher wattage exterior CFLs, and LED nightlights are all viable program additions and should improve cost-effectiveness.
7. **The program's high acquisition cost hampered cost-effectiveness.**

5.5.2 Recommendations

Based on the EM&V findings, the Evaluator recommends the following:

1. **Consider tiered direct install packages based upon heating and water heating fuel type.** The Evaluators found that only 7.58% of participants had electric water heating. If an arrangement cannot be reached with New Mexico Gas to cost-share, PNM and Ecova should consider developing a package for customers with gas water heating that does not include the low flow devices. This could be provided for a lower co-pay.

2. **Revisit the training of home assessors.** Twelve percent of survey respondents indicated dissatisfaction with the knowledge and expertise of the home assessor. PNM and Ecova should revisit the training of these assessors. Assessors in need of supplementary training could be identified via a brief online survey given to participants along with their report.
3. **Reorganize tracking into one unified dataset.** Program tracking was disorganized, requiring multiple iterations of communication between the Evaluators and PNM to sort out Ecova's energy savings calculations. Tracking should be stored in one consistent database, providing:
    a. Customer contact information;
    b. Measure category;
    c. Expected savings;
    d. Installing trade ally; and
    e. Rebate amount.
4. **Update deemed parameters for DI measures using 2014 in-service rates.** This included ISRS of:
    a. 98.4% for CFLs;
    b. 91.4% for faucet aerators;
    c. 92.2% for low flow showerheads; and
    d. 98.4% for programmable thermostats.

6. Low Income Home Efficiency

6.1 Program Description

The Low Income Home Efficiency Program (LIHEP) offers PNM income-qualified residential customers an in-home energy assessment and free, direct installation of energy efficient measures, along with incentives for other improvements.

The program is implemented by Ecova, Inc. (Ecova). Participants receive an energy assessment and for a direct installation package that includes up to 20 CFLs, low-flow showerheads, faucet aerators, programmable thermostats, and in some cases, refrigerator replacements.

In the process of implementing the home energy audits, Ecova identified income-qualified customers to participate in the Low Income Home Efficiency Program. All other customers who received a home audit were processed through the Whole House Program (see Chapter 5).

6.2 M&V Methodologies

The M&V approach for the Low Income Home Efficiency Program is aimed at measuring the following:

- Verifying the installation and retention of direct install measures;
- Verifying energy savings from rebated measures; and
- Estimating cost effectiveness.

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

Table 6-1 Data Sources for Gross Impact Parameters – Low Income Home Efficiency Program

Parameter	***Source***
Number of Units Installed	Program Tracking Data
Unit Energy Consumption	ENERGY STAR®
Location of Installation	Program Tracking Data
Measure Retention	On-site verification and customer surveys
NTGR	Deemed – 100%

6.2.1 Direct Install Energy Savings

Program staff provided direct installation of CFLs, low flow showerheads, programmable thermostats and faucet aerators. These measures are included in the New Mexico TRM, and this was used as the basis for unit energy savings.

6.2.1.1 CFLs

Energy savings for CFLs were calculated in the same manner as for Whole House.

6.2.1.2 Electric Water Heater Adjustment Factor

Low-flow showerheads and faucet aerators were installed in customers' homes regardless of what type of fuel source their water heaters used. Ecova used an adjustment factor of 10% to calculate savings from these measures to account for the 10% of customers in PNM service territory that have electric water heaters. The Evaluators determined through on site visits and the telephone survey that 27.5% of LIHEP customers had electric water heating. Thus, electric water heating adjustment factor of 27.5% was applied to NM TRM savings from low-flow showerheads and faucet aerators for the program. This is significantly higher than the rate of 7.58% observed in the Whole House Program.

6.2.1.3 In-Service Rates

Measure retention was addressed through on-site verification and telephone surveys. ADM conducted 19 on-site verification visits and 40 telephone surveys to measure retention rates, otherwise known as installation rates or in-service rates (ISR). ISRs were calculated for the measures that Ecova representatives directly installed in customers' homes. Customers were asked if they had removed any of the following equipment since installation:

- CFLs
- Faucet aerators
- Low flow showerheads
- Programmable thermostats

ADM staff verified counts of measures on-site at the customers' homes during site visits according to information that was given in the tracking data. Further, those customers that were surveyed by telephone were asked, *"did you remove any of the measures, and if so, how many of them did you remove?"* These quantities were compared against quantities listed as installed in the tracking data. The ISRs used are summarized in Table 6-2.

Table 6-2 In-Service Rates for Direct Install Measures

Measure	ISR
CFLs	98.5%
Faucet Aerator	92.6%
Low-Flow Showerhead	90.9%
Programmable Thermostat	85.7%

6.2.1.1 Refrigerator Savings

PNM and Ecova completed early replacement of functioning refrigerators. The Evaluators found that program staff used the results of metering completed by the New Mexico Mortgage Finance Authority as part of their activities in the Department of Energy Weatherization Assistance Program to support deemed savings of 1,011 kWh and .10 kW (the values verified in the 2013 M&V of the Low Income CFL & Refrigerator Replacement Program).

6.2.2 Gross Ex Post Savings Estimation

Data used for the gross ex post savings evaluation included:

- Program tracking data from the main tracking database;
- Program supporting documentation provided by PNM;
- ISRs developed from participant survey data collected through telephone surveying; and,
- Data from relevant secondary sources.

All equipment rebated through the program was subjected to an engineering desk review. The desk review serves a quality assurance function that attests to the dependability of program tracking data and provides assurance that the energy savings reported were supported by appropriate documentation. The desk review provided assurance that:

1. The energy savings and demand reductions are claimed in accordance with the protocols in the *New Mexico Technical Resource Manual* (if applicable)
2. The documentation, specifically rebate applications and product invoices, support the measure rebate numbers that are claimed by the program.

The Evaluators calculated ex post savings by applying the values provided in the New Mexico TRM. Measures not included in the TRM were issued ex post savings values based on planning documents provided to the Evaluators by PNM at the beginning of the 2014 evaluation cycle. The table below shows the type of equipment, the savings value applied to calculate ex post savings, the effective useful life (EUL) and the source of each of those values.

Table 6-3 Ex Post Values, EUL and Sources by Equipment Type

Equipment Type	*# Units Installed*	*Ex Post kWh/unit*	*Ex Post kW/unit*	*Source*	*EUL*	*Source*
CFLs	8,843	Varies	Varies	NM TRM, Table 43	8	NM TRM
Faucet Aerators	1,115	236	N/A	NM TRM, Table 39	10	NM TRM
Low-Flow Showerheads	470	491	N/A	NM TRM, Table 34	10	NM TRM
Programmable Thermostats	427	49	N/A	PNM Ex Ante Spreadsheets	11	2013 Pennsylvania TRM
ENERGY STAR Refrigerators	615	1,011	0.10	PNM Ex Ante Spreadsheets	18	2013 Oklahoma Residential Deemed Savings Document

The values in Table 6-3 were then multiplied by the quantities for each measure that were given in the tracking data, the ISR and the electric water heater adjustment factor (where applicable) to derive program level savings.

6.2.3 Net Savings Estimation

With this program being targeted at low income customers, a NTGR of 100% was assumed and applied. As a result, net savings are equal to gross savings.

6.3 Impact Findings

6.3.1 Savings from CFLs

Through the 2014 Low Income Home Efficiency Program, 8,843 CFLs were installed. Figure 6-1 summarizes the CFLs installed through the program by wattage.

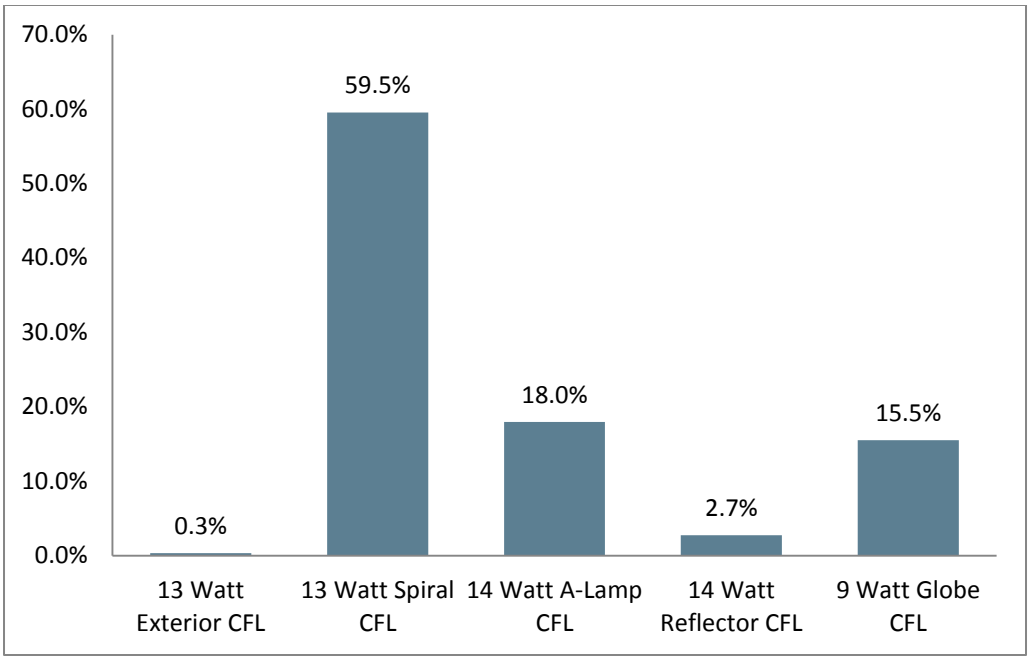

Figure 6-1 Summary of CFLs Installed by Wattage

The Evaluators had intended to verify energy savings from CFLs using the room of installation to apply the subspace hours from the New Mexico TRM. This approach was taken in prior years with the Low Income CFL & Refrigerator Program implemented by the Mortgage Finance Authority. However, this data was not collected by Ecova. CFLs were marked as either being installed "Interior" or "Exterior". Without sufficient data to support further analysis, the overall average hours of use from the New Mexico TRM was applied (2.24 per day).

Table 6-4 LIHEP Verified CFL Savings

Measure	# Units Installed	Ex Ante kWh	Gross Ex Post kWh	Realization
9W Globe	1,426	79,057	22,968	29.1%
13W Spiral	5,480	171,191	132,397	77.3%
13W Exterior	31	1017	749	73.6%
14W A-Lamp	1,655	63,920	38,652	60.5%
14W Reflector	251	9,699	5,862	60.4%
Total	8,843	324,884	200,628	61.8%

Gross realization for CFLs was exceedingly low. The Evaluators found that savings estimates listed in Ecova tracking data were highly overstated. For example, for 9W Globe CFLs, EISA requires a baseline of 29W. To produce the savings estimates shown in Ecova tracking data, CFLs would require 2,772 hours of operation annually.

The overall verified gross savings from CFLs are:

- 200,629 kWh;

- 26.96 kWh; and
- 1,605,024

6.3.2 Savings from Low-Flow Showerheads and Faucet Aerators

LIHEP installed 1,176 faucet aerators and 492 low-flow showerheads in 2014. Resulting savings calculations for these two measures combined were:

- 131,062 annual kWh; and
- 1,310,619 lifetime kWh.

6.3.3 Savings from Programmable Thermostats

LIHEP installed 446 programmable thermostats in 2014. Resulting savings calculations were:

- 18,715 annual kWh; and
- 205,868 lifetime kWh.

6.3.4 Savings from Refrigerator Replacements

LIHEP replaced 615 inefficient refrigerators with ENERGY STAR units in 2014. Resulting savings calculations were:

- 621,958 annual kWh;
- 63.3 peak kW; and
- 11,195,240 lifetime kWh.

6.4 Verified Savings

Table 6-5 summarizes the gross and lifetime savings estimates by measure for the 2014 Low Income Home Efficiency Program. A NTGR of one (1) was applied to the whole program, thus net savings are equal to gross savings.

Table 6-5 2014 LIHEP Verified Savings Summary

Measure	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		EUL Years	Lifetime Energy Savings (kWh)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post	
CFLs	44.1	27.0	338,020	200,628	8	2,162,546	1,605,024	59.4%
ENERGY STAR Refrigerators	63.3	63.3	621,958	621,958	18	11,195,240	11,195,240	100.0%
Faucet Aerators	0	0	10,511	58,010	10	295,176	580,100	551.9%
Low-flow Showerheads	0	0	18,706	57,686	10	239,112	576,860	308.4%
Programmable Thermostats	0	0	13,920	11,930	11	240,179	131,230	85.7%
Total:	107.4	90.3	1,003,115	950,212	-	14,132,253	14,088,454	94.7%

Further, the program produced 23,585 Therms savings from low flow devices installed in homes with gas water heating.

6.5 Process Findings

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

- What measures are participants following the completion of the in-home assessment?
- Is the assessment useful to program participants?
- Is the program successful in identifying qualifying low income customers?
- Are participants satisfied with their experience with the program?

6.5.1 Data Collection Activities

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

- *PNM Program Staff Interviews*. The evaluators interviewed staff at PNM involved in the administration of the program. These interviews collected initial background information on program history and implementation, as well as capturing any operational changes or new developments in the program.
- *Ecova Program Staff Interviews*. Ecova implements the program. The Evaluators collected information from this interview as to the implementation process and lessons learned in the first year of program implementation.
- *On-site Visits.* The Evaluators staff verified counts and operation of measures claimed as installed by the program.

- *Participant Surveying*. The Evaluators surveyed a sample of program participants to obtain feedback.

Table 6-6 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 6-6 PNM LIHEP Program Data Collection Summary

Target	Component	Activity	N	Role
PNM Program Staff	Senior Program Developer	Interview	1	Overall administration of PNM DSM programs. This manager is involved in the larger strategic decisions associated with the DSM portfolio, and is involved with the overall coordination of utility resources.
Ecova Staff	Program Manager	Interview	1	Administration of program. Oversight of outreach and installation.
Program Participants	-	On-site Visit	19	Verify installation and retention of measures given in the tracking database. Survey participants on program.
Program Participants	-	Survey	40	Residential participants in the Low Income Home Efficiency Program were surveyed for impact and process data collection.

6.5.2 Market Description

This section presents key background data on the target market for the LIHEP. Data for this section are provided by the Energy Efficiency Potential Study for the State of New Mexico[5] and the American Community Survey (ACS)[6], and surveys with participating market actors.

6.5.2.1 Market Characteristics

To provide estimates of available market for PNM service territory, the Evaluators combined ACS results for counties within the territory (see section 5.5.2.1 for list of counties).

Data from the most recent available ACS indicates that there were a total of 537,365 residences in PNM-served counties as of 2011. Of these, 87.5% are occupied, and of that, 32.9% are low income[7]. Figure 6-2 summarizes a comparison of housing stock of program participants vs. the housing stock of PNM's service territory overall.

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

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

[7] The evaluators set a cutoff of $35,000 when determining if a household is "low income".

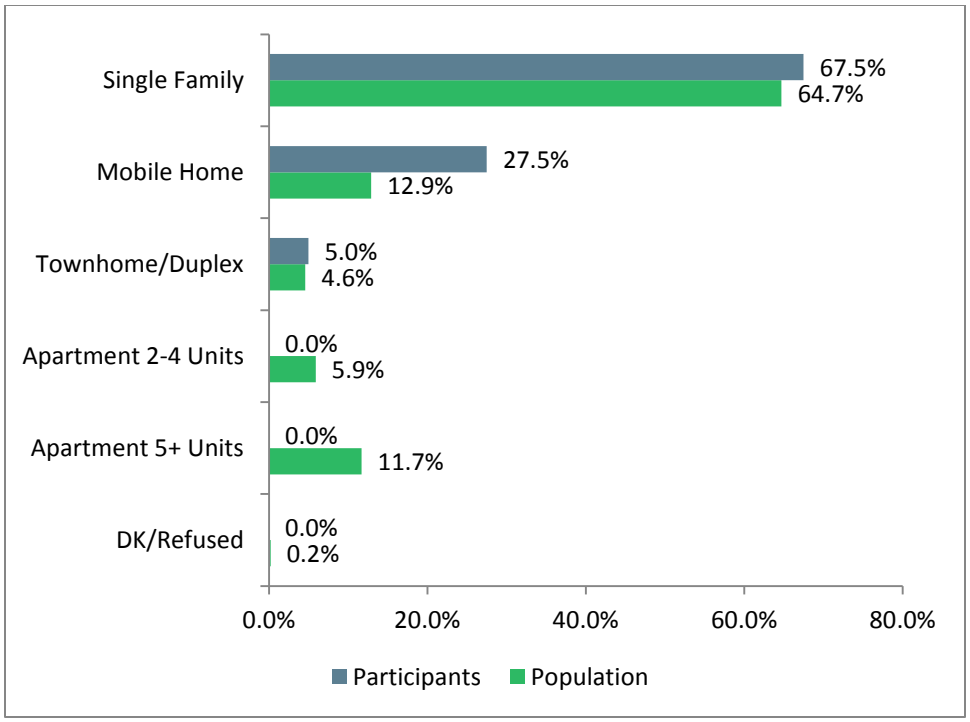

Figure 6-2 Distribution of Residential Buildings Types in PNM Service Territory

A key difference is in the percent of participants in single family homes. Roughly 68% of program participants occupied single family homes, which closely reflects that single family homes constitute 64.7% of housing stock. Eighty percent of survey respondents indicated owning their home, compared to PNM's overall home ownership rate of 68.8%.

The Evaluators also asked survey respondents about the age of their homes. Then those responses were compared to the Whole House Program survey respondents about the age of their homes. A full 28% of LIHEP customers live in homes that were built prior to 1970; nearly twice as many than Whole House customers that live in homes from that same era.

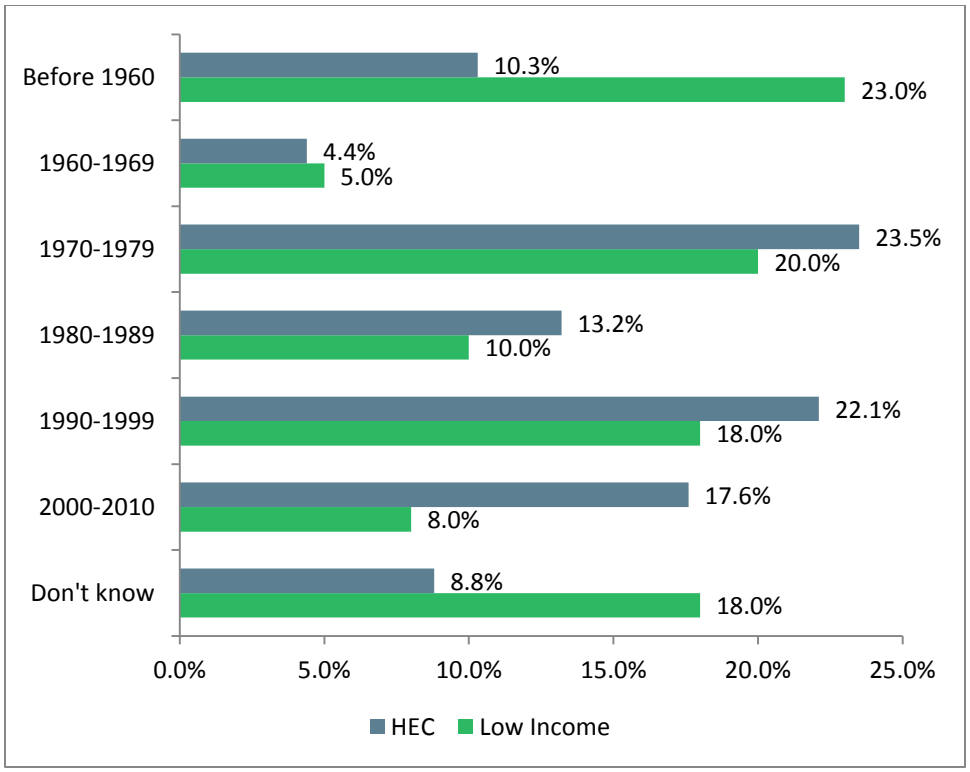

Figure 6-3 Age of Homes Compared, Whole House and LIHEP Customers

6.5.2.2 Market Barriers

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

- **High share of gas space heating and water heating.** Seventy percent of survey respondents indicated having natural gas space heating. Sixty-five percent of survey respondents indicated having natural gas water heating. In addition, PNM's service territory has a relatively mild cooling season and high use of evaporative cooling. This adds significant difficulty to programs with a whole-house approach in that there are limited opportunities to produce kWh savings in a manner that will pass the Utility Cost Test.
- **Difficulty in inducing early replacement.** Most of the program recommendations pertain to the replacement of functioning equipment. In particular, the program attempts to induce early replacement of central air conditioning systems. This is not financially feasible for this program's participants.
- **Lack of cooperation from landlords.** Landlords of properties rented by low income customers are typically not invested in energy efficiency for their tenants. As such this segment is often left out of the program. Only 18% of LIHEP participants reported renting their homes, which is a lower percentage than would

be expected given the overall home-ownership ratio (68.8%) of PNM's service territory.

6.5.3 Program Theory & Design

The LIHEP is designed to provide a comprehensive introduction to energy efficiency to low income residents in PNM's service territory. The program provides an in-house assessment through which receive free, direct installation of CFLs, faucet aerators, programmable thermostats, low flow showerheads, and in some cases, refrigerator replacements. Customers also receive recommendations and pre-authorization for rebates on equipment including:

- Clothes washers;
- Dishwashers;
- Advanced evaporative cooling;
- HVAC early replacement;
- HVAC normal replacement; and
- Window AC units.

6.5.3.1 Program Administration

LIHEP is overseen by a Senior Program Developer at PNM. The manager's responsibilities are focused primarily on verifying invoices from Ecova and ensuring proper payment based on project costs. Other activities associated with program delivery (marketing, QA/QC, etc.) are handled by Ecova.

6.5.3.2 Program Implementation and Delivery

The participation process is as follows:

- *Customer Recruitment*. The outreach efforts by Ecova are targeted at residential single-family homeowners. This has included bill inserts, online advertising, and mass media advertising including television, radio, and print media advertisements. In 2014, PNM and Ecova also worked with community outreach groups to increase awareness of the program.
- *In-Home Assessments*. Ecova uses internal staff to complete in-home assessments. At this time, the Ecova staffer identifies qualifying equipment for the rebate component of the program.
- *Installation*. During the in-home assessment, the Ecova staffer identifies fixtures eligible for installation of CFLs, faucet aerators, and low flow showerheads. With the homeowner's permission, these are then installed.

- *Assessment Summary*. Once direct installation is complete, the homeowner is later provided a brief report summarizing their eligibility for rebates for HVAC and appliance replacements.
- *Application Submittal*. Participants purchase qualifying equipment at their discretion once they have been pre-qualified for a rebate. Their application and associated rebate coupon are submitted to PNM and Ecova.
- *Application Review & Payment*. Staff at Ecova reviews the application and after verifying that measures installed meet program criteria, payment is remitted to the participant. Summaries of payments are sent to PNM for their internal review on a monthly basis.

6.5.4 Program Marketing & Outreach Efforts

PNM markets LIHEP through their general mass-market channels. Activities in support of LIHEP have included:

- Bill inserts;
- Television advertisements;
- Radio advertisements; and
- Print media.

Survey respondents were asked to identify how they became aware of LIHEP. Their responses are summarized in Figure 6-4.

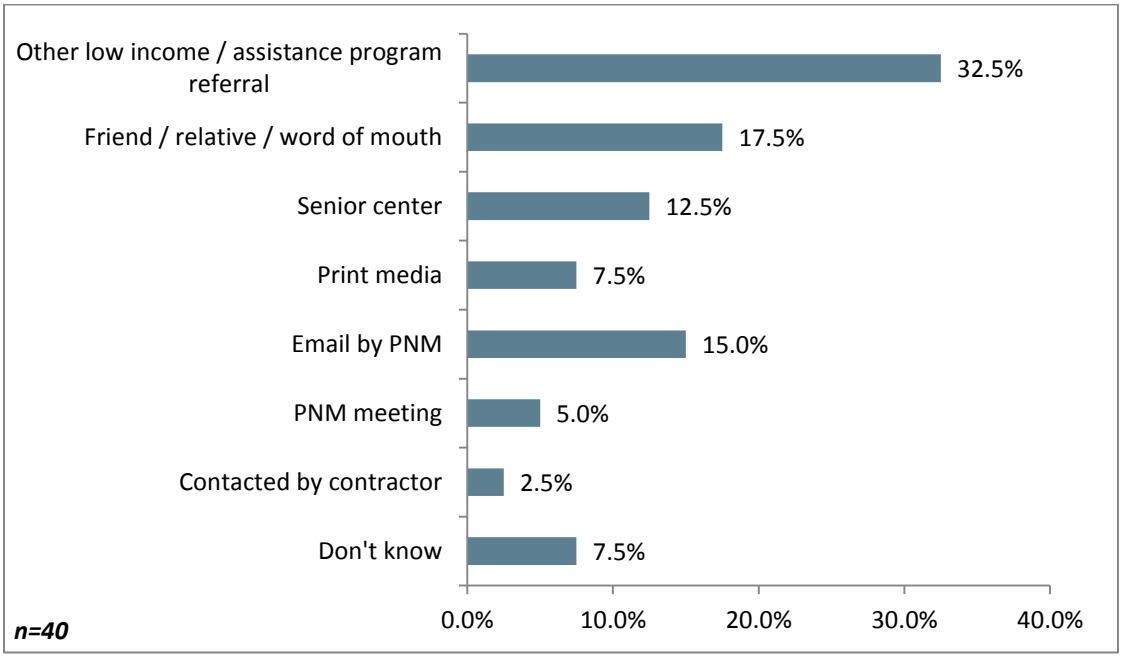

Figure 6-4 LIHEP Sources of Program Awareness

The most commonly indicated source of program awareness was a referral from other low income programs such as the federal LIHEAP program, the Salvation Army, local food banks, and charities sponsored by local churches (32.5%). Other commonly indicated sources were word of mouth from friends and relatives (17.5%), an email from PNM (15.0%) and a meeting at the local senior center (12.5%).

6.5.5 Application Process

Participants in LIHEP can sign up by telephone, through the PNM website, and by filling out and mailing a form sent along with a bill insert. Fifty percent of survey respondents signed up by telephone. Another 40% indicated they signed up for the program through some other means – often through community outreach groups. None of the survey respondents indicated they had signed up for the program online.

6.5.6 Motivations for Participation

Marketing materials and presentations for LIHEP use "reducing energy bills" as the primary message encouraging participation. Survey respondents were asked to identify the reason for their participation. The answers provided were unprompted and were coded into larger categories. Respondents' answers are summarized in Figure 6-5.

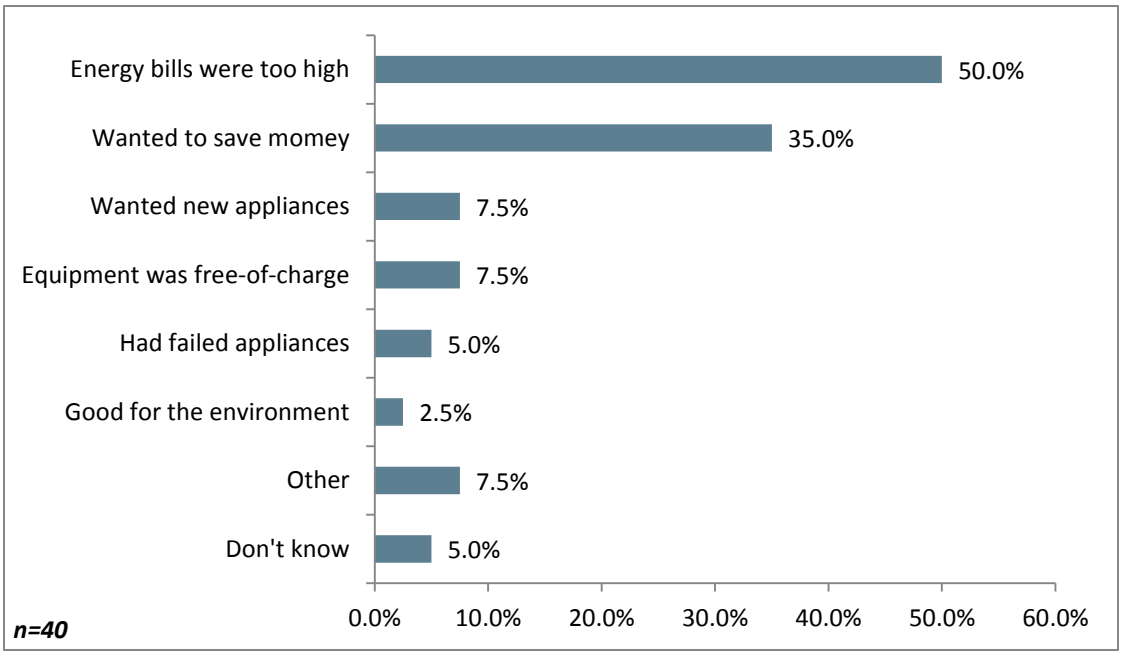

Figure 6-5 LIHEP – Reasons for Participation

Respondents most commonly indicated financial concerns such as "energy bills too high" (50%) and "wanted to save money" (35%) as their primary motivation for participation. Of the 7.5% who responded with an "other" response, most of them cited

wanting to make sure that their current appliances were working efficiently and knew that this service was free for them.

6.5.7 Interactions with Home Assessor

Home assessors from Ecova provide the direct installation of CFLs, water saving measures and refrigerator replacements, as well as recommendations and pre-qualification for potential rebates. Respondents were asked to identify their satisfaction with their interactions with the home assessor as well as with any written summary of recommendations provided by the assessor. Satisfaction with the assessor was rated at 9.38 out of 10 by survey respondents.

6.5.8 Home Assessment Report

Eighty percent of respondents recalled receiving recommendations for other improvements to their home after direct installation was completed. Of these, 88% recalled receiving a written report summarizing the recommendations. These respondents were asked to identify whether this written summary was useful to them. Of those that received a written summary, 89% identified it as "useful" and 11% indicated that it was "not useful".

All respondents were asked to explain why they found the report useful or not useful, and their responses were recorded verbatim. Sample responses from those that found it useful include:

"I explained everything. Gave my Dad hope. CFLs brightened home. [Assessor] was very helpful."

"Light bill went down with new fridge and thermostat and CFLs."

"Just [provided] helpful knowledge."

"Helpful information to save money."

"It let me know what I was doing right to save energy and other things I can do."

Verbatim responses explaining dissatisfaction with the report included:

"Received report, but we don't know how to use. [Assessor] changed lights, that's all. He said the fridge is not old enough [to replace]."

"Did not get complete assessment about air conditioners and other things."

Responses from those indicating satisfaction were largely focused on two areas:

1) The report was useful in prequalifying them for rebates (regardless of whether they acted on these recommendations); and

2) The report was useful in educating the participant on energy efficiency and the status of the efficiency of their home.

Reasons for dissatisfaction included:

1) The participant having no interest in replacing functioning appliances; and
2) The participant not learning anything new from the assessment or report.

The survey results suggest that the program is perceived to have more value among customers that have lower awareness of their energy use or of the existing efficiency of their homes.

6.5.9 Participant Satisfaction

Respondents were asked to rate their satisfaction on a scale of 0-10, with 10 meaning "very satisfied" and 0 meaning "not at all satisfied". Their responses are summarized in

Table 6-7.

Table 6-7 LIHEP Participant Satisfaction

Component	*Mean Score*	*% Don't Know/Not Applicable*
Interactions with the home assessor	9.38	0.0%
Program application process	9.15	2.5%
Rebate amounts	8.77	45.0%
Service provided by installing contractors	9.32	22.5%
Wait-time to receive rebates	8.20	50.0%
Range of equipment covered by the program	8.73	7.5%
The quality of the home assessment report	9.24	5.0%
Overall program experience	7.73	72.5%
n=40		

6.6 Conclusions & Recommendations

Based on the EM&V effort of the 2014 LIHEP, the Evaluator's conclusions and recommendations are as follows:

6.6.1 Conclusions

- **The program has very high participant satisfaction.** Program participants responded very positively when asked to rate their satisfaction with the overall process, and found that the installers were courteous and careful with their homes. Further, most respondents were very satisfied with the observed savings on their bill.
- **Program staff has not updated their savings calculations to reflect the New Mexico TRM.** The Evaluators found that the staff performing the savings calculations for this program had been using prior evaluation numbers or some other means as the basis for savings. Ordinarily, this is a justifiable approach. However, most measures offered in direct install for LIHEP are covered by the New Mexico TRM. It was unclear which values were used to calculate final ex ante savings for CFLs, and ex ante value given for refrigerators in the tracking data did not match PNM's ex ante value spreadsheets.

6.6.2 Recommendations

Based on the EM&V findings, the Evaluator recommends the following:

- **Modify deemed savings based upon 2014 evaluation results.** The findings from the 2014 evaluation are in line with expected savings found in the 2014 New Mexico TRM.
- **Continue community outreach efforts to low income and/or elderly customers.** The most effective form of marketing the program was

presentations at senior centers and charity organizations. Previous customers of the program then recommend it to friends, co-workers and family members. Continuing to provide this service will ensure trust with Ecova and PNM, and thus, increased awareness or the program.

- **Add new measures detailed in the Whole House program for 2015 to the no-cost direct install component of LIHEP.** This would include LED nightlights, and advanced power strips. Advanced power strips would likely need to be installed by program staff as opposed to being a leave-behind measure due to older demographic participating in the LIHEP.
- **Consider the addition of more Spanish language outreach.** This is commonly seen in low income programs in New Mexico but was not widely implemented in 2014 for LIHEP.

7. Residential Stay Cool

7.1 Program Description

The Residential Stay Cool Program provides residential PNM customers with financial incentives for the purchase of efficient cooling equipment and pool pump equipment. Equipment rebated through the program includes:

- Advanced evaporative coolers;
- Advanced evaporative cooler window units;
- Direct-indirect evaporative cooling units;
- CEE Tier 1 air conditioning units;
- ENERGY STAR qualified window air conditioning units; and
- Variable speed drive (VSD) pool pumps.

Higher rebates are given for customers who install new advanced, whole house evaporative coolers than to those who upgrade their whole house AC system to Tier 1 AC units. The program is designed to incentivize customers to switch from refrigerated air conditioning to evaporative cooling. The rebate amounts by equipment type that were issued are summarized in Table 7-1.

Table 7-1 Residential Stay Cool Program Rebate Amounts

Equipment Type	***Rebate Amount***
Advanced Evaporative Cooler (Window Unit)	$100
Advanced Evaporative Cooler (Whole House Unit)	$300
ENERGY STAR Room AC	$25
CEE Tier 1 AC	$100
VSD Pool Pump	$300

7.2 M&V Methodologies

The M&V approach for the Residential Stay Cool Program is aimed at measuring the following:

- Verifying the how many customers participated in the program;
- Verifying how many measures were rebated through the program;
- Verifying energy savings from rebated measures; and
- Estimating cost effectiveness.

Table 7-2 summarizes the inputs needed for gross savings calculations and the source of each input.

Table 7-2 Data Sources for Gross Impact Parameters – Residential Stay Cool Program

Parameter	***Source***
Number of Units Installed	Program Tracking Data
Unit Energy Consumption	New Mexico TRM
NTGR	Participant Surveying

7.2.1 Ex Ante Review

For all measures in the Residential Stay Cool program, a review of ex ante savings was conducted to verify that the expected savings for each measure fell within an acceptable range of deemed savings given in the New Mexico TRM. However, some equipment rebated through the program was not included in the most recent version of the TRM. In those cases, the evaluators reviewed ex ante savings assumptions against existing research, work papers and other TRMs. Additionally, at the end of the 2014, PNM provided to the Evaluators expected savings values for some measures not covered by the NM TRM via Excel spreadsheets. . The table below shows the type of equipment, the savings value applied to calculate ex ante savings, and the source of that value.

Table 7-3 Ex Ante Values and Sources by Equipment Type

Equipment Type	***Ex Ante kWh/unit***	***Ex Ante kW/unit***	***Source***
Advanced Evaporative Cooler (Window Unit)	517	0.94	PNM Ex Ante Spreadsheets
Advanced Evaporative Cooler (Whole House Unit)	1,340	1.99	PNM Ex Ante Spreadsheets
ENERGY STAR Room AC	80	0.14	PNM Ex Ante Spreadsheets
CEE Tier 1 AC	873	1.56	Average of NM TRM savings values for Albuquerque climate zone over SEER 15
VSD Pool Pump	1,041	0.40	PNM Ex Ante Spreadsheets

The tracking data did not include any rebates for direct-indirect evaporative cooling units; therefore, they were not included in ex ante calculations.

7.2.2 Tracking Data Review

The Evaluators received a tracking database from PNM that was developed by CLEAResult. The initial gathering and compiling of tracking data is crucial in facilitating a smooth evaluation effort, and as such the evaluators reviewed this tracking data in order to verify that it contained the required data to:

(1) Recreate energy savings calculations;

(2) Contact participants and trade allies; and

(3) Ensure proper rebate payment amounts;

In order to calculate gross savings, the tracking data should contain the following pieces of information:

- Measures installed;
- Quantities of measures installed;
- Customer contact information; and
- Expected savings.

Quantities of CEE Tier 1 AC rebates were missing. Quantities of Tier 1 ACs were developed by dividing the total rebate amount per customer by the standard rebate for that measure ($100).

The tracking data was also absent of ex ante savings information for all measures. Thus the Evaluators calculated ex ante savings by applying the values as appropriate from Table 7-3 and multiplying those values by quantities installed.

7.2.3 Gross Ex Post Savings Estimation

Data used for the gross ex post savings evaluation included:

- Program tracking data from the main tracking database;
- Program supporting documentation provided by PNM;
- Participant survey data collected through telephone surveying; and,
- Data from relevant secondary sources.

All equipment rebated through the program was subjected to an engineering desk review. The desk review serves a quality assurance function that attests to the dependability of program tracking data and provides assurance that the energy savings reported were supported by appropriate documentation. The desk review provided assurance that:

1. The energy savings and demand reductions are claimed in accordance with the protocols in the *New Mexico Technical Reference Manual* (if applicable)

2. The documentation, specifically rebate applications and product invoices, support the measure rebate numbers that are claimed by the program.

The Evaluators calculated ex post savings by applying the values provided in the New Mexico TRM. Measures not included in the TRM were issued ex post savings values based on planning documents provided to the Evaluators by PNM at the beginning of the 2014 evaluation. The table below shows the type of equipment, the savings value

applied to calculate ex post savings, the effective useful life (EUL) and the source of each of those values.

Table 7-4 Ex Post Values, EUL and Sources by Equipment Type

Equipment Type	*Ex Post kWh/unit*	*Ex Post kW/unit*	*Source*	*EUL*	*Source*
Advanced Evaporative Cooler (Window Unit)	489	0.71	PNM 2014 Planning Documents	15	NM TRM
Advanced Evaporative Cooler (Whole House Unit)	2,085	1.77	NM TRM, Table 59	15	NM TRM
ENERGY STAR Room AC	80	0.14	PNM Ex Ante Spreadsheets	13	2013 Oklahoma Residential Deemed Savings Document
CEE Tier 1 AC	865	0.53	NM TRM, Table 50	15	NM TRM
VSD Pool Pump	1,041	0.40	PNM 2014 Planning Documents	10	DEER 2011

The values in Table 7-4 were then multiplied by the quantities for each measure that were given in the tracking data to derive program level savings.

7.2.4 Net Savings Estimation

Net to gross scores were calculated separately for evaporative coolers and AC units. The Evaluators surveyed 199 program participants to assess NTGR per participant; 40 customers who had purchased high efficiency AC units and 159 who purchased new evaporative cooling units. These scores were then used to derive two program level NTGRs for evaporative and refrigerated cooling.

NTGRs were scored based on asking the customer what they had installed before the new unit, what they actually did install for cooling, and what they would have installed absent the rebate. Specifically, customers were asked:

What was the primary cooling system in your home prior to this?

If PNM's incentive for [MEASURE] were not available, would you have installed different equipment?

What type of cooling system would you have installed?

Survey responses were scored based on the answers to the questions above and the type of unit they purchased. These responses fell into one of five categories of what the customer would have installed without the availability of the rebate versus what they

installed with the rebate. These categories and their corresponding NTGRs are detailed in Table 7-5.

Table 7-5 NTGR Scoring for Residential Stay Cool Program

Installed without rebate	***Installed with rebate***	***NTGR***
No change to decision	N/A	0
Standard evaporative cooler	High efficiency evaporative cooler	0.5
Standard AC unit	High efficiency evaporative cooler	1
Standard evaporative cooler	High efficiency AC	0
Standard AC unit	High efficiency AC	1

The average NTGR for the evaporative cooling units rebated through the program was 32%. For high efficiency AC units, the averaged NTGR was 40%.

Due to low participation with the VSD pool pump measure, the Evaluators issued this measure a NTGR of 100%.

7.3 Impact Findings

The majority of rebates issued through the program were for whole house advanced evaporative coolers. Therefore the majority of savings realized through the program were due to this measure. Figure 7-1 shows the percentage of rebates issued through the program by each type of measure. A total of 2,273 units were rebated through the program.

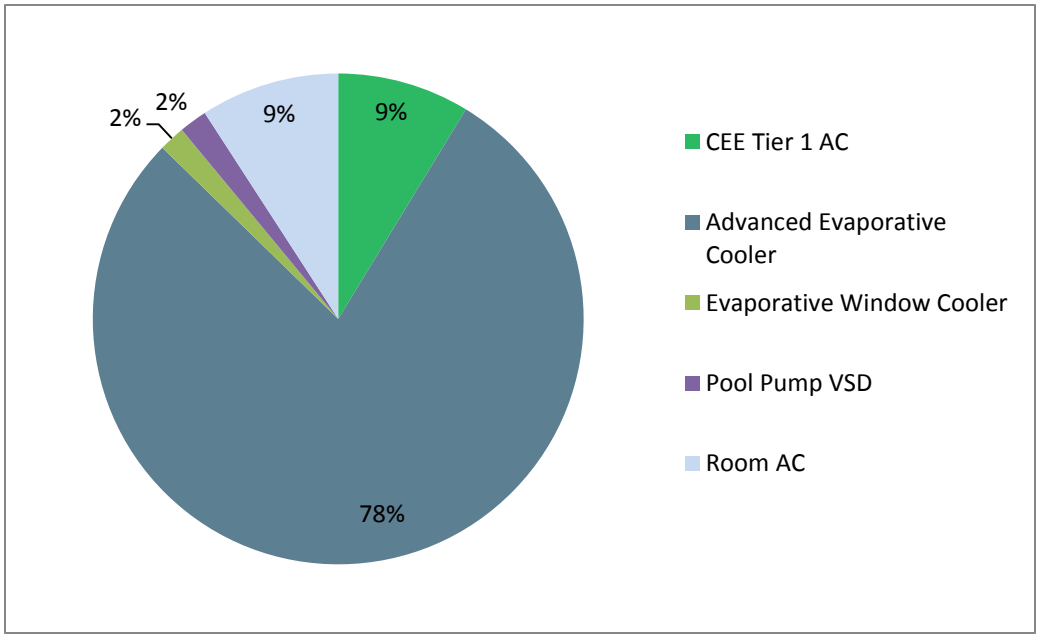

Figure 7-1 Rebates Issued through the 2014 Residential Stay Cool Program

Due to the conservative kWh ex ante assumptions, all measures in the program achieved a high realization rate. The Evaluators were unable to verify the higher than expected per unit kW values used in ex ante documents for both types of evaporative coolers rebated through the program.

7.4 Verified Savings

Table 5-8 summarizes the gross and net savings estimates by measure for the 2014 Residential Stay Cool Program.

Table 7-6 2014 Residential Stay Cool Verified Savings Summary

Measure	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		EUL Years	Lifetime Energy Savings (kWh)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post	
CEE Tier 1 AC	308.9	104.1	172,854	171,249	15	2,592,810	2,568,732	99.1%
Advanced Evaporative Cooler	3,291.1	3,161.2	2,238,824	3,723,810	15	23,366,997	55,857,150	166.3%
Evaporative Window Cooler	36.7	27.7	20,163	19,071	15	302,445	286,065	94.6%
Pool Pump VSD	16.8	16.8	43,722	43,722	10	437,220	437,220	100.0%
Room AC	29.5	29.5	16,640	16,640	13	216,320	216,320	100.0%
Total:	3,683.0	3,339.3	2,492,203	3,974,492	-	26,915,792	59,365,487	159.5%

Net savings are presented in Table 7-7.

Table 7-7 Residential Stay Cool Program Net Savings

	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		EUL Years	Lifetime Energy Savings (kWh)		Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post	
Total:	1,898	1,090.7	1,271,024	1,316,600	-	13,727,054	19,517,078	103.6

7.5 Process Findings

The Evaluators conducted a process evaluation of Residential Stay Cool Program in order to address a range of issues:

- How well did PNM staff, implementation staff, market contractors, and participating customers work together? Are there data tracking and/or communication efficiencies that can be gained?
- How do participants hear about the program? What percentage is contacted directly by PNM or implementation staff? What percentage learns of the program through retailers and other contractors? What percentage hears about the program through another avenue and then contacts PNM?
- Were the program participants satisfied with their experience? What was the level of satisfaction with the available rebates, the application process, and other aspects of program participation? What are the perceived energy and non-energy benefits associated with the program?
- Were there any significant changes or obstacles during the program year? What are the lessons learned for the current program year, and how can they inform future program strategy?
- How effectively are participants being directed towards other PNM programs, such as the Whole House Program? To what extent are program staff and market actors engaging in cross-promotion of PNM programs?

To address these questions, ADM's process evaluation activities included a review of program materials, participant customer surveys, and interviews with program staff.

7.5.1 Data Collection Activities

The process evaluation of Residential Stay Cool Program included the following data collection activities:

- *PNM Program Staff Interviews*. The evaluators interviewed staff at PNM involved in the administration of the program. These interviews collected initial background information on program history and implementation, as well as capturing any operational changes or new developments in the program.

- *CLEAResult Program Staff Interviews*. CLEAResult implements the program. The Evaluators collected information from this interview as to the implementation process and lessons learned in the first year of program implementation.
- *Participant Surveying*. The Evaluators surveyed a sample of program participants to obtain feedback.

Table 5-9 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 7-8 Residential Stay Cool Program Data Collection Summary

Target	Component	Activity	N	Role
PNM Program Staff	Senior Program Developer	Interview	1	Overall administration of PNM DSM programs. This manager is involved in the larger strategic decisions associated with the DSM portfolio, and is involved with the overall coordination of utility resources.
CLEAResult Staff	Program Manager	Interview	1	Administration of program. Oversight of outreach and installation.
Program Participants	-	Survey	199	Residential participants in the Residential Stay Cool Program were surveyed for impact and process data collection.

7.5.2 Market Description

This section presents key background data on the target market for the Residential Stay Cool Program.

7.5.2.1 Market Characteristics

CLEAResult Program Staff were unaware until the Residential Stay Cool program was rolled out that indirect-direct evaporation coolers were limited to the commercial market only. Additionally, advanced evaporative cooling window units were unavailable at most retailers for residential (non-commercial) customers. CLEAResult conducted several on-site visits to retail locations and found that the program signage was prominently displayed. However, the limited options for advanced window evaporative coolers may have contributed to the low number of rebates issued for this measure.

According to the GEP market potential study, market penetration rate is for VSD pool pumps in PNM territory is about half the national average. This is likely due to the low number of in-ground pools (required for VSD pool pump installation) in PNM's service territory. Additionally, market penetration was likely affected by the limited availability of ENERGY STAR VSDs, part of the criteria for pool pumps rebates. The Evaluators also asked survey respondents to identify their cooling equipment prior to installing their rebated equipment. Their responses are summarized in Table 7-9.

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Table 7-9 Participants' Existing Cooling Systems

Existing Cooling System	***% Indicating***
Central Evaporative Cooling System	85.4%
Window Evaporative Cooling System	3.0%
Window Air Conditioner	4.5%
Central Air Conditioner	3.0%
No cooling system in place	3.0%
Don't know	1.0%
n= 199	

7.5.3 Program Theory & Design

The Residential Stay Cool Program is designed to provide residential PNM customers with financial incentives for the purchase of efficient cooling and pool pump equipment. Rebates for these measures included:

- Advanced evaporative coolers
- Advanced evaporative cooler window units
- Direct-indirect evaporative cooling units
- ENERGY STAR qualified window A/C units
- Variable speed drive (VSD) pool pumps

Higher rebates are given for customers who install new advanced, whole house evaporative coolers than to those who upgrade their whole house AC system to Tier 1 AC units. The program is designed to incentivize customers to switch from refrigerated air conditioning to evaporative cooling.

7.5.4 Program Marketing & Outreach Efforts

PNM markets the Residential Stay Cool program through their general mass-market channels. The activities in support of the program have included:

- Bill inserts;
- Television advertisements;
- Radio advertisements; and
- Print media.

Typically though, respondents become aware of the program at the time they are seeking to replace a failed unit and have contacted an HVAC or pool supplier. Seventy percent of respondents indicated learning of the program before installing a new unit. Most of the survey respondents (80%) had planned to buy a new unit before speaking to a contractor or retailer and learning about the program. Further, survey respondents were asked to identify how they became aware of the Residential Stay Cool Program. Their responses are summarized in Figure 7-2.

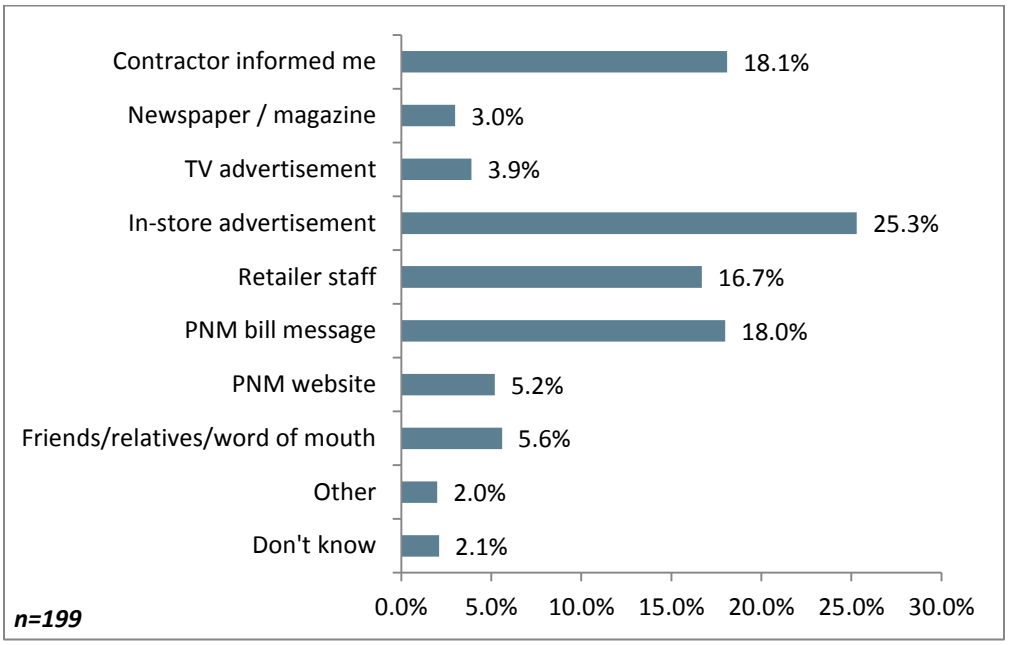

Figure 7-2 Sources of Residential Stay Cool Program Awareness

Most respondents (58.8%) learned of the program through an in-store advertisement (25.3%). Other common sources included a contractor (18.1%), the PNM bill message (18.0%), and retail staff (16.7%). Sixty-two percent of respondents recalled seeing in-store promotion of the program.

Respondents were then asked what sources of information they most value when deciding on an energy efficiency project. A list of potential sources was read off, with respondents rating the sources on a scale of 1-10, with 1 meaning “Not Important at All” and 10 meaning “Very Important”. Table 7-10 summarizes the scoring of importance of various reasons by respondents.

Table 7-10 Importance of Reasons for Purchase

Importance of Reasons for Purchase	*Mean Score*	*% Indicating "Don't Know"*
The financial incentive from PNM	7.61	1.0%
Improving home comfort	8.90	0%
Reducing electricity bills	7.31	4.0%
The rebate amount	7.26	2.0%
Reducing your energy use because it's good for the environment	6.98	13.1%
Information provided by PNM	3.55	39.7%
Recommendation of a friend or relative	5.52	38.7%
Recommendation of a retailer/dealer	6.21	26.1%
n=199		

Highest value was placed on improving home comfort, with a mean score of 8.90. A high value was also placed on financial incentive from PNM (7.61) and reducing electricity bills (7.31).

7.5.5 Motivations for Equipment Choice

Survey respondents were asked about their processes for choosing the equipment that they purchased. Of the customers who purchased evaporative cooling units (n=159), 38% indicated they had considered switching to refrigerated air units. When asked, "If PNM's incentive for [cooling measure] had not been available; would you have installed different equipment?" 71.4% of respondents stated they would not have installed different equipment (n=199). Of the 21.6% respondents that said they would install different equipment absent the rebate, the majority (74.4%) indicated they would've installed a less efficient central or whole house evaporative system.

7.5.6 Participant Satisfaction

Respondents were asked to rate their satisfaction on a scale of 0-10, with 10 meaning "very satisfied" and 0 meaning "not at all satisfied". Their responses are summarized in Table 7-11.

Table 7-11 HECP Participant Satisfaction

Component	*Mean Score*	*% Don't Know/Not Applicable*

Information provided by PNM	8.8	6.5%
Information provided by your contractor	8.9	51.3%
The rebate amount	9.0	0.5%
The level of home comfort after installing the new unit(s)	9.2	2.5%
The ease of the application process	9.2	1.0%
The length of time it took to receive the rebate	8.8	1.5%
Overall program experience	9.3	0.0%
n=199		

7.6 Conclusions & Recommendations

Based on the EM&V effort of the 2014 Residential Stay Cool Program, the Evaluator's conclusions and recommendations are as follows:

7.6.1 Conclusions

1. **The program has very high participant satisfaction.** Program participants responded very positively when asked to rate their satisfaction with the overall process, time to receive rebate check and ease of the application process. Further, most respondents were very satisfied with the performance of the new equipment.
2. **Program staff has not updated their savings calculations to reflect the New Mexico TRM.** The Evaluators found that the staff performing the savings calculations for this program was using prior evaluation numbers as the basis for savings. Ordinarily, this is a justifiable approach. In 2014 this approach was found to underestimate kWh savings for some measures that are included in the New Mexico TRM.
3. **Indirect-direct evaporative cooling units were not effectively a part of the 2014 Residential Stay Cool Program.** The program was designed to include this type of evaporative cooler; however, these types of units are now primarily developed and used for commercial facilities. Pool pumps were also a small part of the program, owing to it being a new rebate for 2014 and the relatively small market for pumps for in-ground pools in PNM territory.

7.6.2 Recommendations

Based on the EM&V findings, the Evaluators recommend the following:

1. **Monitoring of 2015 VSD pool pumps projects.** The Evaluators are planning to conduct on-site power monitoring of residential VSD pool pumps during the summer months for the 2015 evaluation of this program. Building a load profile of actual New Mexico pool pump on/off schedules will increase the accuracy of expected savings if PNM is going to continue to rebate this type of equipment. Savings for pool pumps are likely being underestimated using a deemed approach.

2. **Continue to keep contractors and retailers informed about the newest rebate offerings.** Most customers were informed of the Residential Stay Cool Program rebates either by contractors or in-store signage, depending on the type of unit they wanted to purchase. CLEAResult indicated some difficulty with forging new partnerships with pool supply companies to inform them and their customers about the new VSD pool pump rebate. This temporary hindrance has been overcome in 2014 and PNM should expect to see increased participation for VSD pool pump rebates, provided CLEAResult continues to expand their contractor partnership.

8. Student Efficiency Kits

8.1 Program Description

The Student Efficiency Kits Program is offered to teachers as an elective educational program. The program provides classroom activities, a take-home kit, and instructional materials to assist 5th grade students and their families in conserving energy and water at home.

The kit includes:

- One 1.5 GPM showerhead;
- One shower timer;
- One 1.5 GPM kitchen aerator;
- One 1.0 GPM bathroom aerator
- One electroluminescent night light; and
- Four 13W CFLs.

The program is implemented by National Energy Foundation (NEF), who implements a similar program in a large number of other states. The program recruits 5th grade teachers in participating school districts.

The topics included in the educational module are covered in one or more lessons by participating teachers. After the completion of the lessons, students take the efficiency kit home and with the assistance of their parents, install the provided items and conduct an in-home assessment. The results of this are provided back to NEF.

The survey filled out by students and their parents collect data pertaining both to installation rates of the provided equipment as well as feedback from participant households and teachers to guide program improvement. The Evaluators leveraged this survey data as resurveying the participant population would be impractical.

8.2 M&V Methodology

The M&V approach for the Student Efficiency Kits Program is aimed at the following:

- Verifying the numbers of CFLs, nightlights, showerheads, and aerators distributed as a result of the program;
- Determining the percentage of purchased CFLs, nightlights, showerheads, and aerators that are actually installed;
- Verifying electric water heating rates; and

- Estimating the extent to which installed CFLs are used.

Table 8-1 below summarizes the inputs needed for gross savings calculations and the source of each input.

Table 8-1 Sources for Gross Impact Parameters – Student Efficiency Kits Program

Parameter	***Source***
Equipment Quantities & Specifications	Program tracking data
Unit energy savings	Literature review of existing workpapers
Installation Rate	NEF surveys
Electric water heating rate	NEF
Baseline Wattage	Manufacturer's specifications for lumen equivalence by CFL size & configuration, EISA

8.2.1 Student Efficiency Kits Review of Deemed Savings Estimates

The Evaluator reviewed the deemed savings estimates used by PNM for the 2014 Student Efficiency Kits Program. NEF utilized values from the New Mexico TRM, adjusted for installation and electric water heating rates. Given the types of measures included with the kits, the Evaluators agreed with this approach.

8.2.2 Student Efficiency Kits Verification of Installation

The Evaluators were provided the survey data collected from NEF. This data was used in establishing in-service and electric water heating rates. For the low flow devices, savings are calculated as:

$$kWh\ Savings = UES * \%Install * \%ElecWH$$

Where

UES = Unit Energy Savings – deemed energy savings of included equipment as listed in the New Mexico TRM

%Install = Percent of equipment installed, based off of NEF survey data;

%ElecWH = Percent of homes with electric water heating, based off of NEF survey data.

Further, the Student Efficiency Kits Program provided LED nightlights. Savings from LED nightlights were a function of unit energy savings, installation rates, and the percent of units which replaced an existing nightlight. Savings were only credited for nightlights that replaced an existing unit; no savings were credited if a nightlight was installed in a socket that did not have a nightlight prior.

8.2.3 Student Efficiency Kit - Net Savings Estimates

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

8.3 Process Evaluation

The Evaluators conducted a process evaluation of the Student Efficiency Kits Program in order to address a range of issues:

- What drives measure installation and retention (or lack thereof)?
- Are teachers spending adequate time covering program materials?
- Does the kit contribute to/comply with New Mexico State Educational Standards?
- What are the teacher experiences with the curriculum?
- What opportunities are there for program improvement?

For this program, the Evaluators are presenting process findings before impact findings, as the issues surrounding measure installation and retention directly relate to the subsequent impact values.

8.3.1 Data Collection Activities

The process evaluation of Student Efficiency Kits Program included the following data collection activities:

- *PNM Program Staff Interviews*. The evaluators interviewed staff at PNM involved in the administration of the program. These interviews collected initial background information on program history and implementation, as well as capturing any operational changes or new developments in the program.
- *NEF Staff Interviews*. At the beginning of the evaluation, we conducted interviews with NEF staff to establish expectations of the EM&V effort as well as to gain insight as to NEF's plan for first-year implementation.
- *Participant Teacher Surveying*. The Evaluators conducted an online survey with participating teachers in order to obtain feedback on their perception of the program.

Table 8-2 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 8-2 Student Efficiency Kits Program Data Collection Summary

Target	Title	Activity	N	Role
PNM Program Staff	Senior Program Developer	Interview	1	Overall administration of PNM DSM programs. This manager is involved in the larger strategic decisions associated with the DSM portfolio, and is involved with the overall coordination of utility resources.
National Energy Foundation	Vice President, Programs	Interview	1	Development of program curriculum. Management of program implementation.
Participant Teachers	-	Online Survey	32	An online survey was conducted with participant teachers to obtain their feedback on the program.

8.4 Process Results & Findings

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

8.4.1 Program Theory & Design

The Student Efficiency Kits Program is designed to provide reliable and cost-effective energy savings along with educational outreach to 5th grade students and their families. The educational materials are designed to provide clear links from activities to outcomes on the part of students, and in addition provide guidance on:

- The impact of energy conservation on reducing the use of fossil fuels;
- Careers available in energy-related fields; and
- How the students and their families can save energy at home.

8.4.2 Program Administration

The Student Efficiency Kits Program is overseen by a Senior Program Developer at PNM. The manager's responsibilities are focused primarily on verifying invoices from NEF and ensuring proper payment based on project costs. Other activities associated with program delivery (marketing, QA/QC, etc.) are handled by NEF.

8.4.3 Program Implementation and Delivery

PNM provided guidance to NEF as to where they wanted program implementation to occur in 2014. Implementation was begun in three of PNM's largest school districts:

- Albuquerque Public Schools;
- Rio Rancho Public Schools; and
- Santa Fe Public Schools.

Within these school districts, NEF identified eligible elementary schools and began recruitment of teachers. NEF contacted potential participants by phone or email to discuss the program. Recruited teachers are sent sample materials and are then followed up with to see if they are interested in using the program.

When NEF has completed recruitment at a school, they hold a training session with the participating teachers, reviewing the material and providing the timeline in which they would like the materials completed. This does not always align with the schedule the teacher has in mind, but is constrained by the need of the program to produce current-year kWh savings in order to remain cost-effective.

NEF implemented a second wave of implementation in Fall of 2014, introducing the program to several new school districts. This includes:

- Alamogordo Public Schools;
- Belen Consolidated Schools;
- Bernalillo Public Schools;
- Clayton Municipal Schools;
- Deming Public Schools;
- Las Vegas City Public Schools;
- Los Lunas Public Schools;
- Lordsburg Municipal Schools; and
- Silver Consolidated Schools.

Figure 8-1 summarizes the number of teachers by school district that participated in the program in 2014.

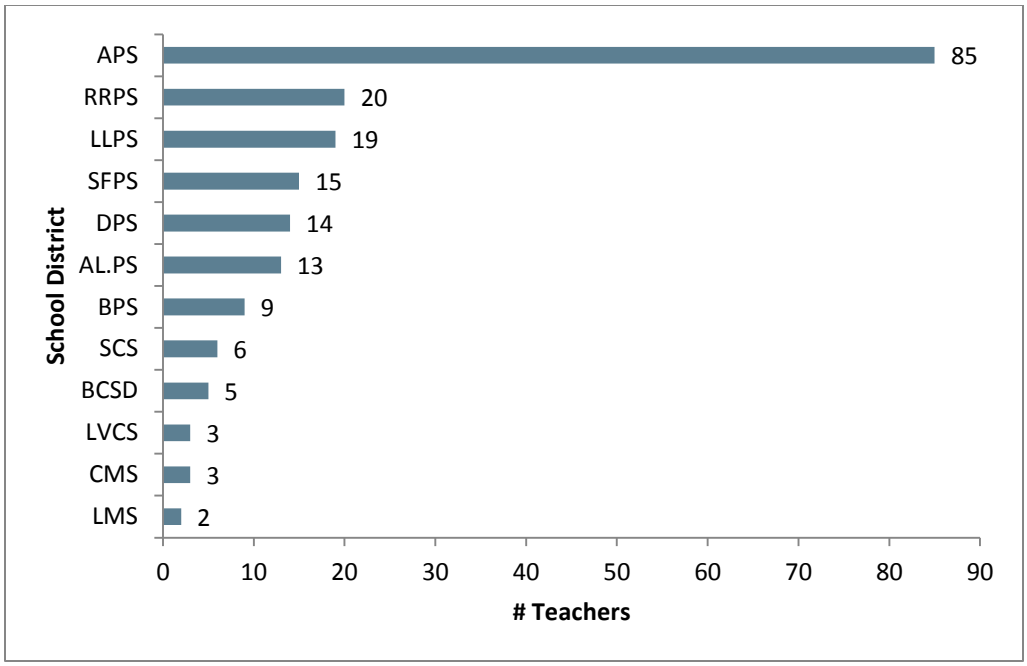

Figure 8-1 Distribution of Participant Teachers by District

For the first wave of participant districts, there is a staff member at each district that has facilitated outreach to potential teachers. These staff members are referred to as Energy Facilitators, and they introduce the program to teachers, who then respond if they are interested. NEF then selected what they determined to be a representative cross-section of elementary schools within each district. Schools were evaluated on the basis of "level of parent engagement"; metrics which contributed to this assessment included qualitative judgment of schools as high- or low-performing and demographic data including income level of the area served by the school.

For the second wave, NEF obtained email addresses for eligible teachers from the school district central office and delivered the introductory invitation to participate to the teachers directly. NEF established quotas to ensure available space for smaller school districts, and assigned openings in larger school districts on a first-come, first-serve basis.

Once recruited, a time is set for NEF to conduct an in-class presentation. A staff member from NEF holds a one-hour presentation to the class room, which is a PowerPoint with interaction between the presenter and the students. This presentation provides an introduction to the student kit materials as well as to other optional activities in the kit. Teachers then may elect to engage in the optional activities with their students as time permits.

When students have completed the take-home kit and in-home assessment, they provide a survey sheet as a "homework" assignment back to their teacher. The teacher then codes the student responses into Scantrons, which are processed by NEF to

produce tracking data. NEF then adjusts their energy savings metrics based off of the installation rates and water heating fuel types.

8.4.4 Program Marketing & Outreach Efforts

Outreach for the Student Efficiency Kits program is high-level; staff from NEF first engage representatives from the school district main office and from this obtain permission to reach out to 5th grade teachers within the district. The district provides NEF a list of teachers, whom NEF then attempts to recruit into the program.

8.4.5 Tracking Data Review

The Evaluators received two tracking files from NEF:

- Summary Data – tabulation of survey results from the take home kit; and
- Individual Data – the survey responses entered via Scantron.

8.4.6 Quality Control Procedures Review

QA/QC for this program is limited to a review of the enrollment and survey data by PNM, which is then cross-referenced with the invoice totals provided by NEF. This is appropriate for this program design.

8.4.7 Teacher Online Survey

The Evaluators were provided a list of participating teachers by NEF via PNM's Collaboration portal. This survey was conducted in July 2014, and thus only comprised the spring participants from the larger school districts in PNM's service territory. The timing of completion of distribution for the Fall cohort did not allow for the Evaluators to administer a web survey.

The tracking provided for the spring distribution listed 121 teachers. Only 20% of participating teachers had a phone number listed. However, all but one teacher had an email address available. Based on this, the Evaluators opted for an online survey, so as to maximize the reach of the survey in the pool of participant teachers.

The distribution of teachers by school district is summarized in Figure 8-2.

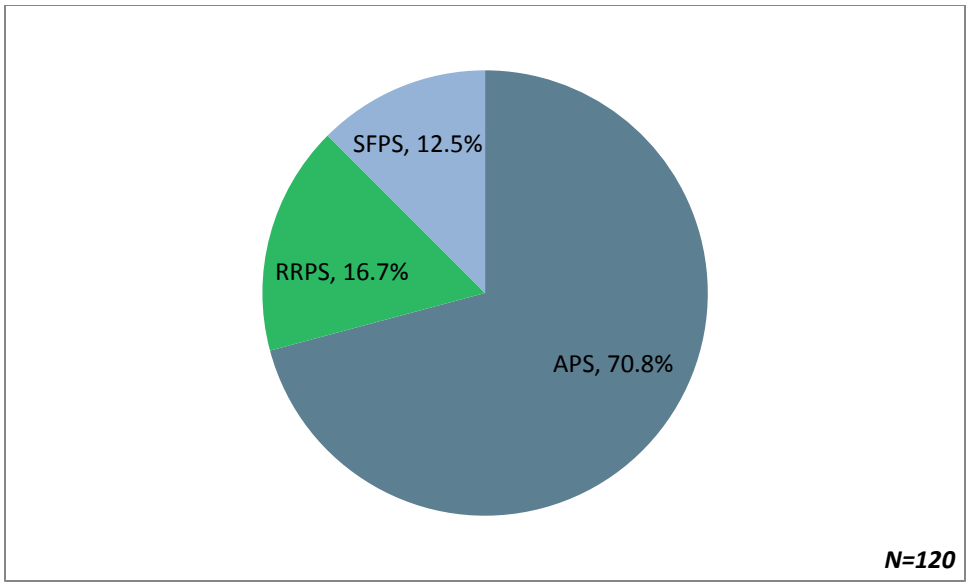

Figure 8-2 Distribution of Participation by School District – Spring Wave

Due to the small number of participating teachers, the survey was sent to a census. The survey was programmed in SurveyGizmo, and distributed to listed teachers over a three week period. In this, teachers were sent an initial outreach email and two reminder emails, in addition to a thank you email after completing the survey.

Thirty-three teachers completed surveys. These surveys were checked for data validity. One completion was removed from the analysis as the respondent answered "Don't Know" to a significant portion of the questions and scored all rating questions at 8 out of 10, leading the Evaluators to conclude that this respondent did not provide reliable answers. A second respondent was removed as they were a school principal and did not deliver the material to students. 31 surveys were used in the analysis. The sample comprised of 29 APS teachers and two SFPS teachers. No RRPS teachers responded to the survey.

8.4.7.1 Participation Summary

The 31 teachers that participated in the survey delivered the program to an average of 24.4 students. Teachers are given some degree of flexibility in how much time is spent on the educational module, as NEF staff does not want the program to overly interfere with core educational activities. Figure 8-3 summarizes the time spent administering the educational module by surveyed teachers.

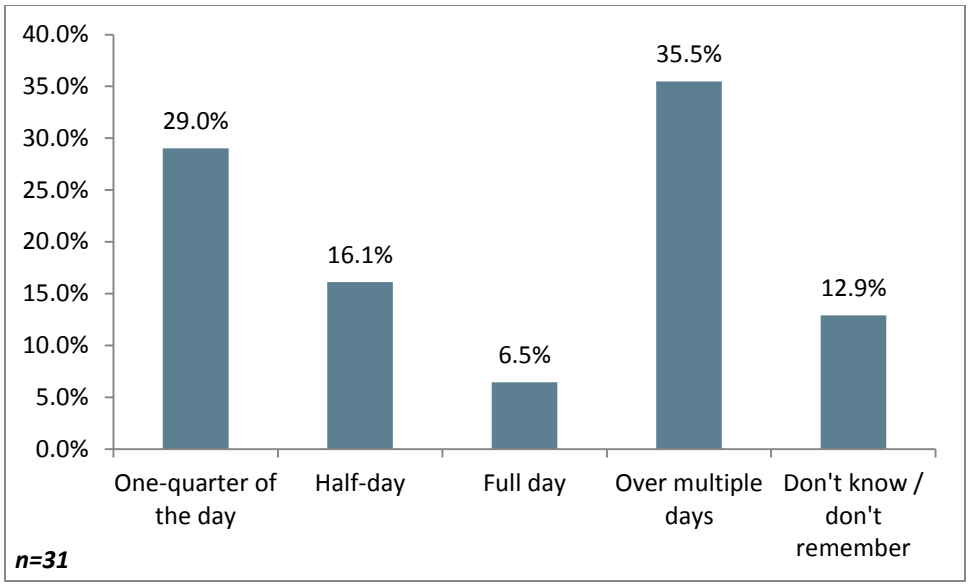

Figure 8-3 Time Spent on NEF Educational Material

Thirty-five percent of participating teachers indicated spending a half-day or less in teaching the program material. When asked to identify whether they would like to have had more time to spend on the program, 35.7% of teachers that spent a half-day or less indicated that they would like to spend more time, compared to 35.5% overall. Further, the class size of teachers that spent a half-day or less delivering the program was 24.4, aligning with the program population.

8.4.7.2 Teacher Feedback on Program Materials

Forty-eight percent of surveyed teachers were able to recall having reviewed the calculation workbook with their students. Teachers were asked to indicate whether they agreed that the program was “a useful learning tool” and “easy for students to use”. Their responses are summarized in Figure 8-4 and Figure 8-5.

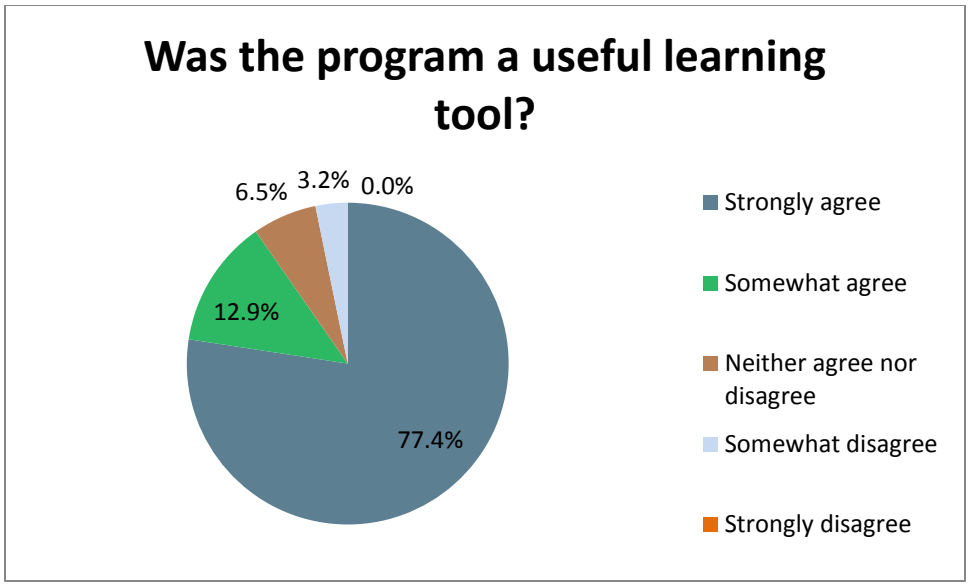

Figure 8-4 Teacher Assessment of Program Usefulness

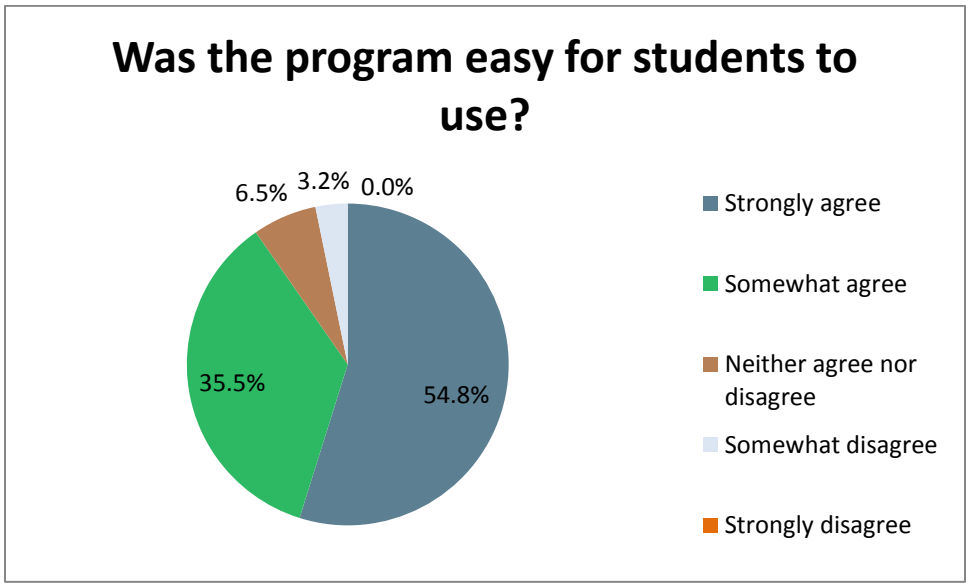

Figure 8-5 Teacher Assessment of Ease of Use

Participant teacher response was exceedingly positive regarding the usefulness of the program a learning tool. Response to the ease of use was lower, though still positive.

Following this, teachers were asked to rate the difficulty of the program materials on a scale of 1-10, with "1" meaning "Too Difficult", "10" meaning "Too Easy", and "5" meaning "Just Right". Table 8-3 summarizes teacher responses to the difficulty rating questions. Scores are presented as mean score, percent scored seven or higher, and percent scored three or lower.

Table 8-3 Teacher Assessment of Kit Difficulty

Factor	Mean Score	% 7 or higher	% 4-6	% 3 or lower
Program Content	5.68	22.6%	74.2%	3.2%
Reading Level	5.52	19.4%	74.2%	6.4%
Workbook Calculations	5.15	18.5%	70.4%	11.1%
Optional Classroom Activities	5.48	17.3%	79.3%	3.4%
Overall program	5.52	12.9%	87.1%	0%

Most teachers found the kit to be at or near "just right" (scored 4-6 out of 10). For those that deviated from this range, responses tended indicate that various aspects of the material were "too easy".

Respondents were then asked to rate various aspects of the program with respect to various statements. Respondents were asked to rate statements on a scale of 1-10, with "1" meaning "strongly disagree", "5" meaning "neither agree nor disagree", and "10" meaning "strongly agree.

Table 8-4 Teacher Assessment of Kit Effectiveness

Factor	Mean Score
The kit was a useful learning tool	8.55
The materials engaged students in learning	8.45
Program materials invite students to engage in analytical thinking	8.32
Program materials invite students to engage in synthesizing ideas	8.13

One respondent indicated low scoring in this component of the survey. Their subsequent explanation was as follows:

"The program presented to my students was a PowerPoint, it was not very engaging. Students were mostly engaged because they were receiving the kits. Having taken part in this program, I would take time to incorporate/expand the ideas therein to make a more broad unit in the future, were I to participate again."

Finally, 51.6% of teachers indicated that they "strongly agree" that their "students were motivated to be more energy/water conscious after the program". Twenty-nine percent "somewhat agree" with this statement.

8.4.7.3 Alignment with State and Federal Educational Standards

Prior to initiating the program, NEF introduced their materials to the New Mexico Department of Education in order to ensure that program materials aligned with New Mexico academic standards. It was confirmed that the materials did align with 5th grade academic standards, allowing NEF to go forward with the material largely as-written.

Teachers were asked to assess the extent to which they found the materials aligned with standards on a scale of 1-10, with "1" meaning "strongly disagree" and "10" meaning "strongly agree" on statements pertaining to alignment with academic standards. Their answers are presented in Table 8-5.

Table 8-5 Teacher Assessment of Alignment with Academic Standards

Factor	Mean Score	7 or higher	4-6	3 or lower
I think the Think! Energy PNM Home Works program is fully aligned with the standards.	7.52	71.0%	29.0%	0%
Program materials provide sufficient opportunity for an assessment of student learning with respect to the correlated math and science standards.	7.30	64.5%	32.3%	3.2%

Further, NEF provides teachers with a webpage[8] where they are shown the areas in which the *Think! Energy Kits* contribute to New Mexico and Federal educational standards. This is shown directly under the option to sign up for the program, and provides a PDF (New Mexico standards) and a MS Excel spreadsheet (federal standards) for teachers to review.

8.4.7.4 Student Motivations and Outcomes

Teachers indicated that the primary motivator among students for engaging with the material was environmental concern. Eighty-four percent of respondents indicated environmental concerns as a primary motivator among their students.

NEF administers surveys used to measure student knowledge pertaining to the concepts covered in the Student Education Kit. The teachers administer these surveys to students during class time. Seventy-one percent of surveyed teachers indicated that they felt the program survey "facilitated accurate assessment of the students' progress". Further, teachers were asked to assess the extent to which they felt the pre and post surveys were good assessments of student knowledge. Their responses are summarized in Figure 8-6.

[8] http://thinkenergy.org/programs/take-action/pnm/

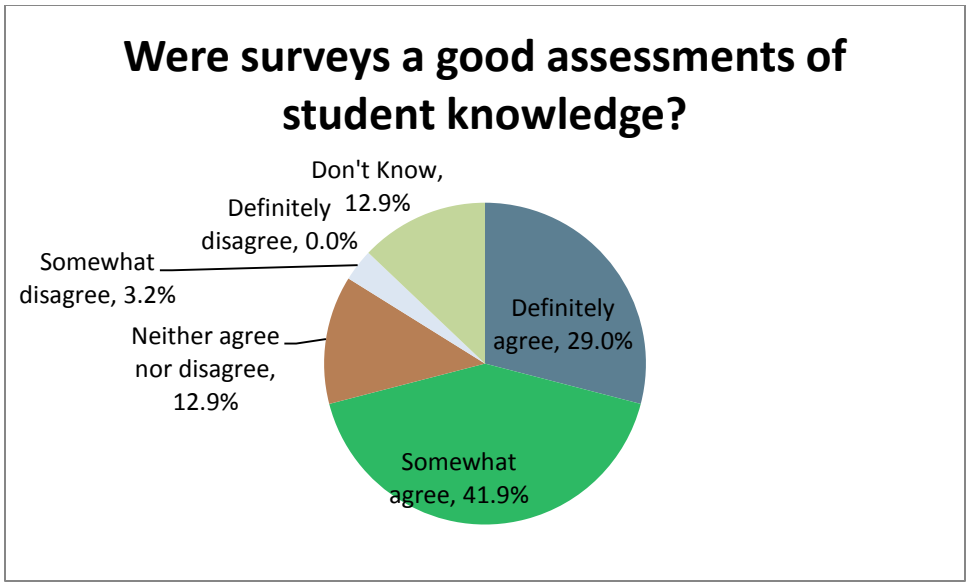

Figure 8-6 Teacher Assessment of Program Surveys

The Evaluators asked teachers to rate the extent to which they agreed with statements about the effect of the *Think! Energy* on their students. Figure 8-7 summarizes responses on a 1-10 scale, with each percent indicating the percent of teachers that provided answers greater than 7 out of 10 when assessing the extent to which they agree with each statement.

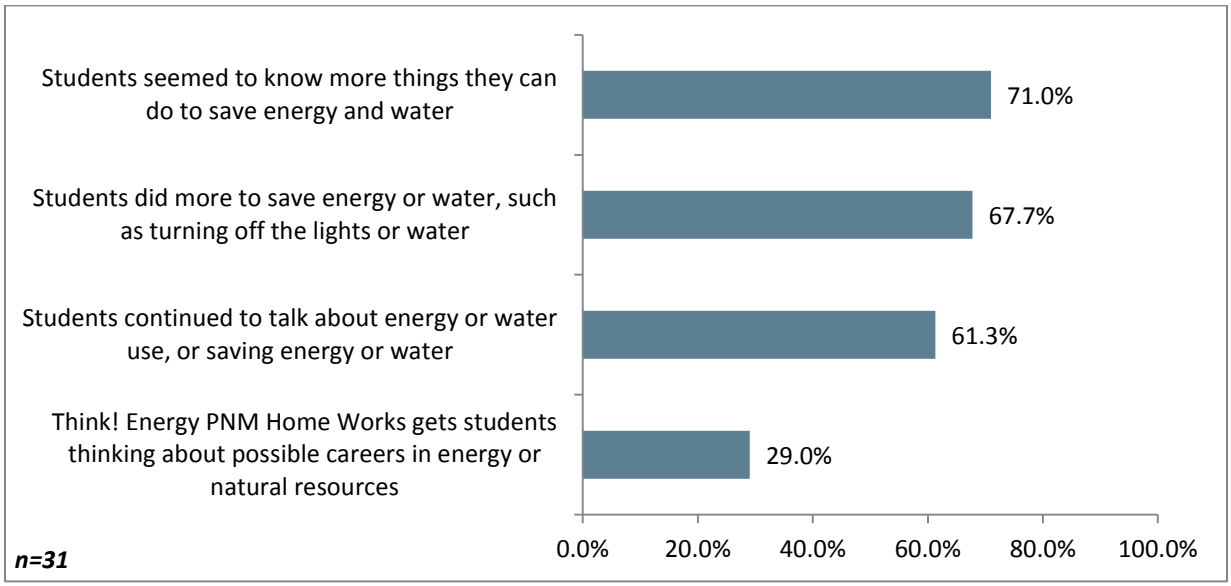

Figure 8-7 Student Behavior after Course Completion

8.4.7.5 Program Timing

Teachers were asked to indicate whether the timing of the program corresponded with the time of year that they would have taught other similarly applicable concepts. Forty-

eight percent of teachers stated that spring program run did correspond with their academic plan. Thirty-two percent stated that it did not, and nineteen percent indicated that they "don't know". Respondents that stated that the materials did not arrive at a convenient time were asked to clarify when they would like to receive it. Fifty percent of those that stated that the program was not timed properly with their academic calendar indicated that they would have preferred to participate in Fall. Twenty percent stated that they would rather participate earlier in Spring. Thirty percent of teachers that stated the timing did not align with their academic calendar specifically indicated that they would prefer their participation be timed to align with when they receive their district's Physical Science Kit. It was the view of these teachers that the kit materials would correspond well with the required Physical Science kit and that this could reinforce the lessons from the Student Efficiency Kits.

8.4.7.6 Further Program Feedback

Seventy-one percent of surveyed teachers indicated that they intend to participate in the program again, while 25.8% stated that they "don't know" if they will participate again. One respondent indicated that they will not participate again. This respondent was asked to explain why they will not be participating again, and responded that in the 2014-2015 school year they will be teaching 4th grade; this respondent otherwise had positive feedback about their program experience.

Teachers were asked to identify any other areas in which they felt the program could be improved. Examples included:

"Tech interactive. Maybe a link on the PNM page that students could access. Teacher could use this as center activity."

"The workbook being entirely in Spanish for my Spanish speaking families. It was a wonderful program including resources that the school and teacher cannot provide on our own. Thank you!"

"Slower paced presentation. More time for student responses."

The teachers had very positive comments about the program, in general:

"Wow, amazing contents! Kids very excited to bring them home. Liked that the whole family was involved, and how math was integrated into the activities."

"Fifth grade students are at a perfect age for this program. They are motivated to do the right thing for the environment."

8.4.8 Measure Use & Retention

Students were asked to fill out a take-home survey detailing what they had installed and providing information on their water heating fuel type. The program was administered in two waves:

- Wave 1: Spring 2014
- Wave 2: Fall 2014

8.4.8.1 CFLs

There were four 13W CFL light bulbs included in every Student Efficiency Kit. Respondents were asked to identify how many of the CFLs they had installed. The installation rate was found to be:

- Wave 1: 65.0% (2.60 CFLs per kit)
- Wave 2: 72.4% (2.90 CFLs per kit)

8.4.8.2 Kitchen Aerator

Question 8 in the student survey asks:

Q.8: Did you install the kitchen aerator from your kit?

The installation rates for each wave were as follows:

- Wave 1: 46.8%
- Wave 2: 53.7%

8.4.8.3 Bathroom Aerator

Question 13 in the student survey asks:

Q.13: Did you install the bathroom aerator from your kit?

The installation rates for each wave were as follows:

- Wave 1: 43.92%
- Wave 2: 50.96%

8.4.8.4 Low Flow Shower Head

The Wave 1 survey did not collect accurate data pertaining to the showerhead installation rate. This is due to the options included in the survey question:

Q.15: What is the flow rate of your new high-efficiency shower head?

0-0.5 GPM

0.6-1.0 GPM

1.1-1.5 GPM

Did not test

Did not install

When examining the data, 58.7% of respondents indicated that they "did not test" the showerhead, whereas 18.7% stated that they "did not install' the showerhead. The Evaluators hypothesized that the "did not test" cohort included both households that installed the showerhead but failed to measure flow-rate, and households that did not install the showerhead. If the "did not test" cohort is assumed to have all installed their showerheads, the Wave 1 showerhead ISR is 81.3%. If they are assumed to not have installed their showerhead, the Wave 1 showerhead ISR is 22.6%. Neither of these values is likely, as in all prior evaluation of school kit programs in New Mexico (implemented by SPS and EPE), showerhead ISRs have varied between 40%-60%. On this basis, the Evaluators concluded that the "did not test" cohort includes a mixture of both those that installed the showerhead but did not test it and those that did not install their showerhead at all. NEF corrected this question in time for the Wave 2 delivery, by changing it to:

Q15a: Did you install the high-efficiency shower head from the kit?

Q15b: What is the flow rate of your new high-efficiency shower head?

Q15a provides the ISR for the Wave 2 delivery.

To account for the unreliable showerhead ISR data in Wave 1, the Evaluators compared the bathroom aerator ISRs for Wave 1 and Wave 2, and used this in scaling the showerhead ISR for Wave 2. The Wave 1 showerhead ISR was calculated as:

$$Wave1\ SH\ ISR = Wave2\ SH\ ISR \times \frac{Wave1\ BA\ ISR}{Wave2\ BA\ ISR}$$

Where

Wave1 SH ISR = Wave 1 showerhead in-service rate;

Wave2 SH ISR = Wave 2 showerhead in-service rate;

Wave1 BA ISR = Wave 1 bathroom aerator in-service rate; and

Wave2 BA ISR = Wave 2 bathroom aerator in-service rate.

This modification was predicated on the following assumptions:

1) **Rural vs. urban distribution.** Wave 1 was focused on the major urban centers in PNM's service territory (Albuquerque, Rio Rancho, and Santa Fe). Wave 2 was administered in PNM's more rural service areas (including Alamogordo, Silver City, Deming, Las Vegas, and Clayton).

2) **Differences in water quality.** The geographic difference in Wave 1 vs. Wave 2 distribution affects ISR insomuch as certain areas of New Mexico have water supplies with a higher mineral content and alkalinity. These conditions make the use of low flow devices more problematic due to mineral buildup and thus result in lower ISR.
3) **Differences in demographics.** The demographics of Wave 1 and Wave 2 differ significantly in terms of English fluency, income level, and political views. These are other factors which may contribute to varying ISRs.
4) **Bathroom aerators are the most comparable device to showerheads in the kit.** In providing lower flow rates to the bathroom, the "spread" between Wave 1 and Wave 2 bathroom aerator installation could serve as a reasonable proxy for the analogous spread between showerhead installation rates.

In the student surveys, the Wave 2 showerhead ISR was found to be 52.1%. Based on the bathroom aerator ISRs shown in Section 8.4.8.3, the Wave 1 showerhead ISR was calculated as:

$$Wave1\ SH\ ISR = 52.14\% \times \frac{43.92\%}{50.96\%} = 44.94\%$$

8.4.9 Summary of Mid-Year Program Changes

NEF made minor modifications to the program following the completion of Wave 1 kit delivery. In discussions with NEF and PNM staff, the Evaluators found that:

- **More program materials were be made available in Spanish.** NEF indicated that they developed Spanish-language translations for their student survey as well as for take-home materials to be used by students and their parents. In Wave 1, the worksheet students bring to their parents was available in Spanish but the Student Guide was not. It was seen as a high priority to develop these materials in time for Wave 2, as this wave included PNM's southern New Mexico cities which have higher rates of Spanish-speaking at home.
- **The student survey was modified to more accurately capture showerhead ISRs.** As mentioned prior, this involved dividing Question 15 into A and B parts, first asking students to indicate whether they installed the showerhead before asking for the post-retrofit flow rate.

8.5 Impact Findings

A total of 3,578 kits were distributed in 2014. Kit distribution included:

- 2,755 kits in Spring 2014; and
- 1,750 kits in Fall 2014.

This provides for total distribution of:

- 18,020 13W CFLs; and
- 4,505 each of LED nightlights, showerheads, kitchen aerators, and bathroom aerators.

The Evaluator applied existing deemed savings for the kit measures, scaled to the impact parameters from the participant survey. Impact parameters are summarized in Table 8-6. Unit Energy Savings (UES) reflects the saving savings that a measure provides when:

- Installed (all measures);
- Installed and verified as replacing an existing light (LED nightlight); and
- Installed and verified in the matching fuel type (low flow devices).

For example, the actual kWh savings from kitchen aerators in Fall distribution is:

236 kWh/unit * 53.7% ISR * 26.5% electric water heating = 33.58 kWh per kit; and

10.5 Therms/unit * 53.7% ISR * 52.3% gas water heating = 2.95 Therms per kit.

As a result, each distributed kit in the Fall wave is expected to provide 33.58 kWh and 2.95 Therms when averaged to the population of that distribution wave.

Table 8-6 Summary of Student Efficiency Kits Impact Parameters

Measure	Parameter	Spring	Fall	UES – kWh	UES – kW	UES - Therms
CFLs	In-service-rate	65.0%	72.4%	26.4	.0031	0
LED Nightlight	In-service-rate	79.9%	88.7%	26.6	0	0
	% Replacing existing unit	49.2%	56.7%			
Showerhead	In-service-rate	44.9%	52.1%	491	0	21.9
Kitchen Aerator		46.8%	53.7%	236	0	10.5
Bathroom Aerator		43.9%	51.0%	180	0	8.0
% Electric water heating		19.4%	26.5%			
% Gas water heating		68.8%	52.3%			
% Propane/other water heating		11.8%	21.2%			

Table 8-7 and Table 8-8 summarize the savings from the Spring and Fall distribution rounds, respectively.

Table 8-7 Summary of Spring Distribution Savings

Measure	kWh	kW	Therms
CFLs	189,748	22.21	0
LED Nightlight	28,787	0	0
Showerhead	117,934	0	18,641
Kitchen Aerator	59,031	0	9,307
Bathroom Aerator	42,253	0	6,655
Total	437,753	22.21	34,603

Table 8-8 Summary of Fall Distribution Savings

Measure	kWh	kW	Therms
CFLs	134,251	15.71	0
LED Nightlight	23,410	0	0
Showerhead	118,723	0	10,453
Kitchen Aerator	58,772	0	5,162
Bathroom Aerator	42,539	0	3,732
Total	377,695	15.71	19,347

8.5.1 Overall Net Savings Summary

Table 8-9 summarizes the net savings estimates for the 2014 Student Efficiency Kits Program. This program has a stipulated 100% NTGR and as a result gross savings equal net savings.

Table 8-9 2014 Student Efficiency Kits Savings Summary

Measure	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		EUL Years	Lifetime Energy Savings (kWh)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post	
Total	51.36	37.92	727,558	815,448	9.22	4,074,322	7,516,068	112.1%

In addition, the program had gas savings of:

- 53,950 Therms annually; and
- 539,901 lifetime Therms.

8.5.1.1 Causes of Increased Realization

Realization for the Student Efficiency Kits Program was 112.1%. The Evaluators concluded that this was due to a higher-than-expected rate of electric water heating. Wave 2 comprised PNM's rural school districts, and in 2014 accounted for 38% of program participation. Rural regions of PNM's service territory have higher rates of electric water heating. The rate of electric water heating seen among program participants is likely to decline in subsequent program years as most of the remaining areas for program expansion are within the Albuquerque metropolitan area.

8.5.1.2 Causes of Shortfalls vs. Program Goals

The filed program had a goal of 1,997,982 kWh. Savings fell short of the filed goal for multiple reasons:

1) The initial program plan called for 6,000 participants. The program only reached 59.5% of the participant goal.
2) PNM has a lower rate of electric water heating than other utilities in New Mexico. In 2014, 22.8% of program participants had electric water heating. This should

be considered a maximum value for this parameter, as in 2014 participation was evenly split between the main population centers (Albuquerque and Santa Fe) versus outlying areas (Las Vegas, Clayton, Alamogordo, Silver City, Deming, Lordsburg). Future program expansions will likely take place in Albuquerque and Santa Fe, and the wave that included these regions had an electric water heating rate of 19.4%.

8.6 Conclusions & Recommendations

Based on the EM&V of the 2014 Student Efficiency Kits Program, the Evaluator has found the following conclusions & recommendations.

8.6.1 Conclusions

1. **Teachers' responses to the program were very positive.** Ninety percent of surveyed teachers "strongly agree" that the program was a useful learning tool. Seventy-one percent indicated that they "definitely" will participate in the program again. Twenty-six percent "don't know" if they will participate again, but many of these respondents stated that this was for reasons largely out of their control (such as not knowing if they are teaching 5th grade going forward).
2. **Per-kit savings are higher in rural school districts.** Wave 1 had savings of 152.42 kWh per kit. Wave 2 had savings of 208.61 kWh per kit. The areas served by Wave 2 have more instances of electric and propane water heating rather than natural gas water heating.
3. **Savings may be higher for some measures than assumed in the TRM.** Low flow devices have savings parameters set for average households. Households participating in the Student Efficiency Kit Program would overall be above-average in size, as all households have at least one school-age child. As a result, TRM values can be considered a conservative estimate for this program.
4. **Some questions pertaining to in-service rates are problematic.** NEF added a question in the Fall wave pertaining to whether the student installed the showerhead. However, this question was placed at the end of the survey instead of aligned with the other survey questions. It is the Evaluators position that this could cause inconsistency in survey data collected for this key parameter. Further, it is never directly asked how many CFLs the students installed; this is ascertained through four questions pertaining to the wattage of the replaced incandescent light bulb for each of the four CFLs, with an option of "did not install" for each of the four questions.
5. **Kit effective useful lives were shorter than indicated in the TRM for each measure.** The Evaluators found an overall EUL of 9.22 years. Ex ante

estimates from PNM and NEF used an EUL of 7.0 years, understating lifetime savings from the program.

8.6.2 Recommendations

1. **Align the timing of kit delivery with physical science units.** Multiple teachers indicated that their curriculum includes a physical science kit each year. They stated that they would prefer if they could participate in the Student Efficiency Kit program at a time that coincides with the physical science kit, as the lessons would be mutually reinforcing.
2. **Consider collecting data pertaining to household size and number of showers in the home.** If the data on household size and number of showers in the home is available, savings could potentially be scaled to accommodate the large household size associated with this program. However, the merits of this recommendation would need to be weighed against possible perceived invasiveness of the questions and cost of data acquisition.
3. **Revise question order for low flow showerheads.** The question of "Did you install the low flow showerhead" should be placed immediately before "what was the flow rate of your new showerhead", instead of at the end of the survey (where it is currently located). This would help ensure consistency in data collection pertaining to in-service rates, as answers in response to the measured flow rate question differ from the direct question in whether the student's family installed the showerhead.
4. **Add the following question: "How many of the four CFLs did your family install?"** Presently, the CFL ISR is collected through a series of four questions of the wattage of the replaced bulb, with a "did not install" option for each of the four questions.
5. **Consider removing questions pertaining to the wattage of the replaced light bulb.** The CFL savings are deemed as per EISA guidelines, and as a result a pre-existing incandescent bulb that is less efficient than EISA is not used in energy savings calculations. A baseline of 43W can be assumed for this purpose, and the questionnaire can be shortened. However, NEF and PNM could elect to keep these questions if they consider them to be an important contributor to the educational value of the kit.
6. **Establish deemed kit values for periods in between evaluation years.** This program is to be evaluated once every three years. As such, PNM may want to consider establishing a deemed kit savings value for years in between evaluations. If PNM chooses to do so, deemed savings should correspond with evaluated savings from each of the two distribution waves to their population centers as follows:

a. Wave 1: 152.42 kWh/kit: Albuquerque, Rio Rancho, Los Lunas, Santa Fe.

b. Wave 2: 208.61 kWh/kit: Deming, Las Vegas, Clayton, Silver City, Lordsburg, Alamogordo, Belen, Bernalillo.

Alternatively, PNM may opt for a survey summary from NEF with each wave and conduct the appropriate analysis using ISR, electric water heating rate, and rate of replacement of an existing fixture (nightlights only). If PNM opts for this route, savings should be calculated for each wave of distribution (Spring vs. Fall), to ensure that survey results are only extrapolated to kits within the same distribution wave.

7. **Update the kit effective useful life to reflect measure lives from the New Mexico TRM.** This would ensure consistency with other programs and utilities' offerings, and improve cost-effectiveness as the program understated lifetime savings. The appropriate EULs are:

    a. CFLs: 6.4 years;

    b. Low flow showerheads: 10 years;

    c. Faucet aerators: 10 years; and

    d. LED nightlights: 16 years[9]

    Alternatively, PNM and NEF could opt for a conservative fixed kit EUL of 8 years.

[9] This measure is not included in the NM TRM. EUL is derived from CA DEER 2011, which is the same cited source used for the other measure EULs.

9. Home Energy Reports

The Home Energy Reports (HER) Program is an educational program run by Opower, a third party implementer for PNM. The program provides educational materials to a sample of PNM 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 HER Program provides feedback to residential participants that will help them change energy use habits to save energy. The program achieves this through the use of a personalized report delivered to participating households. The information included in the report shows the energy use pattern of the household compared against that of their peers and neighbors and recommends particular actions a participant can take to reduce their household's electricity usage.

The HER Program provides recipients with the following items:

- A comparison of last month's electricity costs for the recipient and for two groups of "similar homes" ("all similar homes" and "efficient similar homes")
- A graph that compares monthly electric use for each of the previous 12 months for the recipient vs. two groups of about similar homes

A list of simple actions the household could take to reduce electricity usage.

9.1 Control Group Validity Testing

Opower developed a sample for their recipient and control group to be utilized in the 2014 HER Program. The control group is intended to provide a baseline for comparison for the recipient group, allowing for quantification of net kWh and kW impacts of the program. The sample drawn by Opower for the 2014 HER Program comprised of:

- 56,171 recipients; and
- 10,499 non-recipients.

As a first step in verifying energy savings from the HER Program, the Evaluators analyzed the sample design developed by Opower to ensure:

1) That the control group is representative of the recipient group in terms of billed kWh usage; and
2) That the control group is geographically representative of the recipient group.

9.1.1 Comparison of Usage

Billing data from the recipient and control groups were tested for statistically significant differences. These differences were tested for statistical significance by assessing the

P score on the standard T distribution. The table below summarizes average daily consumption in each of the baseline period months. Average daily consumption (kWh/day), the standard error[10], the magnitude of difference, and the probability score associated with that difference value on the T distribution.

Table 9-1 Baseline Period Comparison of Daily kWh Usage

Observation	Recipient Group Consumption		Control Group Consumption		Difference	PR > T
	Mean	SE	Mean	SE		
December 2012	45.33	0.093	45.46	0.24	0.125	0.6215
January 2013	41.33	0.081	41.39	0.23	0.061	0.7984
February 2013	36.46	0.065	36.65	0.20	0.185	0.3746
March 2013	31.18	0.060	31.08	0.15	-0.101	0.5231
April 2013	30.90	0.083	30.83	0.14	-0.070	0.6641
May 2013	40.79	0.100	40.74	0.19	-0.051	0.8136
June 2013	49.43	0.091	49.56	0.23	0.125	0.6206
July 2013	46.89	0.083	46.94	0.21	0.042	0.8527
August 2013	44.16	0.064	44.16	0.19	0.000	0.9993
September 2013	32.72	0.061	32.90	0.19	0.182	0.3618
October 2013	32.13	0.085	32.14	0.14	0.011	0.9482
November 2013	40.60	0.092	40.60	0.20	0.002	0.9924
December 2013	43.26	0.086	43.43	0.22	0.167	0.4796

Each month is shown to have high P scores; this is interpreted as there being a low probability of the two values being statistically different. On this basis, the Evaluators concluded that the recipient and control group are matched in terms of daily usage in each of the baseline period months.

This is seen further in the figure below, which summarizes monthly use of the two groups.

[10] Defined as standard deviation divided by the square root of the observation count.

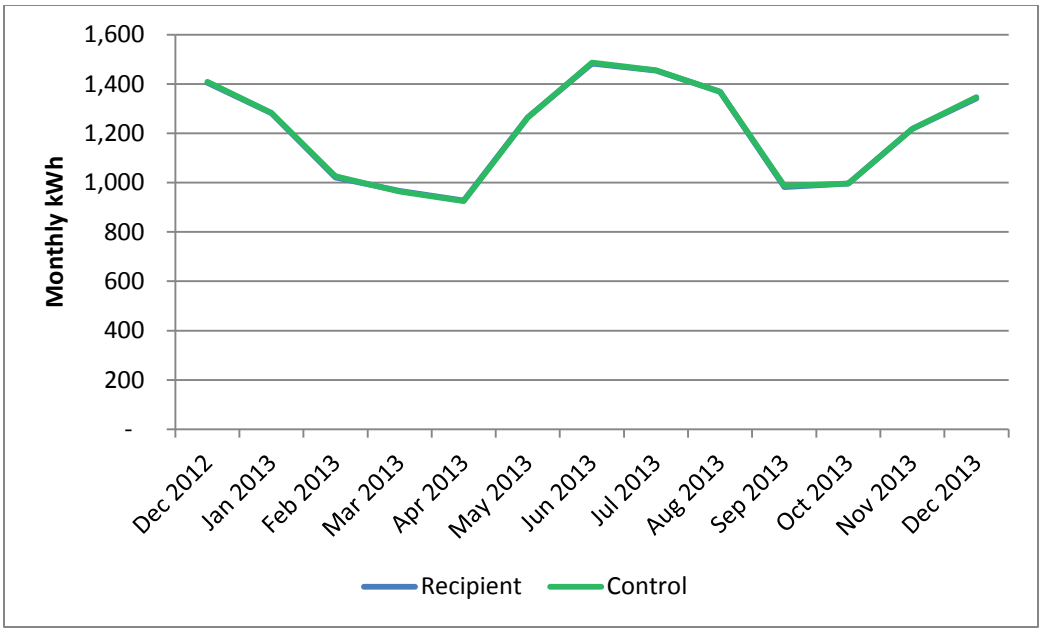

Figure 9-1 Monthly Consumption of Recipient & Control Groups

Based on the usage profile shown above, ADM concludes that this first wave of the program was targeted at homes with refrigerated air cooling and electric heating (though we cannot discern what is the mix of electric radiant versus heat pump space heating). This does not affect the validity of the comparison, however, in that the usage data reflects that the space heating equipment configuration of the two groups must be similar.

9.1.2 Comparison of Geography

The Evaluators opted to review the two populations on the basis of geography in addition to consumption. This will serve as a reasonable proxy for demographic differences which may not be captured in baseline usage, but may impact responsiveness to the Home Energy Report.

The recipient and control groups are of unequal size (with the recipient group being roughly five times the size of the control group). As such, the geographic distribution was assessed on the basis of percent of the overall population rather than absolute numbers. All Opower customer identification numbers were grouped according to the county of their address.

Table 9-2 Geographic Distribution of Recipient & Control Groups

County	Recipient Group	Control Group	Difference
Bernalillo	58.04%	58.44%	0.41%
Sandoval	14.61%	14.52%	-0.09%
Santa Fe	9.36%	9.30%	-0.06%
Valencia	7.67%	7.41%	-0.26%
Otero	4.67%	4.76%	0.09%
Grant	1.90%	1.85%	-0.05%
Lincoln	1.38%	1.22%	-0.16%
Luna	1.11%	1.25%	0.14%
San Miguel	0.85%	0.90%	0.05%
Hidalgo	0.22%	0.16%	-0.06%
Union	0.20%	0.19%	-0.01%

Two counties show differences that could be considered significant. Bernalillo and Valencia County each show differences that would test positive for statistical significance. However, the population of Valencia County is largely comprised within the Albuquerque metropolitan area. When combined, the aggregate difference between the recipient and control group for these two counties is .15% and not statistically significant.

9.2 Regression Model Specification and 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:

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

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 are listed in Table 9-3.

Table 9-3 Regression Coefficients & Model Details

Variable Description	*Regression Coefficient*	*Standard Error*	*T-Stat*	*PR > |T|*
INTERCEPT	3.39063	0.18822	18.01	<.0001
TREATMENT	-0.30541	0.03782	-8.08	<.0001
AVG_PREUSAGE	-0.24021	0.03023	-7.95	<.0001
AVG_PREUSAGE_SUMMER	0.0976	0.01359	7.18	<.0001
AVG_PREUSAGE_WINTER	1.12378	0.01511	74.36	<.0001
APR2014	-2.83847	0.23303	-12.18	<.0001
MAY2014	-3.09361	0.23344	-13.25	<.0001
JUN2014	-2.0509	0.23388	-8.77	<.0001
JUL2014	-0.56031	0.23455	-2.39	0.0169

Variable Description	*Regression Coefficient*	*Standard Error*	*T-Stat*	*PR > |T|*
AUG2014	-0.44323	0.235	-1.89	0.0593
SEP2014	-1.19017	0.23546	-5.05	<.0001
OCT2014	-1.2125	0.23584	-5.14	<.0001
NOV2014	-0.85068	0.23639	-3.6	0.0003
DEC2014	-0.38027	0.24025	-1.58	0.1135
AVG_PREUSAGE_APR2014	1.54725	0.03771	41.03	<.0001
AVG_PREUSAGE_MAY2014	1.32359	0.03783	34.99	<.0001
AVG_PREUSAGE_JUN2014	0.11258	0.03798	2.96	0.003
AVG_PREUSAGE_JUL2014	-0.39629	0.03811	-10.4	<.0001
AVG_PREUSAGE_AUG2014	0.13256	0.03824	3.47	0.0005
AVG_PREUSAGE_SEP2014	0.75025	0.03839	19.55	<.0001
AVG_PREUSAGE_OCT2014	1.61607	0.03848	42	<.0001
AVG_PREUSAGE_NOV2014	0.99374	0.03861	25.74	<.0001
AVG_PREUSAGE_DEC2014	0.26222	0.03927	6.68	<.0001
AVG_PREUSAGE_SUMMER_APR2014	-0.43896	0.01694	-25.91	<.0001
AVG_PREUSAGE_SUMMER_MAY2014	-0.06142	0.01699	-3.61	0.0003
AVG_PREUSAGE_SUMMER_JUN2014	0.85987	0.01706	50.4	<.0001
AVG_PREUSAGE_SUMMER_JUL2014	1.19513	0.01712	69.82	<.0001
AVG_PREUSAGE_SUMMER_AUG2014	0.83817	0.01718	48.79	<.0001
AVG_PREUSAGE_SUMMER_SEP2014	0.37325	0.01725	21.64	<.0001
AVG_PREUSAGE_SUMMER_OCT2014	-0.34071	0.01729	-19.71	<.0001
AVG_PREUSAGE_SUMMER_NOV2014	-0.30994	0.01735	-17.87	<.0001
AVG_PREUSAGE_SUMMER_DEC2014	-0.07806	0.01764	-4.42	<.0001
AVG_PREUSAGE_WINTER_APR2014	-1.29864	0.01887	-68.83	<.0001
AVG_PREUSAGE_WINTER_MAY2014	-1.40991	0.01893	-74.5	<.0001
AVG_PREUSAGE_WINTER_JUN2014	-1.03445	0.019	-54.44	<.0001
AVG_PREUSAGE_WINTER_JUL2014	-0.84428	0.01906	-44.28	<.0001
AVG_PREUSAGE_WINTER_AUG2014	-1.06487	0.01913	-55.66	<.0001
AVG_PREUSAGE_WINTER_SEP2014	-1.28271	0.0192	-66.81	<.0001
AVG_PREUSAGE_WINTER_OCT2014	-1.50238	0.01924	-78.07	<.0001
AVG_PREUSAGE_WINTER_NOV2014	-0.83618	0.0193	-43.31	<.0001
AVG_PREUSAGE_WINTER_DEC2014	-0.23353	0.01964	-11.89	<.0001

9.3 kWh Savings Results

The regression results from Table 9-3 were converted to kWh savings on a monthly basis using the mean HDD and CDD for each month in 2013. The resulting monthly savings are summarized in Table 9-4.

Table 9-4 Home Energy Reports Monthly Savings

Month	*kWh Savings*
April 2014	137,242
May 2014	143,185
June 2014	460,536
July 2014	412,307
August 2014	484,340
September 2014	481,548
October 2014	653,088
November 2014	737,561
December 2014	830,455
Total	4,340,262

That process was conducted for the post months (May – December) and then summed up to reach a total of 77.26 kWh savings per participant. When compared to the average usage of the participant group in 2014 over those months, the percentage savings were determined to be .87%. Using the number of 2014 program participants (56,171), the results were scaled up to equal 4,340,262 kWh in 2014. These numbers are summarized in Table 9-5.

Table 9-5 Home Energy Reports Savings Summary

2014 kWh Savings (Per Participant)	*2014 Participants*	*Percentage Savings*	*2014 Program kWh Savings*	*kW Savings*
77.26	56,171	.87%	4,340,262	789.1

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

9.4 Therms Savings

Data provided by PNM indicated expected natural gas savings of 676,000 Therms associated with the Home Energy Reports Program. Through conversations with PNM, the Evaluators discerned that this was developed as follows:

1) PNM cited the GEP Market Potential Study which indicated that a Home Energy Report would provide 2% natural gas savings.
2) Annual gas consumption for single family households was 688 Therms per year.
3) Items #1 and #2 were scaled up to all recipient households.

Though it is plausible that the activities which cause electric savings from a HERP (such as customers becoming more conscientious of household thermostat settings) would cause natural gas savings, the Evaluators found the numbers provided problematic for the following reasons:

1) In reviewing billing data for the recipient group and discussion with Opower, the Evaluators found that 34.7% of recipients had electric space heating (determined by comparing winter use to shoulder-season use).
2) In a literature review of natural gas home energy report program evaluations, it was found that the typical range of natural gas energy savings was between .8% and 1.0%. This is often lower than electric savings observed in Home Energy Reports due to their being less discretionary gas usage.

On this basis, the Evaluators determined that a conservative estimate of Therms could be applied for purposes of developing TRC estimates. The resulting Therms are:

$$Therms = 56{,}171\ households * 688 \frac{Therms}{household} * 65.3\%\ gas\ heating * .8\%\ reduction$$
$$= 201{,}834\ Therms$$

10. Commercial Comprehensive

10.1 Program Description

The Commercial Comprehensive Program (CCP) is a commercial DSM program that provides rebates for a range of prescriptive and custom measures. The program has three components:

- Retrofit Rebates
- New Construction Rebates
- QuickSaver Direct-Install (run through PNM trade allies)

The program provides prescriptive and custom rebates for measure categories including:

- Lighting;
- HVAC;
- Motors;
- Refrigeration;
- Building Envelope;
- Whole-Building Efficiency

The program is run through a third-party implementer, DNV KEMA.

10.2 M&V Methodology

Evaluation of the Commercial Comprehensive Program (CCP) requires the following:

- Stratified Random Sampling, selecting large saving sites with certainty (as detailed in Section 2.4.2);
- Review of deemed savings parameters for prescriptive projects;
- On-site verification, end-use metering, and DOE-2 simulation in projects where savings are uncertain;
- Interviewing of program participants from each component as well as PNM Trade Allies.

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

Table 10-1 Data Sources for Gross Impact Parameters – Commercial Comprehensive Program

Parameter	***Source***
Project Details	Program Tracking Data
Energy Efficient Equipment Specifications	Manufacturer's Literature
Lighting 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 Albuquerque NM TMY Weather Data
Lighting Peak Coincident Factor	Review of deemed values, assignment of new values based upon facility operating hours should deemed values not provide accurate estimates
Equivalent Full-Load Cooling Hours (EFLH)	PNM Deemed values, reviewed by the Evaluator through simulation of archetypical facilities with Albuquerque or Santa Fe NM TMY Weather Data
Facility Billing Data (For Calibration of Large Cooling Simulation Models)	PNM Profiler Tool

10.2.1 Commercial Comprehensive Program Components

The CCP is divided into four components:

- Retrofit Rebates
- New Construction
- QuickSaver™ Direct Install
- Building Tune-up

The four components have separate samples in order to account for component-specific idiosyncrasies.

10.2.2 Prescriptive vs. Custom Classification

The protocols by which individual projects within the CCP were evaluated varied dependent upon whether the project was classified as prescriptive vs. custom. For projects evaluated with prescriptive protocols, the Evaluator applied deemed values for key parameters, including annual runtime of lighting and equivalent full load hours for cooling. For projects evaluated with a custom protocol, the Evaluator conducted on-site monitoring or simulation as appropriate in estimating savings. In the 2014 evaluation, the Evaluator applied custom protocols to the following projects:

- Those listed as "Custom" by the program implementation staff;
- Prescriptive projects within the "Certainty Stratum"[11]; and
- Projects where it was found that prescriptive protocols were either inappropriately applied or insufficiently certain.

All projects within the certainty stratum were evaluated using custom protocols due to their high contribution to variation. These sites are the higher savers, accounting for 33% of CCP program-level expected gross savings. Additionally, the results of these sites are not extrapolated to other facilities, as all sites within the certainty stratum are case studies, and representative only of themselves.

10.2.3 Commercial Comprehensive Lighting Gross Savings Estimates

The 2014 CCP provided rebates for lighting retrofits, delamping, occupancy sensors, 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.

10.2.3.1 Gross Savings Methodology for High Efficiency Lighting Retrofits

To calculate annual savings from lighting retrofits, the Evaluator applies the following equation:

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

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

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

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

Following this, the Evaluator calculated peak kW savings. This is based upon a PNM-defined peak of 3:00 – 6:00 PM during the hottest summer weekdays. To provide the

[11] "Certainty Stratum" is the stratum of sites with highest savings, for which the M&V results are not extrapolated to other (non-sampled) projects. This term is discussed in greater detail in Section 2.4.

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 10-3 below.

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

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

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

The 2014 CCP provided rebates to facilities that installed lighting and lighting controls as part of new construction projects. Calculations of savings for lighting in new construction applications differs from retrofits in that the baseline is denominated in W/ft^2 for the space type. This is to capture the reduction in Lighting Power Density (LPD) generated by the project. Annual savings from an LPD reduction are calculated as:

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

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

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

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

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

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

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

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

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

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

The methodology to be detailed encompasses the Evaluator's 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:

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

This captures savings attributable to a reduction in operating hours as a result of the lighting controls. In instances where controls are installed alongside a lighting retrofit, savings from occupancy sensors are calculated using the installed kW of the energy efficient lighting, in order to account for dissynergies (i.e., a simultaneous lighting retrofit

and lighting control installation saves less than each of the two measures would have individually). The Evaluator then calculated peak savings for lighting controls as:

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

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

10.2.4 Commercial Comprehensive Cooling Gross Savings Estimates

Gross savings estimates for facilities participating in the 2014 CCP are evaluated by one of two methodologies:

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

10.2.4.1 DOE-2 Simulation Modeling

In evaluating the 2014 CCP, 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.

10.2.4.2 Equivalent Full Load Hours (EFLH) Calculations

For simpler cooling measures, including Package Terminal Heat Pumps (PTHPs) and Roof Top Units (RTUs), the Evaluator applies deemed EFLH values along with specifications of installed capacity and efficiency in evaluating savings. The general form through which kWh savings are calculated in this manner is:

$$Annual\ kWh\ Savings = \#Units \times Cap \times \left(\frac{12}{SEER_{base}} - \frac{12}{SEER_{post}}\right) \times EFLH$$

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

Table 10-6 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 PNM's C&I Workpapers for business cooling measures. The Evaluator tests these values via DOE-2 simulation modeling of archetypical building types using Albuquerque or Santa Fe NM TMY weather data, and revises EFLH by facility type where appropriate. Following this, the Evaluator calculates peak kW savings by the following equation:

$$Annual\ kWh\ Savings = \#Units \times Cap \times \left(\frac{12}{EER_{base}} - \frac{12}{EER_{post}}\right) \times EFLH$$

EER is used in peak demand calculations as it reflects unit efficiency during peak weather conditions.

10.2.5 Commercial Comprehensive Refrigeration Gross Savings Estimates

As with cooling, refrigeration measures are split between prescriptive and custom applications, with the Evaluator applying engineering algorithms for prescriptive and DOE-2 for custom applications, respectively. Measures falling under the prescriptive category include:

- Anti-Sweat Heater (ASH) Controls;
- Electronically Commutated Motors (ECMs);
- Reach-in Night Covers.

10.2.5.1 Gross Savings Methodology for Anti-Sweat Heater Controls

To determine the savings from Anti-Sweat Heater (ASH) controls, the Evaluator used metered data collected from similar facilities in other territories to develop a model based upon power consumption correlated with dew point temperature. TMY weather data for the appropriate weather zone (typically Albuquerque or Santa Fe) is then input into the model and provides estimates of the reduction in usage of anti-sweat heaters when controls are applied. In this monitoring effort, ASH Controller operation was metered on both the frame heater and door heater circuits. In order to calculate interactive effects, the kW reduction from the reduced runtime for the ASH controllers is then divided by the Coefficient of Performance (COP) of the refrigeration system serving the cooler or freezer. The energy savings are then normalized to a per-door savings estimate to determine overall savings for each facility's retrofit.

10.2.5.2 Gross Savings Methodology for Electronically Commutated Motors

To calculate savings from installation of ECM and fan controls, the Evaluator applied monitoring data from evaporator fan circuits of reach/walk in refrigeration units in other territories. By extrapolating monitoring data an average daily profile of fan operation was able to be obtained. Baseline operation of the evaporator fan assumes a 24 hour continuous operation of a shaded pole motor. The Evaluator assumes that the baseline fan motors have an efficiency of 30% compared to the 70% efficiency of the ECMs. In order to calculate the interactive effects, the kW reduction for each hour was divided by the COP of the refrigeration system. The annual savings was calculated by subtracting the as-built energy consumption form the baseline, which assumed a constant operating profile.

10.2.5.3 Gross Savings Methodology for Night-Cover Retrofits

Calculation of savings from reach-in night cover retrofits require verification of square footage, facility operating hours, and efficiency of the refrigeration system serving the units. Using this data, the Evaluator calculated savings as follows:

$$Annual\ kWh\ Savings = \ 0.2 \times \left(\Delta T \times Days \times \frac{\Delta Eff}{COP}\right)^{1.08} \times A^{12}$$

Where

ΔT = Temperature Difference between freezers/coolers and store temperature

Days = Total night cover hours converted to days

Δ*Eff* = Efficiency rate on how well night covers prevent infiltration. 1 means perfectly sealed

COP = Coefficient of Performance of Coolers / Freezers

A = Surface Area covered by night covers

10.2.6 Commercial Comprehensive Whole-Building Gross Savings Estimates

The New Construction Rebates program component provides incentives for whole-building efficiency, taking a wide-scale approach in estimating savings for an entire facility build to exceed minimum code. Components that can contribute to a whole-building incentive may include (but are not limited to):

- Lower lighting power density;
- High efficiency HVAC systems;
- Building shell improvements (Cool-roofs, window glazing, etc.); and
- Refrigeration improvements.

To evaluate savings from whole-building projects, the Evaluator takes a similar approach as with large cooling retrofits, in calibrating and developing a DOE-2 simulation model of the facility. Where possible, the Evaluator calibrated to billing data observed after the facility's construction was complete, then extrapolated to match expected typical occupancy patterns for the facility. Using the occupancy immediately after completion of construction would provide an inaccurate (and exceedingly low) savings estimate, as it generally takes some time for a facility to be fully commissioned and occupied. For example, if PNM provided a whole-building rebate for a new office building, the savings from the office building would be calculated at a typical occupancy rate (with some small number of offices at any given time vacant and available to lease). Immediately after construction is finished, the building would be largely unoccupied, but that is a temporary condition that would likely resolve within the first

[12] Commercial Facilities Contract Group 2006-2008 Direct Impact Evaluation, Appendix E, ADM Associates, Inc., February 18, 2010

year. Given the long measure life of whole-building projects, the Evaluator extrapolates to "typical year" savings by adjusting occupancy to match normal business patterns.

10.3 Impact Findings

The PNM Commercial Comprehensive Program (CCP) contains four components:

(1) Commercial Retrofit Rebates;

(2) Commercial New Construction Rebates;

(3) QuickSaver Direct Installation; and

(4) Building Tune-Up

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

Gross savings were estimated using proven techniques, including engineering calculations using industry standards and verification of computer simulations developed by program contractors to determine energy savings. Table 10-7 summarizes the total participation in the 2014 CCP.

Table 10-7 2014 CCP Participation Summary

Component	# Applicants	# Projects	Expected kWh	Expected kW
Retrofit Rebates	181	293	27,862,812	3,552.03
New Construction	24	31	3,990,959	779.91
QuickSaver	390	476	9,950,842	2,424.39
Building Tune-Up	20	10	57,915	0
Total	615	810	41,862,528	6,756.33

Data provided by PNM showed that during 2014, there were 810 projects by 615 applicants for all program components, which were initially expected to provide gross savings of 44,208,773kWh. The resulting overall sample is presented in Table 10-8.

Table 10-8 CCP Sample Summary

Component	# Sites in Population	Site Visit Sample Size	# Interviews	# Sites Represented in Interviews
Retrofit Rebates	293	27	36	67
New Construction	31	6	4	9
QuickSaver	476	21	47	47
Total	810	54	87	123

In 2014, the CCP's Retrofit Rebates component covered a wide range of measure categories, paying rebates for:

- Lighting;
- HVAC (replacement and tune-up);
- Motors;
- Food Service;
- Refrigeration;
- Plug Loads;
- Building Envelope improvements;
- Advanced AC Tune-up
- Building Operator Certification; and
- Retro-commissioning

Table 10-9 summarizes expected gross savings estimates by measure class for the Retrofit Rebates component.

Table 10-9 Retrofit Rebates Savings by Measure Class

Measure Category	Gross kWh Savings	Gross kW Savings
Lighting	15,373,178	2,739.19
HVAC	8,596,730	499.47
Motors	1,840,980	172.05
Food Service	55,296	10.61
Refrigeration	1,996,628	130.71
Envelope	0	0
Plug Loads	0	0
Total	26,817,248	3,552.03

The New Construction Component offered rebates for the same measure categories as Retrofit Rebates, with the additional option of whole-building incentives

Table 10-10 below summarizes savings by measure class for the New Construction Rebates component.

Table 10-10 New Construction Rebates Savings by Measure Class

Measure Category	Gross kWh Savings	Gross kW Savings
Lighting	2,690,456	614.09
HVAC	794,339	121.99
Food Service	0	0
Motors	0	0
Refrigeration	506,154	49.84
Whole-Building	0	0
Total	3,990,959	799.91

The final program component, QuickSaver Direct Installation, provided incentives for simple lighting and refrigeration measures. Table 10-11 summarizes savings by measure class for this component.

Table 10-11 QuickSaver Gross Savings by Measure Class

Measure Category	Gross kWh Savings	Gross kW Savings
Lighting	9,707,553	3,327.1
Refrigeration	243,289	10.7
Vending Misers	0	0
Total	9,950,842	3,337.8

10.3.1 CCP Gross Savings Estimates

Sampling for evaluation of PNM's CCP was developed using the Stratified Random Sampling procedure detailed in Section 2.4.2. 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.

10.3.1.1 Retrofit Rebates Sample Design

The participant population for Retrofit Rebates was divided into five strata. Table 10-12 summarizes the strata boundaries and sample frames for the Retrofit Rebates component.

Table 10-12 Retrofit Rebates Sample Design

	Stratum 1	Stratum 2	Stratum3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	<20,000	20,000 – 50,000	50,000 – 200,000	200,000 – 650,000	> 650,000	
Number of sites	146	65	53	22	7	293
Total kWh savings	1,167,328	1,995,496	5,243,563	7,817,925	11,638,500	27,862,812
Average kWh	7,995	30,700	98,935	355,360	1,662,643	95,095
Standard deviation of kWh savings	5,013	7,752	37,852	118,131	1,547,155	345,251
Coefficient of variation	.63	.25	.38	.33	.93	3.63
Final sample	5	5	6	4	7	27

10.3.1.2 Retrofit Rebates Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. Table 10-13 presents realization at the stratum level, with Table 10-14 presenting results at the site level.

Table 10-13 Summary of kWh Savings for Retrofit Rebates by Sample Stratum

Stratum	Expected kWh Savings	Realized kWh Savings	Realization Rate
5	11,638,500	9,531,997	81.9%
4	1,390,408	1,503,052	108.1%
3	714,322	834,647	116.8%
2	128,217	122,655	95.7%
1	47,411	52,416	110.6%

Table 10-14 shows the expected and realized energy savings for the program by project.

Table 10-14 Expected and Realized Savings by Project

Project ID(s)	City	Facility Type	Measure Category	Expected kWh Savings	Realized kWh Savings
PNM-12-01104	Rio Ranch	Heavy Industry	HVAC, Motors	4,966,208	4,657,872
PNM-13-01315	Albuquerque	Hotel/Motel	Lighting	1,995,818	593,295
PNM-11-00632	Rio Rancho	Heavy Industry	HVAC, Motors	1,670,057	1,884,284
PNM-14-01734	Albuquerque	College/University	Lighting, HVAC	825,638	845,546
PNM-14-01508	Santa Fe	Hotel/Motel	Lighting	802,083	78,360
PNM-14-01425	Albuquerque	Light Industry	Lighting	719,257	863,021
PNM-14-01487	Multiple	Grocery	Refrigeration	659,439	609,619
PNM-14-01442	Rio Rancho	Heavy Industry	Lighting	503,220	514,533
PNM-13-01393	Silver City	Grocery	Lighting, Refrigeration	387,639	468,961
PNM-14-01541	Albuquerque	Retail/Service	HVAC, Motors	294,161	292,101
PNM-14-01490	Albuquerque	Retail/Service	Lighting, HVAC, Refrigeration, Food Service	205,338	227,457
PNM-13-01206	Albuquerque	School/K-12	Lighting	171,208	210,188
PNM-14-01473	Las Vegas	School/K-12	HVAC	144,787	162,906
PNM-13-01392	Albuquerque	Medical	Motors	134,096	155,771
PNM-14-01474	Las Vegas	School/K-12	Motors	114,088	143,062
PNM-14-01458	Santa Fe	Retail/Service	Lighting	98,363	135,696
PNM-14-01440	Albuquerque	Retail/Service	Lighting	51,780	27,024
PNM-13-01334	Santa Fe	Retail/Service	Refrigeration	32,452	32,391
PNM-14-01515	Santa Fe	Office	Lighting	29,138	41,249
PNM-13-01413	Rio Rancho	Office	Lighting	25,265	24,950
PNM-14-01503	Albuquerque	Retail/Service	Lighting	21,147	15,032
PNM-13-01356	Albuquerque	Grocery	Refrigeration	20,215	9,033
PNM-14-01536	Santa Fe	Retail/Service	Lighting	15,193	27,608
PNM-14-01479	Santa Fe	Grocery	Lighting	9,747	6,455
PNM-14-01510	Las Vegas	School/K-12	HVAC	8,514	5,108
PNM-14-01486	Albuquerque	Medical	Lighting	7,593	7,548
PNM-13-01415	Santa Fe	Retail/Service	Lighting	6,364	5,697

10.3.1.3 Retrofit Rebates Program-Level Gross Realization

Using the realization rates presented in Table 10-13, the Evaluator extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. Table 10-15 presents results by stratum for the Retrofit Rebates component.

Table 10-15 Retrofit Rebates Program-Level Gross Realization by Stratum

Stratum	# Sites	Expected kWh Savings	Realized kWh Savings	kWh Gross Realization Rate	Expected kW Savings	Realized kW Savings	kW Gross Realization Rate
5	7	11,638,500	9,531,997	81.9%	835	629.4	75.4%
4	22	7,817,925	8,451,177	108.1%	1,000.9	1627.2	162.6%
3	53	5,243,563	6,124,482	116.8%	1,032.9	754.2	73.0%
2	65	1,995,496	1,909,690	95.7%	403.5	700.6	173.6%
1	146	1,167,328	1,291,065	110.6%	279.7	367.4	131.4%
Total	293	27,862,812	27,308,411	98.0%	3,552.0	4078.8	114.8%

10.3.1.4 Retrofit Rebates – Causes of Low Realization

Table 10-16 summarizes the causes of savings shortfalls for Retrofit Rebates projects with low realization.

Table 10-16 Retrofit Rebates – Causes of Low Realization

Project ID(s)	Expected kWh Savings	Realized kWh Savings	Realization Rate	Causes of Low Realization
PNM-13-01315	1,995,818	593,295	29.7%	This project is a hotel with a lighting retrofit spanning multiple sub-spaces. Most of the difference in savings was due to the 3,100 LEDs installed in guest rooms. Ex ante calculations used a weighted-average value for hotel hours of operation, which was applied to the guest rooms. The Evaluators calculated savings using sub-space hours, applying 799 annual hours to guest rooms. Other sub-spaces to have low realization due to use of the space-level hours included Office and Dining sub-spaces. The weighted hours mix used in ex ante calculations was inappropriate for this project.
PNM-14-01508	802,083	78,360	9.8%	This project is a hotel with a lighting retrofit. Annual hours of 6,874 were applied to all lighting, as the weighted-average hours of use for this facility type. However, the entirety of the lighting retrofit took place within guest rooms, which operate for 799 hours annually.
PNM-14-01440	51,780	27,024	52.2%	This project was a lighting and controls retrofit in a warehouse space. Due to the uncertainty surrounding the space use, the Evaluators metered lighting runtime. The baseline hours of use were recreated based upon observed instances of lighting automatic shut off. It was found that the lighting was manually shut off for most portions of the day, being turned off entirely during evenings after work shifts were over. The pre-retrofit hours of operation of the low-use spaces that received occupancy

				sensors was 1,914 annually, compared against the DEER value of 3,441 for this facility type.
PNM-13-01356	20,215	9,033	44.7%	This project included the installation of automatic rapid roll-up doors separating a freezer space from ac cold storage space in a refrigerated warehouse. Savings from this measure occur only during business hours, as the door is shut during non-operating hours. Ex ante calculations assumed 16 hours a day of operation. Facility staff indicated to the Evaluators that the schedule averages 12.5 hours a day. Ex ante calculations used a temperature difference of 42 degrees between refrigerator and freezer space. The Evaluators verified a difference of 39 degrees between the two space set points. Ex ante calculations assumed the baseline equipment configuration was a slow, rigid door. Evaluators verified that the pre-existing equipment was a standard roll-up door. Finally, ex ante calculations assumed the refrigeration system had a defrosting system; the equipment does not have a defrosting system, reducing baseline energy consumption.
PNM-14-01503	21,147	15,032	71.1%	Energy savings calculations were accurate. However, the Evaluators found that not all of the 103 listed LEDs were installed. It was verified that a large number of LEDs were sold to the customer to be kept as spares. Further, this was a custom lighting project, and the facility operates for significantly fewer hours than deemed retail/service; the facility schedule is five days a week, with a total of 36 hours of operation per week (1,872 annually).
PNM-14-01479	9,747	6,455	66.2%	This is a small retail facility which installed 13W CFLs, replacing 75W incandescent lamps. The Evaluators revised the baseline from 75W to 53W in accordance with EISA.

10.3.1.5 New Construction Rebates Sample Design

The New Construction Rebates sample was developed in the same manner as the Retrofit Rebates Sample. Stratification differed only due to the limited population size

(29 facilities); the population was divided into four strata instead of five. Table 10-17 below presents the stratification procedure for New Construction Rebates.

Table 10-17 New Construction Rebates Sample Design

	Stratum 1	Stratum 2	Stratum 3	Stratum 4	Totals
Strata boundaries (kWh)	<30,000	30,000 – 200,000	200,000 – 400,000	>400,000	
Number of sites	13	9	7	2	31
Total kWh savings	167,479	702,814	1,709,779	1,410,887	3,990,959
Average kWh Savings	12,883	78,090	244,254	705,443	128,741
Standard deviation of kWh savings	6,213	38,677	56,414	308,123	189,967
Coefficient of variation	.48	.50	.23	.44	1.48
Final design sample	1	2	2	1	6

10.3.1.6 New Construction Rebates Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. Table 10-18 presents realization at the stratum level, with Table 10-19 presenting results at the site level.

Table 10-18 Summary of kWh Savings for New Construction Rebates by Sample Stratum

Stratum	Expected kWh Savings	Realized kWh Savings	kWh Realization Rate	Expected kW Savings	Realized kW Savings	kW Realization Rate
4	923,319	1,150,891	124.7%	139.2	215.2	154.6%
3	454,423	348,429	76.7%	103.1	48.4	46.9%
2	97,006	96,792	99.8%	19.9	60.2	302.8%
1	9,744	7,525	77.2%	1.3	.4	123.0%

Table 10-19 New Construction Rebates Site-Level Realization

Project ID(s)	City	Facility Type	Measure Category	Expected kWh Savings	Realized kWh Savings
PNM-13-01318	Albuquerque	Medical	Lighting, HVAC	923,319	1,150,891
PNM-13-01500	Albuquerque	K-12 School	Lighting, HVAC	240,324	137,426
PNM-14-01511	Albuquerque	Assembly	Lighting	214,099	211,003
PNM-14-01441	Albuquerque	Retail/Service	Lighting, HVAC	52,370	41,188
PNM-13-01366	Albuquerque	Retail/Service	Lighting, HVAC	44,636	55,604
PNM-13-01297	Albuquerque	Retail/Service	Refrigeration	9,744	7,525

10.3.1.7 New Construction Rebates Program-Level Realization

Using the realization rates presented in Table 10-18, the Evaluator extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. The results of this are presented in Table 10-20.

Table 10-20 New Construction Rebates Program-Level Gross Realization by Stratum

Stratum	# Sites	Expected kWh Savings	Realized kWh Savings	kWh Gross Realization Rate	Expected kW Savings	Realized kW Savings	kW Gross Realization Rate
4	2	1,410,887	1,759,376	124.7%	193.94	299.8	154.6%
3	7	1,709,779	1,311,400	76.7%	380.9	178.6	46.9%
2	9	702,814	701,408	99.8%	167.52	507.3	302.8%
1	13	167,479	129,294	77.2%	37.55	46.2	123.0%
Total	31	3,990,959	3,901,478	97.8%	779.91	1031.9	132.3%

10.3.1.8 New Construction Rebates – Causes of Low Realization

Table 10-21 summarizes the causes of savings shortfalls for New Construction projects with low realization.

Table 10-21 New Construction Rebates – Causes of Low Realization

Project ID(s)	Expected kWh Savings	Realized kWh Savings	Realization Rate	Causes of Low Realization
PNM-13-01500	240,324	137,426	57.2%	Lighting savings calculations for this project used 4,000 annual operating hours. The TRM uses annual hours of 2,399 for this facility type (Secondary School).
PNM-13-01297	9,744	7,525	77.2%	This project only included savings from LED case lighting for reach-in cooler units. This was deemed using a T12 baseline, which is inappropriate for new construction. The Evaluators changed the baseline to T8 lighting.

10.3.1.9 QuickSaver Sample Design

The QuickSaver program component provides direct installation of simple lighting and refrigeration measures to small businesses, with PNM Trade Allies receiving a rebate after discounting the installation cost of preapproved energy efficient equipment. The stratification procedure for the QuickSaver component is summarized in Table 10-22 below.

Table 10-22 QuickSaver Rebates Sample Design

	Stratum 1	***Stratum 2***	***Stratum3***	***Stratum 4***	***Stratum 5***	***Totals***
Strata boundaries (kWh)	<10,000	10,000 – 25,000	25,000 – 50,000	50,000 – 100,000	> 100,000	
Number of sites	213	142	69	45	7	476
Total kWh savings	1,245,355	2,351,683	2,356,582	3,091,764	905,458	9,950,842
Average kWh Savings	5,847	16,561	34,153	68,706	129,351	20,905
Standard deviation of kWh savings	2,371	4,292	6,382	13,794	23.916	23,691
Coefficient of variation	.41	.26	0.19	0.25	0.18	1.13
Final design sample	5	5	5	4	2	21

10.3.1.10 QuickSaver Site-Level Realization

Sites chosen within each stratum are visited in order to verify installation of rebated measures and to collect data needed for calculation of ex post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum. Table 10-23 presents realization at the stratum level, with

Table *10-24* presenting results at the site level.

Table 10-23 Summary of kWh Savings for QuickSaver Rebates by Sample Stratum

Stratum	***Expected kWh Savings***	***Realized kWh Savings***	***kWh Realization Rate***	***Expected kW Savings***	***Realized kW Savings***	***kW Realization Rate***
5	238,694	235,849	98.81%	57.17	66.91	117.04%
4	290,542	276,342	95.51%	65.08	55.50	85.28%
3	183,455	163,023	88.86%	43.70	37.68	86.22%
2	75,919	72,114	94.99%	16.48	13.72	83.25%
1	35,306	36,998	104.79%	8.70	7.96	91.49%
Total	823,916	784,326	95.19%	191.13	181.77	95.10%

Table 10-24 QuickSaver Expected and Realized Savings by Project

Project ID	City	Facility Type	Measure Category	Expected kWh Savings	Realized kWh Savings
QS-6584	Albuquerque	Retail/Service	Lighting	127,382	136,698
QS-6546	Albuquerque	Retail/Service	Lighting	111,312	99,151
QS-5408	Albuquerque	Retail/Service	Lighting	82,447	106,046
QS-6075	Albuquerque	Fitness Center	Lighting	76,611	73,588
QS-6006	Albuquerque	Light Industry	Lighting	71,777	56,161
QS-6073	Belen	Retail/Service	Lighting	59,707	40,547
QS-3654	Albuquerque	Warehouse	Lighting	44,892	31,913
QS-5933	Albuquerque	Retail/Service	Lighting	39,373	31,275
QS-4500	Albuquerque	Retail/Service	Lighting	36,073	40,325
QS-6196	Albuquerque	Restaurant	Lighting	33,339	37,128
QS-6024	Belen	Retail/Service	Lighting	29,778	22,382
QS-4300	Rio Rancho	Restaurant	Lighting	21,683	25,393
QS-5850	Albuquerque	Retail/Service	Lighting	20,518	18,526
QS-5516	Albuquerque	Retail/Service	Lighting	12,573	10,513
QS-6234	Santa Fe	Retail/Service	Lighting	10,720	10,294
QS-6005	Albuquerque	Warehouse	Lighting	10,425	7,388
QS-6019	Silver City	Office	Lighting	8,770	8,939
QS-6046	Albuquerque	Restaurant	Lighting	8,475	9,823
QS-6396	Albuquerque	Grocery	Lighting	7,600	5,232
QS-5612	Albuquerque	Office	Lighting	6,144	7,735
QS-6203	Albuquerque	Retail/Service	Lighting	4,317	5,269
			Total:	823,916	784,326

10.3.1.11 QuickSaver Program-Level Gross Realization

Using the realization rates presented in Table 10-23, the Evaluator extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. Table 10-25 presents results by stratum for the QuickSaver component of the CCP.

Table 10-25 QuickSaver Program-Level Gross Realization by Stratum

Stratum	# Sites	Expected kWh Savings	Realized kWh Savings	kWh Gross Realization Rate	Expected kW Savings	Realized kW Savings	kW Gross Realization Rate
5	12	905,458	894,683	98.81%	214.05	250.52	117.04%
4	48	3,091,764	2,952,944	95.51%	700.17	597.10	85.28%
3	92	2,356,582	2,094,059	88.86%	581.93	501.74	86.22%
2	170	2,351,683	2,233,863	94.99%	603.55	502.46	83.25%
1	234	1,245,355	1,305,007	104.79%	324.69	297.06	91.49%
Total	556	9,950,842	9,480,556	95.27%	2,424.39	2,148.88	88.64%

10.3.1.12 Building Tune-Up

The Building Tune-Up (BTU) program channel provides incentives for:

- AC Tune-up;
- Retrocommissioning; and
- Building Operator Certification.

The goal for the BTU program channel in 2014 was to provide 1,090,000 kWh. However, the program channel was approved later in the year than anticipated. For 2014, the BTU channel had 10 completed AC Tune-Up projects, totaling 57,915 kWh (5.31% of goal). As a result, the Evaluators did not conduct M&V of this channel.

Tracking provided by DNV-GL and PNM indicated a numerous initiated projects for the BTU channel for 2015. This included:

- (8) Retrocommissioniong projects, with projected savings of 372,876 kWh; and
- (18) Building Operator Certification projects, with projected savings of 2,255, 105 kWh.

10.3.2 Commercial Comprehensive Net Savings Estimates

The Evaluator estimated net savings for all components of the Commercial Comprehensive Program via detailed participant surveying of a representative sample of decision makers from each program component. 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 Evaluator's NTGR estimates by measure category for each program component, and the associated net savings.

10.3.2.1 Retrofit Rebates Net Savings Estimates

The Evaluator used PNM tracking data on measure details by site in order to aggregate gross savings by measure category within each stratum in the population. NTGR for each measure type was then applied to verify ex-post savings within each stratum in order to develop net realization estimates. In

Table 10-26, verified gross savings by measure category are summarized in order to prepare for application of measure-specific NTGRs. Table 10-27 then presents similar results for verified gross kW savings.

Table 10-26 Retrofit Rebates Stratum-Level Verified Gross kWh Savings by Measure Category

Measure Category	Stratum 5 Verified Gross kWh Savings	Stratum 4 Verified Gross kWh Savings	Stratum 3 Verified Gross kWh Savings	Stratum 2 Verified Gross kWh Savings	Stratum 1 Verified Gross kWh Savings
Lighting	1,534,676	5,713,489	4,515,019	1,576,652	1,169,653
HVAC	5,503,418	1,933,378	883,144	154,266	109,562
Motors	1,884,284	5,229	193,988	-	-
Food Service	-	39,850	21,529	-	-
Refrigeration	609,619	759,231	510,801	178,711	11,850
Total	9,531,997	8,451,177	6,124,482	1,909,629	1,291,065

Table 10-27 Retrofit Rebates Stratum-Level Verified Gross kW Savings by Measure Category

Measure Category	Stratum 5 Verified Gross kW Savings	Stratum 4 Verified Gross kW Savings	Stratum 3 Verified Gross kW Savings	Stratum 2 Verified Gross kW Savings	Stratum 1 Verified Gross kW Savings
Lighting	196.3	1,315.1	651.7	620.6	334.5
HVAC	132.3	221.2	62.6	49.9	31.0
Motors	252.4	0.1	14.2	0.0	0.0
Food Service	-	11.5	2.6	0.0	0.0
Refrigeration	48.4	79.3	23.1	30.1	1.9
Total	629.4	1,627.2	754.2	700.6	367.4

With verified savings compiled by stratum and by measure, the Evaluator then applies measure-category NTGRs to estimate program net savings. These are summarized in Table 10-28 and Table 10-29 below. No respondents for food service or plug loads could be reached for a survey for Retrofit Rebates, and as such proxy values were applied. The Evaluator applied the lighting NTGR for plug loads and the refrigeration NTGR for food service.

Table 10-28 Retrofit Rebates Stratum Level Verified Net kWh Savings by Measure Category

Measure Category	Measure NTGR	Stratum 5 Verified Net kWh Savings	Stratum 4 Verified Net kWh Savings	Stratum 3 Verified Net kWh Savings	Stratum 2 Verified Net kWh Savings	Stratum 1 Verified Net kWh Savings
Lighting	72.0%	1,104,967	4,113,712	3,250,814	1,135,189	842,150
HVAC	93.2%	5,129,186	1,801,908	823,090	143,776	102,112
Motors	100%	1,884,284	5,229	193,988	-	-
Food Service	100%	-	39,850	21,529	-	-
Refrigeration	81.8%	498,668	621,051	417,835	146,186	9,693
Total	81.6%	8,617,105	6,581,750	4,707,256	1,425,151	953,955

Table 10-29 Retrofit Rebates Stratum Level Verified Net kW Savings by Measure Category

Measure Category	Measure NTGR	Stratum 5 Verified Net kW Savings	Stratum 4 Verified Net kW Savings	Stratum 3 Verified Net kW Savings	Stratum 2 Verified Net kW Savings	Stratum 1 Verified Net kW Savings
Lighting	72.0%	141.3	946.9	469.2	446.8	240.8
HVAC	93.2%	123.3	206.2	58.3	46.5	28.9
Motors	100%	252.4	0.1	14.2	-	-
Food Service	100%	-	11.5	2.6	-	-
Refrigeration	81.8%	39.6	64.9	18.9	24.6	1.6
Total	80.5%	556.6	1229.6	563.2	517.9	271.3

10.3.2.2 New Construction Rebates Net Savings Estimates

Due to the limited number of participants and survey respondents, net to gross for the New Construction component was addressed at the facility level rather than the measure category level using NTGR values aggregated from prior program years. For the New Construction component, an overall NTGR of 83.4% was found, resulting in net savings of:

- 3,253,833 kWh
- 850.6 kW

10.3.2.3 QuickSaver Net Savings Estimates

Net savings estimates were determined in a similar manner as done for New Construction, in that the available survey respondents for refrigeration were very limited. Verified net savings estimates are provided in Table 10-30 below.

Table 10-30 QuickSaver Direct Install Stratum-Level Verified Net kWh Savings

Stratum	NTGR	Verified Net kWh	Verified Net kW
5	92.2%	824,898	230.98
4	92.2%	2,722,614	550.53
3	92.2%	1,930,722	462.6
2	92.2%	2,059,622	463.27
1	92.2%	1,203,216	273.89
Total	92.2%	8,741,072	1,981.27

10.3.3 Commercial Comprehensive Net Realization Summary

After evaluating the three program components, the Evaluator compiled net savings to provide an overall net realization rate. Gross and net savings results are summarized in Table 10-31 and Table 10-32.

Table 10-31 Commercial Comprehensive Gross Realization

Component	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Retrofit Rebates	3,552.0	4,078.8	27,862,812	27,308,411	299,887,904	303,728,474	98.0%
New Construction	779.9	1,031.9	3,990,959	3,901,478	43,887,690	42,454,017	97.8%
QuickSaver	2,424.4	2,148.9	9,950,842	9,480,556	119,410,107	113,766,672	95.3%
Building Tune-Up	0	0	57,915	57,915	347,490	347,490	100.0%
Total	6,756.3	7,259.6	41,862,528	40,748,360	463,533,191	460,296,653	97.3%

Table 10-32 Commercial Comprehensive Net Realization

Component	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Retrofit Rebates	2,789.20	3,138.6	21,963,435	22,285,217	263,300,293	247,859,706	101.5%
New Construction	650.4	850.6	3,328,459	3,253,833	36,602,334	35,406,654	97.8%
QuickSaver	2,232.9	1,981.3	9,164,725	8,741,072	102,644,928	104,892,864	95.4%
Building Tune-Up	0	0	50,386	50,386	302,316	302,316	100.0%
Total	5,672.5	5,970.5	34,507,005	34,330,508	402,849,871	388,461,540	99.5%

10.4 Process Findings

This chapter presents the results of the process evaluation of the Commercial Comprehensive Program[13]. The process evaluation focuses on aspects of program policies and organization, as well as the program delivery framework. The process evaluation is largely based upon participant surveying and a review of program documentation.

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

[13] During the data collection process, customers were asked for responses in terms of the specific program component utilized. However, for the purposes of this study, Commercial Comprehensive Program refers to all analyzed programs, including Commercial Retrofit Rebates, New Construction Rebates, and Quick Saver Direct Install.

10.4.1 Overall Program Success

The CCP has at this point become well-established, with utility staff, program implementation staff, trade allies, and PNM customers having learned the minutiae of the program and its offerings. Several "repeat customers" are engaged with large numbers of applications, with more of such businesses added each year. In 2014, the CCP saw returning customers from prior program years across all sectors. In total, for the Retrofit Rebates and New Construction components, 69.0% of the 2014 program year savings came from customers with multiple applications, and 60.0% of 2013 savings came from organizations that participated in the CCP in prior years[14].

With this project removed the share of savings from motors drops from 25% to 3.5%. In Table 10-33 through Table 10-35 below, savings by measure category are presented by year in terms of their share of total program savings over the course of this history of the CCP.

Table 10-33 Retrofit Rebates Savings by Measure Category by Year

Measure Category	***Program Year***					
	2009	***2010***	***2011***	***2012***	***2013***	***2014***
Lighting	93%	80%	77%	37%	62%	55%
HVAC	5%	13%	17%	51%	11%	31%
Refrigeration	2%	6%	2%	8%	2%	7%
Motors	0%	1%	3%	5%	25%	7%
Food Service	0%	0%	0%	.3%	<1%	<1%
Envelope	0%	0%	0%	.4%	<1%	0%
Plug Loads	0%	0%	0%	.1%	0%	0%
Total kWh Savings	8,496,272	23,095,225	23,947,571	28,820,650	26,817,248	27,862,812

[14] These savings overlap to some degree; 51.4% of 20151.4 program year savings came from customers that both submitted multiple applications in 20151.4 and had participated in prior program years.

Table 10-34 New Construction Savings by Measure Category by Year

Measure Category	Program Year					
	2009	2010	2011	2012	2013	2014
Lighting	1.8%	29%	19%	43%	54%	67%
HVAC	0.2%	2%	30%	29%	10%	20%
Refrigeration	0%	0%	2%	4%	23%	13%
Motors	0%	19%	0%	0%	0%	0%
Commissioning	0%	1%	2%	0%	0%	0%
Whole-Building	98%	49%	46%	23%	14%	0%
Food Service	0%	0%	0%	2%	0%	0%
Total kWh Savings	1,970,926	7,310,501	2,158,765	1,217,109	4,216,702	3,990,959

Table 10-35 QuickSaver Savings by Measure Category by Year

Measure Category	Program Year					
	2009[15]	2010	2011	2012	2013	2014
Lighting	-	80%	94%	98%	99%	98%
Refrigeration	-	20%	6%	1%	<1%	2%
Vending Misers	-	0%	0%	1%	<1%	0%
Total kWh Savings	-	3,923,491	9,644,979	12,208,043	13,564,061	9,950,842

As seen in Retrofit Rebates, the CCP is achieving a greater degree of diversity in measure uptake. Measure categories (and savings levels) for New Construction do not serve as a good indicator of program success in this regard in that New Construction projects do not consistently flow into the program; they are dependent upon available funds for construction and an economy that can support expansion, and as such the flow of such projects is uneven and volatile. QuickSaver also serves as a poor metric, in that it only offers lighting and refrigeration measures, and as such the diversity of program performance is dependent largely upon the share of grocery and restaurant participants.

Savings for the QuickSaver program channel dropped by 26.6% in 2014 compared to 2013. The Evaluators spoke with program implementation staff to address this shortfall compared to 2013, and implementation staff attributed this to saturation in the small business market in PNM's service territory. With the high program uptake in prior years, the opportunities for lighting retrofits have been reduced.

10.4.1.1 Measure Uptake by Facility Type

To maintain performance in future program years, the CCP will need to look for deeper savings in program participants, as opportunities for lighting retrofits will decline. Table

[15] Quick Saver was not launched until the latter months of 2010

10-36 below summarizes the share of savings by measure category for each facility type in the Retrofit Rebates and QuickSaver components.

Table 10-36 Retrofit Rebates & QuickSaver Savings by Measure Category by Facility Type

Facility Type	n	Lighting	HVAC	Motors	Refrigeration	Food Service	Envelope	Plug Loads
Art Gallery/Museum	13	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Assembly/Worship	21	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
College/University	11	3.6%	96.4%	0.0%	0.0%	0.0%	0.0%	0.0%
Entertainment	10	96.9%	3.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Fitness Center	7	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Government	22	92.8%	7.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Grocery	60	43.7%	1.2%	0.0%	53.5%	1.6%	0.0%	0.0%
Heavy Industry	10	10.6%	65.3%	24.1%	0.0%	0.0%	0.0%	0.0%
Hotel/Motel	29	98.2%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Light Industry	44	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Medical	11	72.8%	27.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Multifamily Housing	2	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Office	23	43.4%	56.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Restaurant	77	98.1%	0.0%	0.0%	1.9%	0.0%	0.0%	0.0%
Retail/Service	387	92.4%	4.0%	0.0%	3.6%	0.0%	0.0%	0.0%
School/K-12	33	66.4%	33.5%	0.0%	0.1%	0.0%	0.0%	0.0%
Warehouse	44	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Miscellaneous	13	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Overall:	804	66.3%	22.7%	4.9%	5.9%	0.1%	0.0%	0.0%

In examining the participation data by facility type, the Evaluator found the following:

- Significant reclassification of facilities was necessary to make results interpretable. 12.9% of Retrofit Rebate participants were classified as “Miscellaneous” and 9.2% of QuickSaver participants were classified as “Other”. the Evaluator reclassified these facilities where possible, and found significant participation levels on a couple subsectors, including:
  - Art galleries/museums;
  - Assembly/worship facilities (which includes both religious facilities that do not have schools and public assembly spaces or community centers);
  - Entertainment facilities (which included facilities such as bowling alleys and movie theaters);
  - Fitness centers; and

  - Multiple facility types which were in the end classified under "Retail/Service" instead of "Other", including automotive repair and Laundromats.

- Many facilities that were classified as "Retail/Service" were changed to "Grocery". This included convenience stores and gas stations, for which a high portion of energy use is attributable to refrigeration loads.
- The program is not producing savings in plug loads. Utilities elsewhere in New Mexico have engaged this end-use in several ways:
  - El Paso Electric Company has engaged a trade alley that is successfully reaching several municipal government and school district end-users;
  - Southwestern Public Service has achieved significant savings in business PCs through midstream incentives for high efficiency units.

  PNM could likely adopt both these approaches to increase savings from this end-use.

Commercial Retrofit Rebates Customer Profile**Error! Reference source not found.**Table 10-37 presents the average, median and range of the incentives for firms participating in retrofit measures. The average total incentive was $5,885 while the median $1,036. Values were generally skewed high by one large project that received an incentive of $297,292, accounting for 17.3% of all Retrofit Rebate incentive dollars.

Table 10-37 Average and Median Incentive for Retrofit Participants

Type of incentive	*Average*	*Median*	*Range*
Custom Incentive	$3,941	$3,493	$49-$297,972
Prescriptive Incentive	$17,961	$1,032	$30-$50,250
Total Incentive	$5,855	$1,036	$30-$297,972

The Retrofit Rebates component had 293 participating facilities in 2014. Figure 10-1 presents the distribution of participants in the Retrofit Rebates component by facility type and savings.

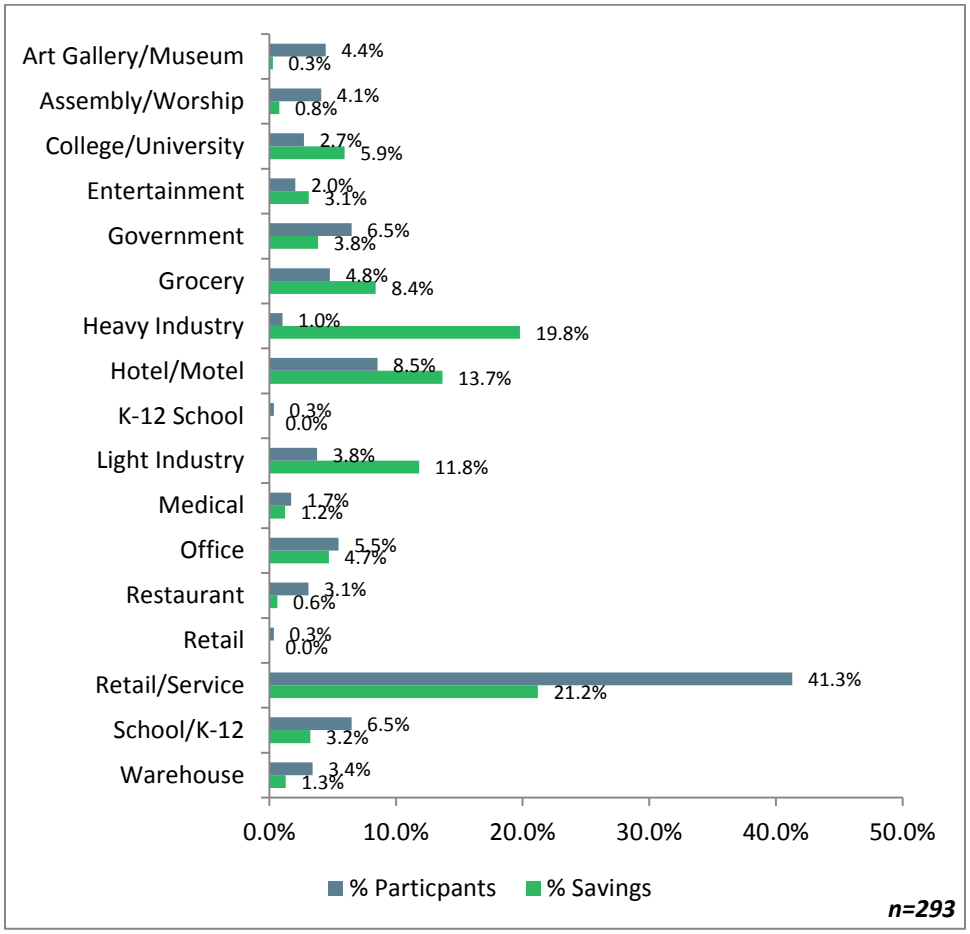

Figure 10-1 Retrofit Rebates Distribution Participation & Savings by Facility Type

10.4.1 Commercial New Construction Rebates Customer Profile

Table 10-38 summarizes the average, median and range of the incentives for New Construction project applications. The average total incentive was $9,670 while the median was to $4,400. Total incentives for projects range as high as $64,185.

Table 10-38 Average and Median Incentive for New Construction Customers

Type of incentive	*Average*	*Median*	*Range*
Custom Incentive	$15,893	$15,454	$660 - $39,892
Prescriptive Incentive	$6,707	$1,743	$270 - $64,185
Total Incentive	$9,670	$4,440	$270 - $64,185

The New Construction Rebates program had 31 applications in 2014. Figure 10-2 presents the distribution of participants by facility type.

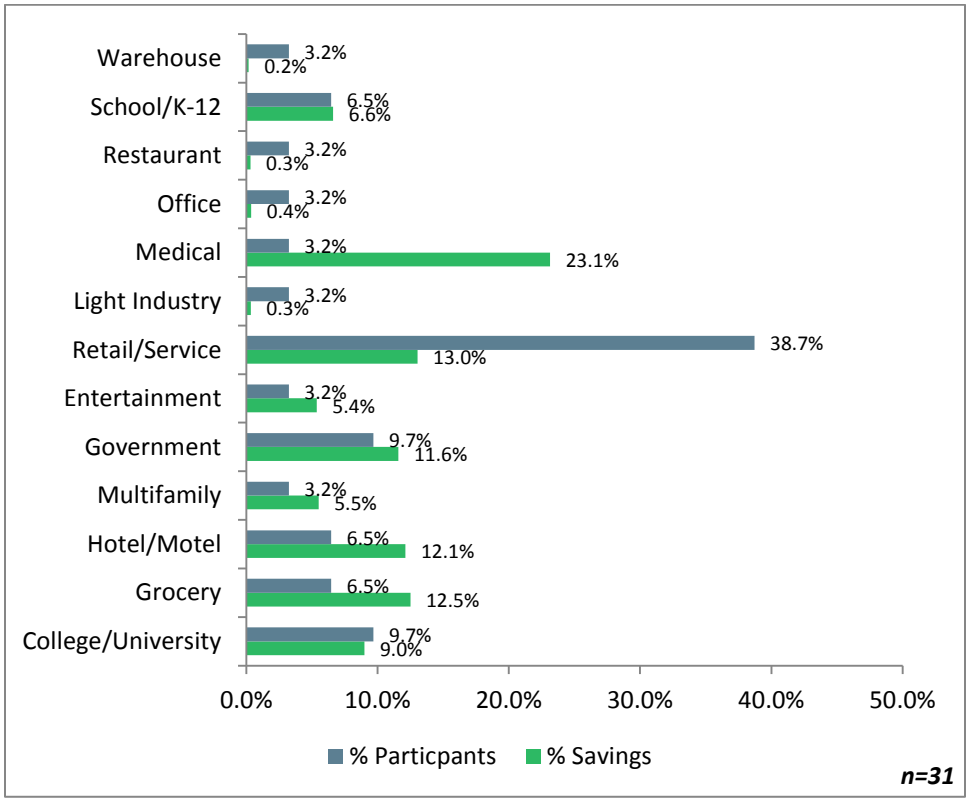

Figure 10-2 New Construction Rebates Distribution of Participants by Facility Type

Retail facilities encompassed the bulk of program participation in the New Construction Rebates component. Retail facilities, however, were low savers on average.

10.4.2 QuickSaver Customer Profile

Table 10-39 presents the average, median and range of the incentives for firms participating in the QuickSaver component.

Table 10-39 Average and Median Incentive for QuickSaver Participants

Type of incentive	*Average*	*Median*	*Range*
Total Incentive	$2,705	$1,446	$79-$21,833

The QuickSaver component had 476 participating facilities in 2014. Figure 10-3 presents the distribution of participants in the QuickSaver component by facility type. Unlike Retrofit Rebates and New Construction, the share of participation and the share of savings are highly correlated, with no facility type constituting an outsized share of savings relative to their share of participation.

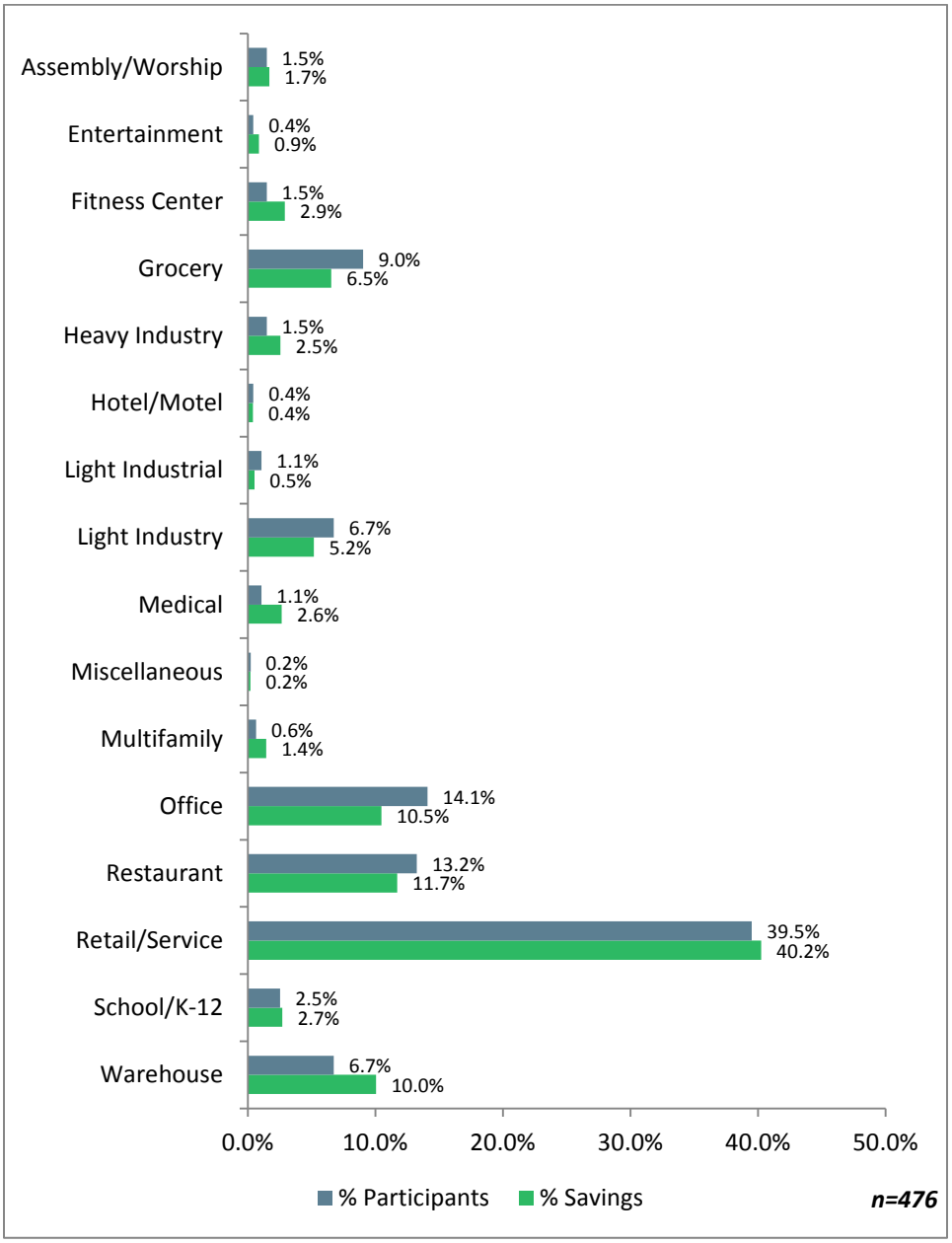

Figure 10-3 QuickSaver Distribution of Participants & Savings by Facility Type

10.4.3 Customer Outcomes

The Public Service Company of New Mexico utilizes multiple marketing strategies to make customers aware of its programs. The program partners with trade allies such as lighting contractors, motor vendors, HVAC companies, engineering firms and others who promote programs with their customers. PNM has a website where customers can learn about various measures and obtain forms. Programs are also marketed through talks and presentations delivered to trade ally organizations, business and professional

associations, and other types of organizations. PNM also directly contacts customers with information.

A survey was conducted to collect data about customer decision-making, preferences, and perspective of the Commercial Comprehensive Program. In total, respondents accounting for 74 Retrofit Rebates projects responded. The pool of New Construction survey participants was exceedingly limited, as most of the participation came from multiple projects from one organization that was non-responsive to the survey.

10.4.3.1 How Customers Learn About the Program

Table 10-40 displays the customer responses to how they learned about the program. The percentages are the percentages of respondents. Because respondents could provide more than one response the total is greater than 100%. The most common way customers learned about the program was directly through PNM representatives. Another 28.6% learned about the program through an equipment vendor or building contractor. This is to be expected since the program attempted to leverage the contacts of trade allies and other building professionals. Sources of information are more limited in scope for New Construction due to the smaller number of projects.

Table 10-40 How Customer Decision Makers Learned about the Program

	Retrofit Rebates
An equipment vendor or building contractor	30.8%
Approached directly by PNM Staff	40.0%
Friends or colleagues (i.e., word of mouth)	26.2%
An architect, engineer or energy consultant	15.4%
The PNM website	3.1%
Past experience with the program	13.8%
Other	4.6%
N	**65**

Respondents were asked what the best way of reaching companies about information on energy saving opportunities. 52.6% stated that the best way to reach them is via email. Other commonly indicated methods were direct contact by program staff (28.1%) and bill inserts or brochures (14.0%).

Sixty-six percent of respondents replied that their company has a specific payback period for energy efficiency improvement implementation. The respondents were asked to specify the payback period needed for energy efficiency improvements and it ranged from two months to 7 years. However, 3.5 years was the most frequent payback period.

10.4.3.2 Customer Decision Making

Before participating in the program, respondents were asked if they had installed any similar equipment, and 63.1% indicated having done so. Respondents were then asked if they had planned to install the energy efficient equipment before participating in the program and 66.2% said they did have plans. Of those that said they did have plans, 86.0% would have installed this equipment without the program rebates, and 74.3% would have installed the same equipment. Participants were then asked about their previous experience with PNM programs and the importance it had in their decision to install energy efficient equipment. Thirty-two percent had previously participated, and 85.7% of prior participants said that it was somewhat to very important in making the decision. Seventy-five percent would have been financially able to install the equipment without financial incentives.

If the financial incentive was not given through the program, 49.2% of respondents would not have done anything differently and 18.4% would have delayed the project. Twelve of respondents would have installed a lower quantity, quality, cost, or efficiency level of equipment, and possibly would have repaired the existing equipment or only install equipment into portions of the facility.

Respondents were also asked an additional question to detail their likelihood of installing without a program-provided incentive.

Table 10-41 Financial Incentive Influence on QuickSaver Installation

If PNM had not provided a financial incentive, would you have installed?	
Definitely would have installed	35.3%
Probably would have installed	33.0%
Probably would not have installed	29.3%
Definitely would not have installed	15.4%
Don't know	15.4%
N	**54**

An important question is when respondents learned about the program. As shown in

Table *10-42*, 44.6%of the customers learned about the program before they planned equipment replacements, and 38.5% learned about it during planning equipment replacement. More than a quarter of respondents indicated that they had learned about the program after the equipment had been specified and/or installed.

Table 10-42 When Customer Decision Makers Learned about the Program

	Retrofit Rebates
Before planning for replacing the equipment began	44.6%
During your planning to replace the equipment	38.5%
Once equipment had been specified but not yet installed	13.8%
After equipment was installed	1.5%
Don't know	1.5%
N	**65**

10.4.3.3 Satisfaction with the Program

Respondents were asked about their levels of satisfaction with selected aspects of the program on a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied. Table 10-43 tabulates the results.

Table 10-43 Customer Decision Maker Satisfaction with Selected Elements Program Experience

Element of Program Experience	***Mean Score***	***Don't Know***	***N***
Performance of the equipment installed	9.71	4.6%	65
Savings on your monthly bill	8.42	15.4%	65
Incentive amount	8.80	0%	65
The effort required for the application process	8.47	1.5%	65
Information provided by your contractor	9.22	29.2%	65
Quality of the work conducted by your contractor	9.63	26.2%	65
Information provided by PNM Account Representative	9.15	9.2%	65
The elapsed time until you received the incentive	8.54	9.2%	65
Overall program experience	9.24	3.1%	65

Overall program experience scored very high with a mean score of 9.24. Respondents reported the greatest satisfaction with the performance of the installed equipment, the elapsed time until receiving the incentive, and the quality of work by their contractor. What is most notable in the satisfaction ratings is the high rating for the wait time to receive the rebate; this score is significantly higher than often observed in energy efficiency programs, and indicative of an efficient incentive processing mechanism.

For those elements that scored lower, respondents were asked to clarify as to why these aspects were unsatisfactory. Regarding the performance of the equipment, one respondent said they were dissatisfied "because it is not doing what was said." Savings

on the monthly bill scored fairly high, but a couple of respondents said that they had not seen a change to their bill, and even removed the new bulbs. Some respondents were disappointed with the amount of incentive money received saying that it was less than expected. Others were dissatisfied with the application process saying that it was complicated and time consuming. Some respondents felt that the PNM account representative provided some inaccurate information and were not knowledgeable enough about the system. Those that were dissatisfied with the overall program said they were "not happy because it did not do what [it] was promised to do," and had problems with the bulbs and application process.

10.4.4 QuickSaver Customer Outcomes

A separate survey was conducted to collect data about QuickSaver participants, including their decision-making, preferences, and perspective on the program. A total of 56 decision makers responded to the survey, representing 108 facilities. In order to provide aggregated results, the analysis will be based on the total number of facilities rather than the number of decision makers responding to the survey.

10.4.4.1 How Customers Learn of the Program

Table 10-44 displays the customer responses to how they learned about the program. The percentages are the percentages of respondents. The most common way customers learned about the program was from a PNM Trade Ally (74.0%). Further, 10.4% listed an architect or engineer as how they learned of the program. When reviewing these customers' project data, the Evaluator found that most engineers indicated were in fact PNM Trade Allies as well. Outside of Trade Allies, many respondents learn of the program through their colleagues and word of mouth, with 29.8% indicating this as how they learned of the program.

Table 10-44 How Customer Decision Makers Learned about the QuickSaver Program

Source Indicated	*Percent of Respondents*
Approached by a PNM Trade Ally	72.3%
Friends or colleagues (i.e., word of mouth)	29.8%
PNM brochure	4.3%
Past experience with the program	10.6%
Other	4.3%
N	**47**

* Customer could make multiple responses. The percentages are based on the number of respondents rather than the number of responses. Thus, the total exceeds 100%.

10.4.4.2 Timing of learning of the Program

Participants were also asked when they had heard about the QuickSaver program. As shown in Table 10-45, 74.5% of respondents found out about the program before planning to replace equipment, and 21.3% learned about it during equipment

replacement planning. Further, 2.1% percent of the respondents indicated learning about the program after equipment had been installed.

Table 10-45 When Customer Decision Makers Learned about the Program

When did you learn of the Commercial Comprehensive Program?	Percent of Respondents
Before planning for replacing the equipment began	74.5%
During your planning to replace the equipment	21.3%
Once equipment had been specified but not yet installed	0%
After equipment was installed	2.1%
Don't Know	2.1%
N	**45**

Respondent responses about when they had heard about the program were cross-tabulated with whether they had previous plans to install energy efficiency measures. Of the participants who indicated that they learned of the program before beginning equipment replacement planning, 94.0% of them had not had prior plans to install equipment. This implies that the program directly influenced these responders to make energy efficiency improvements.

Table 10-46 When Customer Decision Maker Learned about the QuickSaver Program, by Whether There Were Plans to Install Equipment

Had Plans to Install Measure Before Participating	Before Planning For Replacing the Equipment Began	During Your Planning to Replace the Equipment	Once Equipment Had Been Specified But Not Yet Installed	After Equipment Was Installed	Don't Know
Yes	27.3%	63.6%	0%	0%	9.1%
No	88.6%	8.6%	0%	2.9%	0%

10.4.4.3 Customer's Attitudes, Behaviors and Decision Making with Respect to Energy Efficiency

Customers were asked about the relative importance of various factors in their decision making regarding energy efficiency improvements. Respondents were asked to rate these factors on a scale of 1-10 in importance. The results are summarized in Table 10-47.

Table 10-47 Importance of Energy Efficiency Compared to Other Factors

Importance	Mean Score
Incentive Payments from PNM	8.49

Past experience with energy efficient equipment	5.81
Your organization's policies	4.32
Advice or recommendations from PNM	6.74
Advice or recommendations from equipment vendors	4.79
Promoting company image as environmentally friendly	5.62
Productivity benefits / reduced waste	8.04
N	**47**

The Evaluators then reviewed the scores within certain market subsectors to identify any areas in which the relative weight of these factors may have differed significantly. It was found that:

- Hotels and restaurants were significantly more likely to list "promoting company image as environmentally friendly" as an important factor (with a mean score ranging from higher than 8.0 for these groups, compared to 5.62 average for the overall population)
- Industrial facilities rated program incentives a 9.14 out of 10, compared to 8.49 for the survey sample overall.

The importance of energy efficiency and the importance of incentive payments as rated by the customer were examined by the amount of the customer's gross realized savings for projects rebated through the QuickSaver program. Table 10-48 displays the results. Respondents with larger kWh savings tended to place the most importance on incentive payments from PNM. Further, participants with smaller projects displayed lower scores on the importance of advice from vendors and contractors.

Table 10-48 Decision Maker Attitudes toward Energy Efficiency and Program Incentives, by QuickSaver Customer Gross Realized Savings

Group Number	***Realized Gross kWh Savings***	***Mean score for importance of advice from vendors / contractors***	***Mean score for importance of rebates***	***Mean score for importance of green image***
4	>40,000	5.00	8.75	5.50
3	20,000 - 40,000	5.77	9.08	6.54
2	10,000 – 20,000	5.00	8.00	4.50
1	<10,000	3.89	8.33	5.72
All Respondents		4.79	8.49	5.62

10.4.4.4 Where Decision Makers get Their Information

Respondents were asked whom they rely on for information about energy efficiency and program opportunities. Respondents were asked to rate the value of a list of sources on a scale of 1-10, with the results summarized in Table 10-49. Highest scores were given to contractors (7.38), friends and colleagues (5.83), and PNM account

representatives (5.57). The low score for staff from DNV-GL is reflective of how the program design reduces contact between DNV-GL and the end-use customer. Thirty percent of respondents indicated that they "don't know" how to score Kema, and the large number of "1" scores are likely due to end-use customers having had no contact with KEMA over the course of their participation. This is in line with the program design of a trade-ally driven small business program.

Table 10-49 Who Respondents Rely on for Information

Information Source	*Mean Score*
A PNM Account Representative	5.57
The PNM website	2.04
Brochures or advertisements	3.43
Trade associations or business groups you belong	2.64
Trade journals or magazines	1.70
Friends and Colleagues	5.30
An architect, engineer or energy consultant	2.81
Equipment vendors	2.72
Contractors	7.38
Staff from DNV-GL	1.20
N	**47**

10.4.4.5 Satisfaction with the Program

Respondents were asked about their levels of satisfaction with selected aspects of the program on a scale of 1 to 10, where 1 is very dissatisfied, 10 is very satisfied. Table 10-50 shows the results. Satisfaction is exceedingly high across all metrics. Lowest satisfaction was listed for "savings on your monthly bill". However, 42.06% of respondents "don't know" how satisfied they are with it. Regardless, the score of 8.22 for this factor is still reasonably high, and overall program satisfaction is very high (9.21).

Table 10-50 Customer Decision Maker Satisfaction with Selected Elements

Element of Program Experience	Mean Score	Don't Know	N
Performance of the Equipment Installed	9.30	0%	**47**
Savings on Your Monthly Bill	8.22	42.6%	**47**
Incentive Amount	9.07	6.4%	**47**
The Effort Required for the Application Process	9.23	0%	**47**
Information Provided by Your PNM Trade Ally	9.17	0%	**47**
Quality of Work Conducted by Your Trade Ally	9.36	0%	**47**
Information Provided by PNM Account Representative	9.28	38.3%	**47**
Time Elapsed Until You Received the Incentive	9.22	12.8%	**47**
Overall Program Experience	9.21	0%	**47**

Seventy-seven percent of participants reported that the energy efficiency measure met their expectations, compared to 2.1% of respondents said that their expectations were not met. In general, the reason given was that the savings on their bill did not match what they had been told they could expect.

Table 10-51 QuickSaver Satisfaction of Customer Expectations

Level of Satisfaction	Percent of Respondents
Met my expectations	76.6%
For the most part	2.1%
No	0%
Don't know	22.2%
N	**47**

10.4.4.6 Installation and Incentives

Customers were asked about their experiences with project implementation. Table 10-52 displays the results. Ninety-one percent of respondents reported that the implementation went smoothly; 8.5% indicated that implementation "for the most part" went smoothly. When asked to detail what had occurred during implementation, responses included:

"Lighting was defective – had to be fixed twice so far"

"The contractor originally ordered the wrong fixtures - delayed 3 weeks."

"Communication issues. Lost papers, missed phone calls, had to re-negotiate price."

Ninety-eight of respondents felt that they received a quality installation. All respondents that indicated that they do not feel they received a quality installation had also indicated some issue with the implementation process.

Table 10-52 Experience with QuickSaver Project Implementation

	% Respondents				
Question	**Yes**	**For the Most Part**	**No**	**Don't Know**	**Total**
Did the implementation go smoothly?	91.5%	8.5%	0%	0%	100%
Did the incentive agreement that you received meet your expectations?	95.7%	0%	0%	4.3%	100%
Do you feel you got a quality installation?	97.8%	0%	2.2%	0%	100%

In addition, 55.3% of respondents said that they would not have had the financial capability to install the equipment without the program incentives. Respondents were then asked an additional question to detail their likelihood of installing without a program-provided incentive.

Table 10-53 Financial Incentive Influence on QuickSaver Installation

If PNM had not provided a financial incentive, would you have installed?	
Definitely would have installed	8.5%
Probably would have installed	14.9%
Probably would not have installed	48.9%
Definitely would not have installed	27.7%
Don't know	0%
N	**47**

10.4.4.7 Future Energy Efficiency Plans

When asked about their future energy efficiency plans, 50.1% indicated that they "probably" would and 21.3% indicated that they "definitely would" complete another

project within the next two years. Respondents were then asked to identify the most likely projects, which are summarized in Figure 10-4.

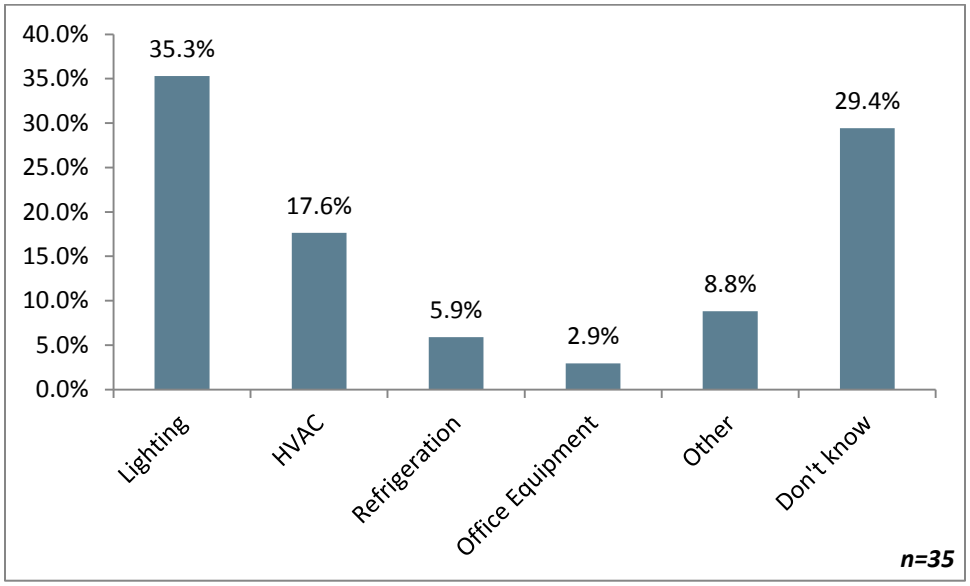

Figure 10-4 Most Likely Energy Efficiency Projects within Two Years

Respondents that stated they were unlikely to implement another project were asked to indicate why not. Seventy-percent of these that stated they are unlikely to complete another project indicated that they have no further need of energy efficiency improvements following their lighting retrofit.

Finally, respondents were asked if they had any comments or suggestions regarding the QuickSaver program. Answers included:

> *"We're thankful for the program and that it is available! It's good for the whole state."*
>
> *"The consultations by PNM and/or contractors should be more thorough and specific on how the lighting will look after installation. My lighting became dimmer and I was initially quite disappointed. (I am getting used to it over time.)"*
>
> *"As a property manager I am taking advantage of this program at several business locations"*
>
> *"Must get the word out about this excellent program! Help my friends' businesses be part of this too. The follow-up for my friends has not been as good."*

"More promotion and getting the word out there. We didn't know about it until approached by a contractor. We would have done it sooner if we had known!"

"It's great and I highly recommend the program."

10.5 Conclusions & Recommendations

Based on the EM&V effort of the 2014 CCP, the Evaluator's conclusions and recommendations are as follows:

10.5.1 Conclusions

1. **The CCP has very high participant satisfaction.** Program participants responded very positively when asked to rate their satisfaction with various components of the program. Satisfaction was high for all metrics, including incentive amounts, service provided by PNM staff, DNV-GL staff, and Trade Allies, ease of application processes, and performance of equipment installed.
2. **The Building Tune-Up channel was not ready for evaluation.** BTU began too late in the program year to support an evaluation. The first evaluation of this program channel will occur in 2015.
3. **QuickSaver is facing increased challenges from market saturation.** Savings from QuickSaver declined by 26.6% compared to the 2013 program year. The Evaluators concluded that this is a result of market saturation and increasingly stringent baselines. The QuickSaver channel has had marked success since 2010, and the opportunities for T12 – T8 retrofits have largely been exhausted as a result.
4. **The program has increased engagement with the grocery sector, resulting in significantly higher refrigeration savings.** Seven percent of Retrofit Rebates savings were from refrigeration improvements, which is a significant increase from 2013 (2%).
5. **Documentation for QuickSaver does not support Effective Useful Life calculations.** There are discrepancies in the data collected for Retrofit Rebates and New Construction compared against QuickSaver. QuickSaver provides much greater detail on the line items installed but does not present the measure lives.
6. **There were significant realization issues with two evaluated large hotel projects.** The Evaluators found two large hotel lighting retrofits to have significant realization issues. These issues were similar to those identified in the 2009 evaluation, and had until now been corrected by program implementation staff. The issues surround the use of whole-facility average hours when a

significant portion of a retrofit is in guest rooms; when this occurs, verified kWh savings drop significantly.

10.5.2 Recommendations

Based on the EM&V findings, the Evaluator recommends the following:

1. **Remove LED Case Lighting from the New Construction program channel.** The Evaluators have found that over the last 18 months, LED lighting has become significantly more prevalent in the sale of new reach-in cases. It has become standard practice with the construction of new grocery facilities to use this equipment, and as such this is not a viable net savings opportunity. PNM should continue to incent this measure for Retrofit Rebates and QuickSaver.
2. **Increase QA on hotel lighting retrofits and apply sub-space hours of use.** For most facility types, the whole-facility average value is an adequate approximation of energy use. For hotels, this can change significantly if a retrofit is centered around guest room lighting. Program staff should exclude guest rooms from the facility-average hours of use calculation, and apply 799 annual hours to these retrofits. Other facility types do not demonstrate such extreme differences in operation between sub-spaces so this process would be warranted only for hotels.
3. **Add measure lives to QuickSaver tracking.** The lifetime kWh field in the Retrofit Rebates and New Construction data is very useful in supporting EM&V; if possible, program staff should add a similar field to QuickSaver tracking.
4. **Verify that all savings are reported.** The Evaluators found numerous instances where tracking data for custom projects failed to show a claimed kW or lifetime kWh value. These values were filled in based on EULs from other similar projects. In the final tracking sent for this program, the total of missing values was as follows:
    a. 9 Retrofit Rebates projects did not list a lifetime kWh;
    b. AC Tune-ups did not have a peak kW entry, resulting in zero kW savings for the Building Tune-up component.

11. Large Commercial & Industrial Self Direct

Customers with annual use exceeding seven million kWh may receive credits for qualifying incremental expenditures made towards energy efficiency improvements at their facilities. These credits may be used to offset up to 70.0% of the energy efficiency tariff rider.

In accordance with 13-00310-UT Final Rule, the Evaluators must review all Self Direct projects.

11.1 M&V Summary

In 2014, there were two Self Direct projects. The projects were as follows:

- **PNM2014-SD1:** This project was an exterior lighting retrofit at an educational facility. This project included the installation of 101 4' 1-lamp 25W T8 fixtures, replacing 40W T12 fixtures. The Evaluators verified that lighting operated 8,760. As a result, gross realization was 164.5%.
- **PNM2014-SD2:** This project included the installation of a VFD on a chilled water pump at a central cooling plant for an educational facility. The facility provided a summary M&V report including usage data associated with the chilled water pump. The Evaluators used this data in replicating the facility's analysis, resulting in 100% gross realization.

The Evaluators completed on-site verification at both projects. The verified Self Direct savings are summarized in Table 11-1. Net-to-gross ratio for this program is 100%. Reports for Self-Direct projects are included in Appendix B.

Table 11-1 Self Direct Realization Summary

Project	*Expected kWh*	*Verified kWh*	*kWh Realization*	*Expected kW*	*Verified kW*	*kW Realization*
PNM2014-SD1	11,944	19,651	164.5%	0.0	2.8	NA
PNM2014-SD2	215,296	215,296	100%	64.0	64.0	100.0%
Total	227,240	234,947	103.4%	64.0	66.8	104.4%

12. Appendix A: Tables for PNM Annual Report

This section contains tables formatted for PNM's annual report submission.

Program	*Participants or Units*	*Annual Savings (kWh)*	*Annual Savings (kW)*	*Lifetime Savings (kWh)*	*Total Program Costs*
Residential Lighting	1,030,935	22,932,889	2,641.3	178,876,536	$1,808,435
Refrigerator Recycling	8,399	6,916,375	1,182.9	33,890,237	$1,317,576
Low Income Easy Savings	6,281	1,168,266	130.5	10,502,711	$399,826
LI CFL & Refrigerator	3939	309,840	47.5	4,171,254	$150,027
Whole House	952	367,586	48.0	3,289,913	$775,898
LI Home Efficiency	882	950,212	90.3	14,088,454	$914,610
Residential Stay Cool	2,267	1,316,600	1,090.7	19,517,078	$773,650
Student Efficiency Kits	4505	815,448	37.9	7,516,068	$289,942
Home Energy Reports	56,171	4,340,262	789.1	4,340,262	$511,199
Community CFL	5,090	90,353	10.6	632,468	$11,448
Commercial Comprehensive	812	34,330,508	5,970.5	388,461,540	$5,573,705
Large C&I Self-Direct	2	234,947	66.8	3,524,205	$0
Power Saver	48,002	481,590	42,826.8	481,590	$6,720,369
Peak Saver	110	725,084	18,054.0	725,084	$1,695,400
Market Transformation	0	0	0.0	0	$316,229
Aggregate Portfolio	1,168,347	74,979,960	72,986.9	670,017,400	$21,258,314

Program	*Participants or Units*	*Participant Costs*	*Cost per kWh Saved*	*2014 Economic Benefits*	*Total Economic Benefits*
Residential Lighting	1,030,935	$2,263,933	$0.01	$838,848	$8,148,886
Refrigerator Recycling	8,399	-	$0.04	$293,815	$1,573,404
Low Income Easy Savings	6,281	-	$0.04	$129,562	$1,470,591
LI CFL & Refrigerator	3939	-	$0.04	$15,116	$291,041
Whole House	952	$16,208	$0.15	$26,097	$297,928
LI Home Efficiency	882	-	$0.24	$49,694	$960,086
Residential Stay Cool	2,267	$82,935	$0.04	$147,597	$2,475,441
Student Efficiency Kits	4505	-	$0.04	$60,044	$731,353
Home Energy Reports	56,171	-	$0.12	$361,889	$361,889
Community CFL	5,090	-	$0.02	$3,325	$27,408
Commercial Comprehensive	812	$12,013,308	$0.01	$1,507,938	$21,951,498
Large C&I Self-Direct	2		$0.00	$13,067	$247,141
Power Saver	48,002	-	$13.95	$5,577,361	$5,577,361
Peak Saver	110	-	$2.34	$2,364,613	$2,364,613
Market Transformation	0	-	NA	-	-
Aggregate Portfolio	1,168,347	$14,376,384	$0.03	$11,388,966	$46,478,640