Evaluation of 2012
Public Service Company of New Mexico
Energy Efficiency & Demand Response Portfolio

Submitted to:

New Mexico Energy Efficiency Evaluation Committee

March 2013

Final

ADM Associates, Inc.

Prepared by:

Adam Thomas
Sung Park, P.E.
Jeremy Offenstein, Ph.D
Brian Harold
Shelby Linerud
Don Dohrmann, Ph.D

Corporate Headquarters:
3239 Ramos Circle
Sacramento, CA 95827
Tel: (916) 363-8383

ADM Associates Inc.
Energy Research & Evaluation

200 Brown Road
Suite 208
Fremont, CA 94539
Tel: (510) 371-0763

Acknowledgements

We would like to thank the staff at Public Service of New Mexico for their time and effort in contributing to this evaluation effort. This project was conducted with regular coordination with staff at PNM, including senior management, program managers, and account executives.

Further, we would like to acknowledge our gratitude towards PNM customers, implementation contractor staff, and trade allies. Their active participation allowed for the evaluation team to collect all needed data for this effort.

Corporate Headquarters:
3239 Ramos Circle
Sacramento, CA 95827
Tel: (916) 363-8383

ADM Associates Inc.
Energy Research & Evaluation

200 Brown Road
Suite 208
Fremont, CA 94539
Tel: (510) 371-0763

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 2012 Demand Side Management (DSM) portfolio by the Public Service Company of New Mexico (PNM). In 2012, the PNM portfolio consisted of six residential and four non-residential programs. ADM estimated gross realization, net savings, and cost-effectiveness for the 10 evaluated programs.

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 2012, the PNM DSM portfolio contained the following programs:

- Residential Lighting
- Residential Refrigerator Recycling
- Market Transformation
- Low Income Easy Savings
- Low Income CFL & Refrigerator Replacement
- ENERGY STAR Homes
- PNM Peak Saver
- PNM Power Saver
- Community CFL
- Energy $mart for Renters
- Student Living Wise
- Commercial Comprehensive (Encompassing Retrofit Rebates, New Construction Rebates, and QuickSaver Direct Install components)

For 2012, ADM evaluated a subset of the portfolio. The programs evaluated for this program year include:

- Commercial Comprehensive;

- Residential Refrigerator Recycling;
- Residential Lighting;
- 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. ADM then estimated free-ridership and associated net-to-gross ratios (NTGRs) for the evaluated programs. Table 1-1 and 1-2 below present the gross and net impact by program.

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	4,219	5,083	33,148,126	41,641,933	232,036,882	291,493,531	125.6%
Refrigerator Recycling	1,746	1,671	10,195,545	9,773,014	49,550,349	47,511,340	95.8%
Low Income Easy Savings	199	199	2,164,242	2,164,242	16,231,813	16,231,813	100.0%
LI CFL & Refrigerator	116	116	1,029,999	1,029,999	13,016,489	13,016,489	100.0%
Community CFL	46	46	396,369	396,369	2,774,583	2,774,583	100.0%
Energy $mart for Renters	12	12	103,275	103,275	722,925	722,925	100.0%
ENERGY STAR New Homes	246	246	342,200	342,200	10,266,000	10,266,000	100.0%
Commercial Comprehensive	8,319	9,805	42,414,994	42,074,260	476,860,732	476,138,651	99.2%
Large C&I Self-Direct	22	22	167,568	167,568	2,513,520	2,513,520	100.0%
Total	14,925	17,200	89,962,318	97,692,860	803,973,293	860,668,852	108.6%

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	2,957	3,816	23,230,775	31,222,472	162,615,422	218,557,304	134.4%
Refrigerator Recycling	1,218	1,090	7,130,798	6,372,005	34,679,546	30,997,934	89.4%
Low Income Easy Savings	199	199	2,164,242	2,164,242	16,231,813	16,231,813	100.0%
LI CFL & Refrigerator	116	116	1,029,999	1,029,999	13,016,489	13,016,489	100.0%
Community CFL	28	28	241,785	241,785	1,692,495	1,692,495	100.0%
Energy $mart for Renters	12	12	103,275	103,275	722,925	722,925	100.0%
ENERGY STAR New Homes	197	197	274,535	274,535	8,236,063	8,236,063	100.0%
Commercial Comprehensive	6,849	8,141	34,597,987	36,563,728	382,346,710	410,459,329	105.7%
Large C&I Self-Direct	22	22	167,568	167,568	2,513,520	2,513,520	100.0%
Total	11,598	13,621	68,940,964	78,139,609	622,054,983	702,427,872	113.3%

Additionally, ADM evaluated the PNM Peak Saver and Power Saver programs, providing independent verification of the per-unit kW Factor and total available demand reduction. The results of these evaluations are presented in

Table 1-3 and

Table 1-4 below.

Table 1-3 PNM Power Saver Evaluation Results

Sector	Peak 15-Minute kW Factor	# Units	Available Demand Reduction (MW)	kWh Savings
Res & Small Commercial	.983	32,339	31.79	404,353
Medium Commercial	1.35	5,068	6.83	174,814
Total	.968[1]	37,397	38.62	579,167

Table 1-4 PNM Peak Saver Evaluation Results

Month	Nominated kW	Verified kW	Realization Rate	kWh Savings
June	22,047	18,484	83.8%	397,761
July	15,000	19,729	131.5%	62,516
August	16,390	19,952	121.7%	94,293
September	16,818	17,731	105.4%	47,534
Total:	17,564	18,795	107.0%	602,103

Finally, ADM estimated cost-effectiveness of the 2012 programs and overall portfolio using the Total Resource Cost (TRC) test and Utility Cost (UC) test. The results are provided in Table 1-5 below.

Table 1-5 Cost Effectiveness Testing by Program

Program	NPV of TRC Benefits	NPV of PAC Benefits	NPV of TRC Costs	NPV of PAC Costs	TRC	UC
Refrigerator Recycling	$2,159,212	$2,159,212	$814,605	$1,201,505	2.65	1.80
Residential Lighting	$22,109,122	$22,109,122	3,224,361	$1,915,937	6.86	11.54
Commercial Comprehensive	$29,194,942	$29,194,942	$9,032,852	$5,736,544	3.23	5.09
ES New Homes	$1,906,195	$1,242,421	$1,086,148	$271,134	1.76	4.58
Community CFL	$116,434	$116,434	$36,518	$25,030	3.19	4.65
Easy Savings	$1,968,255	$1,264,451	$512,401	$512,401	3.84	2.47
LI Frig & CFL	$914,348	$914,348	$660,676	$660,676	1.35	1.35
Energy Smart for Renters	$47,603	$47,603	$109,977	$109,977	.43	.43
Market Transformation	$0	$0	$84,565	$84,565	0.0	0.0
Large Customer Self-Direct	$171,610	$171,610	$0	$0	0.0	0.0
Load Management						
Power Saver	$4,451,550	$4,451,550	$3,875,750	$5,393,244	1.15	.83
Peak Saver	$2,202,926	$2,202,926	$1,172,106	$1,923,906	1.88	1.15
Aggregate Portfolio:	$65,242,197	$63,874,619	$20,609,959	$17,834,919	3.17	3.58

[1] Weighted average of Residential/Small Commercial & Medium Commercial kW Factors

One program (Energy $mart for Renters) failed TRC testing. This program had very low participation rates and savings, and as such did not achieve economies of scale in generating net benefits. Further, as a low income program, the implementation cost is higher than for standard programs.

Despite this, the PNM 2012 portfolio was largely successful in producing cost-effective energy savings. In 2012, the PNM DSM portfolio produced:

- $25,480,963 in net benefits to the residential segment (excluding low income programs);
- $2,930,206 in net benefits from low income programs;
- $29,194,942 in net benefits to the commercial and industrial sectors; and
- $6,654,476 in net benefits from load management programs.

After evaluating the high impact programs of the PNM DSM portfolio, ADM concluded that:

- **The programs are mature and established.** PNM and third party implementation staff have largely incorporated evaluation findings into their implementation processes and savings estimates, providing for effectively-delivered programs with reliable savings estimates.
- **Implementation contractors have a firm understanding of the local market conditions.** Third party implementers used by PNM have at this point implemented for 4-5 program years. This length of experience has enabled the implementation contractors to build an understanding of the local market and momentum in their program administration. Particular examples of this include the Commercial Comprehensive program in developing long-standing relationships with New Mexico business customers and the Residential Lighting Program in drawing participation a wide swath of both small and large retailers.
- **The programs responsible for the bulk of portfolio savings are likely to remain cost-effective in the face of declining avoided costs.** PNM's larger programs have observed declining costs per kWh for implementation due to the efficiencies gained with program maturity. ADM found through parametric testing that programs responsible for over 95% of PNM's 2012 savings have high enough TRC scores to remain cost-effective after applying lower avoided cost levels.

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, ADM 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 ADM following completion of the evaluation effort
- *Deemed Savings* – A savings estimate for homogenous measures, in which an assumed average savings across a large number of rebated units is applied (e.g., assuming 398 kWh savings for a low-flow showerhead)
- *Gross Savings* – Energy or demand savings as determined through engineering analysis and verification
- *Gross Realization Rate* – Ratio of Ex Post Savings / Ex Ante Savings (e.g. If ADM verifies 300 kWh per showerhead, Gross Realization Rate = 300/398 = 75%)
- *Free-Ridership* – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program
- *Net Savings* – Gross savings factoring off free-ridership, (eg., 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*[2] – 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

ADM's methodology in the evaluation of the 2012 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, ADM'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 the 2009-2011 program years, ADM has been able to expand upon the 2012 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 Lighting was evaluated by reviewing the deemed savings calculations for a census of

[2] TRC and PAC are explained in greater detail in Section 2.6

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), ADM 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, ADM then applied a finite population correction factor, defined as:

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

Where

n_0 = Sample Required for Large Population

N = Size of Population

n = Corrected Sample

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. ADM 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 2012 PNM Commercial Comprehensive Program had a CV of 6.74 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 55, with one certainty stratum and 4 sample strata.

2.4.3 Free-Ridership

In determining ex post net savings for the PNM DSM portfolio, ADM 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), ADM 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, ADM 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. A participant that was financially able to purchase high efficiency lighting, for example, could still be scored at 0% free-ridership if it is demonstrated that:

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

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

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

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

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

NTGR = 1 – % Free-Ridership

2.5 Data Collection

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

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

2.5.1 Telephone Surveying

ADM conducted a large volume of telephone surveys in evaluating the 2012 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***
Residential Refrigerator Recycling Participant Surveying	280
Residential Refrigerator Recycling Non-Participant Surveying	200
Residential Lighting – Intercept	96
Residential Lighting –Follow-Up (Subset of Intercept)	68
Commercial Comprehensive – Retrofit Rebates	75
Commercial Comprehensive – New Construction Rebates	7
Commercial Comprehensive – Quick Saver Participants	108
Total Surveys:	834

Surveys with business program participants, PNM staff, and trade allies were conducted by ADM staff. Surveys with residential program participants were conducted by Research America, 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, ADM 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*
Residential Lighting (Store Visits)	8
Commercial Comprehensive – Retrofit	18
Commercial Comprehensive – New Construction	6
Commercial Comprehensive – Quick Saver	21
Total	53

2.6 Cost-Effectiveness Testing

In evaluating the 2012 PNM DSM Portfolio, ADM performed cost-effectiveness testing at the program and portfolio levels. ADM performed the Total Resource Cost (TRC) UC Cost (UC) test.

2.6.1 Total Resource Cost Test

The TRC value is defined as:

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

The parameters for this equation are defined in Table 2-3 below.

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:

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

Most terms in this equation are defined and calculated in the same manner as the components of the TRC test. Where the 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 (PSP) 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. ADM 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 Res & 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 2012 program year. This provides estimates of the value of the resource developed by the program implementation staff.

3.3 PNM Power Saver Program

ADM estimated the available critical peak reduction from the PPSP by analysis of metered data from the curtailment group on the M&V Events in 2012. The sample of 293 metered units was determined by analysis of customer load data in the 2011 evaluation by ADM.

3.3.1 Residential & Small Commercial kW Factor Methodology

The residential kW Factor is calculated as follows:

- The kW Factor is determined as the maximum difference in 15-minute rolling average of 5-minute interval metered kW between a curtailment group and a control group during an M&V Event;
- To qualify as an M&V Event, the event must cover 3:00 – 6:00 PM and have at least (1) hour in that timeframe in which the ambient temperature exceeds 97 deg F in Albuquerque, NM.
- The kW Factor is then normalized to match population tonnage, should population tonnage differ from metered sample tonnage

Based on this analysis, ADM determined a per-unit kW Factor of .98.

3.3.2 Residential & Small Commercial Sample Design

The sample design for Residential & Small Commercial was stratified by tonnage and region, in order to ensure representativeness of the overall population. Table 3-1 below summarizes the sample stratification for the Residential & Small Commercial group.

Table 3-1 Power Saver Res & Small Commercial Sample Design

Region	***Cities Included***	***Tonnage***	***# Sample Points***	***% of M&V Count***
Central	Albuquerque, Corrales, Rio Rancho, Los Ranchos Albuquerque, Bosque Farms. Bernalillo, Algodones, Placitas, Sandia Park	≤ 1.5	55	18.8%
		= 2.0	68	23.2%
		2.5 ≤ … ≤3.5	63	21.5%
		≥ 4.0	61	20.8%
North	Santa Fe	≤ 1.5	5	1.7%
		= 2	8	2.7%
		2.5 ≤ … ≤3.5	5	1.7%
		≥ 4	5	1.7%
South	Belen, Los Lunas, Tijeras	≤ 3.0	5	1.7%
		≥ 3.5	6	2.0%
Southern NM	Alamogordo, Silver City, Deming, Lordsburg	≤ 3.0	7	2.4%
		≥ 3.5	5	1.7%

This sample aligned with the population in being representative of both size and geography.

3.3.3 kW Factor Calculation

In the 2012 cooling season, there were seven qualifying M&V Events. These events occurred on:

- June 18th;
- June 20th;
- June 26th;
- June 27th;
- June 28th;
- June 29th; and
- July 31st.

Table 3-2 below summarizes PNM Power Saver Residential & Small Commercial performance during 2012 M&V Events.

Table 3-2 Residential & Small Commercial M&V Event Performance Summary

Event Date	Event Start Time (MDT)	Event End Time (MDT)	# Qualifying M&V Hours[3]	Peak 15 Minute Reduction
June 18th	2:00 PM	6:00 PM	2	.222
June 20th	2:00 PM	6:00 PM	1	.839
June 26th	2:00 PM	6:00 PM	1	.892
June 27th	2:00 PM	6:00 PM	2	.855
June 28th	2:00 PM	6:00 PM	4	.983
June 29th	2:00 PM	6:00 PM	3	.918
July 31st	2:00 PM	6:00 PM	1	.515

The highlighted cell represents the peak 15 minute kW reduction, calculated from rolling averages of three 5-minute interval data points. This reduction occurred between the hours of 5:00 and 6:00 PM on June 28th. Figure 3-1 below presents the load profiles of the curtailment and control groups during this event.

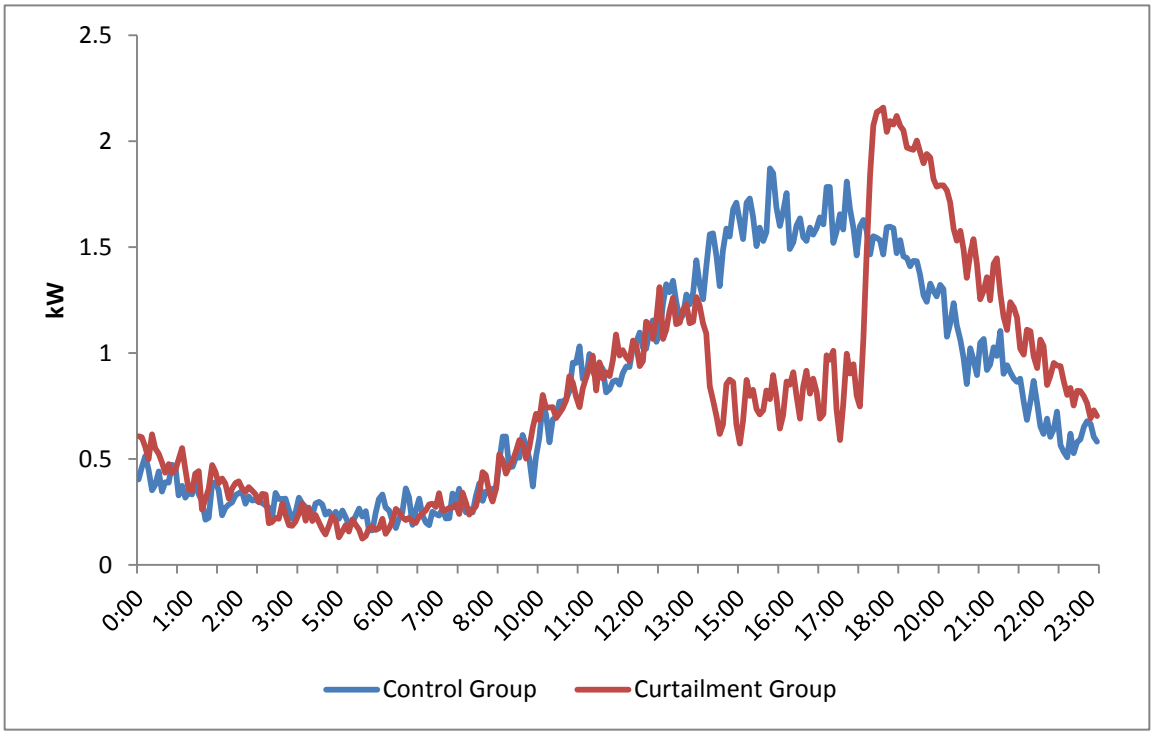

Figure 3-1 June 28th Load Profile: Residential & Small Commercial

[3] To qualify as an M&V hour, the temperature at the Albuquerque International Sunport must be at least 97 degrees F during the hours of 3:00 – 6:00 PM.

The control group closely mirrors the curtailment group for the hours leading up to the event.

3.3.1 Validity Tests of Control Group

In order to assess the representativeness of the control group, ADM compared the load profiles from the M&V Event Days. Table 3-3 summarizes the loads of the two groups in the two hours preceding curtailment on June 28th, 2012,

Table 3-3 Curtailment & Control Group Comparison – Residential & Small Commercial, June 28th 2012

Group	***kW Preceding Curtailment***
Curtailment	1.111
Control	1.135
Difference	.024

As a further check, the two groups' differences in kW are tested for statistical significance. This is conducted on each of the M&V Event days. The two distributions are evaluated via the T-Test[4], using data points for the hours of the day prior to curtailment.

Table 3-4 Statistical Significance Testing of Curtailment & Control Groups on M&V Event Days

Event Date	***P-Value[5]***	***Mean[6]***	***Standard Deviation***
June 18th	.685	-.046	.034
June 20th	.795	-.026	.055
June 26th	.767	-.033	-059
June 27th	.715	-.044	.085
June 28th	.974	-.004	.053
June 29th	.786	-.035	.069

[4] The T-Test is defined as $\frac{\bar{X}_1 - \bar{X}_2}{S_{x1x2}\sqrt{\frac{2}{n}}}$ where X_1 and X_2 are means of the two distributions, S_{x1x2} is the pooled standard deviation, and n is the number of observations in each distribution.

[5] P-Value represents the probability that the two distributions are statistically the same; if a P-Value < .10, then the two groups are said to have statistically significant differences at the 90/10 Confidence & Precision level.

[6] Mean and Standard Deviation values are for the difference between curtailment and control groups in the hours of the day prior to curtailment.

July 31st	.242	-.126	.083

The P-Values exceed the .10 threshold to show statistically significant differences by a wide margin. Placement in curtailment and control groups is subject to 20% rotation at each event, and with the stratified sample design (by tonnage and by geography) there are random rotations that cause the groups to at times be less representative. However, this deviation in representativeness never reaches statistical significance. Given this, ADM concluded that there is no inter-group bias.

3.3.2 Residential & Small Commercial Event Summaries

ADM calculated hourly kW reductions for all hours of all events in 2012. These values were calculated on hourly intervals instead of 15-minute in order to be of better use in PNM's forecast tools. Table 3-5 below summarizes the average hourly per-unit kW reductions for this group by event.

Table 3-5 Hourly kW Reductions by Event – Res & Small Commercial

Date	2:00 – 3:00 PM	3:00 – 4:00 PM	4:00 – 5:00 PM	5:00 – 6:00 PM
June 18th	-.016	-.141	-.098	.048
June 20th	.454	.556	.565	.725
June 25th	.476	.574	.740	.866
June 26th	.438	.731	.685	.786
June 27th	.540	.771	.752	.817
June 28th	.639	.891	.787	.805
June 29th	.680	.797	.623	.702
July 31st	.206	.387	.433	.360
August 9th	-	-	.231	.393
August 10th	.260	.642	.593	.602
September 4th	.355	.487	.498	.622
Average:	.403	.570	.528	.611

The load profiles of the curtailment and control groups are displayed in Figure 3-2 through Figure 3-12 to follow.

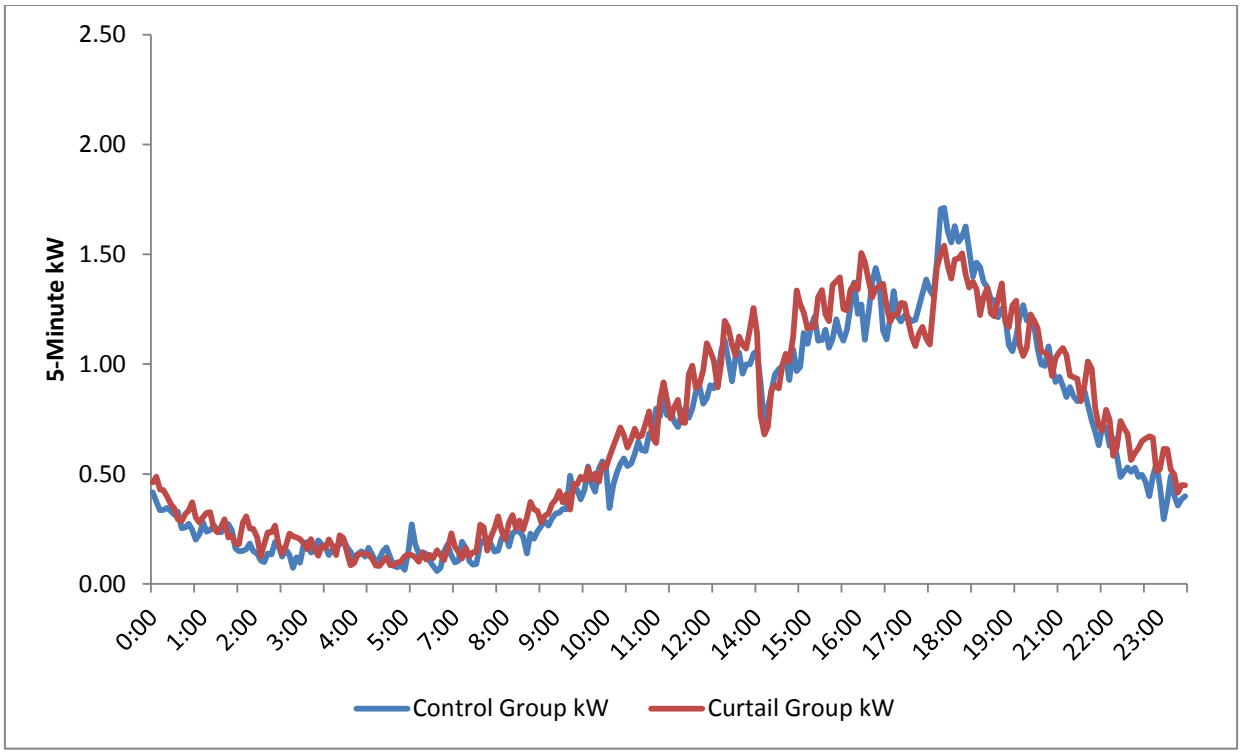

Figure 3-2 June 18th Event Load Profile – Res & Small Commercial

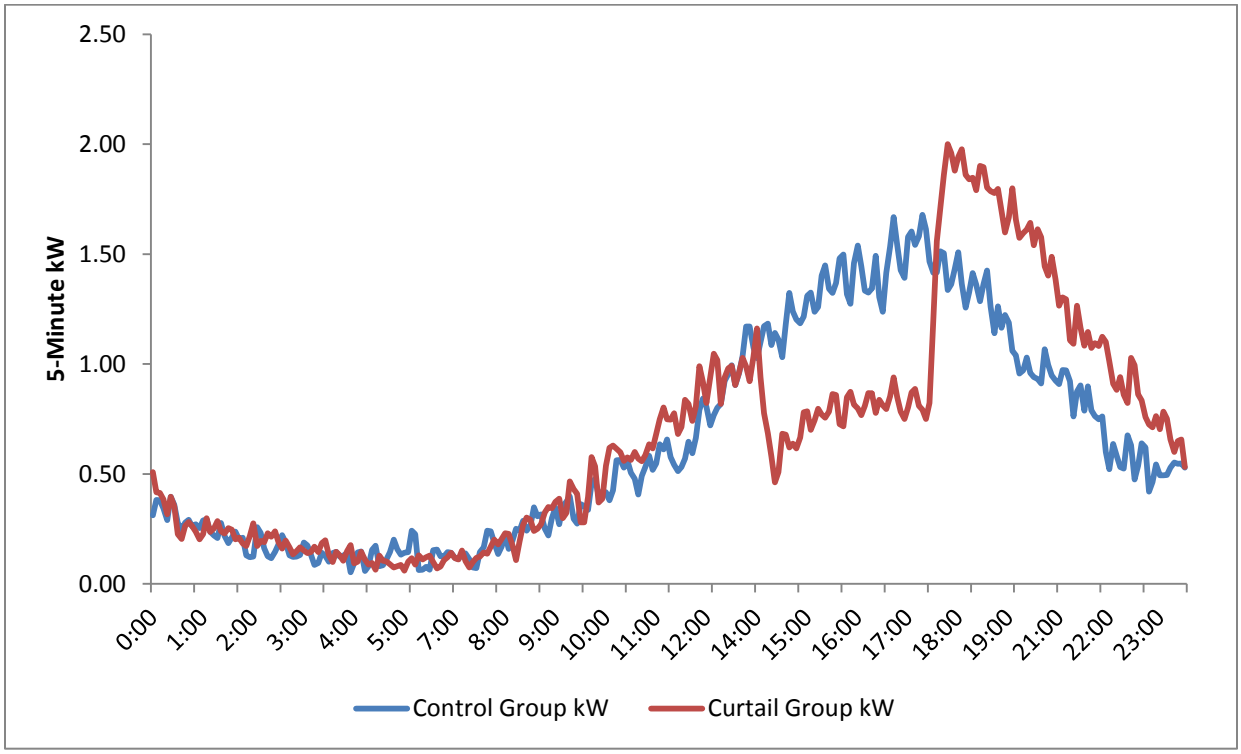

Figure 3-3 June 20th Event Load Profile – Res & Small Commercial

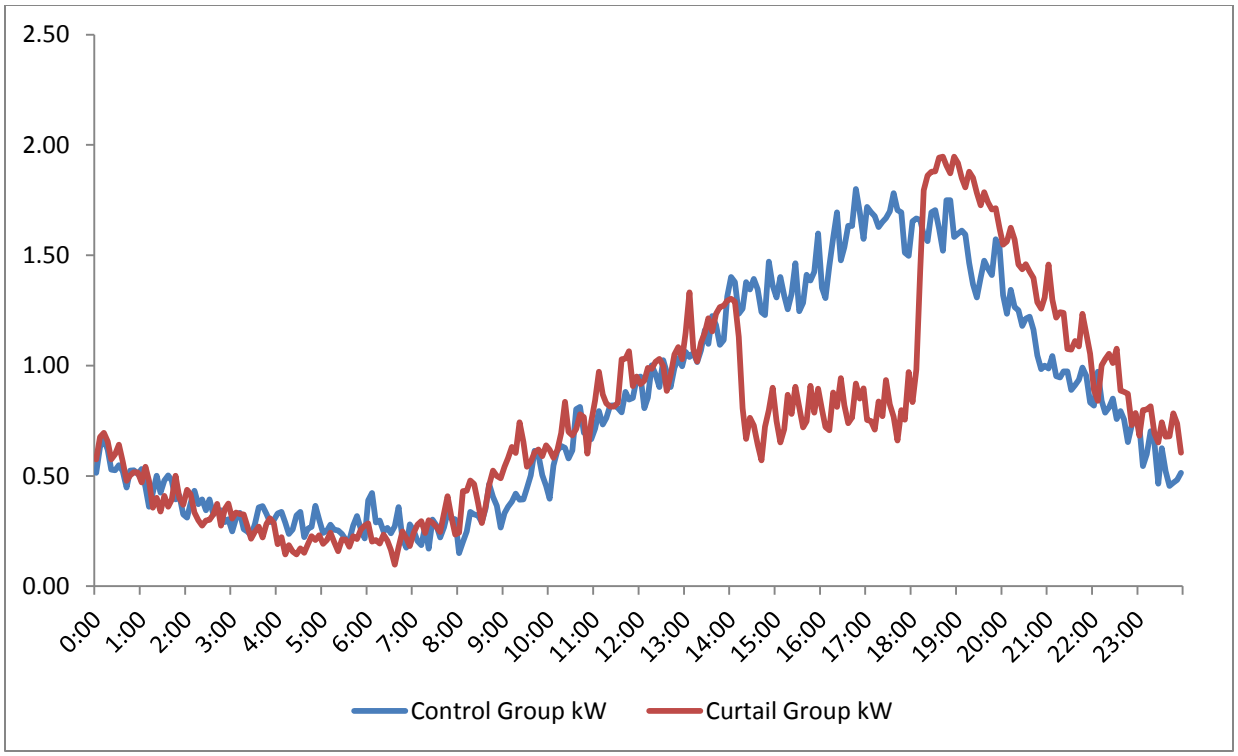

Figure 3-4 June 25th Event Load Profile – Res & Small Commercial

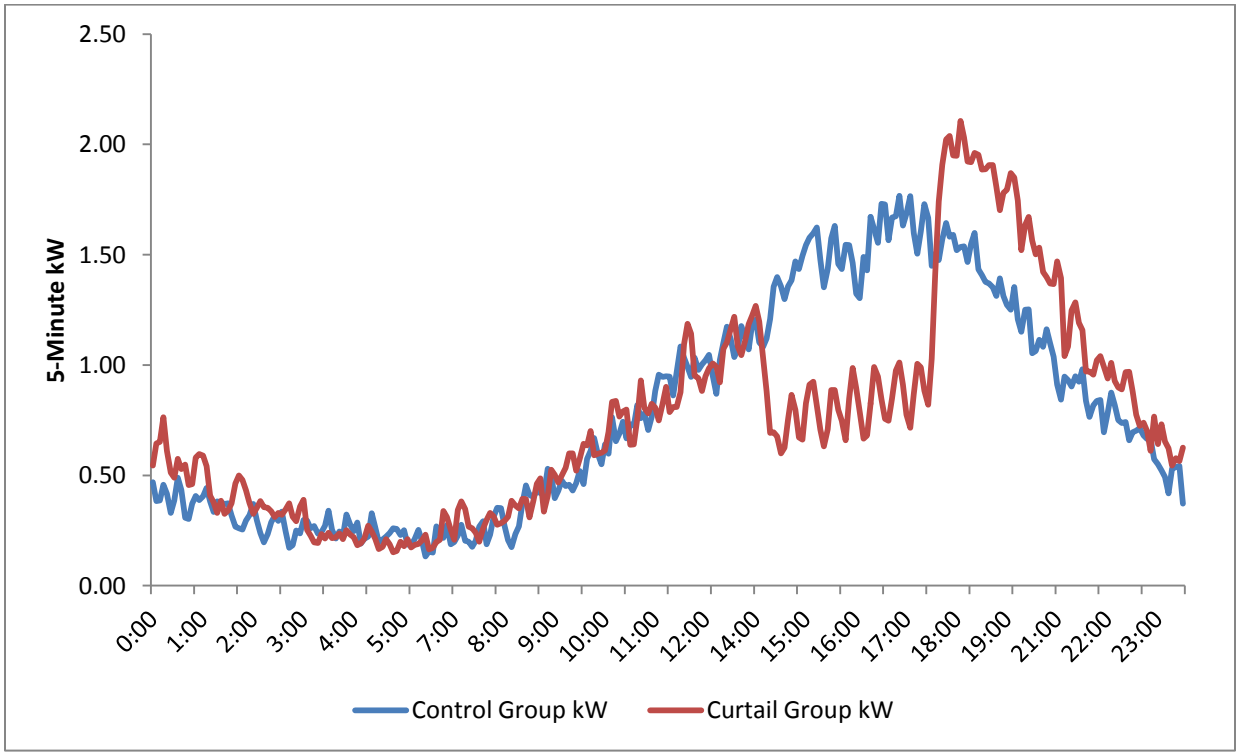

Figure 3-5 June 26th Event Load Profile – Res & Small Commercial

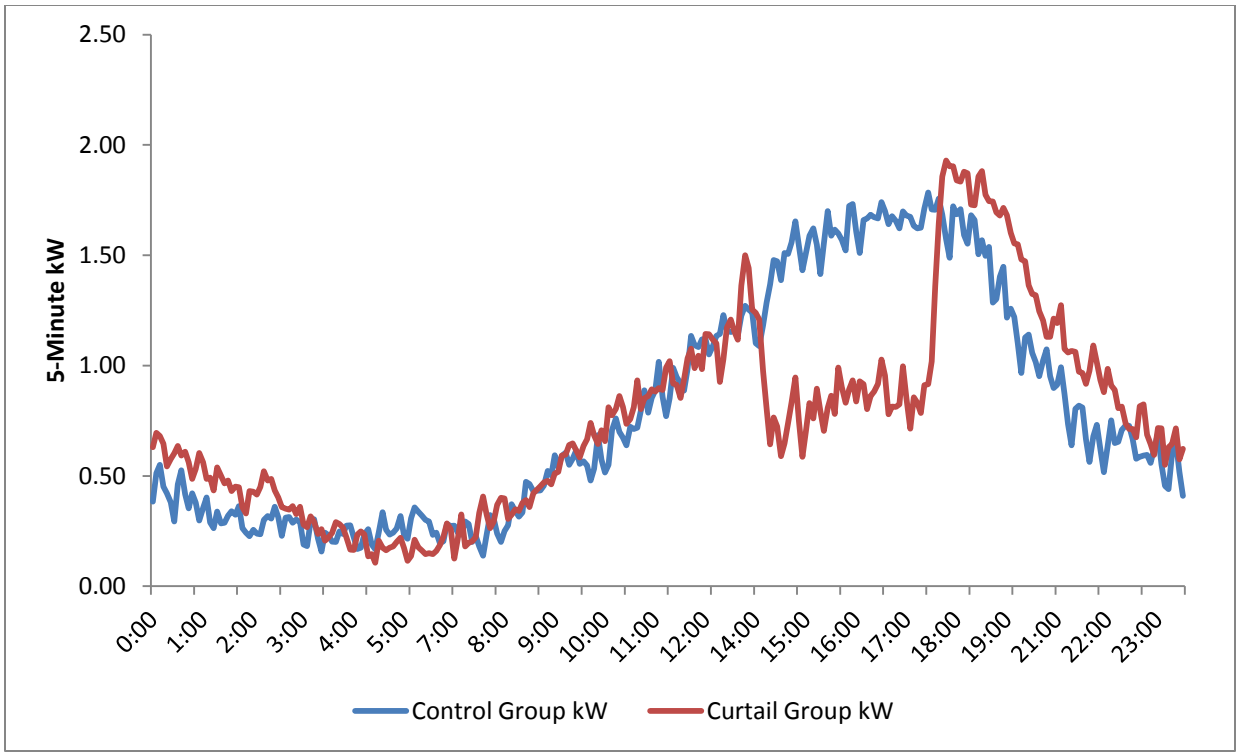

Figure 3-6 June 27th Event Load Profile – Res & Small Commercial

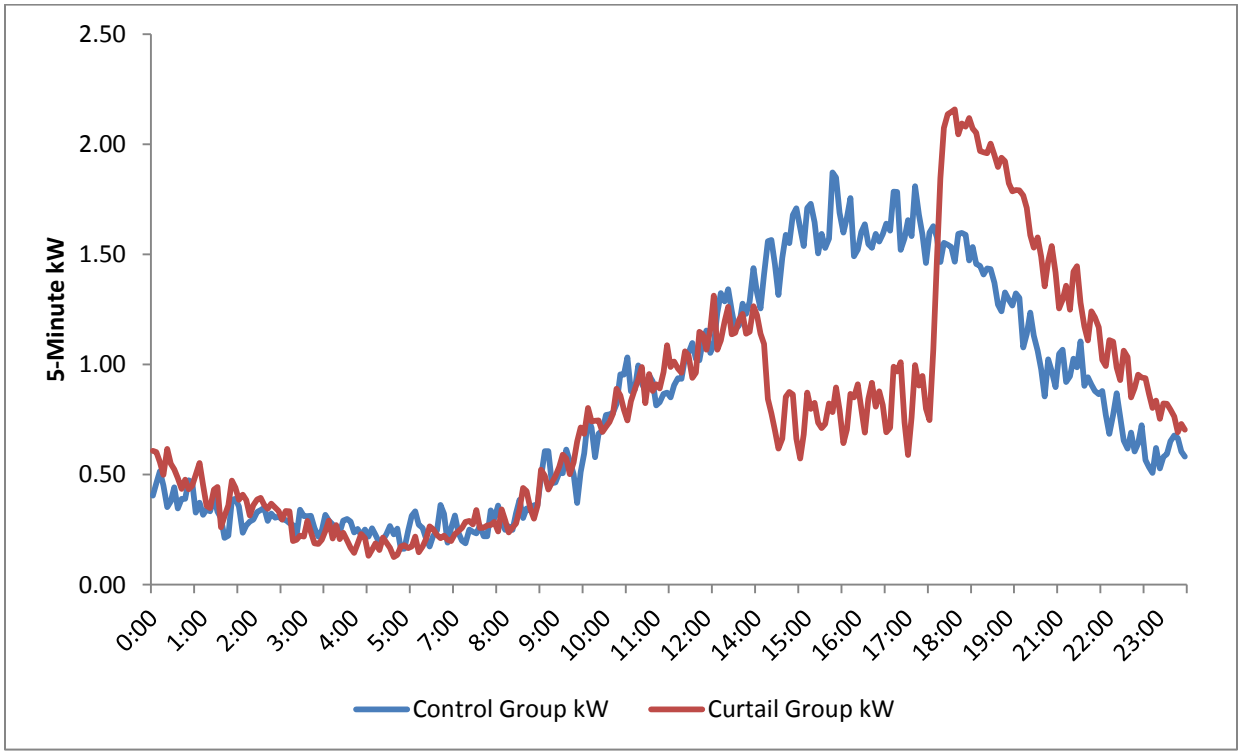

Figure 3-7 June 28th Event Load Profile – Res & Small Commercial

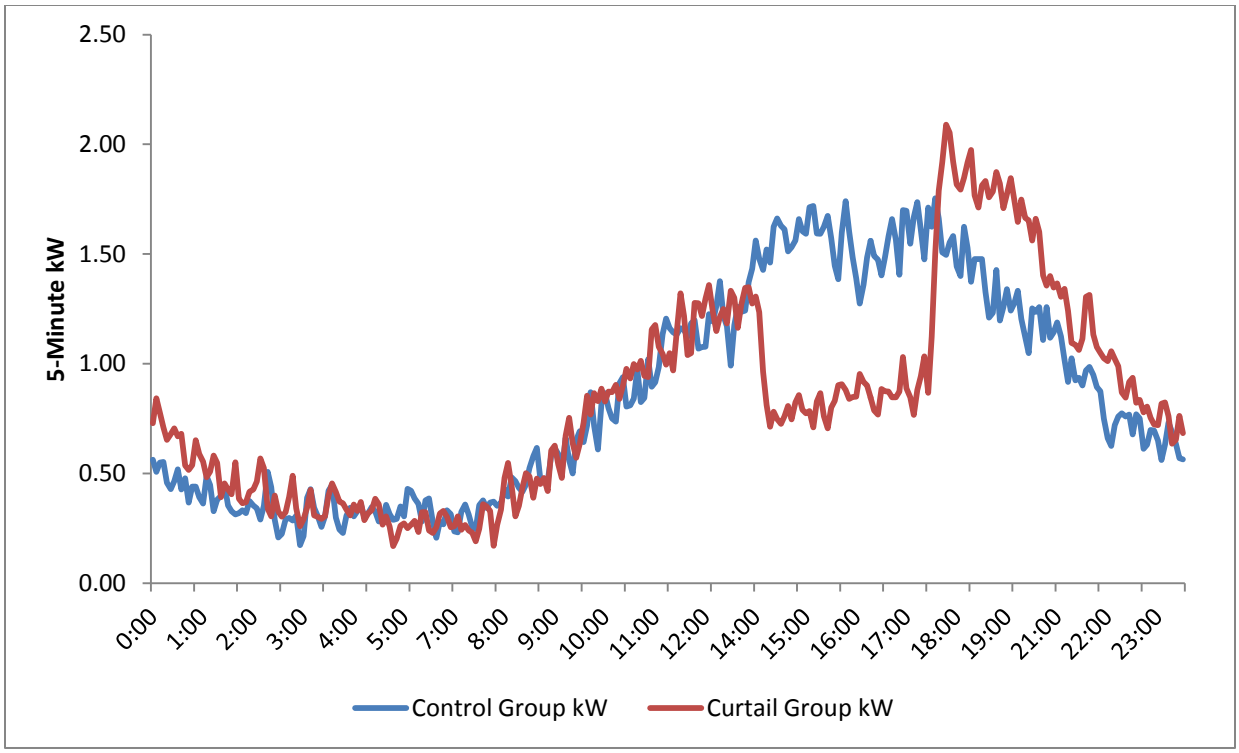

Figure 3-8 June 29th Event Load Profile – Res & Small Commercial

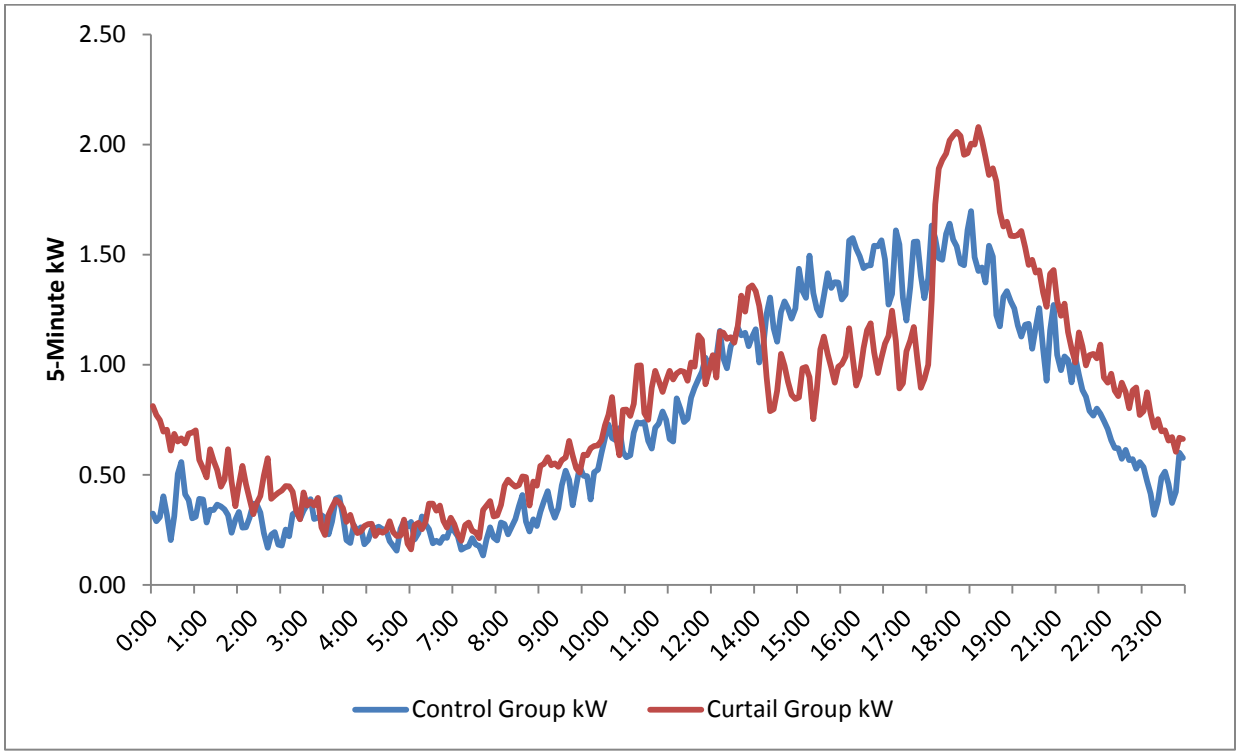

Figure 3-9 July 31st Event Load Profile – Res & Small Commercial

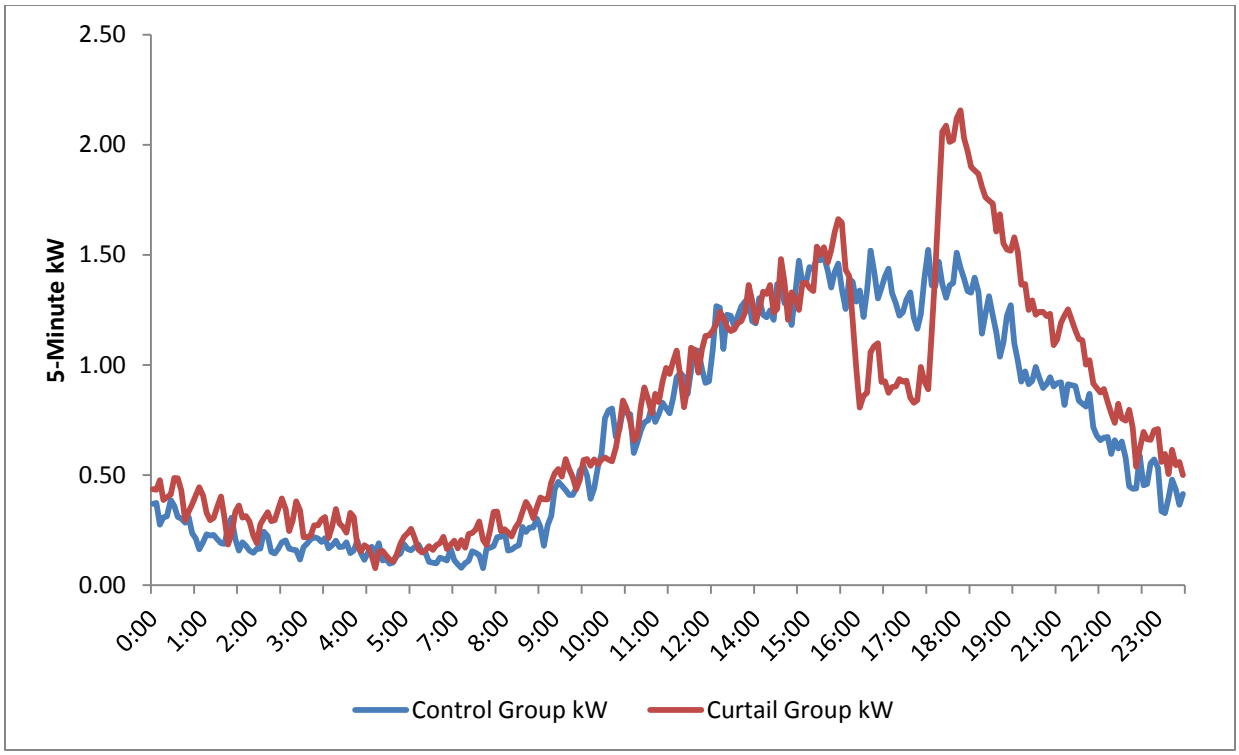

Figure 3-10 August 9th Event Load Profile – Res & Small Commercial

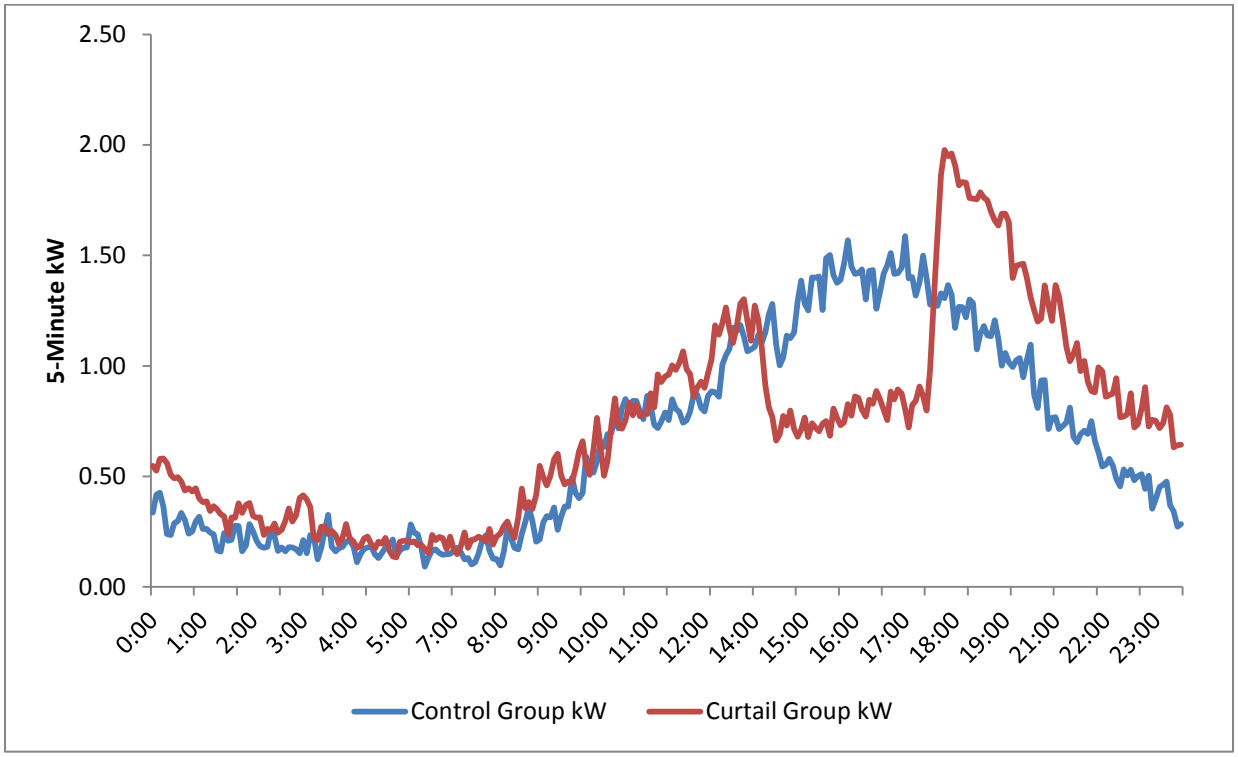

Figure 3-11 August 10th Event Load Profile – Res & Small Commercial

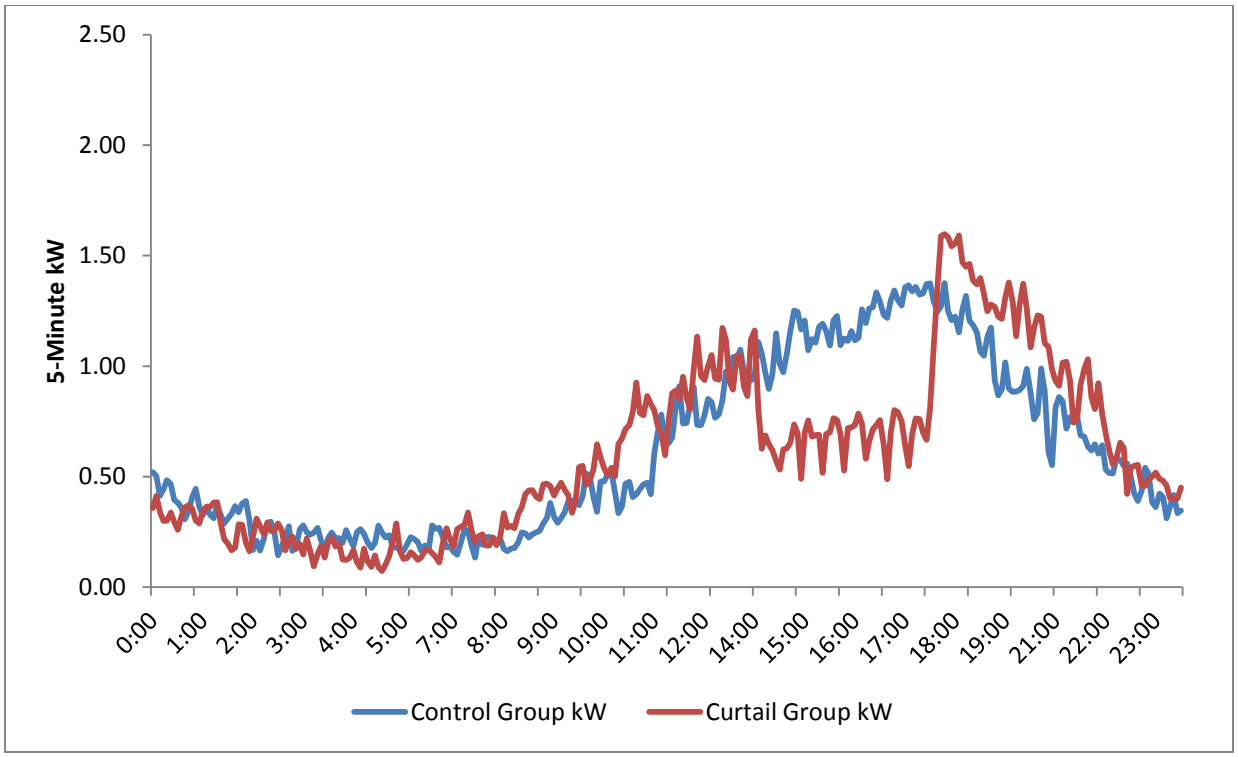

Figure 3-12 September 4th Event Load Profile – Res & Small Commercial

Additionally, ADM calculated hourly reductions subdivided by event hour number (i.e., average reduction for Hour 1 of all events, Hour 2 of all events, etc.). These results are summarized in Table 3-6 below.

Table 3-6 kW Reductions by Event Hour Number – Res & Small Commercial

Date	Hour 1	Hour 2	Hour 3	Hour 4
Demand Reduction	.424	.553	.558	.633

3.3.3 kWh Savings

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

(1) kWh Reduction Factor; and

(2) Snapback Factor.

These factors were determined as follows:

Reduction Factor:

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

Snapback Factor:

Snapback Factors are the sum of kW differences between the curtailment and control groups for the three hours following the end of a curtailment event.

These three factors are then summed to develop the kWh. kWh savings for an event are then calculated as:

$$kWh = (Pre - Cool + kW\ Factor + Snapback) * \#\ Units$$

This is repeated for all events in the season. Though there were only 7 M&V Events in 2012, PNM ran a total of 11 curtailment events over the course of the season. The resulting savings from each event are summarized in Table 3-7 below.

Table 3-7 Residential & Small Commercial kWh Savings

Event Date	Reduction Factor	Snapback Factor	kWh Per Unit	Units[7]	kWh Savings
June 18th	-.207	.153	-.054	31,540	-1,706
June 20th	2.299	-1.398	.902	31,540	28,439
June 25th	2.657	-.604	2.053	31,540	64,751
June 26th	2.640	-1.074	1.566	31,540	49,398
June 27th	2.880	-.288	2.592	31,540	81,757
June 28th	3.122	-1.311	1.812	31,540	57,138
June 29th	2.801	-.984	1.818	31,540	57,326
July 31st	1.386	-1.043	.343	31,315	10,746
August 9th	.623	-.891	-.268	32,281	-8,650
August 10th	2.097	-1.338	.759	32,281	24,508
September 4th	1.961	-.705	1.257	32,339	40,646
				Total:	404,353

3.3.4 Power Saver Medium Commercial kW Factor Methodology

For the medium commercial component, demand reductions are evaluated 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 Res & Small Commercial component. However, the baseline is determined by the following equation:

[7] Unit totals taken from Comverge's monthly installation summaries

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

The medium commercial group was curtailed for the same timeframe as the Res & Small Commercial group across all events.

3.3.5 Power Saver Medium Commercial kW Factor Calculation

As with the Res & Small Commercial group, the peak 15 minute reduction was calculated for Medium Commercial across all M&V Events in order to determine the settlement kW Factor. These calculations are summarized in Table 3-8 below.

Table 3-8 Medium Commercial M&V Event Performance Summary

Event Date	*Event Start Time (MDT)*	*Event End Time (MDT)*	*# Qualifying M&V Hours*[8]	*Peak 15 Minute Reduction – Per Premise*	*Peak 15 Minute Reduction – Per Unit*
June 18th	2:00 PM	6:00 PM	2	8.81	.85
June 20th	2:00 PM	6:00 PM	1	9.34	.90
June 26th	2:00 PM	6:00 PM	1	10.33	.99
June 27th	2:00 PM	6:00 PM	2	13.83	1.33
June 28th	2:00 PM	6:00 PM	4	13.99	1.35
June 29th	2:00 PM	6:00 PM	3	13.54	1.30
July 31st	2:00 PM	6:00 PM	1	10.53	1.00

3.3.6 Medium Commercial Event Summaries

ADM calculated hourly kW reductions for all hours of all events in 2012. These values were calculated on hourly intervals instead of 15-minute in order to be of better use in PNM's forecast tools. Table 3-9 below summarizes the average hourly per-unit kW reductions for this group by event.

[8] To qualify as an M&V hour, the temperature at the Albuquerque International Sunport must be at least 97 degrees F during the hours of 3:00 – 6:00 PM.

Table 3-9 Hourly kW Reductions by Event – Medium Commercial

Date	2:00 – 3:00 PM	3:00 – 4:00 PM	4:00 – 5:00 PM	5:00 – 6:00 PM
June 18th	.921	.743	.696	.759
June 20th	.851	.920	.846	.821
June 25th	.673	.832	.981	.934
June 26th	.873	.955	1.114	1.160
June 27th	.872	1.026	1.274	1.184
June 28th	.871	1.034	1.225	1.302
June 29th	.846	1.118	1.163	1.266
July 31st	.804	.876	.861	.899
August 9th	-	-	.779	.844
August 10th	.553	.669	.799	.860
September 4th	.774	1.056	1.055	.983
Average:	.804	.923	.981	1.001

The event load profiles for the Medium Commercial segment are presented in Figure 3-13 through Figure 3-23 to follow.

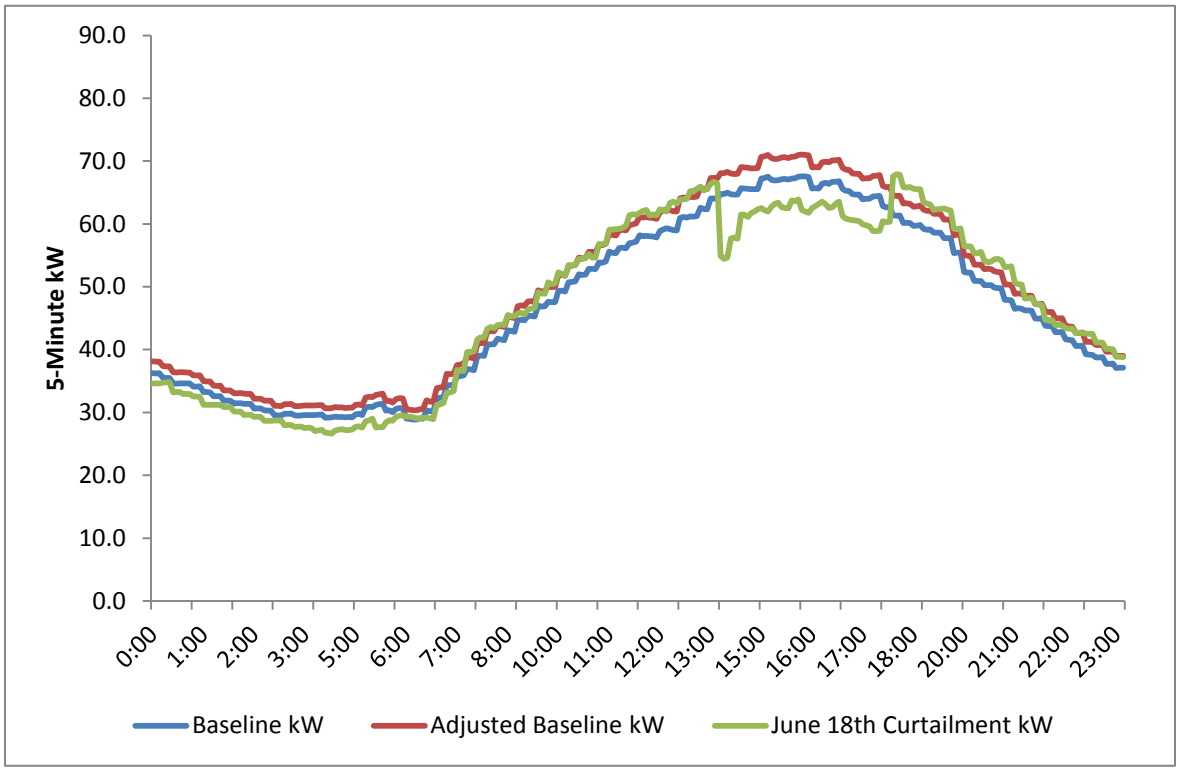

Figure 3-13 June 18th Event Load Profile – Medium Commercial

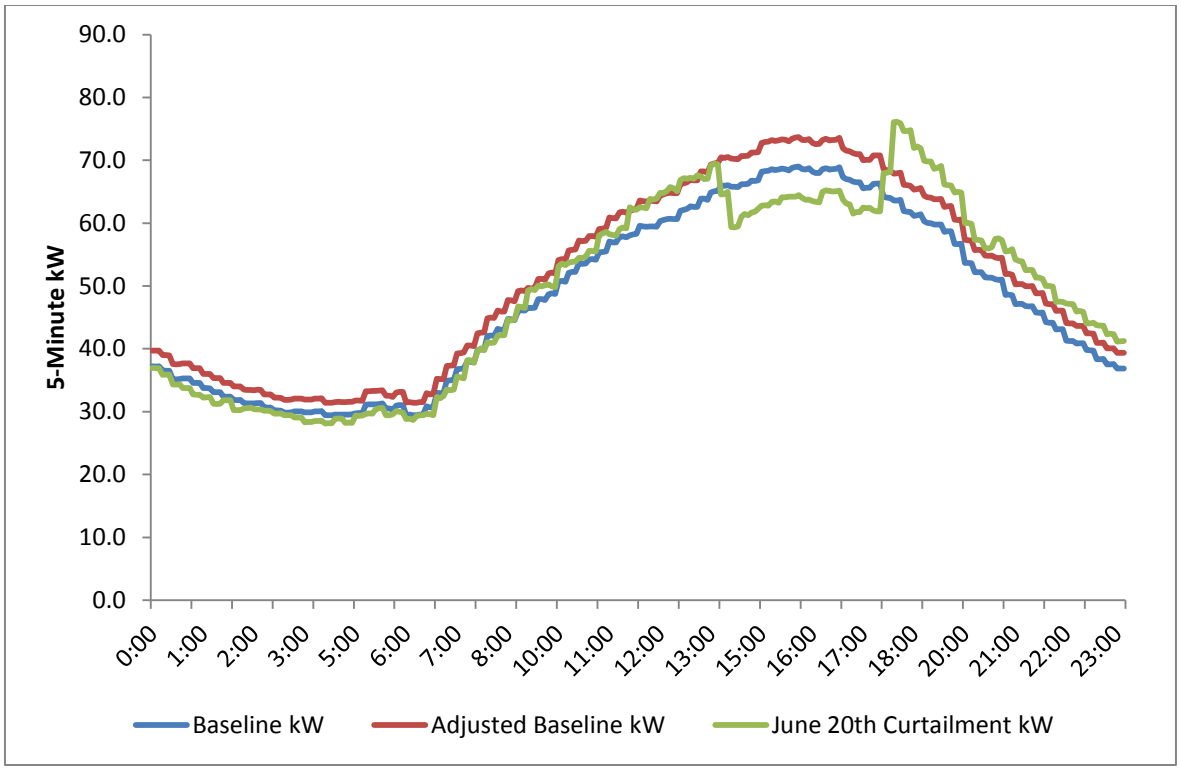

Figure 3-14 June 20th Event Load Profile – Medium Commercial

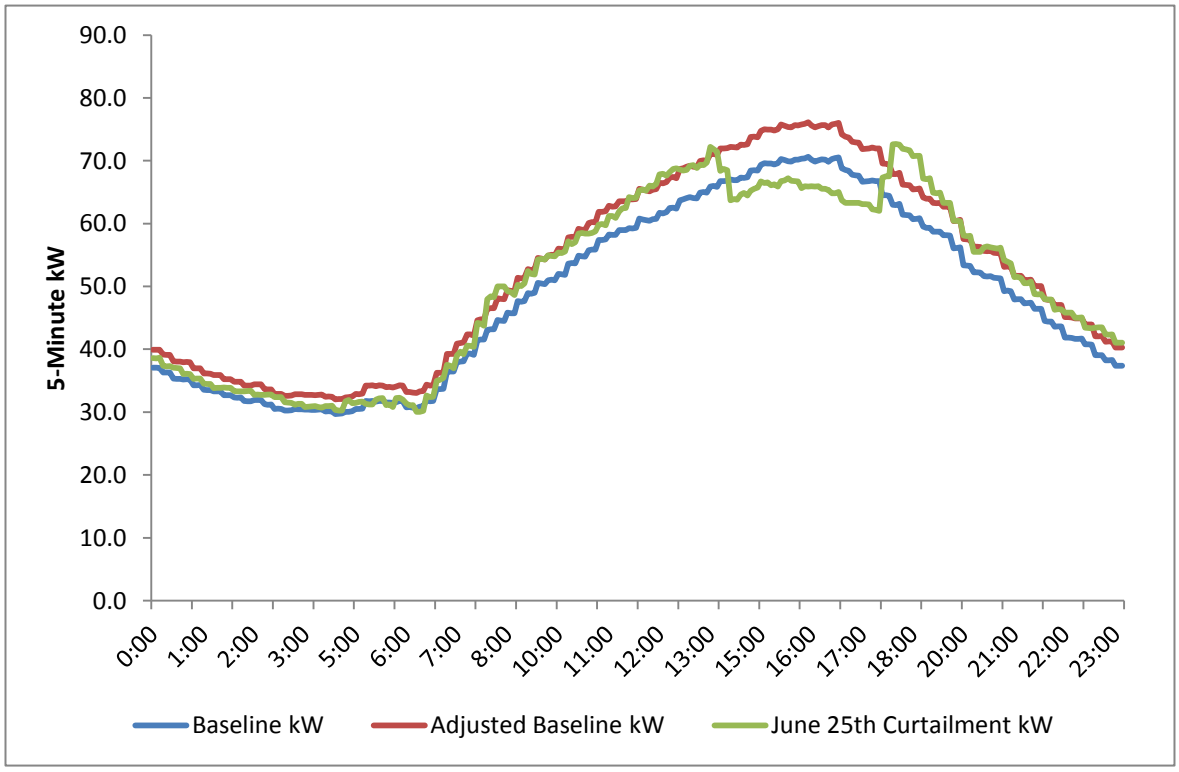

Figure 3-15 June 25th Event Load Profile – Medium Commercial

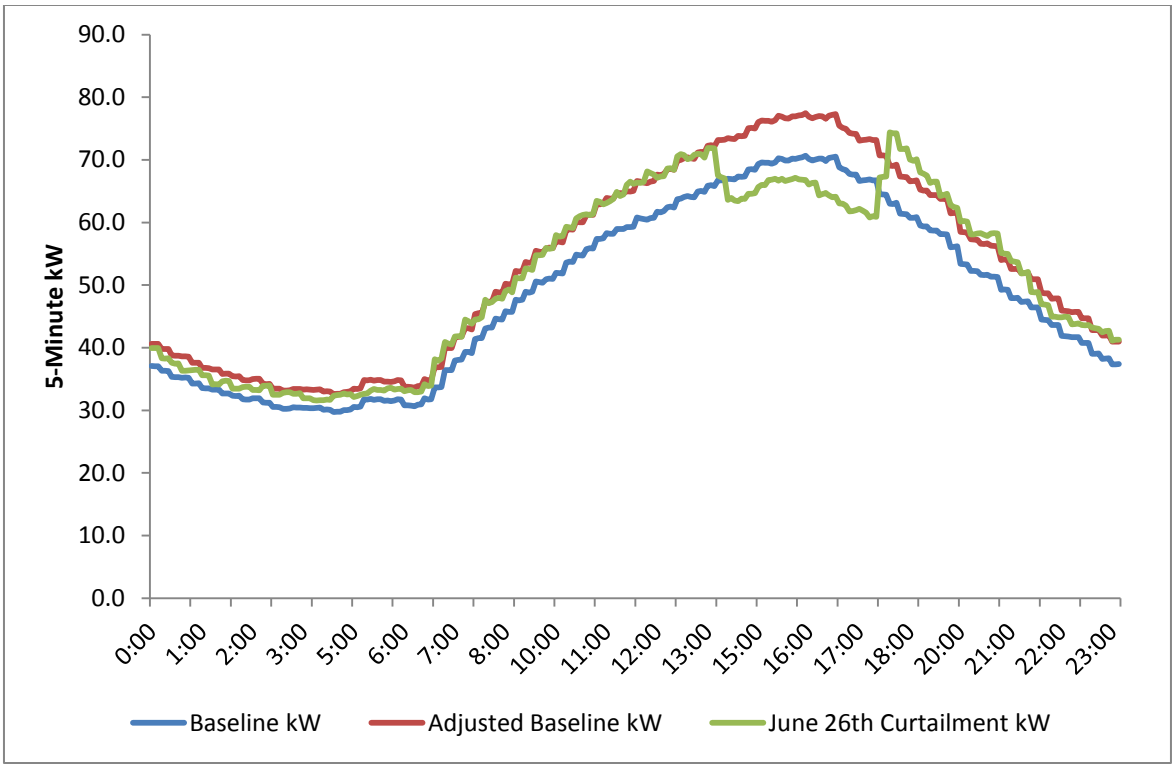

Figure 3-16 June 26th Event Load Profile – Medium Commercial

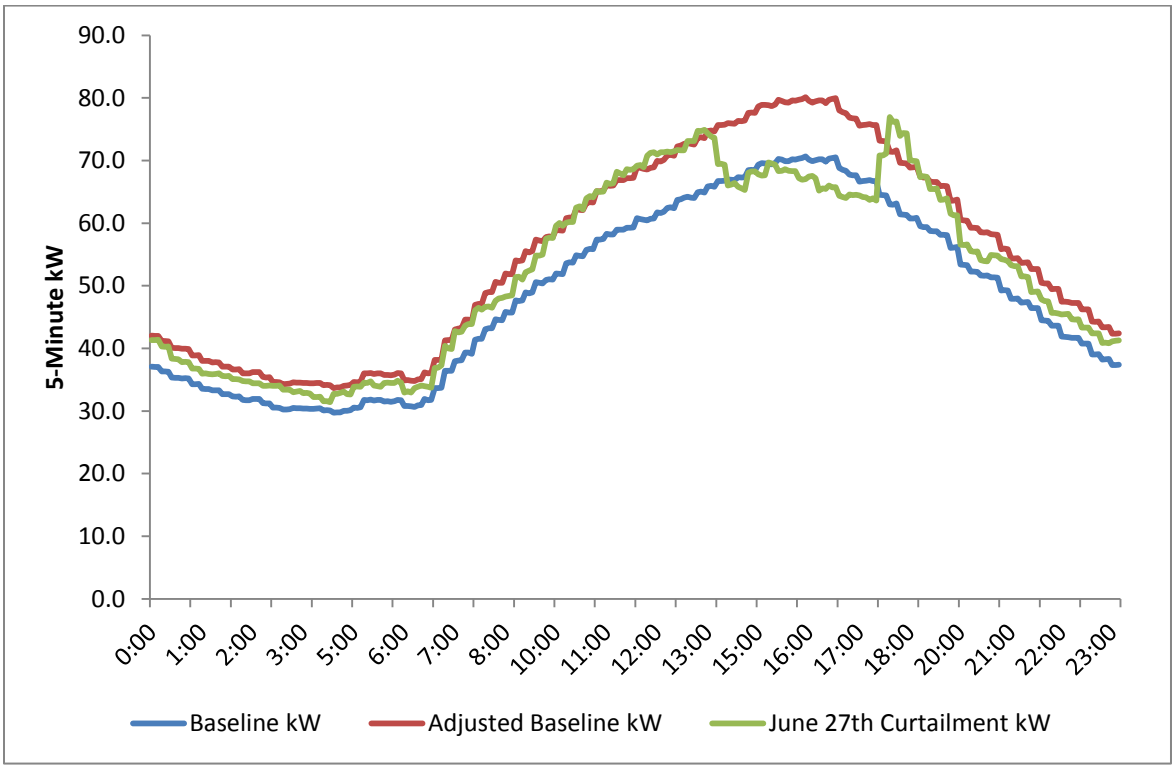

Figure 3-17 June 27th Event Load Profile – Medium Commercial

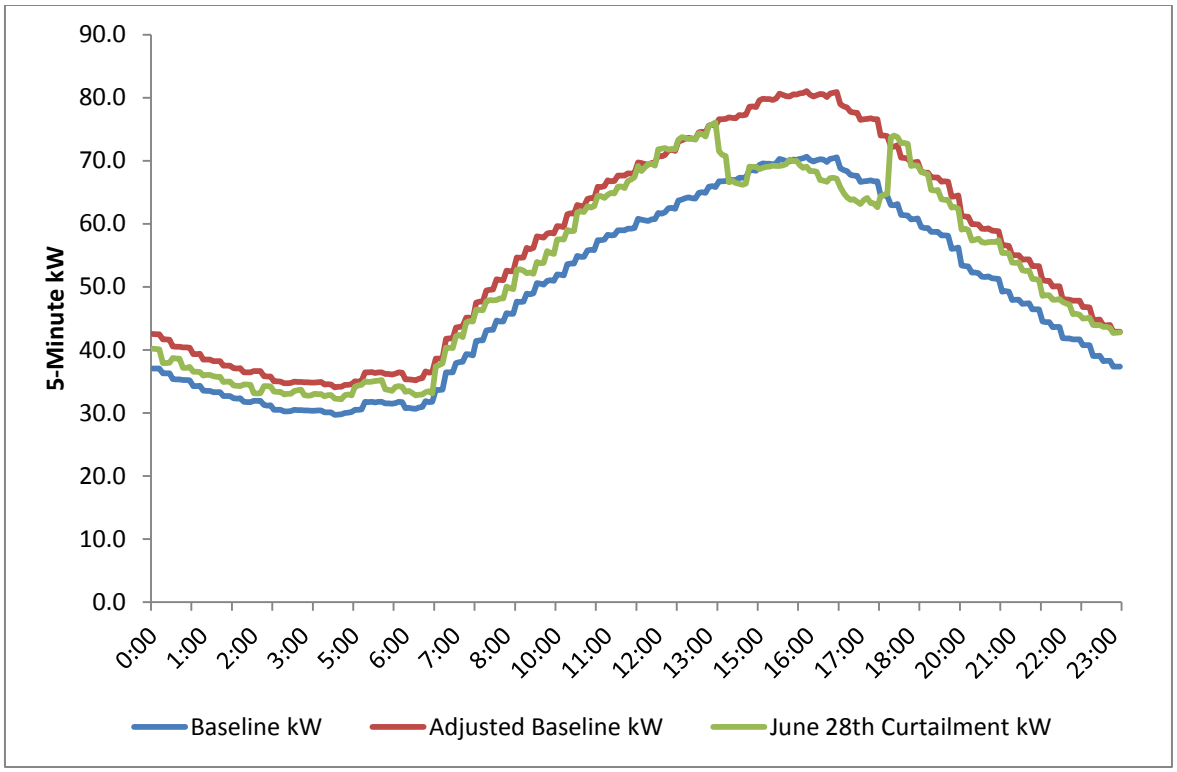

Figure 3-18 June 28th Event Load Profile – Medium Commercial

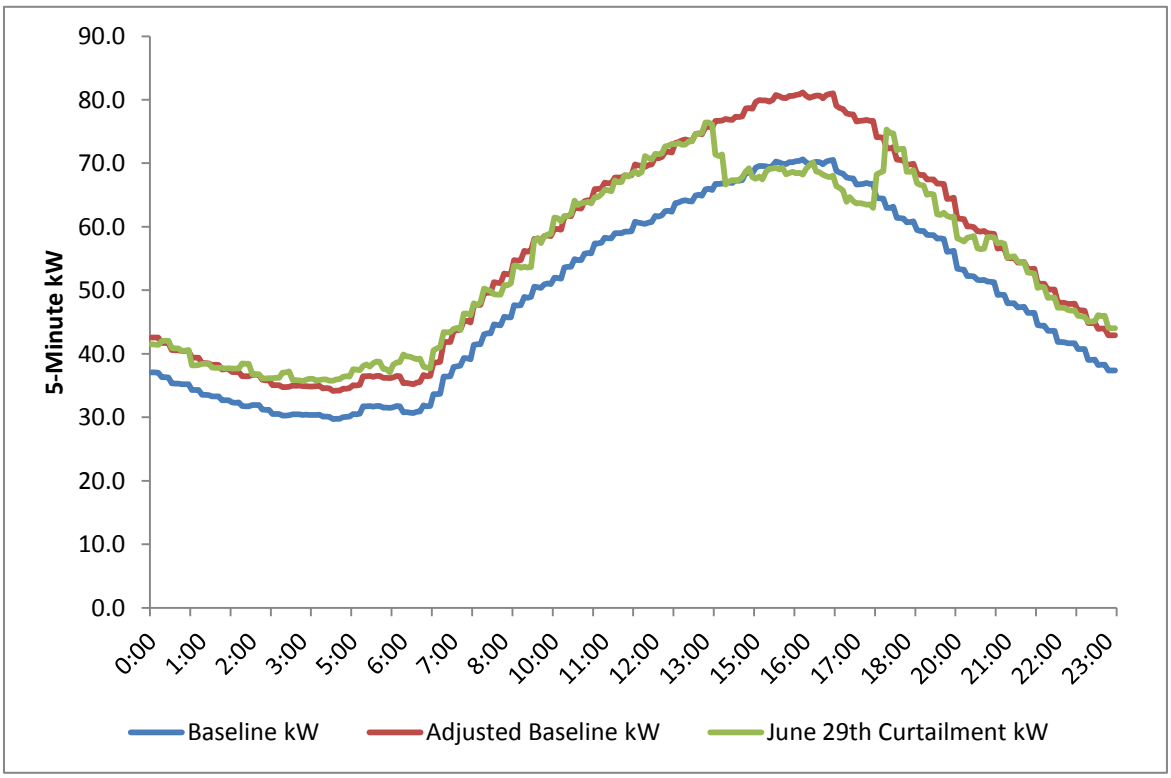

Figure 3-19 June 29th Event Load Profile – Medium Commercial

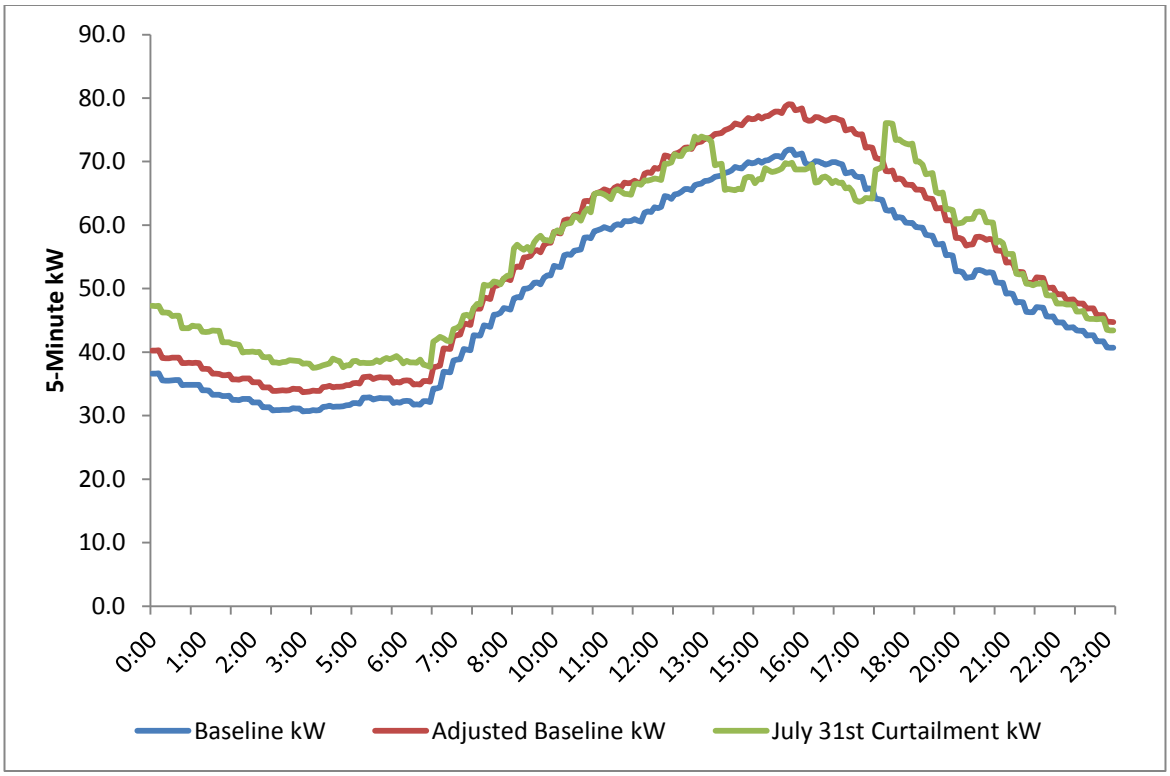

Figure 3-20 July 31st Event Load Profile – Medium Commercial

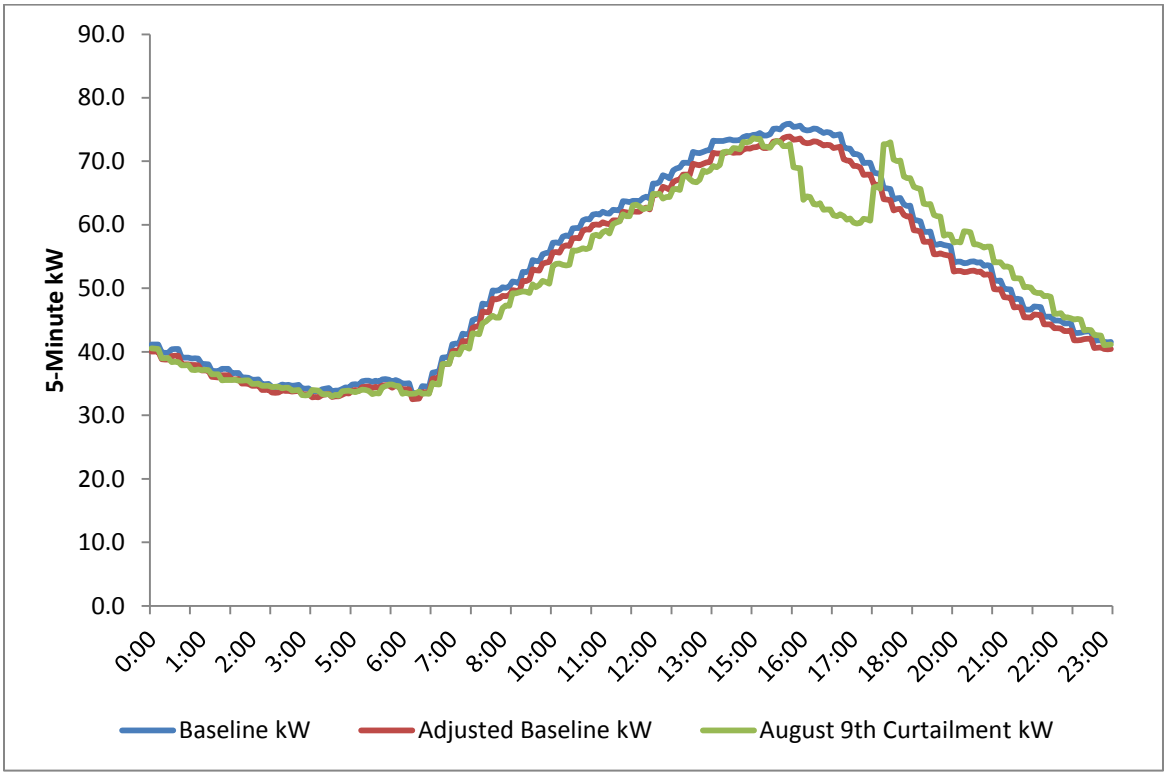

Figure 3-21 August 9th Event Load Profile – Medium Commercial

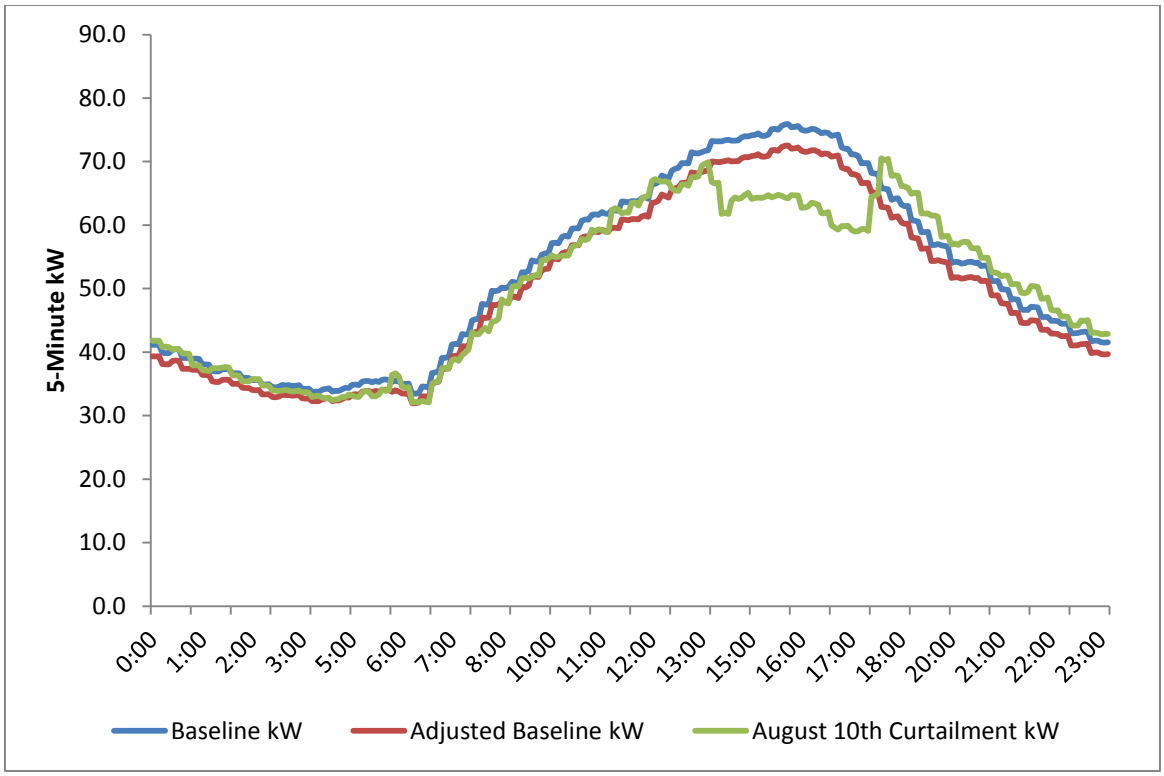

Figure 3-22 August 10th Event Load Profile – Medium Commercial

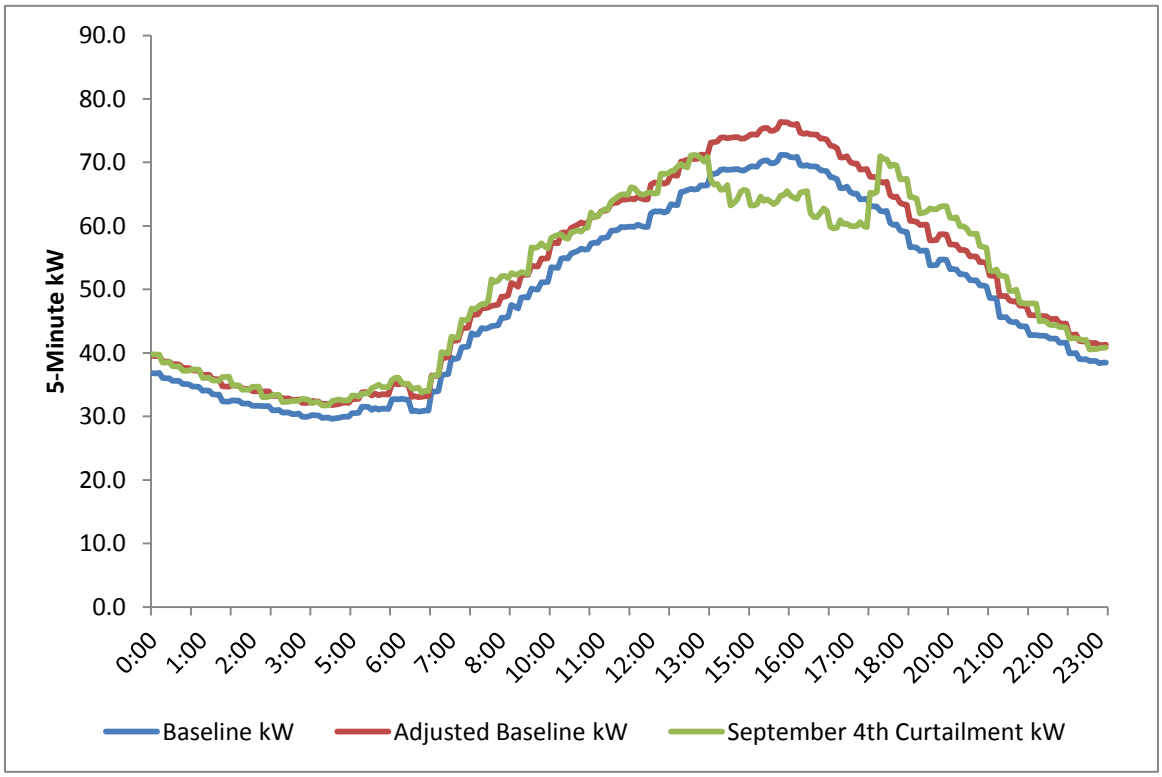

Figure 3-23 September 4th Event Load Profile – Medium Commercial

Additionally, ADM calculated hourly reductions subdivided by event hour number (i.e., average reduction for Hour 1 of all events, Hour 2 of all events, etc.). These results are summarized in Table 3-10 below.

Table 3-10 kW Reductions by Event Hour Number – Medium Commercial

Date	Hour 1	Hour 2	Hour 3	Hour 4
Demand Reduction	.801	.916	1.001	1.017

3.3.7 kWh Savings

kWh savings for the Medium Commercial component were calculated in the same manner as done for the Res & Small Commercial component. The resulting savings from each event are summarized in Table 3-11 below.

Table 3-11 Medium Commercial kWh Savings

Event Date	Reduction Factor	Snapback Factor	kWh Per Premise	kWh Per Unit	Units[9]	kWh Savings
June 18th	3.120	-.181	30.524	2.939	5,121	15,048
June 20th	3.437	-.997	25.352	2.441	5,121	12,498
June 25th	3.420	-.454	30.812	2.966	5,121	15,190
June 26th	4.102	-.384	38.623	3.718	5,121	19,041
June 27th	4.356	-.072	44.505	4.285	5,121	21,941
June 28th	4.432	.310	49.258	4.742	5,121	24,284
June 29th	4.393	.337	49.127	4.730	5,121	24,220
July 31st	3.441	-.734	28.446	2.707	5,033	13,625
August 9th	1.623	-1.039	6.193	.584	5,054	2,954
August 10th	2.880	-1.016	19.754	1.864	5,054	9,423
September 4th	3.868	-.588	34.851	3.280	5,058	16,589
					Total:	174,814

3.3.8 Verified Available Demand Reduction

ADM combined the kW Factor results for the Residential and Commercial sectors along with the total verified installations at the end of the curtailment season in providing estimates of the available demand reduction provided by the PPSP. These results are summarized in Table 3-12 below.

[9] Unit totals taken from Comverge's monthly installation summaries

Table 3-12 Verified Available Demand Reduction for PNM Power Saver Program

Sector	***kW Factor***	***# Units***	***Available Demand Reduction (MW)***	***kWh Savings***
Res & Small Commercial	.983	32,339	31.789	404,353
Commercial	1.35	5,058	6.828	174,814
Total	.968[10]	37,397	38.617	579,167

[10] Weighted Average of Residential & Commercial kW Factors

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, ADM 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:

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

for each 5-minute interval. 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

ADM 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 2012.

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 monthly participation and nomination values.

Table 4-1 2012 Peak Saver Nomination Summary

Month	Total Nominated kW	Number of Events	Average Event Performance
June	22,047	7	18,484
July	15,000	1	19,729
August	16,390	2	19,952
September	16,818	1	17,731

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, Hotel/Motel, and School/K-12 facilities accounted for 68% of total participating facilities and 90% of nominated kW. Snapshots of participation by Nominated kW and by facility counts are presented in Figure 4-1 and Figure 4-2 below.

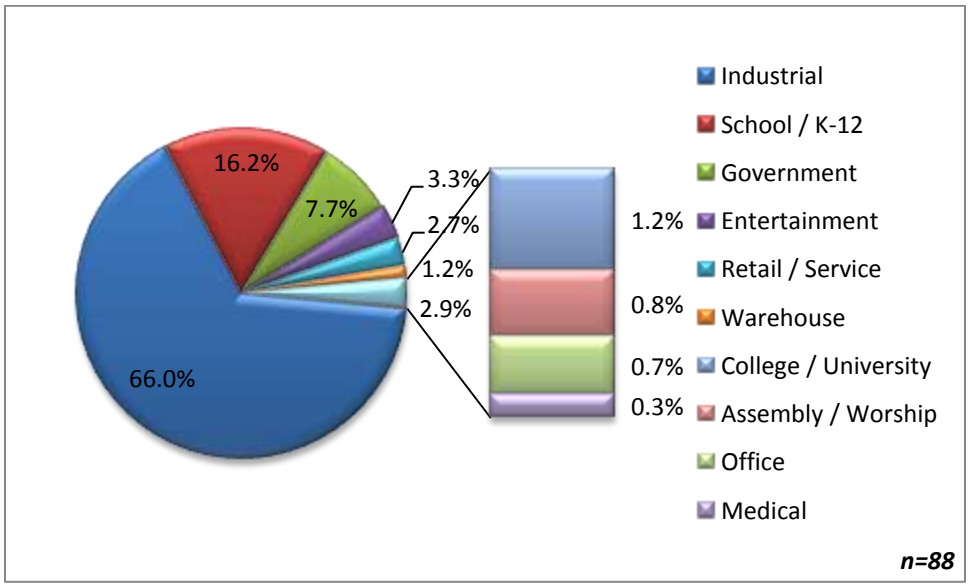

Figure 4-1 Peak Saver Nominations by Facility Type

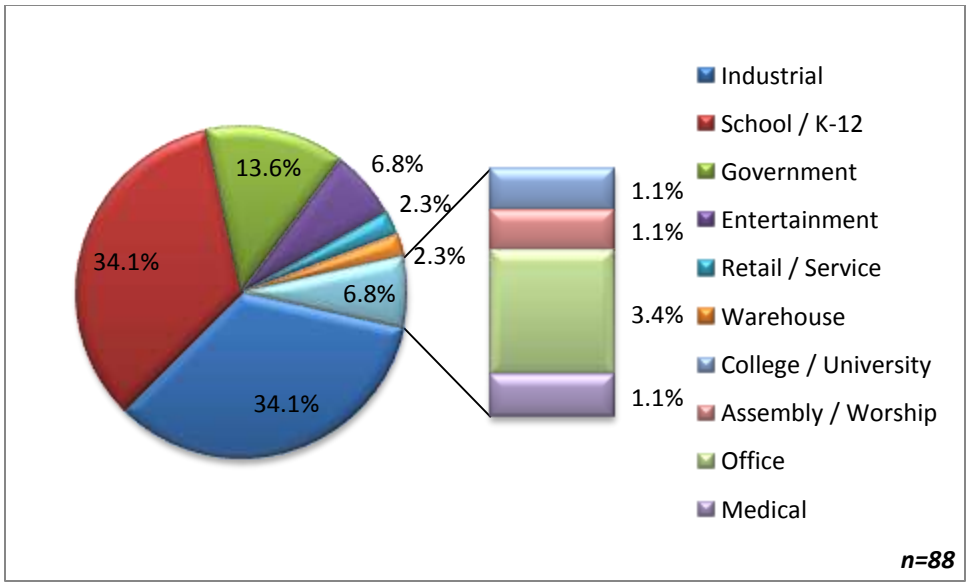

Figure 4-2 Peak Saver Participation by Facility Type

With Industrial customers accounting for an outsized portion of participation and nominated kW, ADM investigated what types of facilities comprised this larger category. A range of facility types were found, with the bulk of nominations within this category coming from Municipal Pumping and Raw Materials Extraction. Figure 4-3 presents the share of participation and kW nomination within the Industrial category comprised of each applicable sub-classification.

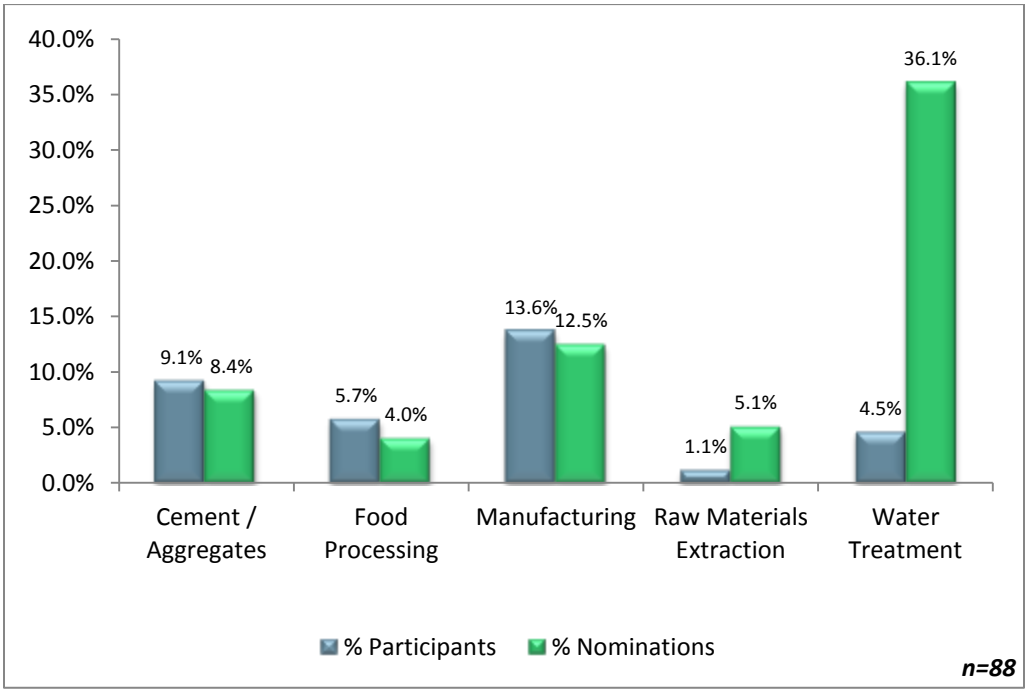

Figure 4-3 Peak Saver Industrial Participants Sub-Classification

4.3.2 Event Load Profiles

Figure 4-4 through Figure 4-14 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.

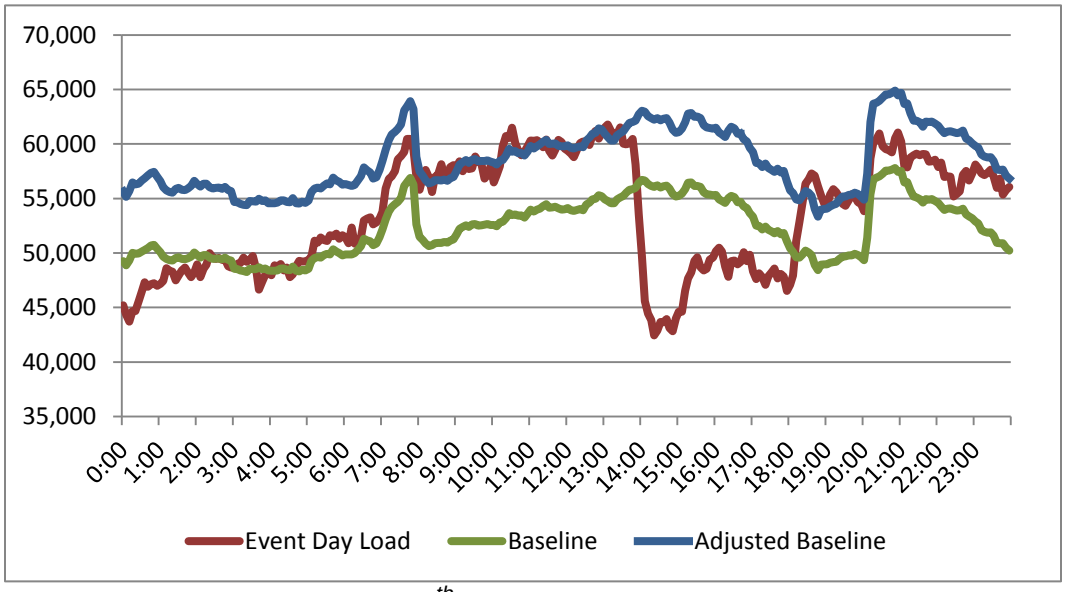

Figure 4-4 June 18th Peak Saver Event Load Profile

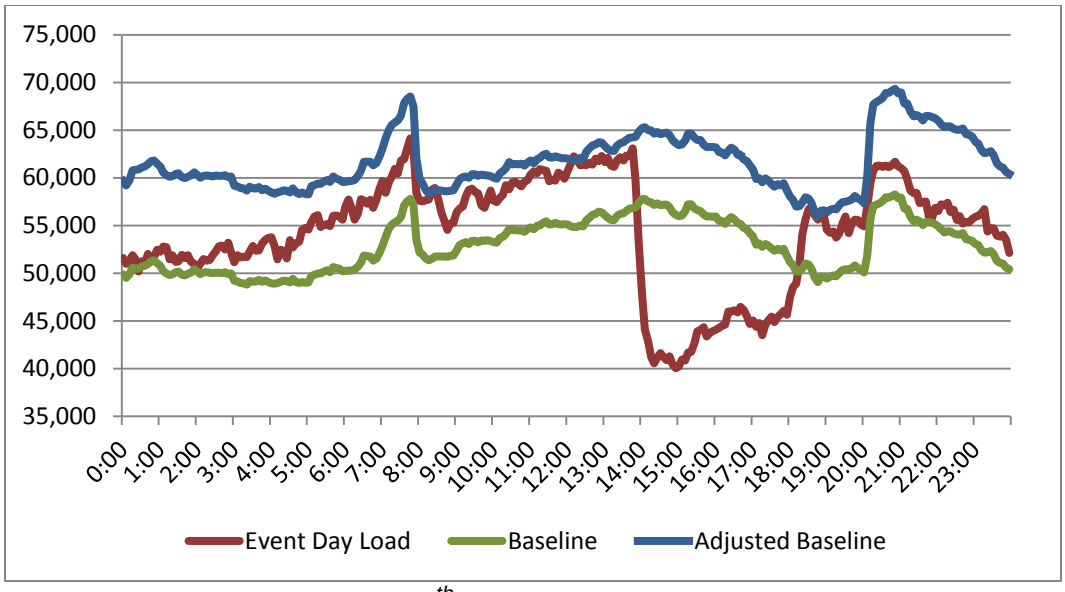

Figure 4-5 June 20th Peak Saver Event Load Profile

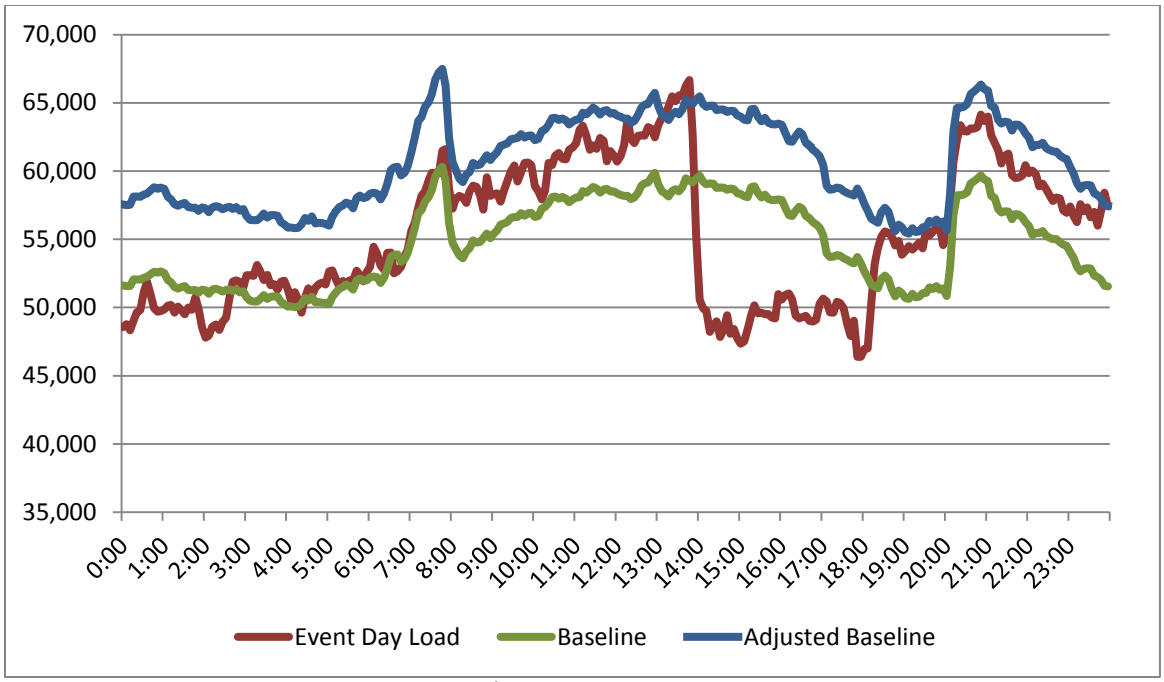

Figure 4-6 June 25th Peak Saver Event Load Profile

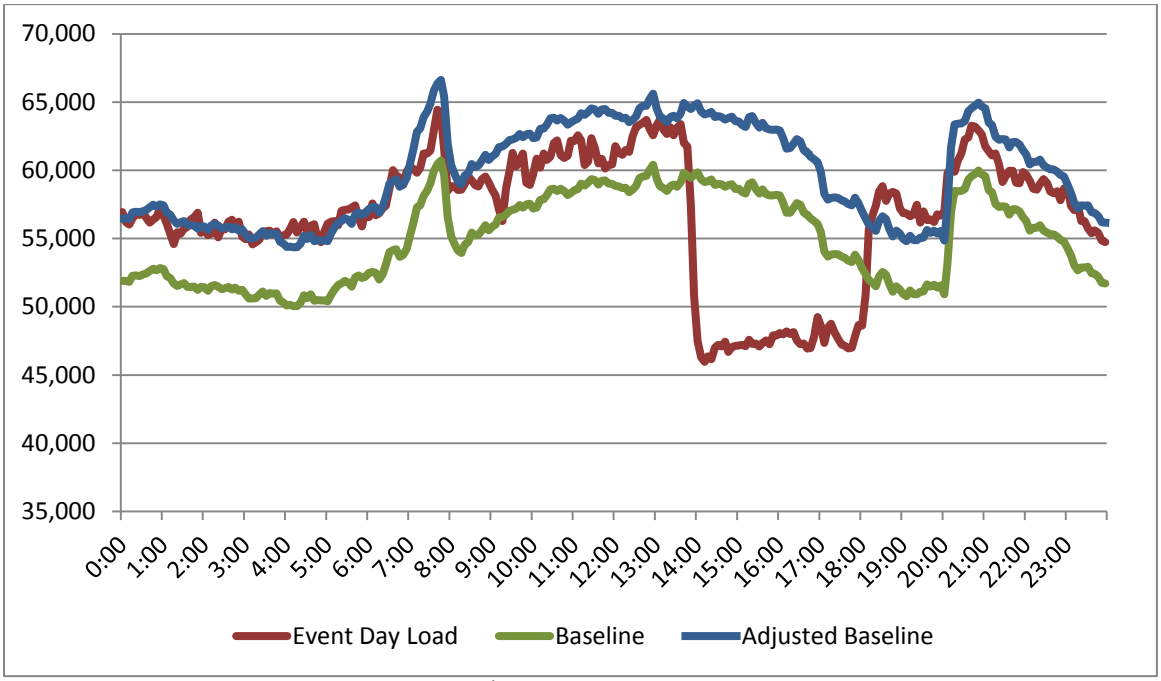

Figure 4-7 June 26th Peak Saver Event Load Profile

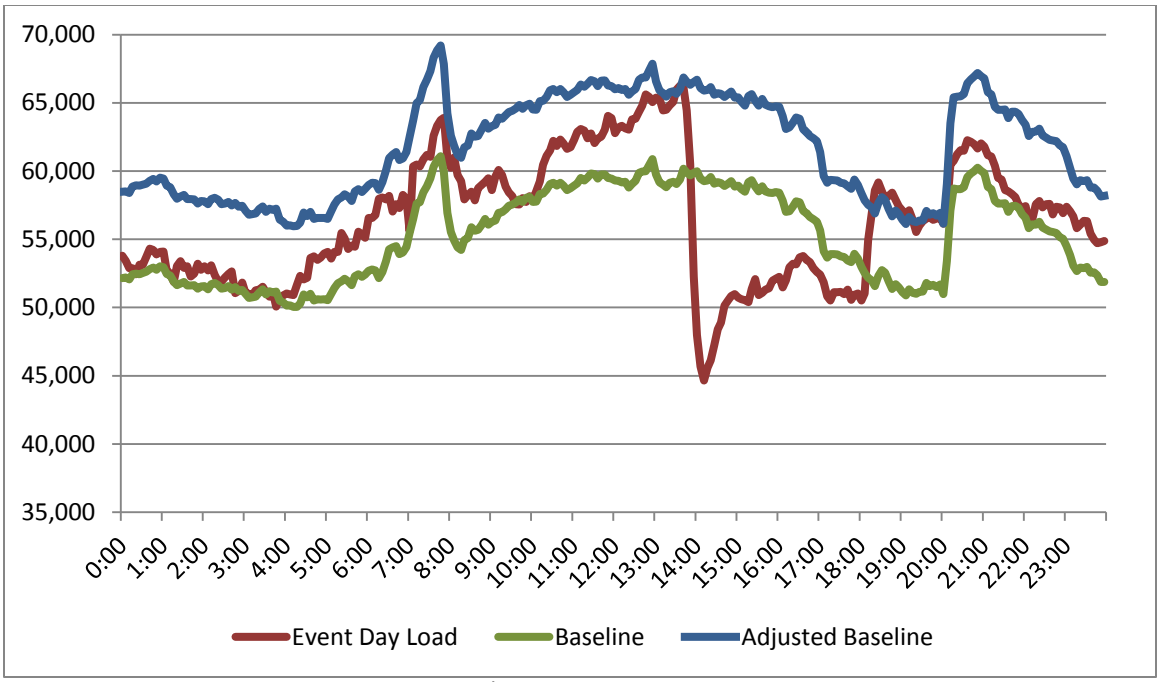

Figure 4-8 June 27th Peak Saver Event Load Profile

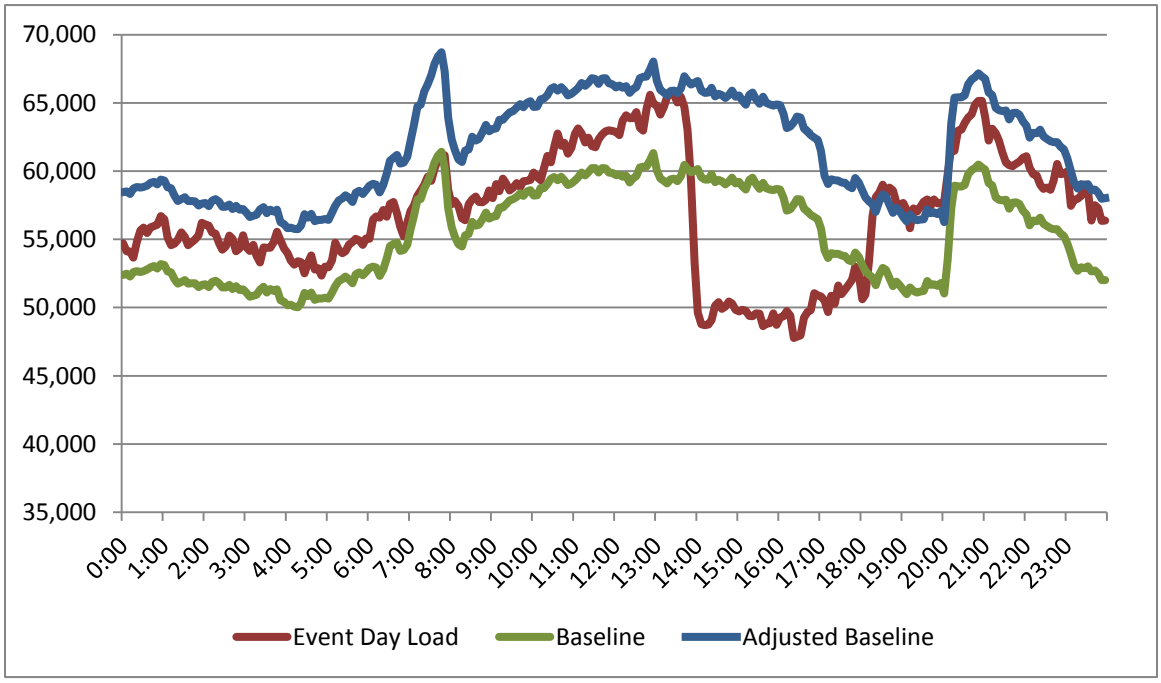

Figure 4-9 June 28th Peak Saver Event Load Profile

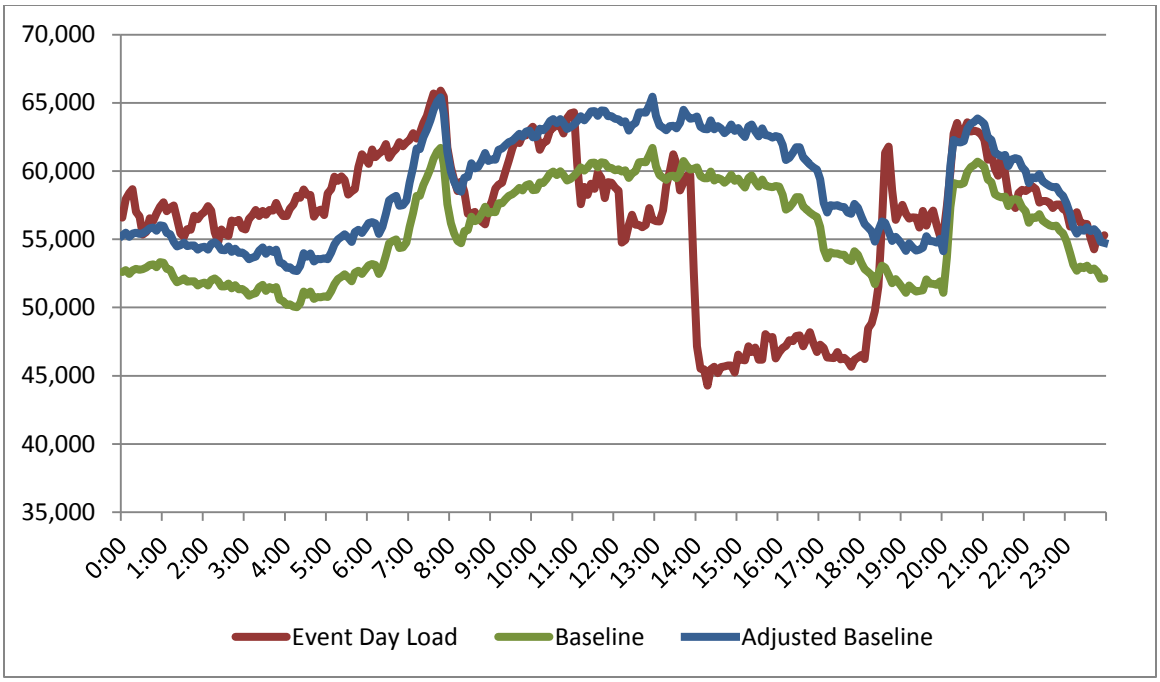

Figure 4-10 June 29th Peak Sever Event Load Profile

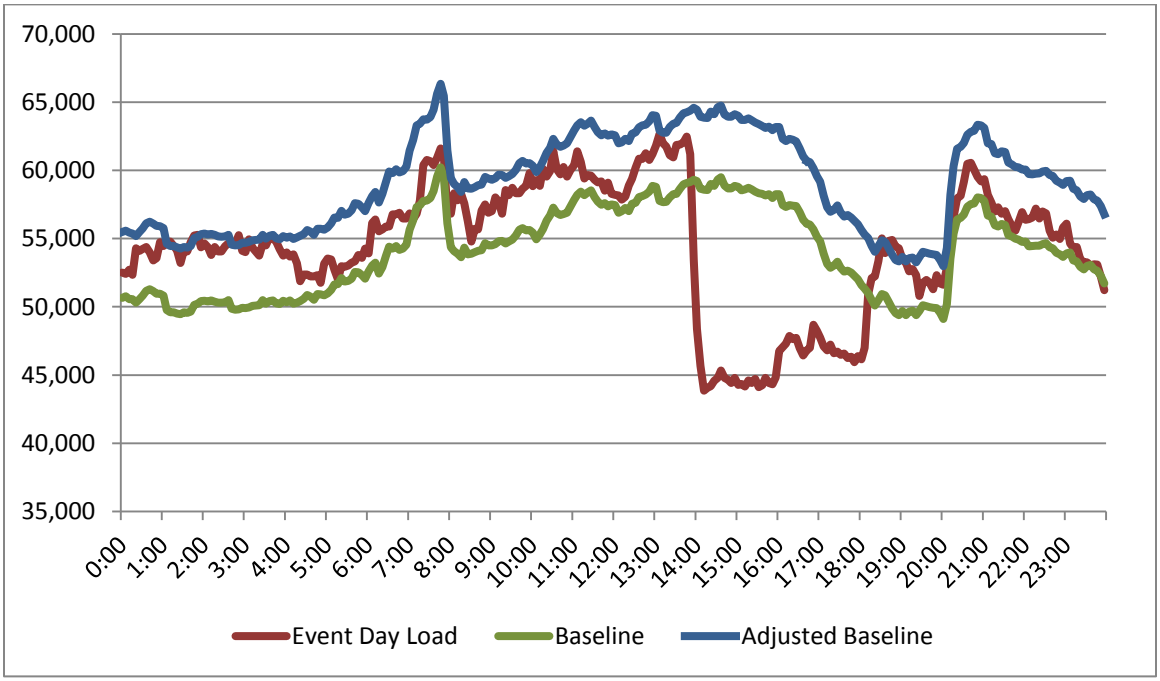

Figure 4-11 July 31st Peak Saver Event Load Profile

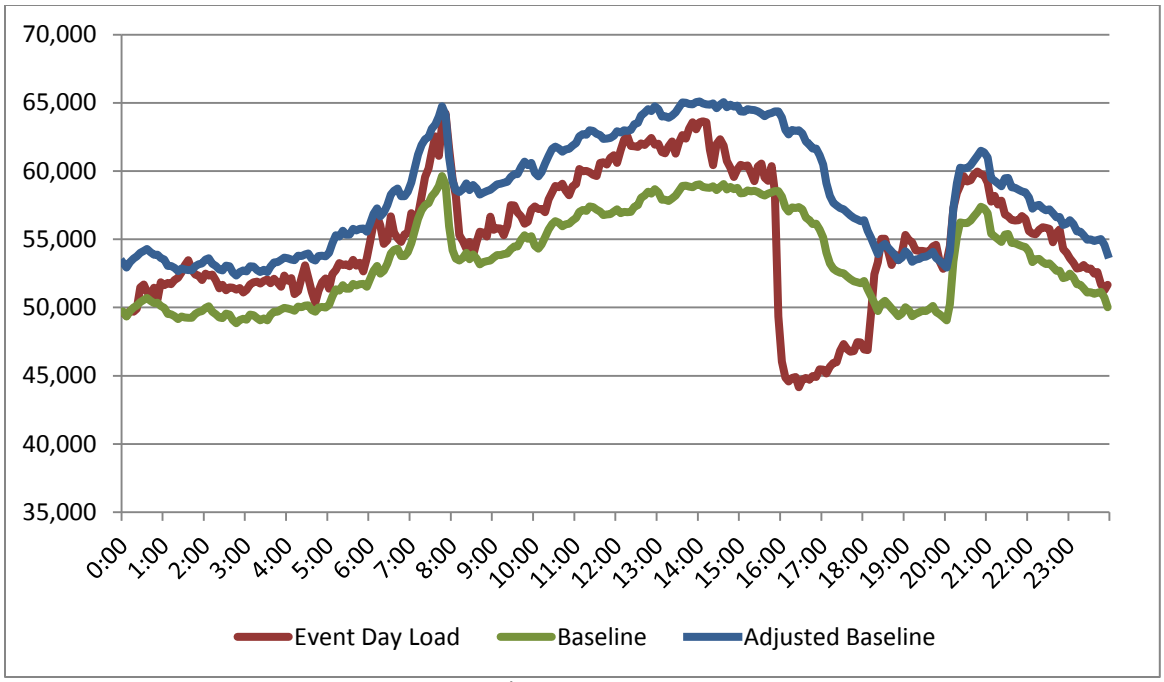

Figure 4-12 August 9th Peak Saver Event Load Profile

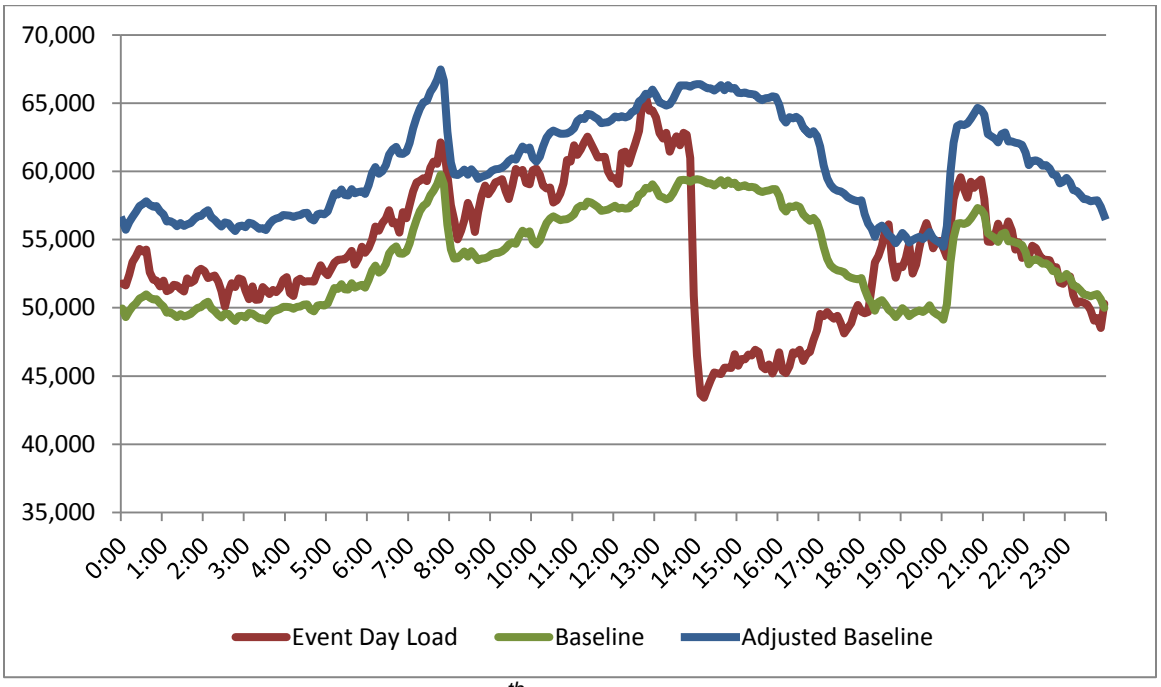

Figure 4-13 August 10th Peak Saver Event Load Profile

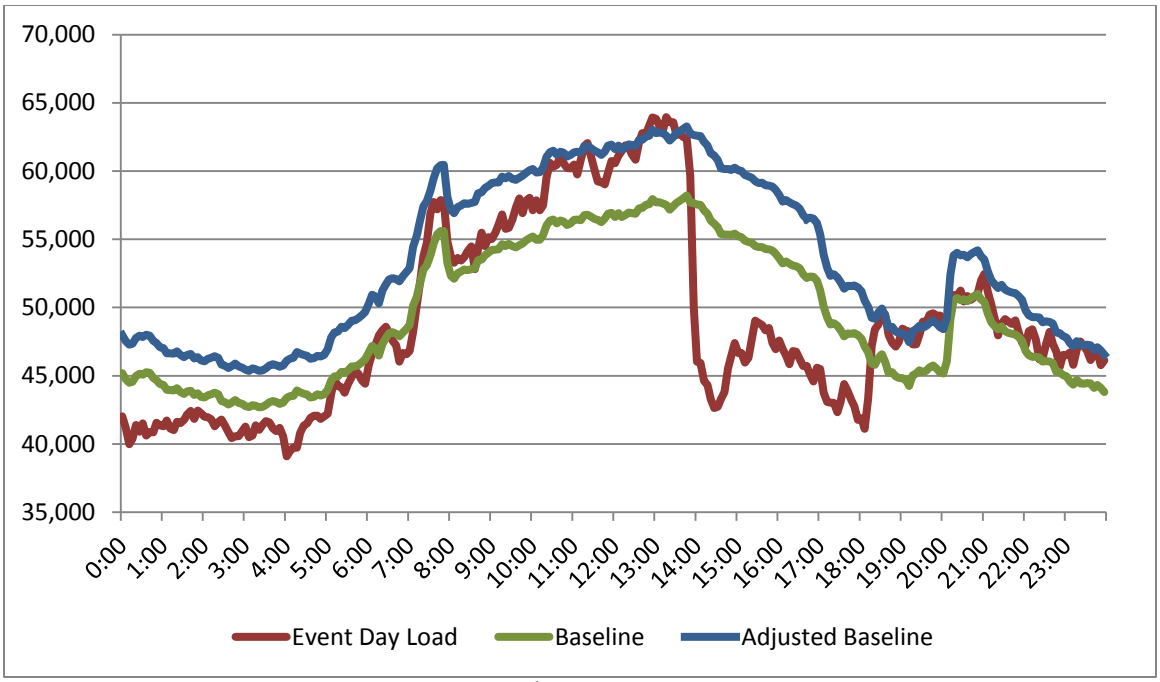

Figure 4-14 September 4th Peak Saver Event Load Profile

4.3.3 Event Performance

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

Table 4-2 Peak Saver Event Performance Summary

Date	Average Performance	10-Minute Performance	Overall Performance	kWh Savings
June 18th	13,293	18,909	16,663	53,174
June 20th	18,863	23,677	21,752	75,453
June 25th	13,013	16,759	15,261	52,052
June 26th	14,160	22,190	18,978	56,642
June 27th	12,242	23,882	19,226	48,967
June 28th	13,371	19,888	17,281	53,483
June 29th	14,497	24,044	20,225	57,990
July 31st	15,629	22,463	19,729	62,516
August 9th	13,976	19,885	17,521	27,952
August 10th	16,585	26,247	22,382	66,341
September 4th	11,883	21,629	17,731	47,534
			Total:	602,103

5. Refrigerator Recycling

5.1 Program Description

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

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

In 2012, the program was configured as a turnkey, stand-alone energy efficiency initiative. The program was advertised to the public via ads, bill stuffers, and point-of-sale flyers and materials. The program requires that refrigerators to be recycled be in working condition. The customer receives pick-up and removal service in addition to a $50 rebate per recycled unit.

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

5.2 M&V Methodologies

The M&V approach for the Refrigerator Recycling Program is aimed at measuring the following:

- Numbers of refrigerators and freezers collected and recycled;
- Average annual kWh savings per collected appliance;

- Average kW reduction per collected appliance.
- Providing estimates of net-to-gross savings and free-ridership; and
- Estimating cost effectiveness of the RRP program in 2012.

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

Table 5-1 Data Sources for Gross Impact Parameters – Residential Refrigerator Recycling Program

Parameter	***Source***
Number of Units Recycled	Program Tracking Data
Unit Energy Consumption	Regression model developed in prior studies, using unit size, age, and configuration.
Location of Installation	Participant Surveys – This value is used to determine peak kW reduction, based upon the share of units used in conditioned vs. unconditioned space.
Net –to-Gross-Ratio	Participant & Non-Participant Surveying
Remaining Useful Life (RUL)	Based upon CA DEER 2008 estimates, RUL of: 5 years for refrigerators; 4 years for freezers.

5.2.1 Unit Energy Consumption

The implementer for PNM Refrigerator Recycling Program estimated ex ante savings for recycled units by taking the at-manufacture estimate of annual kWh usage for a recycled unit and degrading by methodologies outlined in the Lawrence Berkley National Laboratory Residential Energy Databook. ADM determined that a more precise methodology is that outlined by The Cadmus Group in a 2009 study on refrigerator degradation for the California Public Utilities Commission.[11] For its study, Cadmus used data on refrigerator energy use obtained through two in situ monitoring efforts:

- A dual monitoring study that ADM conducted in support of the evaluation of the (California) 2004-2005 Statewide Residential Appliance Recycling Program[12]; and

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

[12] ADM Associates. Evaluation Study of the 2004-05 Statewide Residential Appliance Recycling Program: Measurement 2004-2005 Programs #1114, #1157, #1232 and #1348. April 2008.

- Additional in situ monitoring that Cadmus conducted as part of its study.

The product of these efforts was a database that contained energy use obtained through both DOE testing and in situ monitoring for a sample of 321 units, 184 of which were from the 2004-2005 evaluation and 137 from the 2006-2008 evaluation. Cadmus used the data from this dual monitoring sample to develop regression models that relate in situ energy use to energy use as determined from the DOE test procedure and modification factors based on weather and household size. These modification factors are summarized in Table 5-2.

Table 5-2 In Situ Monitoring Adjustments to DOE Testing Values

Primary	***Household Size***	***Climate Zone***	***n***	***% In Situ Delta[13]***
Yes	1-2	Cool	29	-30.8%
		Warm	18	-19.2%
	3+	Cool	50	-16.0%
		Warm	32	-6.4%
No	1-2	Cool	86	-21.3%
		Warm	42	-15.8%
	3+	Cool	59	-6.8%
		Warm	31	1.3%

For this M&V study, the PNM New Mexico territory is treated as a Warm Climate. Because distribution of household sizes is not known for the population of customers participating in the RRP, the distribution observed in the Cadmus study was used. As this program focuses on second refrigerator recycling, the figures used in the calculations to follow are drawn from Table 3-1 where Primary = "No". There were 145 households with 1-2 people and 59 with 3+. Weighting the "% In Situ Delta" by these values, we get an adjustment factor of:

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

Additionally, annual kWh use is estimated via a regression model based upon the unit size, configuration (side-by-side vs. top-bottom), and defrost type (manual vs. frost free). The variable coefficients are detailed in Table 5-3 below.

Table 5-3 Refrigerator Recycling Regression Model Coefficients

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

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

Variable	*Coefficient*
Side-by-Side * Age (interactive factor)	19.98

The outputted results from this regression were then reduced by 15.4% in order to account for the climate correction for secondary refrigerators.

5.2.2 Part-Use Value

The regression model detailed in Section 5.2.1 provides full-year kWh estimates. Many of the units recycled through this program are not used for the full year. ADM estimated these units Part-Use Factors (PUFs) through two metrics:

1) If the customer would keep the unit in use, PUF is equal to the percent time of the year in which the unit was typically running; and

2) If the customer would transfer their unit, a PUF of 1 was assigned, under the assumption that a customer that receives a used refrigerator is likely to use it as their primary unit.

Combining these two values, ADM determined PUF values of:

- 69.1% for refrigerators; and
- 62.5% for freezers.

This results in annual hours of use of:

- 6,053 for refrigerators; and
- 5,475 for freezers.

With these data, annual savings for a specific unit are:

$$kWh\ Savings = UEC * Part - Use\ Factor$$

5.2.3 Location of Installation

ADM surveyed 280 program participants in order to obtain the location in which the refrigerator or freezer was typically used, in order to determine what share of appliances was used in conditioned versus unconditioned space. The ambient temperature during peak periods affects the efficiency and duty cycle of a refrigerator compressor, and as such this share is used in determining peak kW reduction from refrigerator recycling. Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then

increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[14]. Resultantly, ADM calculated kW factors of .000127 and .000247 for conditioned and unconditioned space, respectively. Our survey results indicated that 68% of the recycled refrigerators were used in conditioned space, with 32% used in unconditioned space. Conversely, only 25% of freezers were used in conditioned space, with 75% used in unconditioned space. Weighting the kW factors by these proportions, the weighted average kW factor is:

- .0001634 for refrigerators; and
- .0002182 for freezers.

5.2.4 Net Savings Estimation

Free-ridership on a program such as the Refrigerator Recycling Program is aimed at determining what customer behavior would have been with their secondary refrigerator or freezer in the absence of the program. This means determining what proportion of participants would have disposed of their refrigerators or freezers without the program in a way that would have removed the refrigerators permanently from the grid.

There are four categories for what could have happened to a refrigerator or freezer had it not been recycled through the program. These categories are:

- Unit is kept by the household but not used;
- Unit is kept by the household and still used;
- Unit is discarded by the household through a method in which the unit would be destroyed; and
- Unit is discarded by the household through a method in which the unit would be transferred and kept in use.

Of these four categories, two are indicative of free-ridership:

- Unit is kept by the household but not used; or
- Unit is discarded by the household through a method in which the unit would be destroyed.

These categories are indicative of free-ridership because the units would have been removed from the grid even if they had not been recycled through the program. Free-ridership is then addressed through participant and non-participant surveying.

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

5.2.4.1 Participant Surveying

A sample of 280 participants were surveyed in this evaluation effort. Questions addressing NTGR issues included:

Q-6 Did you attempt to sell or donate your refrigerator prior to participating in the Refrigerator Recycling Program?

Q-8 Was the old refrigerator still being used when it was picked up?

Q-13 When replacing a major appliance, what do you typically do with the old unit?

Q-14 What would you have done with your old refrigerator if you had not recycled it through PNM?

Q-15 How important was the rebate in your decision to participate in the Refrigerator Recycling Program?

Q-16 How important was the free pickup service in your decision to participate in the Refrigerator Recycling Program

The results from these surveys were used in providing a free-ridership probability score for each respondent. The process by which free-rider scores were assigned to survey respondents is summarized in Figure 5-1 below.

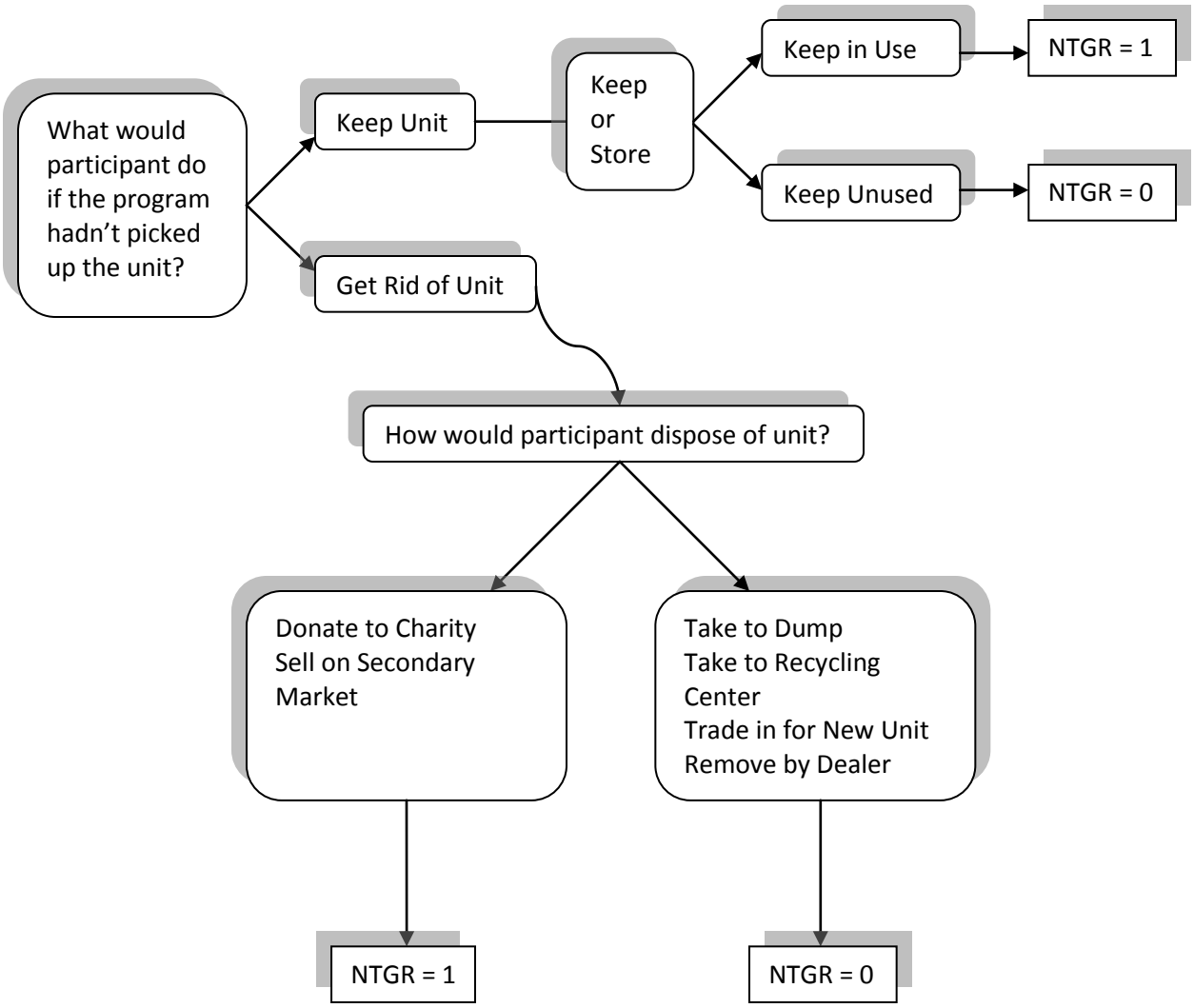

Figure 5-1 Refrigerator Recycling Participant NTGR Scoring

5.2.4.2 Non-Participant Surveying

A sample of 200 non-participants was drawn from PNM's single-family residential customers. These customers were surveyed to ascertain what happens to refrigerators and freezers discarded outside of the program. Respondents are asked:

Q-1 Do you currently have a secondary refrigerator or freezer running in your home, other than mini-fridges or wine coolers?

Q-2 In the past 3 years, have you discarded a refrigerator or freezer?

Q-2a How did you discard this unit?

This is used in developing a Non-Participant Recycling Rate. This is defined as:

$$Non - Part\ Recycle\ Rate = \frac{Non - Part\ \#Units\ Taken\ Off\ Grid}{Total\ \ Non - Part\ Disposals}$$

5.2.4.3 Calculation of Program NTGR

The participant and non-participant surveys provide two free-ridership rates. Program NTGR is determined by aggregating these values as follows:

$$NTGR = 1 - Mean(Particiapant\ Free - Ridership, Non - Particiapnt\ Recycle\ Rate)$$

This value is applied in discounting program kWh and kW savings estimates.

5.3 Impact Findings

ADM estimated savings from the RRP by surveying a sample of program participants and by using available data on the removed refrigerators to calculate unit-specific savings, using a regression methodology developed by Cadmus in 2009. The required sample for 90/10 precision and confidence is 68 surveys. ADM completed 280 surveys, verifying recycling and addressing net-to-gross issues.

ADM verified that average age for units recycled through the 2012 RRP was 21.4 years for refrigerators and 26.7 for freezers. This is similar to the ages found in 2010 and 2011, and with PNM having revised their expected annual savings and EUL for refrigerator and freezer recycling following that evaluation, the values used in calculating expected savings in 2012 were more accurate. Figure 5-2 below presents the age distribution of units recycled through the 2012 RRP.

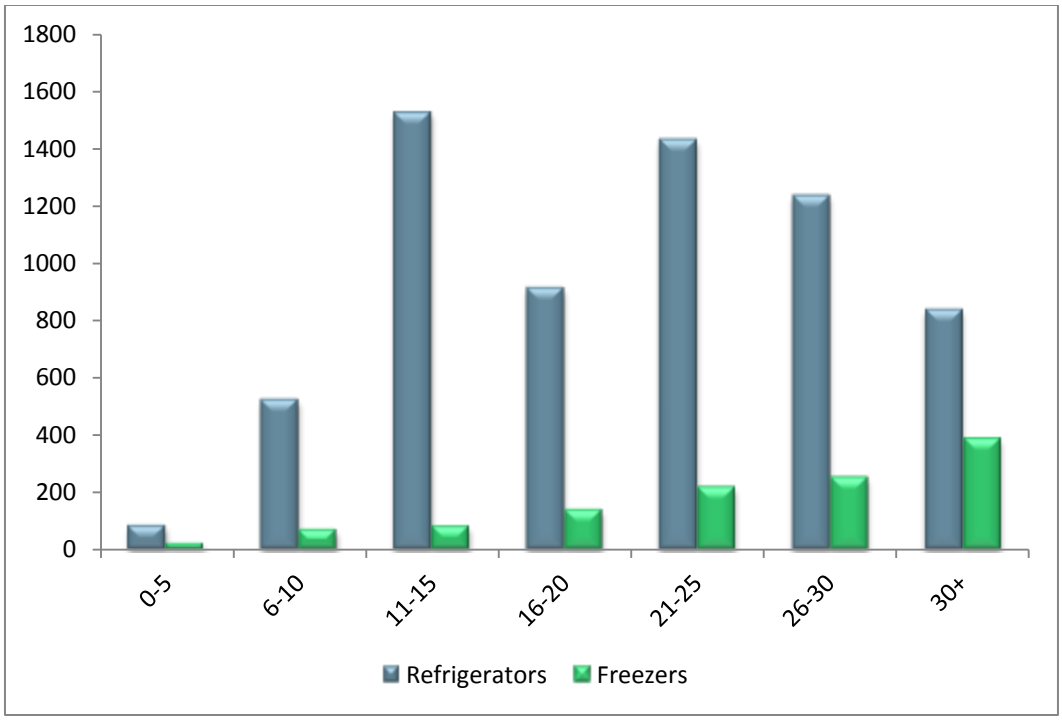

Figure 5-2 Age Distribution of Units in PNM 2012 RRP

5.3.1 Refrigerator Recycling Gross Savings Estimates

Using the regression methodology outlined in Section 5.2.1, ADM calculated UEC based upon unit size, age, defrost type, and configuration. The distribution of savings of recycled units is presented in Figure 5-3 below.

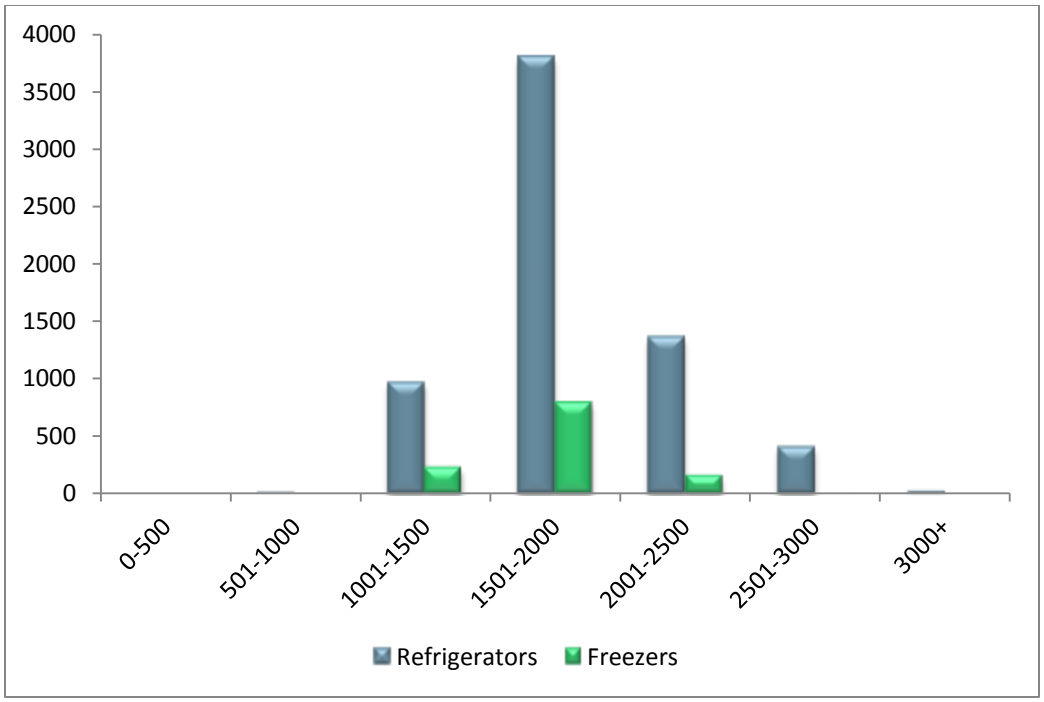

Figure 5-3 UEC Distribution of Refrigerators & Freezers in PNM 2012 RRP

Demand Reduction (kW) is calculated by weighting the annual kWh use based upon the delta T (ambient temperature minus refrigerator temperature). This weight is then increased by the magnitude of the marginal decline in unit efficiency associated with peak-period temperatures, with an average hourly COP calculated based upon the methodology outlined in a NREL 2008 report[15]. Resultantly, ADM calculated kW factors of .000127 and .000247 for conditioned and unconditioned space, respectively. Our survey results indicated that 68% of the recycled refrigerators were used in conditioned space, with 32% used in unconditioned space. Conversely, 25% of freezers were in conditioned space, with 75% in unconditioned space. Weighting the kW factors by these proportions, the weighted average kW factor is .0001634 for refrigerators and .0002182 for freezers. Multiplying this by the ex post kWh savings estimates by unit type provides gross peak demand reduction of 1,671 kW.

5.3.2 Refrigerator Recycling Net Savings Estimates

ADM evaluated net by estimating free-ridership for the 2012 RRP, using the methodology outlined in Section 5.2.4. To obtain net savings for the 2012 RRP, ADM surveyed program participants and non-participants to develop estimates of free-ridership. As detailed in Section 5.2.4, developing free-ridership estimates for the RRP

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

is dependent upon survey questions addressing what is done to refrigerators absent the program.

5.3.2.1 Participant Behavior in the Absence of the Program

One way to assess the impact of the RRP is to examine what participants would have done with their refrigerators and freezers if the program were not in place. Customers have multiple options, including giving the unit away, selling on the secondary market, having the appliance dealer remove the unit when purchasing a new unit, or having the unit hauled away to a dump or landfill.

In the participant survey, respondents were asked what methods they had used in the past when getting rid of a major appliance, and what methods were they likely to consider for the refrigerator or freezer if the program were not available. Participants were first asked:

> **Did you attempt to sell or donate your refrigerator prior to participating?**

If they did attempt to sell or donate, they were then asked:

> **Why didn't you follow through with selling or donating?**

The results of these questions are summarized in Table 5-4 below. The reasons for not following through with the transaction are varied, but several respondents indicated that they found themselves unable to sell the unit at their desired price or that the unit was not in good enough condition to sell.

Table 5-4 Customer Attempts at Selling or Donating Unit

Attempt to Sell or Donate?	***% Indicated***	***Reason Indicated***	***% Reason Indicated***
No	89%		
Yes	11%		
		Couldn't find interested buyer at the price I wanted	13.8%
		Couldn't find interested buyer/recipient because of the unit's condition	10.3%
		Decided recycling the unit was more important than selling it	37.9%
		Other	34.5%
		Don't Know	3.8%
N = 240		***N = 29***	

Reasons under "other" include:

> "The buyer never showed up".

"I became ill and couldn't follow through with it".

"I think it was easier to recycle than sell it and have to put up with people"

Participants are then asked what they have done in the past when disposing of major appliances. Questions addressing this include:

Have you ever needed to replace a major appliance before?

If the respondent indicates "Yes", they are then asked:

When replacing a major appliance, what do you typically do with the old unit?

The question is open-ended, with customers indicating a wide range of disposal practices. The results of questions pertaining to customer behavior in prior appliance disposals are presented in
Table 5-5 below.

Table 5-5 Customer Behavior in Past Appliance Disposal

Replaced Major Appliance?	***% Indicated***	***Method Indicated***	***% Action Indicated***
No	66.4%		
Yes	33.6%		
		Dispose at dump / Recycled	46.8%
		Give to friend/family	14.5%
		Have retailer haul away	8.6%
		Donate to charity	14.0%
		Sell the appliance	7.5%
		Don't Know	4.8%
N = 280		***N = 186***	

27% of respondents indicated that in past appliance disposals, they had taken the old unit to a dump or landfill. An additional 16% indicated having specifically had the unit recycled, and 16% stated that they had the retailer haul the old unit away. By past behavior, a summary of what occurs with the unit (kept on grid, taken off grid, or unknown), is provided in Figure 5-4 below.

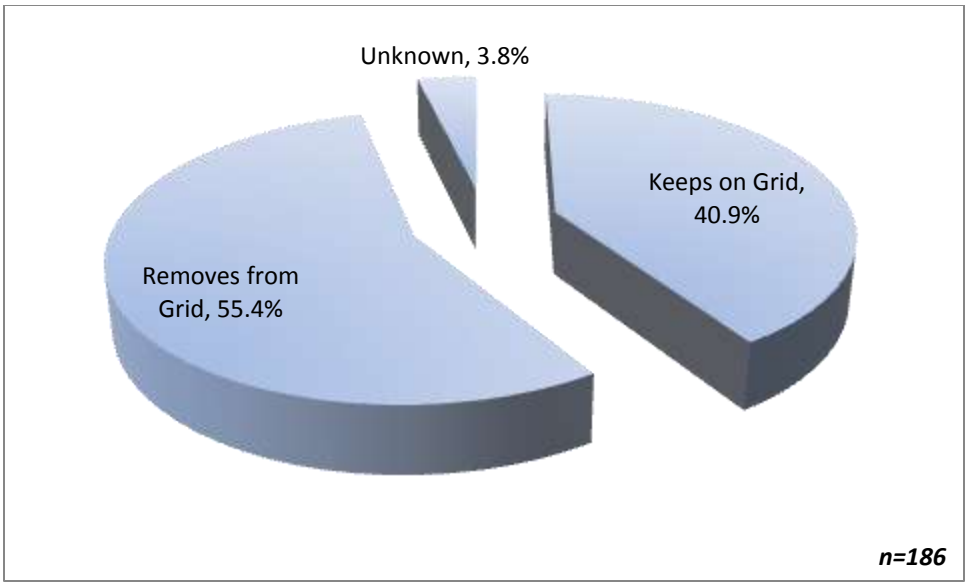

Figure 5-4 Result of Disposal Methods in Prior Appliance Disposals

Following this, respondents are then asked what they would have done with this particular unit in the absence of the program. Respondents are asked:

What would you have done with your old refrigerator if you had not recycled it through PNM?

Table 5-6 Participant Disposal of Units in Absence of Program

Method	***% Indicated***
Taken to Dump / Recycled	26.4%
Give Away / Donate to charity	45.7%
Sell the appliance	11.8%
Keep or Store	4.3%
Continue to Use	6.8%
Other	0.7%
Don't Know	4.3%
N = 280	

When asked about the specific unit recycled, respondents indicated much less often that they would have disposed of or recycled the unit. This is due likely to units being eligible for the program being in better condition than those typically disposed of by program participants. Figure 5-5 summarizes the end results of alternative disposal methods proposed by program participants in the survey.

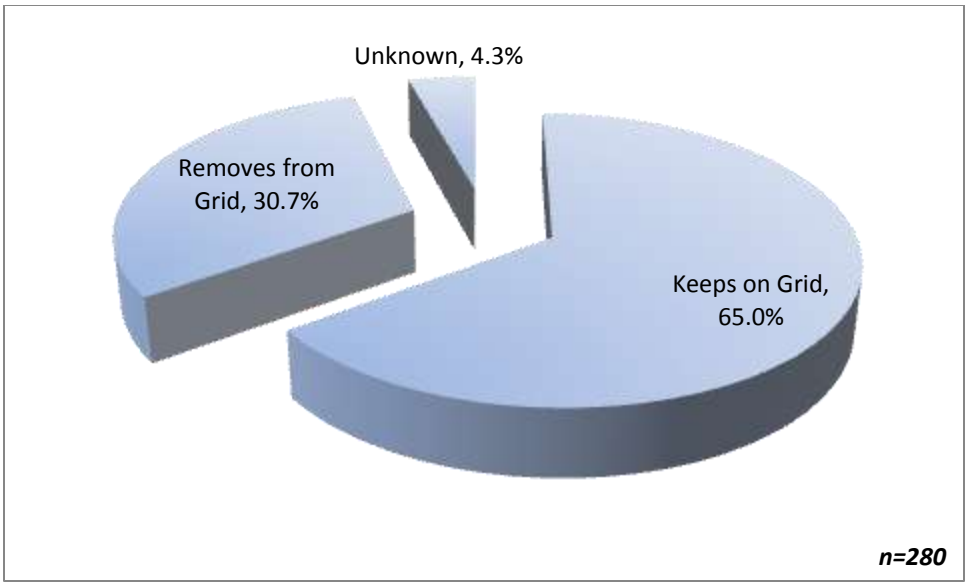

Figure 5-5 Result of Alternative Disposal Methods Indicated by Program Participants

Units belonging to customers who would have kept their unit, given it away, or sold it were likely to have remained on the grid. Units belonging to customers who would have had it hauled to the dump or used a recycling company are likely to have been disposed of.

Additionally, ADM surveyed 200 non-participants in order to collect data on what happens to units disposed of outside of the RRP. Non-participants were asked if they had discarded a refrigerator in the past three years, and if so, how they disposed of it. 17.8% of non-participants indicated having disposed of a refrigerator or freezer within the past three years.

Table 5-7 Methods of Disposal for Non-Participants

Method	***% Indicated***
Taken to Dump / Recycled	65.1%
Give Away / Donate to charity	25.3%
Sell the appliance	9.6%
N = 200	

Table 5-7 summarizes the methods indicated by non-participant respondents. These methods of disposal were then categorized by whether or not they took the unit off of the grid. In Figure 5-6 below, the outcomes of the disposal methods are summarized by whether or not the method removes the unit from the grid.

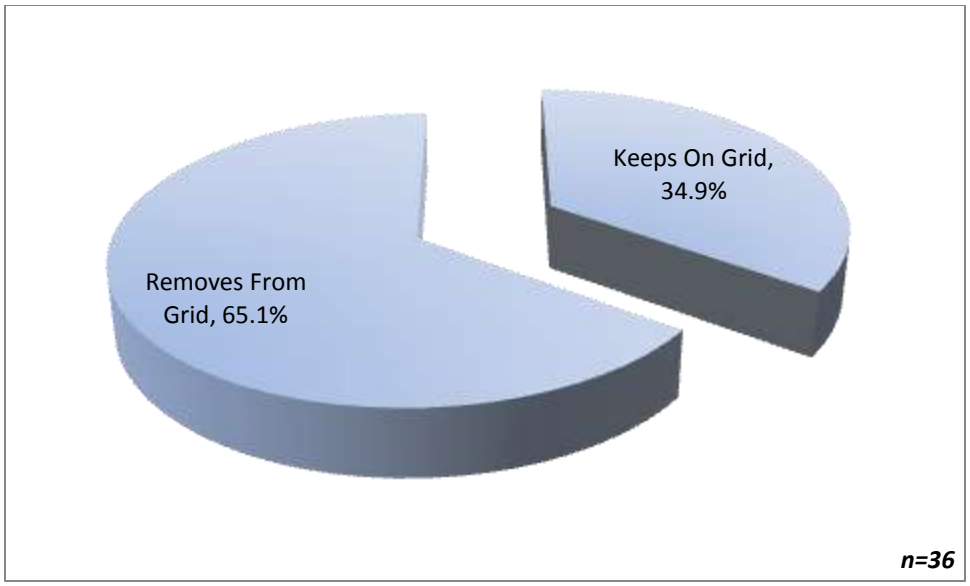

Figure 5-6 Result of Past Disposal Methods Indicated by Non-Participants

This leads to a total usage percentage of 38.6%, which is the value for NTGR through non-participants.

5.3.2.2 Aggregating NTGRS

To obtain final NTGRs for refrigerator and freezer participants, ADM then took a weighted average of participant and non-participant free-ridership rates. Since the non-participant pool is of unknown size, the two values were weighted by the inverse of the sample variance in free-ridership percentages[16]. The values determined through each survey effort are detailed in Table 5-8 below.

Table 5-8 Refrigerator Recycling NTGR Inputs

Motivation	***Participants***	***Non-Participant***
Net-to-Gross Ratio (NTGR)	83.6%	38.6%
NTGR Variance	.223	.322
Variance Inverse	4.48	3.11
N	***280***	***42***

With these values, NTGRs was calculated as:

$$NTGR = \frac{4.48}{4.48 + 3.11} * 83.6\% + \frac{3.11}{44.48 + 3.11} * 38.6\% = 65.2\%$$

[16] This weighting methodology has been applied in prior comparisons of participant and non-participant survey data, including in the California Residential High Impact Measure Evaluation Report (Cadmus Group, 2010).

These values were used to discount gross savings from the RRP.

5.4 Verified Savings

Table 5-9 and Table 5-10 summarize the net savings estimates for the 2012 RRP.

Table 5-9 2012 RRP Gross 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	
Refrigerators	1,416.4	1,375.7	8,683,665	8,419,285	5	43,401,260	42,096,424	96.9%
Freezers	329.9	295.4	1,511,880	1,353,729	4	6,047,520	5,414,916	89.5%
Total	1,746.2	1,671.1	10,195,545	9,773,014	-	49,448,780	47,511,340	95.8%

Table 5-10 2012 RRP Net Savings Summary

Measure	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	
Refrigerators	998.3	897.0	6,123,886	5,489,374	5	30,651,897	27,446,868	89.7%
Freezers	219.7	192.6	1,006,912	882,631	4	4,027,648	3,530,525	87.7%
Total	1,218.0	1,089.6	7,130,798	6,372,005	-	34,625,537	30,977,934	89.4%

5.5 Process Findings

ADM surveyed 280 program participants and 200 non-participants in the evaluation effort for the 2012 Refrigerator Recycling Program. These surveys were focused on collecting data for development of impact evaluation parameters, but they were also leveraged to collect data useful for the process evaluation effort. Data collected via participant surveying is used in evaluating:

- Advertising effectiveness and customer awareness of the program;
- Customers' reasons for recycling and the condition of the units;
- Participant appliance disposal practices;
- Customer satisfaction with various program factors; and
- Recommendations for program improvement.

5.5.1 RRP Process Evaluation Activities

The process evaluation of the RRP included an array of activities, detailed in the subsections to follow.

5.5.1.1 Database Review

ADM completed a review of the tracking database created by JACO. The review identified the data that are being collected, whether any additional data should be incorporated, and whether populated data fields are accurate. The review also examined the quality and timeliness of data flows.

5.5.1.2 Participant Survey

ADM conducted a survey of 280 households that participated in the Refrigerator Recycling Program. The survey was completed by telephone, taking 10-12 minutes to complete. The survey contained a mix of participants that recycled one refrigerator, one freezer, or multiple units comprising both refrigerators and freezers.
Table *5-11* below summarizes the participant survey sample. The sample size allows for 90/10 confidence and precision for refrigerators and freezers separately in these analyses. The survey form used is in Appendix B.

Table 5-11 Refrigerator Recycling Participant Survey Sample Summary

Appliances Removed	*# Completions*
One Refrigerator	220
One Freezer	32
One Refrigerator, One Freezer	2
Two Refrigerators	22
Two Freezers	1
Three Refrigerators	2
Fourteen Refrigerators	1
Total	280

5.5.1.3 Non-Participant Survey

ADM completed surveys with 200 non-participants drawn from PNM's customer list. These lists are provided to JACO on a monthly basis to screen potential participants during scheduling. This list was filtered to remove businesses and multi-family housing, as single family housing drives the residential program. The sample of non-participants was stratified by region, with:

- 180 Respondents from the Albuquerque & Santa Fe area; and

- 20 Respondents from the remainder of PNM territory.

The Albuquerque area included all outlying regions in the greater metropolitan area, including:

- Los Lunas;
- Rio Rancho;
- Belen; and
- Bernalillo;

Regions in the outlying areas included:

- Alamogordo;
- Silver City;
- Deming; and
- Lordsburg.

This sample framework was established in order to address possible differences in attitudes towards the RRP by region.

5.5.2 Scheduling Procedures

This evaluation included a review of JACO's scheduling process for arranging pickup of customers' appliances.

5.5.2.1 Call Handling

The call center for JACO receives calls from customers, several utilities and programs simultaneously, as JACO implements appliance recycling programs nationwide. Each service territory is assigned a separate toll-free number, which is used to identify the program that the caller would fall under. The caller is asked to choose a language by the touch-tone menu that routes the call to the appropriate attendant, with the caller being routed to a Spanish-speaking operator if necessary. Presently, JACO's call center has capacity in excess of what is needed to handle all current programs being implemented.

5.5.2.2 Determination of Eligibility

JACO receives a monthly list from PNM of all eligible customers within their service territory. This allows for JACO to keep their data current and helps to minimize the risk of removing and rebating units from ineligible customers. This provides JACO with customer information including:

- Name;
- Address;
- Account Number; and
- Contact phone number(s)

These data are more comprehensive than what is typically provided to JACO, in that it also includes the customer name. This assists greatly in expediting the verification of eligibility and the overall scheduling process.

During a call with a customer, the call-center operator asks other eligibility questions, including whether the motor is running and if the unit is larger than 10 ft^3. If the customer does not know the unit size off-hand, they may be asked to provide the dimensions of the unit, from which the operator will determine edibility.

5.5.2.3 Unit Location

During the call, the operator asks the caller the physical location of the unit at the pick-up site. This is used to help determine whether there are any obstructions that may make it difficult to pick up the unit. The data collected are largely not usable for impact evaluation, as it's generally difficult to determine if the location is where the unit was during typical operation, or if it is a temporary location in anticipation of pickup.

5.5.2.4 Date Selection

Once the location and eligibility are established, call-center operators are presented with a list of times when JACO staff will be available in the customer's neighborhood. The customer is offered the closest available pick-up date, and if that date does not work, other alternatives are presented until one suffices.

The schedules are determined by geographic region. The number of available pickup dates in a region is determined by the volume of participation associated with the region. This results in a wider range of available pickup days in busier regions, including the greater Albuquerque metropolitan area and Santa Fe. This causes some degree of frustration on the part of customers in far-flung regions or smaller metropolitan areas; there are fewer available times and they often have to wait longer for a pickup date to occur. Given the low volume of recycling, this is largely unavoidable, as keeping dates open on short notice for these regions is not cost-effective. Largely, the limitation on available pickup times is the capacity of the trucks and the length of the runs.

5.5.2.5 Customer Involvement after Scheduling

After a pickup date is scheduled, the operator informs the customer that they will be contacted 24 hours in advance to confirm the pickup date and that the unit needs to be plugged in when the driver arrives. JACO's system provides the operators with an advance call list on each day for the next day's appointments, which the operators then call through. JACO operators also take calls from previously scheduled customers, in order to answer any follow-up questions or to reschedule pickup as needed.

5.5.3 Program Marketing

The marketing efforts for the Refrigerator Recycling Program focused primarily on bill inserts and in-store displays in appliance retailers. For non-participants, 57% of respondents indicated that they had heard of the PNM RRP, while 43% had never heard of the program. The chart for non-participants reflects only the information gathered from customers that had heard of the program. Additionally, non-participants with reasons listed in the "Other" category cited the PNM newsletter and occupations that are related to refrigerators. It should be noted that those that indicated having learned of the program through TV, radio, or print media ads likely learned of the program prior to 2012.

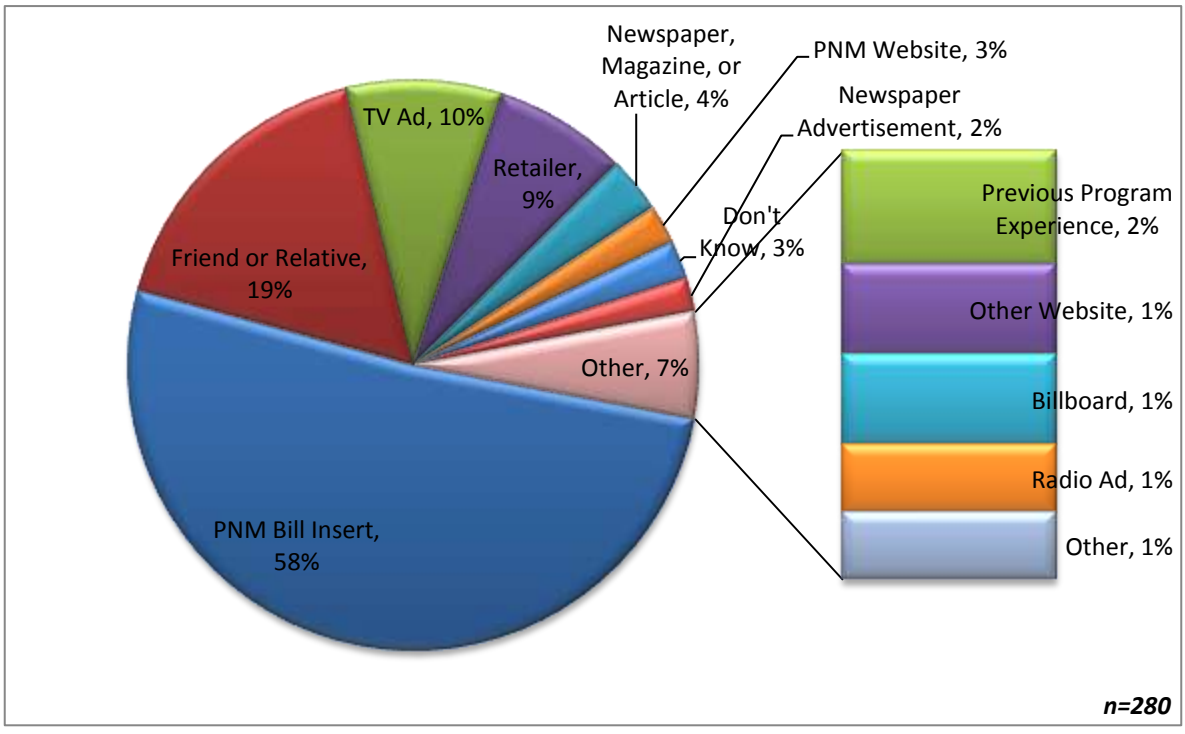

Figure 5-7 Source of Program Awareness– Program Participants

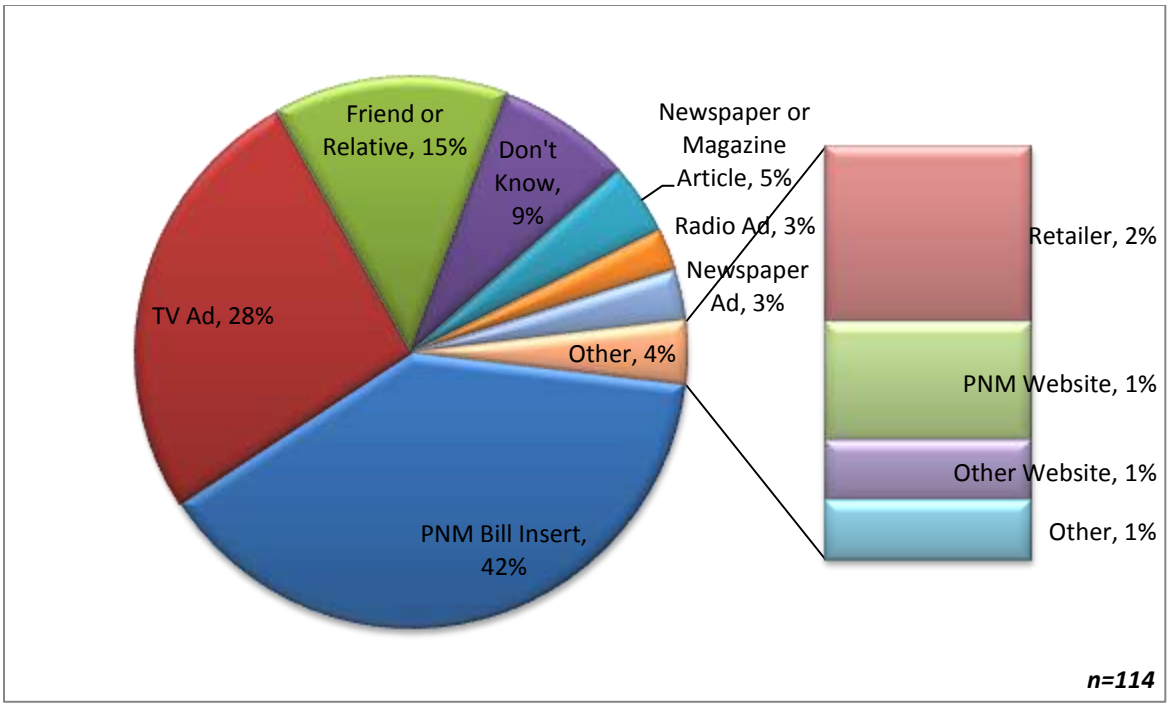

Figure 5-8 Source of Program Awareness – Non-Participants

58% of participants and 42% non-participants indicated having learned of the program from PNM bill inserts. Overall, the only marked difference between how program participants and non-participants learn of the program is that 12% of participants indicated having learned of the program from a retailer, whereas only 1% of non-participants indicated so. This is to be expected; however, in that participants are much more likely to have contacted an appliance retailer when replacing their primary refrigerator.

Following bill inserts, TV advertisements were the second most commonly indicated source of awareness, being listed 15% and 28% percent of the time by participants and non-participants, respectively. Other forms of direct advertisement, including print media and radio ads, are listed much less often as a source of awareness. These were cancelled in 2012, and any indication of these ads by 2012 participants is from customers that heard ads in prior years. PNM phased out these ads due to a lack of response and the relatively high cost in favor of more targeted marketing and this has resulted in reduced costs while maintaining higher program participation.

Given the cost of these forms of advertisement, PNM and JACO may want to reconsider the allocation of these dollars into other advertising channels.

As seen in Table 5-12 below, there is a difference in the channel indicated depending upon whether the respondent recycled a refrigerator or freezer. Direct channels from PNM and JACO were listed more often by freezer participants, who indicated PNM bill

inserts 7% more often and TV Advertisements 12% more often as refrigerator participants. Refrigerator participants were more likely to indicate word of mouth and retailer advertisements.

Table 5-12 Sources of Awareness Comparison: Refrigerator vs. Freezer Participants

Source	***Refrigerator Respondents***	***Freezer Respondents***
Bill Inserts	51%	58%
TV Advertisements	17%	29%
Word of Mouth	21%	15%
Retailer	14%	8%
Newspaper Advertisement	5%	4%
PNM Website	3%	3%
Radio Advertisement	4%	0%
Don't Remember	1%	5%
N	***245***	***45***

5.5.4 Refrigerator Recycling Program Performance

In 2012, the RRP had 7,431 orders, for a total of 7,738 units. Table 5-13 summarizes the performance of the RRP program from 2008 – 2012.

Table 5-13 RRP Program Performance: 2008-2012

Units	***2008***	***2009***	***2010***	***2011***	***2012***
Refrigerators	5,869	6,136	6,817	5,317	6,566
Freezers	612	877	1,016	913	1,172
Total	6,481	7,013	7,833	6,230	7,738

Usage of Recycled Units

Respondents were asked questions related to the usage of the recycled unit. These questions addressed unit location, condition, and how many months a year the unit was in use. Table 5-14 summarizes these results for refrigerators and freezers.

Table 5-14 Location of Use of Recycled Units

Room	Refrigerators	Freezers
Kitchen	69%	25%
Garage	20%	55%
Outdoors	5%	7%
Den/Lounge	1%	7%
Utility Room	1%	4%
Laundry Room	2%	5%
Other	2%	2%
N =	***245***	***45***

Respondents were then asked to describe the working condition of the recycled refrigerator or freezer. Customers were asked if the unit:

- Was in good working condition;
- If it worked well but needed minor repairs, such as a handle or gasket;
- If it worked but had serious problems, such as not defrosting properly; or
- If it didn't work at all.

The results are summarized in Table 5-15 below.

Table 5-15 Condition of Recycled Units

Condition	Refrigerators	Freezers
In good condition	53%	70%
Needed minor repairs	29%	20%
Had serious problems	14%	5%
Didn't work at all	2%	5%
Don't Know	1%	0%
N =	***245***	***45***

Respondents were also asked whether they had considered discarding their refrigerator or freezer prior to hearing about the program. Respondents were asked:

When did you learn about the PNM Refrigerator Recycling Program and the available Rebate?

As summarized in Table 5-16 below, an average of 89% of participant respondents learned of the program either before or during their decision to dispose of their refrigerator or freezer. The sum of refrigerator and freezer respondents is greater than the total number of participants because some respondents had both a refrigerator and freezer. The count of responses from the aggregated group was the

total count of responses for each response type, independent of whether they had a refrigerator or freezer.

Table 5-16 Timing of Learning of Program Relative to Decision to Recycle

Timing of Learning of Program	***Refrigerator Respondents***	***Freezer Respondents***	***Aggregated***
Before deciding to recycle	63%	52%	62%
After deciding to recycle	8%	11%	9%
At the same time	27%	34%	27%
Don't Know	2%	2%	3%
N	***245***	***45***	***280***

Motivation to Participate

Using participant survey data, ADM developed profiles of customers' motivations for participating in the RRP and the various factors that influenced the decision. Participants are asked how they would have disposed of their appliances without the program and what influenced that decision.

Exploring this consideration further, customers were asked an open-ended question where they were to indicate their reasons for participating in the RRP. Table 5-17 below summarizes the reasons given. The top two factors listed by program participants as motivators for program participation were the convenience of the free pickup and the PNM rebate. Reasons under "other" included:

"I was not using the freezer".

"I did because my daughter suggested it".

"I did not want to sell my refrigerator".

Most customers that had reasons in the "Other" category indicated just wanting to get rid of the unit. The sum of refrigerator and freezer respondents is greater than the total number of participants because some respondents had both a refrigerator and freezer. The count of responses from the aggregated group was the total count of responses for each response type, independent of whether they had a refrigerator or freezer.

Table 5-17 Reasons Indicated for Program Participation

Motivation	*Refrigerators*	*Freezers*	*Aggregated*
Convenience of Free Pickup	45%	43%	44%
PNM Rebate	57%	48%	55%
Energy Cost Savings	23%	20%	22%
Good for the Environment	36%	34%	35%
Purchased New Unit	29%	16%	27%
Unit No Longer Worked Properly	13%	5%	12%
Other	2%	14%	4%
Don't Know	2%	2%	2%
N	***245***	***45***	***280***

As part of the evaluation of the reasons for program participation, ADM also asked customers specifically about the importance of the rebate in their decision to participate in the program, as well as the importance of the free pickup service. Table 5-18 below shows the results.

Table 5-18 RRP Motivational Factors

Importance Level	*Rebate*	*Pickup Service*
Very Important	39%	82%
Somewhat Important	34%	12%
Slightly Important	15%	3%
Not at All Important	11%	3%
Don't Know	1%	0%
N	***280***	***280***

As seen above, 73% of program participants indicated the rebate as being "Somewhat Important" or "Very Important". As for the pick-up service, 94% of respondents found it to be "Very Important" or "Somewhat Important". These results suggest that both the rebate and the pick-up service are two of the leading important factors in program participation.

5.5.5 Program Satisfaction

The participant survey for the PNM Refrigerator Recycling Program included questions addressing participant satisfaction with an array of specific issues and processes as well as for the program as a whole. Table 5-19 below summarizes participant responses when asked to rate satisfaction on a scale of 1 to 5, with 1 meaning "Very Dissatisfied" and 5 meaning "Very Satisfied".

Table 5-19 Participant Satisfaction with Program Components

Component	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied	Don't Know
The scheduling process for recycling	84%	9%	4%	1%	1%	0.4%
The work performed by the staff that picked up your appliance	91%	4%	2%	0.4%	0%	3%
The wait time between scheduling and pickup	63%	19%	12%	3%	3%	1%
The wait time to receive the rebate check	58%	22%	14%	1%	1%	3%
The rebate amount	71%	20%	6%	0%	1%	1%
Overall satisfaction with the program	84%	15%	2%	0%	0%	0%
N = 280						

Participants were in general quite satisfied with the program. 93% of respondents were at least "Somewhat Satisfied" with the scheduling process and the work performed by the staff that picked up the appliance. 99% of respondents were at least "Somewhat Satisfied" with the program overall. Sources of dissatisfaction focused largely around wait times for pickup and receipt of the rebate check.

5.5.5.1 Dissatisfaction with Wait Times

Dissatisfaction with wait times was generally straightforward. When asked for detail and context, several respondents indicated that they were dissatisfied with pickup lead times running as long as a month. Other customers indicated that the scheduling times available were not convenient for them, that they waited for a long time during the scheduled day for pickup, or that they had to reschedule the pickup time.

As for the rebate wait time, most dissatisfied customers were dissatisfied because they waited a few weeks to receive the rebate check. A few other respondents indicated that they had not received the check yet. The application to participate indicates that the rebate is mailed in 4-6 weeks after pickup, and by and large JACO did meet that timeline with customers; however, many respondents indicated that that seemed to be an excessive timeframe for such a small check. It should be noted, however, that participants were overall quite satisfied with the program, as 84% indicated being "Very Satisfied' and 15% indicated being "Somewhat Satisfied".

5.5.6 Participant Narrative Commentary

At the end of the survey, respondents were asked:

Do you have any specific comments or suggestions you would like me to relay to PNM about the Refrigerator Recycling Program?

Responses to this included:

> "I think they should keep the program going because there are a lot of people that would be happy to use it."
>
> "I think that similar rebates and free pick-up should be offered for all appliances."
>
> "I think it is a very good program and very good for the environment. People do not know where they can dispose of an appliance. I hope it is continued."
>
> "I think they should do more advertising because not too many people have heard of the program."
>
> "It was very convenient".
>
> "I like the way that the program is set up on the internet. There is no hassle and you get responses very quickly."
>
> "I wish they would have applied the money towards my bill instead of sending me a check."
>
> "I think that they should coordinate the timing a little better."

Some customers were confused about the rebate amount, asking about a $50 rebate. Many participants wondered why PNM would not accept non-functioning appliances. Customer perception on the recycling program seems to be more centered on having the units' hazardous materials properly disposed, rather than focusing on the benefits of removing units from the electrical grid. As a result, participants are left questioning why a unit can be in "too poor shape to recycle".

5.5.7 Non-Participant Behavior

Non-participants were interviewed and asked questions regarding their reasons for non-participation. These questions addressed issues of a logistical matter (i.e., whether the customer has a secondary unit, or if they anticipate having to replace a refrigerator), and that of customer preferences (such as preferring to sell or donate old units).

5.5.7.1 Non-Participant Technical Potential

Customers were first asked:

Do you currently have a secondary refrigerator or freezer running in your home, other than mini-fridges or wine coolers?

34% of respondents indicated having at least one secondary refrigerator or freezer in their home. The profile of these units is summarized in Table *5-20* below.

Table 5-20 Profile of Non-Participant Secondary Units

Unit Type	*% Indicated*	*Median Age*
Top Freezer	30%	8
Bottom Freezer	5%	3
Side-by-Side	15%	6
Freezer Only	42%	7
Refrigerator Only	8%	5
Don't Know	0%	-

5.5.7.2 Likelihood of Participation

Non-participants were asked questions regarding their likelihood of participating in the RRP over the next three years. If they indicated that they were "Somewhat Unlikely" or "Very Unlikely" to participate, they are asked probing questions to explain why. These results are summarized in Table 5-21 below. The column labeled "Reason" includes all respondents that indicated that they are "Somewhat Unlikely" or "Very Unlikely" to participate.

Table 5-21 Likelihood of Participation

Likelihood of Participating	*% Indicated*	*Reason*	*% Indicated*
Very Likely	20%		
Somewhat Likely	20%		
Somewhat Unlikely	14%		
Very Unlikely	40%		
Don't Know	6%		
		Won't have unit to get rid of	44%
		Rebate not high enough	1%
		Don't think program will pick up in my location	2%
		Would rather have retailer haul away	1%
		Don't understand the program	6%
		Other	2%
N = 200		***N = 109***	

Only 40% of non-participants surveyed indicated a likelihood of participating in the PNM RRP. The most cited reason for not participating in the future is that non-participants did

not believe that they would need to recycle any of their refrigerators or freezers in the near future.

5.5.7.3 Tracking Data Review

In 2012, ADM made suggestions for the standardization of city names in the JACO tracking data. This suggestion was adopted, and with this change, ADM has no further recommendations for the program tracking data.

5.6 Conclusions & Recommendations

The Refrigerator Recycling Program, as presently constituted, corresponds with best practices for this program type. The program accommodates refrigerators and freezers, including both primary and secondary units. Further, the program has established an implementation network that reaches the rural areas of PNM's service territory. JACO made some modifications to the tracking data at ADM's recommendation from the 2011 evaluation, which encompassed the full scope of ADM's 2011 comments. One area which might be worth investigating, however, is in expanding the program to include room air conditioners. This is an offering seen elsewhere in appliance recycling programs, and could potentially broaden the reach and savings of the program if the available market is of sufficient size. PNM and JACO should investigate the feasibility of this expansion. Beyond this, ADM has no further comment on the operations of the Refrigerator Recycling Program.

6. Residential Lighting

6.1 Program Description

The Residential Lighting Program is a market-based strategy for promoting use of CFL bulbs of different wattage equivalents and types. The program for 2012 is designed to reach PNM's residential customers in New Mexico by CFL promotion through an upstream buy-down structure that allows retailers to provide discounted pricing for energy-efficient lighting products. Smaller retailers that lack the Point-of-Sale (POS) infrastructure for a markdown program can participate through a coupon channel, through which customers fill out a coupon to obtain their discount at the time of purchase, and the retailer mails in the coupons for reimbursement.

6.2 M&V Methodology

The PNM Residential Lighting Program provides rebates for CFLs through three channels:

- CFL Retail Coupons;
- CFL Retail Markdowns; and
- Online sales.

The M&V approach for the Residential Lighting Program is aimed at the following:

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

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

Table 6-1 Sources for Gross Impact Parameters – Residential Lighting Program

Parameter	***Source***
CFL Quantities & Specifications	Program tracking data
Location of Installation	Telephone follow-up surveys with lighting purchasers
Hours of Use Per Day	California Residential Lighting Metering Study (KEMA, 2009)
CFL Installation Rate	Telephone follow-up surveys with lighting purchasers
Baseline Wattage	Manufacturer's specifications for

	lumen equivalence by CFL size & configuration

6.2.1 RLP Review of Deemed Savings Estimates

ADM reviewed the deemed savings estimates used by PNM for the 2012 RLP. ADM then recruited customers for in-store intercept surveys at 8 participating retailers, stopping customers after completion of their selection to conduct a brief interview. These respondents were then recruited for a follow-up survey, for which they were compensated $25 upon completion. The survey provided other useful data, including:

- Rooms in which pre-existing CFLs were installed;
- Rooms in which newly purchased CFLs were installed;
- Customer feedback on the program;
- Insight into customer decision-making in purchasing CFLs; and
- Changes in customer behavior after having learned of the program.

6.2.2 RLP Sample Plan

The sampling plan for evaluation of the Residential Lighting Program was developed to capture a representative subset of the participant retailers. Intercept surveying was conducted at 8 participating stores from 5 different retail chains.

6.2.3 RLP Verification of Sales

Verification of total sales of CFLs through the Residential Lighting Program was done through review of a sample of invoices between participating retailers and the rebate processing firm, EFI. These invoices were cross-checked with program tracking data in order to ensure that final claimed sales and associated savings matched sales data provided by the retailers.

6.2.4 RLP Verification of Installation

ADM used follow-up surveys with lighting purchasers to verify installation of CFLs. These surveys were conducted with 68 markdown participants. In these surveys, customers were asked how many of their purchased CFLs were installed, and where in their home they were installed. These values are used in calculating the installation rate of purchased CFLs and in establishing hours of use based upon the room types in which the CFLs are installed.

6.2.5 RLP - Net Savings Estimates

Evaluation of net savings from the RLP requires determination of free-ridership through participant surveying. ADM applies the general methodology described in Section 2.4.3

to separate free-ridership into four component parts: financial ability, prior planning, importance of the rebate in decision making, and the likelihood of installing similar equipment without a rebate. The components were addressed with questions detailed in the subsections to follow.

6.2.5.1 Program Inducement

Customers are asked as to any plans they had to purchase any CFLs, or if they had planned on purchasing fewer CFLs than they had intended to purchase after having learned of the rebate. This is addressed in the following questions:

> Question 5: Were you aware of the rebate prior to entering the store that day?
>
> Question 6: Did you plan on purchasing CFLs prior to entering the store that day?
>
> Question 9: If they were not discounted through a PNM program, how likely would have you have been to purchase CFLs?

If the respondent indicates in Question 6 that they already planned on purchasing CFLs before entering the store that day and that they were unaware of the rebate, then the respondent is considered to be a free-rider.

6.2.5.1 Purchase Scaling & Partial Free-Ridership

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

> Question 10: Did the PNM discount for CFLs allow you to purchase more CFLs than you otherwise would have? How many?

If the respondent indicates that they purchased more CFLs as a result of their program participation, then this value is divided by the size of their initial purchase to get the scaling percent that the program caused. This percent is used as the customer NTGR in instances where the customer has been shown as a free-rider in the Program Inducement component.

6.2.5.1 Spillover

Participant spillover is addressed through questions about whether the respondent has since purchase non-incentivized CFLs:

> Question 11: After learning of PNM's discount, have you since purchased any CFLs that were not rebated through the program?

Question 12: What motivated you to purchase these CFLs?

If the respondent indicates in Question 11 that they purchased CFLs without an incentive, their open-ended response to Question 12 is examined in order to determine whether the purchase can be attributed to their past experience with the Residential Lighting Program.

6.3 Impact Findings

ADM estimated savings from the RLP by surveying a sample of program participants to determine installation rate, hours of use (via data collection on the room of installation), and net-to-gross ratio. ADM surveyed a sample comprising both markdown and coupon participants. In total, 69 respondents were given follow-up surveys via telephone to verify installation and to address net-to-gross issues. The results of ADM's evaluation effort are detailed in the subsections to follow.

6.3.1 Database Review

The program distributed a total of 1,181,957 CFLs via retail buy-downs, coupons, and online sales. ADM first examined the tracking database for systemic entry errors for each channel, i.e., duplicate entries and/or erroneous entries (such as data entered into improper columns). There were a significant amount of entries for which unit wattage was missing, which required further research to populate. However, for units with the data fully populated, ADM found quantities and unit specifications to match manufacturer's literature when reviewing a sample of rebated CFLs. Figure 6-1 below presents a summary of CFLs sold through the 2012 RLP.

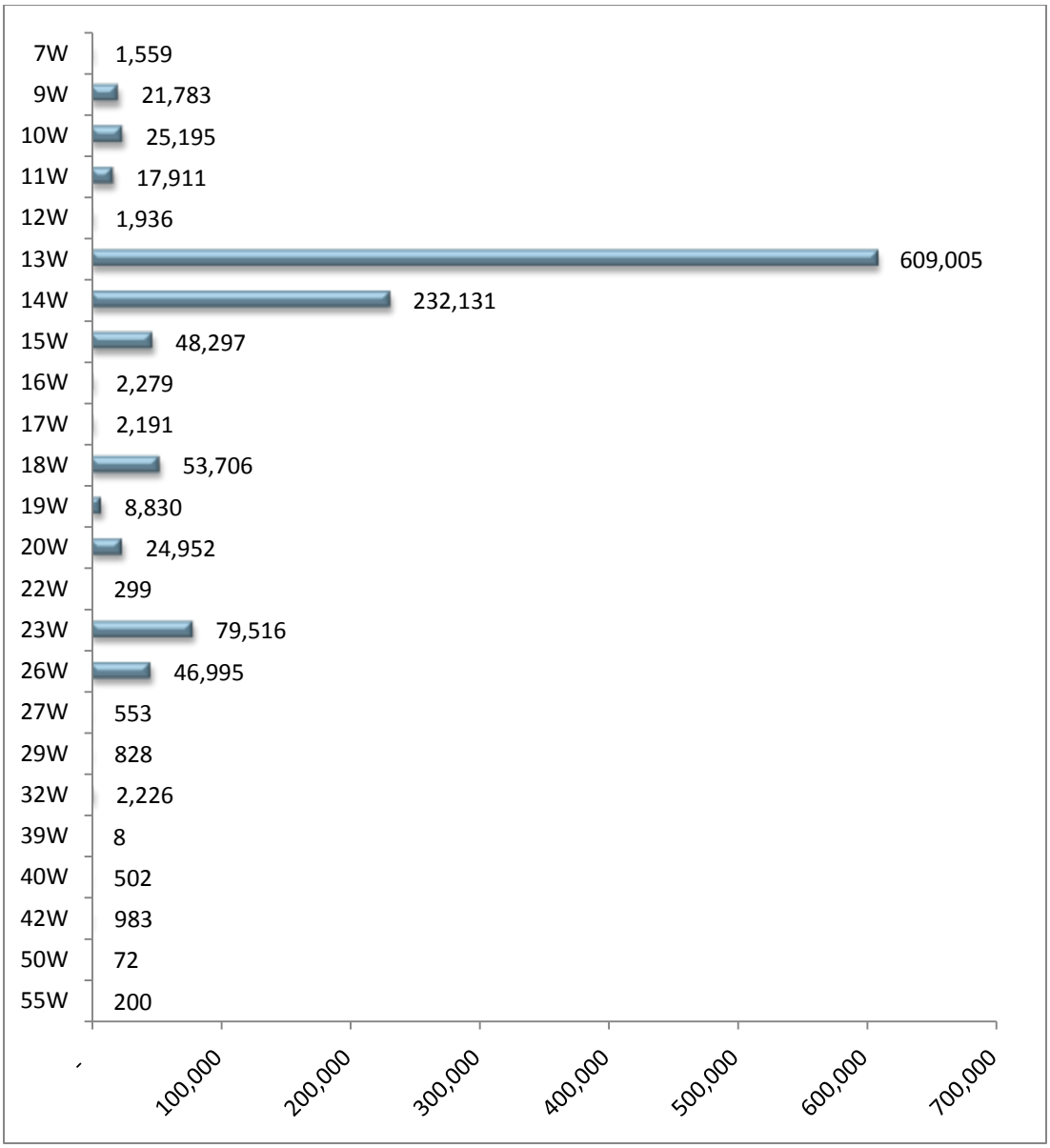

Figure 6-1 Residential Lighting Summary of Sales by Wattage

6.3.2 Residential Lighting Gross Savings Estimates

Gross savings estimates for residential CFLs require the following parameters:

- Baseline wattage;
- Installation rate; and
- Hours of use

6.3.2.1 Baseline Wattage

Baseline wattage is dependent upon CFL wattage and configuration, i.e., spiral, flood, globe, or candelabra. ADM researched each SKU number listed in the program tracking data for residential lighting programs run by each of the three New Mexico investor-owned electric utilities to find the appropriate baseline for the model. These results are presented in Table 6-2 below.

Table 6-2 CFL Baseline Wattage Table

CFL Wattage	CFL Configuration	Baseline Wattage
7	Spiral	25
7	Candelabra	40
9	Spiral	40
9	A-Lamp	40
9	Globe	40
10	Spiral	40
11	Globe	40
11	Candelabra	40
11	Flood	50
12	Globe	60
13	Spiral	60
13	Candelabra	60
14	Spiral	60
14	A-Lamp	60
14	Flood	65
15	Globe	60
15	Spiral	60
15	Flood	65
16	Flood	65
18	Spiral	75
18	Flood	90
19	Spiral	75
20	Spiral	75
23	Spiral	75
23	Flood	90
24	Spiral	100
26	Spiral	100
26	Flood	120
27	Spiral	100
28	Spiral	100
29	Spiral	100
32	Spiral	150
40	Spiral	150

42	Spiral	150
55	Spiral	300

The exception to this table is non-specialty CFLs with a 100W baseline. As a result of the Energy Independence and Security Act of 2007 (EISA), beginning January 1st 2012, manufacture of 100W incandescent lamps was officially ceased. ADM has opted to mimic the approach to the EISA adopted in the Pennsylvania TRM, where EISA baselines take affect 6 months after implementation, in order to account for retailers selling through back-stock. As such, this baseline takes effect for 26-30W CFLs on and after July 1st, 2012.

Table 6-3 below summarizes the baseline changes, effective dates for M&V, and their expected impact on savings per-unit for the RLP.

Table 6-3 CFL Baseline Updates & Effective Dates

CFL Wattage	Baseline Wattage	New Baseline Wattage	Legal Effective Date	M&V Effective Date	% Reduction in Savings
26-30W	100W	72W	1/1/2012	7/1/2012	37.8%
18-23W	75W	53W	1/1/2013	7/1/2013	40.7%
13-15W	60W	43W	1/1/2014	7/1/2014	36.9%
9-12W	40W	29W	1/1/2014	7/1/2014	37.9%

This resulted in the use of a 72W baseline for 26-30W non-specialty CFLs sold as of July 1st, 2012.

6.3.2.2 Installation Rate

Installation rate of CFLs is determined via surveying of lighting purchasers, asking how many have been installed and how many are intended to be installed in the coming month. These values were summed and then divided by total CFLs purchased in determining the overall program installation rate. From the 68 follow-up surveys, ADM found an overall installation rate of 67.7%.

6.3.2.3 Hours of Use

In a 2009 study of California by KEMA[17], CFL use was monitored in statistically significant samples by room type, with the resulting average daily hours of operation by room type summarized in Table 6-4 below.

[17] KEMA, "CFL Metering Study", prepared for the California Public Utilities Commission, 2009

Table 6-4 Daily Hours of Operation by Room Type – KEMA Study

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

The hours of use by room type that PNM applied in their deemed savings estimates was based upon a DOE study conducted by Navigant[18]. The KEMA study is the more recent study and is based upon a significant amount of residential monitored lighting runtime data. However, there are room types from the Navigant study that are not covered in the KEMA study. ADM has applied hours of use from the KEMA study where available and those from Navigant for room types that the KEMA study did not cover. These hours are displayed in

Table 6-5 below.

Table 6-5 Daily Hours of Operation by Room Type – Navigant Study

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

The results from these two studies provide an up-to-date depiction of hours of use by room type for a wide array of residential end-uses. ADM surveyed program participants to address how many CFLs were in their home prior to participating and the room of installation, and then addressing the location of installation of purchased CFLs. From our surveying, ADM found an average of 7.7 pre-existing CFLs per household. Figure 6-2 presents the room of installation of CFLs installed in 2012.

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

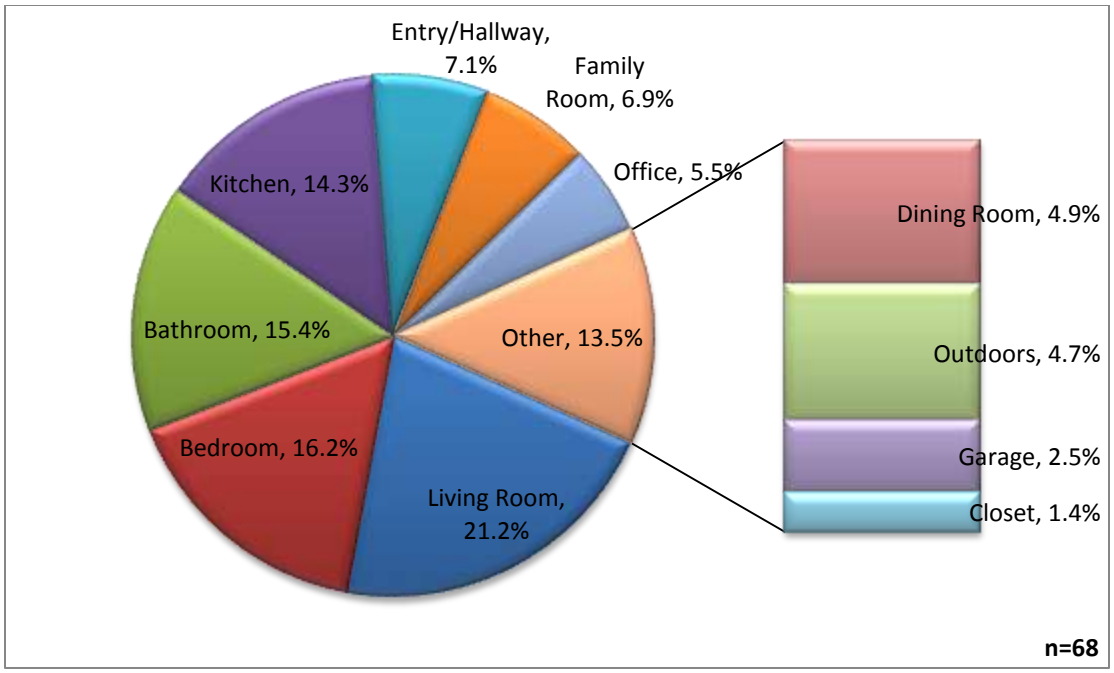

Figure 6-2 Room of Installation of 2012 Installed CFLs

ADM used the share of installations by room type from 2012 along with the values for hours of use by room type from the KEMA and Navigant studies to develop an average hours of use estimate for CFLs distributed through the 2012 RLP. Table 6-6 below presents a summary of hours of use values by room type and the share that they constitute of the 2012 CFL distribution.

Table 6-6 Hours of Use Summary

Room Type	Hours of Use	% of 2012 CFLs
Kitchen	3.5	14.3%
Living Room	3.3	21.5%
Outdoor	3.1	4.7%
Family Room	2.5	6.9%
Garage	2.5	2.5%
Utility Room	2.4	0%
Dining Room	2.3	4.9%
Office	1.9	5.5%
Bedroom	1.6	16.2%
Bathroom	1.5	15.4%
Hall/Entry	1.5	7.1%
Laundry Room	1.2	0%
Closet	1.4	1.4%

From this, a weighted average hours of use value of 2.42 per day was estimated, for 883 hours annually.

6.3.2.4 Peak Demand Reduction

Peak demand reduction is dependent upon the peak coincident factor (PCF), which is defined as the percent of available peak hours in which lighting is operating. PNM' peak period is set on summer weekdays between 3:00 and 6:00 PM. Based upon the KEMA CFL Metering Study, ADM found that the PCF defined for this period is 10.17%, which ADM has applied in the analysis.

6.3.2.5 Savings from 2011 CFLs

In 2011, the PNM Residential Lighting Program was responsible for the sale of 954,042 CFLs, with an installation rate of 73%. According to the KEMA CFL Metering Study, the eventual installed value for markdown CFLs is 96%, with 4% never being installed. This results in 23% of the CFLs sold in 2011 being installed in 2012, and ADM has opted to credit the 2012 program with those first-year savings, in that they were generated by the PNM Residential Lighting Program and never claimed. The results of the 2012 program were as follows:

- 26,657,054 realized gross savings;
- 82% NTGR;
- 258,011 CFLs sold in 2011 but not installed in 2011;
- 38.29 gross kWh per CFL installed;
- .00487 kW per CFL installed;

As a result, 2012 first-year savings from the 2011 program are:

In the above equation, .27 represents the difference between the 2011 installation rate (73%) and full-installation (100%), whereas .23 represents the difference between the 2011 installation rate (73%) and the long-term installation rate (96%). Subsequently, CFLs sold in 2011 and installed in 2012 provide:

- 6,900,833 kWh
- 877.7 net kW; and
- 48,305,831 net lifetime kWh savings

6.3.3 Residential Lighting Net-to-Gross Evaluation

To obtain net savings for the 2012 RLP, ADM surveyed program participants to develop estimates of free-ridership. As detailed in Section 6.2.5, developing free-ridership estimates for the RLP is dependent upon survey questions addressing financial ability, prior planning, importance of the rebate in decision making, and likelihood of installing

similar equipment absent the program. Table 6-7 through Table 6-9 below summarizes the responses to questions addressing free-ridership for the 2012 RLP.

Table 6-7 RLP Prior Planning Results

Component	Question	Yes	No	Don't Know
Program Inducement	Question 5: Were you aware of the incentive prior to entering the store that day?	48.5%	50.0%	1.5%
	Question 6: Did you plan on purchasing CFLs prior to entering the store that day?	55.9%	44.1%	0%
		Definitely	**Probably**	**Probably Not**	**Definitely Not**
	Question 11: If the CFLS were not discounted through the PNM program, how likely is it that you would have purchased CFLs anyway?	51.5%	27.9%	14.7%	5.9%

Table 6-8 Scaling of Purchase Results

Component	Question	Yes	No	% Increase
Purchase Scaling & Partial Free-Ridership	Question 13: After learning of the available discount, did you purchase more CFLs than you otherwise would have?	55.9%	44.1%	-
	Question 13a: How many more CFLs did you purchase as a result of the incentive?	-	-	21.6%

Table 6-9 Spillover Results

Component	Question	Yes	No	Don't Know	% Increase
Spillover	Question 14: After learning of the available discount, did you purchase any CFLs that weren't rebated through the program?	60.3%	33.8%	5.9%	-
	Question 14a: How many CFLs did you purchase that weren't rebated through the program?	42%	33%	25%	24.7%
	Question 15: What motivated you to install these CFLs?	-	-	-	-

The results of these analyses were:

- Free-ridership of 38.1%
- Spillover of 11.3%
- NTGR of 73.2%

6.4 Verified Savings

Table 6-10 below presents gross realization for CFLs sold through the 2012 Residential Lighting Program.

Table 6-10 Residential Lighting Gross Realization Summary

Measurement	Expected Gross Savings	Realized Gross Savings	Gross Realization Rate
Annual Energy (kWh)	33,148,126	33,226,283	100.0%
Demand (kW)	4,219	4,013	94.8%
Lifetime Energy (kWh)	232,036,882	232,583,981	100.0%

Additionally, ADM estimated free-ridership for the RLP via participant surveying, obtaining a value of 73.2% for NTGR. This value was applied in discounting program savings, and the net savings results are presented in Table 6-11 below.

Table 6-11 Residential Lighting Net Realization Summary

Measurement	Expected Net Savings	Realized Net Savings	Net Realization Rate
Annual Energy (kWh)	23,230,775	24,321,639	104.5%
Demand (kW)	2,957	2,938	100.0%
Lifetime Energy (kWh)	162,615,442	170,251,474	104.5%

Further, sales from 2011 that were not installed until 2012 provided:

- 6,900,833 kWh
- 877.7 net kW; and
- 48,305,831 net lifetime kWh savings

Table 6-12 Residential Lighting Net Realization Summary

Measurement	Realized Gross Savings	Realized Net Savings
Annual Energy (kWh)	41,641,933	31,222,472
Demand (kW)	5,083	3,816
Lifetime Energy (kWh)	291,493,531	218,557,304

6.5 Process Findings

ADM surveyed 68 participants in the evaluation effort for the 2012 Residential Lighting Program (RLP). These surveys were focused on collecting data for development of impact evaluation parameters, but they were also leveraged to collect data useful for the process evaluation effort. Data collected via participant surveying is used in evaluating:

- Advertising effectiveness and customer awareness of the program;
- Customers' reasons for their lighting purchase;
- Customer satisfaction with various program factors;
- Expected customer behavioral changes with the pending changes in lighting standards; and
- Recommendations for program improvement.

The RLP is implemented by Applied Proactive Technologies (APT), with database support and rebate processing by Energy Federation Incorporated (EFI). The program is focused on providing point-of-sale instant discounts to qualifying CFLs. For larger retailers, this is accomplished via instant-markdown; the discount is incorporated seamlessly with the check-out process. For smaller retailers, setting up this sort of infrastructure is not cost-effective (due to lower sales volume). For these retailers, PNM allows for participation through paper coupons; the details of the sale are filled out at check-out, the customer receives the discount at the time of sale, and the coupons are then sent to EFI for processing and reimbursement. Further, the RLP offers online sales directly through EFI's website.

6.5.1 RLP Process Evaluation Activities

The process evaluation of the RLP included an array of activities, detailed in the subsections to follow.

6.5.1.1 Markdown Participant Survey

ADM conducted a survey of 68 customers that purchased CFLs at markdown locations. Customers were recruited through on-site intercept surveying at participating markdown retailers. In-store, a member of the evaluation team is placed at a location near the lighting section. When a customer has completed their selection of lighting and leaves the aisle, they are approached and asked to complete a brief questionnaire (2-4 minutes). In this questionnaire, they are asked a couple of questions relating to their usage of CFLs, and the quantity and wattages of their purchase are tallied. In the end, they are asked if they would like the chance to participate in a longer follow-up survey (10-12 minutes), through which ADM collects data on where CFLs are installed, as well as a range of other data related to customer perceptions of CFLs in general and the RLP in particular. In exchange for completing the follow-up survey, customers are given a $25 gift card to a retailer. In order to assuage customer concerns regarding the

legitimacy of the process, we requested and were given a signed letter from the PNM program manager, explaining who we are and what is the purpose of the survey, as well as providing a contact name and number at PNM should they have any questions. The intercept interviewers kept copies of these letters on hand, and if requested by the customer, would give them a copy. If the customer agrees to participate in the follow-up survey, they then provide the intercept interviewer their name and contact phone number, and are called 2-3 months after recruitment. The survey form used is in Appendix B.

6.5.2 Customer Sentiment to CFLs

As for customer satisfaction with CFLs, ADM asked customers to rate their satisfaction with the quality of lighting and with the energy savings observed after installation of CFLs. The results of this are summarized in Table 6-13 below.

Table 6-13 Customer Satisfaction with CFLs

Question	*Very Satisfied*	*Somewhat Satisfied*	*Neutral*	*Someone Dissatisfied*	*Very Dissatisfied*	*Don't Know*	*Mean Score*
How satisfied are you with the quality of lighting from CFLs?	50.0%	35.3%	7.4%	1.5%	1.5%	4.4%	4.37
How satisfied are you with the energy savings from CFLs?	48.5%	14.7%	5.9%	0%	0%	30.9%	4.62

What is revealed in this is that customers are by and large satisfied with the lighting but do not observe noticeable energy savings on their bill. Lighting does make up a small portion of residential load and as such the marginal gain from CFLs may not appear significant to them. The reduction observed may not appear greater in magnitude than their typical month-to-month fluctuations.

6.5.3 Customer Purchase Habits

Additionally, ADM surveyed respondents regarding their strategy for replacing incandescent lighting in their home. Figure 6-3 below presents a summary of customer behavior regarding how they are replacing lighting in their home.

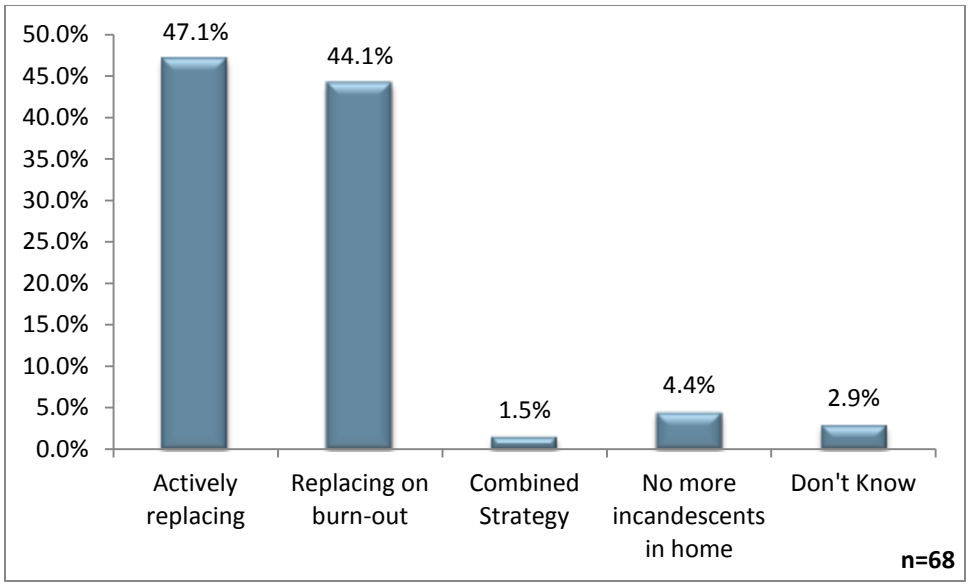

Figure 6-3 CFL Replacement Strategies

4.4% of respondents indicated that with this last purchase, they have replaced all incandescent lamps in their home. Of those that still have available sockets, the current saturation levels are:

- Actively replacing: average of 15.2 CFLs installed
- Replacing on burn-out: average of 12.0 CFLs installed

This is based on the number of pre-existing CFLs in the house plus the number of purchased CFLs that have been installed.

The large volume of customers replacing on burnout corresponds with the location of installation data, in how many CFLs are installed in low-traffic areas. Rooms with low use often have increased switching, which can sharply decrease the EUL of lighting. Additionally, ADM inquired as to what type of lighting the installed CFLs were replacing, summarized in Table 6-14 below.

Table 6-14 Type of Lighting Replaced by CFLs

Question	***Incandescent***	***Burnt-Out CFLs***	***Mix of Both***	***New Fixture***	***Don't Know***	***None Installed***
What type of lighting did the CFLs replace?	64.7%	22.1%	5.9%	4.4%	6%	1.5%

Of the 4.7% of respondents replacing incandescent lamps, 75.0% replaced lighting that was still operating, having been motivated by potential energy savings to switch early.

6.6 Future Program Developments

Programs such as residential lighting are going to face significant changes in 2013 and going forward due to EISA guidelines. CFLs will still be highly cost-effective, but will not return the savings observed in past program years. As such, PNM may want to consider investigating the feasibility of LEDs for the residential sector. Presently, these are unlikely to be cost-effective, but as costs decline the opportunity for introduction to the residential market may arise.

6.7 Conclusions & Recommendations

Based on ADM's evaluation effort of the 2012 RLP, ADM has found the following conclusions & recommendations.

6.7.1 Conclusions

1. **Many customers are still waiting to replace burnt out incandescent bulbs.** 44.1% of survey respondents indicated that they are waiting for their incandescent light bulbs to burn out before replacement. These customers represent delayed savings potential, and the lack of quick installation of CFLs purchased may lead to lower overall installation.

2. **The RLP will absorb the loss in savings due to EISA.** ADM conducted some parametric tests of what would happen to program TRC in prior years if the new baseline was imposed and the RLP passed TRC with a comfortable margin.

3. **The program faces minimal to negligible out-of territory leakage.** The geography of PNM's territory lends itself to preventing leakage. PNM's territory is large and contiguous, with long gaps of sparsely populated areas in between PNM and other utilities' service territories. As such, ADM did not apply any leakage value to scale savings for this program.

6.7.2 Recommendations

1. **Have marketing materials emphasize the cost of waiting.** It was observed that a fair amount of participants were purchasing CFLs, but waiting until incandescent bulbs burnt out before installing. Marketing materials should target this issue, with messages on the cost of waiting to show the need for active replacement of incandescent bulbs.

2. **Research feasibility of LEDs going forward.** Though not likely to be cost-effective at the present time, PNM and APT should research the feasibility of incentivizing LEDs, as declining product costs could make these measures cost-effective.

7. Commercial Comprehensive

7.1 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-Shell;
- Enhanced Commissioning; and
- Whole-Building Efficiency

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

7.2 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 7-1 below.

Table 7-1 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 ADM 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

7.2.1 Commercial Comprehensive Program Components

The CCP is divided into three components:

- Retrofit Rebates
- New Construction
- Quick Saver Direct Install

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

7.2.2 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, ADM 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, ADM conducted on-site monitoring or simulation as appropriate in estimating savings. In the 2012 evaluation, ADM applied custom protocols to the following projects:

- Those listed as "Custom" by the program implementation staff;
- Prescriptive projects within the "Certainty Stratum"; 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.

7.2.3 Commercial Comprehensive Lighting Gross Savings Estimates

The 2012 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.

7.2.3.1 Gross Savings Methodology for High Efficiency Lighting Retrofits

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

Parameters for this equation are defined in Table 7-2 below.

Table 7-2 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, ADM 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 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:

Parameters for this equation are defined in Table 7-3 below.

Table 7-3 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

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

The 2012 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:

Parameters for this equation are defined in Table 7-4 below.

Table 7-4 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, ADM then calculates peak savings for the measure. Peak kW savings are calculated as:

The parameters for this equation are defined in Table 7-5 below.

Table 7-5 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

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

The methodology to be detailed encompasses ADM'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:

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 dissynnergies (i.e., a simultaneous lighting retrofit and lighting control installation saves less than each of the two measures would have individually). ADM then calculated peak savings for lighting controls as:

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.

7.2.4 Commercial Comprehensive Cooling Gross Savings Estimates

Gross savings estimates for facilities participating in the 2012 CCP are evaluated by one of two methodologies:

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

7.2.4.1 DOE-2 Simulation Modeling

In evaluating the 2012 CCP, ADM 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, ADM 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.

7.2.4.2 EFLH Calculations

For simpler cooling measures, including Package Terminal Heat Pumps (PTHPs) and Roof Top Units (RTUs), ADM 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:

Parameters for this equation are defined in Table 7-6 below.

Table 7-6 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. ADM 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, ADM calculates peak kW savings by the following equation:

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

7.2.5 Commercial Comprehensive Refrigeration Gross Savings Estimates

As with cooling, refrigeration measures are split between prescriptive and custom applications, with ADM 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.

7.2.5.1 Gross Savings Methodology for Anti-Sweat Heater Controls

To determine the savings from Anti-Sweat Heater (ASH) controls, ADM 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.

7.2.5.2 Gross Savings Methodology for Electronically Commutated Motors

To calculate savings from installation of ECM and fan controls, ADM 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. ADM 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.

7.2.5.3 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, ADM calculated savings as follows:

[19]

Where,

ΔT = Temperature Difference between freezers/coolers and store temperature

Days = Total night cover hours converted to days

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

ΔEff = 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

7.2.6 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 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, ADM takes a similar approach as with large cooling retrofits, in calibrating and developing a DOE-2 simulation model of the facility. Where possible, ADM 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 year. Given the long measure life of whole-building projects, ADM extrapolates to "typical year" savings by adjusting occupancy to match normal business patterns.

7.3 Impact Findings

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

(1) Commercial Retrofit Rebates;

(2) Commercial New Construction Rebates; and

(3) Quick Saver Direct Installation.

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 7-7 summarizes the total participation in the 2012 CCP.

Table 7-7 2012 CCP Participation Summary

Component	# Applicants	# Projects	Expected kWh	Expected kW
Retrofit Rebates	189	256	28,820,650	4,619
New Construction	16	18	1,217,109	696
Quick Saver	519	652	12,377,235	3,004
Total	724	926	42,414,994	8,319

Data provided by PNM showed that during 2012, there were 926 projects by 724 applicants for all program components, which were initially expected to provide gross savings of 42,414,994 kWh. The resulting overall sample is presented in Table 7-8 below.

Table 7-8 CCP Sample Summary

Component	# Sites in Population	Site Visit Sample Size	# Interviews	# Sites Represented in Interviews
Retrofit Rebates	256	21	35	75
New Construction	18	6	7	7
Quick Saver	652	21	56	108
Total	926	48	98	190

In 2012, the CCP's Retrofit Rebates component covered a wide range of measure categories, paying rebates for:

- Lighting;
- HVAC;
- Motors;
- Food Service;
- Refrigeration;
- Plug Loads; and
- Building Envelope improvements.

Table 7-9 summarizes expected gross savings estimates by measure class for the Retrofit Rebates component.

Table 7-9 Retrofit Rebates Savings by Measure Class

Measure Category	Gross kWh Savings	Gross kW Savings
Lighting	10,545,972	2,587.7
HVAC	14,549,177	1,630.4
Motors	1,378,758	173.2
Food Service	73,728	14.1
Refrigeration	2,149,828	136.0
Envelope	105,298	77.7
Plug Loads	17,888	0
Total	28,820,650	4,619

The New Construction Component offered rebates for the same measure categories as Retrofit Rebates, with two additional measure classes:

- Enhanced Commissioning; and
- Whole-Building Incentives.

Table 7-10 below summarizes savings by measure class for the New Construction Rebates component.

Table 7-10 New Construction Rebates Savings by Measure Class

Measure Category	Gross kWh Savings	Gross kW Savings
Lighting	350,233	34.6
HVAC	524,068	120.0
Food Service	18,616	3.6
Motors	27	0

Refrigeration	46,115	1.4
Whole-Building	278,050	536.0
Total	1,217,109	696

The final program component, QuickSaver Direct Installation, provided incentives for simple lighting and refrigeration measures. Table 7-11 summarizes savings by measure class for this component.

Table 7-11 QuickSaver Gross Savings by Measure Class

Measure Category	***Gross kWh Savings***	***Gross kW Savings***
Lighting	12,208,043	3,003
Refrigeration	128,892	1.9
Vending Misers	40,300	0
Total	12,377,235	3,004

7.3.1 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.

7.3.1.1 Retrofit Rebates Sample Design

The participant population for Retrofit Rebates was divided into 5 strata. Table 7-12 summarizes the strata boundaries and sample frames for the Retrofit Rebates component.

Table 7-12 Retrofit Rebates Sample Design

	Stratum 1	***Stratum 2***	***Stratum3***	***Stratum 4***	***Stratum 5***	***Totals***
Strata boundaries (kWh)	<16,000	16,000 – 70,000	70,000 – 225,000	225,000 – 800,000	> 800,000	
Number of sites	103	86	40	18	3	250
Total kWh savings	750,773	3,132,873	4,651,275	5,943,787	14,341,942	28,820,650
Average kWh	7,289	36,29	116,282	330,210	4,780,647	115,283
Standard deviation of kWh savings	4,462	14.947	39,194	123,283	6,412,669	777,310
Coefficient of variation	.61	.41	.34	.37	1.34	6.74
Final sample	3	3	3	6	3	19

7.3.1.2 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 7-13 presents realization at the stratum level, with Table 7-14 presenting results at the site level.

Table 7-13 Summary of kWh Savings for Retrofit Rebates by Sample Stratum

Stratum	Expected kWh Savings	Realized kWh Savings	Realization Rate
5	14,341,942	14,341,942	100.9%
4	2,762,942	2,917,635	105.6%
3	160,477	102,308	63.8%
2	51,474	60,556	117.6%
1	18,225	17,997	98.7%
Total	17,335,060	17,440,438	100.6%

Table 7-14 shows the expected and realized energy savings for the program by project.

Table 7-14 Expected and Realized Savings by Project

Project ID(s)	City	Facility Type	Measure Category	Expected kWh Savings	Realized kWh Savings
PNM-10-00427	Rio Rancho	Heavy Industry	HVAC	12,180,330	12,737,815
PNM-12-01029	Multiple	Retail/Service	Refrigeration	1,317,112	1,263,718
PNM-11-00722	Albuquerque	College/University	HVAC	844,500	461,928
PNM-12-00871	Albuquerque	Government	Lighting	730,043	797,668
PNM-11-00733	Ruidoso	Grocery	Lighting & Refrigeration	435,068	423,645
PNM-11-00680, PNM-12-00818	Deming	Grocery	Lighting & Refrigeration	430,447	430,627
PNM-11-00693	Albuquerque	Assembly/Worship	Lighting	361,620	157,557
PNM-11-00698	Albuquerque	Heavy Industry	Lighting	293,648	420,637
PNM-12-00800	Albuquerque	Retail/Service	Lighting	292,560	243,118
PNM-11-00752	Albuquerque	Heavy Industry	Motors	219,477	444,383
PNM-12-00872	Albuquerque	Hotel/Motel	Lighting	88,439	59,801
PNM-12-00838	Albuquerque	Office	HVAC	72,038	42,507
PNM-12-00798	Albuquerque	Office	Plug Loads	17,888	17,756
PNM-12-00887	Albuquerque	Retail/Service	Lighting	17,245	30,281
PNM-11-00743	Albuquerque	Office	Lighting	16,341	12,519
PNM-12-00888	Albuquerque	School/K-12	Lighting	7,411	5,853
PNM-12-00870	Albuquerque	Retail/Service	Lighting	6,914	6,934
PNM-12-00771	Santa Fe	Office	Lighting	3,900	5,210
			Total:	17,334,981	17,561,957

7.3.1.3 Retrofit Rebates Program-Level Gross Realization

Using the realization rates presented in Table 7-13, ADM extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. Table 7-15 presents results by stratum for the Retrofit Rebates component.

Table 7-15 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	3	14,341,942	14,463,461	100.9%	1,474	1,646	111.7%
4	18	5,943,787	6,276,750	105.6%	1,038	1,127	108.5%
3	40	4,651,275	2,965,301	63.7%	1,078	2,266	210.2%
2	86	3,132,873	3,685,633	117.6%	712	825	115.9%
1	103	750,773	741,381	98.7%	317	237	74.8%
Total	250	28,820,650	28,132,526	97.6%	4,619	6,101	132.1%

7.3.1.4 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 (23 facilities); the population was divided into two strata instead of five. Table 7-16 below presents the stratification procedure for New Construction Rebates.

Table 7-16 New Construction Rebates Sample Design

	Stratum 1	Stratum 2	Totals
Strata boundaries (kWh)	<100,000	>100,000	
Number of sites	13	5	18
Total kWh savings	438,656	1,217,109	1,217,109
Average kWh Savings	33,743	155,691	67,617
Standard deviation of kWh savings	19,902	60,271	65,620
Coefficient of variation	.59	.39	.97
Final design sample	4	2	6

7.3.1.5 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 7-17 presents realization at the stratum level, with Table 7-18 presenting results at the site level.

Table 7-17 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
2	458,521	318,837	69.5%	448.5	59.6	13.3%
1	25,939	24,093	92.8%	4.8	7.6	158.6%
Total	484,460	342,930	70.8%	453.3	67.2	148.2%

Table 7-18 New Construction Rebates Site-Level Realization

Project ID(s)	City	Facility Type	Measure Category	Expected kWh Savings	Realized kWh Savings
PNM-12-00943	Albuquerque	Office	Whole-Building	201,720	57,452
PNM-12-00941	Rio Rancho	Retail/Service	Lighting, HVAC, Motors, Refrigeration, Food Service	124,277	127,128
PNM-12-00863	Albuquerque	Office	Lighting	69,577	56,588
PNM-12-00825	Albuquerque	Retail/Service	Lighting	62,947	77,649
PNM-11-00672	Albuquerque	Restaurant	Lighting, HVAC, Refrigeration	14,846	9,397
PNM-12-00869	Albuquerque	Retail/Service	Lighting	11,093	14,696
			Total:	484,460	342,930

7.3.1.6 New Construction Rebates Program-Level Realization

Using the realization rates presented in Table 7-17, ADM extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. The results of this are presented in Table 7-19 below.

Table 7-19 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
2	2	778,453	541,305	101.8%	478.3	63.6	13.3%
1	4	438,656	407,438	92.9%	217.3	344.5	158.6%
Total	18	1,217,109	948,743	77.9%	695.6	408.1	58.7%

7.3.1.7 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 7-20 below.

Table 7-20 QuickSaver Rebates Sample Design

	Stratum 1	***Stratum 2***	***Stratum3***	***Stratum 4***	***Stratum 5***	***Totals***
Strata boundaries (kWh)	<10,000	10,000 – 20,000	20,000 – 40,000	40,000 – 90,000	> 90,000	
Number of sites	292	174	108	65	13	652
Total kWh savings	1,612,983	2,457,338	2,999,044	3,593,888	1,713,982	12,377,235
Average kWh Savings	5,524	14,123	27,769	55,291	131,845	18,983
Standard deviation of kWh savings	2,526	3,000	5,697	11,351	38,150	38,150
Coefficient of variation	.46	.21	0.21	0.21	0.29	1.22
Final design sample	4	4	4	4	5	21

7.3.1.8 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 7-21 presents realization at the stratum level, with

Table 7-22 presenting results at the site level.

Table 7-21 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	619,192	772,783	124.8%	139.6	161.8	115.9%
4	248,429	268,467	108.1%	58.0	52.6	90.7%
3	128,445	126,129	98.2%	33.0	35.9	208.6%
2	57,246	61,062	106.7%	14.5	18.2	125.4%
1	16,847	14,664	87.4%	3.7	4.6	124.4%

Total	1,070,159	1,243,105	116.2%	248.9	273.2	109.7%

Table 7-22. QuickSaver Expected and Realized Savings by Project

Project ID	***Facility Type***	***Measure Category***	***Expected kWh Savings***	***Realized kWh Savings***
QS-2098	Miscellaneous	Lighting	149,298	103,379
QS-2205	Office	Lighting	148,234	137,066
QS-2791	Warehouse	Lighting	118,019	290,866
QS-2289	Warehouse	Lighting	105,984	100,393
QS-127	Warehouse	Lighting	97,657	141,079
QS-2428	School/K-12	Lighting	80,810	126,960
QS-2429	Retail/Service	Lighting	71,960	67,388
QS-1806	Assembly/Worship	Lighting	49,824	37,403
QS-2635	Retail/Service	Lighting	45,835	36,716
QS-3459	Retail/Service	Lighting	38551	36,090
QS-2083	Medical	Lighting	35,612	35,273
QS-704	Retail/Service	Lighting	32,068	39,735
QS-2626	Miscellaneous	Lighting	22,214	15,031
QS-2304	Office	Lighting	18,025	14,355
QS-2128	Retail/Service	Lighting	14910	21,857
QS-2045	Restaurant	Lighting	14,040	14,184
QS-2004	Retail/Service	Lighting	10,271	10,666
QS-3300	Retail/Service	Lighting	8096	5,356
QS-2273	Retail/Service	Lighting	5,194	5,552
QS-2829	Retail/Service	Lighting	2,758	3,086
QS-2439	Retail/Service	Lighting	799	670
		Total:	1,070,159	1,243,105

7.3.1.9 QuickSaver Program-Level Gross Realization

Using the realization rates presented in Table 7-21, ADM extrapolated results from sampled sites to non-sampled sites in developing program-level gross savings estimates. Table 7-23 presents results by stratum for the QuickSaver component of the CCP.

Table 7-23 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	13	1,713,982	2,139,137	124.8%	378.7	510.4	115.9%
4	65	3,593,888	3,883,767	108.1%	888.7	743.7	90.7%
3	108	2,999,044	2,944,968	98.2%	733.8	797.1	108.6%
2	174	2,457,338	2,621,143	106.7%	592.9	806.0	125.4%
1	292	1,612,983	1,403,976	87.0%	410.3	438.9	124.4%
Total	652	12,377,235	12,992,991	104.9%	3,004	3,296	109.7%

7.3.2 Commercial Comprehensive Net Savings Estimates

ADM 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 ADM's NTGR estimates by measure category for each program component, and the associated net savings.

7.3.2.1 Retrofit Rebates Net Savings Estimates

ADM 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 7-24 below, verified gross savings by measure category are summarized in order to prepare for application of measure-specific NTGRs. Table 7-25 then presents similar results for verified gross kW savings.

Table 7-24 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	-	3,686,144	2,178,658	2,441,870	645,129
HVAC	12,737,815	733,358	356,253	1,195,689	89,334
Motors	461,928	241,312	193,026	107	-
Food Service	-	-	47,003	-	-
Refrigeration	1,263,718	327,517	127,741	26,832	-
Envelope	-	-	61,994	-	7,955
Plug Loads	-	-	-	21,044	-
Total	14,463,461	4,988,331	2,964,676	3,685,543	742,418

Table 7-25 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	-	866.7	1,738.3	591.5	219.6
HVAC	1,454.1	21.1	155.2	233.1	13.0
Motors	18.0	30.1	156.9	-	-
Food Service	-	-	29.7	-	-
Refrigeration	174.1	21.2	35.3	-	-
Envelope	-	-	150.9	-	4.4
Plug Loads	-	-	-	-	-
Total	1,646	939	2,266	825	237

With verified savings compiled by stratum and by measure, ADM then applies measure-category NTGRs to estimate program net savings. These are summarized in Table 7-26 and Table 7-27 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. ADM applied the Lighting NTGR for Plug Loads and the Refrigeration NTGR for Food Service.

Table 7-26 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	72.5%	-	2,671,692	1,579,077	1,769,851	468,585
HVAC	99.7%	12,699,602	731,295	355,251	1,192,325	89,083
Motors	100%	461,928	241,312	193,026	107	-
Food Service	100%	-	-	47,003	-	-
Refrigeration	100%	1,263,718	327,517	127,741	26,832	-
Envelope	67.3%	-	-	41,750	-	5,357
Plug Loads	72.5%	-	-	-	15,253	-
Total	86.4%	14,425,248	3,971,816	2,343,847	3,004,367	562,025

Table 7-27 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	72.5%	-	628.2	1,259.9	428.7	159.2
HVAC	99.7%	1,449.7	21.0	154.8	232.4	13.0
Motors	100%	18.0	30.1	156.9	-	-
Food Service	100%	-	-	29.7	-	-
Refrigeration	100%	174.1	21.2	35.3	-	-

Envelope	67.3%	-	-	101.6	-	3.0
Plug Loads	72.5%	-	-	-	-	-
Total	80.5%	1,641.8	700.5	1,738.2	661.1	175.1

7.3.2.2 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. Verified net kWh and kW are summarized in Table 7-28 below.

Table 7-28 New Construction Rebates Stratum Level Verified Net kWh Savings by Measure Category

Stratum	NTGR	Verified Net kWh	Verified Net kW
2	68.9%	372,959	43.8
1	68.9%	280,725	237.4
Total	68.9%	653,684	281.2

7.3.2.3 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 7-29 below.

Table 7-29 QuickSaver Direct Install Stratum-Level Verified Net kWh Savings

Stratum	NTGR	Verified Net kWh	Verified Net kW
5	89.3%	1,910,249	455.8
4	89.3%	3,468,201	664.1
3	89.3%	2,629,856	711.8
2	89.3%	2,340,681	719.7
1	89.3%	1,253,751	391.9
Total	89.3%	11,602,741	2,943.4

7.3.3 Commercial Comprehensive Net Realization Summary

After evaluating the three program components, ADM compiled net savings to provide an overall net realization rate. Gross and net savings results are summarized in Table 7-31 and Table 7-31 below.

Table 7-30 Commercial Comprehensive Gross Realization Rate

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	4,619.1	6,100.7	28,820,650	28,132,526	370,285,011	363,809,617	97.6%
New Construction	695.6	408.1	1,217,109	948,743	19,935,076	15,378,097	77.9%
QuickSaver	3,004.4	3,296.1	12,377,235	12,992,991	86,640,645	90,950,937	104.9%
Total	8,319.1	9,804.9	42,414,994	42,074,260	476,860,732	470,138,651	99.2%

Table 7-31 Commercial Comprehensive Net Realization Summary

Component	Peak Demand Reduction (kW)		Annual Energy Savings (kWh)		Lifetime Energy Savings (kWh)		Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	Ex Ante	Ex Post	
Retrofit Rebates	3,602.9	4,916.7	22,480,107	24,307,303	288,822,309	318,644,633	108.1%
New Construction	482.1	281.2	843,457	653,684	13,815,008	10,595,509	77.5%
QuickSaver	2,764.1	2,943.4	11,387,056	11,602,741	79,709,393	81,219,187	104.9%
Total	6,849.1	8,141.3	34,710,620	36,563,728	382,346,710	410,459,329	105.3%

7.4 Process Findings

This chapter presents the results of the process evaluation of the Commercial Comprehensive Program[20]. 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, as in-depth interviews with program staff and other market actors were completed in the 2011 evaluation effort.

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.

[20] 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.

7.4.1 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 2012, the CCP saw returning customers from prior program years across all sectors. In total, For the Retrofit Rebates and New Construction components, 75.5% of the 2012 program year savings came from customers with multiple applications, and 67.8% of 2012 savings came from organizations that participated in the CCP in prior years[21].

These results correspond well with what ADM has learned from conversations with many program participants and PNM Trade Allies; several organizations have taken the program offerings by PNM and incorporated them into their mid- and long-term planning for facility improvements. School districts, retail and grocery chains, property management companies, and industrial plants have become engaged in significant reinvestment in their facilities, reducing long-term operating costs. As is commonly seen with most commercial energy efficiency programs, the bulk of projects have been lighting retrofits. 2012 was an anomalous year, however, in having 51% of Retrofit Rebates savings come from HVAC projects. This is due to one large custom HVAC retrofit at an industrial site that accounted for 40% of expected savings in the retrofit rebates component. With this project removed, the share of savings from HVAC drops from 51% to 14%. In Table 7-32 through Table 7-34 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 7-32 Retrofit Rebates Savings by Measure Category by Year

Measure Category	***Program Year***			
	2009	***2010***	***2011***	***2012***
Lighting	93%	80%	77%	37%
HVAC	5%	13%	17%	51%
Refrigeration	2%	6%	2%	8%
Motors	0%	1%	3%	5%
Food Service	0%	0%	0%	.3%
Envelope	0%	0%	0%	.4%
Plug Loads	0%	0%	0%	.1%
Total kWh Savings	8,496,272	23,095,225	23,947,571	28,820,650

[21] These savings overlap to some degree; 26% of 2011 program year savings came from customers that both submitted multiple applications in 2011 and had participated in prior program years.

Table 7-33 New Construction Savings by Measure Category by Year

Measure Category	Program Year			
	2009	2010	2011	2012
Lighting	1.8%	29%	19%	43%
HVAC	0.2%	2%	30%	29%
Refrigeration	0%	0%	2%	4%
Motors	0%	19%	0%	0%
Enhanced Commissioning	0%	1%	2%	0%
Whole-Building	98%	49%	46%	23%
Food Service	0%	0%	0%	2%
Total kWh Savings	1,970,926	7,310,501	2,158,765	1,217,109

Table 7-34 Quick Saver Savings by Measure Category by Year

Measure Category	Program Year			
	2009[22]	2010	2011	
Lighting	-	80%	94%	98%
Refrigeration	-	20%	6%	1%
Vending Misers	-	0%	0%	1%
Total kWh Savings	-	3,923,491	9,644,979	12,208,043

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. Quick Saver also serves as a poor metric, in that in 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. Vending misers were added as a program option for QuickSaver, but with minimal uptake. After having conducted a comparative review of the implementation practices for vending misers across the electric utilities in New Mexico, ADM concluded that the documentation requirements (which include pre-notification) are excessive for this measure. With loosened QC requirements, this measure could have higher uptake, as observed in a similar program implemented by El Paso Electric Company.

The Retrofit Rebates program, with the full range of program offerings, is showing marked increase in the share of non-lighting measures. Additionally, this component has sustained performance even though its available market has been “cannibalized” to

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

some degree by Quick Saver[23]. This has been the most successful program year for the CCP, with overall savings 20% higher than the next-best year.

7.4.1.1 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 7-35 below summarizes the share of savings by measure category for each facility type in the Retrofit Rebates and QuickSaver components.

Table 7-35 Retrofit Rebates & QuickSaver Savings by Measure Category by Facility Type

Facility Type	n	Lighting	HVAC	Motors	Refrigeration	Food Service	Envelope	Plug Loads
College/University	8	15.2%	8.4%	76.3%	0%	0%	0%	0%
Retail/Service	373	84.7%	2.3%	0%	13.0%	0%	0%	0%
Office	178	88.7%	6.5%	2.1%	0%	0%	2.7%	0%
Restaurant	80	98.7%	0%	0%	1.3%	0%	0%	0%
Hotel/Motel	24	39.7%	60.7%	0%	0%	0%	0%	0%
Light Industry	54	60.4%	23.8%	15.2%	0%	0%	0%	1.0%
School/K-12	31	98.1%	1.9%	0%	0%	0%	.2%	0%
MF Housing	1	0%	100%	0%	0%	0%	0%	0%
Grocery	46	58.7%	0%	.1%	41.1%	38.2%	3.0%	0%
Government	9	100%	0%	0%	0%	0%	0%	0%
Heavy Industry	10	6.1%	93.9%	0%	0%	0%	0%	0%
Warehouse	35	100%	0%	0%	0%	0%	0%	0%
Medical	15	38.7%	61.3%	0%	0%	0%	0%	0%
Entertainment	17	51.5%	48.5%	0%	0%	0%	0%	0%
Assembly/Worship	15	100%	0%	0%	0%	0%	0%	0%
Miscellaneous	1	100%	0%	0%	0%	0%	0%	0%
Overall:	902	55.3%	35.3%	3.3%	5.5%	.2%	.3%	.001%

In reviewing the table above, there are a couple of takeaways in terms of identifying unclaimed opportunities:

- **Restaurants:** There are multiple end-uses not being served by the program. There were no savings for food service and very limited savings for refrigeration equipment. There was minimal uptake of refrigeration equipment in New Construction projects for restaurants, largely focusing on energy efficient ice makers. Food service projects are more difficult to generate, as this requires outreach to the equipment distributors who may then influence a sale.

[23] Prior to the launching of Quick Saver, small business customers were processed in the Retrofit Rebates component.

- **K-12 Schools:** Participation from K-12 schools is limited almost entirely to lighting. As with restaurants, these are facilities with a wide range of end-uses that could potentially be addressed by the CCP. However, obtaining this type of participation from school districts often requires executive-level buy-in to the concept, and outreach at the facility-level will not achieve the diversity of projects desired.

- **Government Facilities:** The current state of participation from government agencies is analogous to that of schools; decision-making is often made high-level, and participation to-date is largely limited to lighting retrofits. As with school districts, further participation in other measure categories is likely to require outreach and partnership with senior-level decision-makers.

- **Offices:** Offices have shown some success in diversity of projects, particularly for participants in Retrofit Rebates. There is notable savings in four measure categories within this facility type (lighting, HVAC, motors, and building envelope improvements). However, in 2012 there were no projects addressing office plug loads. These are a significant contributor to office loads and as the program develops plug load measures, this sector should be the primary target of marketing efforts. Unlike most measures that involve building improvements, this is a category where it is possible to get buy-in from building tenants, as they own the equipment and can move them should they change facility locations.

7.4.2 Program Tracking Database Review

The program tracking data has been reviewed in prior evaluations, with the program implementer (DNV KEMA) incorporating comments from past evaluations. It would be the recommendation of ADM that going forward, the following changes be made to program tracking data:

- In QuickSaver tracking, include a field for Incremental Cost. Presently, the tracking only includes Total Cost.

- Also, for QuickSaver, provide lifetime savings estimates in a manner consistent with the tracking data provided for Retrofit Rebates and New Construction.

7.4.3 Rebate Form Review

In the 2011 evaluation, ADM made recommendations regarding the rebate form. These included developing a separate tab for Food Service (Removing it from the “Refrigeration & Other” tab) and one for Building Envelope. In addition, ADM recommended establishing a “Bulk Order” section of the application, where a participant

could aggregate multiple small facilities. DNV KEMA incorporated all of these recommendations, and ADM has nothing further to recommend at this time.

7.4.1 Commercial Retrofit Rebates Customer Profile

Table *7-36* presents the average, median and range of the incentives for firms participating in retrofit measures. The average total incentive was $7,507 while the median $1,658. Values were generally skewed high by one large project that received an incentive of $730,820, accounting for 38% of all Retrofit Rebate incentive dollars.

Table 7-36 Average and Median Incentive for Retrofit Participants

Type of incentive	*Average*	*Median*	*Range*
Custom Incentive	$33,401	$4,681	$99 - $730,820
Prescriptive Incentive	$3,808	$1,470	$36 - $30,480
Total Incentive	$7,507	$1,658	$36- $730,820

The Retrofit Rebates component had 250 participating facilities in 2012. Figure 7-1 presents the distribution of participants in the Retrofit Rebates component by facility type and savings. Heavy Industry stands out in accounting for only 3.2% of participation but 44.9% of savings. As stated prior, much of this is due to the impact of one project. When that outlier project is removed, Heavy Industry accounts for 2.8% of participants but only 4.5% of savings. The distribution of participation and savings without the outlier facility is presented in Figure 7-2 below.

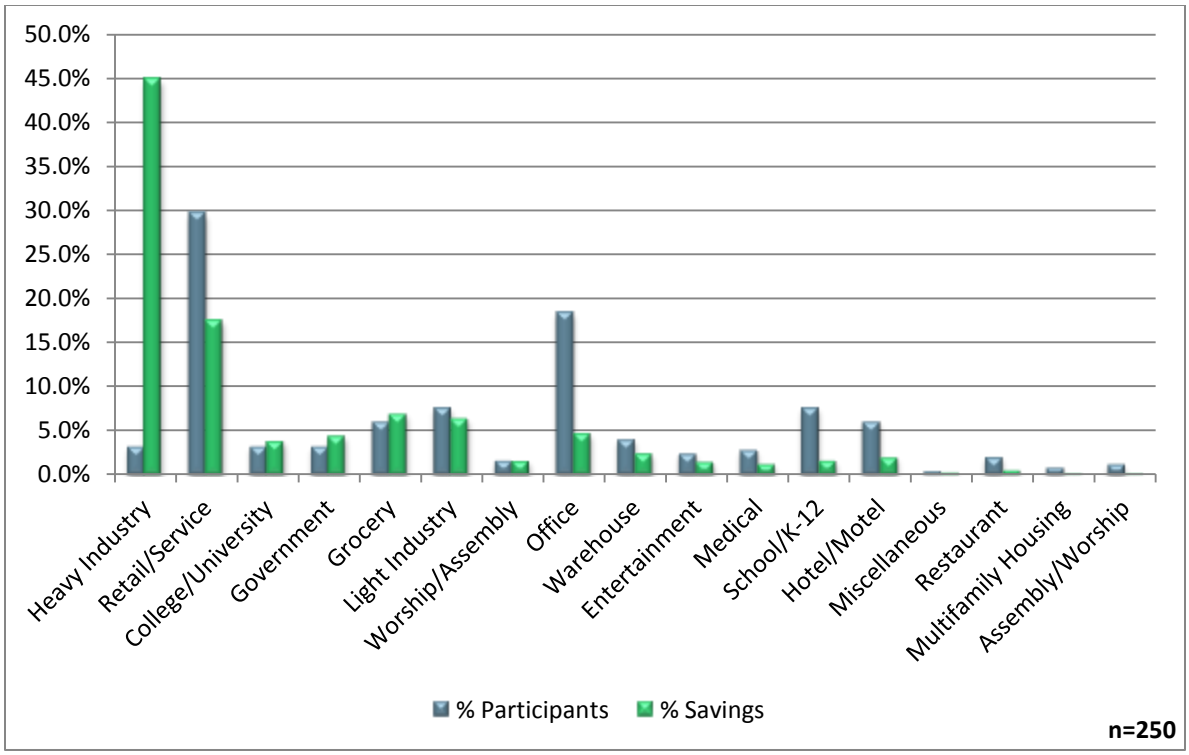

Figure 7-1 Retrofit Rebated Distribution Participation & Savings by Facility Type

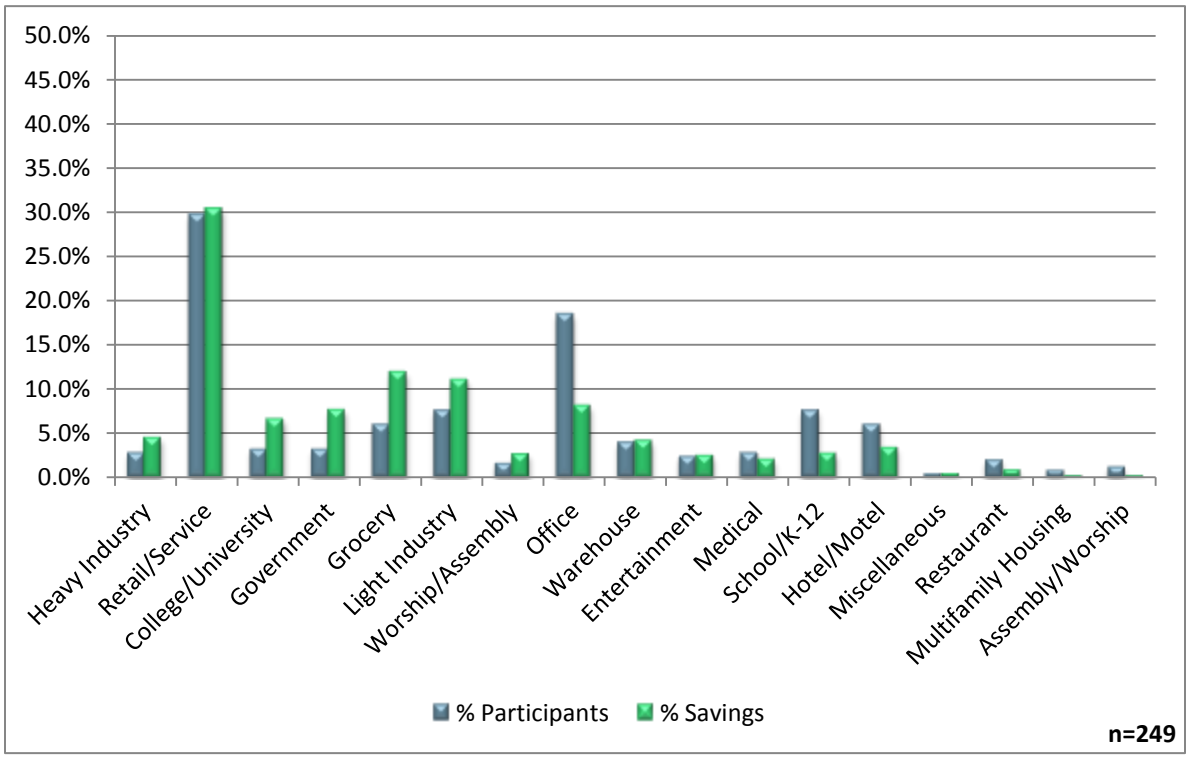

Figure 7-2 Retrofit Rebated Distribution Participation & Savings by Facility Type – Minus Heavy Industry Outlier

7.4.1 Commercial New Construction Rebates Customer Profile

Table 7-37 summarizes the average, median and range of the incentives for New Construction project applications. The average total incentive was $5,064 while the median was to $3,953. Total incentives for projects range as high as $16,138.

Table 7-37 Average and Median Incentive for New Construction Customers

Type of incentive	Average	Median	Range
Custom Incentive	$6,422	$4,582	$1,264 - $16,138
Prescriptive Incentive	$4,542	$3,497	$893 - $14,000
Total Incentive	$5,064	$3,953	$893 - $16,138

The New Construction Rebates program had 18 applications in 2012. Figure 7-3 presents the distribution of participants by facility type.

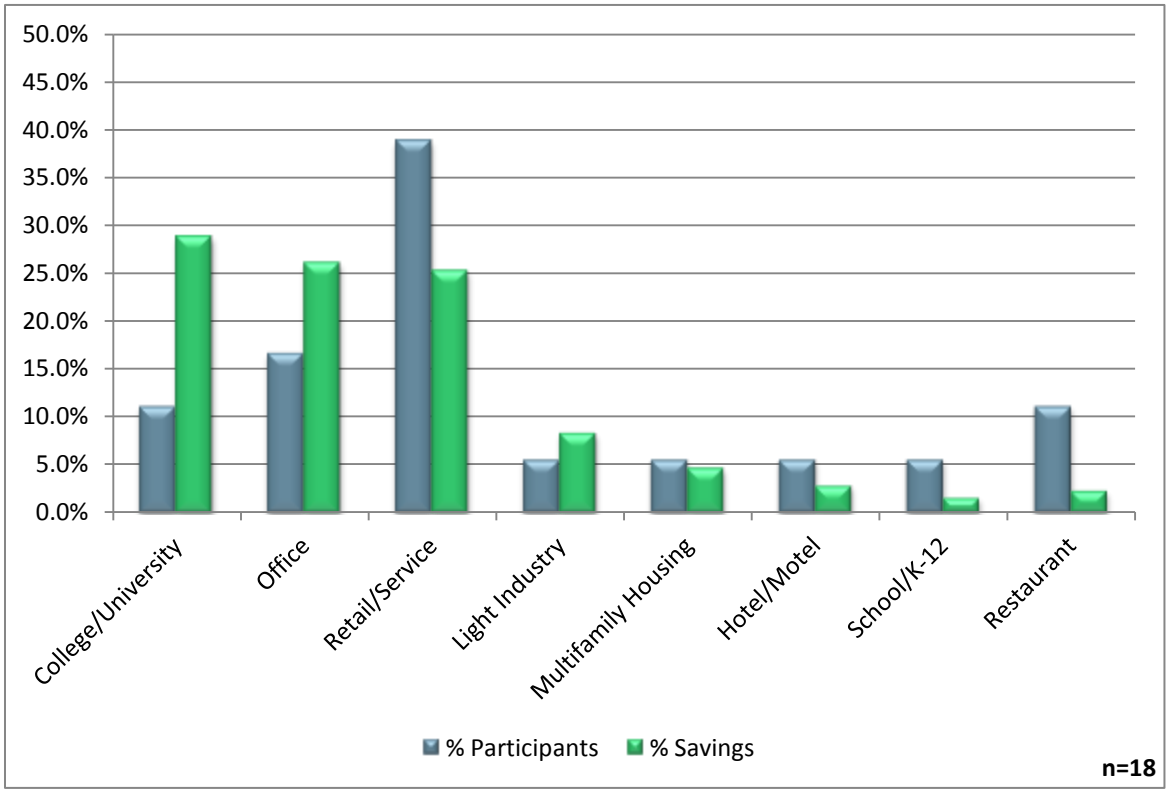

Figure 7-3 New Construction Rebates Distribution of Participants by Facility Type

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

7.4.2 QuickSaver Customer Profile

Table 7-38 presents the average, median and range of the incentives for firms participating in the QuickSaver component.

Table 7-38 Average and Median Incentive for QuickSaver Participants

Type of incentive	Average	Median	Range
Total Incentive	$2,690	$1.531	$44-$34,822

The QuickSaver component had 652 participating facilities in 2012. Figure 7-4 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.

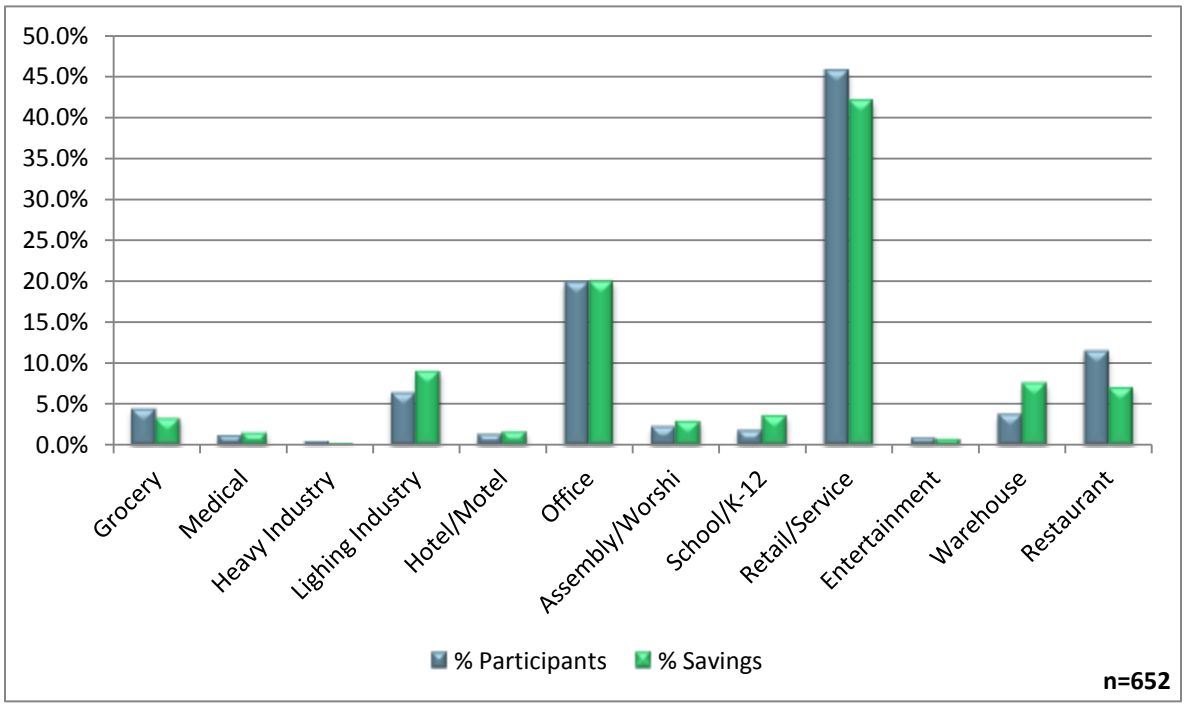

Figure 7-4 QuickSaver Distribution of Participants & Savings by Facility Type

7.4.3 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 and 6 New Construction projects responded.

7.4.3.1 How Customers Learn About the Program

Table 7-39 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 21.2% learned about the program through other building professionals such as architects, engineers, or energy consultants. 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 7-39 How Customer Decision Makers Learned about the Program

	Retrofit Rebates	***New Construction***
An equipment vendor or building contractor	19.7%	42.9%
A PNM representative mentioned it	65.2%	28.6%
Friends or colleagues (i.e., word of mouth)	10.6%	0%
An architect, engineer or energy consultant	1.5%	0%
The PNM website	1.5%	0%
Received Brochure	3.0%	0%
Rebate Consultant	1.5%	0%
Other	4.5%	0%
Don't Remember	0%	14.3%
N	**65**	**6**

An important question is when respondents learned about the program. As shown in Table 7-40, 41.3% of the customers learned about the program before they planned equipment replacements, and 28% learned about it during planning equipment replacement. Nearly a quarter of respondents indicated that they had learned about the program after the equipment had been specified and/or installed.

Table 7-40 When Customer Decision Makers Learned about the Program

	Retrofit Rebates	***New Construction***
Before planning for replacing the equipment began	41.3%	33.3%
During your planning to replace the equipment	28.0%	33.3%
Once equipment had been specified but not yet installed	24.0%	16.8%
After equipment was installed	2.7%	16.8%
Don't know	0%	0%
N	**74**	**12**

Table 7-41 shows a cross-tabulation of whether the respondent had plans to install equipment before participating in the program. Of the Retrofit Rebates participants who indicated that they learned of the program before beginning equipment replacement planning, about 70.6% of them had not had prior plans to install equipment. This implies that the program directly influenced these responders to take action. In contrast, 100% of New Construction respondents indicated having prior plans.

Table 7-41 When Customer Decision Maker Learned about the Program, by Whether There Were Plans to Install Equipment

Component	Had Plans to Install Measure Before Participating	N	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
Retrofit Rebates	Yes	57	32.8%	27.6%	31.0%	3.4%	0.0%
	No	17	70.6%	29.4%	0%	0%	0.0%
New Construction	Yes	5	20.0%	40.0%	20.0%	20.0%	0.0%
	No	1	100%	0%	0%	0%	0%

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

Customers were asked about the importance of energy efficiency in facility operational planning as compared with other factors. As shown in Table 7-42, 76% of Retrofit Rebates respondents and 92% of New Construction respondents reported that compared to other factors energy efficiency was a very important factor in planning their operations.

Table 7-42 Importance of Energy Efficiency Compared to Other Factors

Importance	Retrofit Rebates	New Construction
Very important	82.4%	66.7%
Somewhat important	9.5%	33.3%
Only slightly important	4.1%	0%
Not important at all	0%	0%
Don't Know	4.0%	0%
N	**74**	**6**

Respondents were given a list of factors and asked how important each of the factors was in their decision to participate on a scale of 1 to 4 were 1 was not at all important

and four was very important. These results are presented in the tables below for Retrofit Rebates and New Construction, respectively.

Table 7-43 Factors Influencing the Decision to Participate – Retrofit Rebates

Energy Efficiency Decision Making Factor	Very Important	Somewhat Important	Slighting Important	Not Important At All	Don't Know	N
Incentive payments from PNM	54.1%	27.0%	0.0%	18.9%	0%	74
Past experience with energy efficient equipment	47.3%	24.3%	6.8%	20.3%	1.4%	74
Advice and/or recommendations received from PNM	52.7%	36.5%	9.5%	1.4%	0%	74
Advice and/or recommendations from contractor	36.5%	50.0%	8.1%	4.1%	0%	74
Organization's policies	40.5%	28.4%	2.7%	24.3%	4.1%	74

Table 7-44 Factors Influencing the Decision to Participate – New Construction

Energy Efficiency Decision Making Factor	Very Important	Somewhat Important	Slighting Important	Not Important At All	Don't Know	N
Incentive payments from PNM	33.3%	66.7%	0%	0%	0%	6
Past experience with energy efficient equipment	33.3%	33.3%	0%	33.3%	0%	6
Advice and/or recommendations received from PNM	33.3%	33.3%	0%	33.3%	0%	6
Advice and/or recommendations from contractor	0%	83.3%	16.7%	0%	0%	6
Organization's policies	66.7%	16.7%	0%	16.7%	0%	6

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 Commercial Comprehensive Program. Table 7-45 and Table 7-46 display the results.

Table 7-45 Retrofit Rebates Decision Maker Attitudes toward Energy Efficiency and Program Incentives, by Customer Gross Savings

Stratum Number	***Realized Gross kWh Savings***	***Number of Respondents***	***Percent stating that energy efficiency as a factor in facility operational planning is "very important"***	***Percent stating that incentive payments from PNM are "very important" for decision making regarding energy efficiency improvements***
5	> 800,000	3	100%	66.7%
4	225,000 – 800,000	7	57.1%	85.7%
3	70,000 – 225,000	7	85.7%	85.7%
2	16,000- 70,000	30	80.0%	43.3%
1	< 16,000	27	88.9%	48.1%
All Respondents		74	82.4%	54.1%

Table 7-46 New Construction Project Decision Maker Attitudes toward Energy Efficiency and Program Incentives, by Customer Gross Savings

Group Number	***Realized Gross kWh Savings***	***Number of Respondents***	***Percent stating that energy efficiency as a factor in facility operational planning is "very important"***	***Percent stating that incentive payments from PNM are "very important" for decision making regarding energy efficiency improvements***
3	> 100,000	4	75.0%	50.0%
1	< 100,000	2	50.0%	0%
All Respondents		6	66.7%	33.3%

7.4.3.3 Prior Experience with Efficient Equipment

The respondents were asked whether they had purchased or installed energy efficient equipment before participating in the program, with 64% of the respondents indicating having done so. Respondents were also asked how often they try to purchase and

install energy efficient equipment. As shown in Table 7-47, 63% of the Retrofit Rebates and 50% of New Construction respondents said that they always do this.

Table 7-47 Frequency of Trying to Install Efficient Equipment on Replacement

Response	Retrofit Rebates	New Construction
Always	59.5%	50.0%
Usually	33.8%	16.7%
Sometimes	6.8%	16.7%
Occasionally	0%	16.7%
Never	0%	0%
N	**74**	**6**

7.4.3.4 Satisfaction with the Program

Respondents were asked about their levels of satisfaction with selected aspects of the program on a scale of 1 to 5 where 1 is very dissatisfied and 5 is very satisfied. Table 7-48 shows the results. Respondents reported the greatest satisfaction with the performance of the installed equipment the quality of work by their contractor, and the information provided by their PNM account rep. 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.

Table 7-48 Customer Decision Maker Satisfaction with Selected Elements Program Experience

Element of Program Experience	Percent of Respondents							
	Very Dissatisfied	Somewhat Dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Very Satisfied	Don't Know	Total	N
Performance of the equipment installed	0%	4.1%	1.4%	2.7%	83.8%	8.1%	4.81	74
Information provided by PNM Account Representative	0%	2.7%	0%	4.1%	86.5%	6.8%	4.87	74
Quality of the work conducted by your contractor	0%	0%	1.4%	4.1%	86.5%	18.9%	4.73	74
Incentive amount	1.4%	1.4%	10.8%	5.4%	74.3%	6.8%	4.61	74
The effort required for the application process	0%	5.4%	1.4%	54.1%	32.4%	6.8%	4.22	74
The elapsed time until you received the incentive	0%	0%	1.4%	10.8%	77.0%	10.8%	4.85	74
Savings on your monthly bill	0$	5.4%	4.1%	28.4%	54.1%	8.1%	4.43	74
Information provided by your contractor	0%	0%	17.6%	32.4%	29.7%	20.3%	4.15	74
Overall program experience	0%	4.1%	1.4%	21.6%	64.9%	8.1%	4.60	74

7.4.4 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.

7.4.4.1 How Customers Learn of the Program

Table 7-49 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 (66.7%). Further, 6.5% listed a vendor or contractor and 3.7 listed an architect or engineer as how they learned of the program. When reviewing these customers' project data, ADM found that most contractors and 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 17.6% indicating this as how they learned of the program.

Table 7-49 How Customer Decision Makers Learned about the Quick Saver Program

Source Indicated	*Percent of Respondents*
Approached by a PNM Trade Ally	66.7%
An equipment vendor or building contractor	6.5%
Friends or colleagues (i.e., word of mouth)	17.6%
PNM Brochure	1.9%
A PNM representative mentioned it	.9%
Architect, Engineer, or Energy Consultant	3.7%
Other	0%
N	**108**

* 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%.

7.4.4.2 Timing of learning of the Program

Participants were also asked when they had heard about the Quick Saver program. As shown in Table 7-50, 60% of respondents found out about the program before planning to replace equipment, and 30% learned about it during equipment replacement planning. 5% of the respondents indicated learning about the program after equipment had been specified, and 5% indicated learning of it after equipment had been installed.

Table 7-50 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	91.7%
During your planning to replace the equipment	5.6%
Once equipment had been specified but not yet installed	.9%
After equipment was installed	0%
Other	0%
Don't Know	1.9%
N	**108**

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 7-51 When Customer Decision Maker Learned about the Quick Saver 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	87.5%	12.5%	0%	0%	0%
No	94.0%	3.6%	1.2%	0%	1.2%

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

Customers were asked about the relative importance of energy efficiency in operational planning at their facilities. As shown in Table 7-52, 70% of the customer respondents reported that compared to other factors energy efficiency was very important in planning their operations.

Table 7-52 Importance of Energy Efficiency Compared to Other Factors

Importance	Percent of Respondents
Very important	87.0%
Somewhat important	3.7%
Only slightly important	2.8%
Not important at all	.9%

Don't Know	5.6%
N	**108**

Respondents were given a list of factors, shown in Table *7-53*, and asked how important each of the factors was in their decision to participate in the program. Questions were posed on a scale of 1 to 6 where 1 was very important, 5 was not important at all, and 6 was don't know. The highest percentage of customer respondents rated PNM incentive payments as "very important" (75.9%). Advice and recommendations from PNM was very important to 41.7% of respondents.

Table 7-53 Percent Rating Factors Influencing the Decision to Participate

Energy Efficiency Decision Making Factor	***Not important at all***	***Slightly Important***	***Somewhat important***	***Very important***	***Don't Know***	***N***
Incentive payments from PNM	2.8%	0%	19.4%	75.9%	1.9%	**108**
Past experience with energy efficient equipment	43.5%	5.6%	31.5%	15.7%	3.7%	**108**
Organization's policies	43.5%	8.3%	24.1%	15.7%	8.3%	**108**
Advice and/or recommendations received from PNM	16.7%	6.5%	30.6%	41.7%	4.6%	**108**
Advice and/or recommendations from contractor	40.7%	19.4%	21.3%	14.8%	3.7%	**108**

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 7-54 displays the results. Respondents with larger kWh savings tended to place the most importance on incentive payments from PNM. The results from the highest stratum are difficult to infer any findings from due to there only being three respondents in this group. The projects in the lower savings range were more likely to have the respondent indicate that incentives from PNM and energy efficiency in general are "very important" to their planning. Many of these smaller projects are from corporate or franchise chain stores and restaurants, and as such the decision-making is seen on a larger scale, even if the individual projects are small.

Table 7-54 Decision Maker Attitudes toward Energy Efficiency and Program Incentives, by Quick Saver Customer Gross Realized Savings

Group Number	*Realized Gross kWh Savings*	*Percent stating that energy efficiency as a factor in facility operational planning is "very important"*	*Percent stating that incentive payments from PNM are "very important" for decision making regarding energy efficiency improvements*
5	>90,000	66.7%	66.7%
4	40,000 – 90,000	58.3%	58.3%
3	20,000 - 40,000	86.4%	90.9%
2	10,000 – 20,000	97.0%	48.5%
1	<10,000	84.2%	86.8%
All Respondents		87%	75.9%

7.4.4.4 Where Decision Makers get Their Information

Respondents were asked whom they rely on for information about energy efficiency and program opportunities. Respondents could provide multiple responses so the total of percentages shown in Table 7-55 is more than 100%. The most common sources cited were Friends and Colleagues (53%), Equipment Vendors or Building Contractors (45%), and Brochures or Advertisements (35%).

Table 7-55 Who Respondents Rely on for Information

Information Source	*Percent of Respondents*
A PNM Account Representative	52.8%
The PNM website	16.7%
Brochures or advertisements	38.0%
Trade associations or business groups you belong to	23.1%
Trade journals or magazines	20.4%
Friends and Colleagues	74.1%
An architect, engineer or energy consultant	37.0%
Equipment vendors or building contractors	50.9%
Other	2.8%%
N	**108**

7.4.4.5 Prior Experience with Efficient Equipment

When respondents were asked whether they had purchased or installed energy efficient equipment before participating in Quick Saver, approximately 66.7% reported that they had never done so. In addition, respondents declared how often they try to install energy efficient equipment. Table 7-56 shows that 32.4% of the respondents said that they always do this and another 48.1% said that they usually do this. As with PNM's other programs, the percentage of respondents that now report always purchasing efficient equipment is higher than the percentage that purchased it before the program. This suggests that customers may be more inclined to pursue energy efficient equipment after participating in the program.

Table 7-56 *Frequency of Trying to Install Efficient Equipment on Replacement*

Response	***Percent of Respondents***
Always	32.4%
Usually	48.1%
Sometimes	4.6%
Occasionally	8.3%
Never	5.6%
Don't Know	.9%
N	**108**

8.3% of program participants say that in the last three years they have purchased efficient equipment but did not apply for incentives, as shown in Table 7-57. 1.9% say that they had applied for incentives.

Table 7-57 *Purchase of Energy Efficient Equipment in Last Three Years without Financial Incentive*

Response	***Percent of Respondents***
Yes, purchased energy efficient equipment with no rebate	8.3%
No, Applied for financial incentives on all of the energy efficient equipment	1.9%
Have not purchased equipment	87.0%
Don't Know	2.8%
N	**108**

7.4.4.6 Satisfaction with the Program

Respondents were asked about their levels of satisfaction with selected aspects of the program on a scale of 1 to 5, where 1 is very dissatisfied, 5 is very satisfied. Table 7-58 shows the results. The table is organized by items that had the highest percentage of very satisfied ratings. Respondents reported the greatest satisfaction with the quality of work conducted by their trade ally, and the incentive amount. This was followed by the overall program experience and performance of the installed equipment.

Customers were least satisfied with the information that had been provided by their trade ally, and the information provided by their PNM Account Representative. This indicates that customers believe that PNM should be more transparent, cooperative, or forthcoming with information in order to make the process easier for customers. Even though some items were rated less favorably, none of the respondents provided a very dissatisfied rating, and only 2% included a somewhat dissatisfied rating. This dissatisfaction was with the application process, which is understandable because most participants of programs find applications time-consuming.

Table 7-58 Customer Decision Maker Satisfaction with Selected Elements

Element of Program Experience	Percent of Respondents							
	Very Dissatisfied	Somewhat Dissatisfied	Neither Satisfied nor Dissatisfied	Somewhat Satisfied	Very Satisfied	Don't Know	Mean Score	N
Performance of the Equipment Installed	.9%	.9%	7.4%	8.3%	82.4%	0%	4.70	**108**
Savings on Your Monthly Bill	3.7%	1.9%	17.6%	29.6%	35.2%	12.0%	4.03	**108**
Incentive Amount	0%	0%	5.6%	11.1%	79.6%	3.7%	4.77	**108**
The Effort Required for the Application Process	0%	0%	19.4%	6.5%	65.7%	8.3%	4.51	**108**
Information Provided by Your PNM Trade Ally	0%	0%	6.5%	20.4%	61.1%	12.0%	4.62	**108**
Quality of Work Conducted by Your Trade Ally	0%	1.9%	2.8%	3.7%	91.7%	0%	4.85	**108**
Information Provided by PNM Account Representative	0%	.9%	10.2%	2.8%	73.1%	13.0%	4.70	**108**

Time Elapsed Until You Received the Incentive	0%	2.8%	1.1%	9.3%	62.0%	14.8%	4.53	**108**
Overall Program Experience	0%	.9%	2.8%	11.1%	83.3%	1.9%	4.80	**108**

About 97.2% of participants reported that the energy efficiency measure met their expectations. .9% 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 7-59 Quick Saver Satisfaction of Customer Expectations

Level of Satisfaction	***Percent of Respondents***
Exceeded my expectations	0%
Met my expectations	86.1%
For the most part	4.6%
No	5.6%
Don't know	0%
N	**108**

Table 7-60 shows customer satisfaction levels with selected factors of the program. The results are categorized into five groups, based upon the total savings level achieved by the customer. .

Table 7-60 Quick Saver Respondent Satisfaction Levels, by kWh Savings

Group Number	***kWh Savings***	***Savings on Monthly Bill***	***Incentive Amount***	***Effort Required for the Application Process***	***Elapsed Time Until Incentive Received***	***Overall Program Experience***
5	>90,000	3.00	4.33	4.00	5.00	5.00
4	40,000 – 90,000	3.36	4.75	4.60	4.00	4.75
3	20,000 - 40,000	3.79	4.85	4.74	4.83	4.91
2	10,000 – 20,000	4.39	4.58	3.83	4.29	4.71
1	<10,000	4.16	4.92	4.92	4.69	4.82
All Respondents		4.03	4.77	4.51	4.53	4.80

Table 7-61 displays satisfaction levels for overall program experience, categorized by facility type. Overall, ratings were fairly high across all facility types. Compared to other facilities, retail, office, and restaurant locations had the lowest levels of satisfaction.

Table 7-61 Quick Saver Participant Satisfaction Levels, by Decision Maker Facility Type

Facility Type	Percentage of Respondents	Overall Program Experience (1-5)
Grocery	2.8%	5.00
Light Industry	8.3%	5.00
Office	10.2%	4.55
Assembly/Worship	3.7%	5.00
Warehouse	3.7%	5.00
Retail/Service	31.5%	4.79
Restaurant	38.0%	4.77
School/K-12	1.9%	5.00
Total	100%	4.80

7.4.4.7 Installation and Incentives

Customers were asked about their experiences with project implementation. Table 7-62 displays the results. 97.2% of respondents reported that the implementation went smoothly; .9% indicated that implementation "for the most part" went smoothly and another .9% said it did not go smoothly. When asked to detail what had occurred during implementation, responses included:

> "The outside lighting is awful. The contractor has not responded to this issue"

> "The lack of communication with the contractor caused problems with the installation"

99.1% 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 7-62 Experience with Quick Saver Project Implementation

	% Respondents				
Question	Yes	For the Most Part	No	Don't Know	Total
Did the implementation go smoothly?	97.2%	.9%	.9%	0%	100%

Did the incentive agreement that you received meet your expectations?	86.1%	4.6%	5.6%	0%	100%
Do you feel you got a quality installation?	99.1%	0%	.9%	0%	100%

Respondents were also asked whether a PNM Trade Ally had recommended the installation of the energy efficient measure. 65% of the total, indicated that a trade ally had made the recommendation. Of these respondents, 62% reported that they definitely would not have installed the measure without the trade ally recommendation. Table 7-63 below summarizes the responses to this question.

Table 7-63 Trade Ally Influence on Quick Saver Installation

If a Trade Ally had not recommended the installation, would you have installed?	
Definitely would have installed	2.5%
Probably would have installed	40.0%
Probably would not have installed	36.3%
Definitely would not have installed	18.8%
Don't know	2.5%
N	**80**

In addition, 65.7% 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 7-64 Financial Incentive Influence on Quick Saver Installation

If PNM had not provided a financial incentive, would you have installed?	
Definitely would have installed	2.5%
Probably would have installed	46.3%
Probably would not have installed	43.8%
Definitely would not have installed	35.0%
Don't know	7.5%
N	**108**

7.4.4.8 Future Energy Efficiency Plans

When asked about their future energy efficiency plans, 13% of respondents said that the program had led them to purchase energy efficient equipment without applying for an incentive. Measures installed in this manner included a tankless water heater, solar screens, insulation, and air conditioning tune-ups.

Table 7-65 Future Energy Efficiency Plans

Question	*Percent of Respondents Saying Yes*	*N*
Has your experience with the Commercial Comprehensive Program led you to buy any energy efficient equipment for which you did not apply for a financial incentive?	10.2%	108
Given your experience with the Commercial Comprehensive Program, would you buy energy efficient equipment in the future even if financial incentives for such equipment were not being offered through the Commercial Comprehensive Program?	56.5%	108

Respondents were asked two more questions summarizing their program participation experience. Respondents were asked:

"After having participated in the Quick Saver program, has your company's perspective on energy efficiency changed?"

15.7% indicated "yes" to this question, with responses including:

"If this lighting leads o be a financial savings, I will look to keep us with energy efficient improvements"

"I like saving on my bill"

> "I try to conserve energy by turning off all lights"

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

> "PNM needs to follow up with complaints. I am still waiting to hear back from the installer about my outside lights"
>
> "The program did amok a difference on my feelings on this type of lighting"
>
> "My outdoor energy efficient lights have gone out again. They were replaced once. They are to last a very long time and they haven't. I need someone to come back out to check this problem"
>
> "Thank you for the help"

7.4.5 Future Program Improvements

As the program continues, it will likely grow in popularity and become more widespread in PNM's service area. While many existing factors are moving the program forward, there are still many areas for improvement that will provide strategic advantage in the future.

7.4.5.1 Development of Prescriptive Protocols

Within the last 18 months, PNM and KEMA rolled out a new rebate form and an expanded menu of prescriptive measures. This expansion included:

- LEDs;
- Induction lighting;
- Daylighting controls;
- Vending misers;
- Guest room energy management;
- LED Reach-in refrigerated case lighting;
- Network PC management software; and
- Commercial food service equipment.

Table 7-66 Uptake Rates of New Prescriptive Measures

Measure	*Number of Projects*	*Savings per Project*	*Total Savings*
LED/Induction Lighting	97	23,367	2,557,647
Daylighting Controls	0	0	0
Refrigerated Case Lighting	5	60,970	304,848
Guest Room Energy Management	11	40,795	448,750
Vending Miser	0	0	0
Network PC Management Software	0	0	0
Commercial Food Service	4	23,086	92,344

Some uptake has begun for these new measures. LED lighting in particular has grown more popular equipment costs drop and the quality of lighting improves. Guest room energy management also saw a significant increase in uptake in 2012. Going forward, targeted outreach in underserved measure categories may be warranted (such as in food service or network PC management). As for vending misers, these have been successful elsewhere in New Mexico so it was surprising to observe zero uptake of this measure in PNM's program. ADM reviewed the protocols for implementation and found them overly stringent; there are requirements for pre-inspection and pre-notification which hamper implementation. A contractor that works in El Paso Electric's service territory spoke of the difficulties they faced when attempting to apply for incentives for equipment they installed in Deming (near EPE's territory, but a PNM customer), that drew out to the point where the contractor retracted their application and has since not attempted to bring any further projects into the program. PNM and KEMA may want to consider easing the implementation requirements for this measure to encourage uptake.

7.5 Conclusions & Recommendations

Based on the EM&V effort of the 2012 CCP, ADM's conclusions and recommendations are as follows:

7.5.1 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, KEMA staff, and Trade Allies, ease of application processes, and performance of equipment installed.
2. **The CCP is showing a slow increase in non-lighting participation.** The CCP has shown gradual increases in non-lighting participation. This year was particularly anomalous in having one large HVAC project account for nearly 40%

of Retrofit Rebates savings, but even with that factored out, the program is showing increased uptake of non-lighting measures. This will have to be accelerated, however, as the available opportunities for savings from lighting retrofits will decline with the imposition of new standards for linear and compact fluorescent lighting.

3. **New Construction and Retrocommissioning Projects will benefit from cross-fuel coordination.** New Mexico Gas Company has a Commercial Solutions program currently implemented by CLEAResult Consulting. In 2012, a first test of cross-fuel coordination was completed in the joint-implementation and incentivizing of a retrocommissioning project. This allowed for higher incentives, reduced implementation costs, and the pursuit of more savings opportunities for this project. This is an avenue that should be pursued and expanded upon in coming program years.
4. **LEDs are gaining market share in the commercial sector.** In 2012, the CCP rebated a record number of LED projects in areas other than exit signs. New applications for these fixtures are being devised and utilized when hours of operation are high or the space is refrigerated and has high resulting interactive effects.
5. **Uptake of envelope improvements, food service, and plug load measures has been limited.** These are avenues for deeper savings at several facility types that thus far have seen little to no uptake.
6. **New Construction displays lower participant satisfaction.** ADM noted several interviews where New Construction participants felt dissatisfied with their experience with the program. The pool of possible survey respondents is very limited due to the low participation level of the New Construction component, but the rate of dissatisfaction among these participants was notable. Many indicated a lack of awareness of options for assistance with their program participation, as these participants may not have had the chance to interact with an account manager or other PNM staff. Further, many of the general contractors involved with new construction projects are not PNM Trade Allies and are ill-informed of the program offerings and requirements.

7.5.2 Recommendations

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

1. **Coordinate with NMGCO on food service outreach and implementation.** NMGCO has engaged in significant outreach to food service equipment distributors in support of their Commercial Solutions program. These efforts could be co-funded to benefit both programs, reducing marketing costs and engaging the food service sector in selling high efficient options of both fuel types.

2. **Expand coordination with NMGCO on Retrocommissioning and Whole-Building projects.** Both of these project types have the opportunity for high levels of natural gas savings. By engaging NMGCO, these projects can receive higher overall incentives, and could induce further activity (such as expanding Retrocommissioning to more equipment in the facility, or moving a Whole-Building project from the 10%-20% class to the > 20% class).
3. **Ease the implementation requirements for vending misers.** Presently, the requirements for vending misers are exceedingly high. The requirements should be eased to include post-only inspection of a random sample. This would allow for the duplication of the success El Paso Electric has had with this measure.
4. **Target marketing to sectors with low diversity of participation.** There are several sectors with end-uses that are not being engaged through the program. The most notable of these include restaurants, K-12 schools, and government facilities. These three facility types have over 95% of their savings in 2012 from lighting, despite a wider range of equipment classes to pursue. Governments and K-12 school districts may require partnership and buy-in from higher level decision-makers, however, as the decision for funding the improvements may not come at the facility-level. The restaurant sector has a wide range of savings opportunities outside of lighting with the large loads from food service and refrigeration equipment. These should be pursued where possible, as this is a large and seemingly relative untapped area for potential savings.
5. **Fix the "Building Type" dropdown in the RR/NC application.** Presently, the dropdown in the Applicant Information tab shows a large number of blanks. Particularly visible when the dropdown menu is first opened. This should be fixed so that the applicant can immediately see that there is a long list of facility types. Presently, when the dropdown is first opened, "College/University", "Dwelling Unit", and "Exterior" are shown, followed by a long section of blanks to scroll through.
6. **Change implementation requirements for Guest Room Occupancy Sensors to disallow full shutoff.** Currently, the implementation requirements for this measure require a minimum five degree setback or full shutoff. ADM has found in other territories that full shutoff can lead to significant removal rates, as in peak summer periods this can cause the hotel room to heat to levels that cannot be adequately cooled over the course of nighttime occupancy. This recommendation may slightly lower per-unit savings but would better-ensure measure persistence.

8. 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*
Refrigerator Recycling	7,738	6,372,005	1,090	30,997,934	$1,203,965
Residential Lighting	1,182,365	31,222,472	3,816	218,557,304	$1,915,937
Commercial Comprehensive	926	36,563,728	8,141	410,459,329	$5,736,544
ES New Homes	236	274,535	197	8,236,063	$271,133
Community CFL	12,150	241,785	28	1,692,495	$25,030
Easy Savings	6,565	2,164,242	199	16,231,813	$387,666
LI Frig & CFL	11,020	1,029,999	116	13,016,489	$364,200
Energy Smart for Renters	62	103,275	12	722,925	$1,237
Market Transformation	-	-	-	-	$84,565
Large Customer Self-Direct	4	167,568	22	2,513,520	$0
Power Saver	37,397	579,167	38,617	579,167	$5,393,244
Peak Saver	90	602,103	18,795	602,103	$1,923,906
Aggregate Portfolio:	1,258,553	79,320,879	71,033	703,609,142	$17,307,427

Program	*Participants or Units*	*Participant Costs*	*Cost per kWh Saved*	*2012 Economic Benefits*	*Total Economic Benefits*
Refrigerator Recycling	7,738	$0	$.039	$439,128	$2,159,212
Residential Lighting	1,182,365	$2,596,474	$.009	$3,260,868	$22,109,122
Commercial Comprehensive	926	$7,085,331	$.014	$2,520,145	$29,194,942
ES New Homes	236	$934,560	$.033	$53,212	$1,906,195
Community CFL	12,150	$0	$.015	$16,665	$116,434
Easy Savings	6,565	$0	$.024	$285,028	$1,968,255
LI Frig & CFL	11,020	$0	$.028	$85,193	$914,348
Energy Smart for Renters	62	$0	$.002	$7,982	$47,603
Market Transformation	-	$0	-	$0	$0
Large Customer Self-Direct	4	$0	$.000	$11,550	$171,610
Power Saver	37,397	$0	$9.312	$4,451,550	$4,451,550
Peak Saver	90	$0	$3.195	$2,202,926	$2,202,926
Aggregate Portfolio:	1,258,553	$10,616,365	$.025	$13,334,247	$65,242,197