Evaluation of the 2021 Public Service Company of New Mexico Energy Efficiency and Demand Response Programs

Final Report

Submitted by Evergreen Economics

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Executive Summary

This report presents the independent evaluation results for Public Service Company of New Mexico (PNM) energy efficiency and demand response programs for program year 2021 (PY2021).

The PNM programs and evaluation requirements were first established in 2005 by the New Mexico legislature's passage of the 2005 Efficient Use of Energy Act (EUEA).[1] The EUEA requires public utilities in New Mexico, in collaboration with other parties, to develop cost-effective programs that reduce energy demand and consumption. Utilities are required to submit their proposed portfolio of programs to the New Mexico Public Regulation Commission (NMPRC) for approval. As a part of its approval process, the NMPRC must find that the program portfolio is cost effective based on the Utility Cost Test (UCT).

An additional requirement of the EUEA is that each program must be evaluated at least once every three years. As part of the evaluation requirement, PNM must submit to the NMPRC a comprehensive evaluation report prepared by an independent program evaluator. As part of the reporting process, the evaluator must measure and verify energy and demand savings, determine program cost effectiveness, assess how well the programs are being implemented, and provide recommendations for program improvements as needed.

For PY2021, the following PNM programs were evaluated:

1. Commercial Comprehensive
2. Home Works
3. Easy Savings Kit (Low Income)
4. Power Saver
5. Peak Saver

For each of the evaluated programs, the evaluation team estimated realized gross and net impacts (kWh and kW) and calculated program cost effectiveness using the UCT.[2] Brief process evaluations were also conducted for the Commercial Comprehensive and Residential Comprehensive programs.

[1] NMSA §§ 62-17-1 *et seq* (SB 644). Per the New Mexico Public Regulation Commission Rule Pursuant to the requirements of the EUEA, the NMPRC issued its most recent *Energy Efficiency Rule* (*17.7.2 NMAC*) effective September 26, 2017, that sets forth the NMPRC's policy and requirements for energy efficiency and load management programs. This Rule can be found online at http://164.64.110.134/parts/title17/17.007.0002.html

[2] The evaluation team consists of Evergreen Economics, EcoMetric, Demand Side Analytics, and Research & Polling.

The remaining programs that were not evaluated in 2021 are still summarized in this report. The accomplishments for the non-evaluated programs are reported using the following parameters:

- Gross impacts (kWh, kW) were calculated using PNM's *ex ante* values for annual savings;
- Net impacts were calculated from the gross impacts using the existing *ex ante* net-to-gross (NTG) ratio; and
- Cost effectiveness calculations were calculated using the *ex ante* net impact values and cost data as reported by PNM.

The analysis methods used for the evaluated PY2021 programs are summarized as follows:

Commercial Comprehensive. The measures eligible for the Commercial Comprehensive program are primarily prescriptive in nature, but the program also includes custom projects. Gross impacts were estimated based on a review of the deemed savings values combined with engineering desk reviews of a statistically representative sample of projects covering a range of major measure types in each of the sub-programs. Similar to 2020, there were no site visits conducted in 2021 due to the Covid pandemic. A phone survey was used to verify installation and to collect information needed for a self-report analysis of free ridership to determine net impacts.

Home Works. This program is implemented through participating schools using a 60-minute interactive presentation. Participating teachers are also provided with supplemental instructional materials and optional lessons. A deemed savings review was conducted to determine gross impacts for the measures provided to students as part of the Home Works curriculum. An NTG ratio of 1.0 is assumed for this program. Students filled out a survey as part of the Home Works curriculum, and these survey responses were analyzed as part of the PY2021 evaluation.

Easy Savings Kit (Easy Savings). The Easy Savings program provides a kit for households with easy-to-install measures such as LEDs, faucet aerators, and low flow showerheads. A deemed savings review was conducted to determine gross impacts for measures provided in these kits. An NTG ratio of 1.0 is assumed for this program, given that the customer is required to request the kit directly from PNM and there is an emphasis on serving low-income households. A general population low-income web survey was also conducted as part of the PY2021 evaluation.

Power Saver and Peak Saver. PNM had two demand response programs in PY2021. The Power Saver program focuses on single-family, multifamily, and small and medium commercial customers. For all Power Saver customers, the five-minute interval load data were analyzed during event periods and compared to load shapes from a control group. The Peak Saver program is for larger customers that typically have unique load shapes, which makes finding a matched control group difficult. For these customers, savings were estimated based on the differences in load shapes between event and non-event weekdays for the same customer.

There were two new behavior programs introduced in PY2021, the Commercial Strategic Energy Management (SEM) program and the Residential Home Energy Report program.

The Commercial SEM program targets commercial and industrial customers by focusing on business practice changes to positively affect organizational culture in reducing energy waste and improve energy intensity. Only a small number of customers participated in PY2021 due to issues stemming from COVID, lack of available resources, and prior or recent participation in similar energy management programs.

The Residential Home Energy Report program provides digital home energy reports versus the historical paper only delivery to reduce waste and offers a broader sample of participants personalized tips and efficiency rebate recommendations through a phone app, website, or emailed report. Over 1.7 million emails were sent in PY2021 with a delivery rate of 98 percent, and an open rate of 35 percent. For customers who did not have an email address, paper home energy reports were also sent out.

For these two behavioral programs, the reported savings values provided by the implementers have not been verified through the normal evaluation process; however, both behavioral programs are set to be evaluated in PY2022.

Table 1 summarizes the PY2021 evaluation methods.

Table 1: Summary of PY2021 Evaluation Methods by Program

Program	Deemed Savings Review	Participant Survey / Interviews	Engineering Desk Reviews	Site Visits	Billing Regression
Commercial Comprehensive	◆	◆	◆		
Home Works	◆	◆			
Easy Savings	◆	◆			
Power Saver (Res & Small/Med Commercial)					◆
Peak Saver (Large Commercial & Industrial)					◆

The results of the PY2021 impact evaluation are shown in Table 2 (kWh) and Table 3 (kW), with the programs evaluated in 2021 highlighted in blue. For the non-evaluated programs, the totals are based on the *ex ante* savings and NTG values from the PNM tracking data.

Table 2: PY2021 Savings Summary – kWh

Program	# of Projects	Expected Gross kWh Savings	Engineering Adjustment Factor	Realized Gross kWh Savings	NTG Ratio	Realized Net kWh Savings
Commercial Comprehensive						
Retrofit Rebate	206	27,422,672	1.099	30,139,944	0.861	25,935,422
New Construction	54	11,875,743	1.057	12,547,006	0.861	10,796,699
Quick Saver	207	6,478,594	1.053	6,819,162	1.000	6,819,162
Multifamily	54	4,480,184	0.832	3,729,007	0.861	3,208,811
Building Tune-Up	20	851,852	1.000	851,852	0.861	733,019
Midstream	12	255,645	0.999	255,505	0.861	219,862
AC Tune Up	3	14,453	0.988	14,280	1.000	14,280
Residential Lighting	1,581,327	63,387,747	1.000	63,387,747	0.680	43,103,668
Home Works	12,947	2,562,039	1.010	2,588,467	1.000	2,588,467
Energy Smart	234	377,717	1.000	377,717	1.000	377,717
Residential Comprehensive						
Home Energy Checkup - LI	1,014	1,541,576	1.000	1,541,576	0.980	1,510,590
Home Energy Checkup	978	1,321,275	1.000	1,321,275	0.980	1,294,717
Refrigerator Recycling	5,728	6,237,792	1.000	6,237,792	0.549	3,423,924
Cooling	234	266,179	1.000	266,179	0.663	176,344
Easy Savings	5,541	1,888,070	1.000	1,888,070	1.000	1,888,070
New Home Construction	1,490	2,444,239	1.000	2,444,239	0.730	1,784,294
Residential Behavioral HER	218,311	1,787,050	1.000	1,787,050	1.000	1,787,050
Commercial Behavioral SEM	5	1,320,262	1.000	1,320,262	1.000	1,320,262
Peak Saver	157	165,911	0.440	73,289	1.000	73,289
Power Saver	55,546	157,653	0.790	124,300	1.000	124,300
Total	**1,884,068**	**134,836,653**		**137,714,720**		**107,179,947**

Table 3: PY2021 Savings Summary - kW

Program	# of Projects	Expected Gross kW Savings	Engineering Adjustment Factor	Realized Gross kW Savings	NTG Ratio	Realized Net kW Savings
Commercial Comprehensive						
Retrofit Rebate	206	4,289	1.085	4,656	0.861	4,006
New Construction	54	1,482	1.312	1,945	0.861	1,674
Quick Saver	207	1,312	0.543	713	1.000	713
Multifamily	54	763	0.914	697	0.861	600
Building Tune-Up	20	33	0.416	14	0.861	12
Midstream	12	745	0.017	13	0.861	11
AC Tune Up	3				1.000	
Residential Lighting	1,581,327	15,028	1.000	15,028	0.680	10,219
Home Works	12,947	148	1.137	168	1.000	168
Energy Smart	234	61	1.000	61	1.000	61
Residential Comprehensive						
Home Energy Checkup – LI	1,014	209	1.000	209	0.980	204
Home Energy Checkup	978	138	1.000	138	0.980	135
Refrigerator Recycling	5,728	1,466	1.000	1,466	0.549	805
Cooling	234	111	1.000	111	0.663	73
Easy Savings	5,541	197	1.000	197	1.000	197
New Home Construction	1,490	949	1.000	949	0.730	692
Residential Behavioral HER	218,311				1.000	
Commercial Behavioral SEM	5				1.000	
Peak Saver	157	42,176	0.420	17,509	1.000	17,509
Power Saver	55,546	43,250	0.790	34,100	1.000	34,100
Total	**1,665,752**	**112,357**		**77,973**		**71,180**

Beginning in 2021, the impact evaluation moved to applying new NTG ratios prospectively in future years, rather than retrospectively as had been done in prior years. As a consequence, the same NTG ratios applied in PY2020 were also being used for PY2021. For the PY2021 evaluation, the only updates to the NTG ratios occurred with the Commercial Comprehensive program, and these new ratios will be applied beginning in PY2022. For that program, the ratios will change from 0.86 to 0.84 for all sub-programs except the direct install Quick Saver and AC Tune Up, which will both continue to use an NTG ratio of 1.0.

Table 4 summarizes the updates to the NTG ratios for PY2022, with the updated values shaded in green.

Table 4: Net-to-Gross Ratio Updates for PY2022

Program	PY2021 NTG Ratio	PY2022 NTG Ratio
Commercial Comprehensive		
Retrofit Rebate	0.861	0.842
New Construction	0.861	0.842
Quick Saver	1.000	1.000
Multifamily	0.861	0.842
Building Tune-Up	0.861	0.842
Midstream	0.861	0.842
AC Tune Up	1.000	1.000
Residential Lighting	0.680	0.680
Home Works	1.000	1.000
Energy Smart	1.000	1.000
Residential Comprehensive		
Home Energy Checkup	0.980	0.980
Refrigerator Recycling	0.549	0.549
Cooling	0.663	0.663
Easy Savings	1.000	1.000
New Home Construction	0.730	0.730
Residential Behavioral HER	1.000	TBD

Commercial Behavioral SEM	1.000	TBD
Peak Saver	1.000	1.000
Power Saver	1.000	1.000

Lifetime kWh savings are shown in Table 5 by program and for the portfolio overall. This includes expected gross, realized gross, and realized net kWh lifetime savings. Based on the data collection and analysis conducted for this evaluation, the evaluation team found that, overall, PNM is operating high-quality programs that are achieving significant energy and demand savings and producing satisfied participants.

Table 5: PY2021 Savings Summary – Lifetime kWh

Program	Expected Gross kWh Lifetime Savings	Realized Gross kWh Lifetime Savings	Realized Net kWh Lifetime Savings
Commercial Comprehensive			
Retrofit Rebate	290,680,325	319,483,409	274,915,474
New Construction	125,882,873	132,998,263	114,445,005
Quick Saver	68,673,093	72,283,122	72,283,122
Multifamily	47,489,949	39,527,477	34,013,394
Building Tune-Up	9,029,632	9,029,632	7,769,998
Midstream	2,709,832	2,708,351	2,330,536
AC Tune Up	153,205	151,370	151,370
Residential Lighting	1,267,754,940	1,267,754,940	862,073,359
Home Works	28,621,129	28,916,357	28,916,357
Energy Smart	6,100,352	6,100,352	6,100,352
Residential Comprehensive			
Home Energy Checkup – LI	13,797,105	13,797,105	13,519,783
Home Energy Checkup	11,825,411	11,825,411	11,587,720
Refrigerator Recycling	30,671,468	30,671,468	16,835,569
Cooling	3,973,933	3,973,933	2,632,730
Easy Savings	24,922,519	24,922,519	24,922,519
New Home Construction	42,289,603	42,289,603	30,871,410

Residential Behavioral HER	1,787,050	1,787,050	1,787,050
Commercial Behavioral SEM	3,960,786	3,960,786	3,960,786
Peak Saver	165,911	73,001	73,001
Power Saver	157,653	124,546	124,546
Total	**1,980,646,771**	**2,012,378,695**	**1,509,314,082**

Using net realized savings from this evaluation and cost information provided by PNM, the evaluation team calculated the ratio of benefits to costs for each of PNM's programs and for the portfolio overall. The evaluation team calculated cost effectiveness using the UCT, which compares the benefits and costs to the utility or program administrator implementing the program.[3] The evaluation team conducted this test in a manner consistent with the California Energy Efficiency Policy Manual.[4]

The results of the UCT are shown below in Table 6. Overall, the portfolio had a UCT of 1.48 for PY2021 and therefore was cost effective.

Table 6: PY2021 Cost Effectiveness

Program	Utility Cost Test (UCT)
Res Comp – Refrigerator Recycling	0.60
Res Comp – Cooling & Midstream	0.19
Res Comp – Home Energy Checkup	0.29
Res Comp – Home Energy Checkup LI	0.40
Residential Behavioral HER	0.07
Residential Lighting	4.73
Commercial Comprehensive	1.28
Commercial Comprehensive - Multifamily	0.84
Easy Savings	1.67
Energy Smart (MFA)	0.72

[3] The Utility Cost Test is sometimes referred to as the Program Administrator Cost Test, or PACT.

[4] California Public Utilities Commission. 2013. *Energy Efficiency Policy Manual, Version 5*. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf

New Home Construction	1.40
PNM Home Works	0.72
Commercial Behavioral SEM	0.25
PNM Power Saver	0.22
PNM Peak Saver	0.21
Overall Portfolio	**1.48**

The impact evaluation—which included engineering desk reviews for a sample of Commercial Comprehensive, a review of deemed savings values for the other programs, and statistical models for the Power Saver and Peak Saver programs—resulted in relatively high realized gross savings, particularly for kWh. Adjustments to savings based on the Commercial Comprehensive desk reviews were primarily due to several factors: incomplete project documentation where savings calculations did not match up with the PNM work papers, adjustments to operating hour assumptions for lighting projects (especially lights assumed to run from dusk to dawn), and differences in HVAC baseline parameters. The largest changes in savings were to the peak demand savings for the Midstream sub-program, where the *ex ante* savings were calculated using the 2020 PNM workpapers, which included an error for the ENERGY STAR Glass/Solid Door Reach-In Freezer/Refrigerator measure.

The process evaluation activities included customer surveys and a small number of interviews with contractors for the Commercial Comprehensive program. Satisfaction levels among program participants were very high, with scores increasing from the already high levels observed in prior years. A separate survey was conducted to characterize low-income home households throughout PNM's service territory. While there is potential to achieve energy efficiency in this market, PNM will need to overcome several barriers relating to trust and privacy concerns among low-income households.

1 Commercial Comprehensive Program

1.1 Commercial Comprehensive Gross Impacts

To verify gross savings estimates, the evaluation team conducted engineering desk reviews for a sample of the projects in the Commercial Comprehensive program completed in 2021. The goal of the desk reviews was to verify equipment installation, operational parameters, and estimated savings.

Both prescriptive and custom projects received desk reviews that included the following:

1. Review of project description, documentation, specifications, and tracking system data;
2. Confirmation of installation using invoices and/or post-installation reports; and
3. Review of post-installation reports detailing differences between installed equipment and documentation, and subsequent adjustments made by the program implementer.

For projects in the Commercial Comprehensive program that used deemed savings values for prescriptive measures, the engineering desk reviews included the following:

- Review of measures available in the New Mexico TRM and the PNM work papers to determine the most appropriate algorithms which apply to the installed measure;
- Recreation of savings calculations using TRM/work paper algorithms and inputs as documented by submitted specifications, invoices, and post-installation inspection reports; and
- Review of TRM/work paper algorithms to identify candidates for future updates and improvements.

For the custom projects included in the Commercial Comprehensive program, the engineering desk reviews included the following:

1. Review of engineering analyses for technical soundness, proper baselines, and appropriate approaches for the specific applications;
2. Review of methods of determining demand (capacity) savings to ensure they are consistent with program and/or utility methods for determining peak load/savings;
3. Review of input data for appropriate baseline specifications and variables such as weather data, bin hours, and total annual hours to determine if they are consistent with facility operation; and
4. Consideration and review for interactive effects between affected systems.

The *ex ante* 2021 impacts are summarized in Table 7 for each Commercial Comprehensive sub-program, with the Retrofit Rebate and New Construction sub-programs accounting for most of the savings. In total, the Retrofit Rebate sub-program accounted for 53 percent of the energy impacts in PNM's overall portfolio.

Table 7: Commercial Comprehensive Savings Summary

Sub-Program	# of Projects	Expected Gross kWh Savings	Expected Gross kW Savings
Retrofit Rebate	206	27,422,672	4,289
New Construction	54	11,875,743	1,482
Quick Saver	207	6,478,594	1,312
Multifamily	54	4,480,184	763
Building Tune-Up	20	851,852	33
Midstream	12	255,645	745
AC Tune Up	3	14,453	0
Total	**556**	**51,379,142**	**8,624**

The majority of the gross impact evaluation activities were devoted to engineering desk reviews of a sample of projects. For the desk reviews, the sample frame included projects in the Commercial Comprehensive program. The evaluation team reviewed projects in the Retrofit Rebate, Multifamily, New Construction, Direct Install (Quick Saver), Building Tune-Up, Midstream, and AC Tune-up sub-programs. The sample for the Retrofit Rebate sub-program was stratified to cover a range of different measure types so that no single measure (often lighting) would dominate the desk reviews. The sample was also stratified based on total energy savings within each sub-program. In some cases, very large projects were assigned to a "certainty" stratum and were automatically added to the sample (rather than randomly assigned). This allowed for the largest projects to be included in the desk reviews and maximized the amount of savings covered in the sample. Overall, the sampling strategy ensured that a mix of projects in terms of both project size and measure type would be included in the desk reviews.

The final sample design is shown in Table 8. The resulting sample achieved a relative precision of 90/4.4 for the Commercial Comprehensive program overall, with precision ranging from 80/<1 to 80/73 for the individual sub-programs.

Table 8: Commercial Comprehensive Desk Review Sample

Sub-Program	Measure Group	Stratum	Count	Average kWh	Total kWh Savings	% of Savings	Current Sample
Retrofit Rebate	Custom	Certainty	1	4,531,914	4,531,914	16%	1
		1	5	128,613	643,064	2%	3
	HVAC	Certainty	4	312,268	830,551	3%	4
		1	15	16,919	253,780	1%	3
	Lighting	Certainty	3	862,680	2,588,041	9%	3
		1	8	335,574	2,684,595	9%	3
		2	18	120,394	2,167,091	8%	3
		3	75	25,881	1,941,084	7%	3
	AC Tune Up	Certainty	2	5,261	10,522	<1%	2
	Other	Certainty	4	67,829	271,315	1%	4
Quick Saver		1	5	236,364	1,181,819	4%	3
		2	10	112,759	1,127,594	4%	3
		3	29	39,364	1,141,544	4%	3
		4	93	11,759	1,093,543	4%	3
Building Tune-Up		Certainty	1	275,068	275,068	1%	1
		1	5	59,250	296,250	1%	3
		2	8	35,067	280,536	1%	3
Midstream		Certainty	2	42,967	85,934	0%	2
		1	7	9,921	69,445	0%	4
Multifamily		Certainty	4	711,618	2,556,143	9%	4
		1	16	66,254	1,060,066	4%	5
New Construction		Certainty	3	797,826	1,896,734	7%	3
		1	6	127,852	767,110	3%	4
		2	26	33,796	878,683	3%	3
Total			**350**	**373,633**	**28,632,426**	**100%**	**73**

The gross realized impacts for the Commercial Comprehensive program were determined by performing engineering desk reviews on the sample of projects. For prescriptive projects, the evaluation team found multiple measures that existed in both the New Mexico TRM and the PNM Workpapers, and the savings calculation approaches sometimes differed across sources. In these cases, we examined both sources but defaulted to the methodology and algorithm inputs in the PNM Workpapers. Some of the other incentivized measures existed only in the PNM Workpapers, and in these cases, the algorithms were reviewed for accuracy and adjusted as necessary to calculate realized energy and demand savings. We also deferred to non-prescriptive values (e.g., custom lighting hours of use) assumed in the project files when possible, checking the values for reasonableness by corroborating with sources such as the TRM and posted business hours.

For custom projects, the *ex ante* savings calculations were recreated when possible (i.e., simple spreadsheet calculations). For more complex analyses (whole building energy simulations), the evaluation team audited the approaches taken and inputs used. When applicable, approaches and assumptions used in custom analyses were compared to those contained in the TRM.

Table 9 and Table 10 show the results of the desk reviews and how the resulting engineering adjustments were used to calculated realized savings. For the Commercial Comprehensive program overall, these adjustments resulted in an engineering adjustment factor of 1.058 for kWh and 0.932 for kW.

Table 9: PY2021 Commercial Comprehensive Gross kWh Impact Summary

Sub-Program	# of Projects	Expected Gross kWh Savings	Engineering Adjustment Factor	Realized Gross kWh Savings
Retrofit Rebate	206	27,422,672	1.099	30,139,944
New Construction	54	11,875,743	1.057	12,547,006
Quick Saver	207	6,478,594	1.053	6,819,162
Multifamily	54	4,480,184	0.832	3,729,007
Building Tune-Up	20	851,852	1.000	851,852
Midstream	12	255,645	0.999	255,505
AC Tune Up	3	14,453	0.988	14,280
Total	**556**	**51,379,142**	**1.058**	**54,356,756**

Table 10: PY2021 Commercial Comprehensive Gross kW Impact Summary

Sub-Program	# of Projects	Expected Gross kW Savings	Engineering Adjustment Factor	Realized Gross kW Savings
Retrofit Rebate	206	4,289	1.085	4,656
New Construction	54	1,482	1.312	1,945
Quick Saver	207	1,312	0.543	713
Multifamily	54	763	0.914	697
Building Tune-Up	20	33	0.416	14
Midstream	12	745	0.017	13
AC Tune Up	3	-	-	-
Total	**556**	**8,624**	**0.932**	**8,038**

A summary of the individual desk review findings for each of the 73 projects is included in Appendix E.

1.2 Commercial Comprehensive Net Impacts

The evaluation team estimated net impacts for some programs using the self-report approach. This method uses responses to a series of carefully constructed survey questions to learn what participants would have done in the absence of the utility's program. The goal is to ask enough questions to paint an adequate picture of the influence of the program activities (rebates and other program assistance) within the confines of what can reasonably be asked during a phone survey.

With the self-report approach, specific questions that are explored include the following:

1. What were the circumstances under which the customer decided to implement the project (i.e., new construction, retrofit/early replacement, replace-on-burnout)?
2. To what extent did the program accelerate installation of high efficiency measures?
3. What were the primary influences on the customer's decision to purchase and install the high efficiency equipment?
4. How important was the program rebate on the decision to choose high efficiency equipment?
5. How would the project have changed if the rebate had not been available (e.g., would less efficient equipment have been installed, would the project have been delayed)?

6. Were there other program or utility interactions that affected the decision to choose high efficiency equipment (e.g., was there an energy audit done, has the customer participated before, is there an established relationship with a utility account representative, was the installation contractor trained by the program)?

The method used for estimating free ridership (and ultimately the net-to-gross [NTG] ratio) using the self-report approach is based on the 2017 Illinois Statewide Technical Reference Manual (TRM).[5] For the PNM programs, questions regarding free ridership were divided into several primary components:

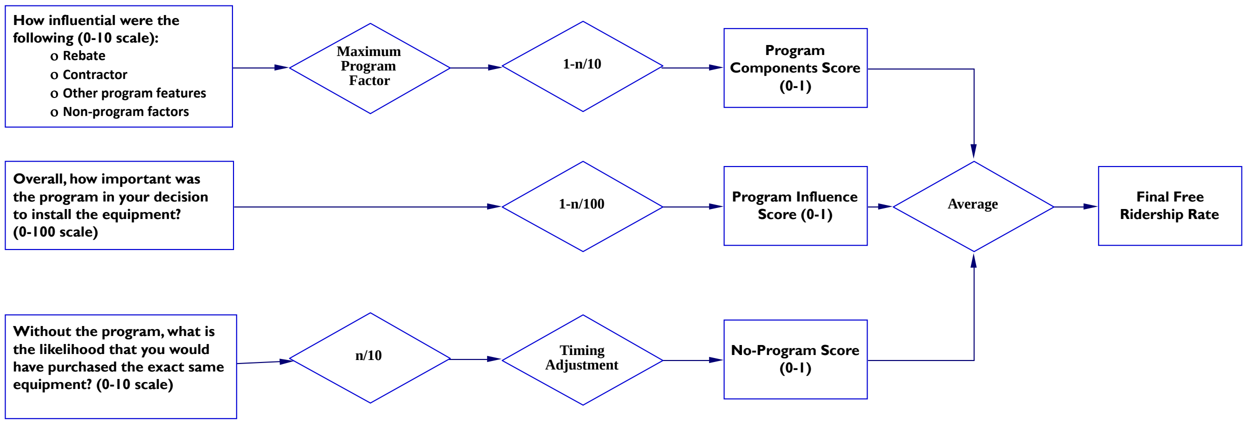
- A ***Program Component*** series of questions that asked about the influence of specific program activities (rebate, customer account rep, contractor recommendations, other assistance offered) on the decision to install energy efficient equipment;
- A ***Program Influence*** question, where the respondent was asked directly to provide a rating of how influential the overall program was on their decision to install high efficiency equipment, and
- A ***No-Program Component*** series of questions, based on the participant's intention to carry out the energy-efficient project without program funds or due to influences outside of the program.

Each component was assessed using survey responses that rated the influence of various factors on the respondent's equipment choice. Since opposing biases potentially affect the main components, the No-Program Component typically indicates higher free ridership than the Program Component/Influence questions. Therefore, combining these opposing influences helps mitigate the potential biases. This framework also relies on multiple questions that are crosschecked with other questions for consistency. This prevents any single survey question from having an excessive influence on the overall free ridership score.

Figure 1 provides a simplified version of the scoring algorithm. In some cases, multiple questions were asked to assess the levels of efficiency and purchase timing in absence of the program. For each of the scoring components, the question responses were scored so that they were consistent and resulted in values between 0 and 1. Once this was accomplished, the three question components were averaged to obtain the final free ridership score.

[5] The full Illinois TRM can be found at http://www.ilsag.info/il_trm_version_6.html

Figure 1: Self-Report Free Ridership Scoring Algorithm



Source: Adapted by Evergreen Economics from the 2017 Illinois TRM.

More detail on each of the three question tracks is provided below.

Program Component Questions

The ***Program Component*** battery of questions was designed to capture the influence of the program on the equipment choice. These questions were also designed to be as comprehensive as possible so that all possible channels through which the program is attempting to reach the customer were included.

The type of questions included in the Program Component question battery included the following:

- How influential were the following on your decision to purchase your energy efficient equipment?
  - Rebate amount
  - Contractor recommendation
  - Utility advertising/promotions
  - Technical assistance from the utility (e.g., energy audit)
  - Recommendation from utility customer representative (or program implementer)
  - Previous participation in a utility efficiency program

As shown at the top of Figure 1, the question with the highest value response (i.e., the program factor that had the greatest influence on the decision to install a high efficiency measure) was the one that was used in the scoring algorithm as the Program Component score.

Program Influence Question

A separate ***Program Influence*** question asked the respondent directly to rate the combined influence of the various program activities on their decision to install energy efficient equipment. This question allowed the respondent to consider the program as a whole and incorporated other forms of assistance (if applicable) in addition to the rebate. Respondents were also asked about potential non-program factors (condition of existing equipment, corporate policies, maintenance schedule, etc.) to put the program in context with other potential influences.

The Program Influence question also provided a consistency check so that the stated importance of various program factors could be compared across questions. If there appeared to be inconsistent answers across questions (rebate was listed as very important in response to one question but not important in response to a different question, for example), then the interviewer asked follow-up questions to confirm responses. The verbatim responses were recorded and were reviewed by the evaluation team as an additional check on the free ridership results.

No-Program Component Questions

A separate battery of ***No-Program Component*** questions was designed to understand what the customer might have done if the PNM rebate program had not been available. With these questions, we attempted to measure how much of the decision to purchase the energy efficient equipment was due to factors that were unrelated to the rebate program or other forms of assistance offered by PNM.

The types of questions asked for the No-Program Component included the following:

- If the program had not existed, would you have
  - Purchased the exact same equipment?
  - Chosen the same energy efficiency level?
  - Delayed your equipment purchase?
- Did you become aware of the utility rebate program before or after you chose your energy efficient equipment?

The question regarding the timing of awareness of the rebate was used in conjunction with the importance rating the respondent provided in response to the earlier questions. If the respondent had already selected the high efficiency equipment prior to learning about the rebate and said that the rebate was the most important factor, then a downward adjustment was made on the influence of the rebate in calculating the Program Component score.

The responses from the No-Program Component questions were analyzed and combined with a timing adjustment to calculate the No-Program score, as shown in Figure 1. The timing adjustment was made based on whether or not the respondent would have delayed their equipment purchase if the rebate had not been available. If the purchase would have been delayed by one year or more, then the No-Program Component score was set to zero, thereby minimizing the level of free ridership for this algorithm component only.

Free Ridership and NTG Calculation

The values from the Program Component score, the Program Influence score, and the No-Program Component score were averaged in the final free ridership calculation; the averaging helped reduce potential biases from any particular set of responses. The fact that each component relied on multiple questions (instead of a single question) also reduced the risk of response bias. As discussed above, additional survey questions were asked about the relative importance of the program and non-program factors. These responses were used as a consistency check, which further minimized potential bias.

Once the self-report algorithm was used to calculate free ridership, the total NTG ratio was calculated using the following formula:

$$Net\text{-}to\text{-}Gross\ Ratio = (1 - Free\ Ridership\ Rate)$$

Beginning in 2021, any updates to program NTG ratios will be applied prospectively. As a result, the new NTG ratios for Commercial Comprehensive developed in the PY2021 evaluation will be used beginning in PY2022. The realized net impacts discussed below are calculated using the existing NTG ratios from PY2020.

1.3 Realized Gross and Net Impacts

The final step in the impact evaluation process is to calculate the realized gross and net savings, based on the program-level analysis described above. The **Gross Realized Savings** are calculated by taking the original *ex ante* savings values from the participant tracking databases and adjusting them using an **Installation Adjustment** factor (based on the count of installed measures verified through the phone surveys) and an **Engineering Adjustment** factor (based on the engineering analysis, desk reviews, etc.):

$$\text{Gross Realized Savings} =$$
$$(\textit{Ex Ante}\ \text{Savings})*(\text{Installation Adjustment})*(\text{Engineering Adjustment Factor})$$

Net Realized Savings are then determined by multiplying the Gross Realized Savings by the NTG ratio:

$$\text{Net Realized Savings} = (\text{Net-to-Gross Ratio})*(\text{Gross Realized Savings})$$

Net impacts for the Commercial Comprehensive program were calculated using NTG ratios from the participant phone survey or *ex ante* values, depending on the sub-program. For the Retrofit

Rebate sub-program, the NTG ratio was developed using the self-report method and participant phone survey data from the PY2020 evaluation.

The resulting NTG ratio is 0.8605. While the survey sample was mostly Retrofit Rebate customers, there were also a few customers from the New Construction and Multifamily sub-programs, and so the same NTG ratio was applied to these programs, as well as to the Building Tune-Up sub-program. This resulted in an increase in the NTG ratio for these latter three sub-programs relative to their original *ex ante* values. For the Quick Saver sub-program, an NTG ratio of 1.00 was applied, due to the direct install design of this sub-program.

Table 11 and Table 12 summarize the PY2021 net impacts for the Commercial Comprehensive program using the existing NTG ratios from PY2020. Net realized savings for the program overall are 47,727,255 kWh, and net realized demand savings are 7,016 kW.

Table 11: PY2021 Commercial Comprehensive Net kWh Impact Summary

Sub-Program	# of Projects	Realized Gross kWh Savings	NTG Ratio	Realized Net kWh Savings
Retrofit Rebate	206	30,139,944	0.8605	25,935,422
New Construction	54	12,547,006	0.8605	10,796,699
Quick Saver	207	6,819,162	1.0000	6,819,162
Multifamily	54	3,729,007	0.8605	3,208,811
Building Tune-Up	20	851,852	0.8605	733,019
Midstream	12	255,505	0.8605	219,862
AC Tune Up	3	14,280	1.0000	14,280
Total	**556**	**54,356,756**	**0.8780**	**47,727,255**

Table 12: PY2021 Commercial Comprehensive Net kW Impact Summary

Sub-Program	# of Projects	Realized Gross kW Savings	NTG Ratio	Realized Net kW Savings
Retrofit Rebate	206	4,656	0.8605	4,006
New Construction	54	1,945	0.8605	1,674
Quick Saver	207	713	1.0000	713
Multifamily	54	697	0.8605	600
Building Tune-Up	20	14	0.8605	12
Midstream	12	13	0.8605	11
AC Tune Up	3		1.0000	
Total	**556**	**8,038**	**0.8729**	**7,016**

Table 13 shows how the Commercial Comprehensive NTG ratios will be updated for PY2022 based on the PY2021 evaluation results.

Table 13: NTG Ratio Updates for PY2022

Sub-Program	PY2021 NTG Ratio	PY2022 NTG Ratio
Retrofit Rebate	0.8605	0.8423
New Construction	0.8605	0.8423
Quick Saver	1.0000	1.0000
Multifamily	0.8605	0.8423
Building Tune-Up	0.8605	0.8423
Midstream	0.8605	0.8423
AC Tune Up	1.0000	1.0000

1.4 Commercial Comprehensive Cost Effectiveness

The evaluation team calculated cost effectiveness using the Utility Cost Test (UCT) for the Commercial Comprehensive program, with the test calculations based on those prescribed in the California Energy Efficiency Policy Manual.[6]

In the UCT, the benefits of a program are considered to be the present value of the net energy saved, and the costs are the present value of the program's administrative costs plus incentives paid to customers. To perform the cost effectiveness analysis, the evaluation team obtained the following from PNM:

- Avoided cost of energy for Energy Efficiency and Demand Response (costs per kWh over a 20+ year time horizon);
- Avoided cost of capacity for Energy Efficiency and Demand Response (estimated cost of adding a kW/year of generation, transmission, and distribution to the system);
- Avoided cost of CO2 (estimated monetary cost of CO2 per kWh generated);
- Avoided transmission and distribution costs;
- Discount rate;
- Line loss factor; and
- Program costs (all expenditures associated with program delivery).

For the Commercial Comprehensive program, the program-weighted average effective useful life values were provided by PNM, calculated by dividing lifetime savings by annual savings. The evaluation team performed a spot check of measure-specific effective useful life values to confirm reasonableness and alignment with the TRM when applicable. The final net energy savings values estimated from the PY2021 impact evaluation for Commercial Comprehensive were used in the final cost effectiveness calculations.

For the 2021 Commercial Comprehensive program, the UCT value was 0.81.

1.5 Quick Saver and Retrofit Rebate Participant Surveys

A respondent phone survey was fielded in late 2021 for participants in the Retrofit Rebate and Quick Saver sub-programs of the Commercial Comprehensive program.

Table 14 shows the distribution of completed surveys for the two sub-programs.

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[6] California Public Utilities Commission. 2013. *Energy Efficiency Policy Manual, Version 5*. http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf

Table 14: Commercial Comprehensive Phone Survey Sample

Sub-Program	Count of Customers with Valid Contact Info	Target # of Completes	Completed Surveys
Retrofit Rebate	115	40	38
Quick Saver	94	60	64
Total	**209**	**100**	**102**

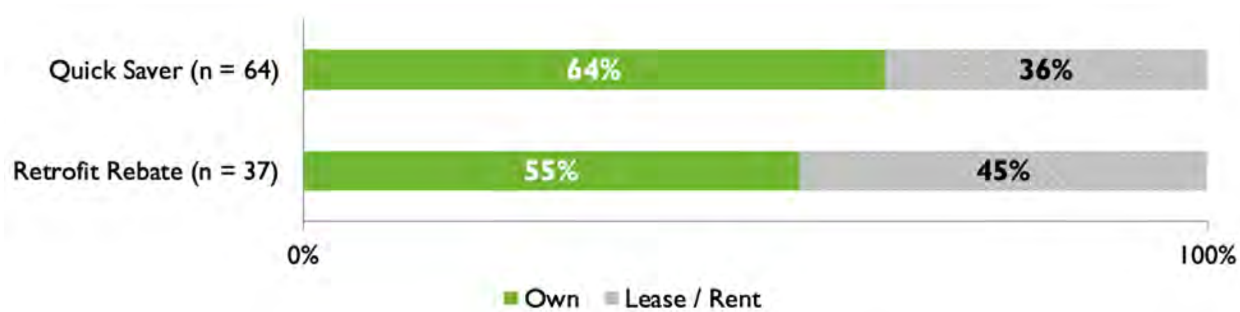
The following sections report results on company demographics, sources of program awareness, motivations for participation, and program satisfaction.

Throughout the analysis described here, we present the survey results as weighted percentages based on the proportion of savings represented by survey respondents relative to the total savings of all program respondents.

1.5.1 Company Demographics

We asked survey respondents whether their company owns or leases the building where the project was completed. Figure 2 shows that 64 percent of Quick Saver sub-program respondents and 55 percent of Retrofit Rebate sub-program respondents owned their building.

Figure 2: Quick Saver and Retrofit Rebate Respondent Own or Rent



The following two figures summarize the survey respondents' building and employee size by whether they participated in the Quick Saver or Retrofit Rebate sub-programs. Figure 3 and Figure 4 show that respondents participating in the Retrofit Rebate sub-program tended to be larger in both building size and number of employees than respondents participating in the Quick Saver sub-program. The vast majority (81%) of Retrofit Rebate respondent buildings were larger than 100,000 square feet, and 34 percent of them had more than 500 full-time employees.

Comparatively, respondents participating in the Quick Saver program were more likely to be small- to mid-sized customers, with the majority of respondent firms (65%) occupying buildings of less than 50,000 square feet. In addition, 86 percent of Quick Saver respondents reported having less than 100 full-time employees.

Figure 3: Quick Saver and Retrofit Rebate Respondent Building Size

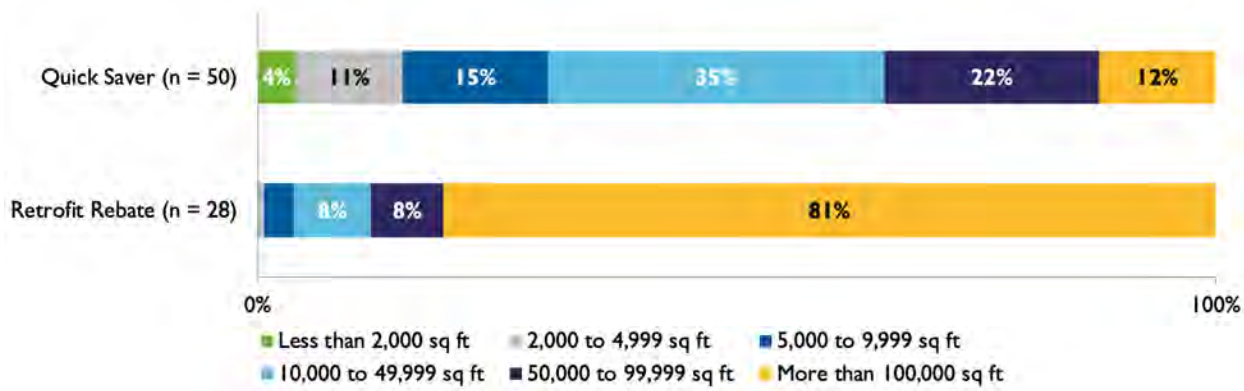


Figure 4: Quick Saver and Retrofit Rebate Respondent Number of Employees

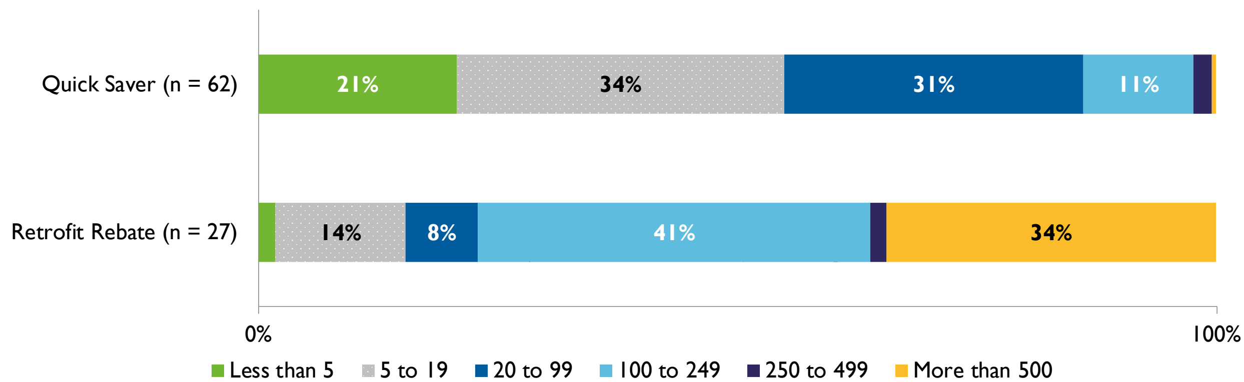
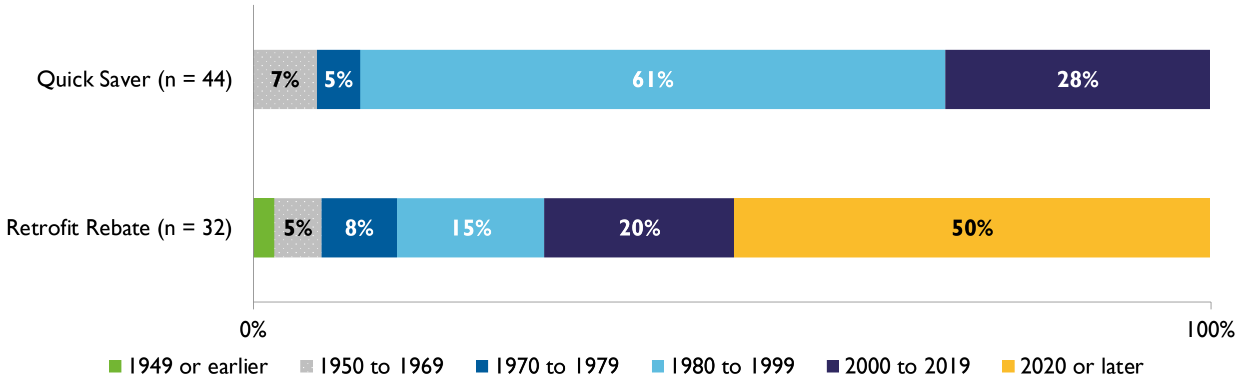


Figure 5 shows that the respondent buildings of the Retrofit Rebate sub-program were newer than those of the Quick Saver sub-program. The majority of the Retrofit Rebate sub-program respondent buildings (50%) were built in 2020 or later, while the majority of the Quick Saver sub-program respondent buildings (61%) were built between 1980 and 1999.

Figure 5: Quick Saver and Retrofit Rebate Respondent Building Age

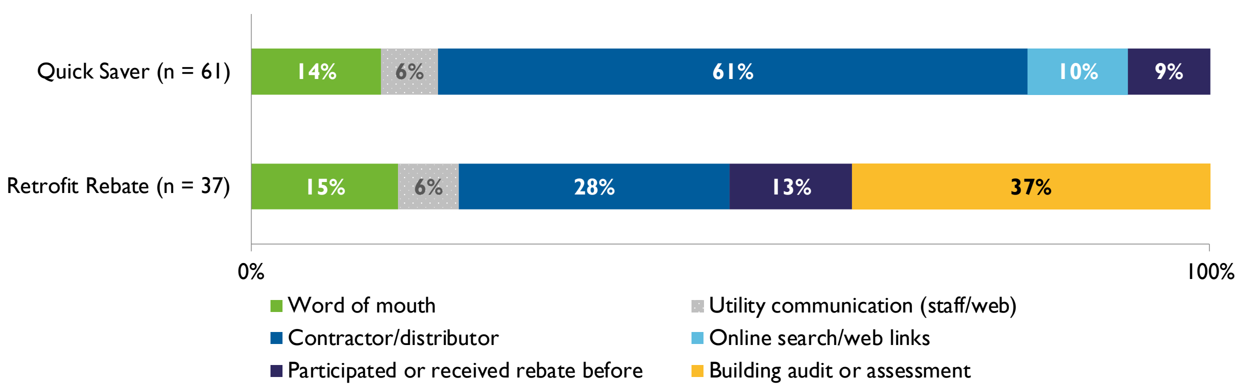


1.5.2 Sources of Awareness

Both Quick Saver and Retrofit Rebate sub-program respondents became aware of the program rebates/assistance through a variety of ways including but not limited to contractors/distributors, online web searches, and previous participation in a PNM rebate program.

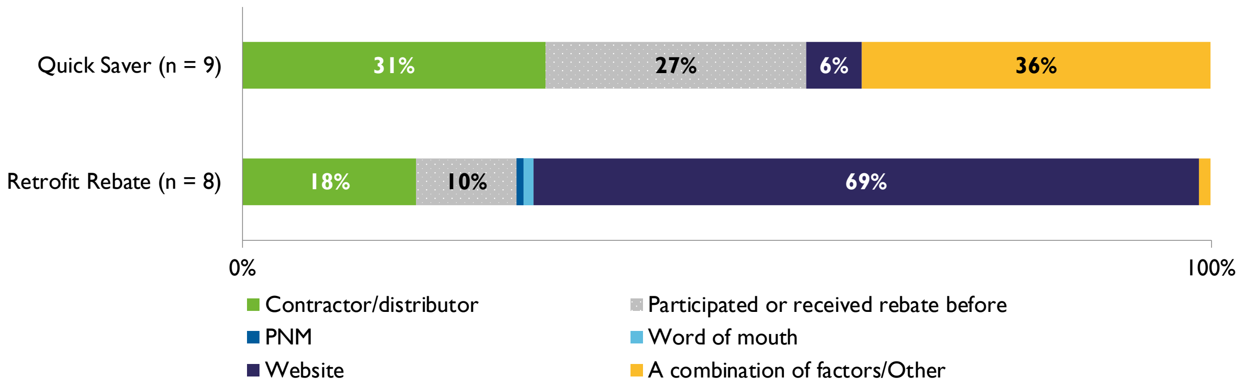
As shown in Figure 6, the majority of Quick Saver sub-program respondents first heard of the program through contractors or distributors (61%) while the majority of Retrofit Rebate sub-program respondents first heard of the program through a building audit or assessment (37%).

Figure 6: Initial Source of Awareness



Respondents were also asked which source was the most useful in helping them to decide whether to participate in the program. Quick Saver sub-program respondents found a combination of factors/other factors most helpful (36%), and Retrofit Rebate sub-program respondents found the website to be the most helpful source (69%).

Figure 7: Most Useful Source of Awareness

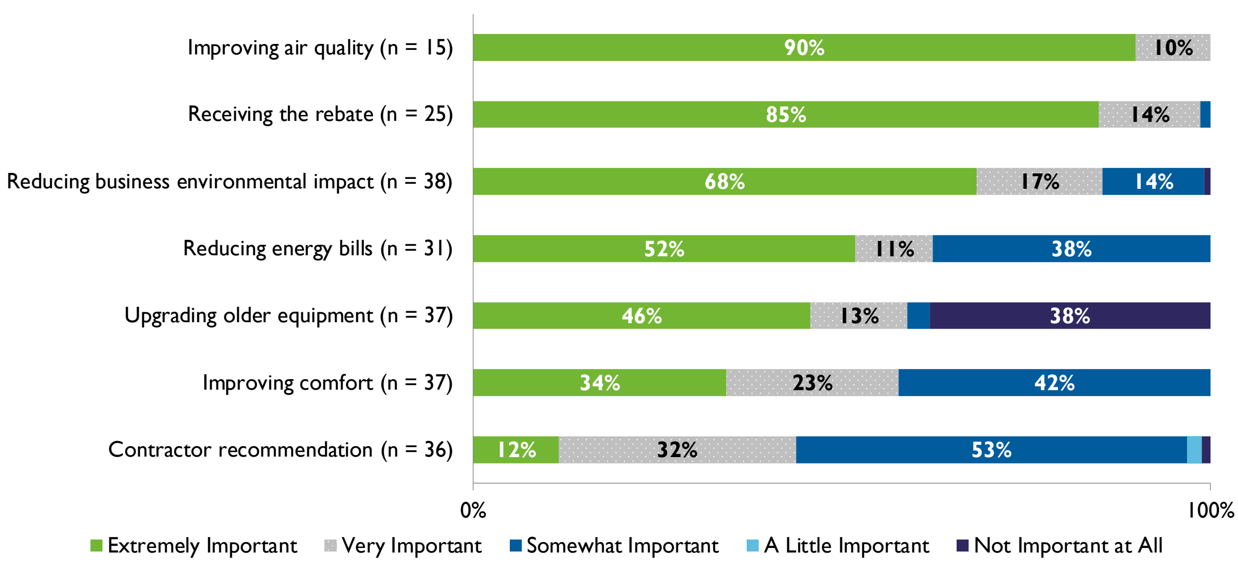


1.5.3 Motivations for Participation

Figure 8 and Figure 9 show the level of importance placed on a variety of factors that might be influencing participation.

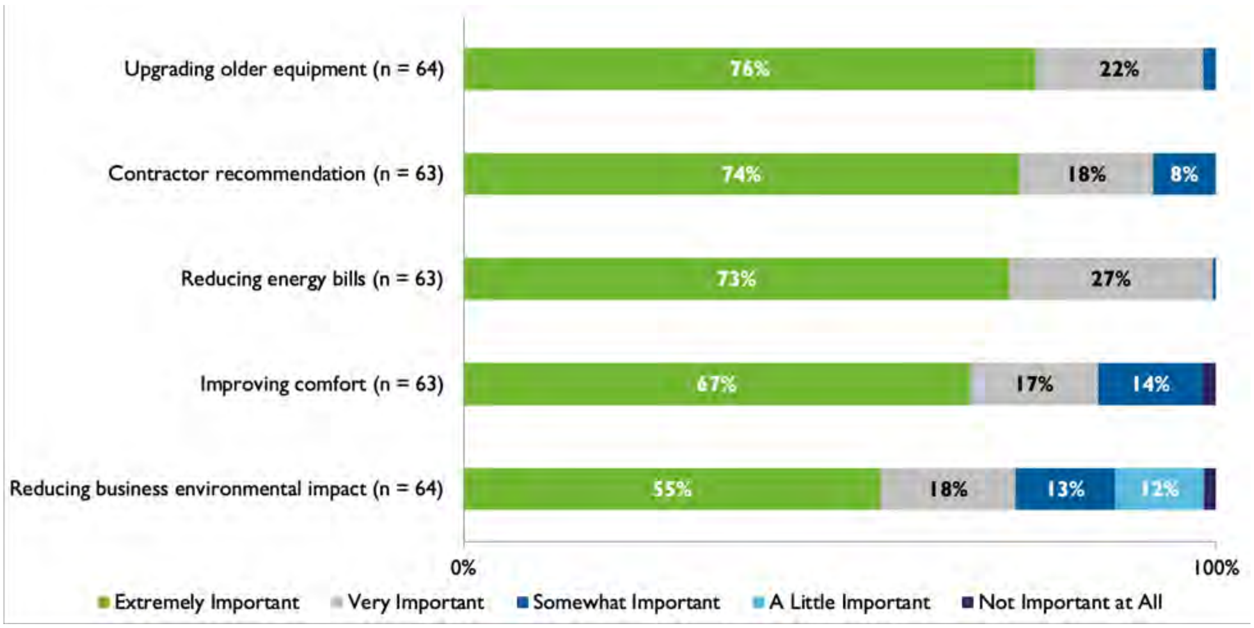
For Retrofit Rebate customers, improving air quality was the most influential factor, with 90 percent of individuals indicating it was extremely important in their decision to participate. Other motivating factors were receiving the rebate (85%) and reducing business environmental impacts (68%).

Figure 8: Retrofit Rebate Motivations for Participation (n=38)



Quick Saver sub-program respondents reported that upgrading older equipment and contractor recommendations were the most important for determining participation in the program, with 76 percent and 74 percent of respondents respectively choosing the factors as extremely important.

Figure 9: Quick Saver Motivations for Participation (n=64)



In addition to motivations for purchasing, Retrofit Rebate sub-program respondents were given a list of potential program and non-program factors that may have influenced their decision about how energy efficient their equipment would be. They were then asked to rate each factor's importance on a 1 to 10-point scale.[7] As shown in Figure 10, previous participation in a PNM program and the dollar amount of the rebate were the highest-rated program factors.

[7] On the 0- to 10-point scale, 0 indicated "not at all important" and 10 indicated "extremely important".

Figure 10: Retrofit Rebate Importance of Program Factors (n=38)

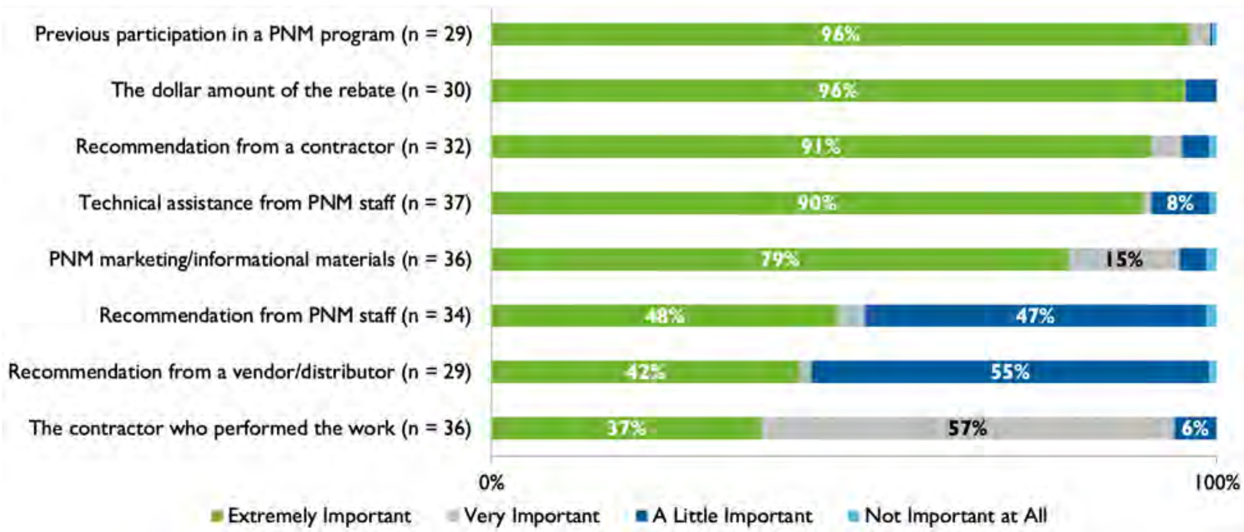
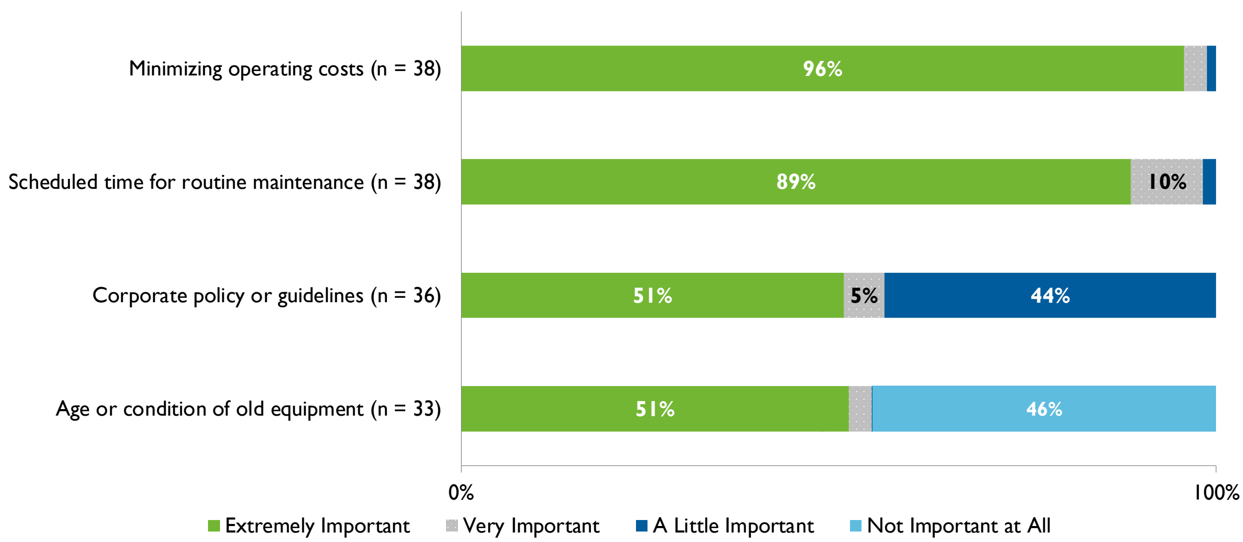


Figure 11 shows that the majority of Retrofit Rebate respondents rated minimizing operating cost and scheduled time for routine maintenance as the most influential non-program factor in the decision regarding efficiency level of the equipment with 96 percent and 89 percent of respondents reporting it as extremely important, respectively. The age or condition of old equipment was reported as the least influential non-program factor, with 46 percent of respondents reporting that it was not important at all.

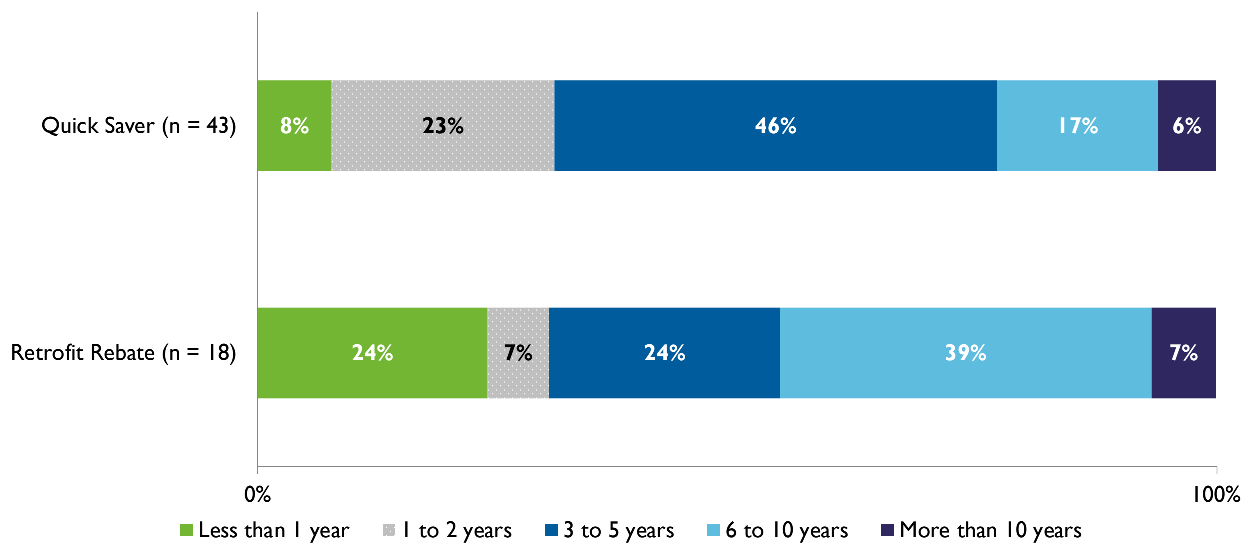
Figure 11: Retrofit Rebate Importance of Non-Program Factors (n=38)



Respondents were asked approximately how much longer their equipment would have lasted if it had not been replaced.

Figure 12 shows that the majority of respondents reported that their equipment would last at least three more years without needing replacement (69 percent for Quick Saver respondents and 70 percent of Retrofit Rebate respondents). This suggests that the program is doing a good job at targeting customers with functioning equipment, rather than those whose equipment is not working and would need to be replaced anyway (i.e., potential free riders).

Figure 12: Remaining Life of Equipment



1.5.4 Respondent Satisfaction

The respondents evaluated their satisfaction with various components of the Quick Saver and Retrofit Rebate sub-programs on the following scale: very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, and very dissatisfied. The individual components that respondents were asked to rank their satisfaction with included:

- PNM as an energy provider
- The rebate program overall
- The equipment installed through the program
- The contractor who installed the equipment
- Overall quality of the equipment installation
- The time it took to receive the rebate
- The dollar amount of the rebate
- Interactions with PNM

- The overall value of the equipment for the price they paid
- The time and effort required to participate
- The project application process

As seen in Figure 13 and

Figure 14, respondents from both the Retrofit Rebate sub-program and Quick Saver sub-program expressed high levels of satisfaction with over 90 percent of respondents from both sub-programs reporting that they were very satisfied with each factor.

Retrofit Rebate respondents reported being most satisfied with the overall quality of the installation (100% reported being very satisfied) while Quick Saver respondents were most satisfied with interactions with PNM (98% reported being very satisfied).

Figure 13: Retrofit Rebate Sub-Program Satisfaction (n=38)

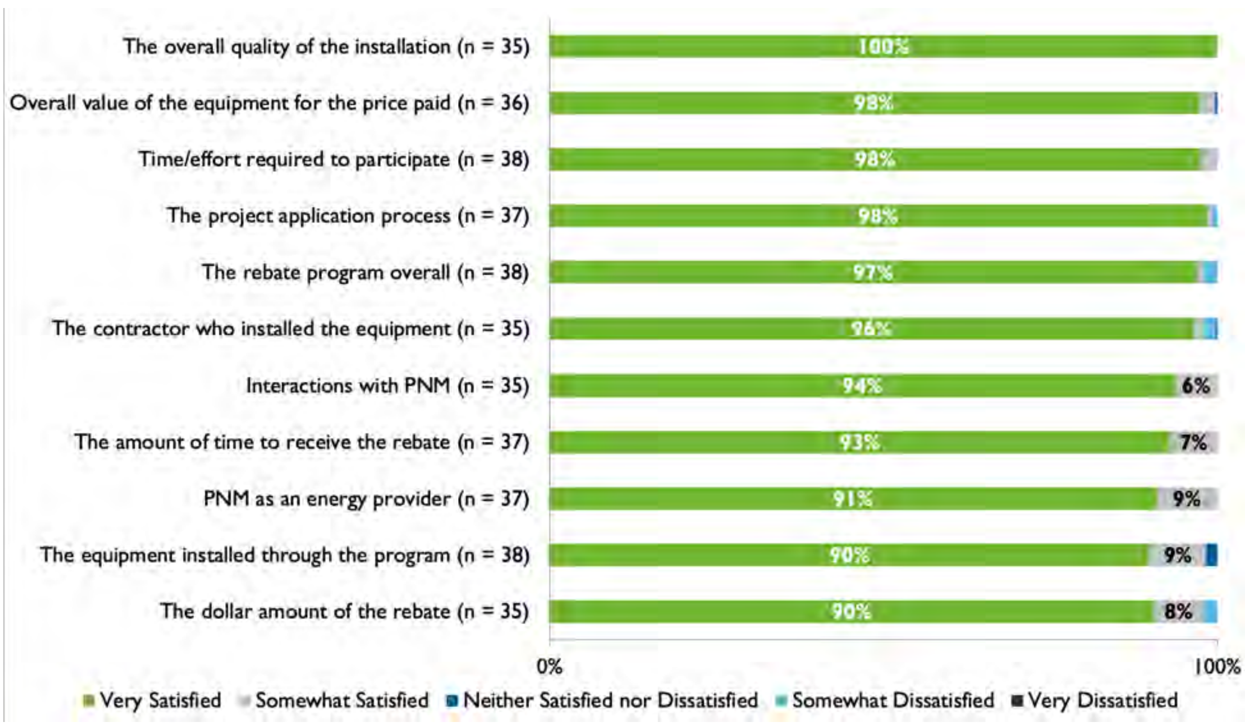
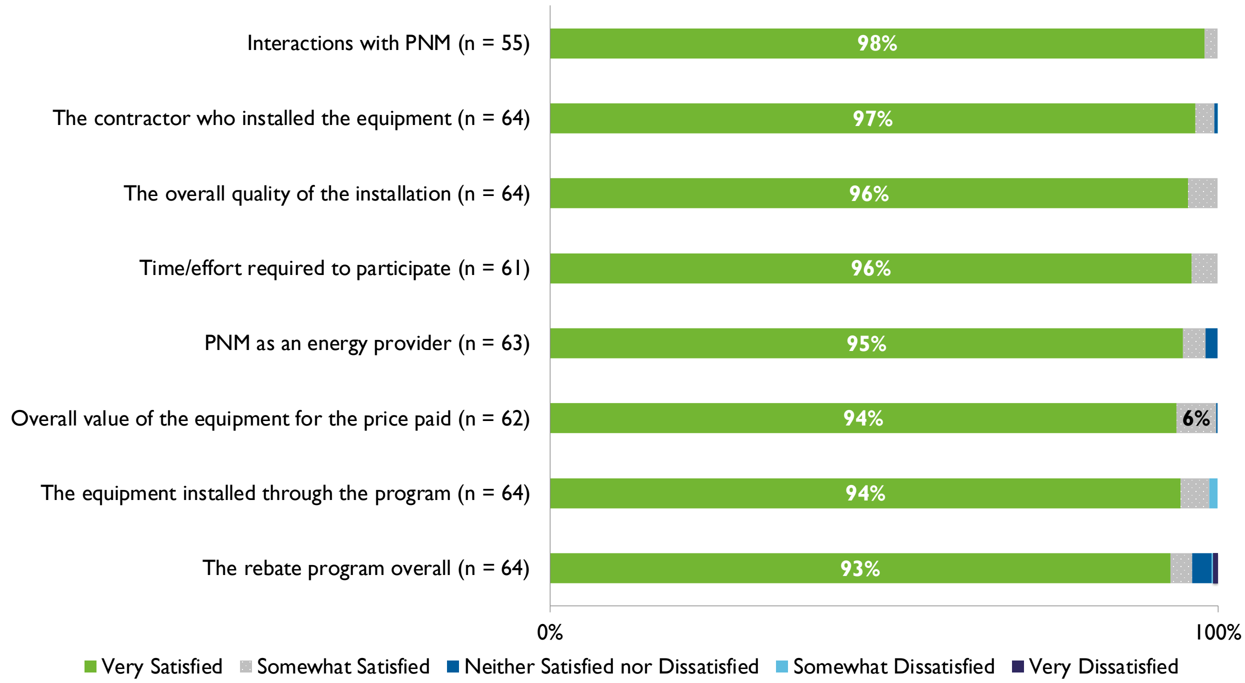


Figure 14: Quick Saver Sub-Program Satisfaction (n=64)



Overall respondent satisfaction for both the Retrofit Rebate and Quick Saver sub-programs is higher in PY2021 than it was in PY2020. While 89 percent of Retrofit Rebate sub-program respondents reported being very satisfied in PY2020 across all factors, in PY2021, the average percent of those who reported being very satisfied across all factors was 95 percent. Notably, in PY2020, 79 percent of Retrofit Rebate sub-program respondents reported that they were very satisfied with the amount of time it took for them to receive the rebate, while in PY2021, 93 percent of respondents reported being very satisfied with this factor.

Greater proportions of Quick Saver sub-program respondents reported being very satisfied for all eight factors in PY2021 than in PY2020. An average of 87 percent of Quick Saver respondents in PY2020 reported being very satisfied across all factors, and in PY2021, the average percent of very satisfied respondents across all factors was 95 percent. In PY2020, 75 percent of Quick Saver sub-program respondents reported being very satisfied with PNM as an energy provider, whereas in PY2021, 95 percent of respondents reported being very satisfied with the factor.

1.6 Commercial Comprehensive Contractor Interviews

The evaluation team completed three interviews with contractors who participated in the Commercial Comprehensive program in PY2021. The interviews lasted between 25 minutes to 1 hour. The following topics were discussed:

- Contractor background and program involvement;

- Program satisfaction; and
- Role and influence of the PNM program in the market.

Due to the low number of interviews and the depth of discussion, this section presents results in a qualitative fashion to show the range of perceptions and responses.

1.6.1 Contractor Background and Program Involvement

The interviewed participants varied regarding the scope of their work and geographic reach of their businesses. Respondents included contractors from small, self-started companies with wide-ranging services in both residential and commercial sectors. They specialize in a range of work such as automotive to lighting. Most contractors reported to work on a local or state level.

Most contractors already had an understanding and awareness of utility energy efficiency programs prior to the 2021 program year. Respondents reported that they received information on rebates through family or colleagues, or directly from PNM. One respondent reported that a PNM representative had directly come and talked to them about rebate opportunities.

The contractors' overall knowledge of the lighting rebate process across respondents suggests that PNM has done a successful job of making rebate information readily available to contractors.

1.6.2 Program Satisfaction

Contractors tended to rate the Commercial Comprehensive program relatively highly, although some did identify room for improvement. Interviewed contractors rated the program a 5 (three responses) on a 5-point scale.[8]

Regardless of the ranking they provided, contractors did identify areas of potential improvement or ideas they wish PNM would consider. These included:

- ***Reducing wait time for contractor compensation*** — One contractor expressed, despite their overwhelming satisfaction with the program, that if contractors could wait less time for payment, it might "streamline" processes.
- ***Increasing contractor accountability*** — One contractor expressed that some contractors should be held to a higher standard by PNM on the quality of their project work. They suggested that after a contractor does an install, PNM program managers should follow up on the quality of the work and the equipment used and advocate for the customer if the install does not meet customer expectations. They also suggested a scenario where

[8] The evaluation team asked contractors to rate the Commercial Comprehensive program overall on a 5-point scale that ranged from 1 ('very dissatisfied') to 5 ('very satisfied'). A 3 was defined as 'neither satisfied nor dissatisfied', while a 4 indicated the contractor was 'somewhat satisfied'.

customers could critique and review contractors to 'weed out' the contractors that are not performing at a high standard.

1.6.3 PNM Program Reach

While contractors reported that most customers who propose an energy efficiency project end up qualifying for a rebate, there were certain customer segments that are not reached as well to begin with, thereby stifling the opportunity for rebates in general. One contractor cited that property managers could be reached more effectively which, in turn, would benefit their residents and bring them cost savings. Another contractor expressed slower adoption among business owners who are focused on keeping their business open rather than looking for new solutions; educating these customers, they said, is not necessarily PNM's responsibility. A different contractor raised the point that while small businesses are taking advantage of the program, larger companies are not being reached as readily. They suggested that PNM conduct more outreach to larger companies; bigger companies may not even turn their lights off, which can quickly add up in costs. Conversely, there are customers who are impacted quite positively by the program, such as charter schools, whose budgets are freed up for school-related costs once their return on investment is realized from an energy efficient installation.

1.6.4 PNM Program Influence

To better understand the program influence on the market, the evaluation team explored how and when contractors communicate about the PNM rebates with customers and what role they play in the contractors' and customers' ultimate choices. The responses suggested that both contractors and informational materials provided by PNM were the main channels of information for customers. The responses also reflected that the rebates greatly influenced customer decision making, especially for customers who perceive cost as a large barrier to upgrading their equipment.

All three contractors identified themselves as the ones who inform customers of the efficiency opportunities either when they approach customers about upgrading their equipment or are approached by a customer who wants a contract. One contractor noted that the pamphlets and brochures are very effective because they give the customer a sense of security that they are dealing with a larger entity than the contractor themselves. Without PNM assistance and backing, this contractor believes people would not be interested in energy efficiency equipment. The incentives, coupled with the credibility of PNM, build interest and trust.

All contractors reported that the rebates influenced their customers' decision making in terms of undergoing projects, as well as positively influencing their respective businesses. One contractor reported that the rebates set up a "win-win-win" situation for everyone involved, thereby increasing customer satisfaction, and ensuring his own livelihood. Another contractor reported that the incentives outside of PNM's service territory are not as attractive and therefore, customers in these areas are less likely to install efficiency measures as those within PNM's service territory.

1.7 Conclusions and Recommendations

Impact evaluation activities for the Commercial Comprehensive program included engineering desk reviews for a sample of the Retrofit Rebate, Multifamily, New Construction, Direct Install (Quick Saver), Building Tune-Up, Midstream, and AC Tune-Up sub-programs. Based on these desk reviews, an engineering adjustment factor of 1.0123 was found for kWh savings, and 0.7163 was found for kW savings. Conclusions and recommendations resulting from these reviews are discussed below:

- Project-specific *ex ante* calculation steps for prescriptive projects were not always documented in the files available for the evaluation team's review.
  - Using inputs from the provided project documents and algorithms from the 2021 PNM Workpapers and the New Mexico TRM resulted in savings different (both higher and lower) than those reported by PNM for multiple projects.
  - Without additional documentation of the project-specific calculations performed by PNM, the reasons for differences between *ex ante* and *ex post* savings were not always clear to the evaluation team.
  - **Recommendation:** Provide documentation of calculation steps made for each project, ensuring that submitted project documentation can be followed to reproduce the reported savings estimates.
- The implementation team confirmed the *ex ante* energy and peak demand savings for the ENERGY STAR Glass/Solid Door Reach-In Freezer/Refrigerator measures were calculated using the algorithms and input parameters from the 2020 PNM workpapers.
  - The peak demand savings algorithm for the ENERGY STAR Glass/Solid Door Reach-In Freezer/Refrigerator measure in the 2020 PNM workpapers contains an error. The error was corrected in the 2021 version of the PNM workpapers. Therefore, the evaluation team used the 2021 PNM workpapers to calculate the peak demand savings, which resulted in lower savings than the savings reported by PNM.
- The supplied information for the Midstream sub-program did not include any application files, *ex ante* savings calculations, or other documentation. All the program data were supplied in an Excel workbook.
  - All Midstream projects were included in a single Excel workbook summary table, where each row represents a different measure. The summary table shows only values (no formulas) for a limited number of parameters related to the facility location, installed equipment, and energy savings.
  - **Recommendation**: Provide copies of invoices, savings calculations (or an explanation of how the savings values in the Excel summary table are generated),

and any other documentation related to equipment involved in the measures for the evaluation teams' review.

- The evaluation team was not able to replicate the *ex ante* HVAC savings for several projects throughout the evaluated sub-programs using the supplied project documentation and PNM workpapers.
  - Using assumptions, algorithms, baseline values provided in the PNM Workpaper and AHRI documentation on installed HVAC units, the evaluation team calculated *ex post* HVAC savings, which were different (both higher and lower) than those reported by PNM.
  - The evaluation team was not able to identify the discrepancy in the *ex ante* and *ex post* savings without additional documentation of the project-specific calculations performed by PNM.
  - **Recommendation:** Provide algorithm inputs that PNM used to calculate the *ex ante* savings for the HVAC projects throughout the sub-programs.
- The evaluation team adjusted the lighting hours of use for multiple Direct Install (Quick Saver) projects to align with either the customer reported hours or the listed building type when customer-reported hours were not available.
  - It is not clear what hours PNM used to calculate the savings for some of the lighting projects in the Direct Install (Quick Saver) sub-program. The project documentation includes customer-reported operating hours.
  - **Recommendation:** Utilize customer-reported operating hours to ensure the operation of the lights is accurately captured, provided they are appropriate for the building type when cross-checked with the PNM Workpaper.
- The evaluation team found Direct Install (Quick Saver) projects that claimed peak demand savings for light fixtures that operate on a dusk-to-dawn schedule. As these fixtures are not on during the afternoon peak demand period, the evaluation team set the demand savings for these fixtures as zero.
  - **Recommendation:** Zero out peak demand savings for light fixtures that operate on a dusk-to-dawn schedule.
- The evaluation team was not able to replicate the *ex ante* savings for the projects in the evaluation sample for the New Construction sub-program.
  - The evaluation team used hours of operation, HVAC interactive factors and coincidence factors as listed in the PNM Workpaper. The *ex ante* savings calculation and application did not provide information regarding hours of operation, HVAC interactive factors, and coincidence factors.
  - **Recommendation:** Provide an Interior/Exterior Lighting COMcheck Certificate for all New Construction lighting projects.
- The evaluation team reduced the *ex ante* peak demand savings for one Building Tune-Up project based on the outputs of the eQUEST model.

- It appears there may have been a cell reference error when calculating the *ex ante* peak demand savings. While the baseline peak demand value had the correct cell reference in the eQUEST outputs, the post-installation peak demand value was referenced from the "RRHS 01-29-21 IMPLEMENTED ECMs - Baseline Design" output value instead of the "RRHS 01-29-21 IMPLEMENTED ECMs – 10" output value.
- **Recommendation:** Ensure demand values from building model "Case Descriptions" are consistently referenced.

2 Easy Savings Kit Program/Low Income Household Survey

PNM's Easy Savings Kit (Energy Savings) program provides LED light bulbs, an LED nightlight, an efficient showerhead, a kitchen and bathroom sink aerator, and a shower timer. PNM provides an Easy Savings kit to its customers (particularly low-income households) that request one; in 2021, 5,541 kits were delivered.

The evaluation of the Easy Savings program included both an impact evaluation and a general population survey of low-income households, each of which is discussed below.

2.1 Easy Savings Gross and Net Impacts

The impact evaluation consisted of a deemed savings review for the measures included in the Easy Savings kits. Based on the measures provided in the kits, the evaluation team used the New Mexico TRM to calculate the total deemed savings for each kit. Based on this review, no changes to the *ex ante* savings values are recommended as they are already taken from the New Mexico TRM. Given the nature of how the Easy Savings kits are distributed and the focus on low-income households, an NTG ratio of 1.0 is stipulated for this program for calculating net impacts.

Taking these adjustments into account, the final gross and net realized savings for both kWh and kW are shown below in Table 15.

Table 15: Easy Savings Gross and Net Impact Summary

Easy Savings	Number of Projects	Expected Gross Savings	Engineering Adjustment Factor	Realized Gross Savings	NTG Ratio	Realized Net Savings
kWh Savings	5,541	1,888,070	1.000	1,888,070	1.000	1,888,070
kW Savings	5,541	197	1.000	197	1.000	197

The UCT was also calculated for the Easy Savings program using the 2021 program costs combined with the lifetime benefits based on the 2021 net kWh savings. Based on these factors, we calculated a UCT value of 1.67 for the 2021 Easy Savings program.

2.2 General Population Low-Income Web Survey

A general population low-income web survey was fielded in February of 2022 for residents in PNM's New Mexico territory. The objective of this survey was to characterize low-income households and collect information on attitudes and barriers toward energy efficiency that PNM can use to help design programs to better serve this market.

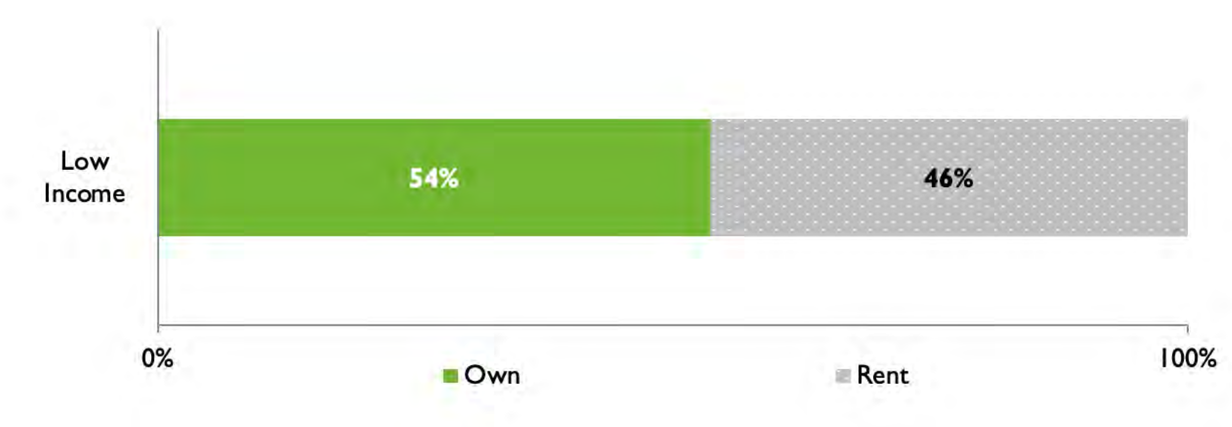
The target number of survey completes was 100, and a total of 141 individuals ultimately responded to the survey, although not all households responded to every survey question.

The key survey results are summarized below, and a copy of the online survey instrument is included in Appendix B.

2.2.1 Low-Income Household Characteristics

We asked respondents whether they owned or rented their home. As shown in Figure 15, 54 percent of respondents reported that they own their home, compared to 46 percent who rent.

Figure 15: Low-Income Respondent Own or Rent (n=138)



Respondents were also asked what type of building they lived in. As seen in Figure 16, the majority of survey respondents (70%) reside in single-family homes. Of the 30 percent who reside in apartments, the largest portion live in multifamily buildings with 40 or more units.

Figure 16: Low Income Respondent Building Type (n=138)

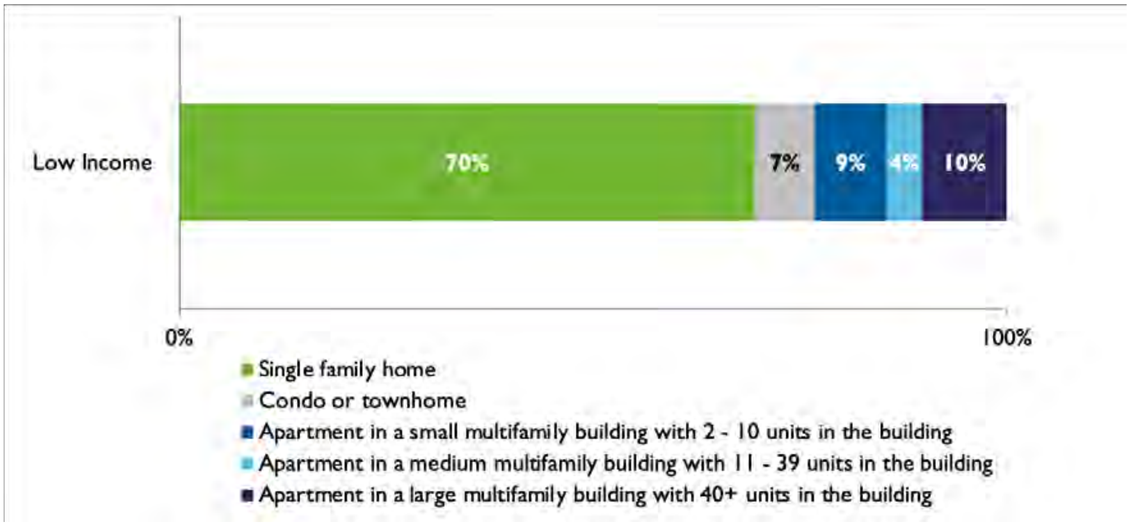
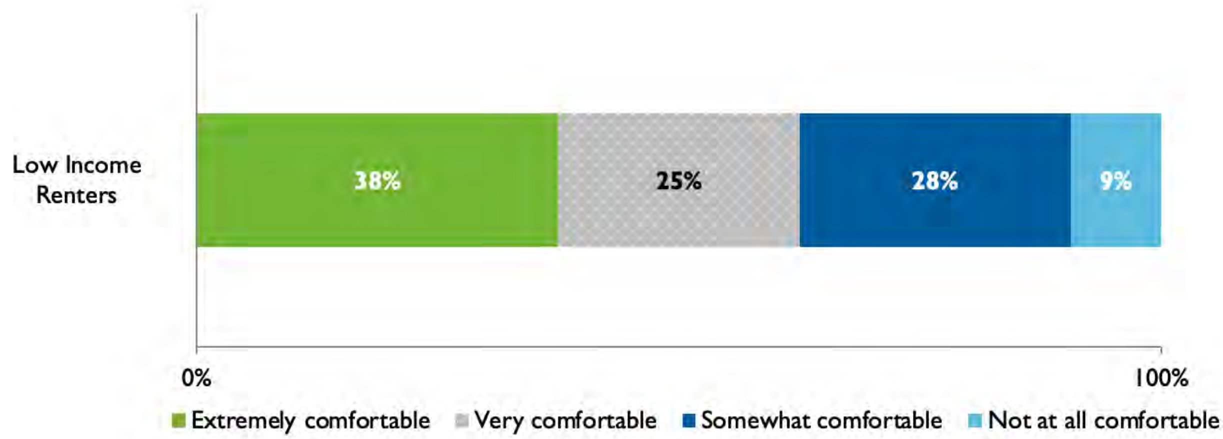


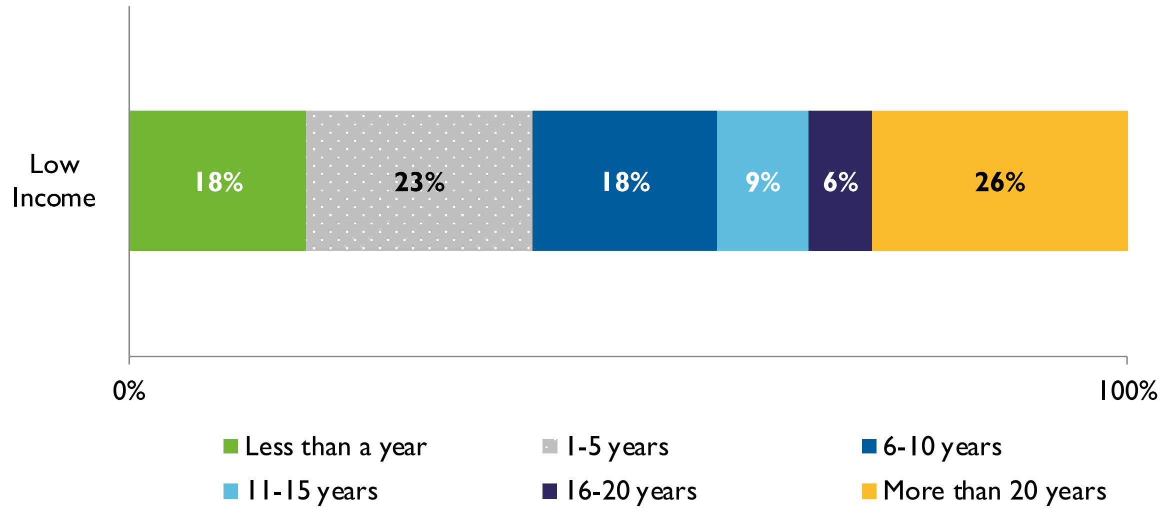
Figure 17 shows how comfortable low-income renters reported feeling about approaching their landlord regarding a poorly functioning appliance. The majority of respondents, 63 percent, reported feeling extremely or very comfortable approaching their landlord. Nine percent reported not feeling comfortable at all.

Figure 17: Low Income Renters' Level of Comfort Talking to Landlord About a Poorly Functioning Appliance (n=64)



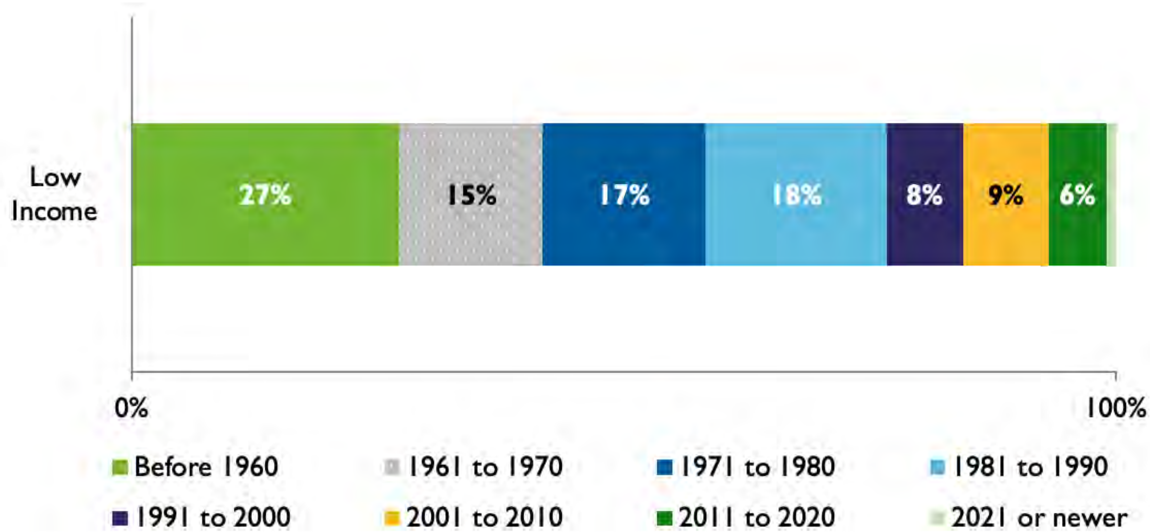
As shown in Figure 18, 26 percent of survey respondents reported living at their current residence for over 20 years (26%).

Figure 18: Low Income Respondent Length of Time at Current Residence (n=141)



The majority of low-income survey respondents live in older buildings, with 59 percent residing in buildings built before 1980 (Figure 19).

Figure 19: Low Income Respondent Building Age (n=103)

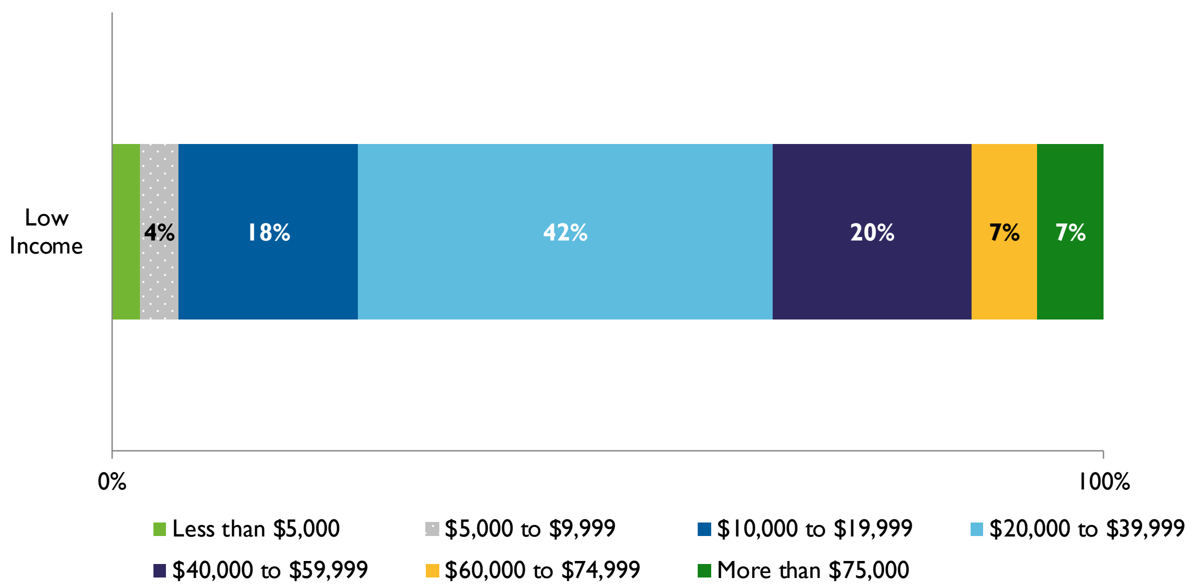


Low-income respondents most often reported residing in homes smaller than 1,500 square feet (66%) (Figure 20).

Figure 20: Low Income Respondent Square Footage of Residence (n=109)

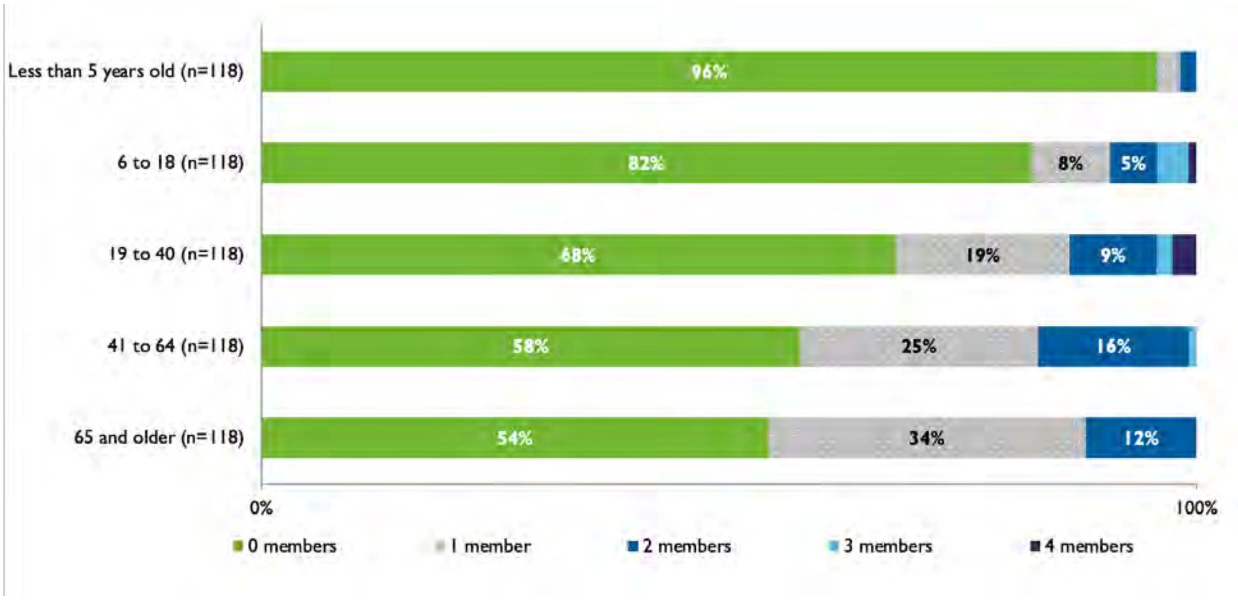
Figure 21 displays the distribution of reported annual household income for the survey respondents. The largest portion of survey respondents (42%) reported that their annual household income was between $20,000 and $39,999.

Figure 21: Low Income Respondent Annual Household Income (n=105)



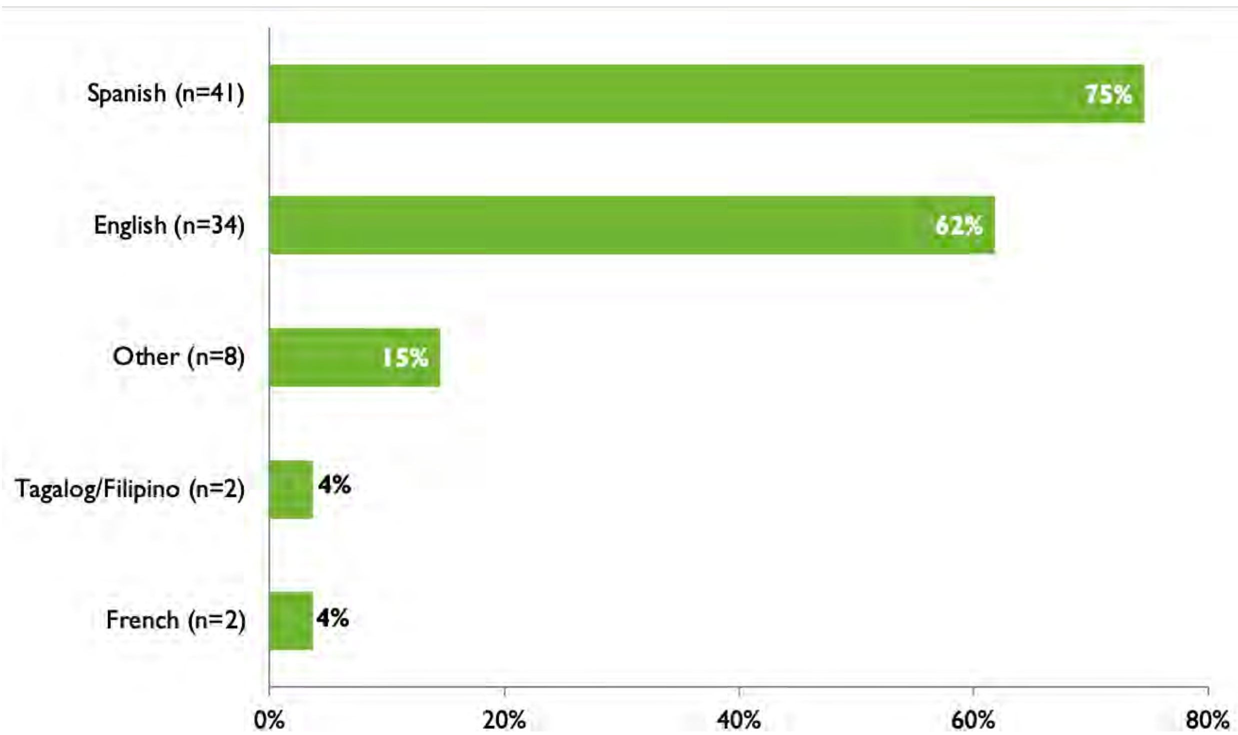
As shown in Figure 22, households of survey respondents include more members of older ages. The average household size for survey respondents is 2.08 household members.

Figure 22: Low Income Respondent Household Member Ages (n=118)



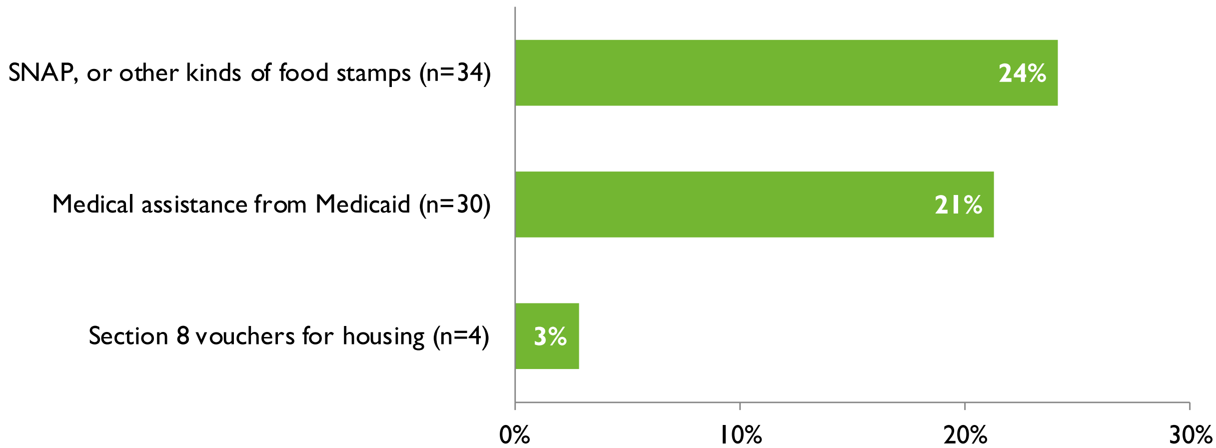
Thirty-nine percent of survey respondents reported that someone in their household spoke a language other than English. Of this 39 percent, Spanish was the most reported language spoken in the respondent households (75%) (Figure 23).

Figure 23: Languages Spoken in Household (n=55)



Survey respondents were asked whether they were enrolled in various forms of government assistance. As shown in Figure 24, around the same percentage of respondents were enrolled in SNAP or other kinds of benefits as were enrolled in Medicaid (24% and 21%, respectively). Very few respondents were enrolled in Section 8 vouchers for housing.

Figure 24: Enrollment in Government Assistance (n=114)

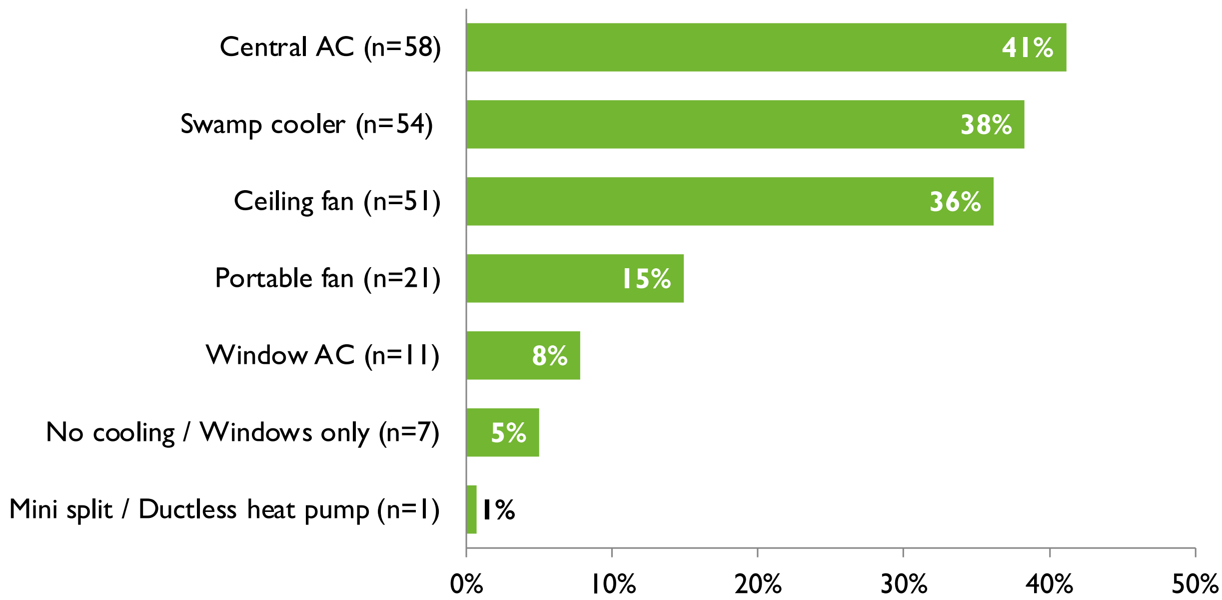


2.2.2 Appliances

Low-income respondents were asked about what types of heating and cooling appliances were in their home, as well as the age of other large appliances.

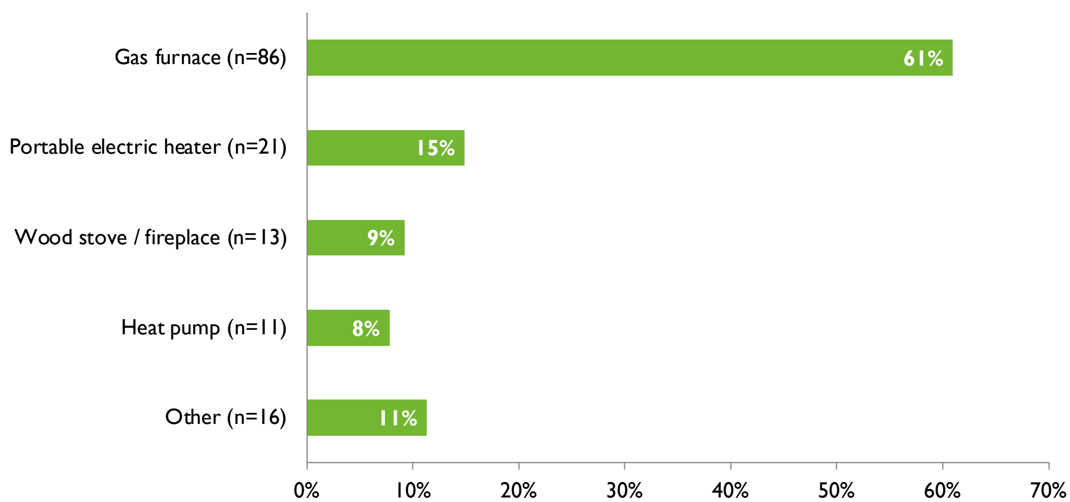
As shown in Figure 25, the most common cooling appliances for low-income respondents were central ACs, swamp coolers, and ceiling fans.

Figure 25: Low Income Respondent Cooling Appliances (n = 141)



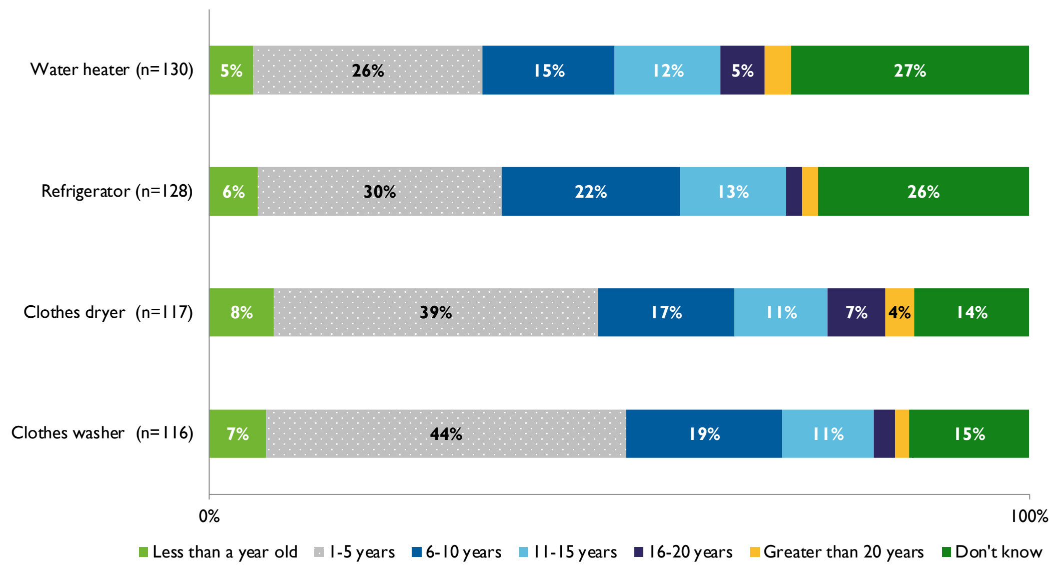
The most common heating appliance reported by survey respondents were gas furnaces. Less common appliances included portable electric heaters and other heating appliances. Contained in the "Other" category are various central systems and additional unique heating appliances (Figure 26).

Figure 26: Low Income Respondent Heating Appliances (n=141)



Survey respondents were then asked about the age of various large appliances. Figure 27 shows the age distribution of water heaters, refrigerators, clothes dryers, and clothes washers. Respondents reported that their clothes washers and clothes dryers tended to be newer appliances, with 51 percent of clothes washers and 47 percent of clothes dryers less than five years old. This could be due, in part, to respondents replacing these appliances together.

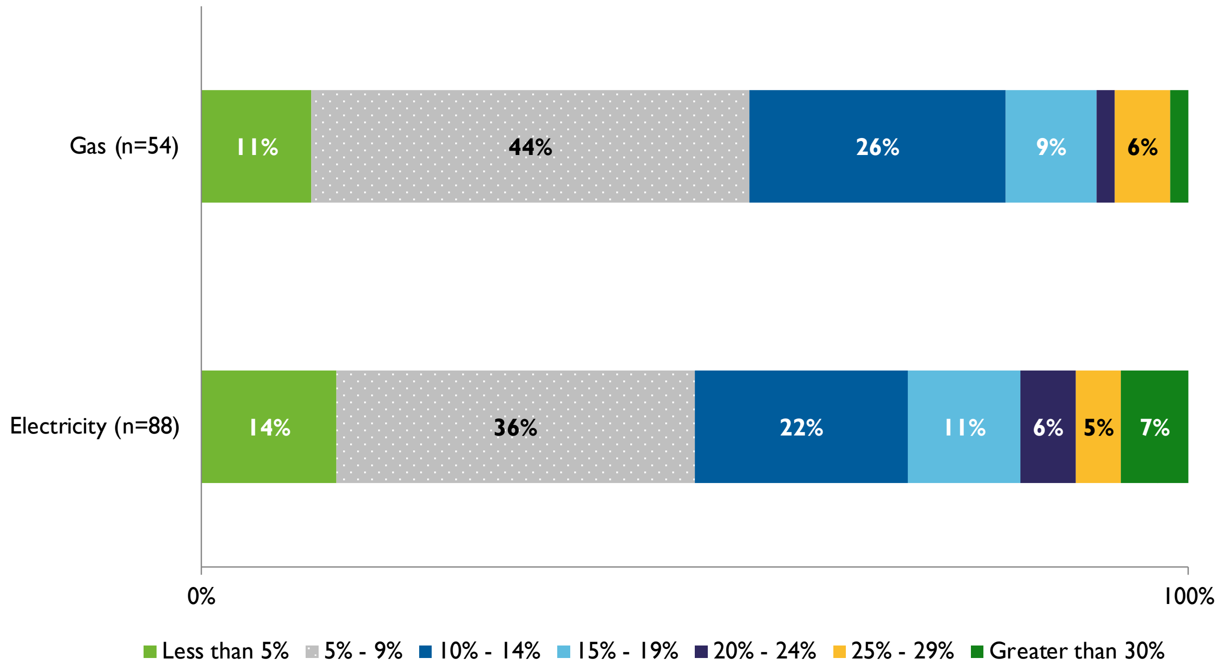
Figure 27: Age of Large Appliances



2.2.3 Utility Bills

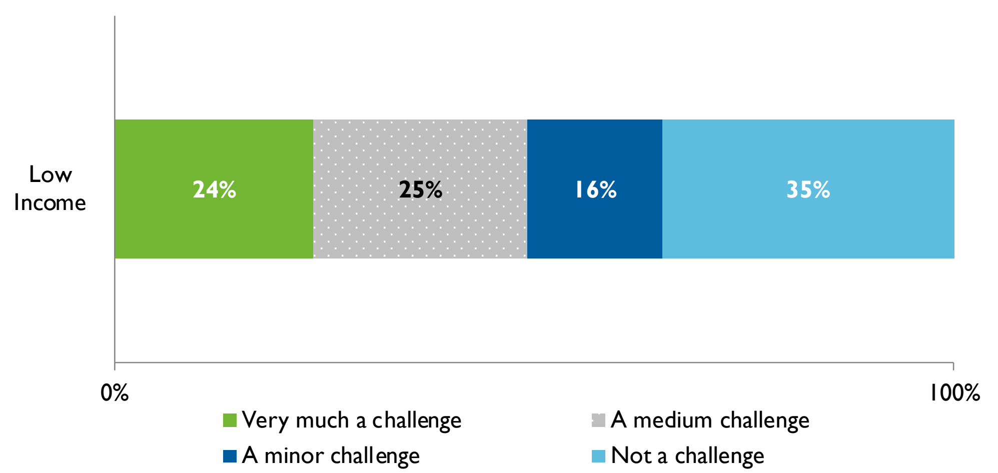
Survey respondents were then asked about their rent, electric bills, and gas bills, and we calculated the percent of monthly rent or mortgage that respondents spent on utility bills based on these responses. Excluded from this chart are respondents who did not know their monthly utility bills and those whose gas and electric bills are included in their rent (19% for electricity bills and 11% for gas bills). Only respondents who reported owning a gas furnace were asked about their monthly gas bill. The results are shown in Figure 28.

Figure 28: Percent of Monthly Rent or Mortgage Spent on Utilities



As shown in Figure 29, a near equal percent of respondents reported that paying their utility bills was very much a challenge or a medium challenge (49%) to those who reported that it was a minor challenge or not a challenge at all (51%). This could be due to the range of utility bill amounts and incomes.

Figure 29: Low-Income Renters Self-Reported Level of Challenge Paying Electric and Gas Bills

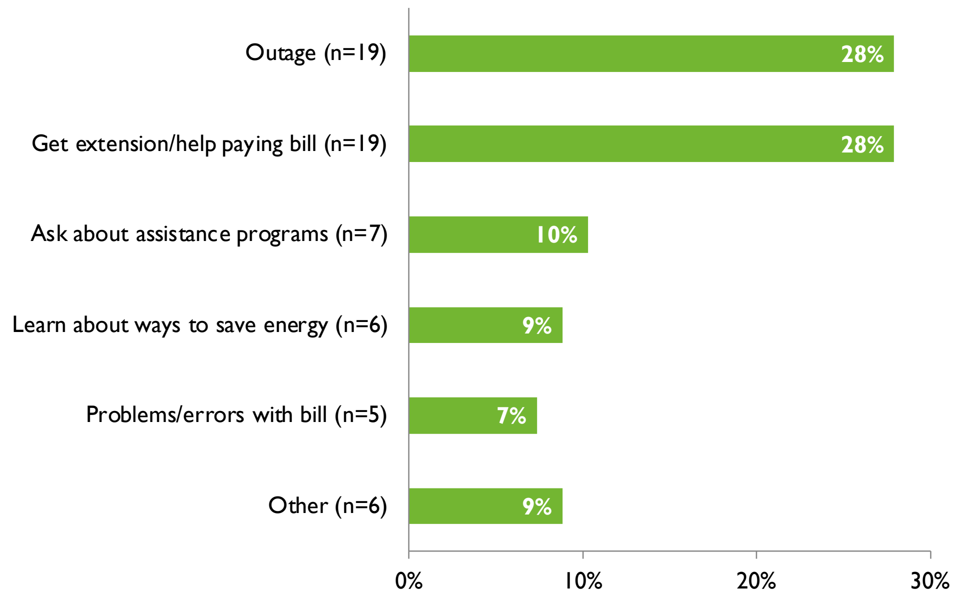


2.2.4 Interaction With PNM

Survey respondents were asked how they have interacted with PNM in the past, as well as their likelihood to participate in a PNM-sponsored program.

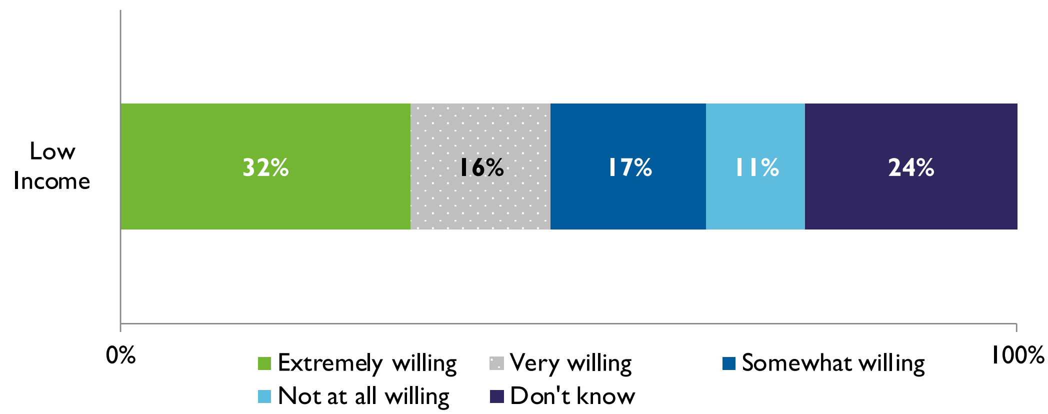
Fifty-two percent of survey respondents reported that they have not contacted PNM in the past 12 months. As shown in Figure 30, of those who did contact PNM, the most often reported reason was to report an outage and to get an extension or help paying their bill.

Figure 30: Interaction with PNM in Past 12-Months (n=68)



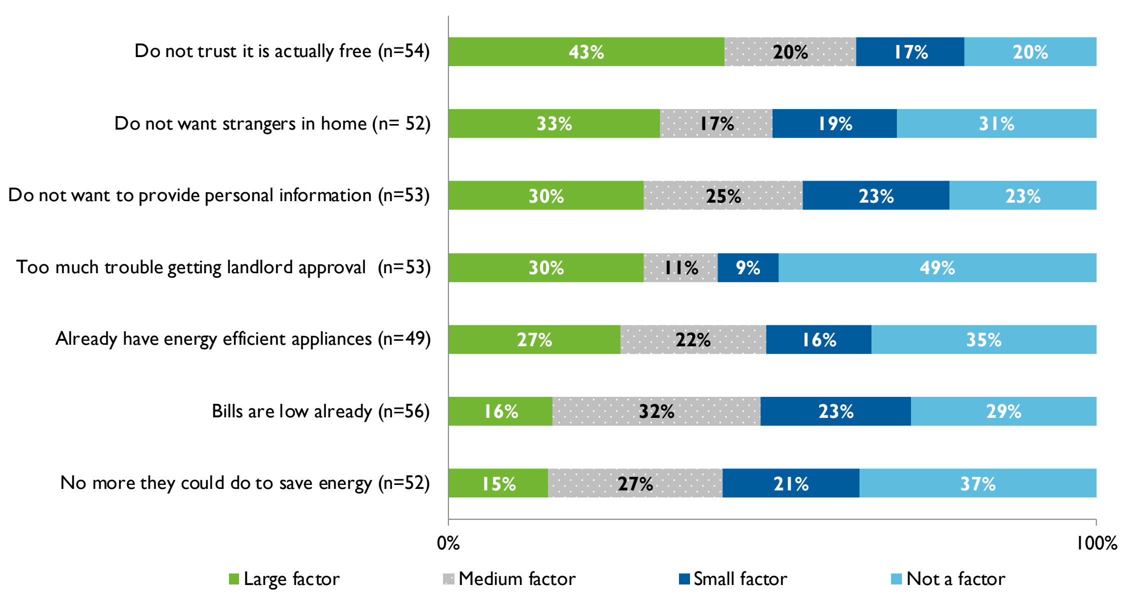
Survey respondents were asked how interested they would be in taking part in a PNM-sponsored program that provided them with free energy efficiency upgrades and equipment. As shown in Figure 31, 48 percent of respondents indicated that they would be extremely or very willing to participate in this type of program.

Figure 31: Willingness to Participate in a PNM-Sponsored Program (n=127)



Respondents who reported that they were "somewhat willing," "not at all willing," or "don't know" about their willingness to participate in such a program were then provided with a list of factors that could make one hesitant to participate in a program similar to the one described. Respondents then reported whether the displayed factor was a small, medium, or large factor in their hesitancy. Figure 32 shows that the largest barrier to participating in a PNM-sponsored program is that respondents are skeptical that the appliances would actually be free.

Figure 32: Barriers to Participating in a PNM-Sponsored Program



2.3 Summary and Conclusions

Based on the survey results, PNM's low-income population skews toward somewhat older households that live in single-family homes, with the vast majority of these buildings (almost 80%)

built before 1990. A significant portion have English as a second language, with Spanish being the most common in households with multiple languages spoken. A significant portion (24%) also reported that paying their monthly utility bill is a significant challenge each month, and of those customers that have contacted PNM, the most common reason given (besides outages) was to receive help or an extension on paying their bill and to get information on assistance and efficiency programs.

Within this context, the low-income sector appears to be receptive to energy efficiency options that PNM might offer. Most respondents indicated a high level of interest in participating in a direct install program if it were offered by PNM. Respondents also seem generally comfortable with approaching their landlords to ask them to update aging appliances. Among potential barriers for a direct install program, the ones that appeared to be most significant (i.e., over 50% rating as a large or medium factor) were not believing the program was free, not wanting strangers in their home, and not wanting to provide personal information. PNM can likely alleviate or eliminate these barriers with increased marketing and education that specifically address these concerns. The fact that respondents indicate they are relatively comfortable with approaching their landlords about improvements and overall show a willingness to participate in a PNM efficiency program will help with driving participation in this sector. Targeting program marketing campaigns to Spanish households will also likely increase participation.

3 Residential Lighting General Population Survey

As part of the PY2021 evaluation, Evergreen fielded a general population survey to collect information on lightbulb purchases among New Mexico households. The survey was fielded online in January and February 2022, and we received 244 responses compared to our original goal of 200 completes. The survey data will be used to assess the current residential lighting baseline assumptions. Note that many customers refused to provide information on income, which limits our ability to break out the results by income levels.

Figure 33 shows the home type for households responding to the survey; the vast majority of respondents are in single-family homes. When the responses are broken out by income (results not shown), there are slightly more low-income respondents living in apartments (12%) and mobile homes (6%).

Figure 33: Home Types (n = 136)

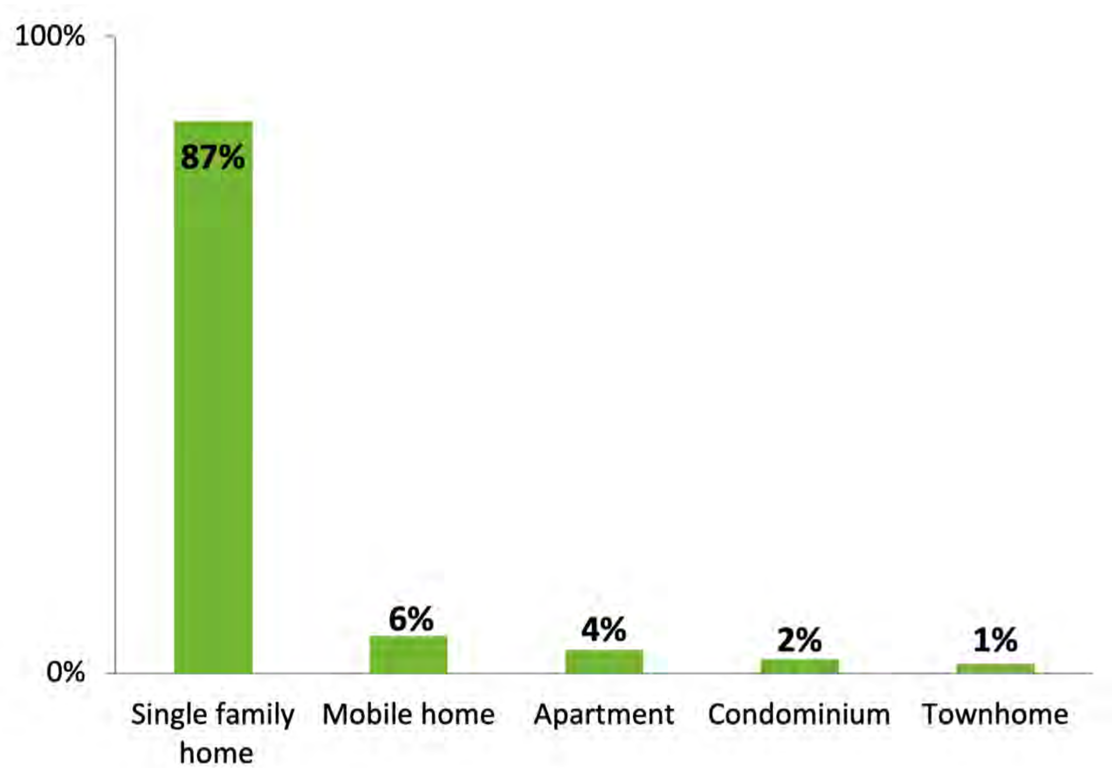


Figure 34

Figure 34 shows that, overall, almost three quarters (73%) of the sample are households with two or fewer people.

Figure 34: Household Size (n = 85)

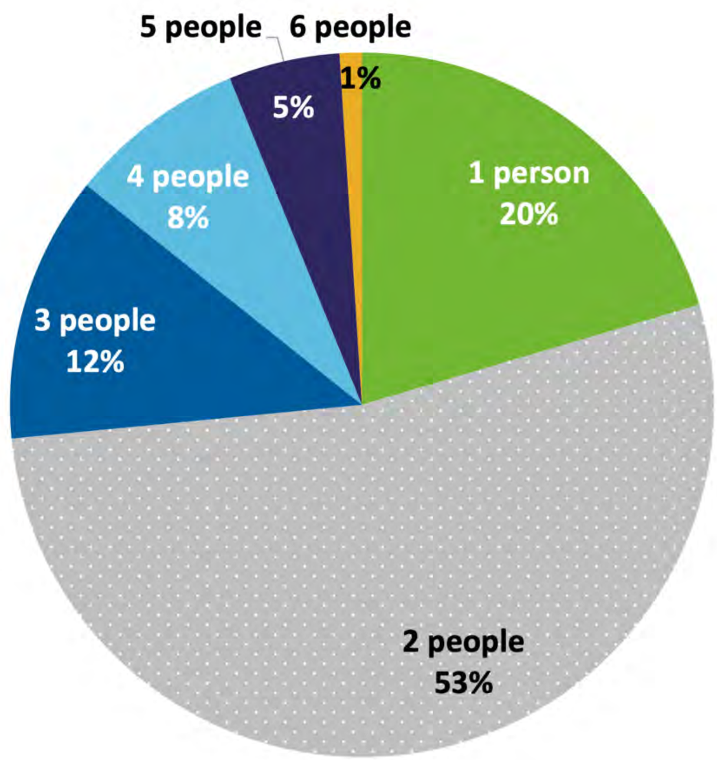


Figure 35 shows how household size varies by income level. Low-income households skew toward larger families, with fewer single-resident households (9%) and over 25 percent of low-income households with four or more people. Overall, low-income households had an average of 1.93 people, compared with 1.59 people for non-low-income households in the sample.

Figure 35: Household Size by Income

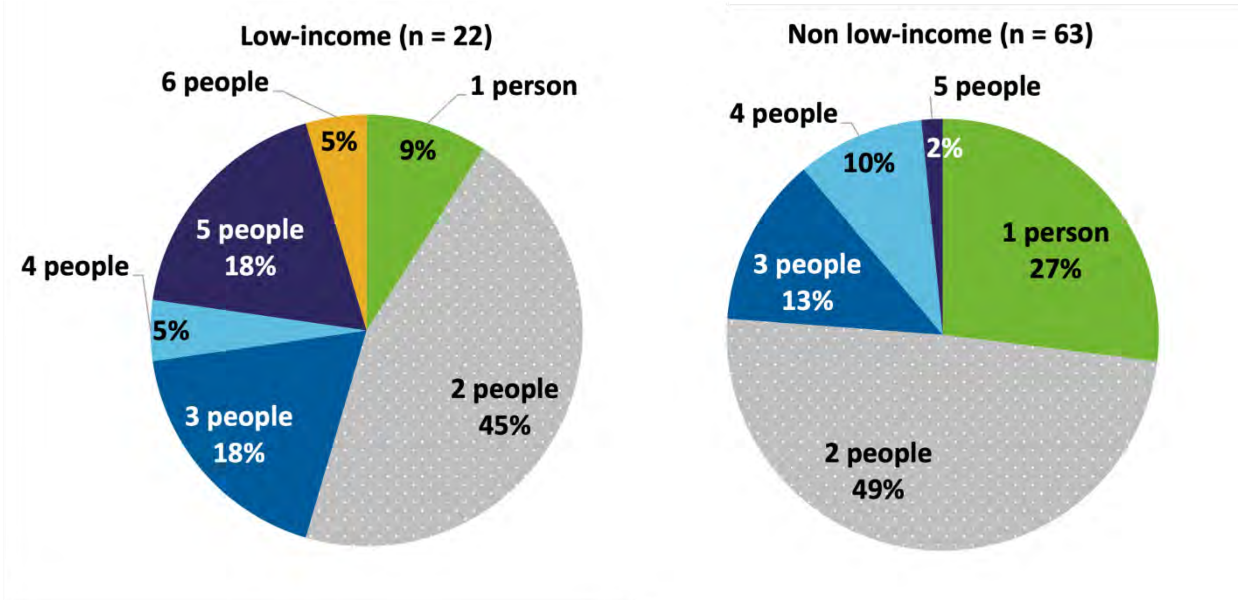


Figure 36 shows the number of low-income households in the sample. Note that less than half the respondents provided information about their income.

Figure 36: Income Breakdown in Survey Sample

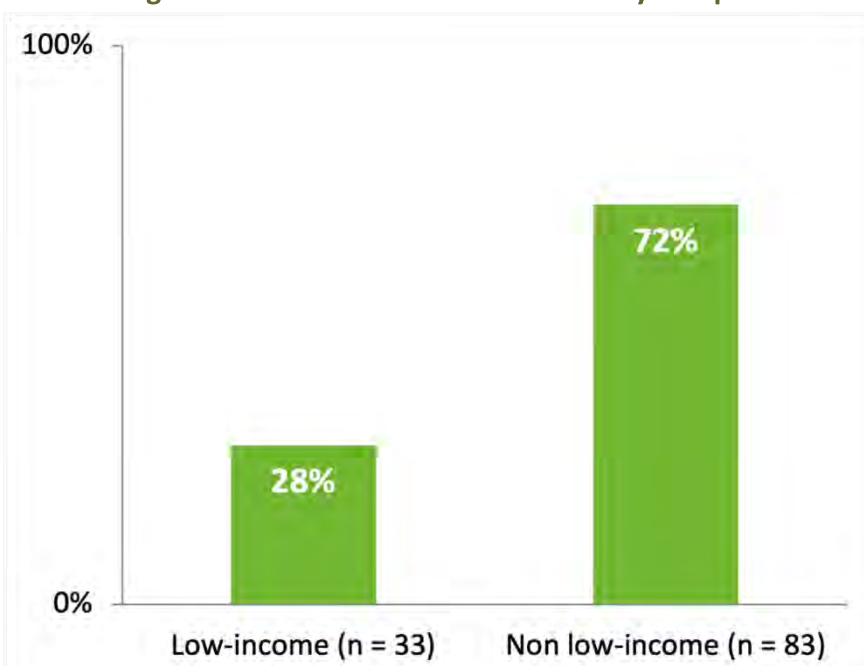


Figure 37 shows the types of lightbulbs purchased over the last year. The majority of the total bulbs purchased were LEDs (58%), and less than 10 percent of bulbs purchased were CFLs.

Figure 37: Bulbs Purchased by Bulb Type

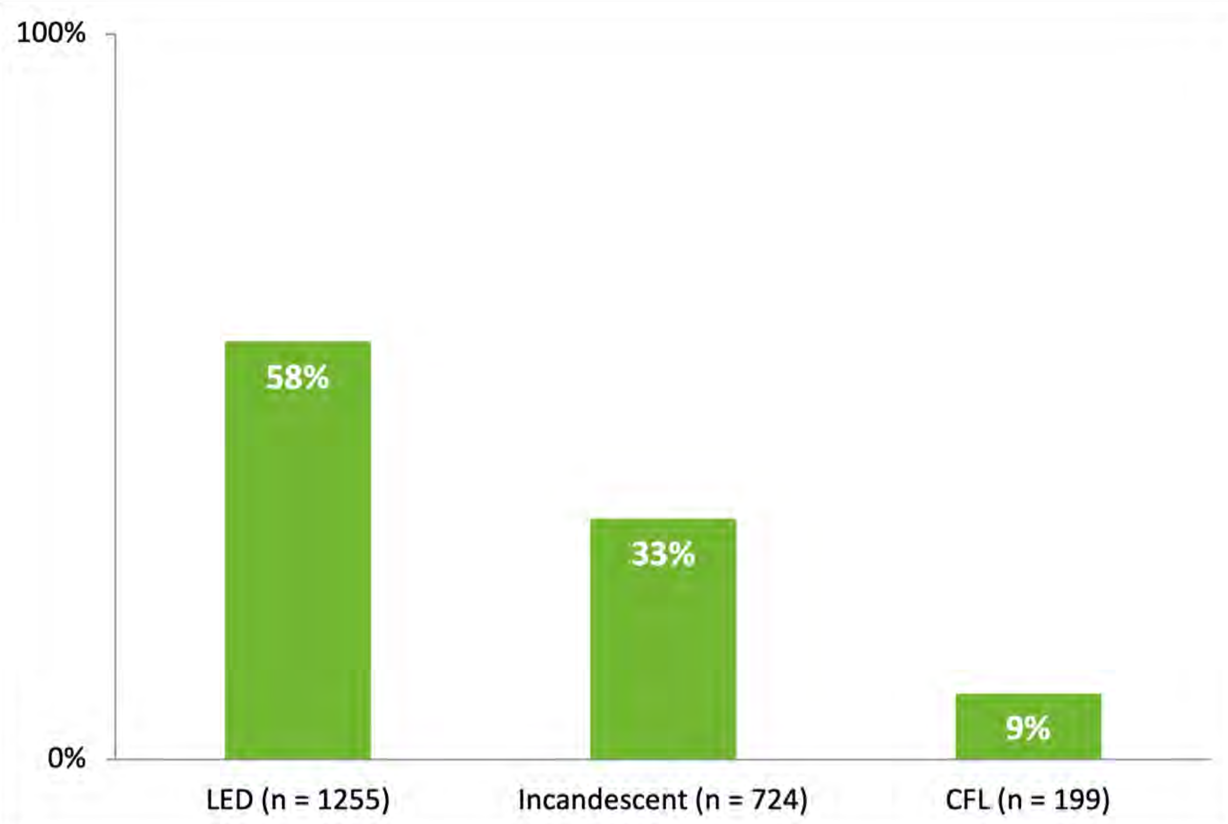
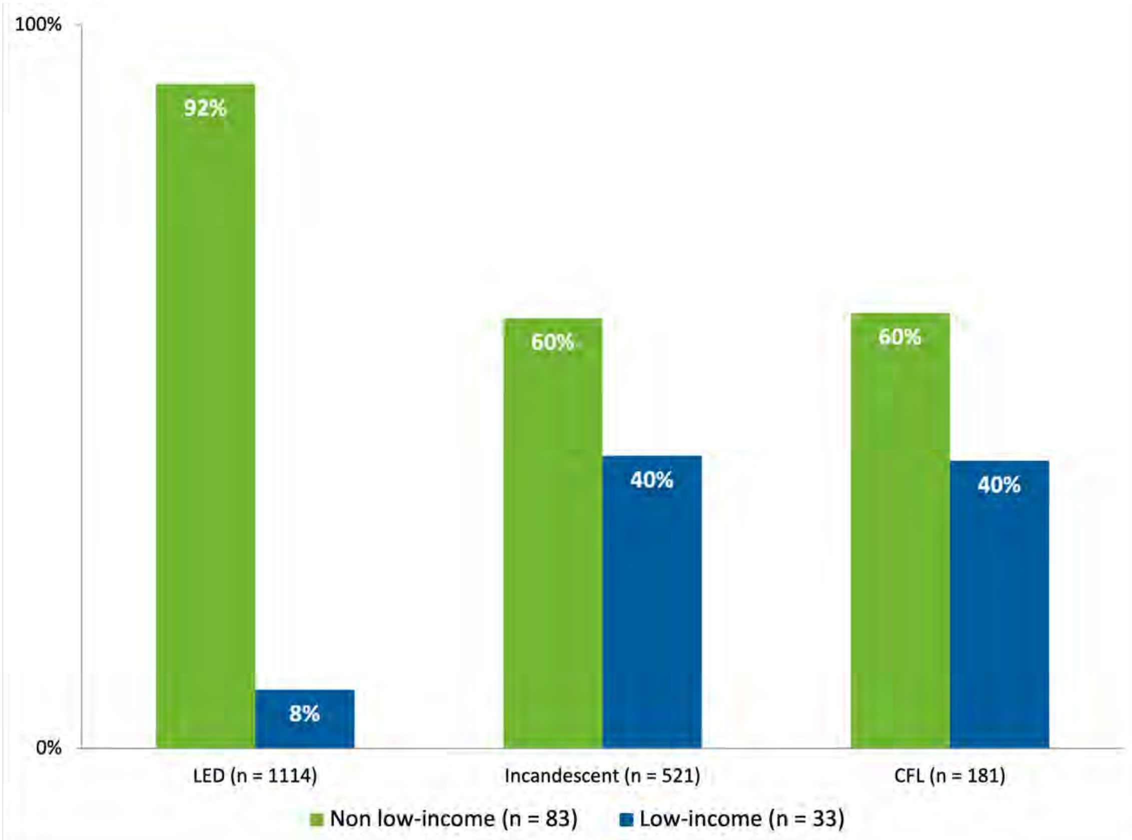


Figure 38 shows the share of each bulb type purchased by income level, for those respondents that provided income information. LEDs are mostly being purchased by non-low-income households, while low income households are responsible for a greater share of incandescent and CFL purchases (40% for both bulb types).

Figure 38: Bulb Types Purchased by Income Level



We also looked at how many of the purchased bulbs were stored versus installed (Figure 39), and examined stored versus installed bulbs by income (Figure 40). Overall, across all bulb types and income levels, respondents were more likely to install the bulbs they purchased compared to storing them. Low-income households tended to store incandescent bulbs at a greater rate, while non-low-income households were more likely to store LEDs for future use compared to low-income households.

Figure 39: Number of Bulbs Installed vs. Stored by Bulb Type

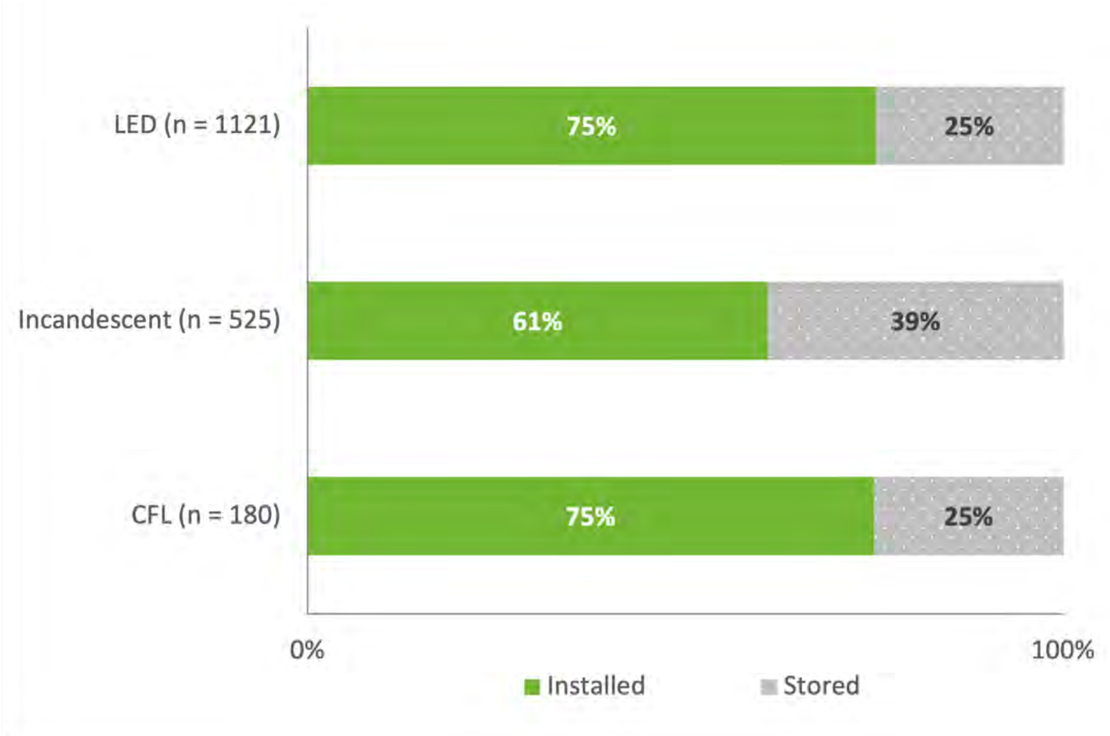
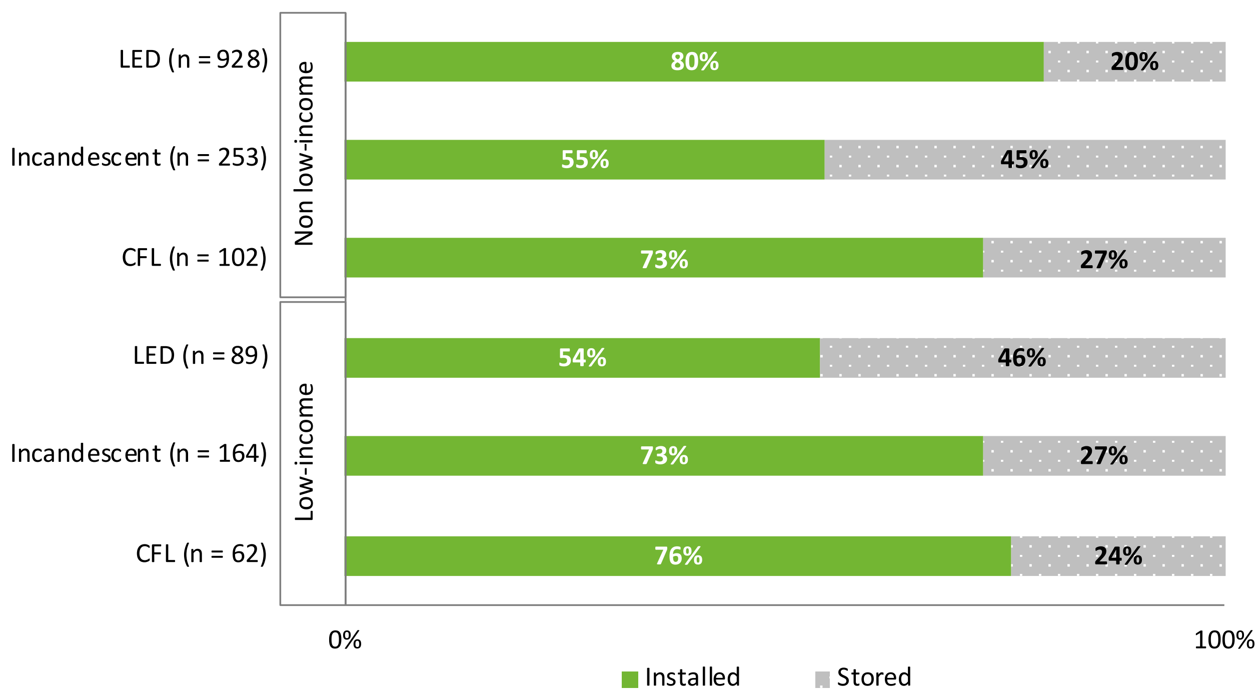


Figure 40: Number of Bulbs Installed vs. Stored by Bulb Type and Income



The following charts (Figure 41-Figure 46) show where households typically purchased each bulb type, broken out by the full respondent population and income level. Note that with the small sample sizes for income, it is difficult to draw definite conclusions by income type. LEDs are generally purchased by all households at larger big box stores (Home Depot, Walmart, Costco, etc.). With incandescents, there is a greater incidence of purchases through online retailers, particularly with non-low-income households. Most CFLs are also purchased at larger big box stores. Although the sample sizes are small, these results do not support the theory that a significant number of CFLs and incandescents are purchased by low-income households at dollar stores or other similar outlets; most of these bulbs are being purchased at the large big box stores, across all income types.

Figure 41: Purchases by Store Type: LEDs (# bulbs = 148)

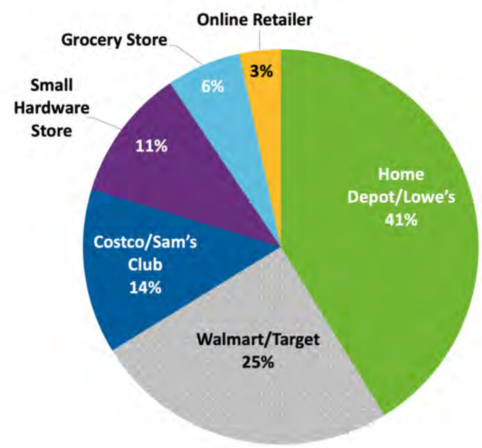


Figure 42: Purchases by Store Type: LEDs (# bulbs =108)

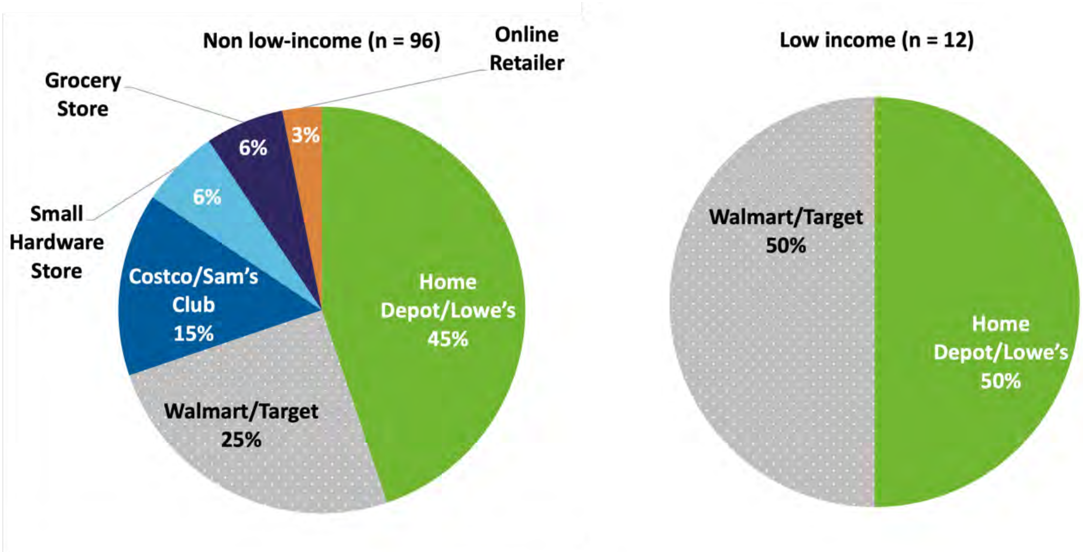


Figure 43: Purchases by Store Type: Incandescents (# bulbs = 137)

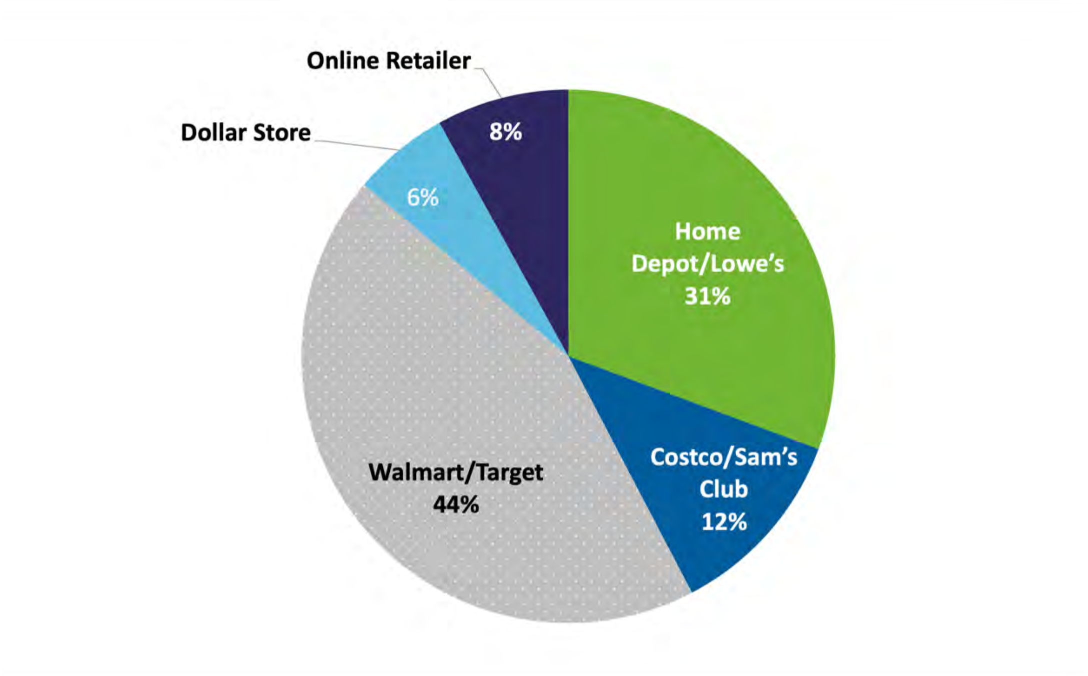


Figure 44: Purchases by Store Type and Income: Incandescents (# bulbs = 92)

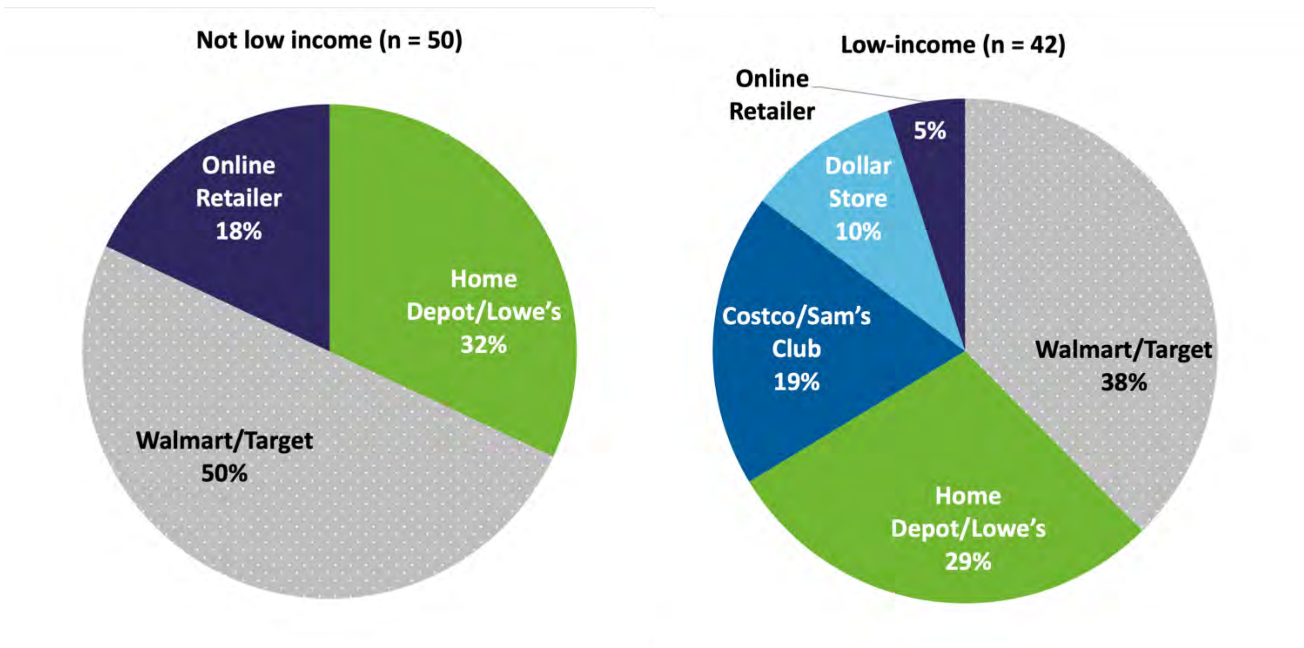


Figure 45: Purchases by Store Type: CFLs (# bulbs = 36)

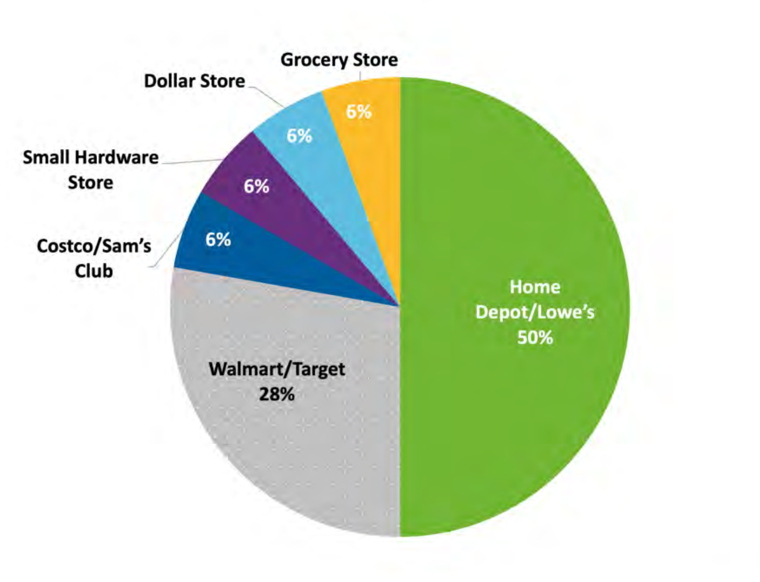
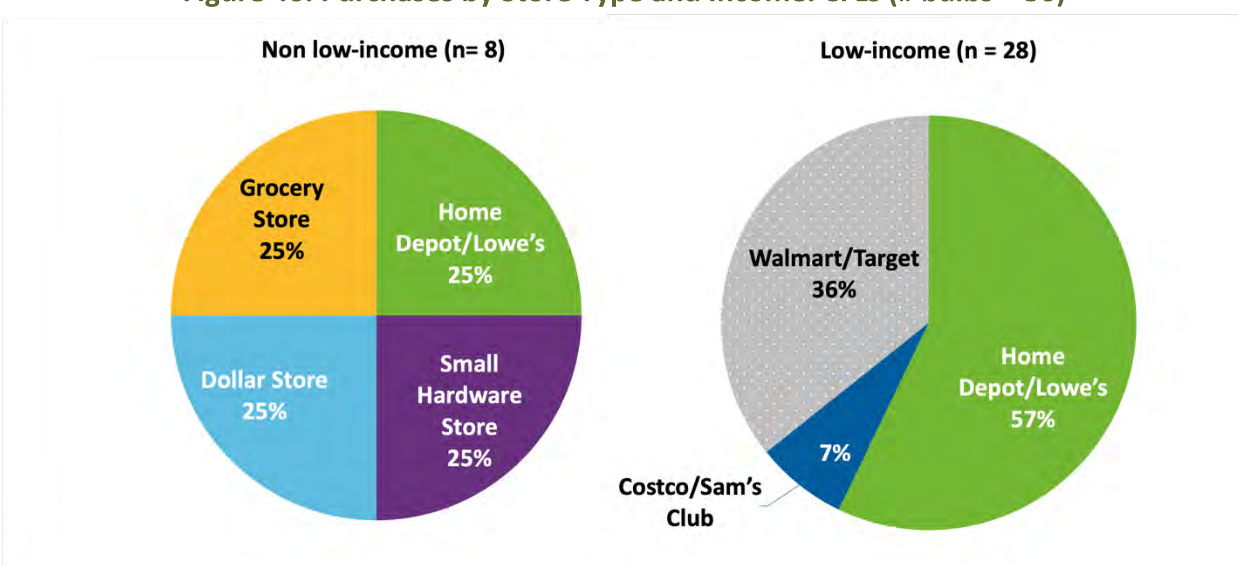
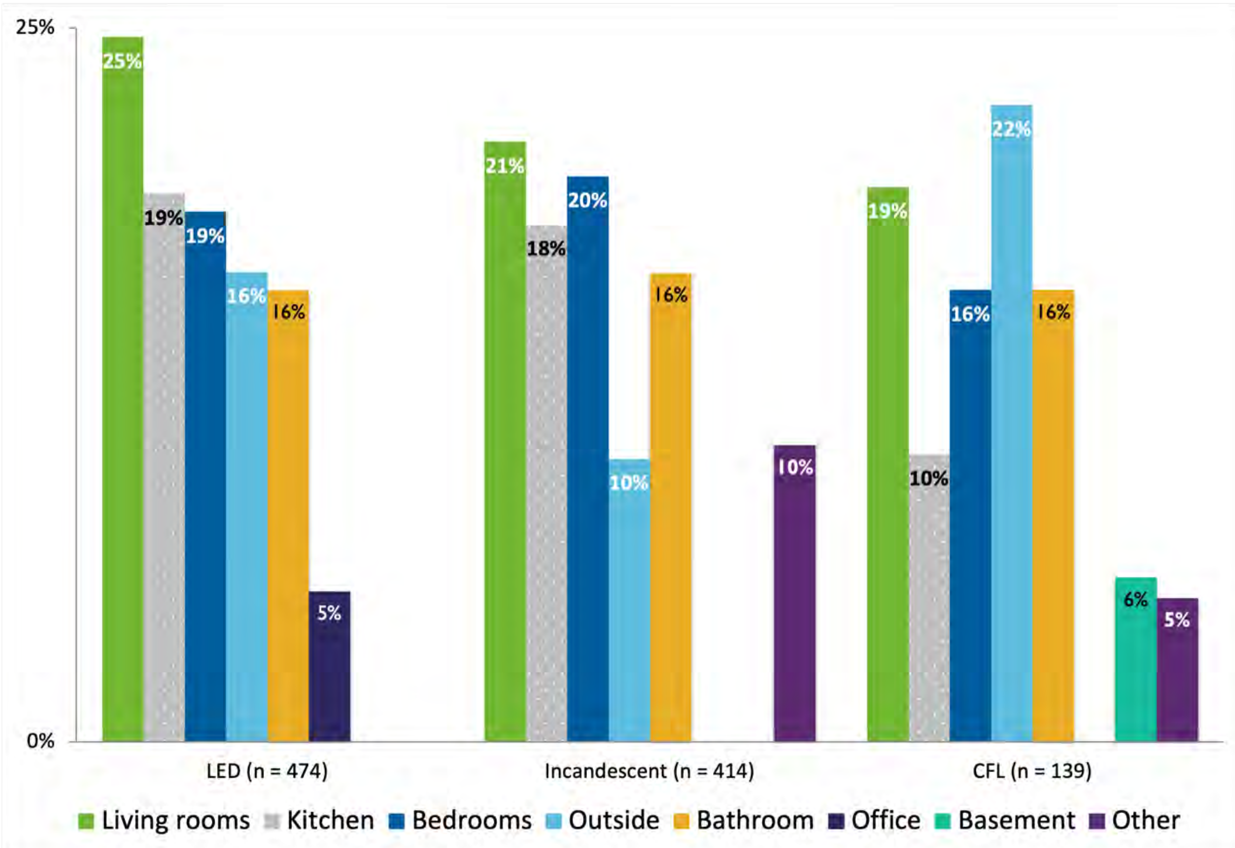


Figure 46: Purchases by Store Type and Income: CFLs (# bulbs = 36)



Finally, Figure 47 shows the distribution of rooms where lightbulbs were installed. In general, the same four locations (Living Room, Bedroom, Outside, Bathroom) comprise the majority of installations for each bulb type. CFLs tended to be installed more frequently outside and less frequently in the kitchen compared with both LEDs and incandescents.

Figure 47: Percent of Bulb Types Installed by Room



4 Home Works

4.1 Home Works Gross and Net Impacts

PNM's Home Works program provides energy efficiency education and kits of easy-to-install energy efficiency and water saving measures such as LEDs, faucet aerators, and low-flow showerheads to elementary and high school students. These measures are accompanied by an in-class curriculum that is designed to increase energy efficiency education. In 2021, 12,947 kits were distributed, with a total of 2,562,039 kWh and 148 kW gross savings claimed.

To evaluate the impacts of the Home Works program, the evaluation team conducted a deemed savings review of the energy saving measures included in the school kits. As part of this review, we attempted to replicate the per unit savings values used by PNM based on the assumptions in the New Mexico TRM. Our savings review found that PNM was using saving values from the Illinois TRM in some cases, when there were savings values available in the New Mexico TRM.

For both kWh and kW savings, an NTG ratio of 1.0 is assumed, which results in the net impacts being equal to the gross realized impacts.

Table 16 summarizes the gross and net realized impacts for the 2021 Home Works program.

Table 16: Home Works Realized Gross and Net Impacts

Home Works	Number of Projects	Expected Gross Savings	Engineering Adjustment Factor	Realized Gross Savings	NTG Ratio	Realized Net Savings
kWh Savings	12,947	2,562,039	1.010	2,588,467	1.000	2,588,467
kW Savings	12,947	148	1.137	168	1.000	168

As with the other programs, cost effectiveness is assessed using the UCT based on net realized savings and the appropriate program costs. For 2021, the Home Works program had a UCT value of 0.72, indicating that the program is not cost effective.

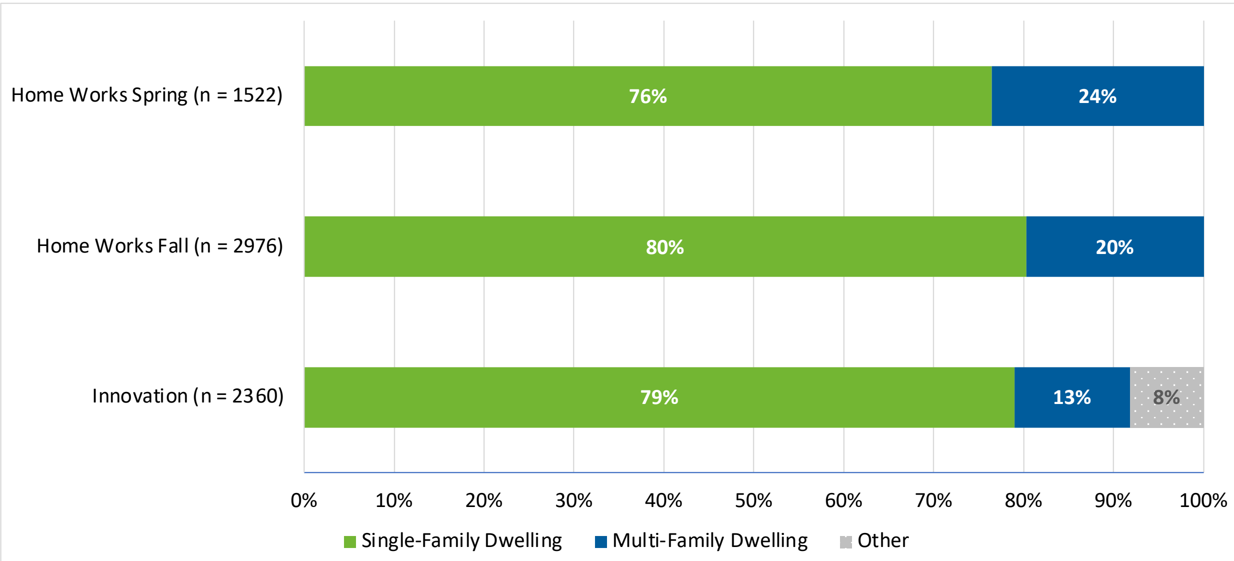
4.2 Home Works Student Surveys

As part of the Home Works program, the Think Energy classroom curriculum was designed to educate students on the importance of energy efficiency in the home. The survey results include students in the Home Works program (designed for elementary school fifth-graders) and in the Innovation program (designed for secondary school students). The Home Works program was administered in both the fall and spring, and survey results were collected in both seasons. The following section presents survey results and figures from both programs. Note that these surveys were administered by the program implementer and not the evaluation team.

Demographics

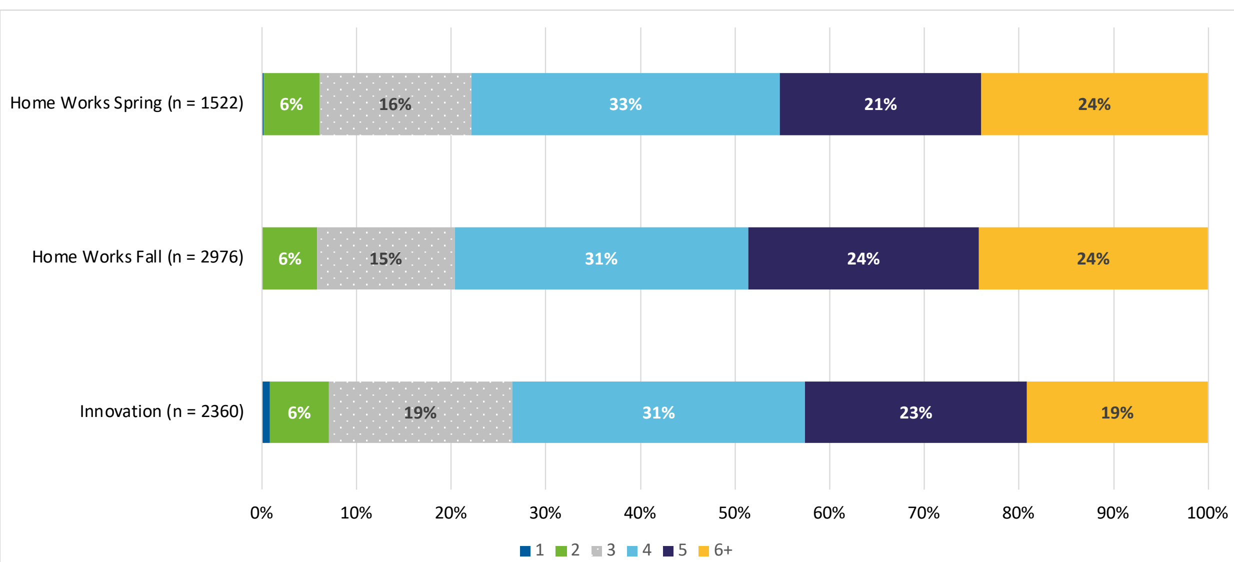
Overall, participants in the Home Works program and the Innovation program were most likely to live in a single-family dwelling, followed by a multifamily dwelling (Figure 48).

Figure 48: Type of Housing



Similarly, participants in both programs were most likely to report having at least four people in their household (Figure 49).

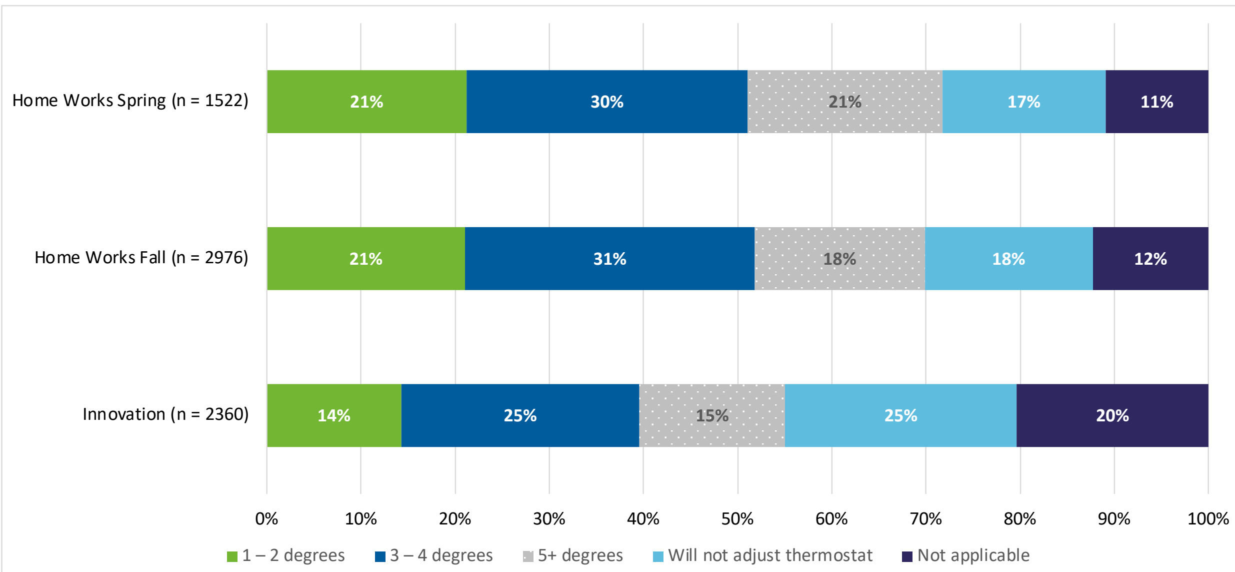
Figure 49: Number of People in Household



Thermostats

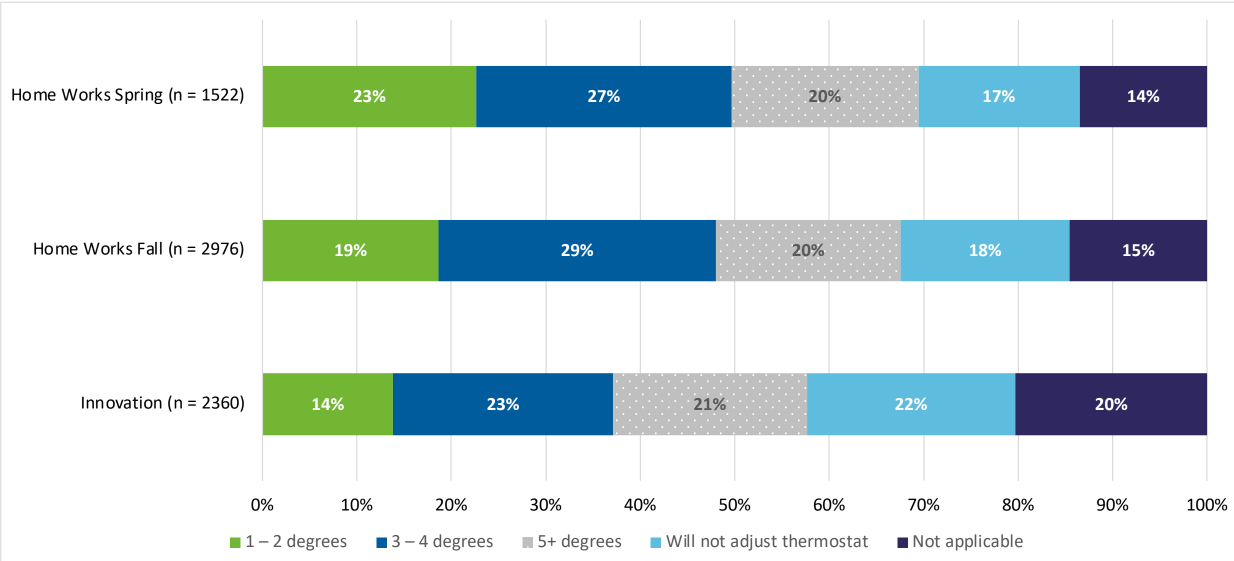
Participants were first asked how many degrees they would decrease their thermostat temperatures in the winter after participating in the program. Across both seasons, approximately 70 percent of participants in the Home Works program stated that they would make some change to their thermostats. Approximately 54 percent of participants in the Innovation program stated that they would decrease their thermostat temperature in the winter (Figure 50).

Figure 50: Thermostat Changes in Winter



In addition, participants were asked how many degrees they would increase their thermostats in the summer for cooling. Similar to the heating question, approximately 70 percent of participants in the Home Works program and 58 percent of participants in the Innovation program reported that they would increase their thermostats in the summer (Figure 51).

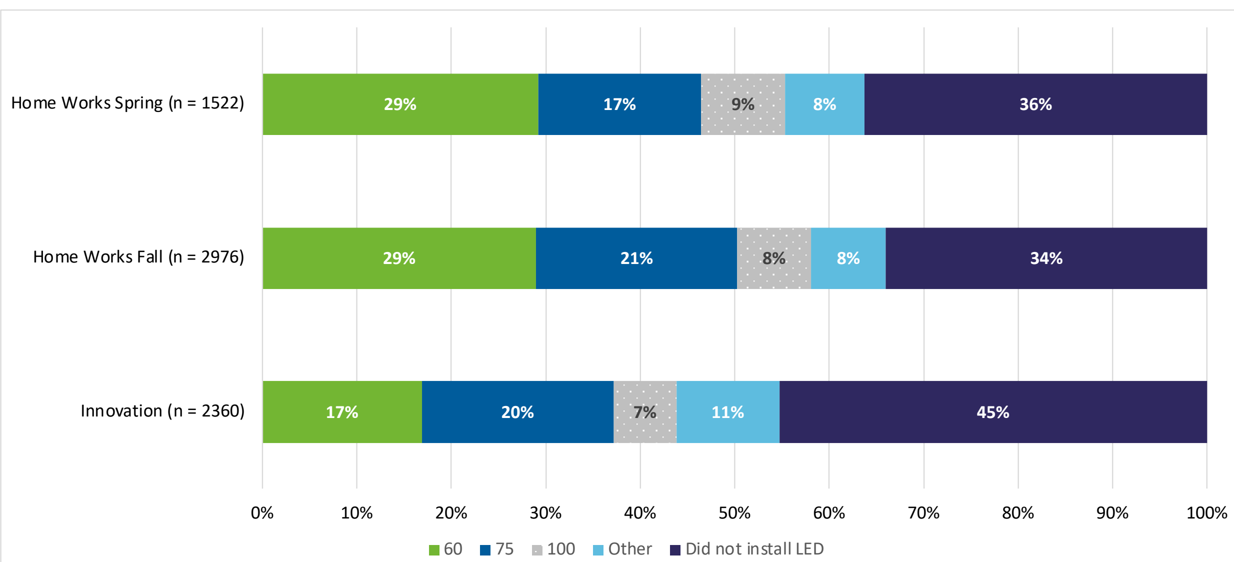
Figure 51: Thermostat Changes in Summer



Lightbulbs

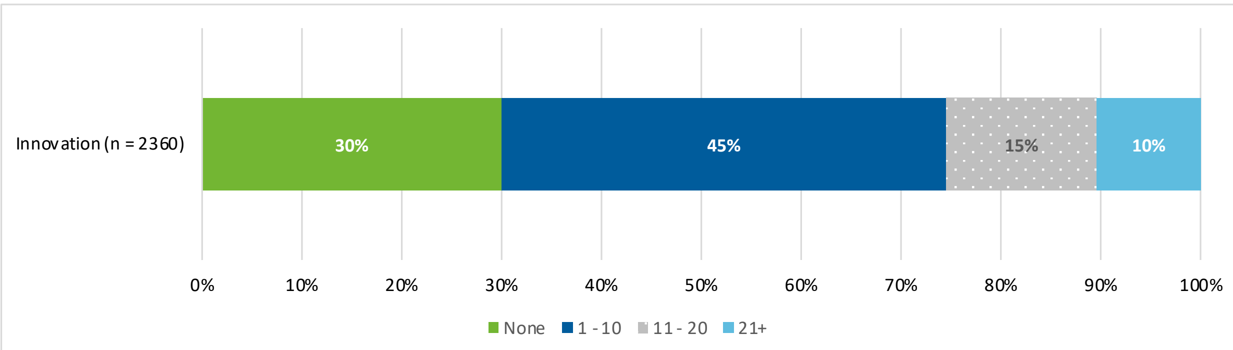
Participants in the Home Works program were asked about the lightbulbs in their homes and how they utilized the LED included as part of their kit. About half of the respondents participating in the Home Works program reported that the bulbs they were replacing with the LEDs from their kit were either 60- or 75-watt bulbs (Figure 52). Thirty-seven percent of Innovation participants reported replacing 60- or 75-watt bulbs. Responses were similar for questions regarding the second and third LED bulbs from the kit.

Figure 52: Original Lightbulb Type Before LED Replacement



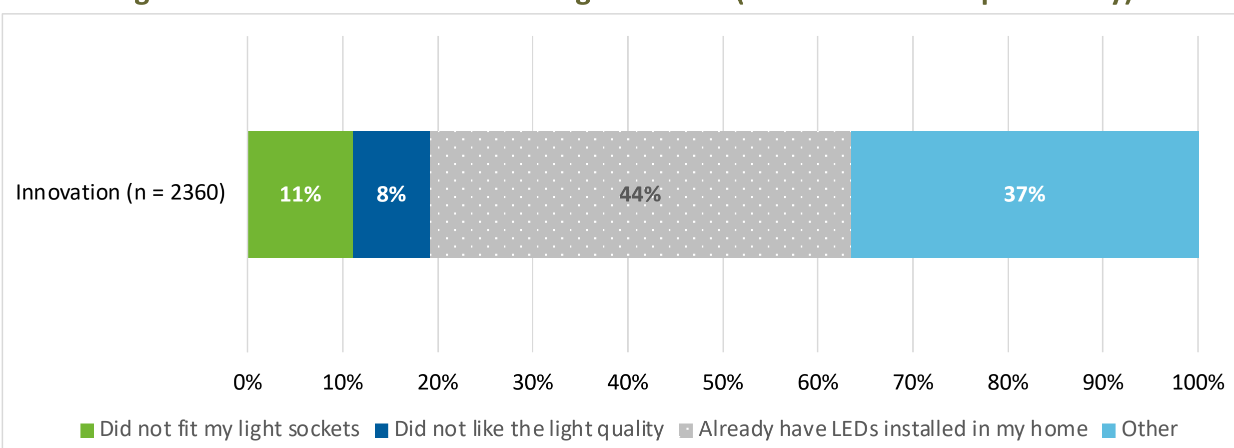
Participants in the Innovation program were asked additional questions about their household lightbulb composition. Fifty-six percent of households reported having 20 or less lightbulbs in their home. Participants were also asked how many LED bulbs they had in the home. Thirty percent stated that they had no LED bulbs at all, while 70 percent had at least one LED bulb in the home (Figure 53).

Figure 53: Number of LED Bulbs in Household Before Program (Innovation Participants Reason Only)



Innovation program participants who responded that they had not installed the LED bulb included in the kit were asked why, of which 44 percent responded that they already had LEDs installed in their homes (Figure 54).

Figure 54: Reasons for Not Installing LED Bulbs (Innovation Participants Only)

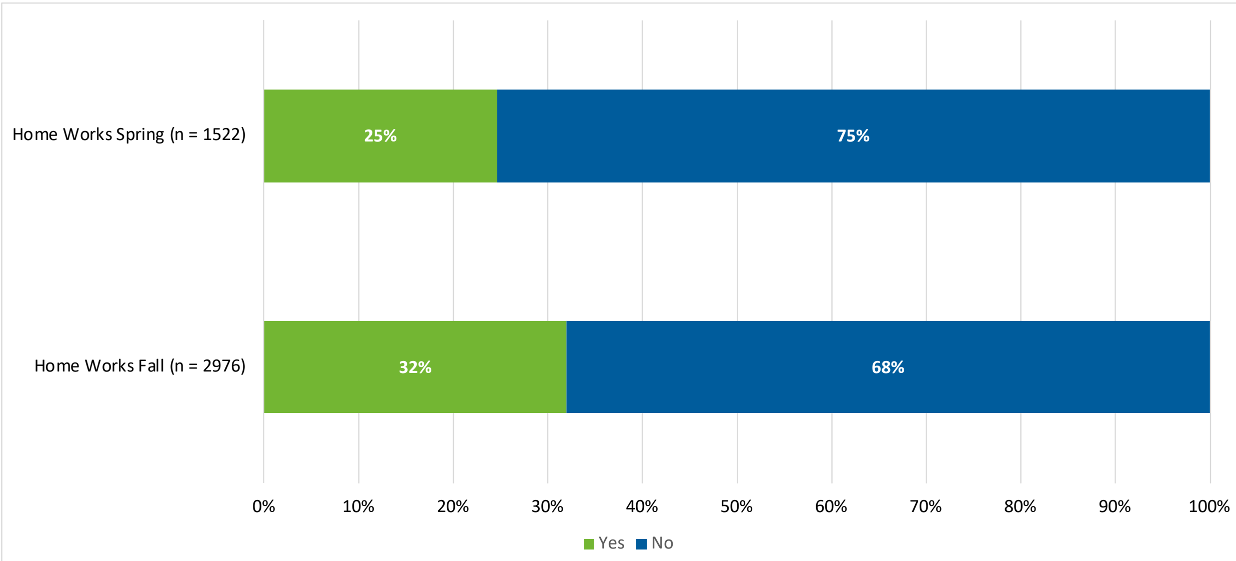


Kitchen

Home Works participants were then asked if and how the program affected their energy use around the kitchen, including questions about the kitchen aerators included in their kits and if they adjusted their refrigerator temperatures.

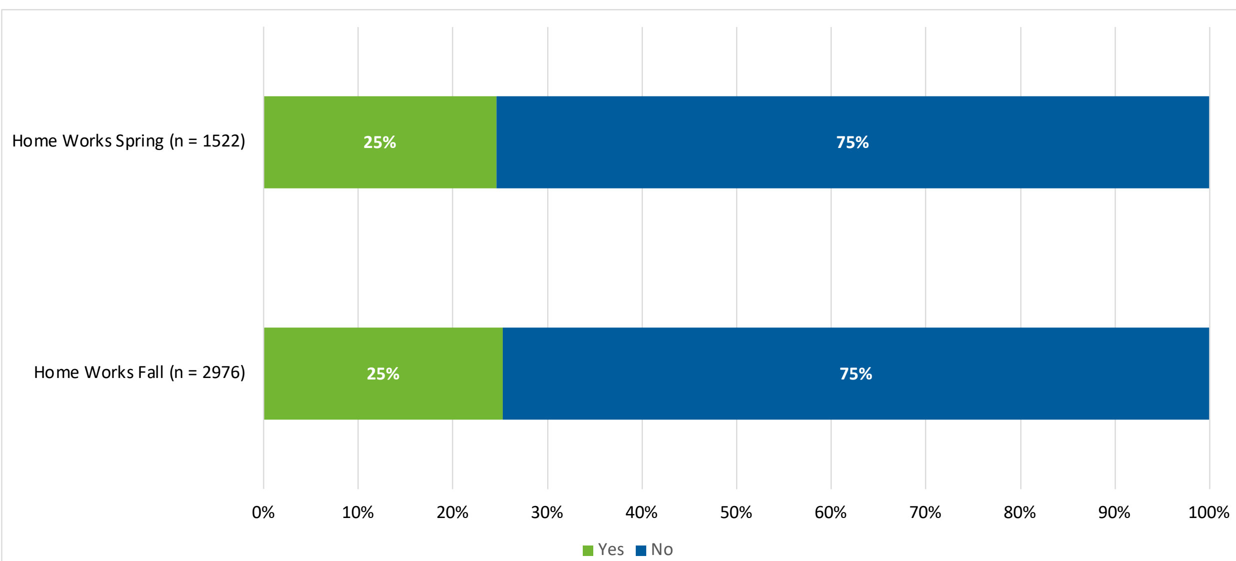
Approximately 28 percent of all Home Works respondents reported installing the kitchen aerator included in their energy kit (Figure 55).

Figure 55: Participants Who Installed the Kitchen Aerator (Home Works Participants Only)



When asked if they had raised their refrigerator temperature after measuring it with the kit thermometer, approximately one-fourth of participants reported that they had increased the temperature (Figure 56).

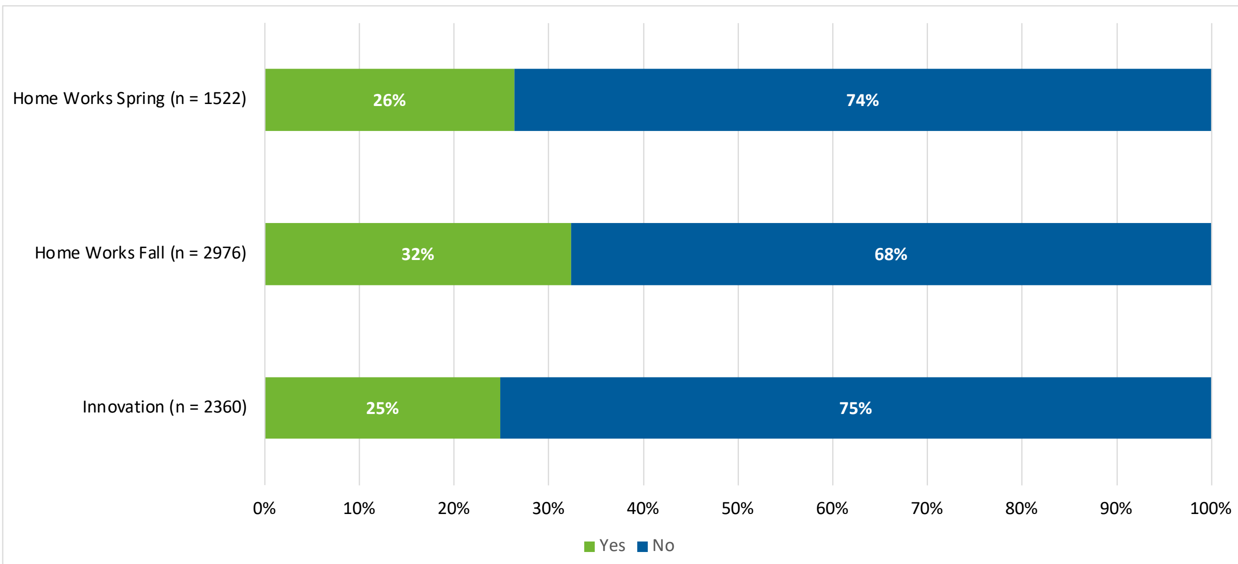
Figure 56: Increases in Refrigerator Temperatures (Home Works Participants Only)



Bathroom

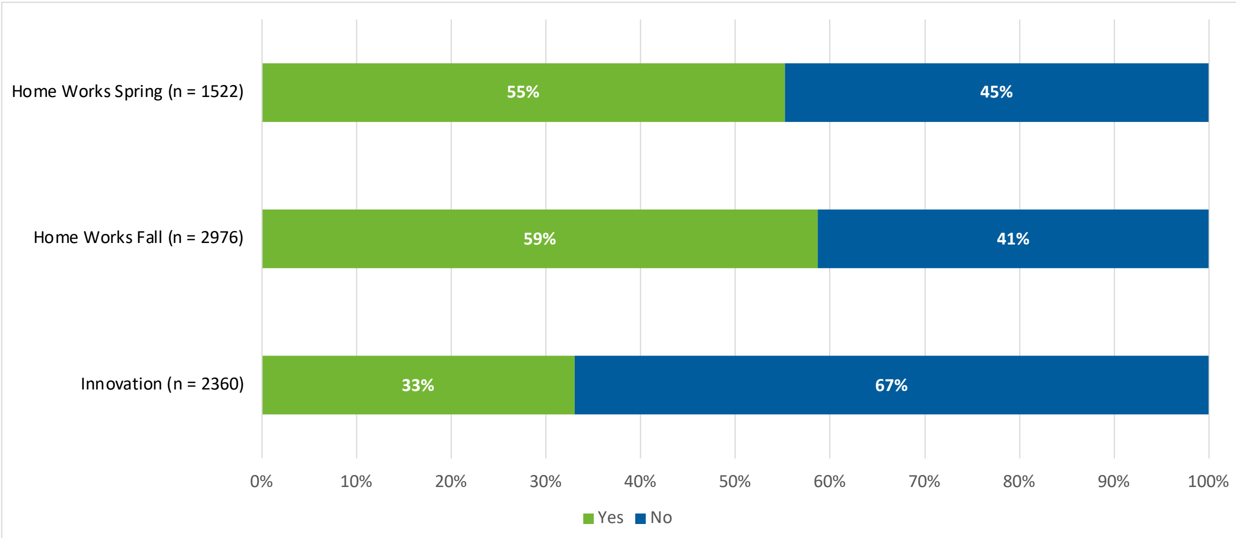
Participants in both programs were asked questions about their bathroom appliances, such as their showers and aerators. When asked if they had installed the bathroom aerator that was included in their energy kit, approximately one-third of all participants in the Home Works program reported performing the installation, while one-quarter of Innovations participants reported doing the installation (Figure 57).

Figure 57: Installation of Bathroom Aerator from Kit



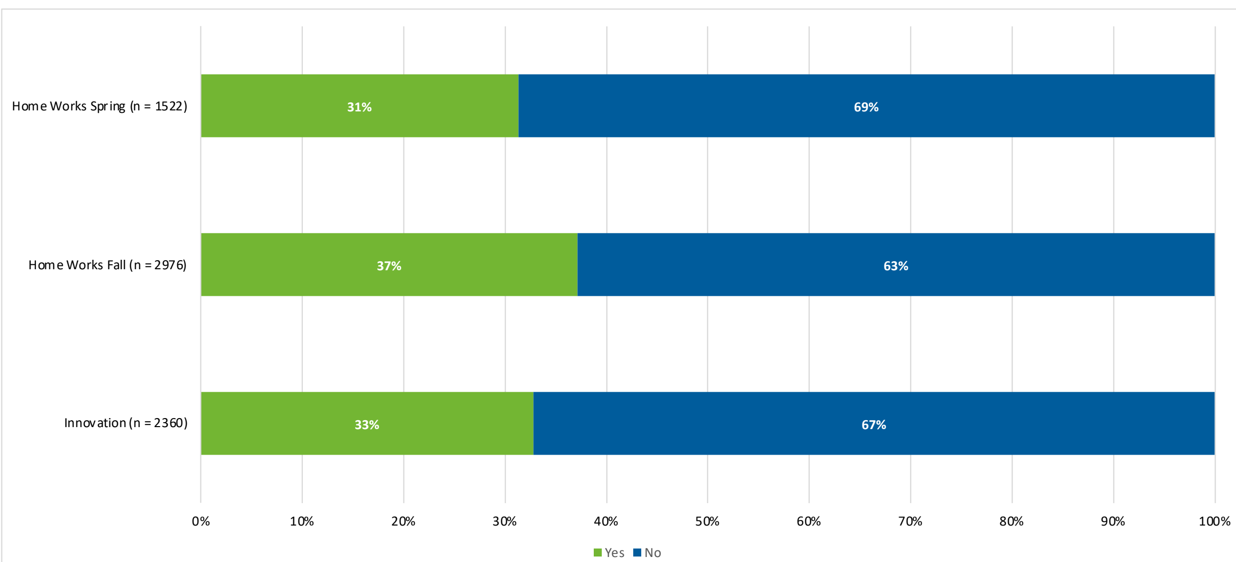
When asked about whether or not they used the shower timer from their kit, participants in the Home Works program were more likely to report having used their shower timers (about 57% of all Home Works participants) than the Innovation participants (33%; Figure 58).

Figure 58: Percentage of Respondents Who Used the Shower Timer



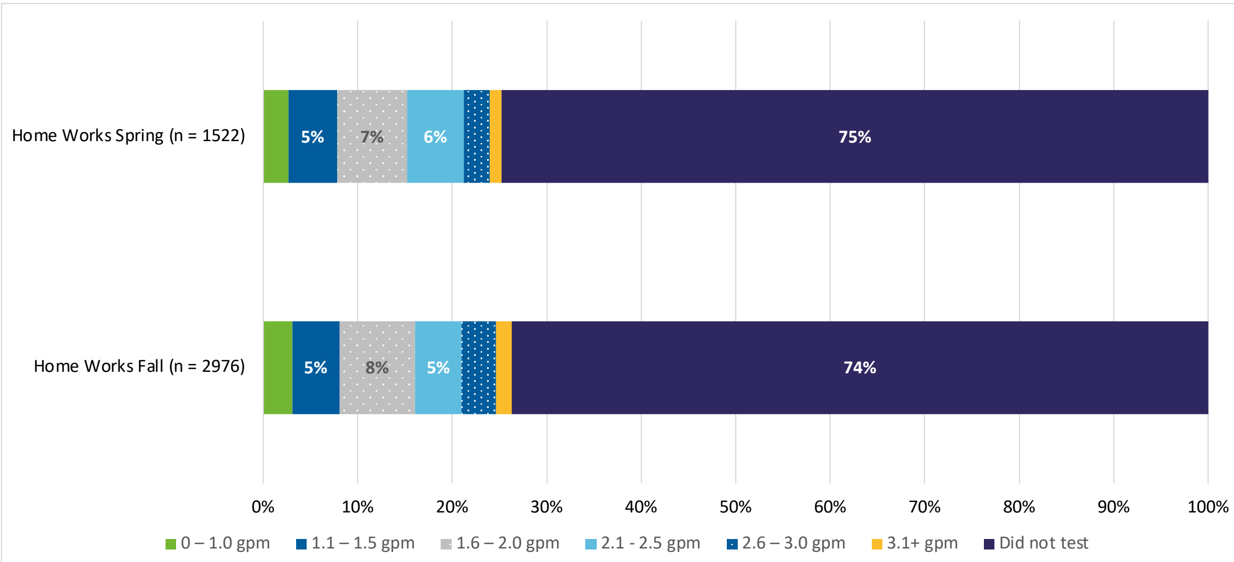
Participants were then asked whether they installed the new high efficiency shower head included in their energy kit. Slightly more than one-third of participants in both groups reported that they had installed the new shower head (Figure 59).

Figure 59: Percentage of Respondents Who Installed the New Shower Head



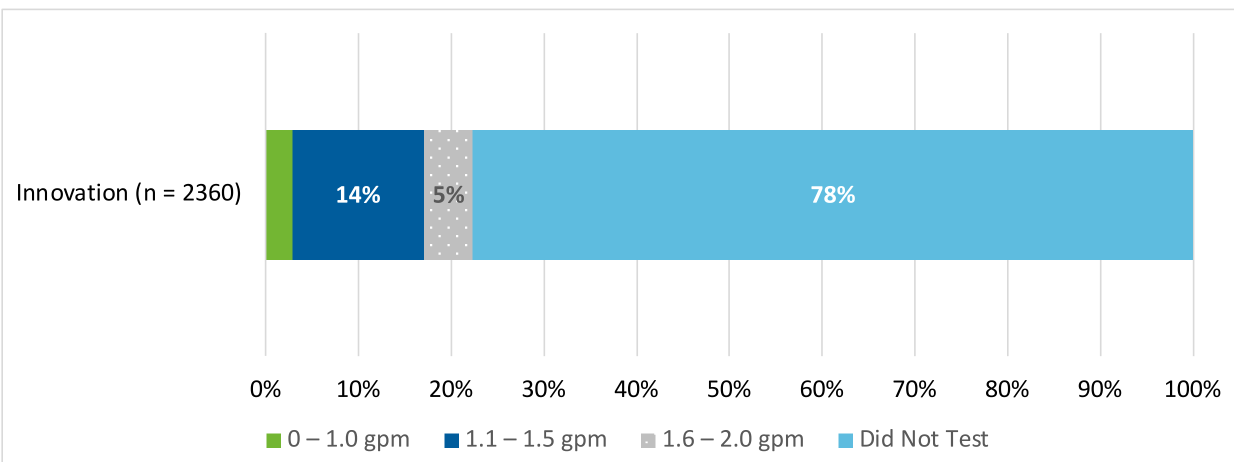
Home Works program participants were asked to measure the flow rate of their *old* shower heads, with approximately three-fourths of participants reporting that they did not test the water flow rate (Figure 60).

Figure 60: Old Shower Head Flow Rate (Home Works Participants Only)



In contrast, Innovation program participants were asked to measure the flow rate of their *new* shower heads. Similarly, approximately three-fourths of Innovation participants also did not test their water flow rate (Figure 61).

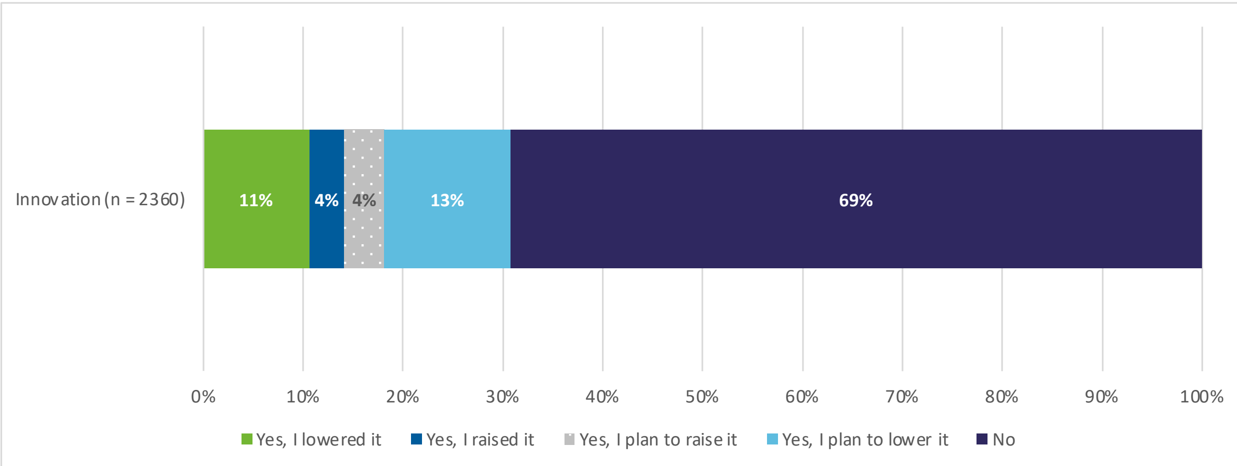
Figure 61: New Shower Head Flow Rate (Innovation Participants Only)



Water Heating

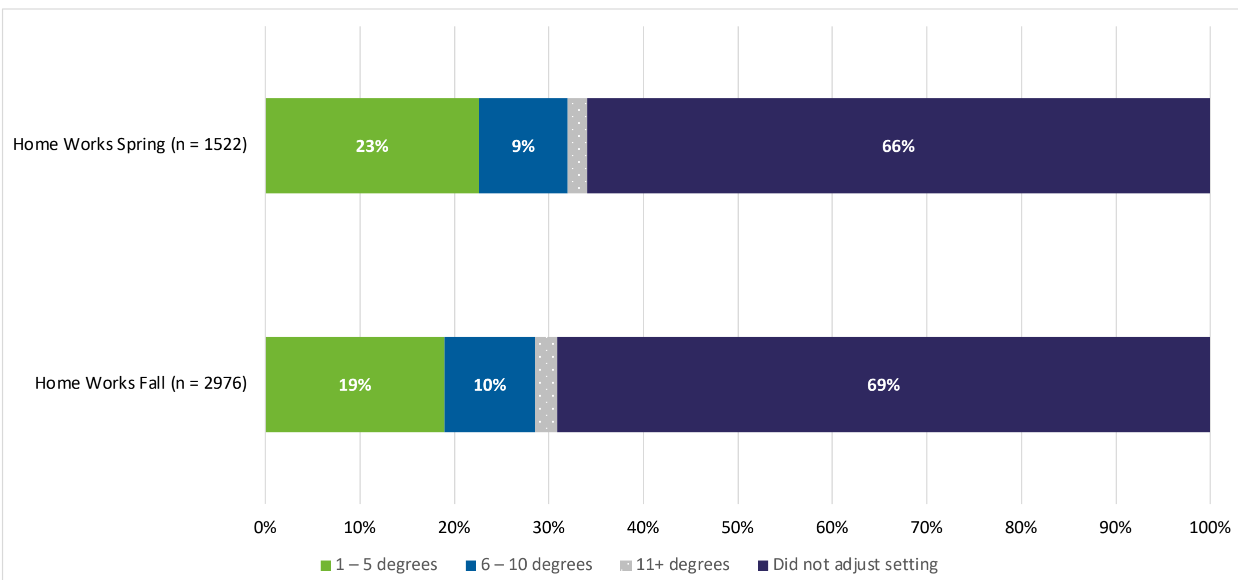
Both Home Works and Innovation program participants were asked about the settings of their water heaters. Innovation program participants were asked whether or not they had made *adjustments* to their water heater, while Home Works participants were asked how much they *decreased* their water heater settings. Sixty-nine percent of Innovation participants stated that they had not changed their settings (Figure 62).

Figure 62: Adjustments to Water Heater Settings (Innovation Participants Only)



A similar proportion of Home Works participants stated that they had not adjusted their water heater settings (Figure 63).

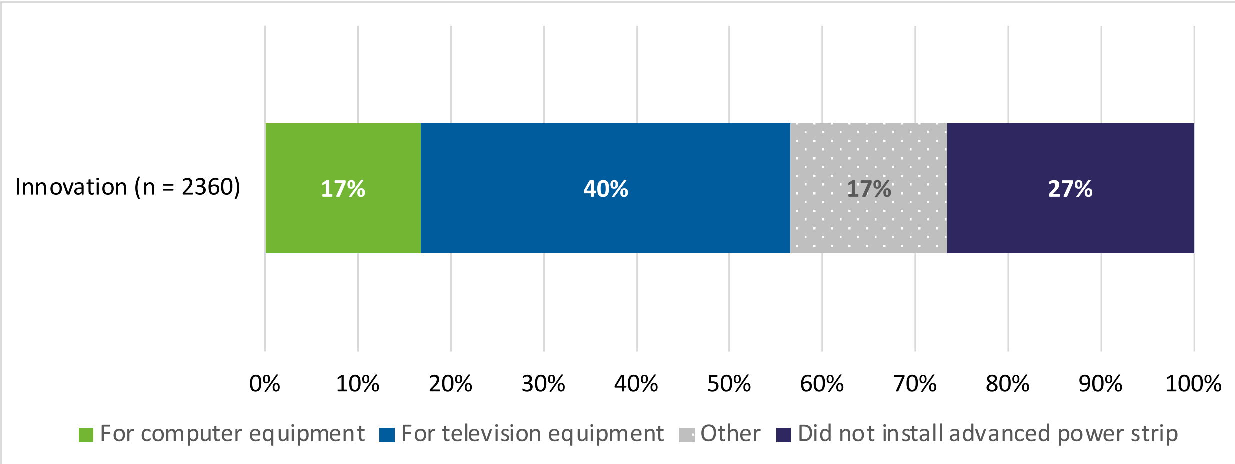
Figure 63: Decreases in Water Heater Settings (Home Works Participants Only)



Power Strip

Participants in the Innovation program were asked how they had used the advanced power strip they received through the program. About 75 percent of participants reported using their advanced power strip, with most (40%) reporting using it for television equipment, then for computers and other purposes (both 17%; Figure 64).

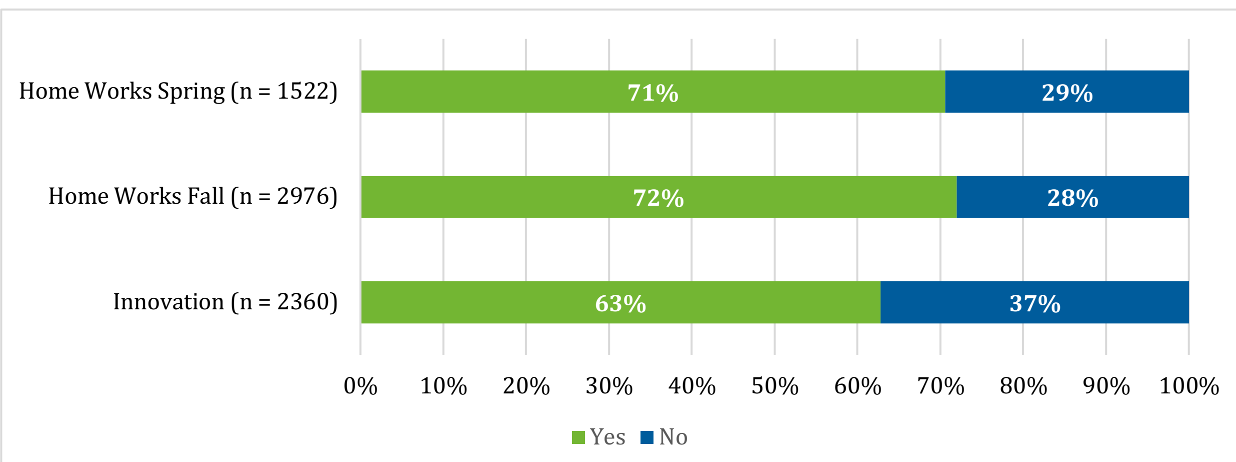
Figure 64: Usages for Advanced Power Strip (Innovation Participants Only)



Behavior Changes

Finally, participants were asked whether their participation in their respective Think Energy programs changed the way that they used energy in their homes. Just over 70 percent of Home Works participants reported that they changed the way they used energy in their homes, while slightly less, 63 percent, of Innovation participants reported changing their home energy use (Figure 65).

Figure 65: Changes in Home Energy Use After Program Completion



5 Load Management as a Resource

On January 31, 2018, the New Mexico Public Regulation Commission (NMPRC) issued a final order in PNM's 2017 energy efficiency case that directs Evergreen Economics, as independent program evaluator for PNM's energy efficiency and load management programs, to do the following:

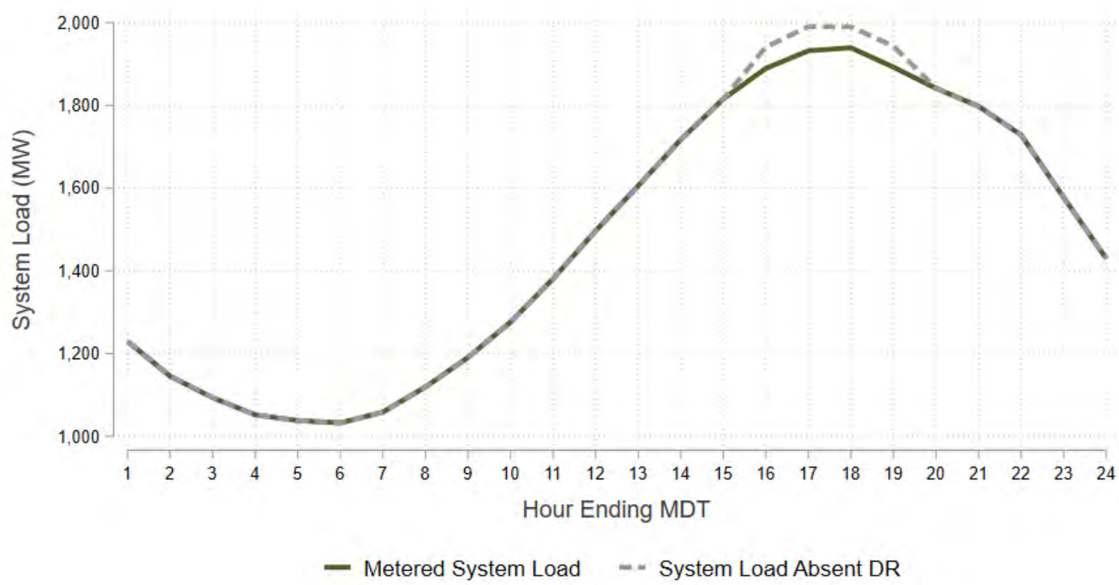
In PNM's future M&V reports, the independent evaluator shall verify that load reductions from deployment of PNM's LM [load management] programs avoided or offset the need for or use of additional peaking units or power purchases or shifted demand from peak to off peak period.[9]

The evaluation team concludes that in 2021, the load management programs served as a capacity resource that avoided the need for additional supply-side peaking capacity.

Figure 66 illustrates the benefits of the load management programs on system load for a high load demand response event day in 2021. Metered retail load on PNM's system peaked at 1,939 MW on June 15, 2021, during hour ending 18:00 (5:00 p.m. to 6:00 p.m. Mountain Daylight Time [MDT]). If we add back verified estimates of demand response performance, adjusted for line losses, the daily peak would have been 1,998 MW during hour ending 18:00 MDT. The load management programs flatten out system loads toward the top of the afternoon ramp, which reduces the amount of peaking resources needed to balance the supply and demand.

[9] PNM. 2021. *PNM Energy Efficiency Program, 2020 Annul Report*, p. 11. https://www.pnm.com/documents/396023/3157050/Energy_Efficiency_2020_Annual_Report+_Final+%281%

Figure 66: PNM System Load June 15, 2021



The two PNM load management—or demand response—programs relied on similar analysis methods to estimate program impacts. Additional detail on the analysis methods used for both programs is included in Appendix G and Appendix H.

PNM's demand side management portfolio includes both energy efficiency and demand response programs. While these two categories of programs both fall under the umbrella of demand side management, it is important to understand some key distinctions with respect to the nature of the resource provided. The two primary benefit streams from demand side management programs are:

- **Energy (kWh)** – The generation of electrical power over a fixed period of time. The avoided cost of energy is largely the cost of the fuel not burned in the marginal generating unit.
- **Capacity (kW)** – Capacity is the ability to provide energy when needed and ensures that there will be sufficient resources to meet peak loads.

The primary objective of energy efficiency programs is to save energy. To the extent that the affected end-uses operate coincident with the system peak, energy efficiency measures will also provide capacity benefits. Demand response programs like Peak Saver and Power Saver are designed to provide capacity benefits. Their value lies in being able to reduce load quickly to balance the demand on the grid if needed. Demand response events typically result in net energy savings because the increased consumption following an event does not totally offset the reduced usage during an event. However, the distribution of benefits across resources is dominated by capacity.

Table 17 shows the energy and capacity benefits for the two demand response programs in 2021. Energy benefits amounted to less than 1 percent of Utility Cost Test (UCT) benefits, while capacity benefits accounted for more than 99 percent of the UCT benefits. This is very different from PNM's energy efficiency programs, where capacity accounts for less than half of UCT benefits.

Table 17: 2021 Demand Response Program Benefits

Program	Energy Benefit ($1,000)	Capacity Benefit ($1,000)	Percent Capacity
Power Saver	$4.97	$4,398.90	99.89%
Peak Saver	$2.93	$2,258.66	99.87%
Energy Efficiency Programs	$41,248.32	$39,240.63	48.35%

Another important distinction between energy efficiency and demand response is that demand response is a dispatchable resource and energy efficiency is not. When PNM supports an energy efficiency measure, the demand savings will remain present until the equipment reaches the end of its useful life. Demand response programs such as Peak Saver and Power Saver are event-based resources that can be dispatched when needed. A critical thing to understand about dispatchable demand response resources is that they provide capacity benefits even if no events are called in a summer. How often demand response is dispatched and which units in the stack are displaced have almost no material impact on the cost effectiveness of demand response programs. In summer 2021, both demand response programs were dispatched two times. PNM's system was less constrained in summer 2021 than in summer 2020—when the western United States faced severe heat waves and PNM called the Peak Saver and Power Saver programs 10 days each.

To provide additional context, the evaluation team reviewed PNM's most recent Integrated Resource Plan (IRP)[10] to summarize how demand side management resources fit into resource planning.

PNM has a summer peak load forecast of approximately 2,000 MW. This does not mean that each summer, peak loads will equal 2,000 MW, because weather plays an important role in electric demand. Figure 67 illustrates this relationship using PNM system loads (2015-2020) and weather records from KABQ's weather station in Albuquerque. PNM is clearly a summer-peaking utility, with maximum summer loads that are 20 to 30 percent higher than winter loads each year.

[10] PNM 2020-2040 Integrated Resource Plan. https://www.pnmforwardtogether.com/assets/uploads/PNM-2020-IRP-FULL-PLAN-NEW-COVER.pdf

System planners must design the system without knowing what weather conditions will be and ensure reliability even in extreme weather years. In addition to securing resources to meet forecasted demand, PNM planners maintain a reserve margin of resources above and beyond forecasted demand to ensure expected levels of reliability. In the 2020 IRP, PNM proposed a minimum reserve margin of 18 percent, an increase from the prior 13 percent. This means that although peak demand is forecast at 2,000 MW, planners need at least 2,360 MW of capacity to satisfy resource requirements. If the peak load for a summer is actually 2,000 MW and no resources experience outages or other disruptions, this means the 360 MW of capacity could go unused for the year.

Figure 67: Daily Maximum PNM System Load and Temperature by Year

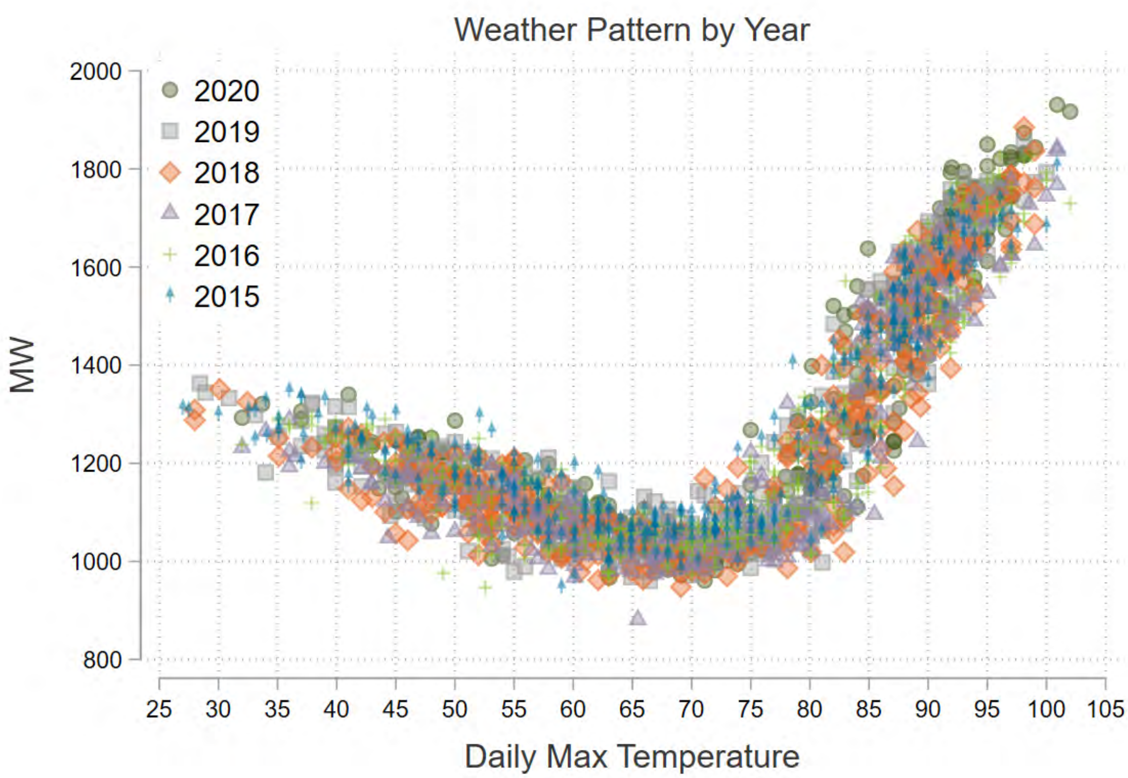
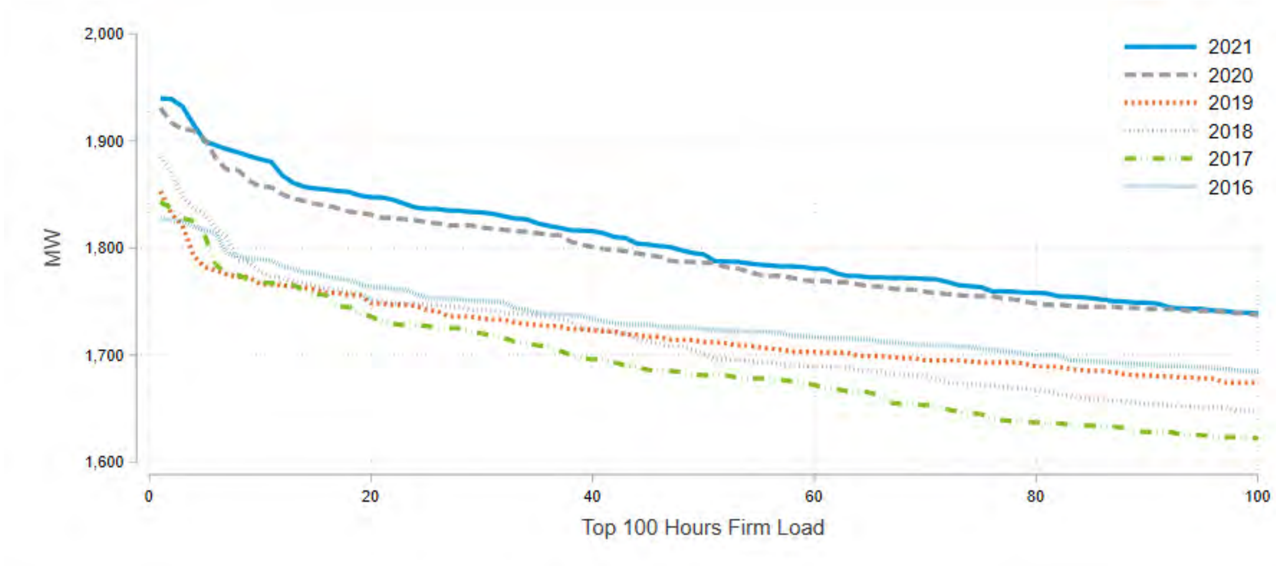


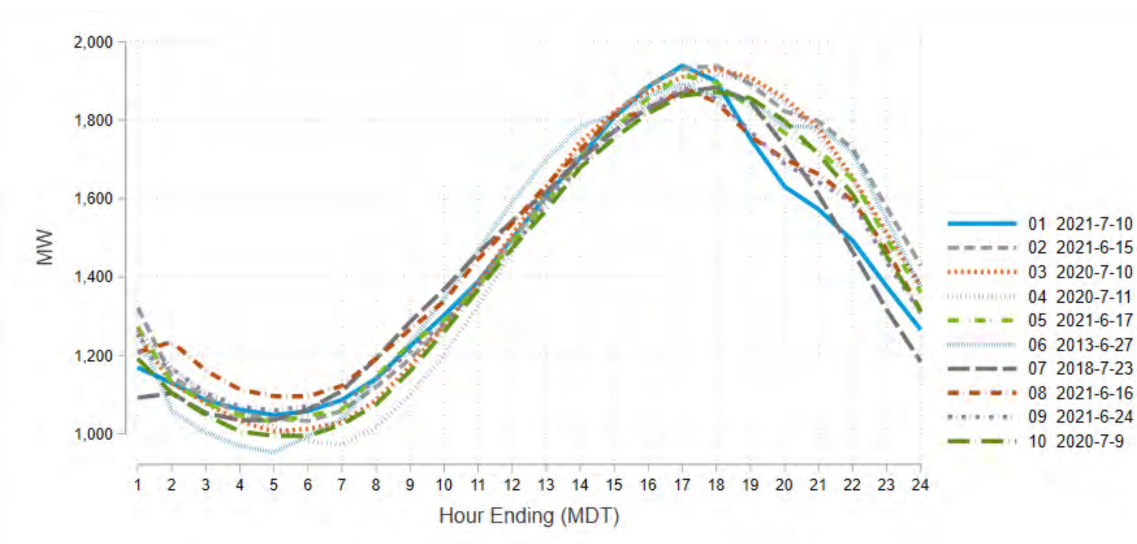
Figure 68 provides annual load duration curves for the top 100 hours of each year. Even within this very narrow portion of the year (1.1% of the hours in a year), the load duration curve has a very steep slope. In 2021, there was a 56 MW difference between the top hour and the tenth-highest load hour for the year. The nine highest load hours occurred on three days (June 15, June 17, and July 10), and system load did not exceed 1,885 MW on any other day.

Figure 68: Top 100 Hour Load Duration Curves 2016-2021



Dispatchable summer capacity resources such as the Peak Saver and Power Saver programs (which are only available in the summer) can be a good fit for the PNM system because peaks occur exclusively in the summer and are focused on specific afternoon and early evening hours. **Error! Reference source not found.** shows PNM's top 10 system load days of the last 10 years. The top two load days, and five of the top nine load days, were in 2021. From 2012 to 2017, the annual peak occurred at hour ending 17 (4:00 p.m. to 5:00 p.m. MDT) on a weekday. In 2018, 2019, and 2020, the system peaked one hour later at hour ending 18 (5:00 p.m. to 6:00 p.m. MDT). In 2021, the annual peak occurred at hour ending 17 (4:00 p.m. to 5:00 p.m. MDT).

Figure 69: Top 10 System Load Days 2012-2021



The reserve margin requirement is above and beyond the forecasted top hour. A supply-side resource such as a natural gas peaking plant built to satisfy peaks plus reserve margin would operate very infrequently—which is not a cost-effective way to operate a power plant. Furthermore, PNM established a goal to be carbon-free by 2040. A fossil fuel peaking resource would be both economically challenged and work against PNM's stated goals. Demand response resources work best when dispatched infrequently because it reduces participant fatigue and limits the financial incentive the utility needs to provide. Demand response programs such as Peak Saver and Power Saver are both aligned with PNM's environmental goals and avoid the costly capital investments of new generation resources.

The Peak Saver and Power Saver programs, however, also have several limitations, as described in the PNM 2020 IRP. Specifically, demand response programs can only be dispatched for several hours at a time (events have historically been four hours in duration) and neither Peak Saver nor Power Saver can be called on weekends. In addition, page 112 of the 2020 IRP indicates that the effective load carrying capacity (ELCC) of demand response programs is expected to decrease as additional demand response capacity is deployed within PNM's service territory.

Like most vertically integrated utilities, PNM treats energy efficiency and demand response differently in its demand forecast and resource stack. Incremental energy efficiency (because it is not dispatchable) lowers the energy and demand forecast. Demand response programs (because they are dispatchable) are listed alongside power plants as resources available to meet demand. Similar to traditional supply-side resources, demand response programs have a position in the dispatch stack. Although there is no fuel cost associated with demand response programs, there is a definite relationship between how often demand response participants are dispatched and the cost of the resource.

The Evergreen team understands that demand response dispatch has a two-part trigger:

1. If the day-ahead temperature forecast is 96°F or higher.
2. A day-of assessment by the Power Operations and Whole Power Marketing departments to assess transmission/capacity constraints or generation issues. These groups also consider participant fatigue and will decide to not dispatch if there are no constraints.

The value in load management programs lies in being able to dispatch the resources when needed, and PNM staff are in the best position to determine when the assets are needed from an operational standpoint. The maximum temperature on June 14, 2021 at KABQ was 103° Fahrenheit (F) so the decision not to dispatch was likely operations-driven. The temperature on July 10 was 99°F but occurred on a Saturday, and so demand response programs were not able to be called on that day. Demand response programs were called for a total of two events in June and August during the summer of 2021.

Because the capacity benefits are the dominant benefit stream for demand response programs, the primary research question for evaluation is "what kW reduction can each program be expected to provide if dispatched during system peak conditions?" This is why readers will note that the evaluation results in the Power Saver and Peak Saver impact results subchapters focus on inferences about expected, or *ex ante*, impacts at peaking conditions rather than simple averages of observed impacts during 2021 events. We analyzed the last six summers of Power Saver results to develop a time-temperature matrix and estimate the expected impact from 5:00 p.m. to 6:00 p.m. at 100°F. Our verified savings analysis of PNM's load management program performance estimates approximately 56 MW of load reduction capability across Power Saver and Peak Saver at the system level.

The avoided cost of capacity value used to monetize capacity benefits from demand side management programs is $129/kW-year. This value is consistent with projections the evaluation team has seen in other jurisdictions of the cost a new combined-cycle natural gas plant would need in order to recover its capital investment and fixed costs, given reasonable expectations about future cost recovery over its economic life.[11] The underlying premise is that the availability of PNM's demand response programs is allowing the utility to defer or avoid the construction or purchase of additional generation capacity. Indeed, page 110 of the 2017 IRP stated: "*Without the demand savings from the programs, 40 MW of additional gas peaking capacity is needed in 2018 and another 41 MW in 2020.*"[12] This statement is consistent with our 2021 verified savings analysis.

Looking forward, the current Power Saver and Peak Saver programs are governed by a five-year contract that expires in 2023, with the option for extension. The 2020 IRP considered extensions of both programs beyond 2023, but ultimately did not select either program for extension in its two preferred plans. The 2020 IRP did, however, opt to extend the relatively new demand response programs enacted with the retirement of the San Juan Generating Station. In the near term, however, both the Power Saver and Peak Saver programs will continue to provide load reduction capability during summer peak periods.

Specific details on the Power Saver and Peak Saver programs are presented in the following two sections.

[11] In a low-carbon planning environment such as that conducted by PNM for the 2020 IRP in accordance with the New Mexico Energy Transition Act, an energy storage device or combustion turbine may be more appropriate alternative sources of generation capacity.

[12] PNM 2017 Integrated Resource Plan. https://www.pnm.com/documents/396023/396193/PNM+2017+IRP+Final.pdf/eae4efd7-3de5-47b4-b686-1ab37641b4ed?t=1498845724233

6 Power Saver Program

Power Saver is a direct load control program offered to residential, small commercial (< 50 kW), and medium commercial (50 kW–150 kW) Public Service New Mexico (PNM) customers. To facilitate load control, participants must have a Digital Control Unit (DCU) device attached to the exterior of their air conditioning unit. This device is capable of receiving a radio signal that will turn off the unit's compressor for an interval of time. Such signals are typically sent on the hottest weekday afternoons of the summer, with the goal being to reduce peak demand. Residential and small commercial participants receive an annual $25 incentive for their participation. Medium commercial participants receive an annual incentive of $9 per ton of refrigerated air conditioning. A residential smart thermostat component was added to the program in 2018 and a residential bring your own thermostat ("BYOT") program was added in 2020. Unlike the DCU components, load curtailment for the two thermostat components is achieved via communication with the Wi-Fi-enabled thermostat.

There were two Power Saver events during the summer 2021 demand response season, which began May 15 and ended September 30, 2021. Table 18 provides some information on these two 2021 events. All DCU events used an adaptive 50 percent cycling strategy where curtailment is based on the runtime in the previous hour. Note that the event start times and end times are in Mountain Daylight Time (MDT).

The realized gross energy savings is 124,300 kWh and the realized gross demand savings is 34,100 kW.

Table 18: 2021 Power Saver Event Summary

Date	Day of Week	Start Time (MDT)	End Time (MDT)	Daily High at KABQ (F)
6/15/2021	Tuesday	3:00 PM	7:00 PM	97
8/09/2021	Monday	2:00 PM	6:00 PM	94

Shortly after the conclusion of the summer 2021 season, Itron provided the Evergreen team with a series of datasets for the evaluation. These files included:

- For Residential DCU and Small Commercial sites, five-minute load data from 5/15/2021 to 8/11/2021;
- For Medium Commercial DCU sites, five-minute load data from 5/15/2021 to 10/01/2021;

- For Residential DCU and Small Commercial sites, a measurement and verification (M&V) list that provided the location type (residential or commercial), the group (control or curtailment), and/or the dates each load control device was active;
- For Medium Commercial sites, an M&V list that provided the dates each load control device was active; and
- For the Two-Way Smart Thermostat and BYOT groups, five-minute runtime data from 5/15/2021 to 9/30/2021.

The Evergreen team also received Itron's Power Saver impact evaluation report, which detailed the methods Itron employed in calculating customer baselines (CBLs) for the five different demand response program offerings. A CBL is an estimate of what participant loads would have been absent the demand response event dispatch. For each demand response program offering, the report also showed the load impact, which is the difference between the CBL and the metered load, for each five-minute interval of each curtailment day. The key steps in the Evergreen-verified savings analysis were:

1. For each demand response program offering, reproduce the performance estimates calculated by Itron using the contractually-agreed upon CBL method.
2. Modify the CBL methodology and produce *ex post* estimates of what the per-device impact was during the 2021 demand response season.
3. Where possible, leverage additional historical data from 2015 through 2021 to produce *ex ante* estimates of what the per-device impact at peaking conditions (5:00 p.m. to 6:00 p.m. at 100°F) will be in future summers.
4. Scale the per-device estimates by the number of active program devices to calculate the aggregate load reduction capability (MW) of the Power Saver program.

Table 19 and Table 20 summarize our findings for residential and commercial segments, respectively. The main driver in the difference between Itron and Evergreen load reduction estimates is that Itron commonly summarized impacts with the maximum (e.g., the largest five-minute impact in a one-hour interval is the impact for that hour), whereas the Evergreen team summarized impacts with an average. Multiplying our per-device reduction estimates by the number of devices in each class leads to a 2021 average total estimated load reduction of approximately 26.46 MW, 1.1 MW, 0.16 MW, 3.35 MW, and 3.38 MW for the Residential DCU, Two-Way Smart Thermostat, BYOT, Small Commercial, and Medium Commercial segments respectively. In aggregate, the average 2021 performance was 34.44 MW. This is approximately 70 percent of Itron's estimate for the 2021 season (50.02 MW). After making an online adjustment for the thermostat groups (82% for Two-Way Smart Thermostats and 85% for BYOT) and an operability adjustment for the other three segments (87%), the aggregate Evergreen-calculated impacts for 2021 are 29.89 MW (compared to 43.25 MW from Itron after adjustment).

The Evergreen team used Power Saver results from 2015-2021 to estimate the load relief capability under extreme conditions. At 100 percent operability, we estimate the program is capable of delivering 39.23 MW of load reduction under planning conditions of 100°F between 5:00 p.m. and 6:00 p.m. MDT. Of the estimated 39.23 MW of load reduction capability, 33.88 MW comes from the Residential DCU segment, 1.44 MW comes from the Two-Way Smart Thermostat segment, 0.17 MW comes from the BYOT segment, and 2.45 MW and 1.29 MW come from the Small and Medium Commercial segments, respectively. Factoring in the operability/online adjustments, the aggregate program can provide 34.05 MW of load relief.

Table 19: High Level Results – Residential

		Unit	Residential DCU		Two-Way Smart Thermostats		BYOT Smart Thermostats	
			Measured	Adjusted	Measured	Adjusted	Measured	Adjusted
Number of Devices Installed		#	46,424	46,424	722	722	214	214
	5-year Rolling Average kW Factor	kW / device[13]	0.71	0.62	1.39	1.14	1.62	1.38
	5-year Rolling Average kW Factor	Total MW	32.96	28.68	1.00	0.87	0.35	0.30
	2021 Load Reduction Estimate	kW / device	0.81	0.70	2.00	1.64	2.04	1.73
	2021 Load Reduction Estimate	Total MW	37.60	32.71	1.44	1.18	0.44	0.37
Evergreen	2021 Load Reduction Estimate	kW / device[14]	0.57	0.66	1.52	1.35	0.67	0.57
Evergreen	2021 Load Reduction Estimate	Total MW	26.46	23.02	1.10	0.900	0.15	0.12
Evergreen	Ex Ante Load Reduction Estimate[15]	kW / device	0.73	0.64	2.00	1.64	0.78	0.66
Evergreen	Ex Ante Load Reduction Estimate[15]	Total MW	33.88	29.48	1.44	1.18	0.17	0.14
Evergreen	2021 Energy Savings	kWh / device	1.02	0.89	6.71	5.50	3.11	2.64
Evergreen	2021 Energy Savings	Total MWh	94.70	82.40	9.69	7.95	1.33	1.13

[13] Based on conversations with PNM and the third-party M&V consultant, DSA, an operability percentage of 87 percent is applied to the 2021 kw factors for the Residential and Commercial DCU segments. Two-way Thermostats received 82 percent and BYOT received an 87 percent adjustment.

[14] Based on full active event hours.

[15] *Ex ante* program capability is reported in the 5:00 p.m.– 6:00 p.m. MDT hour at 100°F.

Table 20: High Level Results – Commercial

		Unit	Small Commercial		Medium Commercial	
			Measured	Adjusted	Measured	Adjusted
	Number of Devices Installed (Number of Locations)	#	4,906	4,906	3,280 (449)	3,280 (449)
Itron	5-year Rolling Average kW Factor	kW / device[16]	1.26	1.10	0.84	0.73
Itron	5-year Rolling Average kW Factor	Total MW	6.18	5.38	2.76	2.40
Itron	2021 Load Reduction Estimate	kW / device	1.06	0.92	1.63	1.42
Itron	2021 Load Reduction Estimate	Total MW	5.20	4.52	5.35	4.65
Evergreen	2021 Load Reduction Estimate	kW / device	0.68	0.59	1.03	0.90
Evergreen	2021 Load Reduction Estimate	Total MW	3.35	2.91	3.38	2.94
Evergreen	Ex Ante Load Reduction Estimate	kW / device	0.50	0.44	0.39	0.34
Evergreen	Ex Ante Load Reduction Estimate	Total MW	2.45	2.13	1.29	1.12
Evergreen	2021 Energy Savings	kWh / device	1.88	1.64	2.94	2.50
Evergreen	2021 Energy Savings	Total MWh	18.44	16.04	19.29	16.78

A detailed discussion of the impact estimation methods and results for each Power Saver customer class group is included in Appendix C.

[16] 2021 kW factors include a rolling average per-device result for 2016-2021. 2021 Small Commercial and Medium Commercial have an 87 percent operability adjustment applied. The 87 percent operability percentage was calculated as 85 percent multiplied by the number of DCU sites that have not been visited in the last two years plus 95 percent multiplied by the number of DCU sites that were visited in the last two years.

6.1 Power Saver Conclusions and Recommendations

After our review of the 2021 Power Saver program, the Evergreen team offers the following recommendations:

- *Ex post* impacts provide a helpful look at program performance, but for planning purposes, a consistent, weather-normalized value should be used. This issue was highlighted by the lack of extreme weather conditions during the summer 2021 demand response seasons. The Evergreen team recommends that *ex ante* program impacts from 5:00 p.m. to 6:00 p.m. MDT at 100°F, de-rated for operability, be used for reporting, cost-effectiveness, and planning.
- The Itron contract definition of capacity performance is upwardly biased by capturing favorable noise along with the program impact. If there is a chance to review the terms, we recommend collapsing to the hourly mean rather than the maximum.
- The connected load assumption used to convert air conditioner runtime to electric demand for the thermostat program components is high given the average air conditioner size in the region. It is also higher than the assumed value in the smart thermostat protocol of the New Mexico TRM. We revised the assumption for the *ex post* analysis of BYOT, but not for Two-Way Smart Thermostats, because Itron technicians record air conditioner nameplate information during installation of Two-Way smart thermostats. Currently the BYOT and Two-Way smart thermostat offerings represent a small fraction of Power Saver resource capability, but as they grow, it will be important to base the load impact calculations on sound assumptions.

7 Peak Saver Program

PNM offers the Peak Saver program to non-residential customers with peak load contributions of at least 50 kW. The program compensates participants for reducing electric load upon dispatch during periods of high system load. Peak Saver was implemented by Enbala in 2021, which managed the enrollment, dispatch, and settlement with participating customers. During the summer 2021 demand response season, there were 157 participating facilities and two demand response events. These events are summarized in Table 21.

Table 21: 2021 Peak Saver Event Summary

Date	Weekday	Participants	Start Time (MDT)	End Time (MDT)	Daily High at KABQ (F)
06/15/2021	Tuesday	157	3:00 PM	7:00 PM	97
08/09/2021	Monday	157	2:00 PM	6:00 PM	94

After the 2021 demand response season concluded, Enbala provided the Evergreen team with one-minute interval load data for each site in the Peak Saver population, as well as some workbooks with the performance metrics (10-minute capacity, average participant capacity, participant event capacity, and energy delivered) for each site/event combination. The interval data spanned a period from June 1 to August 10. The one-minute interval load data also included a field with load impacts calculated using a customer baseline (CBL) method detailed in the contract between PNM and Enbala. A CBL is an estimate of what participant loads would have been absent the demand response event dispatch. Load impacts are the difference between the CBL and the metered load during the event. The relevant CBLs were also in the one-minute load data.

With these data sources, the Evergreen team completed our verified savings analysis. The three key steps in the analysis were to:

1. Reproduce the performance estimates calculated by Enbala using the contractually-agreed upon CBL method;
2. Assess the accuracy of the contract CBL method by examining its ability to predict loads on non-event weekdays;
3. Modify the CBL methodology to reduce bias and calculate verified impacts for each event; and
4. Summarize average performance and discuss key drivers.

7.1 Validation of Settlement Calculations

The settlement calculations called for a "high 3-of-5" baseline with an uncapped, asymmetric day-of adjustment. The high 3-of-5 days were determined as follows:

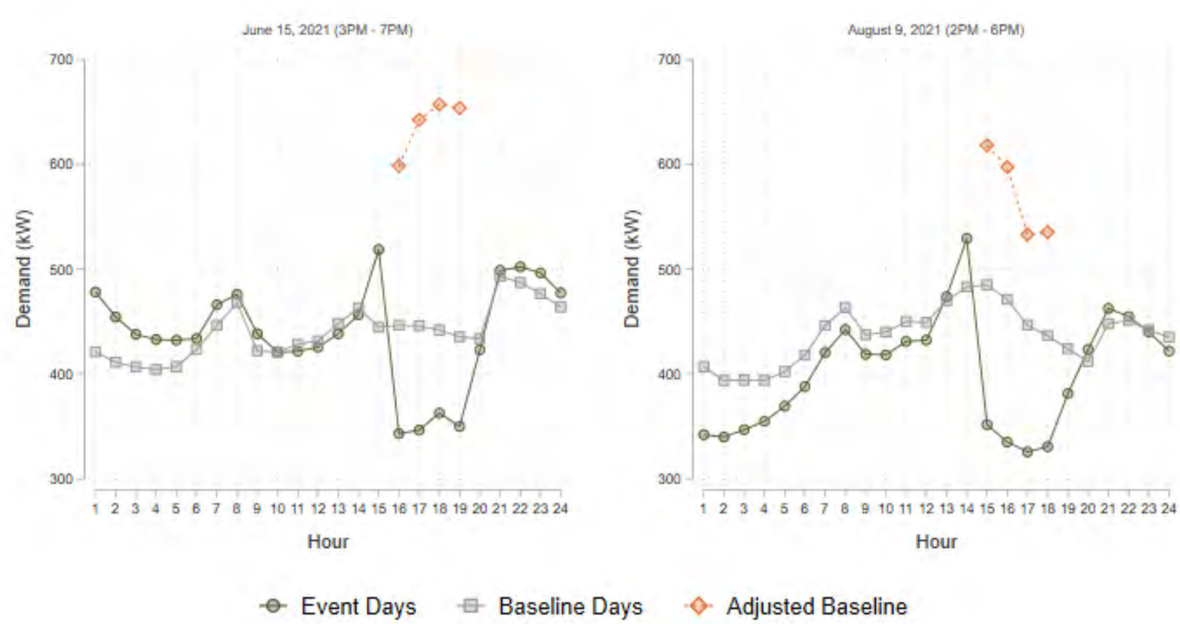
- Select the five non-holiday, non-event weekdays that immediately precede the event; and
- Out of those five days, pick the three days with the highest average demand during the hours in which the event occurred.

In the case of a tie, the day that is closer to the event day was selected as a baseline day. (This tie-breaking procedure was not laid out formally; rather, we discovered it when recreating Enbala's calculations.)

Our team was able to replicate nearly all of the settlement baselines. Across all sites and event hours, the average settlement baseline was 604.46 kW and the average Evergreen baseline was 604.52 kW. Any differences between the settlement baseline and our team's baseline were small, typically under a 0.01 percent difference with a couple of larger differences (up to 2%).

Figure 70 shows average hourly event day loads across the full population, average hourly loads on the high 3-of-5 baseline days, and average hourly baselines for the two different event intervals. Of the two event days, one had an event interval spanning from 3:00 p.m. to 7:00 p.m. (left panel). The other event was from 2:00 p.m. to 6:00 p.m. (right panel).

Figure 70: Peak Saver Loads and Baselines



After verifying that the baselines were calculated correctly, our team moved onto the performance metric calculations. The relevant performance metrics are:

- **10-Minute Participant Capacity Performance** – The difference between the CBL and the lowest actual electrical demand measured by a one-minute interval reading between eight and ten minutes after the start of an event.
- **Average Participant Capacity Performance** – The average difference between the CBL and the participant's actual electric demand beginning 10 minutes after the initiation of the event.
- **Participant Event Capacity Performance** – Weighted average of 10-Minute Participant Capacity Performance (40% weight) and Average Participant Capacity Performance (60% weight).
- **Energy Delivered** – The difference (in kWh) between the adjusted CBL and the metered load summed across all demand response event hours.

Using the settlement baselines, all performance calculations were replicated without problem. Previously, Enbala would zero out the 10-Minute Participant Capacity and the Average Participant Capacity if the Participant Event Capacity Performance was negative, but these values were not zeroed out this year. Per the settlement baselines, Table 22 shows portfolio performance metrics by date.

Table 22: Peak Saver Performance Metrics by Date

Date	10-Minute Participant Capacity (kW)	Average Participant Capacity (kW)	Participant Event Capacity Performance (kW)	Energy Delivered (kWh)
06/15/2021	41,701	45,716	44,332	181,889
08/09/2021	42,663	37,123	40,020	149,933
Average	**42,182**	**41,420**	**42,176**	**165,911**

7.2 Peak Saver Conclusions and Recommendations

After our review of the 2021 Peak Saver program, the Evergreen team offers the following recommendations:

- Make the multiplicative adjustment symmetric rather than asymmetric. As discussed in the assessment of CBL accuracy presented in Section **Error! Reference source not found.**, using an asymmetric adjustment results in an upwards bias in the baseline. Biasing the baseline inherently biases the performance metrics. The bias is greatly reduced when using a symmetric adjustment.

- Add a cap to the multiplicative adjustment factor. Otherwise, baselines are apt to approach unrealistic levels.
- Examine load data for solar patterns or pre-pumping/pre-cooling on event days. Pre-pumping/pre-cooling on event days is fine, but sites that do so should not receive the adjustment factor (or the adjustment factor should be based on weather rather than load). For sites with solar, consider using a smaller adjustment factor cap, using an additive adjustment, or removing the adjustment factor altogether.
- Compare demand response nominations to the average demand on typical summer afternoons. If any nominations seem too high, update them. (We will note that nominations for some sites do change throughout the summer.)
- PNM should also consider collecting all meter channels for sites with solar PV. This would allow the CBL to fully capture the load shape of sites that are net exporters during key times of day. It is possible that these sites reduced load and thus became larger exporters than they would have been on a non-event day, but the available data do not allow for a measurement. Also, an additive adjustment may work better than a multiplicative one for sites whose load can cross zero during the event period or adjustment window.

8 Cost Effectiveness Summary

Earlier chapters presented the UCT cost effectiveness results for those programs evaluated in 2021. This chapter presents a summary of the cost effectiveness calculations for all of the PY2021 PNM programs.

As discussed previously, in order to do the UCT calculation, the evaluation team obtained the following from PNM:

- Avoided cost of energy for Energy Efficiency and Demand Response (costs per kWh over a 20+ year time horizon);
- Avoided cost of capacity for Energy Efficiency and Demand Response (estimated cost of adding a kW/year of generation, transmission, and distribution to the system);
- Avoided cost of CO2 (estimated monetary cost of CO2 per kWh generated);
- Avoided transmission and distribution costs;
- Discount rate;
- Line loss factor; and
- Program costs (all expenditures associated with program delivery).

Additional considerations for the UCT as applied to the PNM programs:

- PNM does not quantify the avoided cost of transmission and distribution.
- PNM provided a levelized avoided cost of capacity, to which the discount rate was not applied further.
- The NMPRC allows for the benefits of low-income programs to be boosted by 20 percent to account for utility system economic benefits. PNM estimates the following proportions of low-income customers participate in their programs:
    - 100 percent of Low-Income Home Energy Checkup
    - 39 percent of Commercial Comprehensive - Multifamily
    - 100 percent of Easy Savings
    - 100 percent of Energy Smart
    - 40 percent of Home Works
- Program costs were broken into the following categories:
    - Administration
    - Promotion
    - Measurement & Verification
    - Rebates

- Third-Party Costs
- Market Transformation

The results of the UCT for all programs based on net realized savings are shown below in Table 23. Overall, the PY2021 portfolio was found to have a UCT ratio of 1.48.

The UCT for the Residential lighting program increased when compared to the UCT in PY2020 because the evaluation team did not truncate the EUL to account for the Tier 2 EISA standards. The UCT calculations use an EUL of 20 years for the Residential Lighting program.

Table 23: PY2021 Cost Effectiveness

Program	Utility Cost Test (UCT)
Res Comp – Refrigerator Recycling	0.60
Res Comp – Cooling & Midstream	0.19
Res Comp – Home Energy Checkup	0.29
Res Comp – Home Energy Checkup LI	0.40
Residential Behavioral HER	0.07
Residential Lighting	4.73
Commercial Comprehensive	1.28
Commercial Comprehensive - Multifamily	0.84
Easy Savings	1.67
Energy Smart (MFA)	0.72
New Home Construction	1.40
PNM Home Works	0.72
Commercial Behavioral SEM	0.25
PNM Power Saver	0.22
PNM Peak Saver	0.21
Overall Portfolio	**1.48**

Evaluation of the 2021 Public Service Company of New Mexico Energy Efficiency and Demand Response Programs

DRAFT Report - Appendices

March 11, 2022

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Appendix A: Commercial Comprehensive Participant Survey Instrument

Hello, my name is (your name) from Research & Polling, Inc. I am calling on behalf of PNM. I'm calling because our records show that you recently completed an energy efficiency project where you installed (measure 1) at your business located at (site address) and received a rebate through the PNM (rebate program). I'd like to ask a short set of questions about your experience with the (rebate program) program. Your time will help us improve this program for other customers like you. Are you the best person to talk to about the/these energy efficiency upgrade(s) and energy use at your firm?

Yes 1
No.......................... 2
Never installed 3

Q1-M1. (A 1) Our records show in 2019 your business got a rebate through PNM for installing (measure 1). Are you familiar with this project?

Yes 1
No 2
Never installed 3
Don't know 4

Q1a-M1. Our records show it was installed at (site address) in (site city). Is that correct?

Yes 1
No 2
Never installed 3

Q1b-M1. Where was (measure 1) installed? (Among those who installed measure 1 at a different location than PNM's records.)

[Data Processing Use Only] Q2-M1. (A 1a) Is there someone else at your company who would know about buying the (measure 1)?

Yes, transfer and go to intro 1
Yes, no transfer 2

Q3-M1. (A 2) Thinking about the (measure 1) for which you received a rebate, is the (measure 1) still installed in your facility?

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q4a-M1. (A 3) Was the (measure 1) removed? (Among those who do not currently have measure 1 installed at their facility.)

Yes, it was removed 01
No 02
Prefer not to answer 03
Don't know 99

Q4b-M1. (A 3) Was the (measure 1) never installed? (Among those who do not currently have measure 1 installed at their facility.)

Yes, never installed 01
Prefer not to answer 02
Don't know 99

Q5-M1. (A 3a) Why was the (measure 1) removed/never installed? (Among those who do not currently have measure 1 installed at their facility or never installed measure 1.)

Q6-M1. (A 4) Is the (measure 1) still functioning as intended? (Among those who currently have measure 1 installed.)

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q7-M1. (A 5) Did your firm use a contractor to install the (measure 1) or did internal staff do the work?

Contractor 01
Internal Staff 02
Prefer not to answer 03
Landlord.......................... 04
Don't know 99

Q8-M1. (A 6) Why did your firm choose to use internal staff instead of a contractor? (Among those who had internal staff install measure 1.)

Prefer not to answer 98
Don't know 99

Q1-M2. (A 1) Our records show in 2019 your business got a rebate through PNM for installing a (measure 2). Do you remember this? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Never installed 3
Don’t know 4

Q1a-M2. Our records show (measure 2) was installed at (site address) in (site city). Is that correct? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Never installed 3
Don't know 4

Q1b-M2. Where was (measure 2) installed? (Among those who received rebates for more than one measure and installed measure 2 at a different location than PNM's records.)

Q3-M2. (A 2) Thinking about the (measure 2) for which you received a rebate, is the (measure 2) still installed in your facility? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q4a-M2. (A 3) Was the (measure 2) removed? (Among those who received rebates for more than one measure and currently do not have measure 2 installed at their facility.)

Yes, it was removed 01
No 02
Prefer not to answer 03
Don't know 99

Q4b-M2. (A 3) Was the (measure 2) never installed? (Among those who received rebates for more than one measure and currently do not have measure 2 installed at their facility.)

Yes, never installed 01
Prefer not to answer 02
Don't know 99

Q5-M2. (A3a) Why was the (measure 2) removed/never installed? (Among those who received rebates for more than one measure and currently do not have measure 2 installed at their facility or never installed measure 2.)

Q6-M2. (A 4) Is the (measure 2) still functioning as intended? (Among those who received rebates for more than one measure and have measure 2 installed.)

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q7-M2. (A 5) Did your firm use a contractor to install the (measure 2) or did internal staff do the work? (Among those who received rebates for more than one measure and have measure 2 installed.)

Contractor 01
Internal Staff 02
Prefer not to answer 03
Don't know 99

Q8-M2. (A 6) Why did your firm choose to use internal staff instead of a contractor? (Among those who received rebates for more than one measure and had internal staff install measure 2.)

Prefer not to answer 98
Don't know 99

Q9-M2. (A 7) Were your (measure 1) and (measure 2) installed/purchased together as a single project or were these done separately? (Among those who received rebates for two measures.)

Together as one project 1
Separately 2
Prefer not to answer 3
Don’t know 4

Q1-M3. (A 1) Our records show in 2019 your business got a rebate through PNM for installing a (measure 3). Do you remember this? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Never installed 3
Don’t know 4

Q1a-M3. Our records show (measure 3) was installed at (site address) in (site city). Is that correct? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Never installed 3
Don’t know 4

Q1b-M3. Where was (measure 3) installed? (Among those who received rebates for more than one measure and installed measure 3 at a different location than PNM's records.)

Q3-M3. (A 2) Thinking about the (measure 3) for which you received a rebate, is the (measure 3) still installed in your facility? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q4a-M3. (A 3) Was the (measure 3) removed? (Among those who received rebates for more than one measure and currently do not have measure 3 installed at their facility.)

Yes, it was removed 01
No 02
Prefer not to answer 03
Don't know 99

Q4b-M3. (A 3) Was the (measure 3) never installed? (Among those who received rebates for more than one measure and currently do not have measure 3 installed at their facility.)

Yes, never installed 01
Prefer not to answer 02
Don't know 99

Q5-M3. (A3a) Why was the (measure 3) removed/never installed? (Among those who received rebates for more than one measure and currently do not have measure 3 installed at their facility or never installed measure 3.)

Q6-M3. (A 4) Is the (measure 3) still functioning as intended? (Among those who received rebates for more than one measure.)

Yes 1
No 2
Prefer not to answer 3
Don't know 4

Q7-M3. (A 5) Did your firm use a contractor to install the (measure 3) or did internal staff do the work? (Among those who received rebates for more than one measure.)

Contractor 01
Internal Staff 02
Prefer not to answer 03
Don't know 99

Q8-M3. (A 6) Why did your firm choose to use internal staff instead of a contractor? (Among those who received rebates for more than one measure and had internal staff install measure 3.)

Prefer not to answer 98
Don't know 99

Q9-M3. (A 7) Were your (measure 1), (measure 2) and (measure 3) installed/purchased together as a single project or were these done separately? (Among those who received rebates for three measures.)

Together as one project	1
Separately	2
Prefer not to answer	3
Don't know	4

Q10. (B 1) How did your company FIRST learn about the program?

Word of mouth (business associate, co-worker)	01
Utility program staff	02
Utility website	03
Utility bill insert	04
Utility representative	05
Utility advertising	06
Email from utility	07
Contractor/distributor	08
Building audit or assessment	09
Television Advertisement - Mass Media	10
Other mass media (sign, billboard, newspaper/magazine ad)	11
Event (conference, seminar, workshop)	12
Online search, web links	13
Participated or received rebate before	14
No way in particular	98
Don't know	99

Q11. (B 2) What other sources did your company use to gather information about the program? ... Were there any others?

Word of mouth (business associate, co-worker)	01
Utility program staff	02
Utility website	03
Utility bill insert	04
Utility representative	05
Utility advertising	06
Email from utility	07
Contractor/distributor	08
Building audit or assessment	09
Television Advertisement - Mass Media	10
Other mass media (sign, billboard, newspaper/magazine ad)	11
Event (conference, seminar, workshop)	12
Online search, web links	13
Participated or received rebate before	14
None	98
Don't know	99

Q12. (B 3) Of all the sources you mentioned, which did you find most useful in helping you decide to participate in the program? (Among those who mentioned additional sources used to gather information.)

None in particular	97
Prefer not to answer	98
Don't know	99

[Data Processing Use Only] POLLER NOTE: Was Measure Installed?

Yes 1
No 2

Q13a. (C 1) Did the equipment that your firm installed replace existing equipment?

Yes (i.e. all equipment was replacing old equipment) 1
Some equipment was a replacement, and some was a new addition 2
No (i.e. all equipment was an addition to existing equipment) 3
Prefer not to answer 4
Don't know 5

Q13b. (C 1) Is the equipment that your firm purchased intended to replace existing equipment? (Among those who did not install the measure.)

Yes (i.e. all equipment is replacing old equipment) 1
Some equipment is a replacement, and some was a new addition 2
No (i.e. all equipment is an addition to existing equipment) 3
Prefer not to answer 4
Don't know 5

Q14a. (C 2) Was the replaced equipment ... (Among those who installed the measure and some or all new equipment was replacing old equipment.)

Fully functional and not in need of repair? 1
Functional, but needed minor repairs? 2
Functional, but needed major repairs? 3
Not functional? 4
Prefer not to answer 5
Don't know 6

Q14b. (C 2) Is the equipment you intend to replace ... (Among those who did not install the measure.)

Fully functional and not in need of repair? 1
Functional, but needs minor repairs? 2
Functional, but needs major repairs? 3
Not functional? 4
Prefer not to answer 5
Don't know 6

Q15a. (C 3a) About how old, in years, was the equipment prior to replacement? (Among those who installed the measure, and some or all new equipment was replacing old equipment, and the replaced equipment was functional.)

Number of years ______
Prefer not to answer 499
Don't know 500

Q15b. (C 3b) About how old, in years, is the equipment you are replacing? (Among those who did not install the measure, some or all new equipment was replacing old equipment, and the replaced equipment was functional.)

Number of years ______
Prefer not to answer 499
Don't know 500

Q16. (C 4) How much longer (in years) do you think your old equipment would have lasted if you had not replaced it? (Among those who installed the measure, and some or all new equipment was replacing old equipment, and the replaced equipment was functional.)

Less than a year 1
1 - 2 years 2
3 - 5 years 3
6 - 10 years 4
More than 10 years 5
Prefer not to answer 6
Don't know 7

Q17. (C 5a) Next I will read a list of reasons your firm may have considered when you decided to conduct your project. For each one, please tell me if it was not at all important, a little important, somewhat important, very important or extremely important. How important was reducing environmental impact of the business on your decision to conduct your project?

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

Q18. (C 5b) How important was upgrading out-of-date equipment on your decision to conduct your project?

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

Q19. (C 5c) How important was improving comfort at the business on your decision to conduct your project?

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

[Data Processing Use Only] POLLER NOTE: Was HVAC Measure Installed?

Yes 1
No 2

Q20. (C 5d) How important was <u>improving air quality</u> on your decision to conduct your project? (Among those who installed HVAC measure.)

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

Q21. (C 5e) How important was <u>receiving the rebate</u> on your decision to conduct your project? (Among those who did not use direct install.)

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

Q22. (C 5f) How important was <u>reducing energy bill amounts</u> on your decision to conduct your project?

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

[Data Processing Use Only] POLLER NOTE: Did respondent answer "Contractor" in Q.7?

Yes 1
No 2

Q23. (C 5g) How important was <u>the contractor recommendation</u> on your decision to conduct your project? (Among those who used a contractor to install the measure.)

1 - Not Important At All 1
2 - A Little Important 2
3 - Somewhat Important 3
4 - Very Important 4
5 - Extremely Important 5
Don't Know/Won't Say 6

[Data Processing Use Only] POLLER NOTE: Did respondent answer "Contractor" in Q.7?

Yes 1
No 2

Q24. (D 1a) Next, I'm going to ask you to rate the importance of each of the following factors on your decision to determine how energy efficient your project would be. Please rate the importance of each of these factors in determining your project's energy efficiency level using a scale from 0 to 10, where 0 means not at all important and 10 means extremely important. Please let me know if the factor is not applicable. How important was the contractor who performed the work in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q25. (D 1b) How important was the dollar amount of the rebate in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q26. (D 1c) How important was technical assistance received from PNM staff in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02

3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q27. (D 1d) How important was endorsement or recommendation by your PNM account manager or other PNM staff in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q28. (D 1e) How important was information from PNM marketing or informational materials in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q29. (D 1f) How important was previous participation in a PNM program in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10 – Extremely important	10
Don't know	97
Prefer not to answer	98
N/A	99

Q30. (D 1g) How important was endorsement or recommendation by a contractor in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10 – Extremely important	10
Don't know	97
Prefer not to answer	98
N/A	99

Q31. (D 1h) How important was endorsement or recommendation by a vendor or distributor in determining how energy efficient your project would be? (Among those who did not use direct install.)

0 – Not important at all	00
1	01
2	02
3	03
4	04
5	05
6	06
7	07
8	08
9	09
10 – Extremely important	10
Don't know	97
Prefer not to answer	98
N/A	99

Q33. (D 1j) Now, I would like to read you some factors that are not related to the rebate program. Using the same scale from 0 to 10, where 0 means not at all important and 10 means extremely important., please rate the following non program factors' importance in determining your project's energy efficiency. How important was the age or condition of the old equipment in determining your project's energy efficiency? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q34. (D 1k) How important was corporate policy or guidelines in determining your project's energy efficiency? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q35. (D 1l) How important was minimizing operating cost in determining your project's energy efficiency? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08

9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q36. (D 1m) How important was scheduled time for routine maintenance in determining your project's energy efficiency? (Among those who did not use direct install.)

0 – Not important at all 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 – Extremely important 10
Don't know 97
Prefer not to answer 98
N/A 99

Q37. (D 2) Of the items I just asked you about, think of the program factors as relating to assistance provided by the utility, such as the rebate, marketing from PNM, recommendation by a contractor and technical assistance from PNM. I also asked you about some non-program factors, which included the age and condition of the old equipment, company policy, operating costs and routine maintenance.

If you had to divide 100% of the influence on your decision to determine how energy efficient your new equipment would be between the PNM program and non-program factors, what percent would you give to the importance of the program factors? (Among those who did not use direct install.)

Percentage Program Factors .... ______%
Prefer not to answer 499
Don't know 500

Q38. (D 3) And what percent would you give to the importance of the non-program factors? (Among those who did not use direct install and provided a percentage for the importance of program factors on their decision.)

Percentage Non-Program Factors .... ______%
Prefer not to answer 499
Don't know 500

Q39. (D 5) Did you first learn about the (rebate program) BEFORE or AFTER you decided how energy efficient your equipment would be? (Among those who did not use direct install.)

Before 1

After 2
Prefer not to answer 3
Don't know 4

Q40. (D 6) Using a scale from 0 to 10, where 0 means not at all likely and 10 means extremely likely, please rate the likelihood that you would have installed the same equipment with the exact same level of energy efficiency if the (rebate program) was not available. (Among those who did not use direct install.)

0 - Not at all likely 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 - Extremely likely 10
Don't know 97
Prefer not to answer 98
N/A 99

Q41. (D 7) You just rated your likelihood to install the same equipment without any assistance from the program as a(n) (response from Q40) out of 10. Earlier, when I asked you to rate the importance of each program factor on your decision, the highest rating you gave was a (highest rating/s from Q24-Q32) out of 10 for the importance of (re-read question wording for highest responses Q24-Q32). Can you briefly explain why you were likely to install the equipment without the program, but also rated the program as highly influential in your decision? (Among those who did not use direct install, stated that they were 08, 09, or 10 as extremely likely to install the same equipment if the rebate program was not available, and rated one or more program factors as 08, 09, or 10 on the previous list.)

Q42. (D 8) You just rated your likelihood to install the same equipment without any assistance from the program as a(n) (response from Q40) out of 10. Earlier, when I asked you to rate the importance of each program factor on your decision, the highest rating you gave was a(n) (lowest rating/s from Q24-Q32) out of 10. Can you briefly explain why you said you were not likely to install the equipment without help from the program, yet did not rate the program as highly influential in your decision? (Among those who did not use direct install, stated that they were 00, 01, or 02 as not at all likely to install the same equipment if the rebate program was not available, and rated one or more program factors as 00, 01, or 02 on the previous list.)

Q43. (D 9) If the (rebate program) was not available, would you have delayed starting the project to a later date? (Among those who did not use direct install.)

Yes 1
No 2
Would not have done the project at all 3

Prefer not to answer 4
Don't know 5

Q44. (D 10) Approximately how much later would you have done the project if the (rebate program) was not available? Would it have been … (Among those who did not use direct install and stated they would have delayed starting the project if the rebate program was not available.)

Within one year 1
Between 12 months and less than 2 years 2
Between 2 years and 3 years 3
Greater than 3 years 4
Would not have installed the equipment at all 5
Prefer not to answer 6
Don't know 7

Q45. (D 11) Using a scale from 0 to 10, where 0 means not at all likely and 10 means extremely likely, please rate the likelihood that you would have conducted this project within 12 months of when you actually completed this project if the (rebate program) was not available. (Among those who did not use direct install and stated they would have delayed starting the project within one year if the rebate program was not available.)

0 - Not at all likely 00
1 01
2 02
3 03
4 04
5 05
6 06
7 07
8 08
9 09
10 - Extremely likely 10
Don't know 97
Prefer not to answer 98
N/A 99

Q46. (E 1a) For each of the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. PNM as an energy provider.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q47. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with PNM as an energy provider.)

Q48. (E 1b) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The rebate program overall.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q49. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with the rebate program overall.)

Q50. (E 1c) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The equipment installed through the program.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q51. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with the equipment installed through the program.)

[Data Processing Use Only] POLLER NOTE: Was installation done by "Contractor" in Q.7?

Yes 1
No 2

Q52. (E 1d) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The contractor who installed the equipment. (Among those who used a contractor to do the installation.)

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7

Don't know 8

Q53. Can you tell me why you gave that rating? (Among those who used a contractor to do the installation and were Very Dissatisfied or Somewhat Dissatisfied with the contractor who installed the equipment.)

Q54. (E 1e) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The overall quality of the equipment installation. (Among those who used a contractor to do the installation.)

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q55. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with the overall quality of the equipment installation.)

Q56. (E 1f) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The amount of time it took to receive your rebate for your equipment. (Among those who did not use direct install.)

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q57. Can you tell me why you gave that rating? (Among those who did not use direct install and were Very Dissatisfied or Somewhat Dissatisfied with the amount of time it took to receive the rebate for the equipment.)

Q58. (E 1g) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The dollar amount of the rebate for the equipment. (Among those who did not use direct install.)

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4

Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q59. Can you tell me why you gave that rating? (Among those who did not use direct install and were Very Dissatisfied or Somewhat Dissatisfied with the dollar amount of the rebate for the equipment.)

Q60. (E 1h) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. Interactions with PNM.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q61. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with interactions with PNM.)

Q62. (E 1I) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The overall value of the equipment your company received for the price you paid.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q63. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with the overall value of the equipment their company received for the price they paid.)

Q64. (E 1j) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The amount of time and effort required to participate in the program.

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3

Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q65. Can you tell me why you gave that rating? (Among those who were Very Dissatisfied or Somewhat Dissatisfied with <u>the amount of time and effort required to participate in the program.</u>)

Q66. (E 1k) For the following, please tell me if you were very dissatisfied, somewhat dissatisfied, neither satisfied nor dissatisfied, somewhat satisfied or very satisfied. The project application process. (Among those who did not use direct install.)

Very Dissatisfied 1
Somewhat Dissatisfied 2
Neither Satisfied nor Dissatisfied 3
Somewhat Satisfied 4
Very Satisfied 5
Not applicable 6
Prefer not to answer 7
Don't know 8

Q67. Can you tell me why you gave that rating? (Among those who did not use direct install and were Very Dissatisfied or Somewhat Dissatisfied with <u>the project application process.</u>)

Q68. (E 2) Do you have any recommendations for improving the (rebate program) program?

No 97
Prefer not to answer................ 98
Don't know 99

Q69. (Gen 1) Finally, we have a few questions about your firm for classification purposes only. Do you own or lease your building where the project was completed?

Own 01
Lease/Rent 02
Prefer not to answer 03
Don't know 99

Q70. (Gen 1a) Does your firm pay your PNM bill, or does someone else (e.g., a landlord)? (Among those who answered that they own, lease, or rent the building where the project was completed.)

Pay own 1
Someone else pays 2
Prefer not to answer 3
Don’t know 4

Q71. (Gen 2) Approximately what is the total square footage of the building where the project was completed?

Less than 1,000 square feet	1
Between 1,000 and 1,999 square feet	2
Between 2,000 and 4,999 square feet	3
Between 5,000 and 9,999 square feet	4
Between 10,000 and 49,999 square feet	5
Between 50,000 and 99,999 square feet	6
100,000 square feet or more	7
Prefer not to answer	8
Don’t know	9

Q72. (Gen 3) Approximately what year was your firm’s building built?

1939 or earlier	01
1940 to 1949	02
1950 to 1959	03
1960 to 1969	04
1970 to 1979	05
1980 to 1989	06
1990 to 1999	07
2000 to 2009	08
2010 and later	09
2020	10
Prefer not to answer	11
Don't know	12

Q73. (Gen 4) Approximately, How many full-time equivalent (FTE) employees does your company currently have in the state of New Mexico?

Less than 5	01
5-9	02
10-19	03
20 - 49	04
50 - 99	05
100 - 249	06
250 - 499	07
500 - 999	08
1,000 - 2,500	09
More than 2,500	10
Prefer not to say	11
Don’t know	12

Q74. (Gen 5) And this is my last question. How long has your company been in business?

Number of years______

Appendix B: General Population Low-Income Survey Instrument

Thank you for taking our survey! Your responses will help PNM better understand the lives, experiences and needs of New Mexico households like yours. As a thank you for taking this survey, we will be providing a $10 Amazon gift card upon completion. This survey should take less than 10 minutes to complete.

The questions are for research purposes only. We are not selling anything, and we will not give any of your specific responses to anyone outside the research team. Your responses will remain anonymous and we will only be sharing study results that are summarized for all families that are taking this survey.

A. Screener Questions

Q1. Do you own or rent your home?

a) Own
b) Rent
c) Don't know

Q2. What type of building do you live in?

a) Single family home
b) Condo or townhome
c) Apartment in a small multifamily building with 2-10 units in building
d) Apartment in a medium multifamily building with 11-39 units in building
e) Apartment in a large multifamily building with 40+ units in building
f) Don't know

Q3. (IF RENT) How comfortable would you be approaching your landlord to talk about replacing a poorly functioning appliance?

a) Extremely comfortable
b) Very comfortable
c) Somewhat comfortable
d) Not at all comfortable

Q4. Does anyone in your household speak a language other than English?

a) Yes
b) No [Skip to Q6]
c) Don't know [Skip to Q6]

Q5. What are ALL of the languages that are spoken in your household?

a) English
b) Spanish
c) Mandarin
d) Cantonese
e) Tagalog/Filipino

f) Korean
g) Vietnamese
h) German
i) Chinese
j) Japanese
k) Other (please specify):_______________
l) Don't know

B. Building Characteristics

Next, we would like to find out more about the characteristics of the building you live in.

Q6. How many years have you lived at your current residence?
# of years: ____

Q7. Approximately when was your home/building built?
a) Before 1960
b) 1961 to 1970
c) 1971 to 1980
d) 1981 to 1990
e) 1991 to 2000
f) 2001 to 2010
g) 2011 to 2020
h) 2021 or newer
i) Don't know

Q8. What is the square footage of your home/apartment?
a) Under 1,000 sq ft
b) 1000 to 1,499 sq ft
c) 1500 to 1,999 sq ft
d) 2000 to 2,499sq ft
e) 2500 to 2,999 sq ft
f) 3,000 to 3,999 sq ft
g) More than 4,000 sq ft
h) Don't know

Q9. How many bedrooms are there?
# of bedrooms: _____

Q10. Which of these do you use to cool your home? Select all that apply.
a) No cooling / windows only
b) Central AC
c) Heat pump
d) Ceiling fan
e) Portable fan
f) Window AC
g) Swamp cooler

h) Other (please specify):______________
i) Don't know

Q11. [IF Central AC] Approximately how old is your air conditioner?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) Don't know, but it was here when I moved in
h) Don't know

Q12. [IF Heat Pump] Approximately how old is your heat pump?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) Don't know, but it was here when I moved in
h) Don't know

Q13. Which of these do you use to heat your home? Select all that apply.
a) Gas furnace
b) Heat pump
c) Portable electric heater
d) Wood stove / fireplace
e) Other (please specify): _______________
f) Don't know

Q14. [IF Gas Furnace] Approximately how old is your furnace?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) Don't know, but it was here when I moved in
h) Don't know

Q15. Approximately how old is your refrigerator?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years

e) 16-20 years
f) Greater than 20 years
g) Don't know, but it was here when I moved in
h) Don't know

Q16. Approximately how old is your clothes washer?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) I don't have a clothes washer in my home
h) Don't know, but it was here when I moved in
i) Don't know

Q17. Approximately how old is your clothes dryer?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) I don't have a clothes dryer in my home
h) Don't know, but it was here when I moved in
i) Don't know

Q18. Approximately how old is your water heater?
a) Less than a year old
b) 1-5 years
c) 6-10 years
d) 11-15 years
e) 16-20 years
f) Greater than 20 years
g) Don't know, but it was here when I moved in
h) Don't know

C. Monthly Mortgage/Rent and Utility Bills

Next, we have a few questions about your rent and monthly utility bills.

Q19. How much is your monthly rent or mortgage payment?
a) OWNERS: Monthly mortgage payment = $______
b) RENTERS: Monthly rent = $________

Q20. (If Q13 = a) Roughly what is your monthly gas bill?

a) Monthly gas bill = _______
b) My gas bill is included in my rent
c) Don't know

Q21. Roughly what is your monthly electricity bill?
a) Monthly electric bill = ________
b) My electric bill is included in my rent
c) Don't know

D. Engagement with Utility and Utility services

Q22. In the last 12 months, have you contacted PNM for any of the below reasons? Select all that apply.
- ☐ Outage
- ☐ Learn about ways to save energy
- ☐ Problems/errors with bill
- ☐ Get extension/help paying bill
- ☐ Ask about assistance programs
- ☐ Other (please specify): _______
- ☐ No, I haven't contacted them in the last 12 months

Q23. How willing would you be to participate in a PNM-sponsored program and have free energy efficient appliances and upgrades installed in your home?
a) Extremely willing
b) Very willing
c) Somewhat willing
d) Not at all willing
e) Don't know

[If Q23=c, d, or e] Next is a list of reasons some people may not want to participate in a program like this. For each one, please indicate if it would be a large factor, medium factor, small factor or not a factor in making you or your household hesitant to participate in the program.

Q24. [If Q23=a, b, or e]
- Our bills are low already
- Don't trust it is really free
- There is no more we can do to save energy
- We already have energy efficient appliances
- We don't want strangers in our home
- It's too much trouble to get approval from the landlord
- We don't want to provide personal information required to participate.

Q25. Relative to other bills you have to pay, how much of a challenge is it to pay your electricity and gas bills? Would you say it's…
a) Not a challenge
b) A minor challenge
c) A medium challenge
d) Very much a challenge

e) Don't know

G. Final Demographic Questions

There are just a few questions left to get a little more detail about your household. For these next questions, your household is defined as adults or children who live in your home at least half the time.

Q26. For your household, please indicate how many people in your home are in the following age groups:
- a) Less than 5 years old: ___
- b) 6 to 18 years old: ___
- c) 19 to 40 years old: ___
- d) 41 to 65 years old: ___
- e) More than 65 years old: ___

Q27. Are any members of your household considered permanently disabled?
- a) Yes
- b) No
- c) Don't know

Q28. What is your zip code?

Q29. In 2021, did you receive assistance from any of the following government programs? Select all that apply.
- a) Section 8 vouchers for housing
- b) SNAP, or other kinds of food stamps
- c) Medical assistance from Medicaid
- d) Other (please specify):
- e) Don't know
- f) None of the above

Q30. Please indicate your total household yearly income.
- a) Less than $5,000
- b) $5,000 to $9,999
- c) $10,000 to $19,999
- d) $20,000 to $39,999
- e) $40,000 to $59,999
- f) $60,000 to $74,999
- g) $75,000 to $99,999
- h) $100,000 to $124,999
- i) $125,000 to $150,000
- j) More than $150,000
- k) Don't know
- l) Prefer not to say

Thank you very much for helping us with this survey! Your responses provide valuable feedback that will help PNM improve its energy efficiency and conservation programs.
To show our appreciation, we will be emailing you a $10 Amazon gift card.

Q31. Please provide an email where you would like the $10 gift card sent.

Email address: ____________________

Appendix C: General Population Lighting Survey Instrument

Hello, my name is [NAME] and I am calling from Research and Polling on behalf of the New Mexico Public Utilities Commission and your electric utility. We are doing a study on the types of light bulbs people buy, and your responses will be used to help design better energy efficiency programs in New Mexico. Your response is important to us, we want to make sure our findings represent families like yours.

Q1. Have you purchased any light bulbs for your home in the last 12 months?

a. Yes
b. No [Thank & Terminate]
c. Don't know [Thank & Terminate]

Q2. How many bulbs did you purchase that were incandescent or halogen (higher wattage i.e. 60 or 75 W bulbs) in the past 12 months?

Incandescent or Halogen: An incandescent bulb is a traditional light bulb that you are most familiar with; it has been available for 100 years. Halogens are a type of incandescent bulb that look similar, but the interior contains a little capsule that produces the light.

a. Free response [number validated]

Q3. How many bulbs did you purchase that were CFLs (Compact Fluorescent Lamps) in the past 12 months?

CFL (Compact Fluorescent Lamp): CFLs are the ones with the twisty spiral that have been around for about 20 years. Some CFLs may have a plastic or glass cover over the spiral tube to make them look more like a traditional lightbulb.

a. Free response [number validated]

Q4. How many LED light bulbs did you purchase in the past 12 months?

LED: LEDs are the newest type of light bulb on the market and typically cost more than the other type of lightbulbs. An LED usually has a plastic base above the screw in part, sometimes with ridges.

a. Free response [number validated]

Bulb Battery

[Ask blub battery for each [BULBTYPE] where a>0 in Q2 through Q4]

Q5. Where did you buy the [BULBTYPE](s)? [Select categories mentioned by respondents]

a. Home Depot or Lowe's
b. Other Large Home Improvement Store (Dixieline, Orchard Supply)

c. Costco or Sam's Club
d. Walmart or Target
e. Small Hardware Store (such as Ace or True Value)
f. Dollar Store (Dollar General, Dollar Tree, Family Dollar)
g. Convenience Store
h. Grocery Store (Sprouts, Vons, Ralph's, Safeway, Albertsons)
i. Lighting and Electronics Store (such as best buy or Frys)
j. Online Purchase from Online Retailer (such as Amazon.com or 1000 bulbs)
k. Retail Store Website (such as HomeDepot.com or Walmart.com)
l. Other [Specify: _____________]
m. Don't know

Q6. [If more than one answer selected for Q5 ask:] Of the [answer from Q4/Q3/Q2 depending on BULBTYPE] [BULBTYPE]s you said you bought in the past 12 months, how many [BULBTYPE]s did you buy from [STORE from Q5]?

Repeat for each store type mentioned in Q5.

Q7. [If sum of responses from Q6 ≠ Q4/Q3/Q2 (depending on BULBTYPE) ask] The amount of [BULBTYPE]s you mentioned totaled [sum of responses in Q6] but you mentioned that you bought [answer from Q4/Q3/Q2]. Is the total amount of [BULBTYPE]s purchased incorrect or should we make changes to one of the stores?

a. The total is incorrect [Repeat Q4/Q3/Q2 and then return to Q7]
b. One of the store answers was incorrect [Repeat Q6 and then return to Q7]

Q8. How many of the [BULBTYPE] bulbs did you install?

a. Don't know [Skip to Q13]
b. I didn't install any bulbs [Skip to Q13]
c. Number of [BULBTYPE] (number validated)
    a. [value]

Q9. [IF Q8 = C] Of the [answer from Q8] [BULBTYPE]s you said you installed, please indicate the number installed in each room.

a. Bedrooms
b. Living room
c. Outside
d. Bathroom
e. Kitchen
f. Basement
g. Office
h. Other: __________

Repeat for each location mentioned in Q10.

Q10. [If sum of responses from Q9 ≠ Q8 ask] The amount of [BULBTYPE]s you mentioned installing totaled [sum of responses in Q8] but when we went room by room it totaled [answer from Q9]. Is the total amount of [BULBTYPE] installed incorrect or should we make changes to the room counts?

a. The total is incorrect [Repeat Q4/Q3/Q2 and then return to Q10]
b. One of the room answers was incorrect [Repeat Q9 and then return to Q10]
c. The total is correct.

Demographics Battery

Q11. How many people live in your home year round?

Q12. Is your home a single family home, apartment, townhome, condo or mobile home?

a. Single family home
b. Apartment
c. Townhome
d. Condominium
e. Mobile home
f. Other:______________

Q13. Lastly, which of these ranges does your income fall in?

a. $0 to $20k
b. $21k to 40k
c. $41k to 60k
d. $61k to 80k
e. $80k to 100k
f. $100k or more
g. Refused

T&T: Thank you for taking the time to help us with this important research

Appendix D: Commercial Comprehensive Contractor Interview Guide

INTRODUCTION

TALKING POINTS FOR RECRUITMENT

- EVERGREEN ECONOMICS IS CONDUCTING AN EVALUATION OF [UTILITY'S] [PROGRAM] FOR THE NEW MEXICO PUBLIC REGULATION COMMISSION AND THE STATE'S UTILITIES.
- WE HAVE IDENTIFIED SELECTED CONTRACTORS THAT INSTALLED EQUIPMENT THAT RECEIVED REBATES FROM THE EFFICIENCY PROGRAMS IN 2021 FOR BRIEF TELEPHONE INTERVIEWS.
- WE WOULD NEED ABOUT 20 MINUTES FOR THE INTERVIEW.
- YOUR RESPONSES WILL BE ANONYMOUS BUT WILL BE VERY HELPFUL IN HELPING THE STATE'S UTILITIES ENSURE THEIR ENERGY EFFICIENCY PROGRAMS BEST SERVE THEIR CUSTOMERS.
- WHEN WOULD BE A GOOD TIME TO TALK?

TALKING POINTS FOR STARTING THE INTERVIEW

- IDENTIFY SELF.
- THIS SHOULD TAKE ABOUT 20 MINUTES.
- YOUR RESPONSES WILL BE ANONYMOUS, SO PLEASE FEEL FREE TO SPEAK CANDIDLY.
- DO YOU HAVE ANY QUESTIONS BEFORE WE BEGIN?
- WOULD YOU FEEL COMFORTABLE IF I RECORD THIS CALL FOR NOTE TAKING PURPOSES? WE WILL NOT SHARE THE RECORDING WITH ANYONE OUTSIDE OUR COMPANY AND WILL NOT ATTRIBUTE ANYTHING YOU SAY BACK TO YOU.

INTERVIEWEE BACKGROUND

LET'S BEGIN WITH A COUPLE OF BACKGROUND QUESTIONS….

A1. TO START, PLEASE TELL ME A BIT ABOUT YOUR COMPANY.

PROBE TO UNDERSTAND:

- SERVICES OFFERED
- TYPES OF CUSTOMERS (ESP. SECTOR – RESIDENTIAL, COMMERCIAL, OR BOTH)
- REGIONS SERVED
- INTERVIEWEE ROLE

PROGRAM AWARENESS AND ENGAGEMENT

B1. DO YOU RECALL HOW YOU FIRST LEARNED ABOUT AND GOT INVOLVED WITH THE [RESIDENTIAL/COMMERCIAL] REBATE PROGRAMS THROUGH [UTILITY]?

LISTEN (AND PROBE AS NEEDED) FOR:

- ANY RESERVATIONS ABOUT PARTICIPATING
- ANY BARRIERS TO PARTICIPATING
- WHETHER OR NOT THEY WORK WITH ANY OTHER NEW MEXICO [UTILITY] REBATE PROGRAMS

B2. COULD YOU DESCRIBE WHAT INVOLVEMENT WITH NEW MEXICO [UTILITY] REBATE PROGRAMS AS A CONTRACTOR INVOLVES?

PROBE AS NEEDED:

- IN WHAT WAYS DO YOU INTERACT WITH NEW MEXICO [UTILITY] OR THEIR IMPLEMENTERS ABOUT THIS PROGRAM?
- WHAT INFORMATION OR SERVICES DO YOU RECEIVE FROM NEW MEXICO [UTILITY] (BEYOND THE ABILITY TO OFFER REBATES TO YOUR CUSTOMERS)?

B3. IN WHAT WAYS IS THE [UTILITY] PROGRAM HELPFUL TO YOU IN YOUR BUSINESS?

PROBE, AS NEEDED:

- REBATE
    - INCREASES CUSTOMER SATISFACTION WITH US
    - INCREASES BUSINESS
    - HELPS US UP-SALE TO HIGHER EFFICIENCY LEVELS
- ABILITY TO MENTION THE CONNECTION WITH THE [UTILITY] PROGRAM
- [UTILITY] MESSAGING TO CUSTOMERS ON BENEFITS OF [MEASURE(S)]

B4. WHAT SHARE OF YOUR [RESIDENTIAL/COMMERCIAL] PROJECTS WITHIN [UTILITY] TERRITORY WOULD YOU ESTIMATE CURRENTLY END UP QUALIFYING FOR AND RECEIVING A [UTILITY] REBATE?

- WHAT COULD [UTILITY] DO TO INVOLVE YOU MORE IN THE PROGRAM?

B5. DOES [UTILITY] MAKE IT CLEAR WHICH OF YOUR PRODUCTS OR SERVICES ARE ELIGIBLE FOR [UTILITY] REBATES?

PROBE AS NEEDED:

- IS THERE ANYTHING [UTILITY] SHOULD DO TO MORE CLEARLY COMMUNICATE THAT?

B6. HAVE THE PROGRAMS INFLUENCED WHAT EQUIPMENT YOU SUGGEST TO A CUSTOMER?

B7. DO YOU HAVE ANY SUGGESTIONS FOR [UTILITY] CONTRACTOR SERVICES AND SUPPORT – EITHER OVERALL OR FOR THE [PROGRAM] SPECIFICALLY?

PROGRAM PROCESSES

C1. IN WHAT WAYS ARE YOU INVOLVED WITH THE REBATE PORTION OF THE PROGRAM AND THE PAPERWORK AND PROCESS REQUIRED TO PARTICIPATE?

PROBE TO UNDERSTAND:

- WHETHER CONTRACTOR COMPLETES THE REBATE APPLICATION
- TIME REQUIRED FOR PAPERWORK AND WHETHER THAT IS A BURDEN
- WHETHER THE REBATE GOES DIRECTLY TO THE CUSTOMER OR CONTRACTOR (WITH A MARKDOWN ON THE CHARGE TO CUSTOMER)
- RECOMMENDED IMPROVEMENTS

C2. WHEN AND HOW DO YOU BRING UP EITHER [UTILITY] REBATES OR THE EQUIPMENT THEY REBATE WHEN TALKING WITH CUSTOMERS?

LISTEN FOR (AND PROBE AS NEEDED):

- WHAT SHARE OF CUSTOMERS ARE ALREADY AWARE OF REBATES BEFORE THE CONTRACTOR BRINGS IT UP
- WHAT IT IS THE MOST EFFECTIVE SALES TOOL OR MESSAGE TO GET CUSTOMERS TO UPGRADE TO HIGH EFFICIENCY
- WHAT ROLE THE [UTILITY] REBATES PLAY IN MOTIVATING UPGRADES
- WHAT PARTICULAR EQUIPMENT IS EASIER OR HARDER TO GET CUSTOMERS TO UPGRADE TO HIGH EFFICIENCY AND WHY

C3. DO YOU HAVE ANY COMMENTS ABOUT THE PROGRAM OFFERINGS? IS THERE ANYTHING MISSING? ANYTHING NOT NEEDED? OR ANYTHING THAT COULD BE BETTER?

MARKET RESPONSE

D1. OVERALL, TO WHAT DEGREE DO YOU SEE THE PROGRAM INCREASING THE INTEREST AND DEMAND FOR ENERGY EFFICIENT EQUIPMENT?

PROBE TO UNDERSTAND:

- WHY IS THAT?
- IS THE PROGRAM HAVING A LARGE OR SMALL EFFECT ON THE MARKET?

D2. ARE THERE MARKETS THAT YOU FEEL [UTILITY] [RESIDENTIAL/COMMERCIAL] ENERGY EFFICIENCY PROGRAMS ARE REACHING WELL? NOT WELL?

PROBE TO UNDERSTAND:

- SUGGESTED APPROACHES THAT MIGHT EXPAND THE REACH OF THE PROGRAM INTO MARKETS THAT MAY BE UNDERSERVED BY THE PROGRAM.

D3. OVERALL, WHAT ISSUE(S), IF ANY, MAY AFFECT FUTURE PROGRAM PARTICIPATION BY CUSTOMERS? WHAT ABOUT FUTURE PROGRAM PARTICIPATION BY CONTRACTORS? [INTERVIEWER NOTE: EXAMPLE ISSUES ARE CHANGES TO BUILDING CODES AND STANDARDS BEING PROMOTED AND PROGRAM INCENTIVE LEVELS].

PROGRAM SATISFACTION

E1. FINALLY, I'D LIKE TO ASK ABOUT YOUR AND YOUR CUSTOMERS' SATISFACTION WITH THE [UTILITY] [PROGRAM]. PLEASE RATE YOUR OVERALL SATISFACTION WITH THE PROGRAM ON A 1 TO 5 SCALE WHERE 1 IS NOT AT ALL SATISFIED, 2 IS SOMEWHAT DISSATISFIED, 3 IS NEITHER SATISFIED NOR DISSATISFIED, 4 IS SOMEWHAT SATISFIED AND 5 IS VERY SATISFIED?

- WHAT IS YOUR SATISFACTION?
- HOW DO YOU THINK YOUR CUSTOMERS WOULD RATE THE PROGRAM?

[IF RATING < 5] WHAT COULD [UTILITY] DO TO INCREASE YOUR SATISFACTION WITH THE PROGRAM?

PROBE IF NEEDED:

- WHAT IS WORKING BEST?
- WHAT IS MOST CHALLENGING OR NEEDS IMPROVEMENT?

E2. HAVE YOU HAD ANY FEEDBACK FROM YOUR CUSTOMERS ABOUT THEIR EXPERIENCES WITH THE [PROGRAM] THAT YOU THINK [UTILITY] SHOULD KNOW?

E3. ASIDE FROM ANYTHING WE'VE ALREADY DISCUSSED, WAS THERE EVER AN OCCASION WHEN THE PROGRAM DIDN'T MEET YOUR EXPECTATIONS? PLEASE EXPLAIN.

CLOSING

F1. IS THERE ANYTHING ELSE WE DIDN'T COVER THAT YOU'D LIKE TO MENTION OR DISCUSS ABOUT YOUR EXPERIENCES WITH THE [UTILITY] [PROGRAM]?

[THANK AND END]

Appendix E: Power Saver Detailed Evaluation Methods and Findings

Power Saver is a direct load control program offered to residential, small commercial (< 50 kW), and medium commercial (50 kW – 150 kW) Public Service New Mexico (PNM) customers. To facilitate load control, participants must have a Digital Control Unit (DCU) device attached to the exterior of their air conditioning unit. This device is capable of receiving a radio signal that will turn off the unit's compressor for an interval of time. Such signals are typically sent on the hottest weekday afternoons of the summer, with the goal being to reduce peak demand. Residential and small commercial participants receive an annual $25 incentive for their participation. Medium commercial participants receive an annual incentive of $9 per ton of refrigerated air conditioning. A residential smart thermostat component was added to the program in 2018 and a residential bring your own thermostat ("BYOT") program was added in 2020. Unlike the DCU components, load curtailment for the two thermostat components is achieved via communication with the Wi-Fi-enabled thermostat.

There were two Power Saver events during the summer 2021 demand response (DR) season, which began May 15th and ended September 30th. Table 1 provides some information on these two 2021 events. All DCU events used an adaptive 50% cycling strategy where curtailment is based on the runtime in the previous hour. Note that the event start times and end times are in Mountain Daylight Time (MDT).

- The realized gross energy savings for summer 2021 was **124.3 MWh**. The energy savings estimate for the program takes into account the load shed during the event and the post-event snapback and is a function of the number of events called.
- The average delivered load reduction of the Power Saver program during summer 2021 event hours was 29.9 MW. It is important to note that event conditions were relatively mild during summer 2021. Under planning conditions, we estimate the load reduction capability of the Power Saver program at **34.1 MW**.

Table 1: 2021 Power Saver Event Summary

Date	Day of Week	Start Time (MDT)	End Time (MDT)	Daily High at KABQ (F)
6/15/2021	Tuesday	3:00 PM	7:00 PM	97
8/09/2021	Monday	2:00 PM	6:00 PM	94

The event on August 9, 2021 was delayed for the three Digital Control Unit (DCU) segments that rely on radio frequency messaging for curtailment (Residential, SCI, MCI). From 2pm to 4pm a communication issue prevented the DCUs from cycling. We exclude these hours from the evaluated impacts for the DCU segments.

Shortly after the conclusion of the summer 2021 season, Itron provided the Evergreen team with a series of datasets for the evaluation. These files included:

- For Residential DCU and Small Commercial sites, 5-minute load data from 5/15/2021 to 8/11/2021
- For Medium Commercial DCU sites, 5-minute load data from 5/15/2021 to 10/01/2021
- For Residential DCU and Small Commercial sites, an M&V list that provided the location type (residential or commercial), the group (control or curtailment), and/or the dates each load control device was active
- For Medium Commercial sites, an M&V list that provided the dates each load control device was active
- For the Two-Way Smart Thermostat and BYOT groups, 5-minute runtime data from 5/15/2021 to 9/30/2021

The Evergreen team also received Itron's Power Saver impact evaluation report, which detailed the methods Itron employed in calculating customer baselines (CBLs) for the five different DR program offerings. A CBL is an estimate of what participant loads would have been absent the DR event dispatch. For each DR program offering, the report also showed the load impact, which is the difference between the CBL and the metered load, for each 5-minute interval of each curtailment day. The key steps in the Evergreen verified savings analysis were:

1) For each DR program offering, reproduce the performance estimates calculated by Itron using the contractually-agreed upon CBL method.
2) Modify the CBL methodology and produce ex post estimates of what the per-device impact was during the 2021 DR season.
3) Where possible, leverage additional historical data from 2015 - 2021 to produce ex ante estimates of what the per-device impact at peaking conditions (5-6 PM at 100°F) will be in future summers.
4) Scale the per-device estimates by the number of active program devices to calculate the aggregate load reduction capability (MW) of the Power Saver program.

Table 2 and Table 3 summarize our findings for residential and commercial segments, respectively. The main driver in the difference between Itron and Evergreen load reduction estimates is that Itron commonly summarized impacts with the maximum (e.g., the largest 5-minute impact in a one-hour interval is the impact for that hour), whereas the Evergreen team summarized impacts with an average. Multiplying our per-device reduction estimates by the number of devices in each class leads to a 2021 average total estimated load reduction of approximately 26.46 MW, 1.1 MW, 0.16 MW, 3.35 MW, and 3.38 MW for the Residential DCU, Two-Way Smart Thermostat, BYOT, Small Commercial, and Medium Commercial segments respectively. In aggregate, the average 2021 performance is 34.44 MW. This is approximately 70% of Itron's estimate for the 2021 season (50.02 MW). After making an online adjustment for the thermostat groups of (82% for Two-Way Smart Thermostats and 85% for BYOT) and an operability adjustment for the other three segments (87%), the aggregate Evergreen-calculated impacts for 2021 are 29.89 MW (compared to 43.25 MW from Itron after adjustment).

The Evergreen team used Power Saver results from 2015-2021 to estimate the load relief capability under extreme conditions. At 100% operability, we estimate the program is capable of delivering 39.23 MW of load reduction under planning conditions of 100°F between 5:00 PM and 6:00 PM MDT. Of the estimated 39.23 MW of load reduction capability, 33.88 MW comes from the Residential DCU segment, 1.44 MW comes from the Two-Way Smart Thermostat segment, 0.17 MW comes from the BYOT segment, and 2.45 MW and 1.29 MW come from the Small and Medium Commercial segments, respectively. Factoring in the operability/online adjustments, the aggregate program can provide 34.05 MW of load relief.

Table 2: High Level Results – Residential

		Unit	Residential DCU Measured	Residential DCU Adjusted	Two-Way Smart Thermostats Measured	Two-Way Smart Thermostats Adjusted	BYOT Smart Thermostats Measured	BYOT Smart Thermostats Adjusted
Number of Devices Installed		#	46,424	46,424	722	722	214	214
	5-year Rolling Average kW Factor	kW / device[1]	0.71	0.62	1.39	1.14	1.62	1.38
	5-year Rolling Average kW Factor	Total MW	32.96	28.68	1.00	0.87	0.35	0.30
	2021 Load Reduction Estimate	kW / device	0.81	0.70	2.00	1.64	2.04	1.73
	2021 Load Reduction Estimate	Total MW	37.60	32.71	1.44	1.18	0.44	0.37
Evergreen	2021 Load Reduction Estimate	kW / device[2]	0.57	0.66	1.52	1.35	0.67	0.57
Evergreen	2021 Load Reduction Estimate	Total MW	26.46	23.02	1.10	0.900	0.15	0.12
Evergreen	Ex Ante Load Reduction Estimate[3]	kW / device	0.73	0.64	2.00	1.64	0.78	0.66
Evergreen	Ex Ante Load Reduction Estimate[3]	Total MW	33.88	29.48	1.44	1.18	0.17	0.14
Evergreen	2021 Energy Savings	kWh / device	1.02	0.89	6.71	5.50	3.11	2.64
Evergreen	2021 Energy Savings	Total MWh	94.70	82.40	9.69	7.95	1.33	1.13

[1] Based on conversations with PNM and the third-party M&V consultant, DSA, an operability percentage of 87% is applied to the 2021 kw factors for Resedential and Comerical DCU segments. Two-way Thermostats received 82% and BYOT received and 87% adjustment.

[2] Based on full active event hours.

[3] Ex ante program capability is reported in the 5 PM – 6 PM MDT hour at 100°F.

Table 3: High Level Results – Commercial

		Unit	Small Commercial Measured	Small Commercial Adjusted	Medium Commercial Measured	Medium Commercial Adjusted
	Number of Devices Installed (Number of Locations)	#	4,906	4,906	3,280 (449)	3,280 (449)
Itron	5-year Rolling Average kW Factor	kW / device[4]	1.26	1.10	0.84	0.73
Itron	5-year Rolling Average kW Factor	Total MW	6.18	5.38	2.76	2.40
Itron	2021 Load Reduction Estimate	kW / device	1.06	0.92	1.63	1.42
Itron	2021 Load Reduction Estimate	Total MW	5.20	4.52	5.35	4.65
Evergreen	2021 Load Reduction Estimate	kW / device	0.68	0.59	1.03	0.90
Evergreen	2021 Load Reduction Estimate	Total MW	3.35	2.91	3.38	2.94
Evergreen	Ex Ante Load Reduction Estimate	kW / device	0.50	0.44	0.39	0.34
Evergreen	Ex Ante Load Reduction Estimate	Total MW	2.45	2.13	1.29	1.12
Evergreen	2021 Energy Savings	kWh / device	1.88	1.64	2.94	2.50
Evergreen	2021 Energy Savings	Total MWh	18.44	16.04	19.29	16.78

[4] 2021 kW factors include a rolling average per-device result for 2016-2021. 2021 Small Commercial and Medium Commercial have an 87% operability adjustment applied. The 87% operability percentage was calculated as 85% multiplied by the number of DCU sites that have not been visited in the last two years plus 95% multiplied by the number of DCU sites that were visited in the last two years.

1 Methodology

This section discusses the methods used to validate Itron's impact estimates and those used by the Evergreen team to provide their ex post and ex ante impact estimates.

1.1 Residential DCU Impact Validation

The impact evaluation for the Residential DCU class relies on an alternating treatment design. Under this approach, load in the group that was not dispatched serves as a proxy for what curtailment group load would have been if the DR event had not been initiated. Both groups contained approximately 130 devices.

Impact estimates were derived using 5-minute interval kW data collected by DENT Elite Pro SP Portable Power Data Loggers and PowerCAMP and IntelliMEASURE M&V equipment. Steps taken are as follows:

1. For both the control and curtailment groups, calculate the average demand (kW) for each 5-minute interval.
2. For both the control and curtailment groups, calculate a fifteen-minute rolling average demand. Suppose the average demand for the control group is 3 kW during interval t, 4 kW during interval $t + 1$, and 5 kW during interval $t + 2$. The fifteen-minute rolling average demand for interval t would then be 4 kW.
3. For each interval, find the difference between the rolling averages for the control and curtailment groups (where difference = control – curtailment).
4. The impact for any given event hour is the maximum difference across the 12 intervals in the hour, as calculated in step 3.
5. The maximum difference across all qualified event hours[5] is the kW per device impact estimate for the 2021 DR season.
6. Adjust the residential impacts for an operability factor of 87%. The determination of the operability percentage is detailed in detail in Section 1.6.

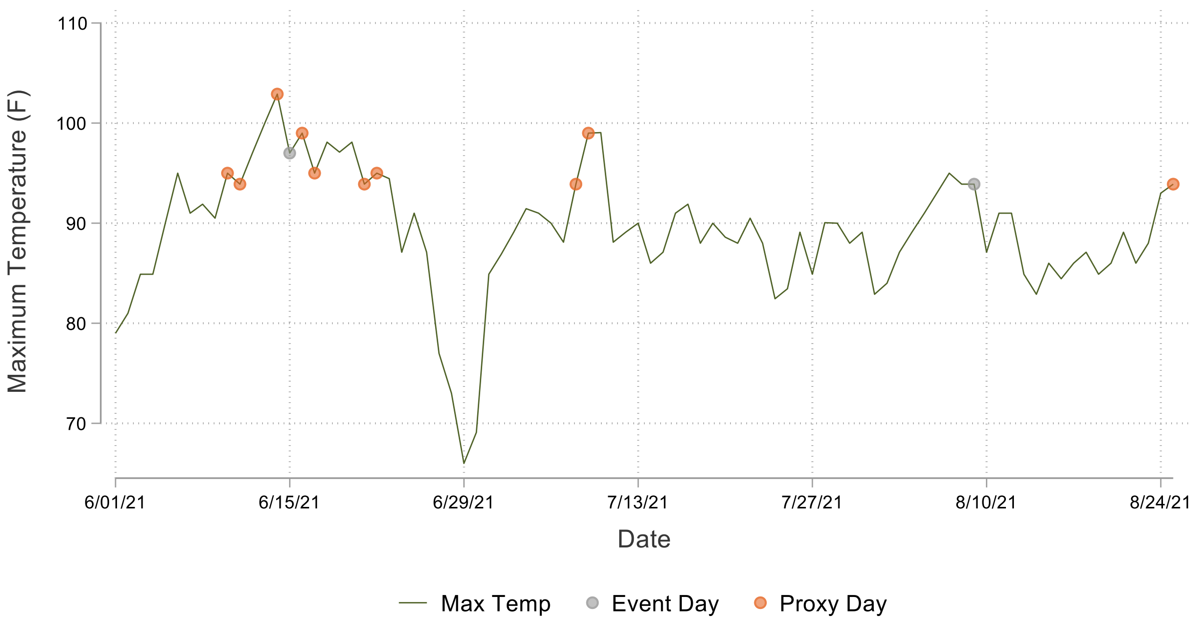
1.2 Evergreen Estimate of Residential DCU Impacts

In 2018, the Residential DCU segment of Power Saver switched to alternating dispatch between M&V groups to determine which devices were called to reduce load on event days. In theory, this means that any difference in the behavior of the two groups is removed when we look at events across the whole summer. Because dispatch alternates between the two groups, any bias in impacts should be minimal, on average. Nevertheless, to assess the differences between the groups, the Evergreen team compared the load profiles of the two groups on proxy days. Proxy

[5] 'Qualified' hours were defined as hours where the outdoor temperature is at least 97 degrees (F). No event hours exceeded 97°F. PNM considered event hours 3-7 PM on on June 15,2021 qualifying hours.

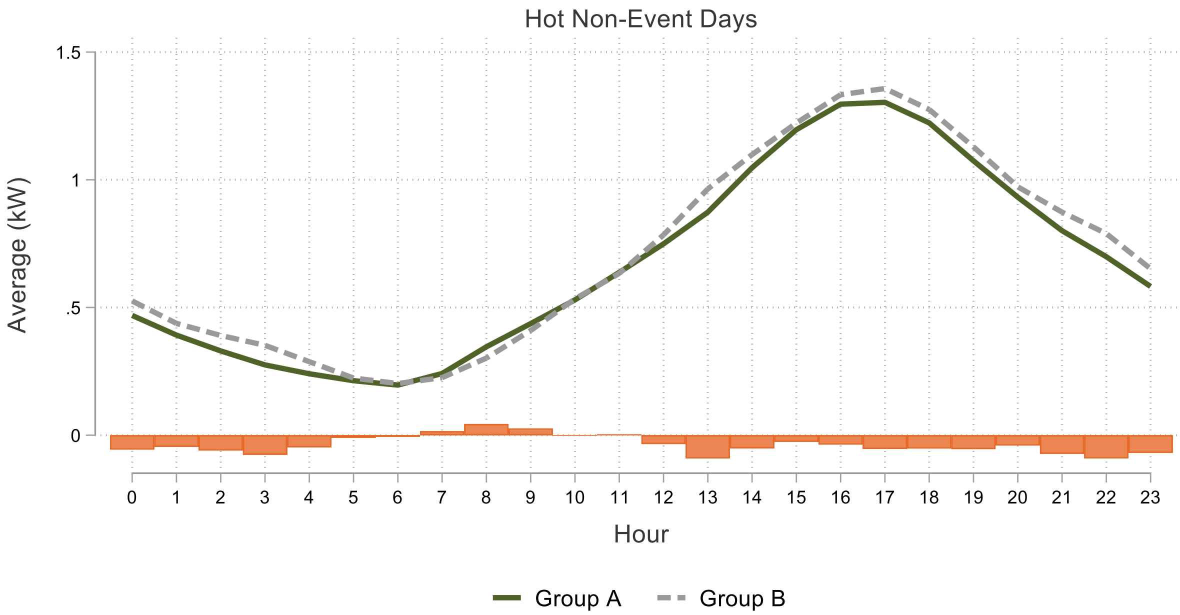
days are non-event days that were chosen from non-holiday weekdays where the maximum temperature was at least as hot as the event days. There were 10 proxy days used to develop this comparison. Figure 1 shows the maximum temperature and distribution of proxy days throughout the summer, compared to the event days and non-event days.

Figure 1: Weather on Event and Proxy Days



The average hourly load profiles for the two residential M&V groups, averaged across all proxy days, are shown in Figure 2. The average difference between the two groups is 0.04 kW, with a maximum difference of 0.09 kW. The average difference during typical event hours is 0.04 kW and the maximum is 0.05 kW. Group B tends to have slightly higher average cooling load than group A so when Group B is curtailed impact estimates that rely on a simple difference will be understated. When Group A is curtailed and Group B acts as the control group, a simple difference in average group loads will overstate the load reduction.

Figure 2: Residential DCU Load Shapes on Event-Like Days



The Evergreen team felt that taking the simple difference between the two groups would not be sufficient to calculate an unbiased ex post event impact. Instead, we used a difference-in-differences approach. Table 4 provides an illustration. In this illustration, Group A is the curtailment group. The difference-in-difference calculation nets out the proxy day difference from the event day difference.

Table 4: Difference-in-Difference Illustration

Hour Ending (MDT)	Proxy Day Difference (kW)	Event Day Difference (kW)	Difference-in-Difference (kW)
3:00 PM	0.03	0.54	0.51
4:00 PM	0.05	0.70	0.65
5:00 PM	0.06	0.61	0.55
6:00 PM	0.04	0.58	0.54

As described further in Section 2, the Evergreen team also believes that the Itron method for calculating the impacts for the Residential DCU segment overstates the actual program performance because the impact for each hour is defined as the *maximum* difference out of the twelve 5-minute intervals within the hour (see step 4 of Section 1.1). We believe that using the maximum difference of all intervals within each hour, as opposed to the average difference, overstates the amount of load shed produced by a typical DR event because it counts favorable noise. In Section 2, we develop an alternative DR impact methodology that relies on the average impact rather than the maximum, and use this methodology to produce ex ante estimates for future program planning.

1.3 Two-Way Smart Thermostat, BYOT, Small Commercial, and Medium Impact Validation

The impact evaluation for the Small Commercial, Medium Commercial, Two-Way Smart Thermostat, and BYOT components relies on a "high X of Y" customer baseline (CBL) approach with a multiplicative day-of adjustment. Under this approach, the average load for three of the previous five eligible[6] days is used as a proxy for what load would have been if the DR event had not been called. In selecting which three days to use, the criterion is greatest maximum load during the event window. For a hypothetical event that lasts from 3:00 PM until 7:00 PM, the steps to calculating the impact estimate are as follows:

1. Calculate the unadjusted baseline.
    - For each of the five eligible days prior to the event day, calculate the average demand during event hours across the entire M&V population. Select the three days with the greatest average demand (i.e., "high 3 of 5").
    - Across the three baseline days, calculate the average demand across the entire M&V population for each 5-minute interval. This essentially collapses the three baseline days into one baseline day.
    - For each 5-minute interval, calculate a 15-minute rolling average kW load. As an example, suppose the average 5-minute interval load is 10 kW at time t, 12 kW at time $t + 1$, and 14 kW at time $t + 2$. The 15-minute rolling average kW load at time t would be (10 + 12 + 14)/3 = 12 kW. This value (12 kW) would be the unadjusted CBL at time t.
2. Calculate 15-minute rolling average demand (kW) for the entire M&V population.
    - Across the entire M&V population, calculate average demand for each 5-minute interval.
    - For each 5-minute interval, calculate a 15-minute rolling average as described above.
3. Calculate the multiplicative adjustment factor.
    - For the twelve 5-minute intervals preceding the event, sum up the 15-minute rolling average demand for the unadjusted baseline.
    - For the twelve 5-minute intervals preceding the event, sum up the 15-minute rolling average demand for the M&V population.
    - Divide the second sum by the first sum. This quotient is the adjustment factor.
4. Calculate the impact.

[6] Eligible days are weekdays that are neither holidays or DR event days.

- Multiply the unadjusted baseline by the adjustment factor. This yields the adjusted CBL.
- For each 5-minute interval, subtract the 15-minute rolling average demand for the entire M&V population (as calculated in Step 2) from the adjusted baseline. Note that this yields 12 impacts in every hour.
- For Two-Way and BYOT add 0.1 kW to impacts to account for the thermostats curtailing the air handler fan in addition to the AC compressor.
- For each event hour, take the maximum 5-minute impact. This value serves as the impact estimate for the event hour.
- The maximum 5-minute impact across all qualified event hours (when temperature exceeds 97°F) is the 2021 Power Saver impact estimate. [7]

1.3.1 BYOT Connected Load Assumption

BYOT Smart Thermostats are not installed by Itron field technicians. As a result, A/C tonnage and amperage information is missing for all participants who have enrolled in the BYOT program component. In the absence of A/C unit nameplate information, a default value is used as the connected load estimate. This default connected load value is estimated from the 2020 Two-Way Smart Thermostat residential population. This value is then used to convert A/C runtime to power draw (kW) for each 5-minute interval.

Itron uses a connected load of 4.19 kW. Evergreen used a connected load of 3.22 kW to calculate BYOT 5-minute kW interval data based on the formulas and assumptions below drawn from the Smart Thermostat and High Efficiency Air Conditioner measures in the New Mexico 2021 Technical Reference Manual.

$$Connected\ Load = \frac{Capacity_{cool}}{1000\frac{W}{kW}} \times \frac{1}{EER} = 3.22\ kW$$

Where:

- $Capacity_{cool}$ = 36,000 BTU/hour (2021 TRM Section 4.20.3)
- EER = -0.02 * $SEER^2$ + 1.12 * SEER (2021 TRM Section 4.6.4)
  - Assuming SEER = 13 (2021 TRM Section 4.20.3)

[7] No event hours exceeded 97°F. PNM considered event hours on June 15,2021 qualifying hours.

1.4 Evergreen Estimate of Two-Way Smart Thermostat, BYOT, Small Commercial, and Medium Commercial Impacts

Reported impacts for the Two-Way Smart Thermostat, BYOT, Small Commercial, and Medium Commercial offerings rely on a CBL method where the key step involves taking the maximum 5-minute rolling average difference within each hour. The maximum difference for the hour is the reported impact. The Evergreen team feels that using the maximum difference, rather than the average difference, overstates the capability of the program by including favorable noise into the impact calculation. Therefore, the Evergreen impact estimates for these program offerings use the same general baseline method as summarized in Section 1.3 except that the rolling 5-minute impacts are summarized by the mean rather than the maximum by hour.

Figure 3 illustrates why using the maximum five-minute impact within each hour overstates the true DR program impact, using the BYOT program as an example. The figure shows the baseline (green) and average participant load (gray) for each 5-minute interval on 6/15/2021. Within a given event hour, the average participant load ranges from as low as 0.45 kW to as high as 1.67 kW. The average kW was 1.02 kW. Therefore, taking the maximum of the five-minute impacts within a given hour will yield an inflated impact value compared to taking the average five-minute impact.

Figure 3: BYOT Baseline and Actual Load for June 15, 2021

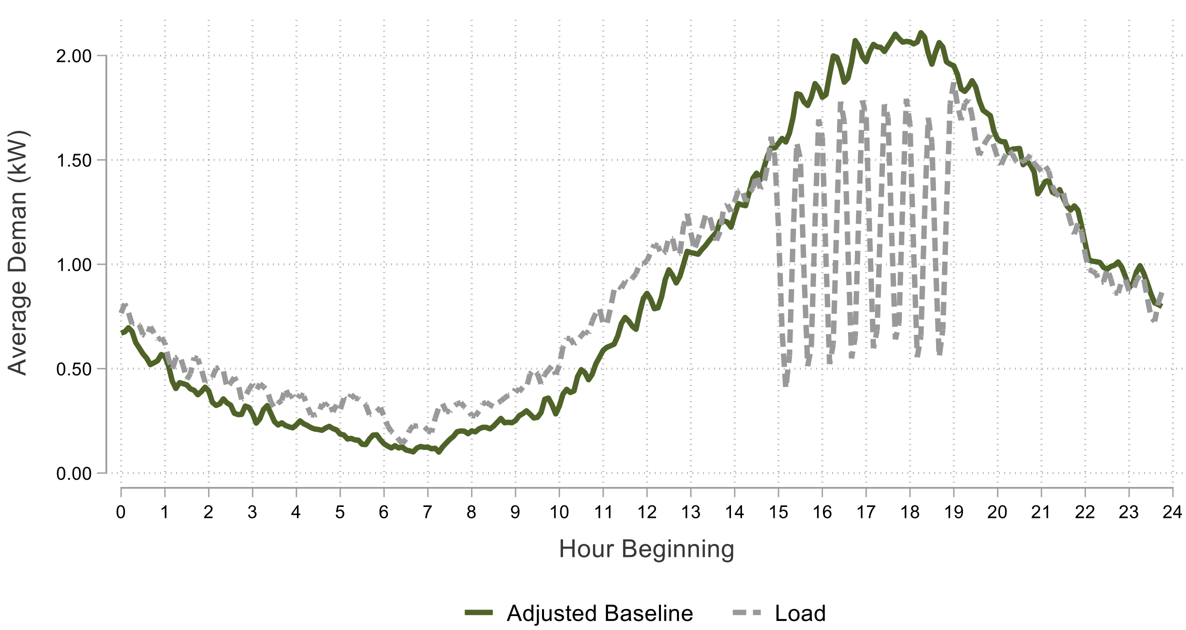
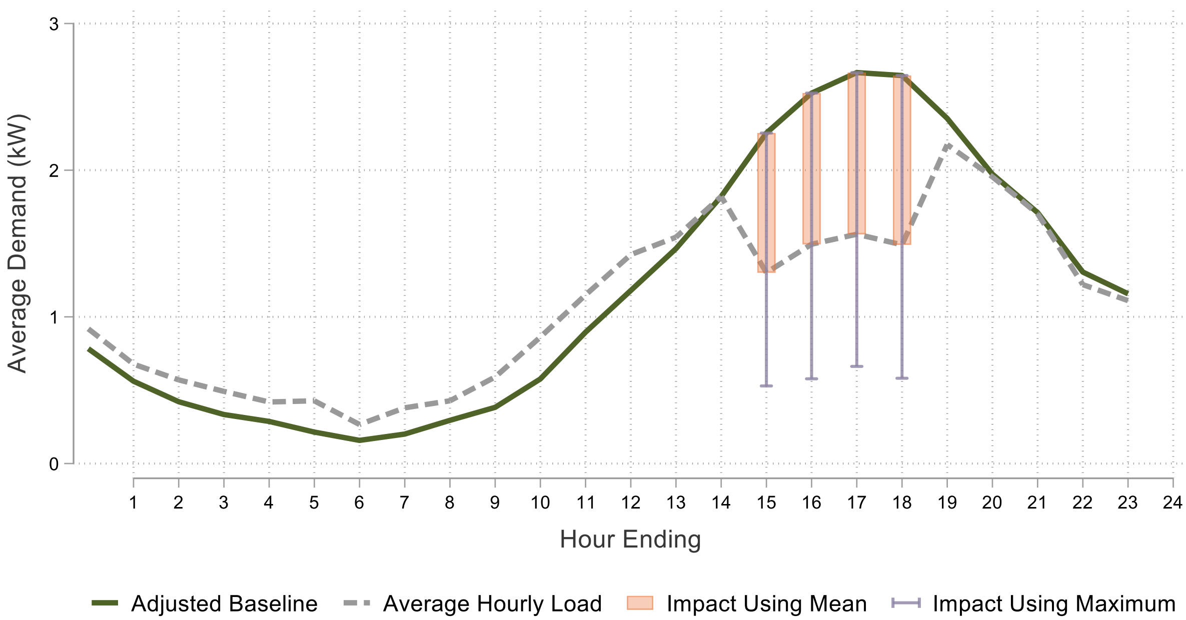


Figure 4 compares the impacts using the two different methods. As in Figure 3, the green and gray lines represent the customer baseline and participant load on 6/15/2021; the key change is that the values shown are the average for each hour, as opposed to the granular five-minute intervals.

The added orange bars show the hourly DR impacts using the average impacts, while the purple capped lines show the impact calculations using the Itron maximum methodology. Note that the average impacts (orange) are equal to the difference between the baseline and the average participants' loads, while the Itron impacts (purple) far overstate actual DR program performance. Again, this is an artifact of using the highest 5-minute impact within each hour.

Figure 4: BYOT Baseline and Actual Load for July 6, 2020 with Impacts Calculated Using Mean and Max Methodologies



The degree to which impacts are overstated using the Itron method depends on how much loads vary within each hour. To illustrate the bias of this method for different programs, in Figure 5 we plot the load profiles on 6/15/2021 for all four programs that rely on the CBL method (BYOT, Two-Way Smart Thermostats, Small Commercial, and Medium Commercial). Figure 6 adds the same impacts as in Figure 4 – the impact for the Evergreen "mean" approach in orange and the impact for the Itron "maximum" approach in purple. The level of bias of the Itron method is represented by the relative size of the purple lines to the orange bars. Figure 6 shows that while the Itron impact calculation method is most biased for the BYOT segment, the Two-Way Smart Thermostat, Small Commercial, and Medium Commercial segments are also overstated.

Figure 5: Baseline and Actual Loads for SCI, MCI, Twoway, and BYOT Program Offerings for June 15, 2021

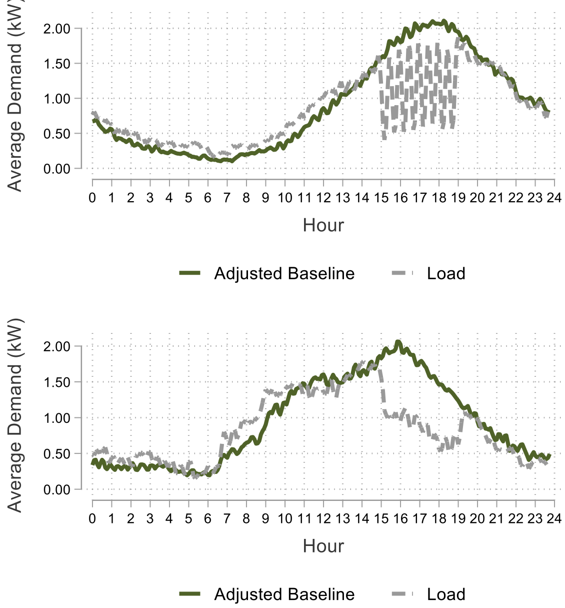
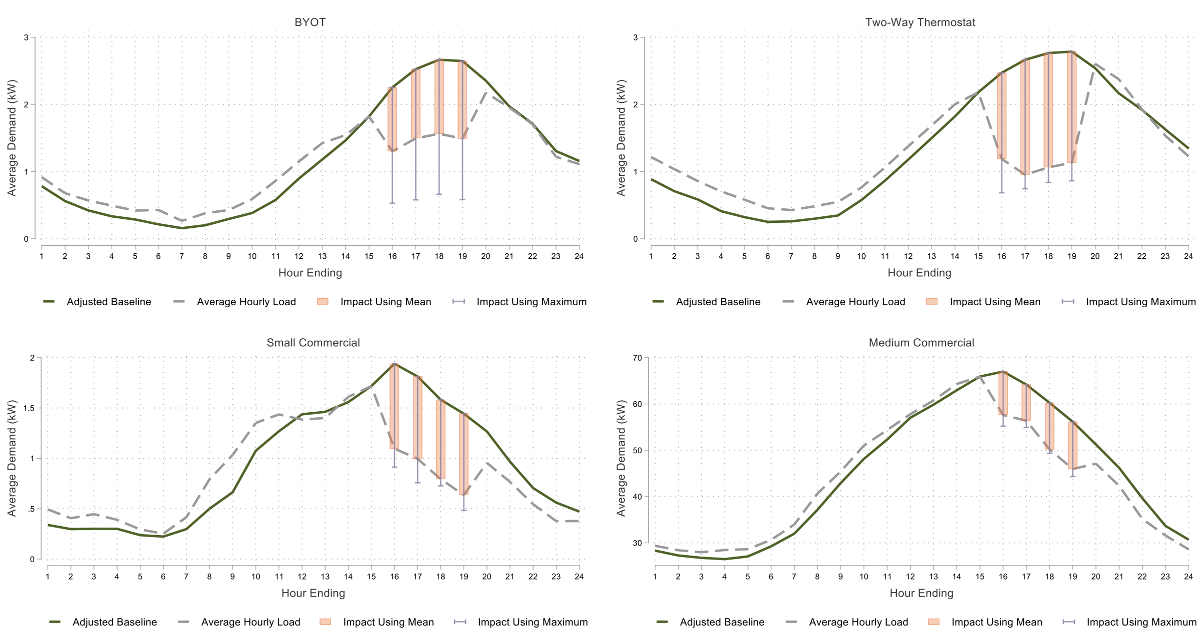


Figure 6: Baseline and Actual Loads for SCI, MCI, Twoway, and BYOT Program Offerings for June 15, 2021 with Mean and Max Impacts



1.5 Ex Ante Impacts

Of particular interest for ex ante load considerations is how sensitive the program performance is to temperature and time of day. When additional years of data are included in such an analysis, a wider range of program conditions can be investigated which leads to a more robust understanding of the capability of the program.

To produce an ex ante impact estimate for Residential DCU customers, the Evergreen team leveraged 2015-2021 verified load reduction estimates. In 2015-2017 and in 2019, only one of the Residential DCU M&V groups was consistently curtailed while the other group acted as a control. In 2018, 2020 and 2021 the curtailment groups switched between event days. Because some differences exist between the two groups in terms of load profile on event-like days, the Evergreen team used a difference-in-differences impact estimation method, which was described in Section 1.2, to estimate the impacts for these earlier summers.[8] Ex post impacts in 2018 were not calculated via difference-in-differences, as statistically significant differences between the groups were not found.

To produce an ex ante impact estimate for the Small Commercial segment, the Evergreen team leveraged 2015-2021 verified load reduction estimates. Prior to 2019, impacts for the Small Commercial segment were calculated in a manner similar to the Residential DCU segment – an M&V group was split into curtailment and control groups. The control group was used as a baseline for the curtailment group. In 2019, 2020, and 2021 the full M&V group was curtailed for all events, and the program implementer relied on an X-of-Y baseline method to estimate impacts (same method as the one used for the Large Commercial segment). Therefore, the ex-ante estimate is a function of historical ex post estimates that were developed using slightly different methods over the years.

For the Medium Commercial segment, we leveraged 2017-2021 verified load reduction estimates. The same approach for estimating ex post results for the Medium Commercial segment was used in 2017, 2018, 2019,2020, and 2021.

For the Two-Way Smart Thermostat segment, we leveraged 2019-2021 verified load reduction estimates. The 2019 approach relied on control groups, while the 2020 and 2021 approaches relied on the X-of-Y baseline method described above.

[8] There were not many non-event weekdays during the summer of 2015 where the maximum outdoor temperature exceeded 94 degrees (F), so a threshold of 91 degrees (F) was used for the 2015 data instead. The temperature threshold for the summer of 2016 was 94 degrees (F), just like the threshold for the summer of 2017. In 2018, the groups were similar in terms of non-event day usage, so the difference-in-differences method was not necessary.

For the BYOT segment we leveraged 2020-2021 verified load reduction estimates. The same approach for estimating ex post results was used in both years.

Note that all Evergreen ex ante impacts rely on Evergreen's calculated impacts for all years, as opposed to Itron's impacts (i.e., the impacts that go into the ex-ante values rely on the average load reductions for each hour instead of the maximum load reductions).

Once data had been compiled for each customer segment, a regression was run that explains changes in impacts as a function of temperature and hour. The resulting regression model was used to predict impacts for a range of planning scenarios. Two event days (7/31/2015 and 7/13/2020) were excluded from the regressions because weather conditions on these days differed from typical planning scenarios – the former date had relatively low temperatures throughout the event, while the latter experienced storm conditions midway through the event. The regression equation specified was:

$$\Delta kW_h = \alpha + \beta * T_t + \sum_{h=15}^{h=20} \gamma_h * I_h + \sum_{h=15}^{h=20} \delta_h * I_h * T_h + \varepsilon_h$$

Where the variables have the following interpretations:

Table 5: Ex Ante Regression Terms

Variable	Interpretation
α	Constant term
β	The incremental kW usage associated with a warming of 1 degree Fahrenheit
T_t	Outdoor air temperature in hour h
γ_h	Incremental kW usage associated with each hour
I_h	Indicator variable equal to 1 if the hour is 14, 15, 16, etc., and 0 if not
δ_h	Incremental kW usage associated with a 1-degree increase in outdoor temperature in hour h
ε_h	The error term

1.6 Operability Adjustments

To reach a true estimate of program capability, ex post and ex ante impacts in this analysis need to be adjusted for operability. In a previous evaluation, the Evergreen team recommended adjusting residential impacts by 8% based on operability inspections that occurred during Summer 2018. Our 2018 Evaluation Report covered the inspection process and key findings in detail. Itron's 2018 report adopted this recommendation. In 2021, the adjustment factor was 87% for the Residential DCU, Small Commercial, and Medium Commercial programs. The 87% operability adjustment value represents a weighted average of 85% and 95% where the two values correspond to sites that have not been visited in the past two years and sites that have been visited in the past two years, respectively. Separately, Itron's report notes that an 82% online factor (not operability factor) is applied to the Two-Way Smart Thermostat group and an 85% online factor is applied to the BYOT group. We have adopted these adjustments as well. Unless otherwise noted, results in this analysis are reported without the operability adjustment applied.

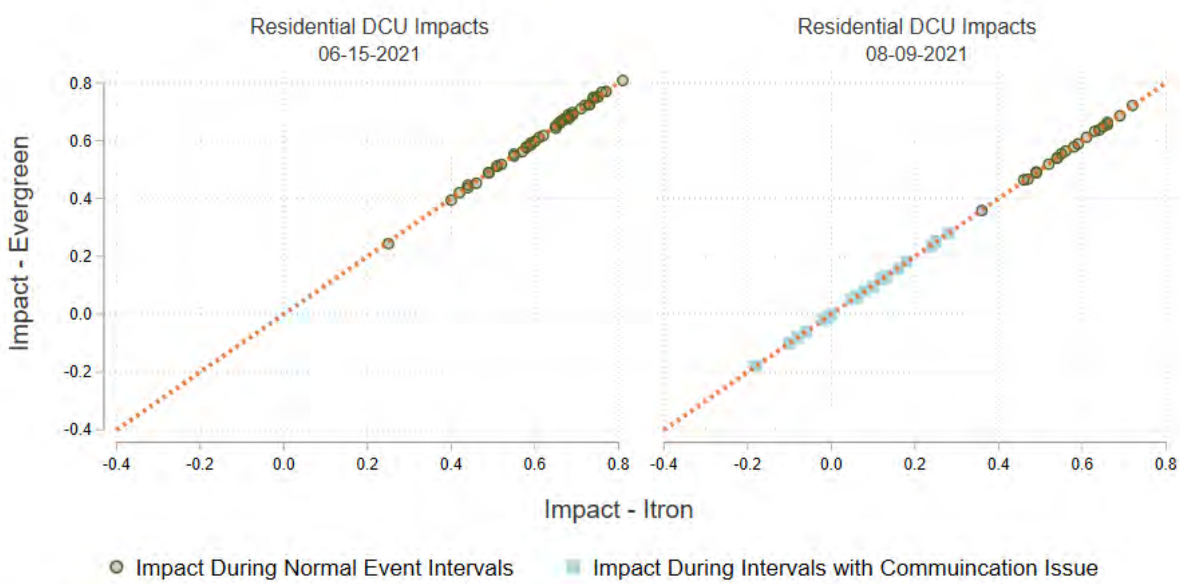
2 Residential DCU Results

This section reviews the Residential DCU impacts calculated by Itron and validated by the Evergreen team. Additionally, the team provides feedback on the evaluation approach used by Itron and provides an alternative impact analysis for summer 2021 events. Finally, ex ante impacts, combining multiple years of event history, are produced for various temperature scenarios.

2.1 Validation of Calculations

After receiving the participant load data from Itron, the Evergreen team attempted to reproduce the impacts in Itron's Power Saver impact evaluation report. Figure 7 compares the impacts as calculated by Itron and by Evergreen at the 5-minute level for each event day. The Evergreen team successfully replicated impacts for the two qualifying hour event days (6/15 and 8/9. For reference, Itron's Residential DCU impact estimates are shown in Table 6. Note that an asterisk (*) denotes a date where all hours are qualifying event hours (when the outdoor temperature was at least 97 degrees or by discretion of Itron). The maximum impact during qualifying event hours was 0.81 kW for the Residential DCU class without any adjustment for operability.

Figure 7: Residential DCU Impact Verification, Comparison by Day



The dotted line represents what a perfect match would look like.

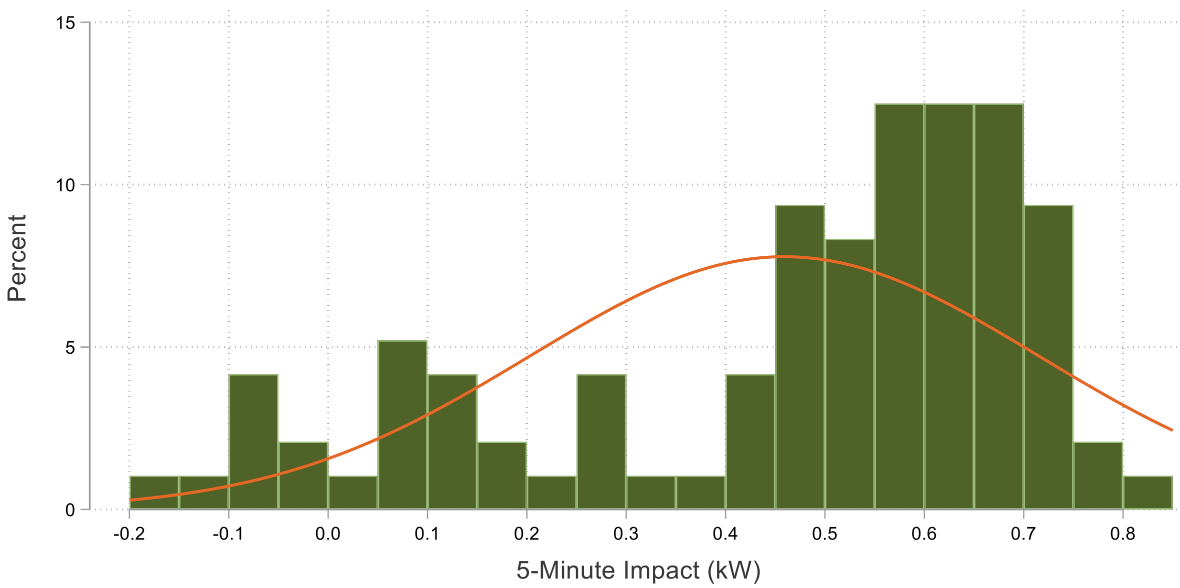
Table 6: Residential Impact Estimates (kW) by Date and Time[9]

	Hour Ending (MDT)				
Date	**3:00 PM**	**4:00 PM**	**5:00 PM**	**6:00 PM**	**7:00 PM**
6/15/2021*	-	0.75	0.77	0.81	0.72
8/09/2021	0.13	0.31	0.72	0.63	-

2.2 Evergreen Ex Post Impacts

For the Residential DCU segment, Itron's per device kW impact estimate for the 2021 season is the maximum difference between 5-minute rolling average loads for the control and curtailment groups (0.81 kW). (See Section 1.1 for more details.) The critical word here is *maximum*. The Evergreen team feels that using the maximum difference overstates the amount of load shed produced by a typical Power Saver DR event by counting favorable noise. This is especially true from a system planning perspective, as using the maximum is a poor basis for the estimated load relief upon dispatch. Figure 8 shows the distribution of impacts at the 5-minute level – 0.81 kW clearly overstates the center of the distribution.

Figure 8: Distribution of 5-Minute Residential DCU Impacts



Respectively, the mean and median are 0.46 kW and 0.55 kW.

[9] Source: Itron's 2021 PNM Power Saver Program Report. Table 38.

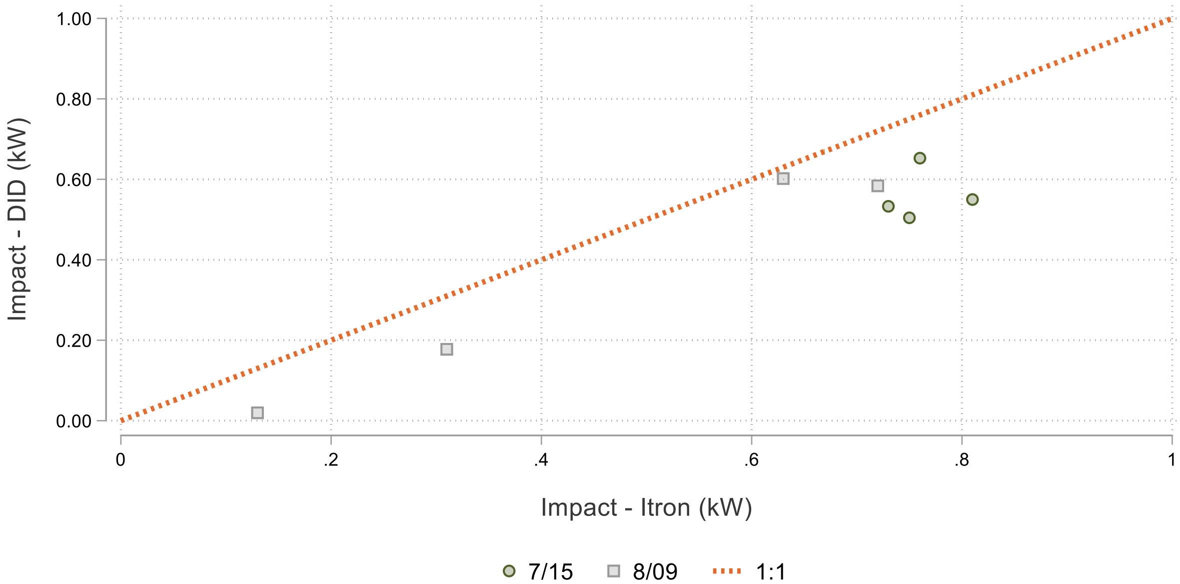
Rather than the maximum difference, the Evergreen team feels that using an average impact across an hour (rather than a maximum) returns an unbiased estimate of Power Saver program impacts during DR events. After reviewing different methodologies, the Evergreen team opted for a difference-in-difference approach for estimating ex post impacts. This approach was described in Section 1.2. Results for the 2021 DR season are summarized in Table 7. Note that the curtailment group rotated between events, which is why the sign of the non-event-day difference changes from one event to the next.

Table 7: Impact Calculations

Date	# of Curtailed Devices	Hour Ending MDT	Temp. (F)	Control kW	Curtail kW	Non-Event Diff. (kW)	Impact (kW)
6/15/2021	129	16	96	1.28	0.74	-0.03	0.50
		17	95	1.43	0.73	-0.05	0.65
		18	94	1.32	0.71	-0.06	0.55
		19	93	1.27	0.69	-0.04	0.53
8/09/2021	131	15	94	1.10	1.15	-0.07	0.02
		16	94	1.28	1.14	-0.03	0.18
		17	93	1.33	0.80	-0.05	0.58
		18	93	1.28	0.74	-0.06	0.60

The average impact during full qualifying event hours was 0.56 kW. Due to a communication error devices were not active during the first two hours of the August event day. The impact during active event hours was 0.57 kW. Figure 9 compares Evergreen's ex post hourly impacts with the impacts calculated by Itron. The Evergreen impact is lower in nearly all cases, by about 0.15 kW on average.

Figure 9: Comparison of Evergreen Ex Post Impacts and Itron Impacts



The 1:1 line shows what the trend would look like if the DID and Itron impacts were identical.

2.2.1 Net Energy Savings

The Evergreen team estimated net energy impacts for the Residential DCU program offering by summing ex post impacts from the onset of each event through the end of the event day. The calculation of impacts is exactly as described earlier in this section. Table 8 shows the energy savings estimates (per device) for each event day. During active events the net daily energy savings were 1.02 kWh per device. Multiplying this estimate by the 2 event days and the number of active devices (46,424) yields an aggregate savings estimate of 94.7 MWh for the Residential DCU program offering. After adjusting for operability there were 82.4 MWh of Residential DCU savings.

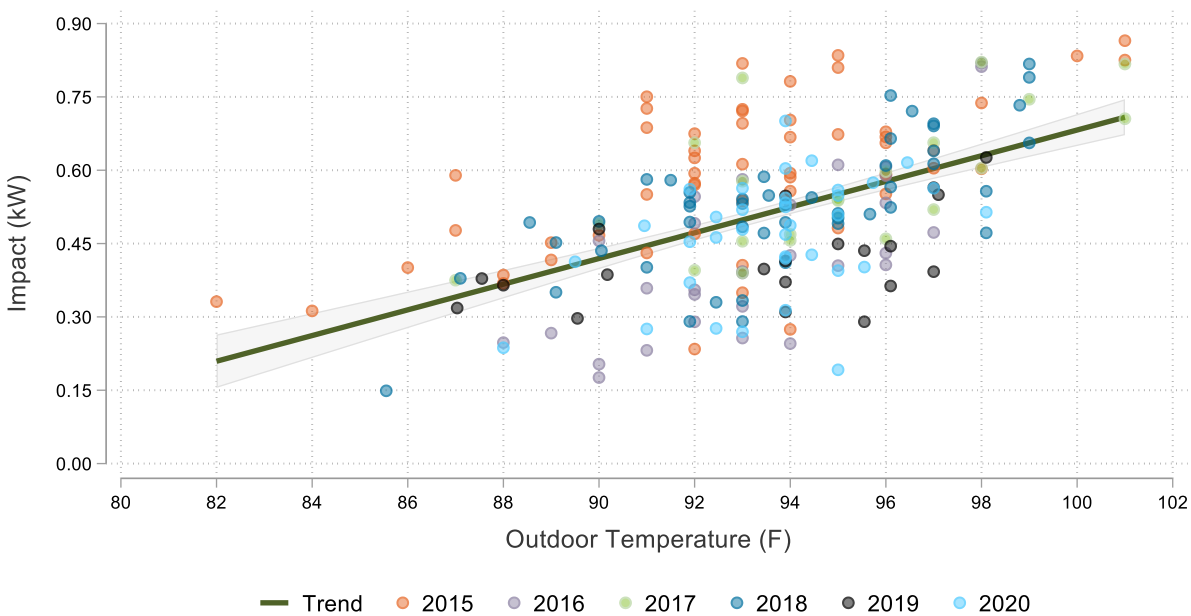
Table 8: Per Device Energy Savings by Event Day

Date	Event Start (MDT)	Event Savings (kWh)	Snapback (kWh)	Net Savings (kWh)
6/15/2021	3:00 PM	2.24	0.94	1.29
8/09/2021	4:00 PM	1.19	0.44	0.74
Average	**-**	**1.71**	**0.69**	**1.02**

2.3 Evergreen Ex Ante Impacts

Figure 10 compares 2015-2021 ex post impact estimates for each event hour with the outdoor air temperature for that hour (weather data comes from weather station KABQ in Albuquerque). There is a clear trend in the figure – the hotter it is outside, the greater the impacts tend to be. To develop an ex ante impact estimate, the Evergreen team developed a regression model that estimates the ex post impact as a function of temperature and time. The specified model was shown in Section 1.5, and the results from the model are described in more detail below. The Evergreen team predicts that the impact of a Residential DCU DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 0.73 kW per device.

Figure 10: Hourly Impacts against Outdoor Temperature (F)



The regression was run on full event hours (some events in prior summers started mid-hour) and weighted by the number of curtailed devices (each summer had slightly different numbers of dispatched devices). Regression output is shown in the table below. In general, earlier hours corresponded to higher kW values, with a drop over time in impacts as less load was available to shed. Temperature has a positive coefficient, indicating that higher temperatures produce larger load reductions. Note that any coefficient with "*" next to it is statistically significant at the 95% confidence level.

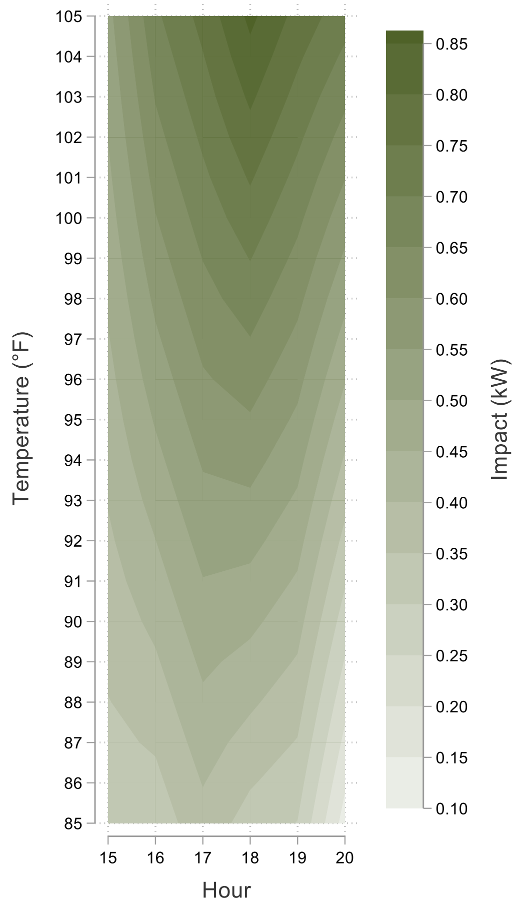
Table 9: Residential Ex Ante Regression Output

Term	Variable	Coefficient (b)	Standard Error	P-Value	95% CI
β	Temperature	0.011*	0.001	0.000	(0.010, 0.012)
γ_h	Hour 14	(base – omitted)			
	Hour 15	-0.645*	0.080	0.000	(-0.802, -0.488)
	Hour 16	-0.633*	0.079	0.000	(-0.787, -0.479)
	Hour 17	-1.330*	0.073	0.000	(-1.474, -1.187)
	Hour 18	-1.148*	0.082	0.000	(-1.309, -0.987)
	Hour 19	-1.776*	0.148	0.000	(-2.065, -1.487)
δ_h	Hour_14_x_Temp	(base – omitted)			
	Hour_15_x_Temp	0.008*	0.001	0.000	(0.006, 0.009)
	Hour_16_x_Temp	0.008*	0.001	0.000	(0.007, 0.010)
	Hour_17_x_Temp	0.016*	0.001	0.000	(0.014, 0.017)
	Hour_18_x_Temp	0.013*	0.000	0.000	(0.012, 0.015)
	Hour_19_x_Temp	0.019*	0.002	0.000	(0.016, 0.022)
α	Constant	-0.614*	0.057	0.000	(-0.726, -0.501)

Using the regression coefficients shown in the table above, the Evergreen team created a time-temperature matrix (TTM) that shows expected load reductions (per device) for different outdoor temperatures and at different times of the day. The TTM is shown in Table 10. Again, the Evergreen team predicts that the impact of a Residential DCU DR event at peaking conditions is 0.73 kW per device.

Table 10: Residential DCU Time-Temperature Matrix

Temp	Hour Ending MDT					
	15	16	17	18	19	20
105	0.53	0.69	0.77	0.86	0.78	0.72
104	0.52	0.67	0.75	0.84	0.76	0.69
103	0.51	0.65	0.73	0.81	0.73	0.66
102	0.5	0.63	0.71	0.78	0.71	0.63
101	0.49	0.62	0.69	0.76	0.69	0.6
100	0.48	0.6	0.67	0.73	0.66	0.57
99	0.47	0.58	0.65	0.7	0.64	0.54
98	0.46	0.56	0.63	0.68	0.61	0.51
97	0.45	0.54	0.61	0.65	0.59	0.48
96	0.44	0.52	0.59	0.62	0.56	0.45
95	0.42	0.51	0.57	0.6	0.54	0.42
94	0.41	0.49	0.56	0.57	0.52	0.39
93	0.4	0.47	0.54	0.54	0.49	0.36
92	0.39	0.45	0.52	0.51	0.47	0.34
91	0.38	0.43	0.5	0.49	0.44	0.31
90	0.37	0.41	0.48	0.46	0.42	0.28
89	0.36	0.39	0.46	0.43	0.4	0.25
88	0.35	0.38	0.44	0.41	0.37	0.22
87	0.34	0.36	0.42	0.38	0.35	0.19
86	0.33	0.34	0.4	0.35	0.32	0.16
85	0.32	0.32	0.38	0.33	0.3	0.13



To get an idea of the Residential DCU resource capability on aggregate, the number of active devices can be multiplied by the values shown in Table 10. As of the end of summer 2021, there were 46,424 active residential devices. Thus, the expected aggregate impact of an event hour ending at 6:00 PM (MDT) when the outdoor temperature is 100 degrees would be 0.73 kW. Residential results are subject to an operability adjustment to better reflect the fact that not all devices in the population will be able to curtail load when called due to damage, wiring, or connection issues. The operability adjusted aggregate load is 87% of the unadjusted load, or 29.48 MW.

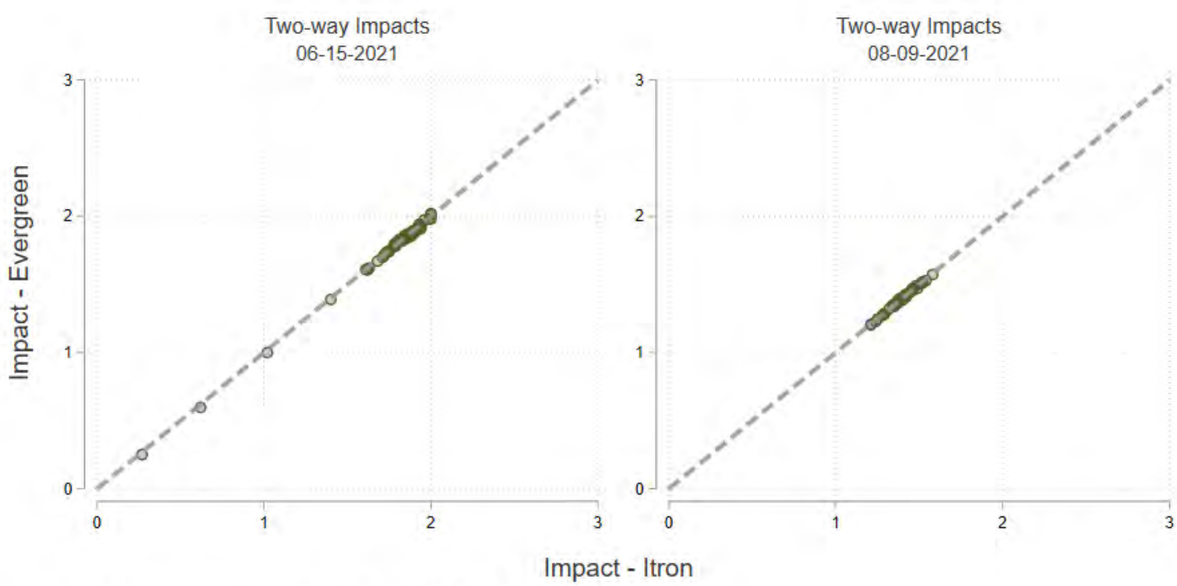
3 Two-Way Smart Thermostat

For the Two-Way Smart Thermostat program offering, usage during the curtailment event is compared to usage on high load days preceding the event. This section reviews the Two-Way Smart Thermostat impacts calculated by Itron and validated by the Evergreen team. Additionally, we provide feedback on the evaluation approach used by Itron and provides an alternative impact analysis for summer 2021 events, which we implemented for the Two-Way Smart Thermostat program offering as well as the BYOT, Small Commercial, and Medium Commercial program offerings in their respective sections. Finally, ex ante impacts, combining multiple years of event history are produced for various temperature scenarios.

3.1 Validation of Calculations

After receiving the participant load data from Itron, the Evergreen team attempted to reproduce the impacts in Itron's Power Saver impact evaluation report. We were able to closely replicate impacts the event days. We believe the marginal differences between the Evergreen and Itron values can be attributed to rounding differences between the baseline adjustments. Evergreen found maximum impact during qualifying event hours was 2.02 kW per thermostat. Itron found maximum impact to be 2.00 kW per thermostat. Both teams found maximum impact on June 15th during hour ending 7pm. Figure 11 compares impacts as calculated by Itron and by Evergreen at the 5-minute level. For reference, Evergreen's Two-Way Smart Thermostat impact estimates are shown in Table 11. Note that an asterisk (*) denotes a date with qualifying event hours.

Figure 11: Two-Way Smart Thermostat Impact Verification



The dotted line represents what a perfect match would look like.

Table 11: Two-Way Smart Thermostat Impact Estimates (kW) by Date and Time

	Hour Ending (MDT)				
Date	**3:00 PM**	**4:00 PM**	**5:00 PM**	**6:00 PM**	**7:00 PM**
6/15/2021*	-	1.78	1.93	1.98	2.02
8/09/2021	1.29	1.41	1.52	1.57	-

3.2 Evergreen Ex Post Impacts

As discussed in Section 1.4, the Evergreen team thinks the method used to estimate impacts for the Two-Way Smart Thermostat program offering overstates the true average impact. For each event hour during the 2021 DR season, Table 12 shows the estimates produced by the Evergreen team[10]. Our methods differed from Itron's just slightly – in any place where a maximum was called for, we replaced it with the mean. Our reduction estimate is the average of the values in the 'Impact' column during all event hours was 1.52 kW

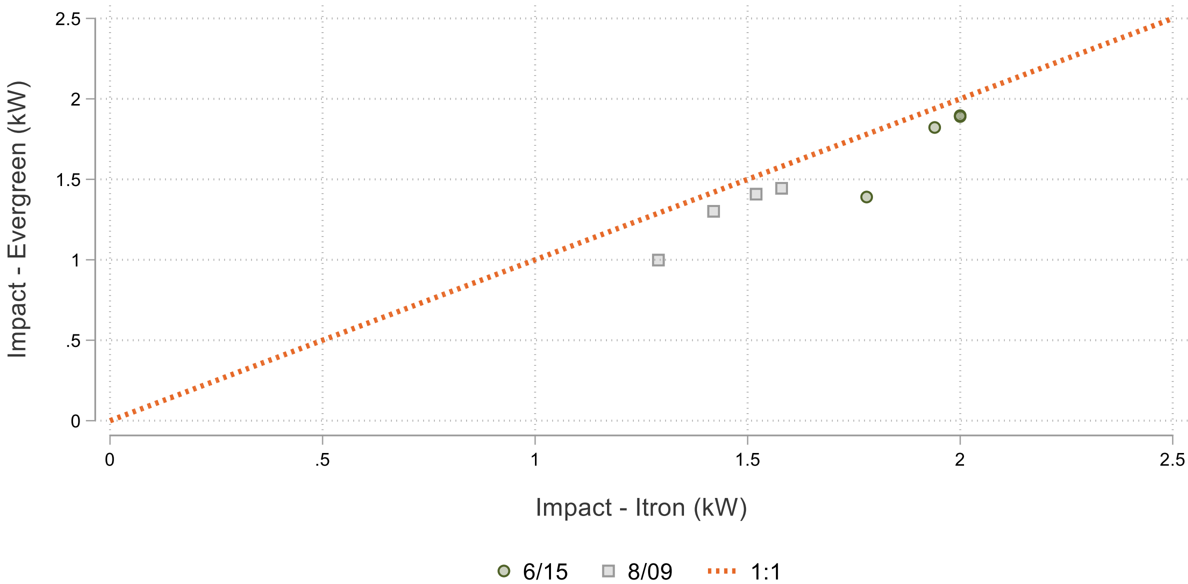
Table 12: Two-Way Smart Thermostat Impact Results

Date	# of Curtailed Devices	Hour Ending MDT	Temp.	CBL kW	Observed kW	Impact
6/15/2021	598	16	96	2.45	1.16	1.39
		17	95	2.63	0.91	1.82
		18	94	2.73	0.93	1.90
		19	93	2.75	0.96	1.89
8/09/2021	640	15	94	1.69	0.79	1.00
		16	94	1.89	0.69	1.30
		17	93	2.04	0.74	1.41
		18	93	2.12	0.78	1.44

Figure 12 compares Evergreen's ex post hourly impacts with the impacts calculated by Itron. The Evergreen impact is lower in all cases.

[10] Note that the Two-Way devices include a 0.1 kW adjustment to the impact to account for the thermostat curtailment on the air handler fan for systems set to "auto".

Figure 12: Comparison of Evergreen Ex Post Impacts and Itron Impacts



The 1:1 line shows what the trend would look like if the DID and Itron impacts were identical.

3.2.1 Net Energy Savings

The Evergreen team estimated net energy impacts for the Two-Way Smart Thermostat program offering by summing ex post impacts from the onset of each event through the end of the event day. The calculation of impacts is exactly as described earlier in this section. Table 13 shows the energy savings estimates (per facility) for each event day. On average, net daily energy savings were 6.72 kWh per device. Multiplying this estimate by the number of event days (two) and the number of active devices (640) yields an aggregate savings estimate of 8.60 MWh for the Two-Way Smart Thermostat program offering.

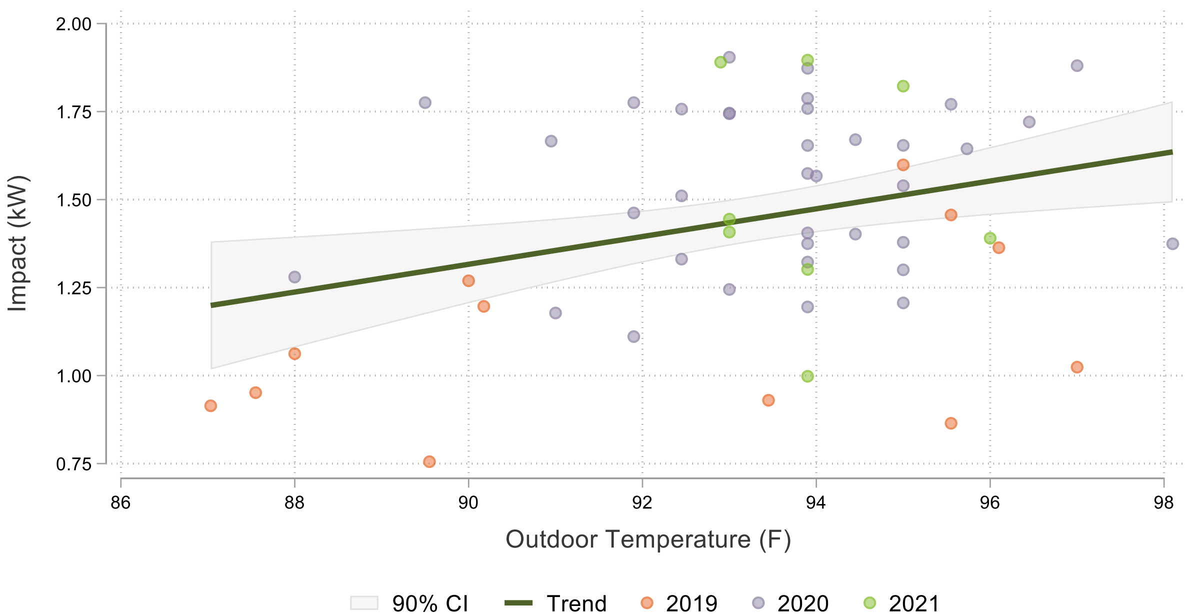
Table 13: Per Device Energy Savings by Event Day

Date	Event Start (MDT)	Event Savings (kWh)	Snapback (kWh)	Net Savings (kWh)
6/15/2021	3:00 PM	7.00	0.45	6.55
8/09/2021	4:00 PM	5.15	-1.72	6.87
Average		**6.08**	**-0.64**	**6.72**

3.3 Evergreen Ex Ante Impacts

Figure 13 compares 2019-2021 ex post impact estimates for each event hour with the outdoor air temperature for that hour.[11] Weather data comes from weather station KABQ in Albuquerque. The magnitude of the impact increases with temperature. To produce an ex ante impact estimate, the Evergreen team developed a regression model that estimates the ex post impact as a function of temperature and time. The specified model was shown in Section 1.5, and the results from the model are described in more detail below. Using the model, the Evergreen team predicts that the impact of a Two-Way Smart Thermostat DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 2.00 kW per device.

Figure 13: Hourly Impacts against Outdoor Temperature (F)



The ex-ante regression model was run on full event hours and weighted by the number of curtailed devices (each summer had slightly different numbers of dispatched devices). Regression output is shown below. Temperature has a positive coefficient, indicating that higher temperatures produce higher impacts, as do the hour impacts. The interaction terms, represented by δ_h, are mostly negative, indicating that the incremental effect of temperature in a given hour actually decreases the impact. It should be noted that hour 20 was extremely rare and accounted for only three of the 48 event hours during the past two years. In addition, unlike other programs, hour ending 15 is not included in the regression due to a lack of data. Due to the small sample

[11] Note that the baseline method used to calculate ex post impacts for 2020 and 2021 differed slightly from the control group method used to calculate ex post impacts in 2019.

sizes and year-to-year variability, none of the estimates in this regression are statistically significant.

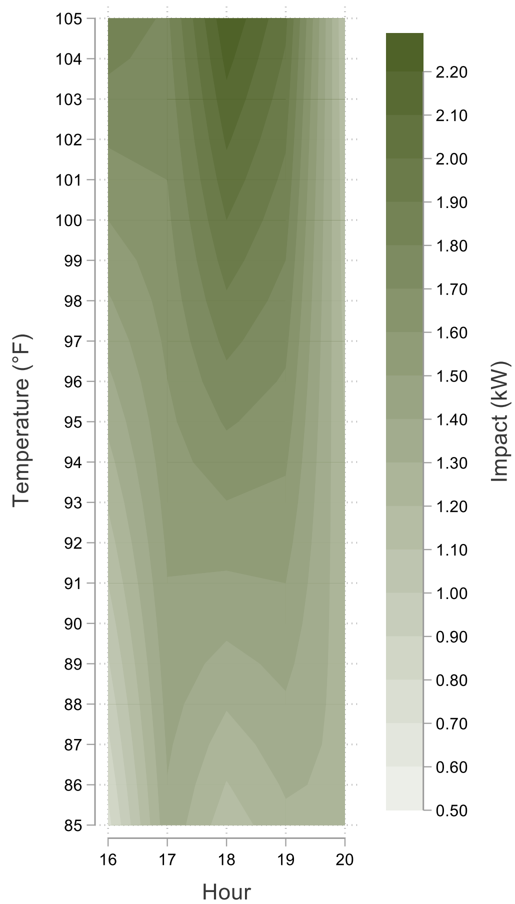
Table 14: Two-Way Smart Thermostat Ex Ante Regression Output

Term	Variable	Coefficient (b)	Standard Error	P-Value	95% CI
β	Temperature	0.055	0.043	0.214	(-0.033, 0.144)
γ_h	Hour 16	(base – omitted)			
	Hour 17	3.589	5.265	0.499	(-7.021, 14.200)
	Hour 18	0.188	5.345	0.972	(-10.584, 10.960)
	Hour 19	2.039	4.906	0.680	-7.848, 11.925)
	Hour 20	6.017	7.619	0.434	(-9.338, 21.373)
δ_h	Hour_16_x_Temp	(base – omitted)			
	Hour_17_x_Temp	-0.035	0.056	0.535	(-0.148, 0.078)
	Hour_18_x_Temp	0.002	0.057	0.969	(-0.113, 0.117)
	Hour_19_x_Temp	-0.018	0.052	0.734	(-0.124, 0.088)
	Hour_20_x_Temp	-0.065	0.083	0.442	(-0.232, 0.103)
α	Constant	-3.946	4.119	0.343	(-12.247, 4.356)

Using the regression coefficients shown in Table 14, the Evergreen team created a time-temperature matrix (TTM) that shows expected load reductions (per device) for different outdoor temperatures and at different times of the day. The TTM is shown in Table 15. These results should be interpreted with caution due to their small sample sizes. The Evergreen team predicts that the impact of a Two-Way Smart Thermostat DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 2.00 kW per device.

Table 15: Two-Way Smart Thermostat Time-Temperature Matrix

Temp	Hour Ending MDT				
	16	17	18	19	20
105	1.87	1.78	2.29	2.02	1.1
104	1.81	1.76	2.23	1.99	1.11
103	1.76	1.74	2.17	1.95	1.12
102	1.7	1.72	2.12	1.91	1.13
101	1.65	1.7	2.06	1.87	1.14
100	1.59	1.68	2.00	1.84	1.15
99	1.53	1.66	1.94	1.8	1.16
98	1.48	1.64	1.89	1.76	1.17
97	1.42	1.62	1.83	1.73	1.18
96	1.37	1.6	1.77	1.69	1.18
95	1.31	1.58	1.71	1.65	1.19
94	1.26	1.56	1.66	1.61	1.2
93	1.2	1.54	1.6	1.58	1.21
92	1.15	1.52	1.54	1.54	1.22
91	1.09	1.5	1.48	1.5	1.23
90	1.04	1.48	1.42	1.46	1.24
89	0.98	1.46	1.37	1.43	1.25
88	0.93	1.44	1.31	1.39	1.26
87	0.87	1.42	1.25	1.35	1.27
86	0.81	1.4	1.19	1.31	1.28
85	0.76	1.37	1.14	1.28	1.29



To get an idea of Two-Way Smart Thermostat resource capability on aggregate, the number of active facilities can be multiplied by the values shown in Table 15. As of the end of summer 2021, there were 722 active Two-Way Smart Thermostat devices. Thus, the expected aggregate impact of an event hour ending at 6:00 PM (MDT) when the outdoor temperature is 100 degrees would be 2.00 MW. Adjusted for operability using the 82% adjustment factor, this aggregate impact is 1.64 MW.

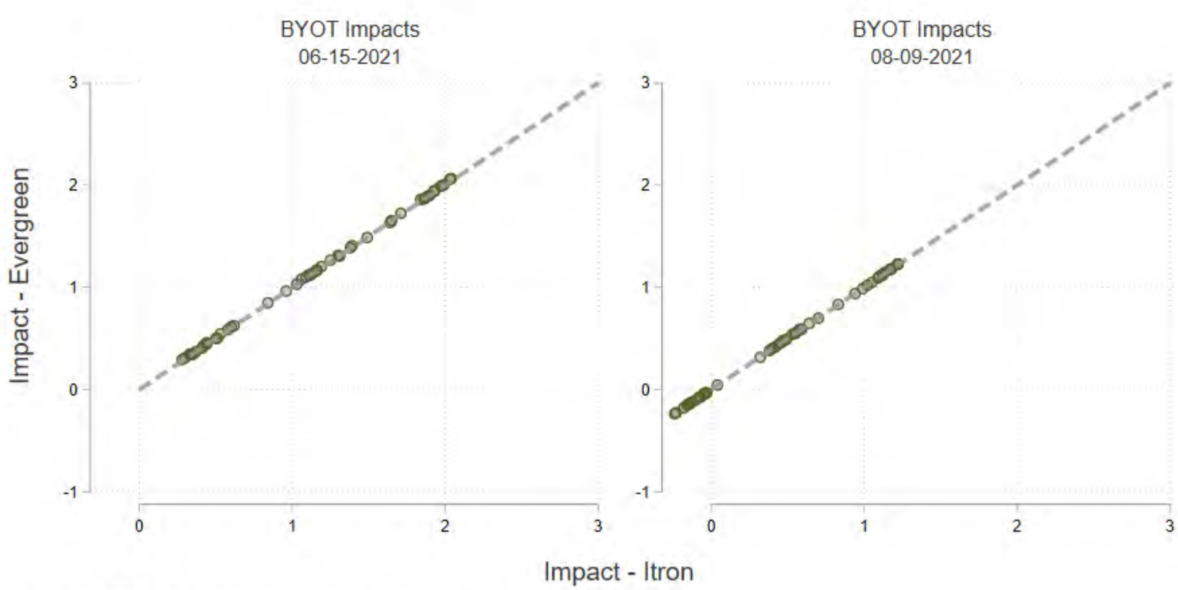
4 Bring Your Own Thermostat (BYOT)

For the BYOT program offering, usage during the curtailment event is compared to usage on high load days preceding the event. The remainder of this section provides greater detail on how the Evergreen team attempted to validate Itron's calculations, as well as a discussion of ex post and ex ante impacts and baseline accuracy.

4.1 Validation of Calculations

After receiving the participant load data from Itron, the Evergreen team attempted to reproduce the impacts in Itron's Power Saver impact evaluation report. The marginal differences from the Evergreen team and Itron can be attributed to rounding differences between the baseline adjustments. Itron found the maximum impact to be 2.04 kW. Evergreen found maximum impact during qualifying event hours was 2.06 kW per device. Both found maximum impact recorded on June 15th at hour ending 7pm. Figure 14 compares impacts as calculated by Itron and by Evergreen at the 5-minute level. For reference, BYOT impact estimates are shown in Table 16. Note that an asterisk (*) denotes a date where all hours are qualifying event hours (when the outdoor temperature was at least 97 degrees).

Figure 14: BYOT Impact Verification



The dotted line represents what a perfect match would look like.

Table 16: BYOT Impact Estimates (kW) by Date and Time

Date	Hour Ending (MDT) 3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM
6/15/2021*	-	1.72	1.95	2.00	2.06
8/09/2021	1.02	1.17	1.18	1.23	-

4.2 Evergreen Ex Post Impacts

As discussed in Section 1.4, the Evergreen team thinks the method used to estimate impacts for the BYOT program offering overstates the true average impact. For each event hour during the 2021 DR season, Table 17 shows the estimates produced by the Evergreen team[12]. Our methods differed from Itron's just slightly – in any place where a maximum was called for, we replaced it with the mean. Evergreen also opted for a lower connected load when converting A/C runtime to electric demand.

Table 17: BYOT Impact Results

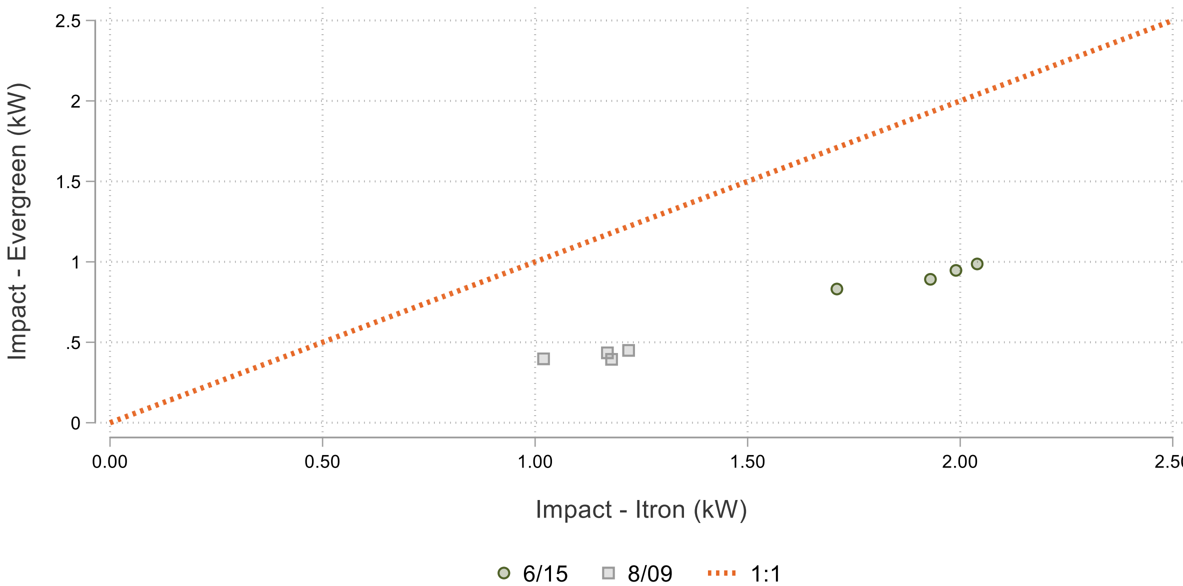
Date	# of Curtailed Devices	Hour Ending MDT	Temp.	CBL kW	Observed kW	Impact
6/15/2021	166	16	96	1.73	1.00	0.83
		17	95	1.94	1.15	0.89
		18	94	2.05	1.20	0.95
		19	93	2.03	1.15	0.99
8/09/2021	183	15	94	1.08	0.78	0.40
		16	94	1.29	0.95	0.43
		17	93	1.36	1.07	0.39
		18	93	1.50	1.15	0.45

Our reduction estimate is the average of the values in the 'Impact' column during event hours was 0.67 kW. Figure 15 compares Evergreen's ex post hourly impacts with the impacts calculated by Itron. The Evergreen impact is lower in all cases, and by a larger amount than other customer sectors, due to a greater cycling strategy that leads to a low average impact (see Figure 68 of the

[12] Note that the BYOT devices include a 0.1 kW adjustment to the impact to account for the thermostat curtailment of the air handler fan for system set to 'auto'.

Itron report and Section 1.4 of this report). The average qualifying event hour aggregate impact was 0.12 MW. Multiplying by the percent of online thermostats (85%) yields an aggregate impact of 0.10 MW.

Figure 15: Comparison of Evergreen Ex Post Impacts and Itron Impacts



The 1:1 line shows what the trend would look like if the DID and Itron impacts were identical.

4.2.1 Net Energy Savings

The Evergreen team estimated net energy impacts for the BYOT program offering by summing ex post impacts from the onset of each event through the end of the event day. The calculation of impacts is exactly as described earlier in this section. Table 18 shows the energy savings estimates (per facility) for each event day. On average, net daily energy savings were 3.11 kWh per facility. Multiplying this estimate by the number of event days (two) and active devices (214) yields an aggregate savings estimate of 1.33 MWh for the BYOT program offering.

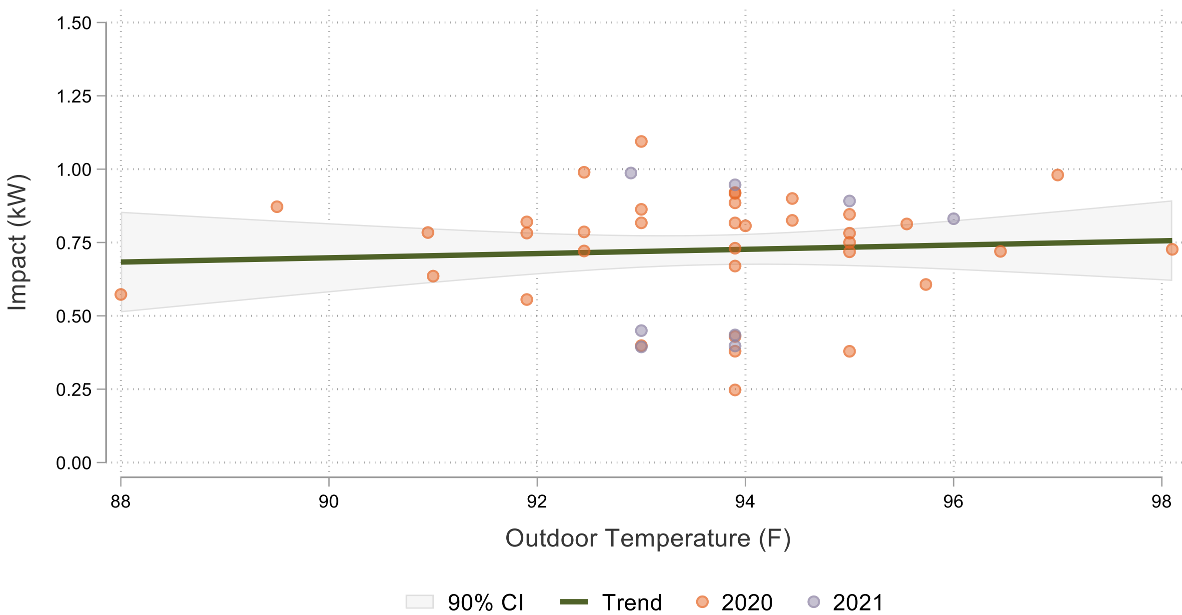
Table 18: Per Device Energy Savings by Event Day

Date	Event Start (MDT)	Event Savings (kWh)	Snapback (kWh)	Net Savings (kWh)
6/15/2021	3:00 PM	3.66	0.76	2.90
8/09/2021	4:00 PM	1.67	-1.64	3.31
Average		**2.67**	**-0.44**	**3.11**

4.3 Evergreen Ex Ante Impacts

Figure 16 compares 2020 and 2021 ex post impact estimates for each event hour with the outdoor air temperature for that hour. Weather data comes from weather station KABQ in Albuquerque. The results do not show strong weather sensitivity, though this might change with additional data from future program years.

Figure 16: Hourly Impacts against Outdoor Temperature (F)



To develop an ex ante impact estimate, the Evergreen team developed a regression model that estimates the ex post impact as a function of temperature. Unlike the other ex ante models following the form of Section 1.5, "hour" was not included as an explanatory variable in this model, as there simply are not enough data points to do so. When evaluating 2022 impacts, we will attempt to include the "hour" terms. The ex ante regression model was weighted by the number of curtailed devices in each event hour. Regression output is shown below in Table 19. Due to the small sample size, temperature is not considered a statistically significant predictor of the demand reduction.

Regression output is shown below in Table 19. Due to the small sample size, none of regression coefficients are significant.

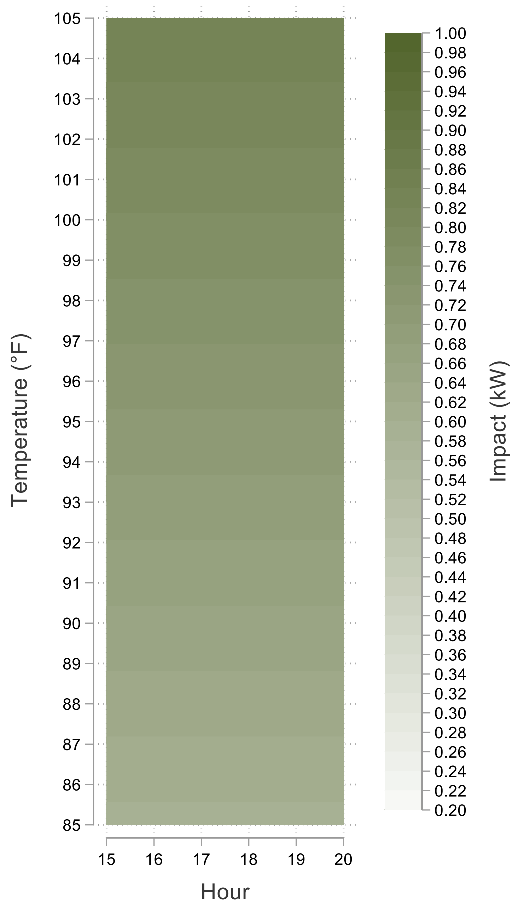
Table 19: BYOT Ex Ante Regression Output

Term	Variable	Coefficient (b)	Standard Error	P-Value	95% CI
β	Temperature	0.012	0.019	0.527	(-0.027, 0.051)
α	Constant	-0.455	1.811	0.803	(-4.100, 3.199)

Using the regression coefficients shown in Table 19, the Evergreen team created a time-temperature matrix (TTM) that shows expected load reductions (per device) for different outdoor temperatures and at different times of the day. The TTM is shown in Table 20. Using the model, the Evergreen team predicts that the impact of a BYOT DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 0.78 kW per device. However, these results should be interpreted with caution due to their small sample sizes.

Table 20: BYOT Time-Temperature Matrix

Temp	Hour Ending MDT					
	15	16	17	18	19	20
105	0.84	0.84	0.84	0.84	0.84	0.84
104	0.83	0.83	0.83	0.83	0.83	0.83
103	0.82	0.82	0.82	0.82	0.82	0.82
102	0.8	0.8	0.8	0.8	0.8	0.8
101	0.79	0.79	0.79	0.79	0.79	0.79
100	0.78	0.78	0.78	0.78	0.78	0.78
99	0.77	0.77	0.77	0.77	0.77	0.77
98	0.75	0.75	0.75	0.75	0.75	0.75
97	0.74	0.74	0.74	0.74	0.74	0.74
96	0.73	0.73	0.73	0.73	0.73	0.73
95	0.72	0.72	0.72	0.72	0.72	0.72
94	0.7	0.7	0.7	0.7	0.7	0.7
93	0.69	0.69	0.69	0.69	0.69	0.69
92	0.68	0.68	0.68	0.68	0.68	0.68
91	0.67	0.67	0.67	0.67	0.67	0.67
90	0.65	0.65	0.65	0.65	0.65	0.65
89	0.64	0.64	0.64	0.64	0.64	0.64
88	0.63	0.63	0.63	0.63	0.63	0.63
87	0.62	0.62	0.62	0.62	0.62	0.62
86	0.61	0.61	0.61	0.61	0.61	0.61
85	0.59	0.59	0.59	0.59	0.59	0.59



To get an idea of BYOT resource capability on aggregate, the number of active participants can be multiplied by the values shown in Table 20. As of the end of summer 2021, there were 214 active BYOT participants. Thus, the expected aggregate impact of an event hour ending at 6:00 PM (MDT) when the outdoor temperature is 100 degrees would be 0.17 MW. Adjusted for operability using the 85% online factor, this aggregate impact is 0.14 MW.

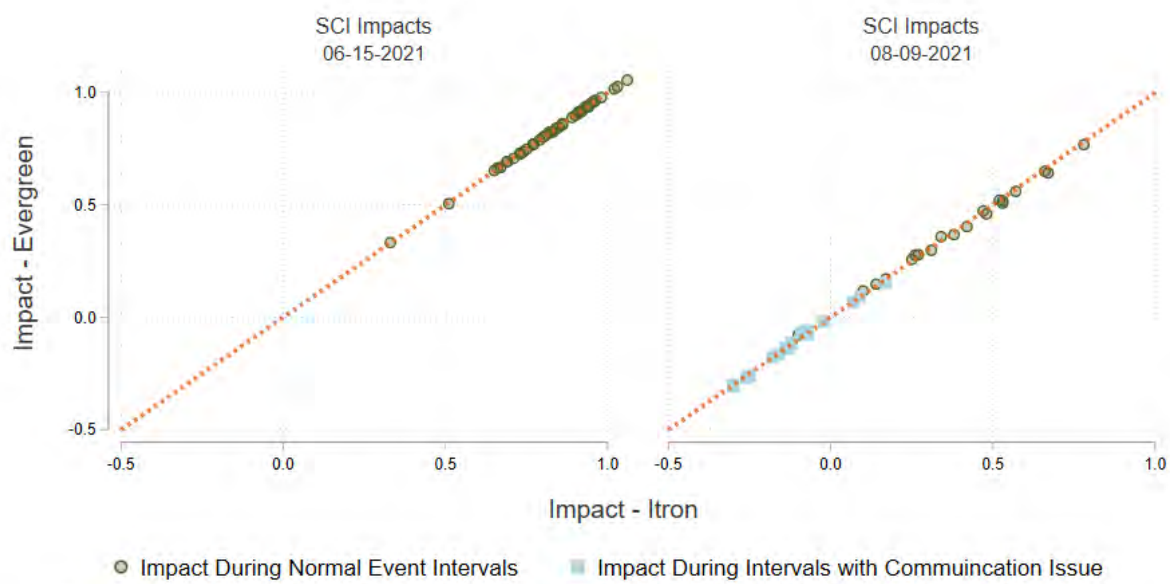
5 Small Commercial Results

For the Small Commercial program offering, usage during the curtailment event is compared to usage on high load days preceding the event. This section reviews the Small Commercial impacts calculated by Itron and validated by the Evergreen team. Additionally, ex ante impacts, combining multiple years of event history are produced for various temperature scenarios.

5.1 Validation of Calculations

After receiving the participant load data from Itron, the Evergreen team attempted to reproduce the impacts in Itron's Power Saver impact evaluation report. Figure 17 compares impacts as calculated by Itron and by Evergreen at the 5-minute level. A full summary of Itron's event hour impacts is shown in Table 21. Itron's per device kW impact estimate for the Small Commercial class (1.06 kW) is the maximum fifteen-minute rolling average reduction during the qualifying event hours on 6/15. (See Section 1.3 for more details.)

Figure 17: Small Commercial Impact Verification



The dotted line represents what a perfect match would look like.

Table 21: Small Commercial Impact Estimates (kW) by Date and Time

	Hour Ending (MDT)				
Date	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM
6/15/2021*	-	1.03	1.06	0.86	0.96
8/09/2021	0.15	-0.02	0.77	0.56	-

5.2 Evergreen Ex Post Impacts

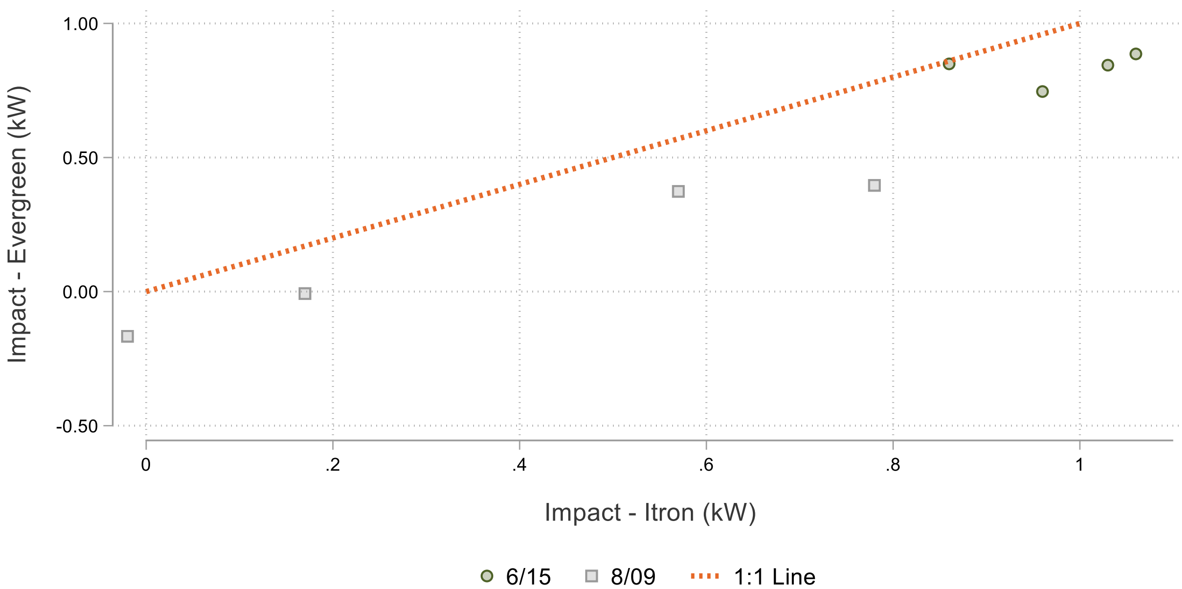
As discussed in Section 1.4, the Evergreen team thinks the method used to estimate impacts for the Small Commercial program offering overstates the true average impact. For each event hour during the 2021 DR season, Table 22 shows the estimates produced by the Evergreen team. Our methods differed from Itron's in that in any place where a maximum was called for, we replaced it with the mean.

Table 22: Impact Calculations for the Small Commercial Segment

Date	# of Curtailed Devices	Hour Ending MDT	Temp.	CBL kW	Observed kW	Impact
6/15/2021		16	96	1.94	1.10	0.84
		17	95	1.88	1.00	0.89
		18	94	1.64	0.79	0.85
		19	93	1.38	0.64	0.75
8/09/2021		15	94	1.41	1.41	-0.01
		16	94	1.28	1.45	-0.17
		17	93	1.20	0.80	0.40
		18	93	1.14	0.76	0.37

The average difference during full event hours was 0.37 kW. Devices were not active during the first two hours of the August event day due to a communications issue. The average impact during active event hours was 0.68 kW. Figure 18 compares Evergreen's ex post hourly impacts with the impacts calculated by Itron. The Evergreen impact is lower in all cases. As of the end of summer 2021, there were 4,906 active small commercial devices. Thus, the average qualifying event hour aggregate impact was 2.40 MW. Adjusted for 87% operability, the aggregate impact was 2.09 MW.

Figure 18: Comparison of Evergreen Ex Post Impacts and Itron Impacts



The 1:1 line shows what the trend would look like if the Evergreen and Itron impacts were identical.

5.2.1 Net Energy Savings

The Evergreen team estimated net energy impacts for the Small Commercial program offering by summing ex post impacts from the onset of each event through the end of the event day. The calculation of impacts is exactly as described earlier in this section. Table 23 shows the energy savings estimates (per device) for each event day. On average, net daily energy savings were 1.88 kWh per device. Multiplying by the number of events (two) and the number of active devices (4,906) yields an aggregate savings estimate of 18.4 MWh for the Small Commercial DCU segment.

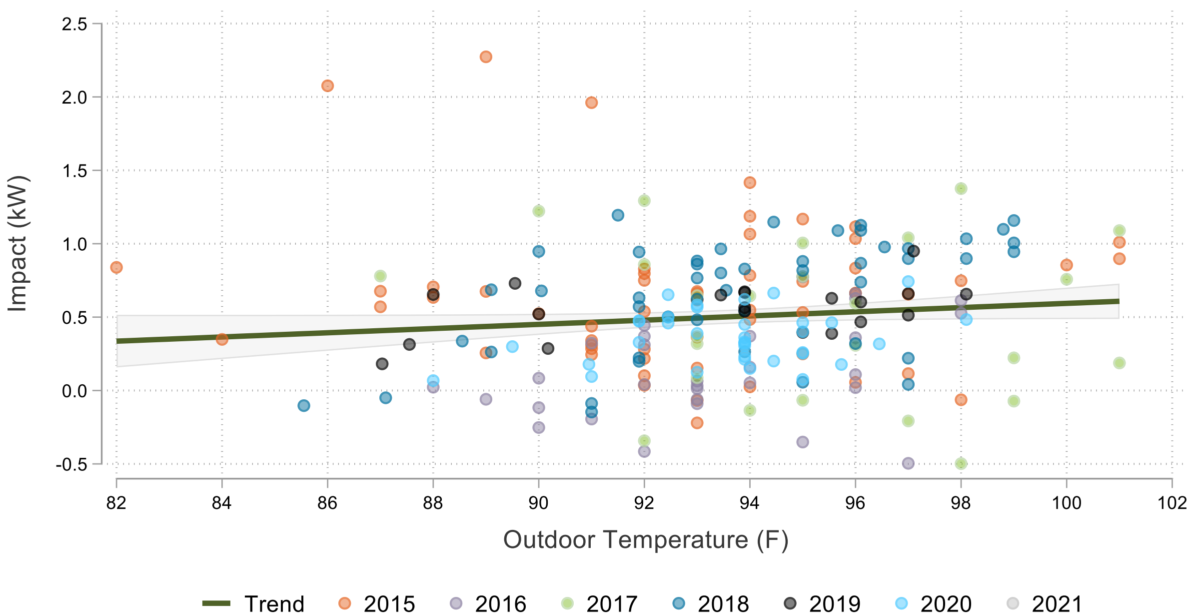
Table 23: Per Device Energy Savings by Event Day

Date	Event Start (MDT)	Event Savings (kWh)	Snapback (kWh)	Net Savings (kWh)
6/15/2021	3:00 PM	3.33	0.60	2.73
8/09/2021	4:00 PM	0.60	-0.44	1.04
Average		**1.96**	**0.08**	**1.88**

5.3 Evergreen Ex Ante Impacts

Figure 19 compares 2015-2021 ex post impact estimates for each event hour with the outdoor air temperature for that hour. Weather data comes from weather station KABQ in Albuquerque. The trend in temperature is quite subtle; there are only slight increases in impact magnitude as temperature increases. To develop an ex ante impact estimate, the Evergreen team developed a regression model that estimates the ex post impact as a function of temperature and time. The specified model was shown in Section 1.5, and the results from the model are described in more detail below. Using the model, the Evergreen team predicts that the impact of a Small Commercial DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 0.5 kW per device.

Figure 19: Hourly Impacts against Outdoor Temperature (F)



The regression was run on full event hours (some events in prior summers started mid-hour) and weighted by the number of curtailed devices (each summer had slightly different numbers of dispatched devices). Regression output is shown below in Table 24. In general, earlier hours corresponded to higher kW values, with a drop over time in impacts as less load was available to shed. It should be noted that hour 20 was relatively rare; only seven events during the past four years included a full-hour event during this period and as such, should be interpreted with care. Temperature has a negative coefficient, indicating that higher temperatures produce lower impacts after accounting for the hour and the interaction between temperature and time. The interaction terms, represented by δ_h, are all positive, indicating that the incremental effect of temperature in a given hour increases the impact. Again, hour 20 should be interpreted with caution as only seven data points were available to fit the model. Note that any coefficient with * next to it is statistically significant. Due to the small sample sizes and year-to-year variability, none of the estimates in this regression are statistically significant.

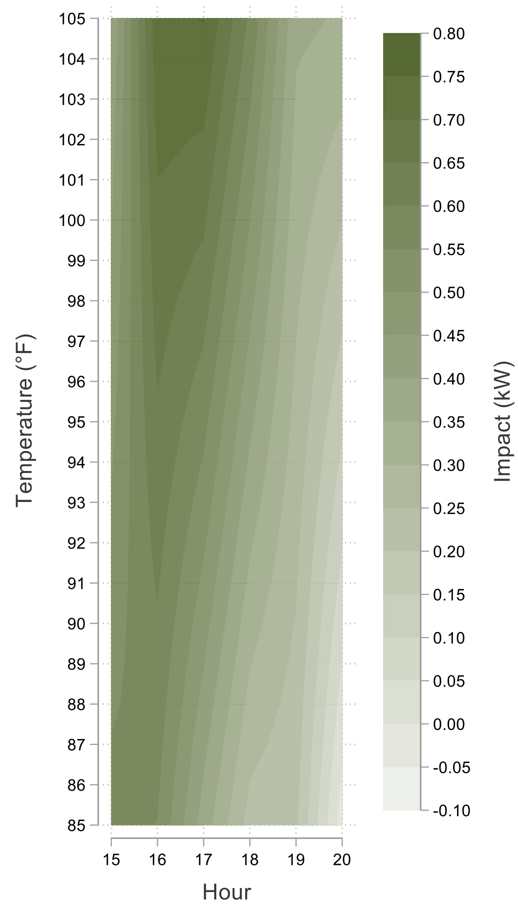
Table 24: Small Commercial Ex Ante Regression Output

Term	Variable	Coefficient (b)	Standard Error	P-Value	95% CI
β	Temperature	-0.008	0.023	0.727	(-0.054, 0.038)
γ_h	Hour 15	(base – omitted)			
	Hour 16	-1.151	2.953	0.610	(-7.333, 4.313)
	Hour 17	-2.480	2.810	0.378	(-8.021, 3.060)
	Hour 18	-2.566	2.688	0.341	(-7.866, 2.733)
	Hour 19	-1.690	2.888	0.559	(-7.384, 4.003)
	Hour 20	-2.859	4.589	0.534	(-11.904, 6.186)
δ_h	Hour_15_x_Temp	(base – omitted)			
	Hour_16_x_Temp	0.018	0.032	0.584	(-0.046, 0.081)
	Hour_17_x_Temp	0.027	0.030	0.376	(-0.033, 0.088)
	Hour_18_x_Temp	0.026	0.029	0.369	(-0.031, 0.084)
	Hour_19_x_Temp	0.016	0.031	0.618	(-0.046, 0.077)
	Hour_20_x_Temp	0.027	0.051	0.599	(-0.072, 0.125)
α	Constant	1.257	2.115	0.553	(-2.963, 5.477)

Using the regression coefficients shown in Table 24, the Evergreen team created a time-temperature matrix (TTM) that shows expected load reductions (per device) for different outdoor temperatures and at different times of the day. The TTM is shown in Table 25. These results should be interpreted with caution due to their small sample sizes. For the 5-6 PM interval at 100°F, the expected load impact is 0.50 kW. The expected load impact is lower for the 5-6 PM interval than earlier in the day because there is less naturally available load earlier in the day for curtailment.

Table 25: Small Commercial Time-Temperature Matrix

Temp	Hour Ending MDT					
	15	16	17	18	19	20
105	0.41	0.74	0.75	0.59	0.36	0.34
104	0.41	0.73	0.73	0.57	0.35	0.33
103	0.42	0.72	0.71	0.56	0.35	0.31
102	0.43	0.71	0.7	0.54	0.34	0.29
101	0.44	0.7	0.68	0.52	0.33	0.27
100	0.45	0.69	0.66	0.50	0.32	0.25
99	0.45	0.68	0.64	0.48	0.32	0.23
98	0.46	0.67	0.62	0.47	0.31	0.21
97	0.47	0.66	0.6	0.45	0.3	0.2
96	0.48	0.65	0.58	0.43	0.29	0.18
95	0.49	0.64	0.56	0.41	0.28	0.16
94	0.49	0.63	0.55	0.39	0.28	0.14
93	0.5	0.62	0.53	0.37	0.27	0.12
92	0.51	0.61	0.51	0.36	0.26	0.1
91	0.52	0.61	0.49	0.34	0.25	0.09
90	0.53	0.6	0.47	0.32	0.25	0.07
89	0.54	0.59	0.45	0.3	0.24	0.05
88	0.54	0.58	0.43	0.28	0.23	0.03
87	0.55	0.57	0.41	0.27	0.22	0.01
86	0.56	0.56	0.4	0.25	0.22	-0.01
85	0.57	0.55	0.38	0.23	0.21	-0.03



To get an idea of the Small Commercial resource capability on aggregate, the number of active devices can be multiplied by the values shown in Table 25. As of the end of summer 2021, there were 4,906 active small commercial devices. Thus, the expected aggregate impact of an event hour ending at 6:00 PM (MDT) when the outdoor temperature is 100 degrees would be 2.45 MW. Adjusted for 87% operability, the aggregate impact is 2.13 MW.

6 Medium Commercial

For the Medium Commercial program offering, usage during the curtailment event is compared to usage on high load days preceding the event. The remainder of this section provides greater detail on how the Evergreen team attempted to validate Itron's calculations and discusses ex post and ex ante impacts and baseline accuracy.

6.1 Validation of Calculations

After receiving the participant load data from Itron, the Evergreen team attempted to reproduce the impacts in Itron's Power Saver impact evaluation report. We believe that the marginal differences between our results and the Itron analysis come from rounding of the baseline adjustments. Figure 20 compares impacts as calculated by Itron and by Evergreen at the 5-minute level. For reference, the Evergreen medium commercial impact estimates are shown in Table 26. Note that an asterisk (*) denotes a qualifying event hour. Evergreen found the maximum impact during qualifying event hours was 11.85 kW per facility from 6-7 pm on 6/15. Itron found a maximum impact of 11.80 kW per facility or 1.61 kW per device from 3-4 pm. While the maximum impacts are very close, it is worth noting the two analyses draw the settlement kW factor for Medium Commercial from two different hours.

Figure 20: Medium Commercial Impact Verification

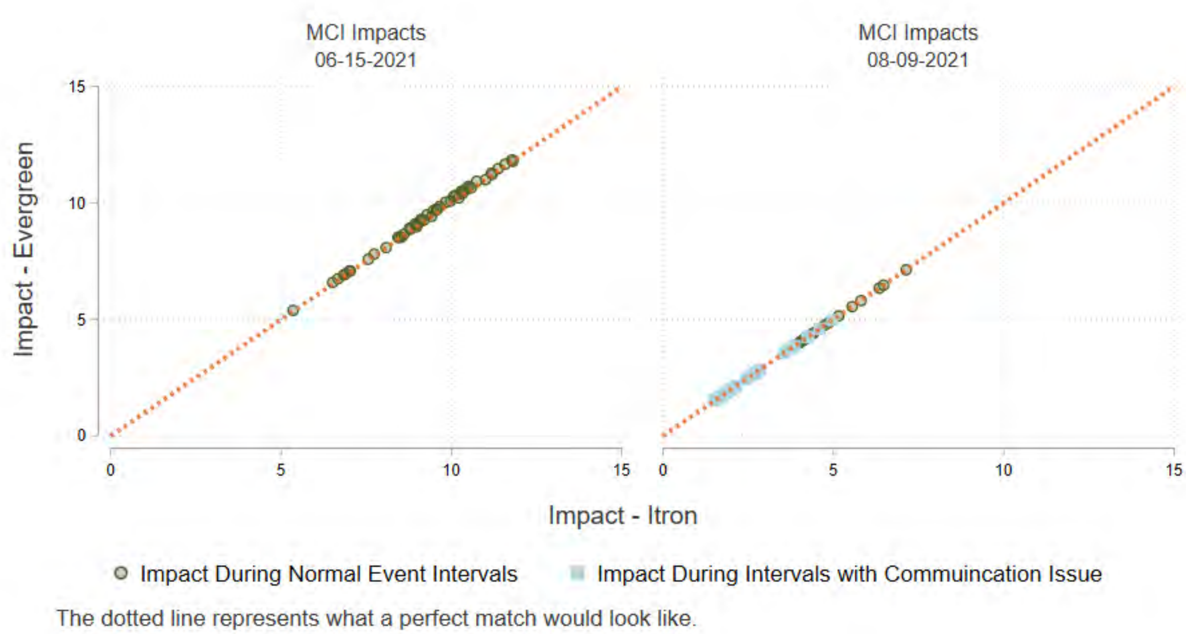


Table 26: Medium Commercial Impact Estimates (kW) per facility by Date and Time

Date	Hour Ending (MDT)				
	3:00 PM	4:00 PM	5:00 PM	6:00 PM	7:00 PM
6/15/2021*	-	11.79	9.28	10.93	11.85
8/09/2021	4.97	3.74	7.13	4.42	-

6.2 Evergreen Ex Post Impacts

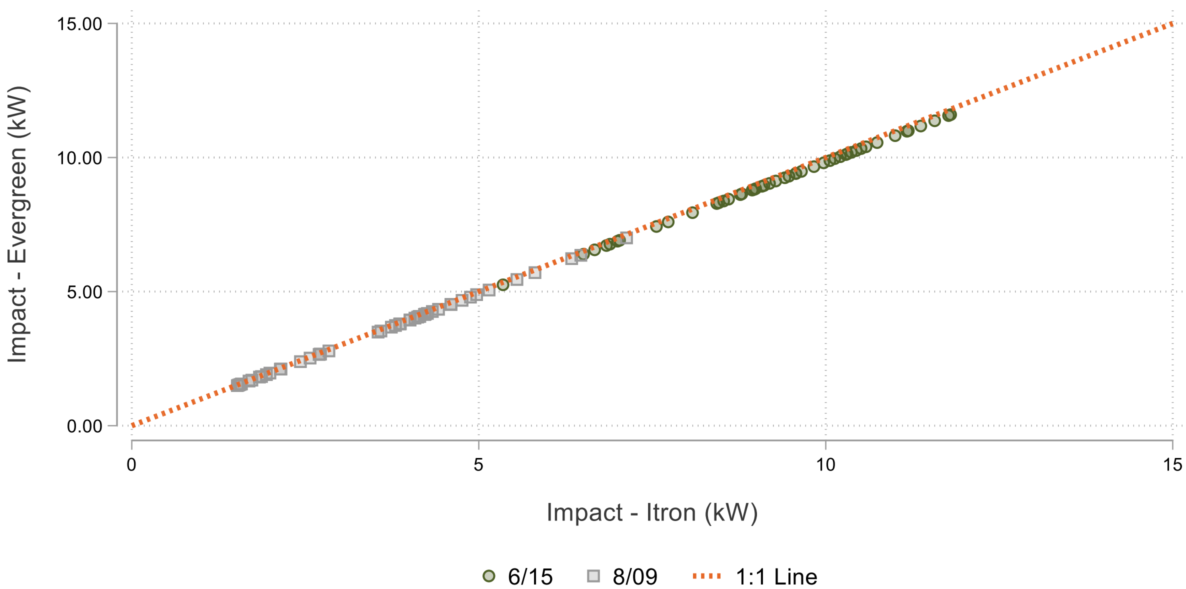
As discussed in Section 1.4, the Evergreen team believes that the method used to estimate impacts for the Medium Commercial program offering overstates the true average impact. For each event hour during the 2021 DR season, Table 27 shows the estimates produced by the Evergreen team. Our methods differed from Itron's just slightly – in any place where a maximum was called for, we replaced it with the mean.

Table 27: Medium Commercial Impact per Device Results

Date	# of Curtailed Devices	Hour Ending MDT	Temp.	CBL kW	Observed kW	Impact (kW)
6/15/2021	449	16	96	9.00	7.74	1.26
		17	95	8.62	7.58	1.04
		18	94	8.08	6.75	1.33
		19	93	7.53	6.18	1.36
8/09/2021	449	15	94	9.38	8.93	0.45
		16	94	9.10	8.83	0.27
		17	93	8.36	7.65	0.71
		18	93	7.50	7.01	0.49

Our reduction estimate is the average of the values in the 'Impact' column during active event hours, which is 1.03 kW, compared to 0.86 kW for all hours. Figure 21 compares Evergreen's ex post hourly impacts with the impacts calculated by Itron. The Evergreen impact is lower in all cases, by about 0.21 kW on average. It is important to note that these impacts are per facility, not per device. Itron notes that there were 3,280 devices installed at 449 facilities at the end of the 2021 DR season, indicating there were approximately 7.31 devices per facility. Thus, Evergreen's per-device estimate during qualifying hours is 1.03 kW and the average qualifying event hour aggregate impact was 3.38 MW. Adjusted for 87% operability, the aggregate impact was 2.94 MW.

Figure 21: Comparison of Evergreen Ex Post Impacts and Itron Impacts



The 1:1 line shows what the trend would look like if the DID and Itron impacts were identical.

6.2.1 Net Energy Savings

The Evergreen team estimated net energy impacts for the Medium Commercial program offering by summing ex post impacts from the onset of each event through the end of the event day. The calculation of impacts is exactly as described earlier in this section. Table 28 shows the energy savings estimates (per device) for each event day. On average, net daily energy savings were 21.46 kWh per facility. Multiplying this estimate by two days and by the number of active facilities (449) yields an aggregate savings estimate of 19.27 MWh for the Medium Commercial program offering.

Table 28: Energy Savings by Event Day

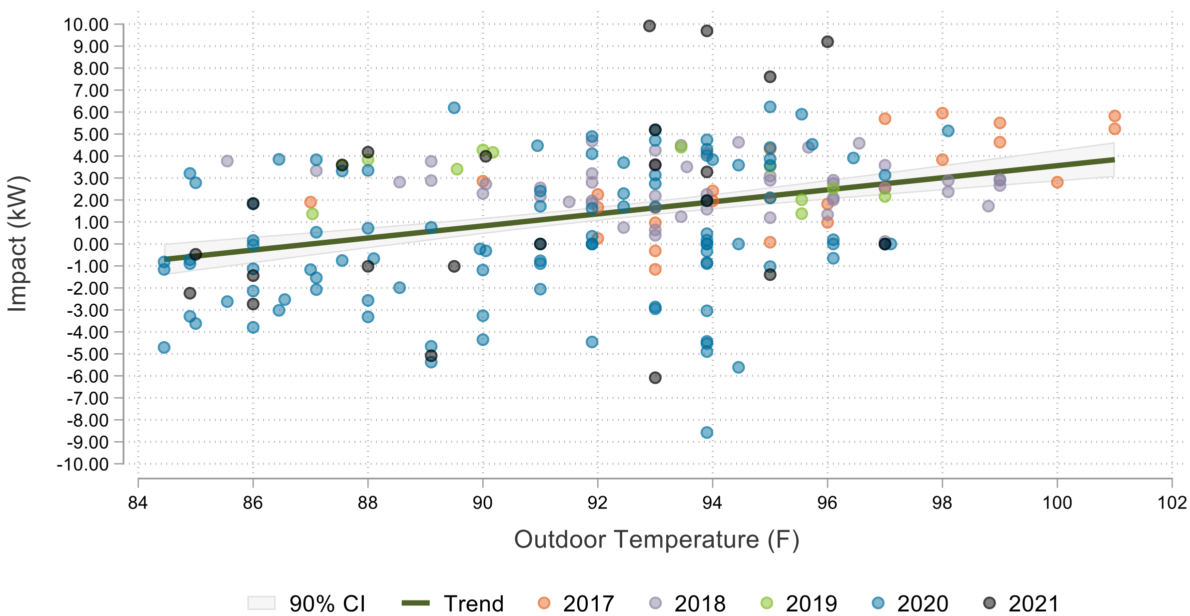
Date	Event Start (MDT)	Event Savings (kWh)	Snapback (kWh)	Net Savings (kWh)
6/15/2021	3:00 PM	4.98	2.10	2.89
8/09/2021	4:00 PM	1.20	-1.81	3.02
Average		**3.09**	**0.16**	**2.94**

6.3 Evergreen Ex Ante Impacts

The method used by the Evergreen team to calculate ex post impacts for 2021 was the same as what was used in prior years – a baseline method. This allows us to compare impacts across years and use additional data to predict what the program can deliver in terms of load reduction under different planning scenarios. Figure 22 compares 2017-2021 ex post impact estimates for each event hour with the outdoor air temperature for that hour.[13] Weather data comes from weather station KABQ in Albuquerque. The trend in temperature is small but positive; impact magnitudes increase as temperature increases. To develop an ex ante impact estimate, the Evergreen team developed a regression model that estimates the ex post impact as a function of temperature and time. The specified model was shown in Section 1.5, and the results from the model are described in more detail below. Using the model, the Evergreen team predicts that the impact of a Medium Commercial DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 2.87 kW per facility, or 0.39 kW per device.

It is interesting to note that the 2018, 2019, 2020, and 2021 load impacts did not actually demonstrate much temperature sensitivity, while 2017 impacts did, in a way that was much more dramatic than what was observed with small commercial customers. With a small sample and large, variable customer loads, any change in sample composition can dramatically affect the overall result, meaning that any trends should be observed with caution.

Figure 22: Hourly Impacts against Outdoor Temperature (F)



The ex-ante regression model was run on full event hours (some events in prior summers started mid-hour) and weighted by the number of curtailed devices (each summer had slightly different numbers of dispatched devices). Regression output is shown below. There is no clear relationship

[13] We dropped one additional day, 7/29/2020, because it had large and negative impacts caused by the top-X-of-Y baseline method.

between event hour and impact. It should be noted that hour 20 was extremely rare; only two events during the past three years included a full-hour event during this period. Temperature has a positive coefficient, indicating that higher temperatures produce higher impacts. The interaction terms, represented by δ_h, are all negative, indicating that the incremental effect of temperature in a given hour actually decreases the impact. Again, hour 20 should be interpreted with caution as only two data points were available to fit the model. Note that any coefficient with * next to it is statistically significant. Due to the small sample sizes and year-to-year variability, none of the estimates in this regression are statistically significant.

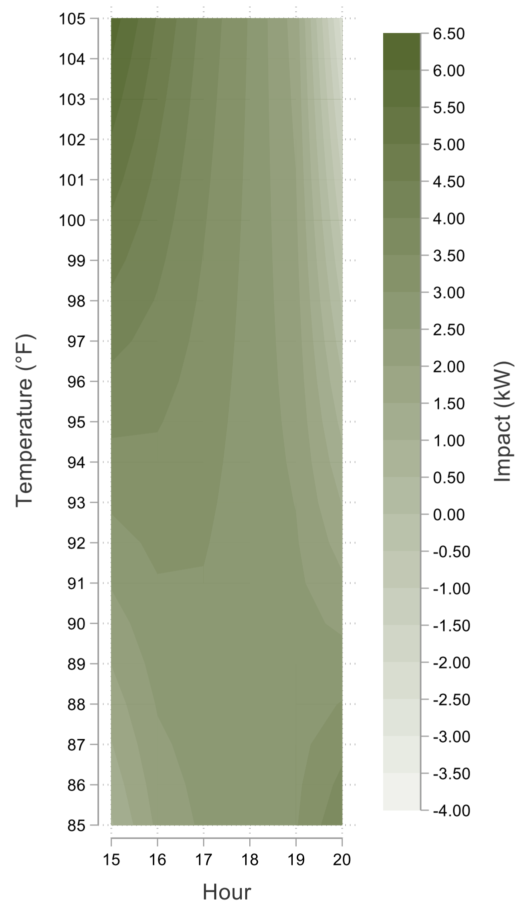
Table 29: Medium Commercial Ex Ante Regression Output

Term	Variable	Coefficient (b)	Standard Error	P-Value	95% CI
β	Temperature	0.267	0.296	0.370	(-0.320, 0.853)
γ_h	Hour 15	(base – omitted)			
	Hour 16	11.738	29.944	0.696	(-47.615, 71.091)
	Hour 17	18.945	29.194	0.518	(-38.923, 76.813)
	Hour 18	22.966	28.494	0.422	(-33.513, 79.447)
	Hour 19	29.746	28.334	0.296	(-26.417, 85.909)
	Hour 20	52.095	33.127	0.119	(-13.569, 117.760)
δ_h	Hour_15_x_Temp	(base – omitted)			
	Hour_16_x_Temp	-0.124	0.326	0.704	(-0.771, 0.522)
	Hour_17_x_Temp	-0.203	0.318	0.524	(-0.834, 0.427)
	Hour_18_x_Temp	-0.250	0.311	0.422	(-0.866, 0.366)
	Hour_19_x_Temp	-0.326	0.309	0.294	(-0.939, 0.287)
	Hour_20_x_Temp	-0.577	0.364	0.115	(-1.298, 0.143)
α	Constant	-21.719	27.052	0.24	(-75.341, 31.903)

Using the regression coefficients shown in Table 29, the Evergreen team created a time-temperature matrix (TTM) that shows expected load reductions (per device) for different outdoor temperatures and at different times of the day. The TTM is shown in Table 30. Using the model, the Evergreen team predicts that the impact of a Medium Commercial DR event at peaking conditions (5:00 PM – 6:00 PM MDT when outdoor temperature is 100 degrees) is 2.87 kW per facility, or 0.39 kW per device. These results should be interpreted with caution due to their small sample sizes, especially for hour ending 20.

Table 30: Medium Commercial Time-Temperature Matrix

Temp	Hour Ending MDT					
	15	16	17	18	19	20
105	6.27	4.96	3.86	2.96	1.77	-2.26
104	6.01	4.82	3.79	2.94	1.83	-1.95
103	5.74	4.68	3.73	2.92	1.89	-1.63
102	5.47	4.53	3.67	2.91	1.95	-1.32
101	5.21	4.39	3.61	2.89	2.01	-1.01
100	4.94	4.25	3.54	2.87	2.07	-0.7
99	4.68	4.11	3.48	2.86	2.13	-0.39
98	4.41	3.96	3.42	2.84	2.19	-0.08
97	4.14	3.82	3.35	2.83	2.25	0.23
96	3.88	3.68	3.29	2.81	2.31	0.54
95	3.61	3.54	3.23	2.79	2.37	0.85
94	3.34	3.39	3.16	2.78	2.43	1.16
93	3.08	3.25	3.1	2.76	2.49	1.47
92	2.81	3.11	3.04	2.74	2.55	1.78
91	2.54	2.97	2.97	2.73	2.61	2.1
90	2.28	2.83	2.91	2.71	2.66	2.41
89	2.01	2.68	2.85	2.7	2.72	2.72
88	1.74	2.54	2.78	2.68	2.78	3.03
87	1.48	2.4	2.72	2.66	2.84	3.34
86	1.21	2.26	2.66	2.65	2.9	3.65
85	0.94	2.11	2.59	2.63	2.96	3.96



To get an idea of Medium Commercial resource capability on aggregate, the number of active facilities can be multiplied by the values shown in Table 30. As of the end of summer 2021, there were 449 active Medium Commercial facilities. Thus, the expected aggregate impact of an event hour ending at 6:00 PM (MDT) when the outdoor temperature is 100 degrees would be 1.29 MW. Adjusted for 87% operability, this aggregate impact is 1.12 MW.

7 Recommendations

After our review of the 2021 Power Saver program, the Evergreen team offers the following recommendations:

- Ex post impacts provide a helpful look at program performance, but for planning purposes, a consistent, weather-normalized value should be used. This issue was highlighted by the lack of extreme weather conditions during the summer 2021 DR seasons. The Evergreen team recommends that ex ante program impacts from 5:00 PM to 6:00 PM MDT at 100°F, de-rated for operability, be used for reporting, cost-effectiveness, and planning.
- The Itron contract definition of capacity performance is upwardly biased by capturing favorable noise along with the program impact. If there is a chance to review the terms, we recommend collapsing to the hourly mean rather than the maximum.
- The connected load assumption used to convert air conditioner runtime to electric demand for the thermostat program components is high given the average air conditioner size in the region. It is also higher than the assumed value in the smart thermostat protocol of the New Mexico TRM. We revised the assumption for the ex post analysis of BYOT, but not for Two-Way because Itron technicians record A/C nameplate information during installation of Two-Way thermostats. Currently the BYOT and Two-Way thermostat offerings represent a small fraction of the Power Saver resource capability, but as they grow it will be important to base the load impact calculations on sound assumptions.

Appendix F: Peak Saver Detailed Evaluation Methods and Findings

Public Service New Mexico (PNM) offers the Peak Saver program to non-residential customers with peak load contributions of at least 50 kW. The program compensates participants for reducing electric load upon dispatch during periods of high system load. Peak Saver was implemented by Enbala in 2021, who managed the enrollment, dispatch, and settlement with participating customers. During the summer 2021 demand response season, there were 157 participating facilities and two demand response events. These events are summarized in Table 31.

Table 31: 2021 Peak Saver Event Summary

Date	Weekday	Participants	Start Time (MDT)	End Time (MDT)	Daily High at KABQ (F)
06/15/2021	Tuesday	157	3:00 PM	7:00 PM	97
08/09/2021	Monday	157	2:00 PM	6:00 PM	94

After the 2021 demand response (DR) season concluded, Enbala provided the Evergreen team with one-minute interval load data for each site in the Peak Saver population, as well as some workbooks with the performance metrics (10-minute capacity, average participant capacity, participant event capacity, and energy delivered) for each site/event combination. The interval data spanned a period from June 1 to August 10. The one-minute interval load data also included a field with load impacts calculated using a customer baseline (CBL) method detailed in the contract between PNM and Enbala. A CBL is an estimate of what participant loads would have been absent the DR event dispatch. Load impacts are the difference between the CBL and the metered load during the event. The relevant CBLs were also in the one-minute load data.

With these data sources, the Evergreen team completed our verified savings analysis. The four key steps in the analysis were:

1) Reproduce the performance estimates calculated by Enbala using the contractually-agreed upon CBL method;
2) Assess the accuracy of the contract CBL method by examining its ability to predict loads on non-event weekdays; and
3) Modify the CBL methodology to reduce bias and calculate verified impacts for each event.
4) Summarize average performance and discuss key drivers.

The findings from our analysis are described in subsequent sections.

1 Validation of Settlement Calculations

The settlement calculations called for a "high 3-of-5" baseline with an uncapped, asymmetric day-of adjustment. The high 3-of-5 days were determined as follows:

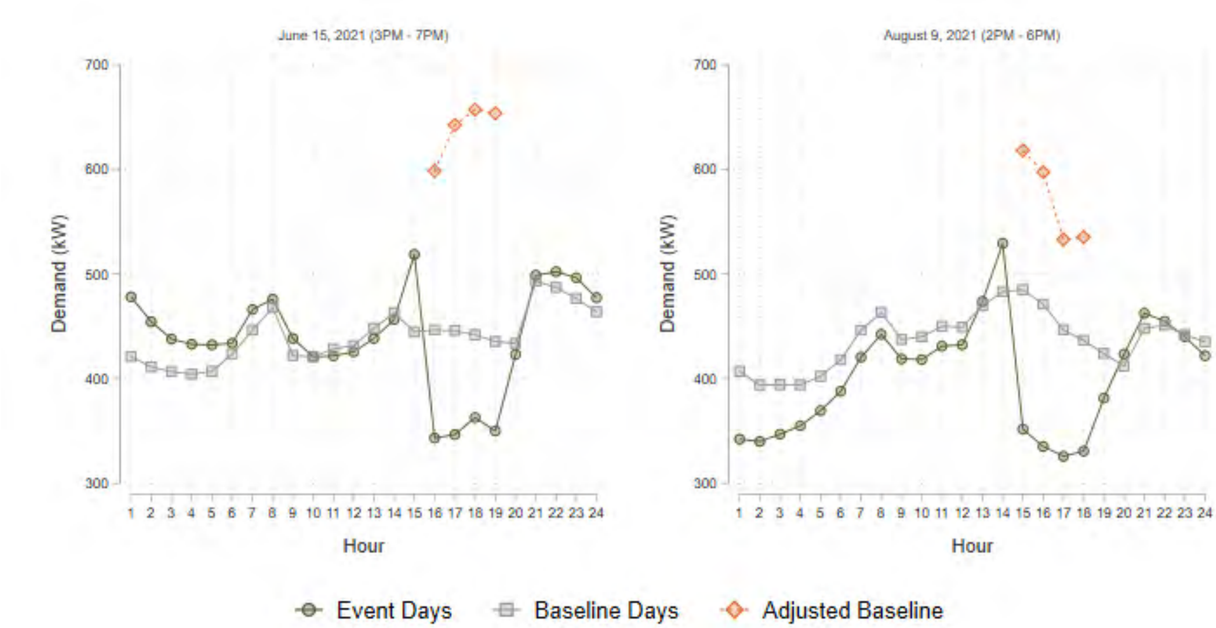
- Select the five non-holiday, non-event weekdays that immediately precede the event; and
- Out of those five days, pick the three days with the highest average demand during the hours in which the event occurred.

In the case of a tie, the day that is closer to the event day was selected as a baseline day. (This tie-breaking procedure was not laid out formally; rather, we discovered it when recreating Enbala's calculations.)

Our team was able to replicate nearly all of the settlement baselines. Across all sites and event hours, the average settlement baseline was 604.46 kW and the average Evergreen baseline was 604.52 kW. Any differences between the settlement baseline and our team's baseline were small, typically under a 0.01 percent difference with a couple of larger differences (up to 2 percent).

Figure 23 shows average hourly event day loads across the full population, average hourly loads on the high 3-of-5 baseline days, and also average hourly baselines for the two different event intervals. Of the two event days, one had an event interval spanning from 3:00 PM to 7:00 PM (left panel). The other event was from 2:00 PM to 6:00 PM (right panel).

Figure 23: Peak Saver Loads and Baselines



After verifying that the baselines were calculated correctly, our team moved onto the performance metric calculations. The relevant performance metrics are:

- **10-Minute Participant Capacity Performance** – The difference between the CBL and the lowest actual electrical demand measured by a one-minute interval reading between eight and ten minutes after the start of an event.
- **Average Participant Capacity Performance** – The average difference between the CBL and the participant's actual electric demand beginning ten minutes after the initiation of the event.
- **Participant Event Capacity Performance** – Weighted average of 10-Minute Participant Capacity Performance (40% weight) and Average Participant Capacity Performance (60% weight).
- **Energy Delivered** – The difference (in kWh) between the adjusted CBL and the metered load summed across all DR event hours.

Using the settlement baselines, all performance calculations were replicated without problem. Previously, Enbala would zero out the 10-Minute Participant Capacity and the Average Participant Capacity if the Participant Event Capacity Performance was negative, but these values were not zeroed out this year. Per the settlement baselines, Table 32 shows portfolio performance metrics by date.

Table 32: Peak Saver Performance Metrics by Date

Date	10-Minute Participant Capacity (kW)	Average Participant Capacity (kW)	Participant Event Capacity Performance (kW)	Energy Delivered (kWh)
06/15/2021	41,701	45,716	44,332	181,889
08/09/2021	42,663	37,123	40,020	149,933
Average	**42,182**	**41,420**	**42,176**	**165,911**

2 Assessment of CBL Accuracy

Developing an unbiased prediction of what load would have been absent a demand response event is essential to producing a defensible demand response impact estimate. This hypothetical non-event load is the customer baseline (CBL). If the CBL methodology tends to produce unbiased estimates of load (i.e., average error of zero), then demand response impact estimates will also be unbiased. If the CBL tends to overpredict or underpredict load, then demand response impacts will be overstated or understated.

This section details our review of the Enbala contract CBL methodology (described at the beginning of Validation of Settlement Calculations). Specifically, we assess the ability of the CBL methodology to predict load on non-event weekdays, and we explore the distribution of adjustment factors.

2.1 Placebo Event Analysis

Assessing the accuracy of a baseline on an event day is not possible because the counterfactual is unknown. In other words, we do not know what the demand would have been if the event was not called. However, on non-event weekdays there is no demand response, so using the same algorithm to generate a baseline should reasonably predict the metered load. For these days, the true value of demand response is 0 kW so if the baseline yields a non-zero impact estimate, it can be attributed to error. Individual errors are expected as the lookback window is not intended to be a perfect predictor of future load. That said, an unbiased baseline methodology should produce a distribution of errors which are centered around zero, on average.

The Evergreen team used this analysis of central tendency to assess the accuracy of the settlement CBL. By creating a set of placebo event days composed of each non-event weekday for which a site had the previous five days of data, we investigated for systematic bias. Each placebo event was assumed to start at 3:00 PM and last for four hours – this mimics one of the event intervals from the two DR events in 2021. Any negative impacts were not zeroed out. For each placebo event, the average CBL during the event window at each site was summed to find the aggregate CBL. The same process was used to find the aggregate metered load. Since no demand response occurred, the impact estimate (difference between CBL and metered load) should be zero and is thus labeled as error. Note that sites with solar power were removed from this analysis.[14] For sites with solar, the baseline adjustment mechanism used in the settlement CBL is affected by cloud coverage as well as gross load. That's problematic, of course, but it's a separate issue that we did not want to confound with the results of the exercise described in this section.

Results for the settlement baseline, aggregated by month, are shown in Table 33. On average, the baseline produced about 7 MW of upwards bias (meaning the baseline overstated load by 7 MW). The average percent bias across the 43 placebo events was 14.3 percent. Since actual DR reductions are not 100 percent of load, the bias in impact estimates for actual events is necessarily greater than 14.3 percent.

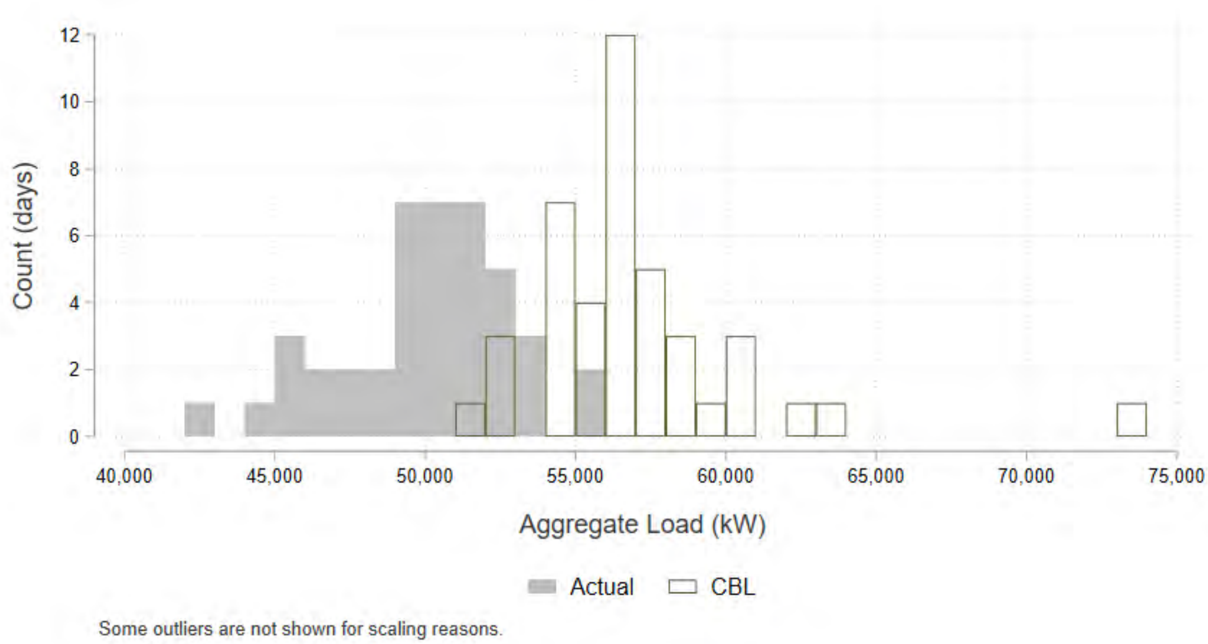
[14] The Evergreen team worked with PNM to identify sites as solar or non-solar.

Table 33: CBL Accuracy Assessment for Placebo Events

Month	Number of Placebo Events	Avg. Daily High Temp at KABQ	Avg. Aggregate Metered Load (kW)	Avg. Aggregate CBL (kW)	Avg. Error (kW)
June	16	89.7	48,796	57,022	8,226
July	22	89.2	49,352	55,590	6,238
August	5	88.9	52,431	59,087	6,656
Average	**---**	**89.3**	**50,193**	**57,233**	**7,040**

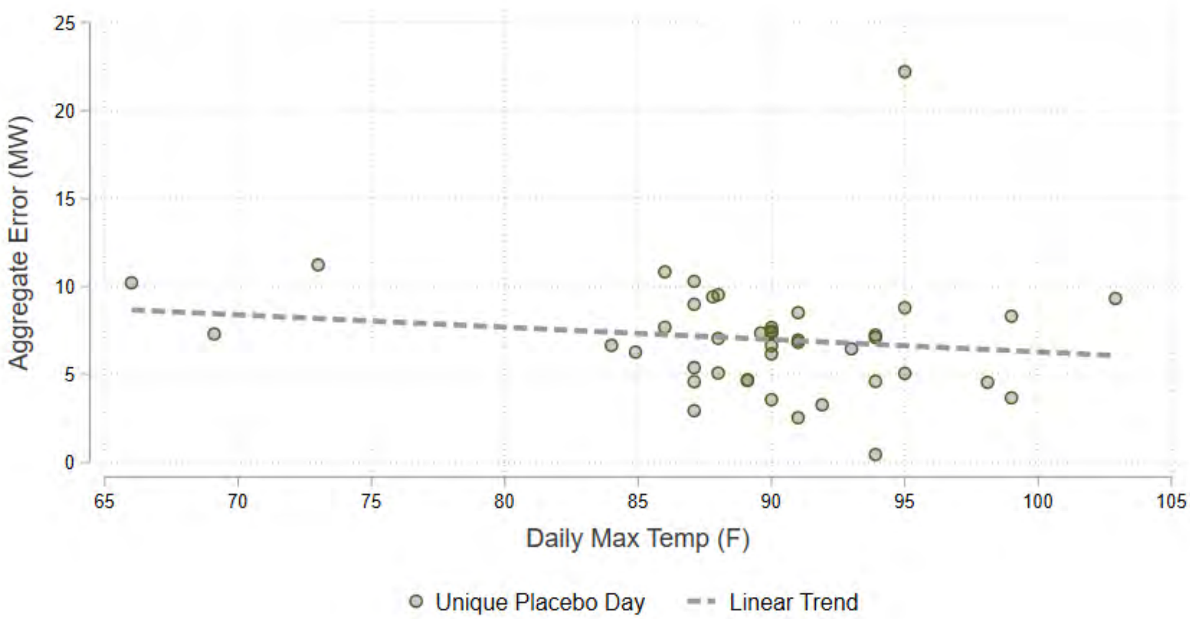
Figure 24 compares actual aggregate load from the placebo event days (gray bars) to aggregate baselines (translucent bars). Ideally, the two distributions would be approximately identical. It is clear from the distribution that the CBL is upward biased.

Figure 24: Histogram of Placebo Event Days – Settlement Method



The placebo days summarized in Table 33 are not perfect representations of actual event days, which tend to be the hottest days of the summer. DR events are called because system operators expect higher than normal loads which will approach the constraints of the system. As a result, the performance of a baseline on hot days is much more important for assessing accuracy than its performance on a mild day. As shown in Figure 25, the performance of the baseline is slightly negatively correlated with temperature. The average error on a placebo day with a maximum temperature of at least 95 degrees was over 8.8 MW.

Figure 25: Enbala Average Aggregate Baseline Error vs. Temperature



The Evergreen Team believes that the primary reason for such large errors in the settlement CBL is the asymmetric application of the weather-sensitive adjustment. The baseline can only be adjusted up, not down, which naturally biases the error upward. The unadjusted baseline actually produces less aggregate error than the adjusted baseline. While adjusting the baseline using event day loads has been shown to improve accuracy, the adjustment needs to be bi-directional. In most organized demand response markets, including PJM, CAISO, and ISO New England, a symmetric adjustment is employed.

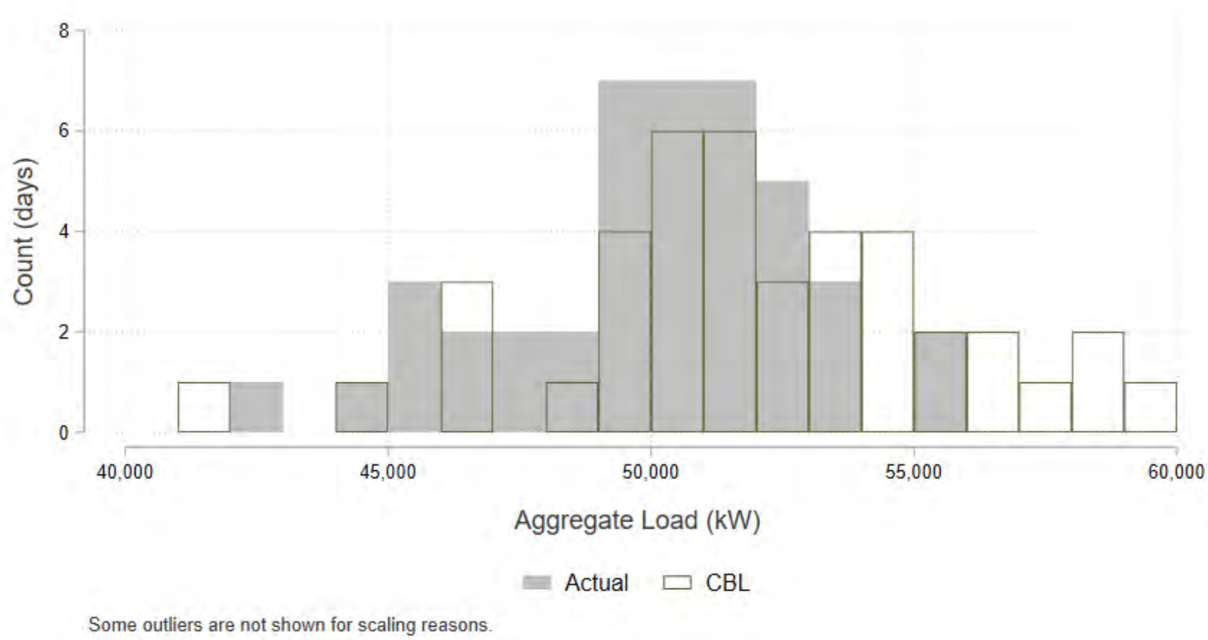
To illustrate the effect of a symmetric adjustment, we altered the CBL methodology to apply the adjustment in either direction depending on its value. Using this new adjusted baseline, we performed the same accuracy test described above. The results are displayed in Table 34. Average error for this method falls under 2.5 MW.

Table 34: Accuracy Assessment with Symmetric Adjustment

Month	Number of Placebo Events	Avg. Daily High Temp at KABQ	Avg. Aggregate Metered Load (kW)	Avg. Aggregate CBL (kW)	Avg. Error (kW)
June	16	89.7	48,796	51,499	2,703
July	22	89.2	49,352	51,029	1,676
August	5	88.9	52,431	55,483	3,052
Average	**---**	**89.3**	**50,193**	**52,670**	**2,477**

Figure 26 shows the histogram as Figure 24 but using the symmetric adjustment rather than the asymmetric adjustment. It is clear that the actual and counterfactual loads are better aligned in this case.

Figure 26: Histogram of Placebo Event Days – Symmetric Adjustment



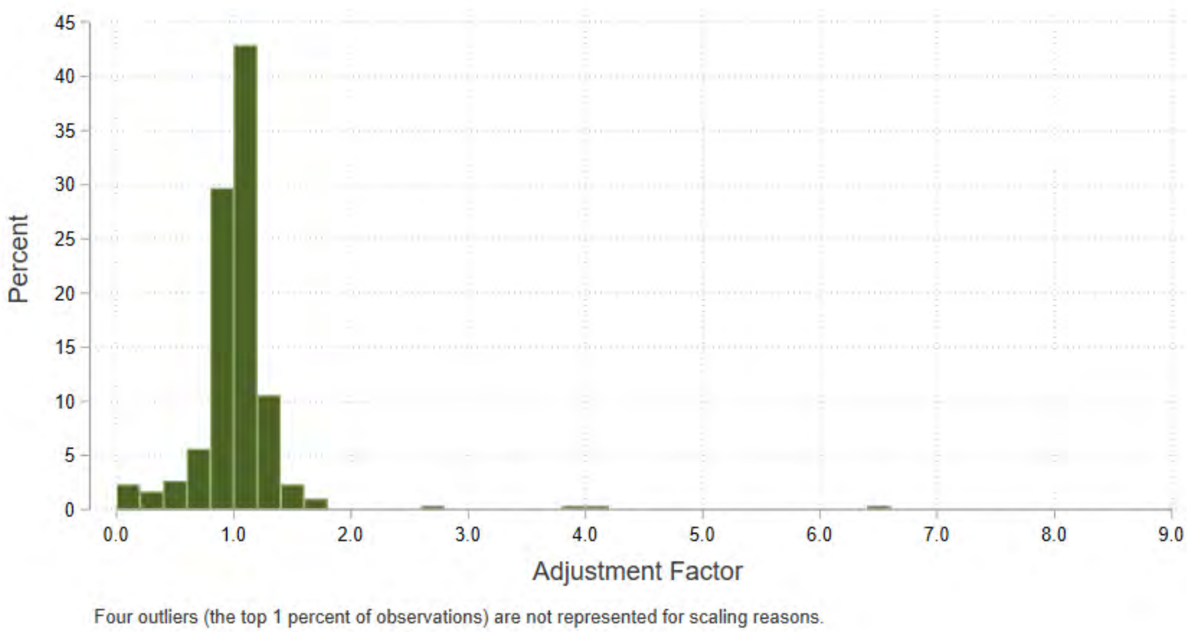
Using an asymmetric adjustment yielded an average error of 7 MW and an upwards bias of 14.3 percent. Using a symmetric adjustment yielded an average error under 2.5 MW and an upwards bias of 4.8 percent. While the baseline with a symmetric adjustment still overestimates on average, the distribution of errors falls on both sides of zero and the mean prediction is much closer to true load.

2.2 Adjustment Factors

As demonstrated above, the application of the adjustment factor plays a significant role in the accuracy of the CBL. Because the adjustment in the settlement CBL is applied as a multiplicative adjustment, even values that appear close to 1 (i.e., 1.1) can result in an adjustment of hundreds of kWs for a large customer. The average value of the symmetric adjustment factor across event days and sites was 1.57, and 81 percent of the adjustment factors were within 30 percent of 1 (between 0.70 and 1.30). The median factor, which is unaffected by extreme values, was 1.02.

Figure 27 shows the distribution of adjustment factors (except for the top 1 percent of observations). Recall that the adjustment factors are only applied if they increase the baseline in the contract CBL. In other words, any factor less than one is rounded up to one. In the majority of cases, the adjustments produced baseline values that were reasonable in the context of their distribution of load throughout the summer. Still, there were a handful of adjustment factors larger than two. Even for the most extreme cases of weather sensitivity, adjusting the baseline by a factor of two or more is dubious. Undoubtedly, leaving the asymmetric adjustment factor uncapped leads to an upwards bias in event day baselines, particularly when the adjustment is not symmetric. This again means impacts are, on average, being overstated using the settlement baseline calculation method. This can be addressed by subjecting the offset factor to a cap which prevents the adjustment factor from taking on extreme values.

Figure 27: Distribution of Adjustment Factors



The largest adjustment factor during the 2021 DR season was 97 on 6/15. The Evergreen team investigated load at this site to see if we could determine what happened. Figure 28 shows average hourly demand for the baseline days and hourly demand for the event day in question. Average demand during the baseline days was about 36.87 kW and the maximum hourly demand was 146.51 kW. The settlement baseline is orders of magnitude higher than the hourly demand during the event hours. Figure 29 shows the same graph with the settlement baseline removed for clarity. Note the change in scale of the y-axis. Right before the event, there was a large spike in demand, likely due to pre-pumping. This spike, combined with the lower load on the lookback days, resulted in a large adjustment factor. The customer's highest metered load for the whole summer was only 147 kW. Perhaps the site did curtail load during the event on 6/15, but a baseline of 2 MW to 6 MW is unreasonable for this site during the event window. This investigation helps to highlight the problematic nature of an uncapped adjustment in conjunction with erratic load patterns.

Figure 28: Investigating a Large Adjustment Factor

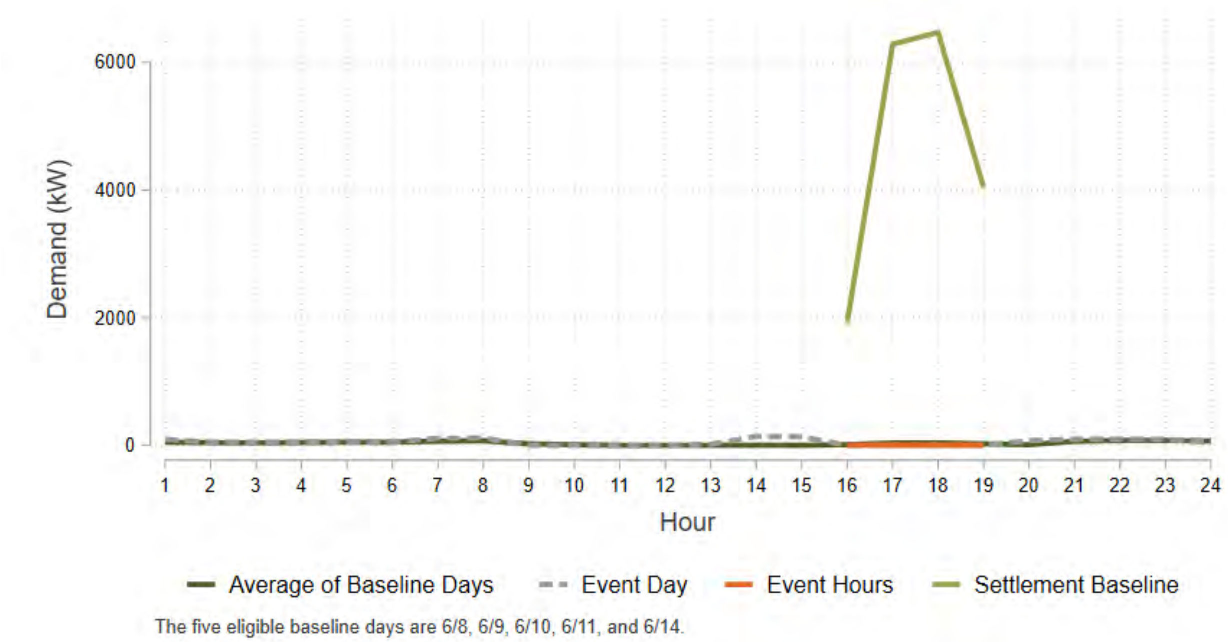
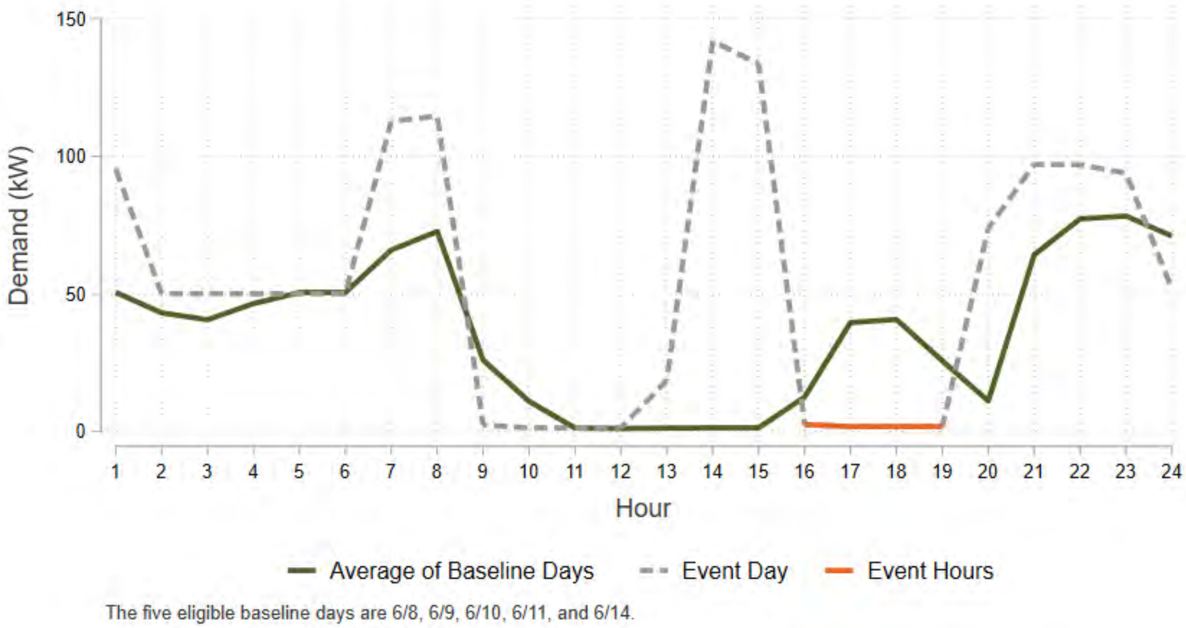


Figure 29: Investigating a Large Adjustment Factor – Settlement Baseline Removed



For sites with solar power, the adjustment factor is dependent on a cloud coverage effect that is not accounted for. If cloud cover begins mid-way through the adjustment window on the event day, net utility-supplied load for the hour will increase. If the lookback days were all sunny, then average load during the adjustment window on the lookback days will necessarily be lower than average load during the same window on the event day. This will result in a large adjustment ratio.

A similar effect may occur if sites engage in pre-cooling or pre-pumping in response to the pending demand response event. There is nothing wrong or nefarious about such behavior, but when this occurs, the adjustment factor will be artificially inflated, as seen in the example above.

The adjustment factor is intended to correct for the differences in load between event and baseline days that result from the non-random selection of event-days. Event days are typically the hottest days of the summer and, as such, may be reasonably expected to have higher demand than baseline days. However, a weather adjustment need not be applied to sites which do not have weather sensitive load. It is our view that sites identified as weather sensitive are the only ones which should receive an adjustment to the baseline (excluding those with solar power and those who pre-pump in preparation for the demand response event).

3 Evaluated Impacts

3.1 Approach

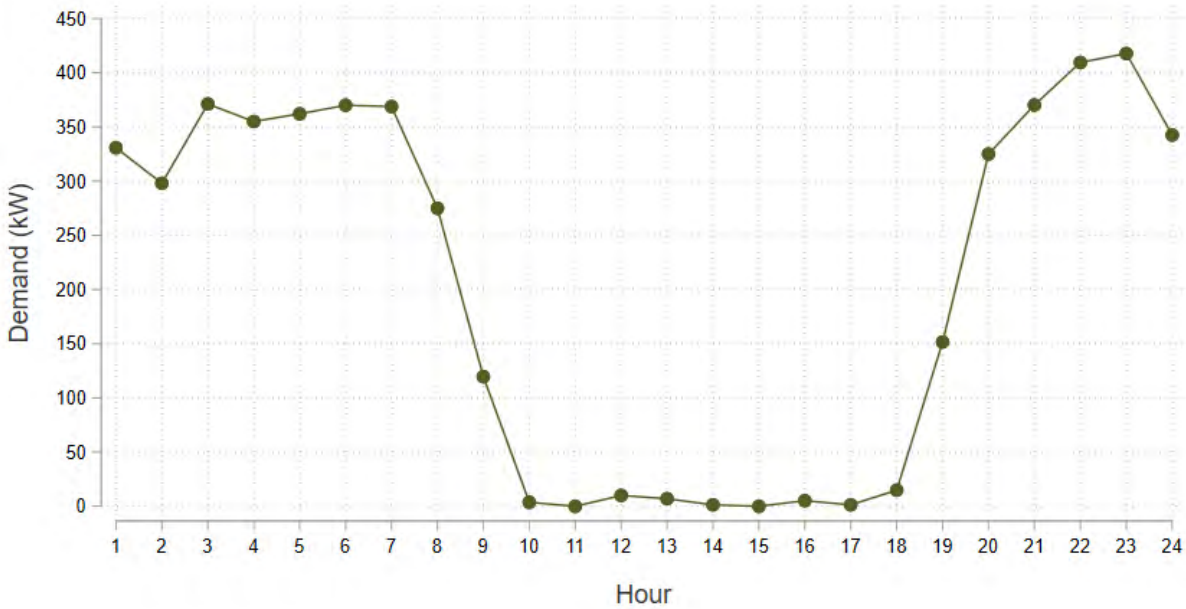
Based on our review of the contract CBL methodology used to generate the settlement baselines and impact estimates, the Evergreen team calculated the evaluated CBL (and the performance metrics they feed into) using the following methodology:

- The adjustment factor is symmetric, meaning it can increase or decrease baselines, rather than only serving to increase baselines;
- The adjustment factor is capped at ±20 percent rather than uncapped;
- The adjustment factor is only applied to sites that (1) have weather sensitive loads, (2) do not have solar power, and (3) do not pre-pump or pre-cool prior to demand response events; and
- For sites that meet the first two requirements listed above but not the third, an additive adjustment factor based on weather was applied rather than an adjustment factor based on pre-event load.

Regarding weather sensitive loads, the Evergreen team estimated weather sensitivity at each site by assessing the relationship between load and temperature during the combined event hours (2:00 PM – 7:00 PM, which includes the most common adjustment window) on non-event, non-holiday weekdays during the 2021 summer. Sites were considered to be weather sensitive if (1) the correlation between temperature and load was positive and (2) temperature was found to be a statistically significant predictor of load. In total, 87 of the 157 sites met these criteria.

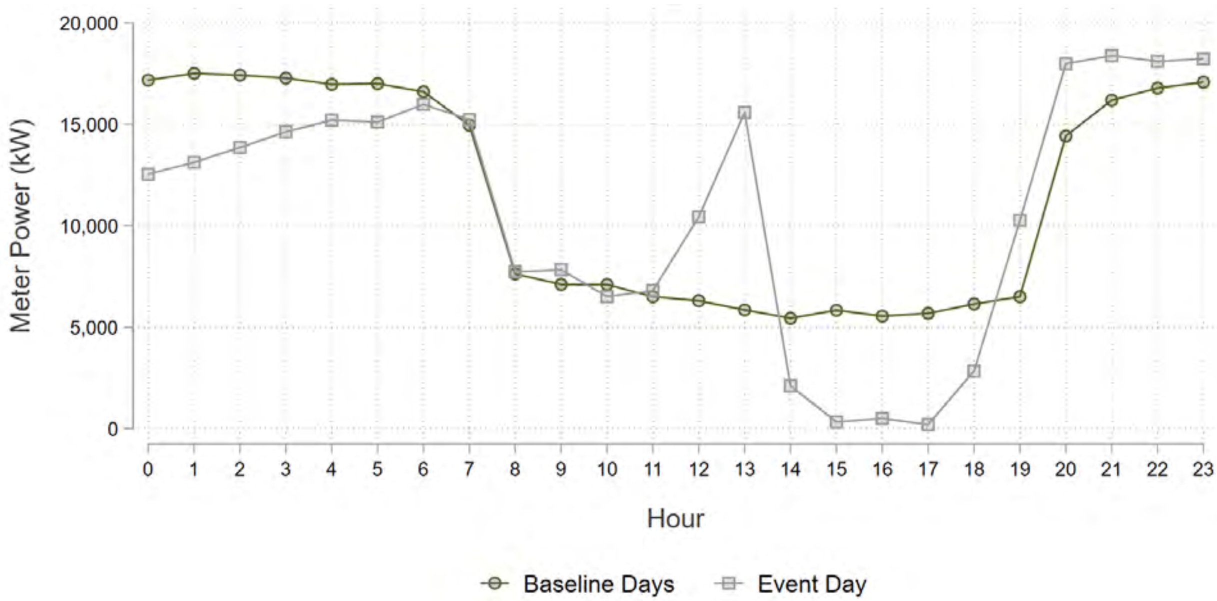
Our team reviewed hourly load profiles for the full population of program participants. Sites that showed the distinct solar net load profile, as in Figure 30, were treated as solar sites even if they were not identified as such in the Enbala data. In total, 25 of 157 sites were considered sites with solar power.

Figure 30: Example of Solar Load Profile



Regarding pre-pumping or pre-cooling, our team reviewed hourly load profiles on event days and baseline days for the full population of program participants. Figure 31 illustrates this exercise. Sites with a notable incline in pre-event load, relative to load during the same hours on baseline days, were treated as pre-pumpers or pre-coolers. This is a reasonable action for a demand response participant. The issue is that it inflates the baseline adjustment, which is calculated based on pre-event load. In total, only eight of 157 sites were considered pre-pumpers. (Note we're using "pre-pumping" as a catch-all term to identify any load-shifting behaviors that precede a DR event.)

Figure 31: Example of Pre-Pumper Load Profile



Nine of the 87 weather-sensitive sites had solar and received no adjustment. When these factors are considered in tandem, the load-based adjustment factor was applied to the baselines for 73 of the 157 sites. Five other sites received a weather-based adjustment. This is an additive adjustment similar to the weather-based adjustment used by PJM. The adjustment is calculated as:

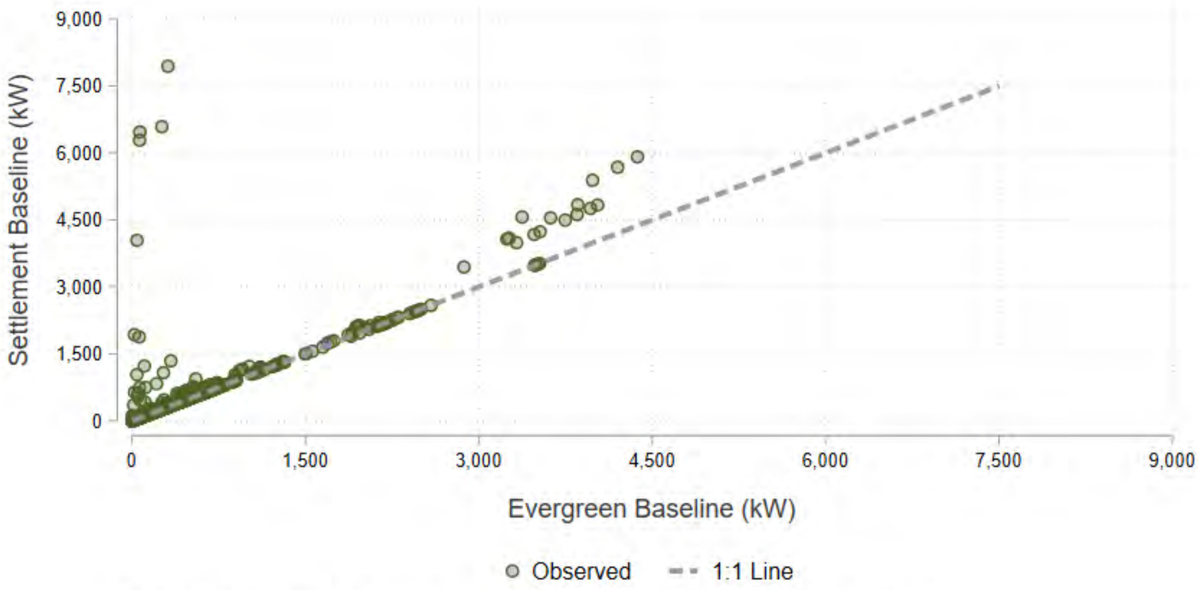
$$Adjustment = Slope * (\Delta_{Temp})$$

In the equation above, "Slope" is a value that quantifies the relationship between outdoor temperature and load for the facility (i.e., for each one unit increase in temperature, how much does load increase on average?). This value is determined via the regression modeling. The second component, Δ_{Temp}, represents the difference between the average outdoor temperature during the event and the average outdoor temperature during the event window on the three selected baseline days.

3.2 CBL Comparison

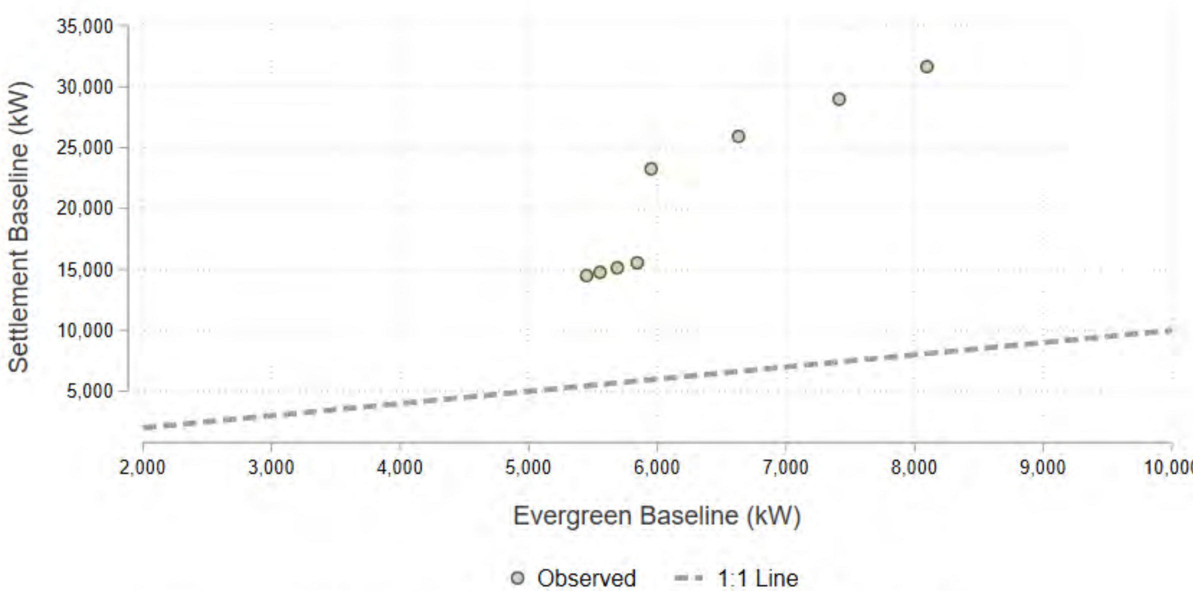
Because the Evergreen team calculated baselines in a manner that was similar to settlement baseline methodology, the baselines themselves were largely similar. This is illustrated in Figure 32, which compares the baselines our team calculated with the settlement baselines. Three sites have much higher settlement baselines due to pre-pumping. One site, whose demand is significantly higher than the other sites, is shown in a separate figure (Figure 33). This site is the same site that was singled out in the 2020 evaluation. For this site, we see more deviations from the settlement baseline than we have in the past. This is likely due to the fact that this site appeared to participate in vigorous pre-pumping for both events of the season. In the latter figure, note the difference in the scale of the Y-axis and X-axis.

Figure 32: Baseline Comparison – All Sites but One



The 1:1 line represents what the trend would look like if the two methods produced identical baselines.

Figure 33: Baseline Comparison – Separate Site



The 1:1 line represents what the trend would look like if the two methods produced identical baselines.

By date, Table 35 and Table 36 show the average baseline under the settlement method and under the Evergreen method. Table 36 singles out the site that has significantly higher demand. (This site is not included in Table 35.) This site accounts for 60 percent of the differences in baselines. The settlement method is naturally going to produce a much larger baseline since it uses an asymmetric adjustment mechanism.

Table 35: Baseline Comparison – All Sites but One

Date	Settlement Baseline (kW)	Evergreen Baseline (kW)	Difference (kW)
06/15/2021	72,698	61,267	11,431
08/09/2021	74,645	66,242	8,403
Average	**73,672**	**63,755**	**9,917**

Table 36: Baseline Comparison – Other Site

Date	Settlement Baseline (kW)	Evergreen Baseline (kW)	Difference (kW)
06/15/2021	27,465	7,022	20,443
08/09/2021	14,991	5,633	9,357
Average	**21,228**	**6,328**	**14,900**

3.3 Performance Metrics

The results of the Evergreen team's 2021 Peak Saver Demand Response evaluation are shown in Table 37. For comparison, the savings produced by the program implementer are shown in Table 38. On average, the verified capacity performance estimates using the Evergreen methodology are 42 percent of the values calculated by Enbala using the settlement CBL. Section 0 described some of the drivers leading to lower estimates for the Evergreen method.

Our findings indicate the Peak Saver program is approximately a 17.5 MW capacity resource, up 35 percent from the 2020 estimate (12.9 MW). Importantly, we'd note there was some variation in verified capacity performance between the two events in the 2021 season (14.7 MW in June and 20.3 MW in August). A few key sources of the variation in verified capacity performance include:

1. **Return towards pre-pandemic demand reductions from the largest sites.** Verified capacity performance doubled from 2.3 MW on June 15 to 4.6 MW on August 9 for the largest Peak Saver site (in terms of average demand). In 2020, verified demand reductions for this site were approximately 1 MW on average (compared to 5 MW in prior summers). This site's DR commitment in 2021 increased slightly between the two events from 8.5 MW to 8.7 MW. The second largest Peak Saver participant also increased their verified capacity performance (2.5 MW to 3.5 MW). The return towards pre-pandemic reductions in 2021 supports our estimate of the magnitude of Peak Saver as a 17.5 MW capacity resource.

2. **Time of the year.** Approximately one third of the Peak Saver participants are schools. For these participants, impacts in August were around 1.5 MW compared to approximately 2.5 MW for the June event. Over two thirds of these schools started classes after the August 9 event, and these schools experienced an 82 percent decrease in verified capacity performance between the June and August events.
3. **Event conditions.** Temperatures ranged from 94°F to 97°F during event hours. Historically, demand reductions are larger when temperatures are higher, on average. Last year, temperatures ranged from 79°F to 98°F during event hours. Higher temperatures during event hours in 2021 could explain some of the improved performance of the Peak Saver program.

Table 37: Evaluated Performance Summary by Event

Event Date	10-Minute Capacity Performance (kW)	Average Capacity Performance (kW)	Verified Capacity Performance (kW)	Energy Performance During Event Hours (kWh)
06/15/2021	16,479	13,552	14,723	52,849
08/09/2021	21,470	19,512	20,295	76,474
Average	**18,975**	**16,532**	**17,509**	**64,662**

Table 38: Performance Summary – Program Implementer

Event Date	10-Minute Capacity Performance (kW)	Average Capacity Performance (kW)	Verified Capacity Performance (kW)	Energy Performance During Event Hours (kWh)
06/15/2021	41,701	45,716	44,332	181,889
08/09/2021	42,663	37,123	40,020	149,933
Average	**42,182**	**41,420**	**42,176**	**165,911**

Table 39 compares daily energy savings the energy performance during event hours. This is the aggregate difference between energy use on an event day and the baseline for all hours following the beginning of the event (including the event hours), with the adjustment factor applied to all hours. Comparing the energy savings during the event and the daily energy savings helps illustrate the extent to which event load was shifted to other hours. On average, aggregate energy use decreased by 59.0 MWh on event days. One would expect daily energy savings to be less than event energy savings due to snapback. This was the case for Peak Saver in 2021, as the event energy impact exceeded the daily energy impact by an average of 5.7 MWh. This is due to customers increasing their energy use in the post-event hours (i.e., their actual load was more than their baseline).

Table 39: Daily Energy Savings – Event Hours and Post-Event Hours

Event Date	Daily Energy Impact (kWh)	Event Energy Impact (kWh)
06/15/2021	40,286	52,849
08/09/2021	77,693	76,474
Average	**58,989**	**64,662**

3.4 Nominations

The following sections detail comparisons the Evergreen team made between monthly site-level DR kW commitments (“nominations”), average demand, and DR impacts. The latter section is a comparison between nominations and demand. As is often the case, this investigation spurred another: how do nominations compare with load on non-event days? Findings from this section are presented in 3.4.1. Throughout these two sections, note that results are presented at the participant level rather than the site level. That is, if one participant has three sites in the program, those three sites will be aggregated.

It is important to note that nominations will change throughout the summer for some participants. For the majority of participants, this is not the case. There were only nine changes in nominations over the 2021 summer, none of which exceeded a 0.3 MW difference. The comparisons made in Section 3.4.1 use the average nomination between June 2021 and August 2021, while Section 3.4.2 uses the actual values for each site on each participating event day.

3.4.1 Comparing DR Nominations and Average Demand

In comparing DR nominations to load, our team only investigated the most common event hours (3:00 PM – 7:00 PM) on non-event, non-holiday weekdays. Additionally, any hours where the temperature was below 80 were removed. Under these conditions, we calculated average hourly demand for each participant, then compared these averages to the average nomination. For the comparison, two metrics were calculated: raw differences and ratios. Raw differences are simply the difference between average demand and the average nomination. Ratios were calculated as the average nomination divided by average load (and multiplied by 100%).

Figure 34 shows the distribution of differences. A difference greater than zero implies average demand exceeds the average nomination – this is what we would expect to see for all sites (though this may get muddied for sites with solar power). Indeed, most sites fall to the right of zero, but not all do. Less than 9 percent of sites had an average demand that did not exceed the average nomination.

Figure 34: Comparing Nominations and Non-Event Demand

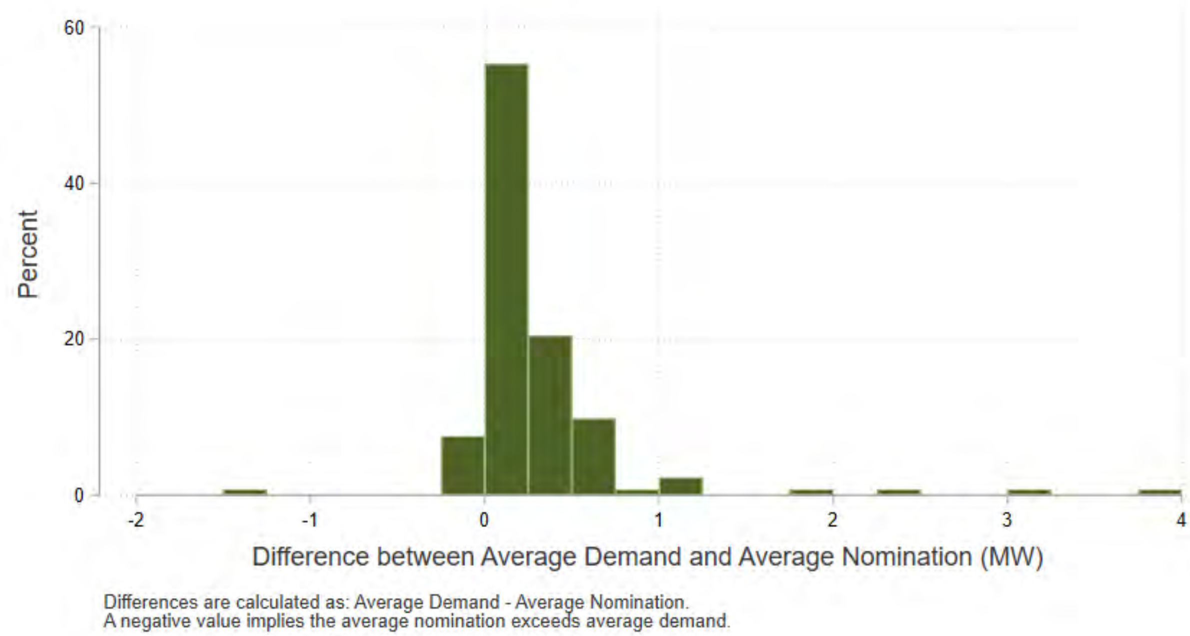


Figure 35 shows the distribution of ratios (ratio = average nomination / average demand * 100%). A value greater than 100 percent implies the average nomination exceeds average demand. For a handful of sites, the ratio was considerably greater than 100 percent. The largest outlier has a ratio greater than 675 and is known to have solar power. Figure 36 shows the average nomination and average non-event weekday demand for this site. Note that the nomination for this site was 15 kW at the beginning and end of the summer. Using the 15 kW value, average load at this site on non-event weekdays is about a quarter of the nomination (3:00 PM - 7:00 PM).

Figure 35: Nominations as a Percentage of Demand

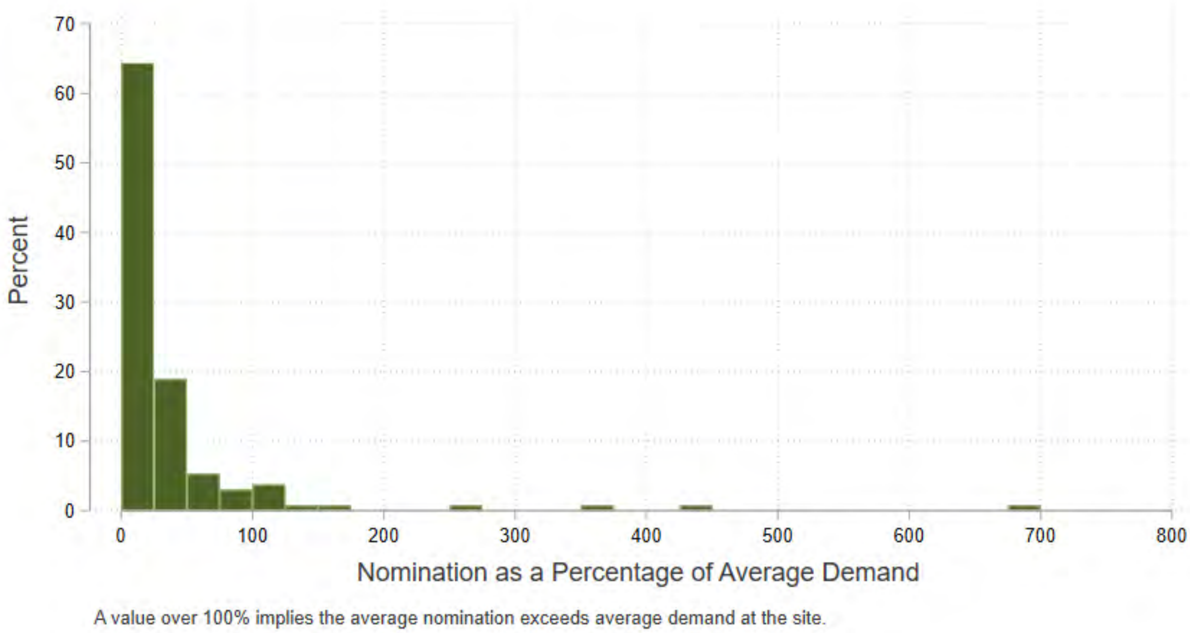
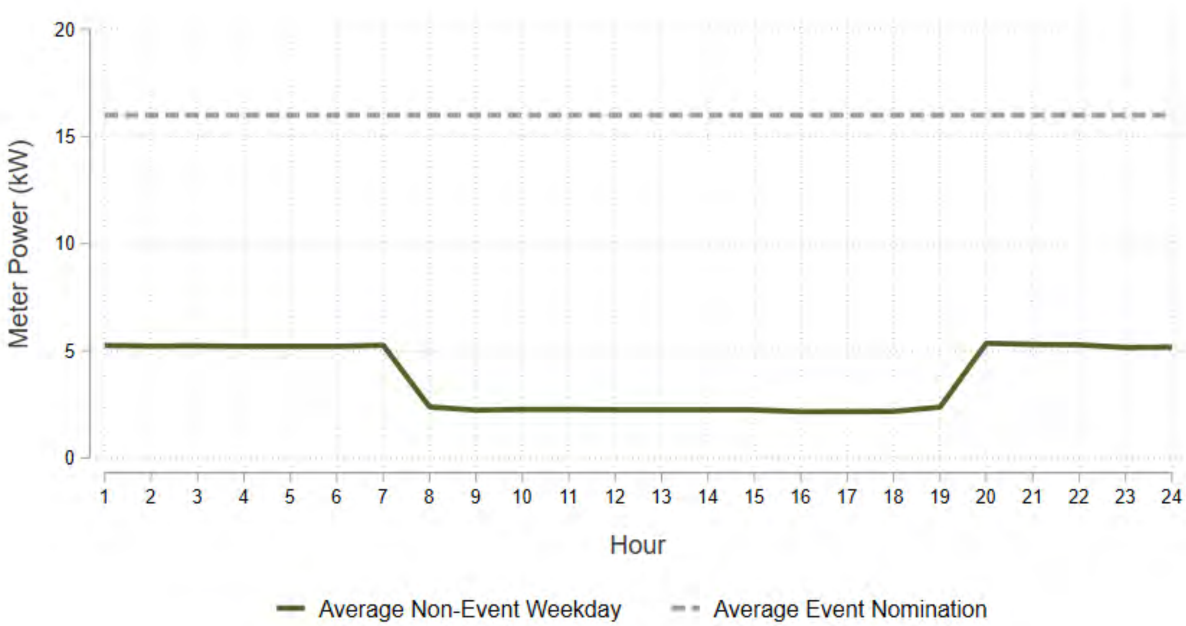


Figure 36: Investigating Nomination as a Percentage of Average Demand



For most participants, DR nominations make sense relative to their average hourly demand on non-event summer afternoons. For a handful of others, we would recommend reviewing the loads and nominations with Enbala (and possibly the customer).

3.4.2 Comparing DR Nominations and DR Performance

This section compares DR nominations with verified performance metrics (as calculated by the Evergreen team). The metric our team reviewed was the percent of the nomination achieved, calculated as follows:

$$Percent\ of\ Nomination\ Achieved = 100\% * \frac{Verified\ Reduction}{Nominated\ Reduction}$$

Figure 37 shows the distribution of these percentages. For each participant, unique percentages were calculated for each event, using the nomination for the relevant month. Sites that did not participate in a certain event day are not included in this analysis. Instances where actual reductions do not exceed nominated reductions result in percentages that are less than 100 percent, and vice-versa. The majority of the distribution falls below 100 percent, implying that most sites did not achieve their nominated load reduction on most event days. An achievement percentage less than zero means the DR performance for the event was negative.

Figure 37: Distribution of Percent Differences

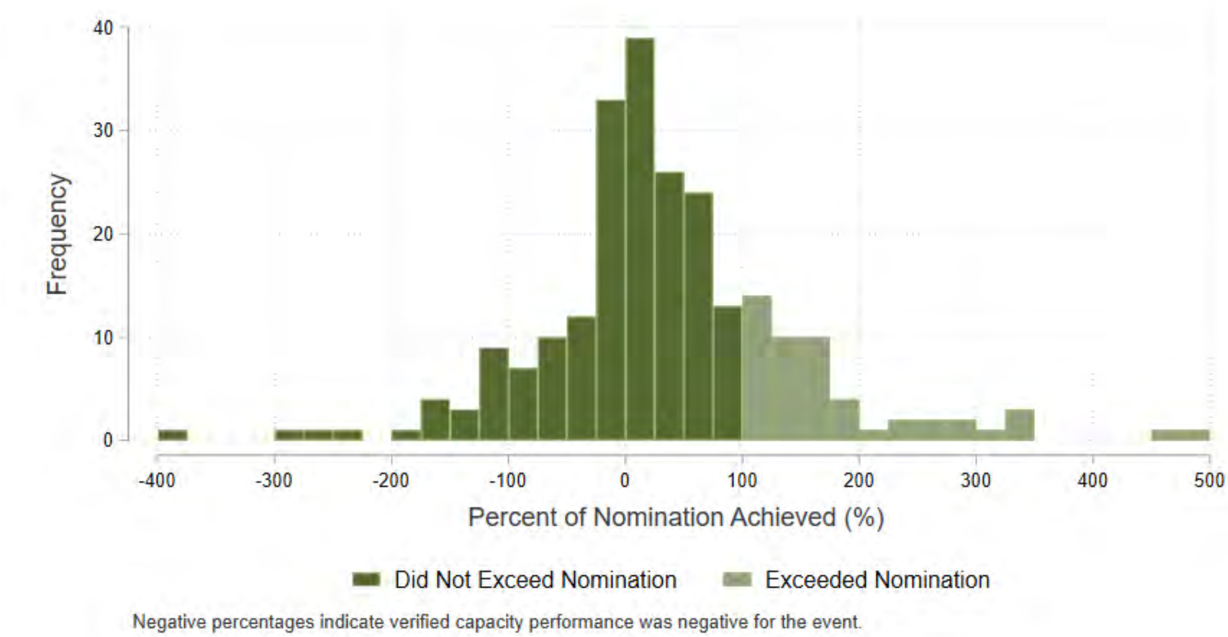


Table 40 groups participants based on how their verified reductions compared to their nominated reductions. Several participants made a bulk nomination for their multiple sites. Of the 132 participants, 25 exceeded their nomination on average.[15] Another 64 participants – accounting for

[15] Recall that sites are aggregated to the participant level. Some participants had multiple sites.

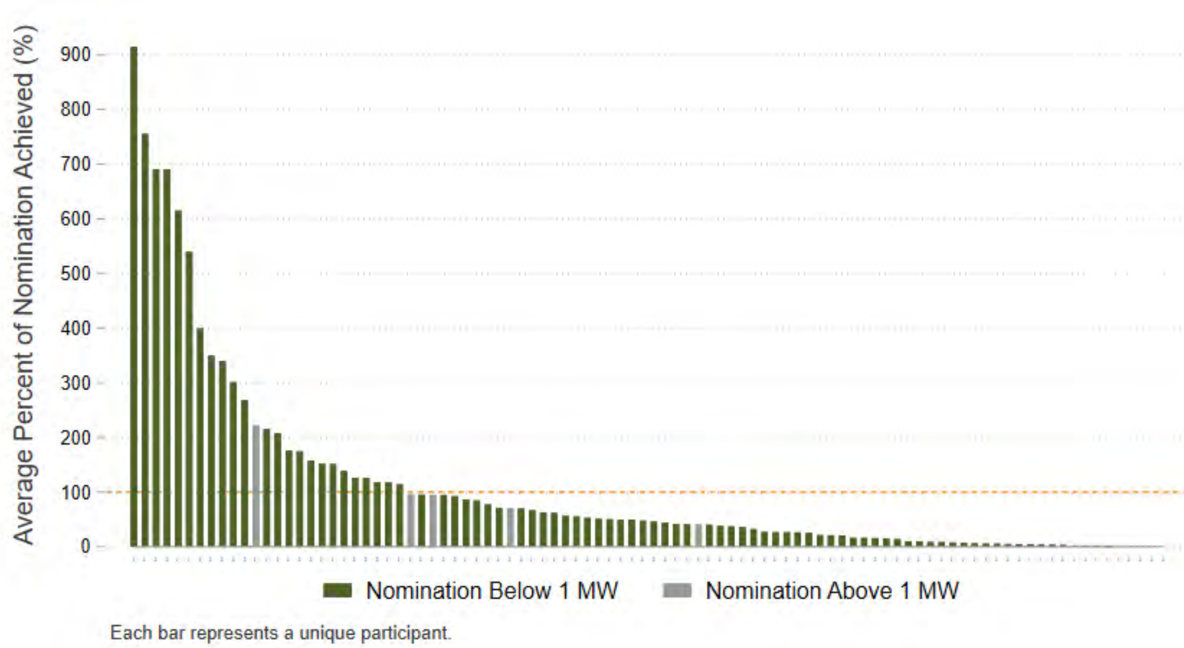
roughly 81 percent of the total nominations – did not exceed their nomination but did provide demand reductions. Figure 38 shows, on average, what percentage of their nomination each site achieved. The 38 participants with negative verified reductions are not included in the figure. Four of these 38 sites have solar PV and six of them are schools. Two of the four that have solar PV are also city government buildings that dropped their nominations to 0 in the month of August.

Table 40: Comparing Performance and Nominations

Result	Frequency	Aggregate Nomination (kW)[1]
Did Not Exceed Nomination	64	20,245
Exceeded Nomination	25	3,290
Negative Performance	38	1,465
Nomination of 0 kW	5	0
Total	**132**	**25,000**

[1] Participant-level nominations are averaged across the summer before aggregating.

Figure 38: Average Performance by Site



4 Recommendations

After our review of the 2021 Peak Saver program, the Evergreen team offers the following recommendations:

- Make the multiplicative adjustment symmetric rather than asymmetric. As discussed in the assessment of CBL accuracy presented in Section 2.1, using an asymmetric adjustment results in an upwards bias in the baseline. Biasing the baseline inherently biases the performance metrics. The bias is greatly reduced when using a symmetric adjustment.
- Add a cap to the multiplicative adjustment factor. Otherwise, baselines are apt to approach unrealistic levels.
- Examine load data for solar patterns or pre-pumping/pre-cooling on event days. Pre-pumping/pre-cooling on event days is fine, but sites that do so should not receive the adjustment factor (or the adjustment factor should be based on weather rather than load). For sites with solar, consider using a smaller adjustment factor cap, using an additive adjustment, or removing the adjustment factor altogether.
- Compare DR nominations to the average demand on typical summer afternoons. If any nominations seem too high, update them. (We'll note that nominations for some sites do change throughout the summer.)
- PNM should also consider collecting all meter channels for sites with solar PV. This would allow the CBL to fully capture the load shape of sites that are net exporters during key times of day. It's possible that these sites reduced load and thus became larger exporters than they would have been on a non-event day, but the available data doesn't allow for a measurement. Also, an additive adjustment may work better than a multiplicative one for sites whose load can cross zero during the event period or adjustment window.

The below tables offer a year-over-year comparison of the Peak Saver performance metrics for the years 2018 through 2021. The relevant performance metrics are:

- **10-Minute Participant Capacity Performance** – The difference between the CBL and the lowest actual electrical demand measured by a one-minute interval reading between eight and ten minutes after the start of an event.
- **Average Participant Capacity Performance** – The average difference between the CBL and the participant's actual electric demand beginning ten minutes after the initiation of the event.
- **Participant Event Capacity Performance** – Weighted average of 10-Minute Participant Capacity Performance (40% weight) and Average Participant Capacity Performance (60% weight).
- **Energy Delivered** – The difference (in kWh) between the adjusted CBL and the metered load summed across all DR event hours.

Prior to 2021, Enbala would zero out the 10-Minute Participant Capacity and the Average Participant Capacity if the Participant Event Capacity Performance was negative, but these values were not zeroed out in 2021. Per the settlement baselines, Table 41 shows average portfolio performance metrics by year as calculated by the evaluation team. Table 42 shows average portfolio performance metrics by year as calculated by the program implementer.

Table 41: Historical Evaluated Performance Summary Averages

Year	Participants	Events	10-Minute Capacity Performance (kW)	Average Capacity Performance (kW)	Verified Capacity Performance (kW)	Energy Performance During Event Hours (kWh)
2018	86	12	17,558	13,655	15,216	57,371
2019	92	3	17,460	15,342	16,189	60,250
2020	130	10	13,433	12,528	12,890	52,991
2021	157	2	18,975	16,532	17,509	64,662
Average	**116**	**7**	**16,857**	**14,514**	**15,451**	**58,819**

Table 42: Historical Performance Summary Averages - Program Implementer

Year	Participants	Events	10-Minute Capacity Performance (kW)	Average Capacity Performance (kW)	Verified Capacity Performance (kW)	Energy Performance During Event Hours (kWh)
2018	86	12	28,337	24,438	25,998	96,437
2019	92	3	30,419	27,645	28,754	109,958
2020	130	10	18,728	17,806	18,175	70,905
2021	157	2	42,182	41,420	42,176	165,911
Average	**116**	**7**	**29,917**	**27,827**	**28,776**	**110,803**

Appendix G: Commercial Comprehensive Desk Review Results Summary

Project Number	PNM-21-04399	PNM-21-04437	PNM-21-04423	PNM-21-04324	PNM-21-04336	PNM-21-04340	PNM-21-04458
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	New Construction	New Construction	New Construction	Retrofit Rebate	New Construction	Retrofit Rebate	New Construction
Project Description	New Construction Lighting & HVAC	New Construction Lighting & HVAC	New Construction Lighting & HVAC	High-Efficiency Water Cooled Centrifugal Chiller	New Construction Lighting and HVAC	Retrofit of Unitary Split Air Conditioners	New Construction Unitary Split Air Conditioners & Lighting
Measure Type	New Construction Lighting	New Construction Lighting	New Construction Lighting	Retrofit HVAC	New Construction Lighting	Retrofit HVAC	New Construction Lighting
Building Type	Education	Retail	Education	Office	Education	Retail	Miscellaneous
Other Building Type							
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	143,644	118,538	167,534	80,576	308,752	5,281	6,422
Gross Reported First Year Peak Demand Savings (kW)	41.94	5.86	20.84	38.24	96.68	2.63	1.11
Gross Reported First Year Gas Savings (therms)	0.00	0.00		0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	171,804	138,980	179,671	75,233	417,412	8,053	5,659
Gross Verified First Year Peak Demand Savings (kW)	59.85	9.88	43.28	26.33	101.44	4.64	1.13
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.20	1.17	1.07	0.93	1.35	1.52	0.88
Gross Peak Demand RR	1.43	1.69	2.08	0.69	1.05	1.76	1.02
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1	The ex post savings increased due to the AC measures. The ex post HVAC savings referenced the unit quantities, size, and efficiencies from the supplied project documentation while using the methodology outlined in the workpapers and NM TRM. The evaluation team referenced the LPDs from the supplied project documentation while the HOU values of 2,385 hrs/yr and 4,192 hrs/yr were used for the interior and exterior fixtures, respectively.	HVAC Interactive Factors & Coincidence Factor for energy savings (kWh) and peak demand (kW) may not have been considered in the ex ante Calculations. In addition, hours of operation for lighting fixtures might differ from ex ante calculations. Baseline efficiencies considered by evaluator may also be different for Unitary AC systems. Evaluator considered "Retail" building type to calculate ex post savings.	Unitary Split AC do not providing any savings because the SEER value is below the Qualifying value as per Workpaper. HVAC Interactive Factors & Coincidence Factor for energy savings (kWh) and peak demand (kW) was not considered in the ex ante Calculations. Evaluator considered "Education" building type to calculate ex post savings.	The kWh savings RR is 93.4% and peak kW savings RR is 68.9%. Ex ante calculations not provided, reason for discrepancy unknown. May be use of different EFLH in ex post Calculations or use of different Coincident Factor for ex post Calculations based on the building type. Evaluator considered "Office" building type to calculate ex post savings.	The ex post savings increased primarily due to the HVAC measures. The evaluation team used building specific inputs and methodology from the 2021 workpapers and NM TRM. Rason for savings discrepancy may be due to the use of different kWh/Ton savings values for HVAC systems from PNM workpaper. Evaluator considered "Education" building type to calculate ex post savings.	The kWh savings RR is 152% and peak kW savings RR is 176%. ex ante calculations not provided, reason for discrepancy unknown. The evaluation team used the values in the 2019 workpapers for a "Retail/Service" building type to calculate the ex post savings. The 2019 workpapers were used based on the dates provided in the project documentation. Evaluator considered "Retail" building type to calculate ex post savings.	The evaluation team used building specific inputs and methodology from the 2021 workpapers and NM TRM. A retail/service building type was assumed since the building type listed on the application was Miscellaneous. The LPD and HOUs for the ex post lighting calculations were referenced from the supplied project documentation. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.
Include any other important observations here							

Project Number	PNM-21-04305	PNM-21-04420	PNM-20-04254	PNM-21-04319	PNM-20-04253	PNM-20-04162	PNM-20-04258
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Retrofit Rebate	New Construction	Retrofit Rebate	Retrofit Rebate	New Construction	New Construction	New Construction
Project Description	Retrofit of VRF	New Construction Lighting	Retrofit of VRF	Retrofit of VRF and Lighting Systems	New Construction Lighting	New Construction Lighting	New Construction Lighting
Measure Type	Retrofit HVAC	New Construction Lighting	Retrofit HVAC	Retrofit HVAC	New Construction Lighting	New Construction Lighting	New Construction Lighting
Building Type	Miscellaneous	Miscellaneous	Office	Office	Office	Retail	Education
Other Building Type							
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	106,223	93,000	521,527	122,225	293,411	40,777	8,604
Gross Reported First Year Peak Demand Savings (kW)	38.40	13.15	138.16	32.48	40.28	6.66	0.00
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	128,553	129,539	489,126	102,514	259,533	38,008	8,552
Gross Verified First Year Peak Demand Savings (kW)	28.23	27.39	132.63	28.88	55.33	8.54	0.00
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.21	1.39	0.94	0.84	0.88	0.93	0.99
Gross Peak Demand RR	0.74	2.08	0.96	0.89	1.37	1.28	
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1	The evaluation team used building specific inputs and VRF methodology from the 2021 workpapers and NM TRM. A commercial building type (Albuquerque) was assumed since the building type listed on the application was Museum.	The evaluation team referenced the building area and installed wattages from the post-inspection form and the COMcheck certificate, respectively. The annual hours were referenced from the PNM workpapers for each space type at the facility.	The evaluation team used building specific inputs and VRF methodology from the 2019 workpapers and NM TRM for an office building type. The values from the 2019 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The evaluation team used building specific inputs, VRF methodology, and heat pump methodology from the 2021 workpapers and NM TRM for an office building type. The values from the 2021 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The evaluation team used the LPDs and building area listed in the final application to calculate the ex post savings. Additionally, the WHFe, WHFd, and CF for an Office building type from the 2019 workpapers was used in the savings calculations. The annual HOUs used in the ex post calculation were referenced from the post-installation report. The 2019 workpapers were referenced due to the date on the application and application summary report being before the update to the workpapers in May 2021. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.	The evaluation team used the LPDs and building area listed in the final application to calculate the ex post savings. Additionally, the HOUs, WHFe, WHFd, and CF for a Retail/Service building type from the 2019 workpapers was used in the savings calculations. The 2019 workpapers were referenced due to the date on the application and application summary report being before the update to the workpapers in May 2021. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.	
Include any other important observations here							

Project Number	18971	19097	19121	19158	19179	19252	PNM-21-04287
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	AC Tune Up
Project Description	Replacement with Efficient LEDs	Replacement with Efficient LEDs	Replacement with Efficient LEDs	Replacement with Efficient LEDs	Replacement with Efficient LEDs	Replacement with Efficient LEDs	Tuning Up the existing AC
Measure Type	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	AC Tune Up
Building Type	Health	Miscellaneous	Warehouse/ Industrial	Retail	Miscellaneous	Miscellaneous	Office
Other Building Type					Restaurant - Fast Food	Automotive Service/Repair	
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	4,760	34,891	39,906	35,123	13,447	6,913	8,346
Gross Reported First Year Peak Demand Savings (kW)	1.15	7.69	9.14	7.62	1.20	1.11	0.00
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	4,825	35,906	39,759	38,228	13,492	6,882	8,221
Gross Verified First Year Peak Demand Savings (kW)	1.15	2.77	0.00	7.36	1.34	1.00	0.00
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.01	1.03	1.00	1.09	1.00	1.00	0.99
Gross Peak Demand RR	1.00	0.36	0.00	0.97	1.12	0.90	
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1		The HVAC system details are not provided. As a default, AC with Non-electric Heating considered for ex post analysis. Photocells were installed for Exterior lighting and daylighting selected as controls methodology for Interior lighting. Exterior space type may not have been considered for ex ante calculations. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.	The reason for discrepancy in kW saving is due to the space type selected as Exterior by evaluator based on Pre & Post Photos. This was may have not been considered in the ex ante calculations.	The HVAC system details were not provided. As a default, AC with Non-electric Heating considered for ex post analysis. Space type unknown for light fixtures. As a default, Interior was considered by the evaluator. Reason for discrepancy in kW and kWh savings may be that HVAC Interactive Factors and Coincidence factors were not considered in the ex ante calculations. The calculation sheet was not provided, evaluator could not verify the Reported Savings methodology.	The HVAC system details are not provided. As a default, AC with Non-electric Heating is selected. Reason for discrepancy in kW and kWh savings may be that HVAC Interactive Factors and Coincidence factors were not considered in the ex ante calculations. The calculation sheet was not provided, evaluator could not verify the Reported Savings methodology.	The space type was considered as Manufacturing - Light Industrial, the building does not fall into any NM TRM categories. HVAC system details were not provided. As a default, AC with Non-electric Heating considered for ex post analysis. Reason for discrepancy in kW and kWh savings may be that HVAC Interactive Factors and Coincidence factors were not considered in the ex ante calculations. The calculation sheet was not provided, evaluator could not verify the Reported Savings methodology.	
Include any other important observations here		Building type is Restaurant - Sit Down. The air conditioning system details is not provided. As a default, AC with Non-Electric Heating is selected.	Building type is Warehouse. The air conditioning system details were not provided. As a default, Storage - Conditioned with Non Electric Heating is considered.	Building type is Retail - Single Story Large. The air conditioning system details were not provided. As a default, AC with Non-Electric Heating is selected.	Building type is Restaurant - Fast Food. The air conditioning system details were not provided. As a default, AC with Non-Electric Heating is selected.	Building type is Automotive Service/Repair. The air conditioning system details were not provided. As a default, AC with Non-Electric Heating is selected.	

Project Number	PNM-21-04288	18698	17665	19017	19466	19209	19251
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	AC Tune Up	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)	Direct Install (Quicksaver)
Project Description	Tuning Up the existing AC	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting
Measure Type	AC Tune Up	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting
Building Type	Miscellaneous	Miscellaneous	Miscellaneous	Miscellaneous	Exterior	Grocery	Office
Other Building Type		Multifamily-Common Areas	Fitness/Sport Center	Fitness/sports center	Light Industry - Exterior		
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	2,176	76,977	109,532	139,153	192,402	266,728	184,122
Gross Reported First Year Peak Demand Savings (kW)	0.00	17.66	18.25	25.86	44.05	39.71	37.83
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	2,175	77,045	107,990	136,960	192,306	287,683	204,678
Gross Verified First Year Peak Demand Savings (kW)	0.00	0.01	7.78	7.77	0.00	36.54	31.38
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.00	1.00	0.99	0.98	1.00	1.08	1.11
Gross Peak Demand RR		0.00	0.43	0.30	0.00	0.92	0.83
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1			The evaluation team referenced the existing fixture wattages from the PNM workpapers. The post-installation fixture wattages were referenced from the supplied project documentation. The peak demand savings realization rate is less than 1.00 because the ex ante savings included peak demand savings for exterior light fixtures that operate from dusk-to-dawn.	The evaluation team referenced the existing fixture wattages from the PNM workpapers. The post-installation fixture wattages were referenced from the supplied project documentation. The peak demand savings realization rate is less than 1.00 because the ex ante savings included peak demand savings for exterior light fixtures that operate from dusk-to-dawn.	There are no peak demand savings for these exterior light fixtures. The ex post calculations use a CF of 0.	The evaluation team referenced the existing fixture wattages from the PNM workpapers. The post-installation fixture wattages were referenced from the supplied project documentation. The fixture HOUs were referenced from the "POST" form supplied in the project documentation. Finally, the WHFe, WHFd, and CF for a Grocery building type were used in the ex post calculation.	The evaluation team referenced the existing fixture wattages from the PNM workpapers. The post-installation fixture wattages were referenced from the supplied project documentation. The fixture HOUs were referenced from the "POST" form supplied in the project documentation. Finally, the WHFe, WHFd, and CF for an Office building type were used in the ex post calculation.
Include any other important observations here							

Project Number	19421	19005	19127	PNM-20-04013	PNM-20-04183	PNM-20-04134	PNM-21-04290
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Direct Install (Quicksaver)	Multifamily	Multifamily	Multifamily	Multifamily	Multifamily	Multifamily
Project Description	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new efficient Unitary and Split AC , LED lighting and Heat Pump	Installation of new efficient Unitary and Split AC , LED lighting and Heat Pump	Installation of new efficient Unitary and Split AC , LED lighting and Heat Pump	Installation of ENERGY STAR Qualified windows with double pane
Measure Type	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	HVAC	HVAC	HVAC	Other
Building Type	Health	Miscellaneous	Miscellaneous	Residential - Multifamily	Residential - Multifamily	Residential - Multifamily	Residential - Multifamily
Other Building Type		Multifamily-Common Areas	Multifamily-Common Areas				
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	199,458	14,493	37,076	886,037	471,442	371,135	1,916
Gross Reported First Year Peak Demand Savings (kW)	25.30	3.32	8.49	141.30	101.69	23.52	0.54
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	222,193	14,493	37,001	878,270	513,290	332,849	1,916
Gross Verified First Year Peak Demand Savings (kW)	21.89	0.00	0.00	178.48	121.74	30.35	0.57
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.11	1.00	1.00	0.99	1.09	0.90	1.00
Gross Peak Demand RR	0.87	0.00	0.00	1.26	1.20	1.29	1.05
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1	The evaluation team referenced the existing fixture wattages from the PNM workpapers. The post-installation fixture wattages were referenced from the supplied project documentation. The fixture HOUs were referenced from the "POST" form supplied in the project documentation. Finally, the WHFe, WHFd, and CF for a Health/Medical building type were used in the ex post calculation.	The evaluator was able to replicate ex ante savings. Utility workpaper, reported HOU, and interactive factors taken into consideration for ex post savings calculations. Discrepancy between the ex ante and ex post kW savings is due to consideration of "Exterior" building type in ex post analysis.	The evaluator was able to replicate ex ante savings. Utility workpaper, reported HOU, and interactive factors taken into consideration for ex post savings calculations. Discrepancy between the ex ante and ex post kW savings is due to consideration of "Exterior" building type in ex post analysis.	The evaluation team reference the project details from the post-inspection form to calculate the ex post savings for each of the three measures. The evaluation team used the Multifamily values (cooling and heating) from the PNM workpapers to calculate the energy and peak demand savings for the installed Heat Pumps. The peak demand savings for the heat pump water heater measure are greater than the ex ante savings. It's not clear what coincidence factor was used in the ex ante calculations.	The ex post savings used WHFe, WHFd, and CF values for a Multifamily building type. An LPD value of 0.7 W/sf was used in the ex post savings while the building area was referenced from the final application. Finally, the lighting HOUs were referenced from the supplied post-inspection report. The evaluation team used building specific inputs and VRF methodology from the 2019 workpapers and NM TRM for an a Multifamily building type. The values from the 2019 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The ex post savings used WHFe, WHFd, and CF values for a Multifamily building type. An LPD value of 0.7 W/sf was used in the ex post savings while the building area was referenced from the final application. Finally, the lighting HOUs were referenced from the supplied post-inspection report. The evaluation team used building specific inputs and heat pump methodology from the 2019 workpapers and NM TRM for an a Multifamily building type. The values from the 2019 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The evaluation team was not able to replicate the reported savings based on the supplied project documentation. Reason for discrepancy in kW and kWh savings is unknown.
Include any other important observations here							

Project Number	PNM-21-04291	PNM-21-04361	PM-20-00272	PM-21-00276	PM-21-00277	PM-21-05475	PM-21-05515
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Multifamily	Multifamily	Midstream	Midstream	Midstream	Midstream	Midstream
Project Description	Retrofitting HVACs with Smart Thermostats	Installation of new efficient Unitary and Split AC , LED lighting and Heat Pump	Installation of new high-efficiency Vending Machine	Installation of new high-efficiency Glass/Solid Door Reach-In Refrigerator - Electric	Installation of new high-efficiency Glass/Solid Door Reach-In Refrigerator/Freezer - Electric	Installation of new high-efficiency Glass/Solid Door Reach-In Refrigerator - Electric	Installation of new high-efficiency Glass Door Reach-In Refrigerator/Freezer - Electric
Measure Type	HVAC	HVAC	Midstream	Midstream	Midstream	Midstream	Midstream
Building Type	Residential - Multifamily	Residential - Multifamily	Office	Miscellaneous	Miscellaneous	Miscellaneous	Miscellaneous
Other Building Type				Restaurant	Restaurant	Restaurant	Restaurant, Hotel/Motel, Assembly
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	37,368	827,529	3,502	574	7,455	10,423	39,256
Gross Reported First Year Peak Demand Savings (kW)	0.00	131.37	0.00	11.73	57.21	132.39	175.59
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	37,362	375,027	3,726	260	1,519	1,929	7,520
Gross Verified First Year Peak Demand Savings (kW)	0.00	59.78	0.05	0.03	0.16	0.21	0.81
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.00	0.45	1.06	0.45	0.20	0.19	0.19
Gross Peak Demand RR		0.46		0.00	0.00	0.00	0.00
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1		The evaluation team used the HOUs for a multifamily dwelling building type for the residential spaces and the HOUs for the office space. The application summary report appears to show that the building type for the lighting savings was Healthcare. This is an adult living community so the evaluation team used a different building type. The evaluation team used building specific inputs and AC methodology from the 2021 workpapers and NM TRM for an a Multifamily building type. The values from the 2021 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The kWh savings RR is 106% and peak kW savings RR is 0%. The evaluation team was not able to replicate the reported savings based on the supplied project documentation. Reason for discrepancy in kW and kWh savings is unknown.	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.
Include any other important observations here							

Project Number	PM-21-05550	PNM-20-04158	PNM-20-04168	PNM-21-04320	PNM-21-04350	PNM-21-04407	PNM-20-04130
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Midstream	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate
Project Description	Installation of new high-efficiency Glass Door Reach-In Refrigerator/Freezer - Electric	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Installation of new high-efficiency (LED) lighting	Energy Efficient Glass Door-In Freezer
Measure Type	Midstream	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Lighting	Retrofit Other
Building Type	Miscellaneous	Office	Miscellaneous	Health	Retail	Education	Retail
Other Building Type	Restaurant, Hotel/Motel, Assembly			Medical			
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	46,678	21,935	118,331	14,526	131,410	1,196	113,921
Gross Reported First Year Peak Demand Savings (kW)	274.94	2.09	20.83	3.73	22.98	0.43	292.45
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	7,823	23,731	119,979	22,442	131,289	1,196	17,401
Gross Verified First Year Peak Demand Savings (kW)	0.84	2.67	21.39	3.74	22.98	0.43	1.86
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	0.17	1.08	1.01	1.54	1.00	1.00	0.15
Gross Peak Demand RR	0.00	1.28	1.03	1.00	1.00	1.01	0.01
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.	The evaluation team referenced the supplied project documentation and PNM workpapers to calculate the ex post savings. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.	The evaluation team referenced the supplied project documentation and PNM workpapers to calculate the ex post savings. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.	The evaluation team referenced the supplied project documentation and PNM workpapers to calculate the ex post savings. The discrepancy between the ex ante and ex post savings is not clear based on the supplied project documentation.			The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.
Include any other important observations here							

Project Number	PNM-20-04271	PNM-21-04463	PNM-19-03736	PNM-19-03856	PNM-19-03877	PNM-19-03925	PNM-20-03999
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate	Building Tune-Up	Building Tune-Up	Retrofit Rebate	Retrofit Rebate
Project Description	Energy Efficient Glass Door-In Freezer	Electronically Commutated (EC) Motors for Walk-in Coolers	VAV AHU Duct-Static Reset, Exhaust Fans, Night Setback, Night OSA Damper Control, Economizer Calibration, S/A Reset and LED lighting	Building Operator Certification	Building Operator Certification	Interior & Exterior Lighting Replacement	Interior Lighting Replacement
Measure Type	Retrofit Other	Retrofit Other	Building Tune-Up	Building Tune-Up	Building Tune-Up	Retrofit	Retrofit
Building Type	Retail	Grocery	Education	Warehouse/ Industrial	Office	Office	Office
Other Building Type				Commercial & Industrial			
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	29,852	78,123	275,068	59,250	18,331	710,231	878,729
Gross Reported First Year Peak Demand Savings (kW)	76.64	9.06	32.77	0.00	0.00	115.41	177.60
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	1,839	78,123	275,068	59,250	18,331	1,040,316	856,763
Gross Verified First Year Peak Demand Savings (kW)	0.20	9.06	13.63	0.00	0.00	268.29	177.09
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	0.06	1.00	1.00	1.00	1.00	1.46	0.98
Gross Peak Demand RR	0.00	1.00	0.42			2.32	1.00
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Custom Calculation	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Custom Analysis	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1	The evaluation team referenced the values and methodology in the PNM workpapers to calculate the ex post savings for this measure. The discrepancy between the ex ante and ex post savings is not known based on the supplied project documentation.		It appears there may have been a cell reference error when calculating the ex ante peak demand savings. While the baseline peak demand value had the correct cell reference in the eQUEST outputs, the post-installation peak demand value was referenced from the "RRHS 01-29-21 IMPLEMENTED ECMs - Baseline Design" output value instead of the "RRHS 01-29-21 IMPLEMENTED ECMs – 10" output value.			The larger discrepancy between the Ex Ante and Ex Post savings may be due to operating hours or consideration of HVAC interactive factors & Coincidence Factor by the evaluator. Customer HOU, quantities and wattages from Lighting Scope of Work spreadsheet was used for Ex Post savings.	The discrepancy between the Ex Ante and Ex Post savings may be due to consideration of different quantities and wattages. Lighting specs don't match replacement wattages in Ex Post report. Customer HOU and wattages from Post Inspection used for Ex Post savings. Missing ex ante calculations to verify methodology and variables.
Include any other important observations here				Total conditioned space is 4,000,000 sq ft. However, only claiming at the capped 250,000 sq ft.	Total conditioned space is 77,344 sq ft.		

Project Number	PNM-20-04046	PNM-20-04078	PNM-20-04081	PNM-20-04202	PNM-20-04251	PNM-20-04256	PNM-21-04306
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate	New Construction	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate
Project Description	Interior Lighting Replacement	Custom HVAC - Chilled Water Optimization	Interior Lighting Replacement	New Construction Lighting, HVAC and Custom Refrigeration	Interior & Exterior Lighting Replacement	Interior & Exterior Lighting Replacement	Exterior Lighting Replacement
Measure Type	Retrofit	Retrofit Custom	Retrofit	New Construction Lighting	Retrofit	Retrofit	Retrofit
Building Type	Retail	Warehouse/ Industrial	Retail	Warehouse/ Industrial	Miscellaneous	Office	Exterior
Other Building Type		Heavy Industry					
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	365,105	4,531,914	999,081	1,294,571	318,428	275,688	179,492
Gross Reported First Year Peak Demand Savings (kW)	82.02	199.68	115.61	119.49	57.01	54.40	0.00
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	496,501	4,531,914	1,187,925	1,266,005	277,843	290,862	184,682
Gross Verified First Year Peak Demand Savings (kW)	81.74	199.68	121.07	147.19	59.56	59.24	0.00
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.36	1.00	1.19	0.98	0.87	1.06	1.03
Gross Peak Demand RR	1.00	1.00	1.05	1.23	1.04	1.09	
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Custom Calculation	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Custom Analysis	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper
Other Savings Source				Custom Analysis			
TRM/Workpaper Assessment				The deemed savings technical assumptions and calculations align with the methodology outlined in the workpaper.			
Reasons for RR(s) <> 1	Discrepancy between kWh RR is due to the evaluation team adjusting operating hours. The evaluation team updated the annual HOUs for the facility to align with the value in the post-inspection report (5,408) as they were significantly different from the Retail/Service HOU value listed in the workpapers (3,677). This adjustment increased the ex post savings.		The discrepancy between the ex ante savings and the ex post savings is not known. The evaluation team used the customer HOU from Post Inspection form. The fixture wattages were referenced from the PNM Workpapers using the information contained in the Post Inspection form. The ex post savings also include WHFe, WHFd, and CF factors for a Retail/Service building type.	The discrepancy between the ex ante and ex post savings appears to be a result of the HVAC measures in this project. The evaluation team used building specific inputs and heat pump/AC methodology from the 2019 workpapers and NM TRM for an a Multifamily building type. The values from the 2019 workpapers were used in the ex post savings due to the date listed on the application and application summary report.	The evaluation team referenced the fixture wattages from the supplied project documentation. The fixture HOUs were referenced post-inspection report. Finally, WHFe, WHFd, and CF factors for an Office building type were used in the ex post calculations.	Discrepancy between the ex ante and ex post savings may be due to consideration of IF & Coincidence Factor by the evaluator. Customer HOU from Post Inspection was used for ex post savings calculations and may differ from HOU used in ex ante calculations. The evaluation team referenced the fixture quantities, wattages, location, and operating hours from the post-inspection form for this project. Missing ex ante calculations to verify methodology and variables. The discrepancy between the ex ante and ex post savings are not known.	Discrepancy between the ex ante and ex post kWh savings is due to wattage adjustment by the evaluator as per the PNM work paper for 150 W metal halide. Customer HOU from Post Inspection was used for ex post savings calculations and may differ from HOU used in ex ante calculations. The evaluation team referenced the fixture quantities, wattages, location, and operating hours from the post-inspection form for this project.
Include any other important observations here		Large project from 2020 being paid out in two parts. Total savings for the project are 9,531,914 kWh and 525 kW, however, only 4,531,913 kWh and 199.68 kW are being claimed in 2021 as the remaining savings. Optimized CHW loop by converting to a variable speed system and implementation of OptimumLoop algorithms to improve plants efficiency from 0.725 kW/ton to 0.612 kW/ton.		Deemed savings and methodology from workpaper for NC Lighting and HVAC was followed for ex post savings calculations. Custom Refrigeration calculation was followed for post savings. Interior and Exterior Lighting calculations were provided. HVAC submittals were provided as well as mechanical schedule to verify equipment installed. Custom Refrigeration upgrades included Compressor VFDs, Ice Cream Room Booster Compressor, Thermosiphon Oil Cooling, Condenser Fan VFDs, Evaporator Fan VFDs, Evaporator EC Motors and Oversized Evaporators. Custom calculations were provided and reference the Energy Modeling Guideline for Cold Storage and Refrigerated Warehouse Facilities.			

Project Number	PNM-21-04292	PNM-21-04293	PNM-21-04299	PNM-21-04301	PNM-21-04313	PNM-21-04316	PNM-21-04351
Utility	PNM	PNM	PNM	PNM	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Building Tune-Up	Building Tune-Up	Building Tune-Up	Building Tune-Up	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate
Project Description	Building Operator Certification	Building Operator Certification	Building Operator Certification	Building Operator Certification	Compressor replacement	Custom Motors	Split AC and Air Source Heat Pumps
Measure Type	Building Tune-Up	Building Tune-Up	Building Tune-Up	Building Tune-Up	Retrofit Custom	Retrofit Custom	Retrofit HVAC
Building Type	Education	Warehouse/ Industrial	Miscellaneous	Education	Warehouse/ Industrial	Miscellaneous	Office
Other Building Type		Commercial & Industrial	Resort & Casino		Heavy Industry		
Site Visit Being Conducted	No	No	No	No	No	No	No
Gross Reported First Year Energy Savings (kWh)	59,250	59,250	59,250	21,212	241,521	18,370	7,937
Gross Reported First Year Peak Demand Savings (kW)	0.00	0.00	0.00	0.00	29.72	0.00	4.28
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	59,250	59,250	59,250	21,212	241,521	18,369	8,232
Gross Verified First Year Peak Demand Savings (kW)	0.00	0.00	0.00	0.00	36.08	0.00	5.14
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gross Energy Savings RR	1.00	1.00	1.00	1.00	1.00	1.00	1.04
Gross Peak Demand RR					1.21		1.20
Gross Therms RR							
Ex Ante Calculation Methodology	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)	Custom Calculation	Custom Calculation	Prescriptive (TRM, Workpaper)
Other Calculation Methodology							
Savings Source	Utility Workpaper	Utility Workpaper	Utility Workpaper	Utility Workpaper	Custom Analysis	Custom Analysis	Utility Workpaper
Other Savings Source							
TRM/Workpaper Assessment							
Reasons for RR(s) <> 1					Ex ante demand savings in tracker differ from energy analysis provided. However, kWh savings in tracker and energy analysis match. Discrepancy may be due to consideration of CF.		The evaluation team calculated the savings for the ACs and HPs using the 2019 workpapers using an Office building type. The 2019 workpapers were used due to the date listed on the application. The discrepancy between the ex ante and ex post savings is not clear.
Include any other important observations here	Total conditioned space is 1,000,000 sq ft. However, only claiming at the capped 250,000 sq ft.	Total conditioned space is 4,000,000 sq ft. However, only claiming 250,000 sq ft.	Total conditioned space is 600,000 sq ft. However, only claiming at the capped 250,000 sq ft.	Total conditioned space is 89,500 sq ft.	Replacement of Leroi and Quincy compressors with 2 Atlas Copco 160 compressors. Compressor 1 & 2 will be replaced by VFD compressors as well as change in header pressure. Followed custom calculation for ex post analysis, kWh. Evaluator considered coincidence factor for Heavy Industry.	Replacing an older CRAC unit on a Data Floor with a newer more efficient unit to help ease the load off of older units. Replace Canatal Series 9 (Model: 9AD26VEBHAX)with a DB-AIR II (Model: DBAD 19).	Project installation site in Silver City, evaluator considered the climate zone city nearest to be Las Cruces, NM. Deemed savings values from workpaper for HVAC was followed for ex post savings calculations.

Project Number	PNM-21-04356	PNM-21-04385	PNM-21-04464
Utility	PNM	PNM	PNM
Program	Commercial Comprehensive	Commercial Comprehensive	Commercial Comprehensive
Subprogram	Retrofit Rebate	Retrofit Rebate	Retrofit Rebate
Project Description	Retrofitting medium temperature glass doors	Energy Recovery Ventilator and Custom Retrofit of Heat Pumps & VSD on HVAC Motors	EC Motors for Walk-in Refrigerated and Freezer Cases
Measure Type	Retrofit Custom	Retrofit HVAC	Retrofit Other
Building Type	Grocery	Education	Grocery
Other Building Type			
Site Visit Being Conducted	No	No	No
Gross Reported First Year Energy Savings (kWh)	122,171	13,304	49,419
Gross Reported First Year Peak Demand Savings (kW)	10.36	2.62	5.66
Gross Reported First Year Gas Savings (therms)	0.00	0.00	0.00
Gross Verified First Year Energy Savings (kWh)	122,171	13,247	49,419
Gross Verified First Year Peak Demand Savings (kW)	10.35	3.76	5.66
Gross Verified First Year Gas Savings (therms)	0.00	0.00	0.00
Gross Energy Savings RR	1.00	1.00	1.00
Gross Peak Demand RR	1.00	1.44	1.00
Gross Therms RR			
Ex Ante Calculation Methodology	Custom Calculation	Prescriptive (TRM, Workpaper)	Prescriptive (TRM, Workpaper)
Other Calculation Methodology			
Savings Source	Custom Analysis	Utility Workpaper	Utility Workpaper
Other Savings Source		Custom Analysis	
TRM/Workpaper Assessment			
Reasons for RR(s) <> 1		Discrepancy in ex ante and ex post savings is unknown. Evaluator considered deemed savings values for the Santa Fe climate zone and "college/university" building type, this may attribute to the discrepancy in savings RR for split AC. Missing ex ante calculations for VSD's and split ac to determine discrepancy between ex ante and ex post savings.	
Include any other important observations here	Retrofitting 220' linear feet of medium temperature glass doors onto existing cases or 102 doors. CF for Grocery was considered for ex ante and ex post kW savings calculations.	Deemed savings values from workpaper for split ac and VSD's was followed for ex post savings calculations. Custom HVAC calculation was used for ex ante savings for the recovery ventilator.	