Evaluation of the 2017 New Mexico Gas Company Energy Efficiency Programs

Final Report

June 22, 2018

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Executive Summary

This report presents the independent evaluation results for the New Mexico Gas Company (NMGC) energy efficiency programs for program year 2017 (PY2017).

The NMGC 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 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, NMGC 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 savings, determine program cost effectiveness, assess how well the programs are being implemented, and provide recommendations for program improvements as needed.

For PY2017, the following NMGC programs were evaluated:

- Efficient Buildings
- Income Qualified
- Multi-Family
- ThermSmart New Homes

For each of the evaluated programs, the evaluation team estimated realized gross and net therm impacts and calculated program cost effectiveness using the UCT. A brief process evaluation was also conducted for the Efficient Buildings and Multi-Family programs.

The remaining programs that were not evaluated in 2017 are still summarized in this report. The accomplishments for the non-evaluated programs are reported using the following parameters:

[1] NMSA §§ 62-17-1 *et seq* (SB 644). Per the New Mexico Public Regulation Commission Rule[1]Pursuant to the requirements of the EUEA, the NMPRC issued its most recent *Energy Efficiency Rule* (*17.7.2 NMAC*) effective January 1, 2015, that sets forth the NMPRC's policy and requirements for energy efficiency and load management programs. This Rule can be found online at http://164.64.110.239/nmac/parts/title17/17.007.0002.htm

- Gross therm impacts were calculated using the NMGC *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 NMGC.

The analysis methods used for the evaluated PY2017 programs are summarized as follows:

Efficient Buildings. The measures eligible for the Efficient Buildings program include a variety of end uses that are installed in prescriptive, custom, and direct install projects. In PY2017, custom projects made up the majority of savings, and direct install projects made up the largest number of projects. Gross impacts were estimated based on engineering desk reviews of a statistically representative sample of projects covering a range of major measure types. 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.

Income Qualified. This program provides weatherization and other efficiency improvements at no cost or low cost to low-income households. Measures include insulation, duct sealing, water heating, and space heating. The majority of projects in PY2017 were custom in nature with savings based on customized home energy audits. 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.

Multi-Family. This program is new in the NMGC portfolio for PY2017. Previously, low-income multi-family properties were served as part of the Income Qualified program. In the Multi-Family program's current design, the implementer (ICAST) provides turnkey services to install efficiency measures at a reduced cost to the customer. Gross impacts were estimated based on an engineering desk review of a representative sample of projects covering both the direct install and deep retrofit program components. Phone interviews with a small sample of participants were conducted to verify installation and collect information related to satisfaction with the program.

ThermSmart New Homes. The ThermSmart New Homes program is also new in the NMGC portfolio for PY2017, and is coordinated with the other residential new construction programs offered by New Mexico's electric utilities. Gross savings for this program were estimated based on engineering desk reviews for a statistically representative sample of projects. Net impacts were calculated using the *ex ante* net-to-gross (NTG) ratio for the program, since participating builder interviews to collect information needed for a self-report analysis of free ridership are scheduled for the PY2018 evaluation.

Table 1 summarizes the PY2017 evaluation methods.

Table 1: Summary of PY2017 Evaluation Methods by Program

Program	Deemed Savings Review	Phone Verification	Engineering Desk Reviews
Efficient Buildings	◆	◆	◆
Income Qualified	◆	□	◆
Multi-Family	◆	◆	◆
ThermSmart New Homes	◆		◆

The results of the PY2017 impact evaluation are shown in Table 2, with the programs evaluated in 2017 highlighted in blue. For the non-evaluated programs, the totals are based on the *ex ante* savings and NTG values from the NMGC tracking data.

Table 2: PY2017 Savings Summary – Therms

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Efficient Buildings	389	818,683	1.0282	841,799	0.5298	445,961
Income Qualified	467	154,291	0.9770	150,736	1.0000	150,736
Multi-Family	2,113	161,403	0.9273	149,665	1.0000	149,665
ThermSmart New Homes	566	214,166	1.0388	222,478	0.8000	177,982
Water Heating	5,699	217,311	1.0000	217,311	0.6888	149,687
Space Heating	1,386	103,986	1.0000	103,986	0.7576	78,784
Total		**1,669,840**		**1,685,976**		**1,152,816**

Lifetime therm savings are shown in Table 3 by program and for the portfolio overall. This includes expected gross, realized gross, and realized net lifetime savings.

Table 3: PY2017 Savings Summary – Lifetime Therms

Program	Expected Gross Lifetime Savings (therms)	Realized Gross Lifetime Savings (therms)	Realized Net Lifetime Savings (therms)
Efficient Buildings	11,678,468	12,008,215	6,361,612
Income Qualified	2,160,076	2,110,304	2,110,304
Multi-Family	1,792,155	1,661,827	1,661,827
ThermSmart New Homes	5,354,150	5,561,949	4,449,560
Water Heating	1,945,636	1,945,636	1,340,180
Space Heating	2,077,338	2,077,338	1,573,875
Total	**25,007,823**	**25,365,269**	**17,497,357**

Using net realized savings from this evaluation and cost information provided by NMGC, the evaluation team calculated the ratio of benefits to costs for each of NMGC'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.[2] The evaluation team conducted this test in a manner consistent with the California Energy Efficiency Policy Manual.[3] The results of the UCT are shown below in Table 4. All programs had a UCT of greater than 1.00, and the portfolio overall was found to have a UCT ratio of 1.73.

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

[3] http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf

Table 4: PY2017 Cost Effectiveness

Program	Utility Cost Test (UCT)
Efficient Buildings	2.59
Income Qualified	1.05
Multi-Family	1.49
ThermSmart New Homes	2.23
Water Heating	1.43
Space Heating	1.31
Overall Portfolio	**1.73**

Based on the data collection and analysis conducted for this evaluation, the evaluation team found that, overall, NMGC is operating high quality programs that are achieving significant energy savings and producing satisfied participants.

The impact evaluation—which included engineering desk reviews for a sample of Efficient Buildings, Income Qualified, Multi-Family, and ThermSmart New Homes projects—resulted in relatively high realized gross savings. Adjustments to savings based on the desk reviews were often due to the use of average values in lieu of project-specific values or conflicting savings values between documentation sources. The evaluation team has provided a number of recommendations to improve savings values that include calculating savings specific to the installed equipment, documenting adjustments to project savings, and other minor consistency improvements. The net impacts for the Efficient Buildings program were found to be lower than usual for PY2017 due to one large custom project with a low NTG ratio that that greatly affected the total weighted average for the program. However, going forward, the evaluation team recommends that NMGC continue to apply the existing *ex ante* NTG ratios for the Efficient Buildings program for planning purposes.

In terms of cost effectiveness, the UCT test was used and found all NMGC programs to be cost effective. If NMGC or the NMPRC desires other cost effectiveness tests to be used in the future, the evaluation team would suggest that NMGC track all measure costs so that the Total Resource Cost (TRC) test could be calculated in future program years.

The process evaluation activities, which included surveys with Efficient Buildings program participants and interviews with Multi-Family program participants, found very high levels of satisfaction across various aspects of the programs. Customers reported that

the programs were very influential in their decision to make efficiency upgrades, and the programs appear to be operating effectively.

1 Introduction

This report presents the independent evaluation results for New Mexico Gas Company's (NMGC's) energy efficiency programs for program year 2017 (PY2017).

The NMGC 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).[4] The EUEA requires public utilities in New Mexico, in collaboration with other parties, to develop cost-effective programs that reduce energy 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.

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, NMGC 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 savings, determine program cost effectiveness, assess how well the programs are being implemented, and provide recommendations for program improvements as needed.

Within this regulatory framework, the Evergreen evaluation team was chosen to be the independent evaluator for NMGC in May 2017, and a project initiation meeting was held with NMGC staff on September 13, 2017. The Evergreen evaluation team consisted of the following firms:

- **Evergreen Economics** was the prime contractor and managed all evaluation tasks and deliverables;
- **EcoMetric** provided engineering capabilities and led the review of NMGC's savings estimates; and
- **Research & Polling** fielded all the phone surveys.

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The remaining programs that were not evaluated in 2017 are still summarized in this report. The accomplishments for the non-evaluated programs are reported using the following parameters:

- Gross impacts (therms) were calculated using the NMGC *ex ante* values for annual savings;
- Net impacts were calculated from the gross impacts using the existing *ex ante* net-to-gross ratio; and
- Cost effectiveness calculations were calculated using the *ex ante* net impact values and cost data as reported by NMGC.

The remainder of this report is organized as follows. The *Evaluation Methods* chapter describes the various analysis methods and data collection activities that were conducted for the PY2017 evaluation. The *Impact Evaluation Results* chapter follows and presents the energy savings by program. *The Cost Effectiveness Results* are summarized in the next chapter, followed by a chapter presenting the *Process Evaluation Results.* The main report concludes with a chapter on evaluation *Conclusions and Recommendations.* Additional technical detail on the evaluation methods and results are included in several appendices.

2 Evaluation Methods

The analysis methods used for the evaluated PY2017 programs are summarized as follows:

Efficient Buildings. The measures eligible for the Efficient Buildings program include a variety of end uses that are installed in prescriptive, custom, and direct install projects. In PY2017, custom projects made up the majority of savings, and direct install projects made up the largest number of projects. Gross impacts were estimated based on engineering desk reviews of a statistically representative sample of projects covering a range of major measure types. 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.

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Table 5 summarizes the PY2017 evaluation methods. Additional detail on each of these evaluation methods is included in the remainder of this chapter.

Table 5: Summary of PY2017 Evaluation Methods by Program

Program	Deemed Savings Review	Phone Verification	Engineering Desk Reviews
Efficient Buildings	◆	◆	◆
Income Qualified	◆	□	◆
Multi-Family	◆	◆	◆
ThermSmart New Homes	◆		◆

2.1 Phone Surveys

A participant phone survey was fielded in early 2018 for participants in the Efficient Buildings program, and in-depth interviews (covering similar topics) were conducted for participants in the Multi-Family program during this same period. The surveys averaged about 20 minutes in length and covered the following topics:

- Verification of measures included in NMGC's program tracking database;
- Satisfaction with the program experience;
- Survey responses for use in the free ridership calculations;
- Participation drivers and barriers; and
- Customer characteristics.

Additional interviews were also conducted by engineers if additional information was needed for the individual project desk reviews.

The original goal was to complete 50 phone surveys for the Efficient Buildings program and as many phone interviews as possible for the smaller Multi-Family program. Table 6 shows the distribution of completed surveys.

Table 6: NMGC Phone Survey Summary

Program	Customers with Valid Contact Info	Target # of Survey Completes	Completed Surveys
Efficient Buildings	156	50	51
Multi-Family	10	5	5
Total	**166**	**55**	**56**

The final survey instrument for the Efficient Buildings program is included as Appendix A, and the final interview guide for the Multi-Family program is included as Appendix B.

2.2 Engineering Desk Reviews

In order to verify gross savings estimates, the evaluation team conducted engineering desk reviews for a sample of projects in the Efficient Buildings, Multi-Family, Income Qualified, and ThermSmart New Homes programs. 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:

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

For projects in the Efficient Buildings, Income Qualified, Multi-Family, and New Homes programs 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 utility workpapers to determine the most appropriate algorithms which apply to the installed measure;
- Recreation of savings calculations using TRM or workpaper algorithms and inputs as documented by submitted specifications, invoices, and post-installation inspection reports; and
- Review of New Mexico TRM algorithms to identify candidates for future updates and improvements.

For the custom projects included in the Efficient Buildings, ThermSmart New Homes, and Income Qualified programs, the engineering desk reviews included the following:

- Review of engineering analyses for technical soundness, proper baselines, and appropriate approaches for the specific applications;
- 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
- Consideration and review for interactive effects between affected systems.

In support of the engineering desk reviews, primary data were collected for select projects through in-depth interviews. These interviews involved speaking with project contacts to confirm equipment installation and operational parameters, in order to determine if additional adjustments to the savings calculations were necessary.

2.3 Net Impact Analysis

2.3.1 Self-Report Approach

The evaluation team estimated net impacts for the Efficient Buildings program 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:

- What were the circumstances under which the customer decided to implement the project (i.e., new construction, retrofit/early replacement, replace-on-burnout)?
- To what extent did the program accelerate installation of high efficiency measures?
- What were the primary influences on the customer's decision to purchase and install the high efficiency equipment?
- How important was the program rebate on the decision to choose high efficiency equipment?
- 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, etc.)?
- 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 NTG ratio) using the self-report approach is based on the 2017 Illinois Statewide Technical Reference Manual (TRM).[5] For the NMGC programs, questions regarding free ridership were divided into several primary components:

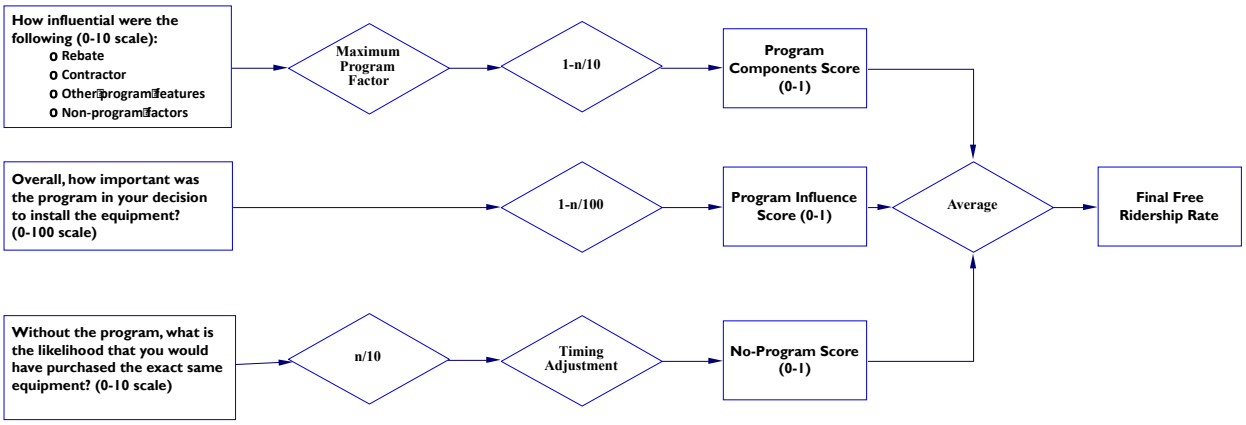
- A ***Program Component*** series of questions that asked about the influence of specific program activities (rebate, customer account rep, contractor recommendations, other assistance offered) on the decision to install energy efficient equipment;
- A ***Program Influence*** question, where the respondent 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 are 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 Questions

A separate battery of ***No-Program*** component questions was designed to understand what the customer might have done if the NMGC rebate program had not been available. With these questions, the evaluation team 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 NMGC.

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 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 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 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:

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

2.4 Realized Gross Savings and Net Impact Calculation

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.):

Gross Realized Savings =

(*Ex Ante* Savings)*(Installation Adjustment)*(Engineering Adjustment Factor)

Net Realized Savings are then determined by multiplying the Gross Realized Savings by the net-to-gross ratio:

Net Realized Savings = (Net-to-Gross Ratio)*(Gross Realized Savings)

2.5 Cost Effectiveness

The cost effectiveness of NMGC's programs was tested using the Utility Cost Test (UCT). 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. In order to perform the cost effectiveness analysis, the evaluation team obtained the following from NMGC:

- Avoided cost of energy (costs per MMBtu or per therm over a 20+ year time horizon);
- Distribution loss factor (percentage used to adjust avoided cost for distribution losses);
- Discount rate (percentage used to calculate the net-present value of future savings);
- Any assumed non-energy benefits, expressed in monetary terms or as a percentage of savings for each measure or program; and
- Administrative costs (all non-incentive expenditures associated with program delivery).

In response to the request for these data, NMGC provided its annual average avoided costs, discount rate, and program administrative costs. NMGC informed the evaluation team that the avoided costs provided were in 2016 dollars, and so an inflation rate and a discount rate provided by NMGC were applied to analyze avoided costs in terms of 2017 dollars. NMGC does not quantify a distribution loss factor separate from the avoided cost of energy.

Program savings, incremental measure costs, and effective useful life values were taken from the final PY2017 tracking data submitted by NMGC. The final net energy savings values estimated from the PY2017 impact evaluation were used in the final cost effectiveness calculations.

Additionally, Section 17.7.2.9.B(4) of the New Mexico Energy Efficiency Rule allows utilities to claim utility system economic benefits for low-income programs equal to 20 percent of the calculated energy benefits. The evaluation team applied this 20 percent adder to the benefits calculated for the Income Qualified program and the low-income projects in the Multi-Family program.

The evaluation team input the savings and cost data into a cost effectiveness model that calculated the benefits, costs, and benefit-cost ratio for each measure, project, or program entered, and rolled up the data into program-level UCT values.

3 Impact Evaluation Results

The results of the PY2017 impact evaluation are shown in Table 7, with the programs evaluated in 2017 highlighted in blue. For the non-evaluated programs, the totals are based on the *ex ante* savings and net-to-gross (NTG) values from the NMGC tracking data.

As noted previously, each program is required to be evaluated a minimum of once every three years. For 2017, the evaluated programs covered 81 percent of the *ex ante* therm savings.

Table 7: PY2017 Savings Summary – Therms

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Efficient Buildings	389	818,683	1.0282	841,799	0.5298	445,961
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Total		**1,669,840**		**1,685,976**		**1,152,816**

Lifetime therm savings are shown in Table 8 by program and for the portfolio overall. This includes expected gross, realized gross, and realized net lifetime savings.

Table 8: PY2017 Savings Summary – Lifetime Therms

Program	Expected Gross Lifetime Savings (therms)	Realized Gross Lifetime Savings (therms)	Realized Net Lifetime Savings (therms)
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Space Heating	2,077,338	2,077,338	1,573,875
Total	**25,007,823**	**25,365,269**	**17,497,357**

Details on the individual program impacts are summarized below, with additional details on the analysis methods and results for some programs included as appendices where noted.

3.1 Efficient Buildings Program

3.1.1 Efficient Buildings Gross Impacts

The *ex ante* PY2017 impacts are summarized in Table 9 for the Efficient Buildings program. In total, the Efficient Buildings program accounted for 49 percent of energy impacts in NMGC's overall portfolio for PY2017.

Table 9: Efficient Buildings Savings Summary

Measure Category	# of Projects	Expected Gross Therm Savings
Custom	11	621,963
Prescriptive	82	25,268
Direct Install	296	171,453
Total	**389**	**818,683**

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

across the prescriptive, custom, and direct install categories. The sample was stratified to cover a range of different measure types so that no single measure would dominate the desk reviews. The sample was also stratified based on total energy savings within each measure group. 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 10. The resulting sample achieved a relative precision of 90/4 overall, with precision ranging from 90/12 to 90/17 for the individual measure groups. For two measure groups, a census was achieved.

Table 10: Efficient Buildings Desk Review Sample

Measure Group	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Custom	Certainty	7	88,087	616,612	77%	7
Kitchen Appliances	1	5	1,677	8,385	1%	2
Kitchen Appliances	2	14	514	7,198	1%	3
Kitchen Appliances	3	27	189	5,107	<1%	3
Other	Certainty	3	1,372	4,116	<!%	3
Water Conservation	Certainty	3	7,239	21,718	3%	3
Water Conservation	1	9	2,720	24,482	3%	2
Water Conservation	2	16	1,729	27,665	3%	4
Water Conservation	3	15	1,137	17,059	2%	3
Water Conservation	4	63	248	15,635	2%	2
Weatherstripping	Certainty	1	11,095	11,095	1%	1
Weatherstripping	1	2	8,910	17,819	2%	2
Weatherstripping	2	12	1,276	15,313	2%	3
Weatherstripping	3	50	230	11,503	1%	5
Total		**227**		**803,707***	**100%**	**43**

*Note that the total therms shown here does not match the grand total for the program shown in other impact tables. This is because the sampling was conducted at the measure level rather than at the project level, so for projects with multiple measure types, only savings from the primary measure sampled is included in this table.

As discussed in the *Evaluation Methods* chapter, gross realized impacts for the Efficient Buildings program were determined by performing engineering desk reviews on the sample of projects.

For prescriptive projects, the majority of measure savings were calculated using algorithms and assumptions contained in the New Mexico TRM. For projects where these types of measures were installed, the evaluation team reviewed project-specific inputs and project documentation to confirm that the proper TRM algorithms and associated input values were used.

Savings for prescriptive weatherstripping and commercial cooking equipment measures were calculated using algorithms and assumptions documented in workpapers prepared by the program implementer, CLEAResult, for NMGC. The evaluation team reviewed the general assumptions and methodologies contained in the workpapers for accuracy and appropriateness. For projects where these measures were installed, the evaluation team reviewed project-specific inputs and project documentation to confirm that the proper input values were used.

Custom projects in the Efficient Buildings program quantified savings using a variety of spreadsheet-based methods. For these projects, the evaluation team reviewed the submitted analyses to ensure the soundness of the calculation approaches used and use of proper inputs based on submitted supporting documentation. When applicable, approaches and assumptions used in custom analyses were compared to those contained in the TRM.

A sub-sample of projects also received an additional in-depth interview from an engineer. Custom projects and projects with high levels of savings were identified as candidates for interviews. Reviewing engineers contacted selected participants by phone and email to confirm installation of incentivized equipment and verify operational parameters integral to the calculation of estimated savings. A total of three interviews were performed. No major issues were identified during the interviews, and all equipment was confirmed to be installed and operating correctly. The interview findings that impacted savings estimates are listed below:

- During one interview for a school project, the participant contact confirmed that the project's steam boilers were operating at an average efficiency slightly higher than what had been assumed in the *ex ante* analysis. The analysis was updated based on this information, resulting in a slight decrease in savings associated with the project's steam trap replacements.
- During another interview for a manufacturing project, the participant contact shared screenshots showing actual 2017 production data, which showed lower production than had been estimated in the *ex ante* analysis. However, the

participant later provided more current production data showing production that was higher than was originally anticipated. The analysis was updated with the latest actual production data, resulting in an increase in savings associated with the project's manufacturing equipment installation.

Table 11 shows the results of the desk review and how the resulting engineering adjustment factor was used to calculated realized savings. For the Efficient Buildings program overall, these adjustments resulted in an engineering adjustment factor of 1.0282.

Table 11: PY2017 Efficient Buildings Gross Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings
Efficient Buildings	389	818,683	1.0282	841,799

Engineering adjustment factors that varied significantly from 1.0 for individual projects were due to the following reasons:

- Reported savings for commercial water heaters and cooking appliances were calculated using average values instead of project-specific values. When substantiated by project documentation, the evaluation team adjusted the savings calculations to account for project-specific values. The values adjusted are as follows:
    - Water Heaters: The evaluation team used TRM savings values corresponding to specific building types, rather than the average savings values for all commercial building types as were used in the *ex ante* analyses. This resulted in verified savings lower than those reported.
    - Cooking Appliances: The evaluation team used project-specific operating hours when possible, rather than the general operating hours documented in the CLEAResult workpapers. Unit-specific performance values (such as idle energy rate) as shown by product specification sheets/ENERGY STAR listings were used in the savings algorithms, rather than ENERGY STAR minimum values. This resulted in verified savings both lower and higher than those reported.
- The weatherstripping measure savings listed on the incentive application differ from those contained in the associated workpaper. Additionally, the reported savings for this measure differ from those calculated using either the application or workpaper values. The evaluation team deferred to the savings as documented in

the workpaper after validating the calculations contained in the workpaper. This resulted in verified savings lower than those reported.

- The savings for one manufacturing project were calculated based on a regression model correlating gas usage with facility production, and the *ex ante* savings were based on an estimate of total production for 2017. The evaluation team conducted an in-depth engineering interview with the contact for this project, during which actual 2017 production data were obtained showing that the actual 2017 facility production was lower than what was estimated in the *ex ante* analysis. However, the site contact later provided more recent production data for FY2018, and indicated that these data were more representative of future projected operation. The FY2018 data showed production was higher than what was estimated in the *ex ante* analysis; thus, the gross verified savings are higher than the reported savings.
- The savings for a project installing boiler controls were estimated by applying a savings percentage to the project's estimated pre-retrofit boiler gas usage. The savings percentage was determined based on the results from a pilot, which involved performing IPMVP Option C analyses for similar projects installing the same measure. The savings percentage used in the *ex ante* analysis was derived from the initial phase of the pilot. At the time of the engineering desk review, an additional phase of the pilot had been completed, providing results from additional projects and refining the savings percentage estimate. The evaluation team used a savings percentage based on the most recent pilot results, which resulted in an increase in savings.

A summary of the individual desk review findings for each of the 43 projects is included in Appendix C.

3.1.2 Efficient Buildings Net Impacts

Net impacts for the Efficient Buildings program were calculated using an NTG ratio that was developed using the self-report method described in the *Evaluation Methods* chapter using participant phone survey data. For all direct install projects, an NTG ratio of 1.00 was applied.[6] The resulting NTG ratio for the Efficient Buildings program overall is 0.5298. For prescriptive projects, the NTG ratios were very high on average, but one large custom project with a lower NTG ratio brought down the average for the whole program. Excluding this large custom project from the program-level NTG calculation yields an NTG ratio of 0.9228 (this includes all other custom projects as well as prescriptive and direct install projects). The evaluation team recommends that, going forward, NMGC

[6] NMGC currently has an *ex ante* NTG ratio of 1.00 for direct install projects, and the evaluation team agrees this is appropriate, as the targeted customers are very unlikely to complete these projects on their own. This is analogous to assigning an NTG ratio of 1.00 to low income programs, which is typically done for the same reason.

continue to utilize the existing *ex ante* NTG ratios for the Efficient Buildings program, rather than the lower value of 0.5298 that applies only to the PY2017 savings.

Table 12 summarizes the PY2017 net impacts for the Efficient Buildings program using the NTG ratios described above. Net realized savings for the program overall are 445,961 therms.

Table 12: PY2017 Efficient Buildings Net Impact Summary

Program	# of Projects	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Efficient Buildings	389	841,799	0.5298	445,961

3.2 Income Qualified Program

The Income Qualified program provides energy efficiency upgrades at no cost or low cost to low-income customers. Measures include insulation, duct sealing, water heating, and space heating. The majority of savings in this program come from measures with custom savings calculations based on an energy audit of the participant's home. To evaluate the impacts of the Income Qualified program, the evaluation team conducted engineering reviews on a statistically representative sample of custom measures and a deemed savings review of the prescriptive measures offered through the program.

A stratified random sample was used to select the custom projects for review, as shown in Table 13. A total of 19 projects were reviewed, which was a sufficient sample to achieve a 90/8.5 level of relative precision.

Table 13: Income Qualified Desk Review Sample*

Program	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Income Qualified	1	20	1,235	24,693	18%	4
Income Qualified	2	39	765	29,834	22%	4
Income Qualified	3	57	530	30,231	22%	4
Income Qualified	4	81	349	28,286	21%	4
Income Qualified	5	174	139	24,245	18%	3
Total		**371**		**137,289**	**100%**	**19**

*Note that this sample only includes Income Qualified projects with custom savings calculations. Savings for prescriptive projects were reviewed separately.

Savings for Income Qualified projects that received an energy audit were quantified using the Weatherization Assistant energy analysis software, developed by Oak Ridge National Laboratory for the U.S. Department of Energy. For these projects, the evaluation team compared software inputs to the available supporting project documentation, which included invoices, pre-retrofit photographs, and post-retrofit photographs.

Based on the engineering reviews, the evaluation team found that the analysis reports for one Income Qualified project showed that pre-retrofit billing data had been used to adjust the savings estimates produced by the Weatherization Assistant tool. However, the reported savings correspond to the unadjusted savings shown by the tool. The program implementer noted that the pre-retrofit billing data shows low energy consumption since this customer was heating their home to 60°F due to cost concerns, and that the analysis assumes the home is heated to a more typical temperature of 70°F, which is made possible since the weatherization measures and new furnace reduce heating costs. This represents a "snapback" effect, as the customer is increasing the heating output of the furnace due to the lower operating costs that result from the increased efficiency of the furnace. To account for this snapback effect, the evaluation team adjusted the savings to assume a home heated to 68°F, as this is in line with ASHRAE residential comfort standards for the heating season. The analysis thus assumes the home is heated to the minimum acceptable temperature, as opposed to a higher temperature based on customer preference. This adjustment resulted in a roughly 10 percent reduction in the savings estimated for this project. This reduction in savings was the largest contributor to the engineering adjustment factor for the Income Qualified program.

Additionally, the evaluation team found that in the analyses for multiple projects, the post-retrofit furnace efficiencies did not match the efficiencies listed on specification sheets for the furnaces shown in the project documentation. The evaluation team adjusted savings based on the documented furnace efficiencies, affecting both heating system savings and weatherization measure savings. Furnaces with lower efficiencies resulted in lower heating system savings and higher weatherization measure savings, and furnaces with higher efficiencies resulted in higher heating system savings and lower weatherization measure savings.

The resulting engineering adjustment factor for the Income Qualified program overall is 0.9770. As noted above, the most significant contributor to this factor was the adjustment made to account for the snapback in the project that included adjusted savings estimates. A summary of the individual desk review findings for each of the 19 projects is included in Appendix C.

In addition to desk reviews for custom measures, the evaluation team conducted a deemed savings review for the small portion of prescriptive measures installed through the program. In the deemed savings review, the evaluation team attempted to replicate the

per unit savings values used by NMGC based on the assumptions in the New Mexico TRM. For the prescriptive measures in the program, the evaluation team found that the deemed savings values were within a reasonable range of the TRM values and were being correctly applied to the individual measures. Therefore, no adjustments to savings were made based on the deemed savings review.

For net impacts, the NTG ratio for the Income Qualified program is stipulated at 1.00 because the program serves only low-income customers. As a result, the net realized savings are equal to the gross verified savings. The final realized gross and net savings for therms are shown in Table 14.

Table 14: Income Qualified PY2017 Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Income Qualified	467	154,291	0.9770	150,736	1.00	150,736

3.3 Multi-Family Program

The Multi-Family program is implemented by ICAST as a turnkey program for multi-family buildings, including both market rate and low-income properties. Efficiency upgrades are available for individual tenant units as well as for common areas at a reduced project cost that reflects the incentive offered by NMGC. In PY2017, projects consisted of low-income direct installs, low-income deep retrofits, and market rate direct installs.

For the Multi-Family program, the gross impact analysis consisted of an engineering review of a statistically representative sample of projects. A stratified random sample was used to select the projects for review, as shown in Table 15. A total of 18 projects were reviewed, which was a sufficient sample to achieve a 90/8 level of relative precision.

Table 15: Multi-Family Desk Review Sample

Measure Group	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Deep Retrofit	Certainty	1	22,099	22,099	14%	1
Deep Retrofit	1	4	5,922	23,686	15%	3
Deep Retrofit	2	6	4,275	25,652	16%	2
Deep Retrofit	3	14	1,523	21,319	13%	2
Direct Install	Certainty	1	21,246	21,246	13%	1
Direct Install	1	2	11,094	22,187	14%	2
Direct Install	2	10	2,521	25,214	16%	7
Total		**38**		**161,402**	**100%**	**18**

Savings for measures in the Multi-Family program were quantified using algorithms and assumptions contained in the program's Technical Resource Library (TRL). Most of the algorithms in the TRL are taken from the New Mexico TRM, and the others are taken from the Texas TRM. Additionally, the TRL includes notes that algorithm inputs may be adjusted to account for existing baseline conditions that differ from those assumed in the TRM. For these projects, the evaluation team reviewed the algorithms and inputs to ensure that they were properly applied and that any adjustments made were appropriate.

Based on this review, the evaluation team found that one Multi-Family project claimed savings for adding twelve inches of blown fiberglass roof insulation to achieve an insulation level of R-49. However, the Multi-Family TRL and New Mexico TRM only list savings for achieving R-30 insulation. Therefore, the evaluation team estimated savings for this insulation measure by creating a custom analysis based on the TRM algorithms and assumptions as appropriate. In this custom analysis, the evaluation team assumed a baseline condition of R-19, as blown fiberglass insulation has an R-value of approximately R-2.5 per inch of thickness. This analysis yielded a savings estimate for this insulation measure lower than that reported by the program.

The resulting engineering adjustment factor for the Multi-Family program is 0.9273. A summary of the individual desk review findings for each of the 18 projects is included in Appendix C.

For net impacts, the NTG ratio for low-income properties is stipulated at 1.00. For market rate direct installs, the evaluation team applied an NTG ratio of 1.00 as well, due to the

direct install design of this portion of the program.[7] Consequently, the overall NTG ratio used to calculate net savings for PY2017 is 1.00 for the Multi-Family program.

The final realized gross and net savings for therms are shown in Table 16.

Table 16: Multi-Family PY2017 Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Multi-Family	2,113	161,403	0.9273	149,665	1.00	149,665

3.4 ThermSmart New Homes Program

The ThermSmart New Homes program is a new offering for NMGC in PY2017. Incentives are paid to home builders that take a whole home approach to efficiency upgrades. The homes must be verified by an accredited HERS rater, and incentives are provided based on the reduction in therms compared to a baseline home.

For the ThermSmart New Homes program, the gross impact analysis consisted of an engineering review of a statistically representative sample of projects. A stratified random sample was used to select the projects for review, as shown in Table 17. A total of 12 projects were reviewed, which was a sufficient sample to achieve a 90/5 level of relative precision.

Table 17: ThermSmart New Homes Desk Review Sample

Measure Group	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Performance	1	91	599	54,501	25%	3
Performance	2	196	409	80,136	37%	3
Performance	3	114	323	36,838	17%	3
Performance	4	166	257	42,691	20%	3
Total		**567**		**214,166**	**100%**	**12**

[7] NMGC originally had an *ex ante* NTG ratio of 0.85 for market rate direct install projects. However, the evaluation team believes that assigning an NTG ratio of 1.00 is appropriate, as the targeted customers are very unlikely to complete these projects on their own. This is analogous to assigning an NTG ratio of 1.00 to low income programs, which is typically done for the same reason.

Savings for performance homes in the ThermSmart New Homes program are quantified using REM/Rate energy modeling software. For these projects, the evaluation team compared the baseline reference home parameters to the 2009 International Energy Conservation Code, compared the proposed home parameters to the submitted project documentation, and executed simulations to independently produce model results.

For some performance homes in the SmartTherm New Homes program, the evaluation team executed the submitted REM/Rate models without any modifications, which yielded savings higher than those reported. It is not clear why the savings differed, and since no explanation was provided and no changes were made, the evaluation team deferred to the results from its execution of the models. The resulting engineering adjustment factor for the ThermSmart New Homes program is 1.0388. A summary of the individual desk review findings for each of the 12 projects is included in Appendix C.

Interviews with ThermSmart New Homes builders were not conducted as part of the PY2017 evaluation, and so self-report information on free ridership was not collected for the net impacts analysis.[8] Instead, the *ex ante* NTG ratio of 0.80 was applied for this program to determine the PY2017 net savings. The final realized gross and net impacts are shown below in Table 18 for the ThermSmart New Homes program.

Table 18: ThermSmart New Homes PY2017 Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
ThermSmart New Homes	566	214,166	1.0388	222,478	0.80	177,982

[8] Interviews with ThermSmart New Homes builders will be conducted as part of the PY2018 evaluation activities and coordinated with the New Homes programs offered by the electric utilities.

4 Cost Effectiveness Results

The evaluation team calculated cost effectiveness using the Utility Cost Test (UCT) for each individual NMGC energy efficiency program, as well as the cost effectiveness of the entire portfolio of programs.[9] The evaluation team conducted these tests in a manner consistent with the California Energy Efficiency Policy Manual.[10]

Cost effectiveness tests compare relative benefits and costs from different perspectives. The specific cost effectiveness test used in this evaluation, the UCT, compares the benefits and costs to the utility or program administrator implementing the program. The UCT explicitly accounts for the benefits and costs shown in Table 19.

Table 19: Utility Cost Test Benefits and Costs

Benefits	Costs
• Utility avoided energy-related costs • Utility avoided capacity-related costs, including generation, transmission, and distribution	• Program overhead/administrative costs • Utility incentive costs • Utility installation costs

Using net realized savings from this evaluation and cost information provided by NMGC, the evaluation team calculated the ratio of benefits to costs for each of NMGC's programs and for the portfolio overall. The results of the UCT are shown below in Table 20. All programs had a UCT of greater than 1.00, and the portfolio overall was found to have a UCT ratio of 1.73.

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

[10] http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/EEPolicyManualV5forPDF.pdf

Table 20: PY2017 Cost Effectiveness

Program	Utility Cost Test (UCT)
Efficient Buildings	2.59
Income Qualified	1.05
Multi-Family	1.49
ThermSmart New Homes	2.23
Water Heating	1.43
Space Heating	1.31
Overall Portfolio	**1.73**

5 Process Evaluation Results

This chapter summarizes key methods and findings from the PY2017 process evaluation of the NMGC Efficient Buildings and Multi-Family programs. These findings, along with findings from the impact evaluation, informed the conclusions and recommendations presented in the following chapter.

5.1 Efficient Buildings Participant Surveys

As part of the evaluation, the evaluation team conducted phone surveys with representatives from 50 participating companies that received rebates through the NMGC Efficient Buildings program. These surveys were completed in April 2018 and ranged from 15 to 20 minutes in length.

The participant survey was designed to cover the following topics:

- Verifying the installation of measures included in the program tracking database;
- Collecting information on participants' satisfaction with the program experience;
- Survey responses for use in the free ridership calculations;
- Baseline data on energy use and/or equipment holdings;
- Participant drivers and barriers; and
- Additional process evaluation topics.

NMGC provided program data on the Efficient Buildings participant projects, which allowed us to select a sample for surveys. The evaluation team randomly selected and recruited program participants from the population of Efficient Buildings participants that had valid contact information.

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

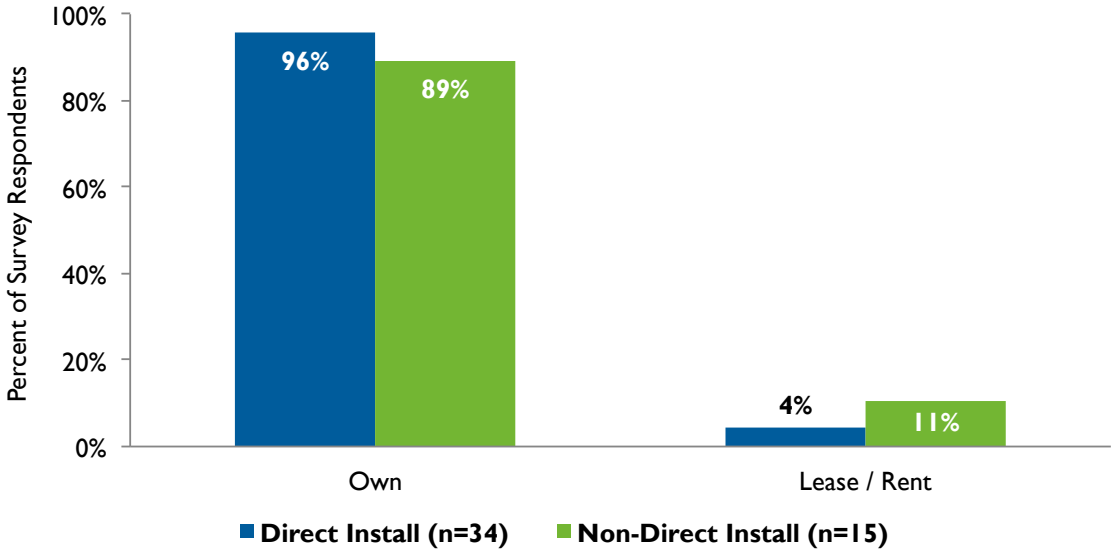
Throughout the analysis described here, the evaluation team presents the survey results as weighted percentages based on the proportion of savings represented by survey respondents relative to the total savings of all program participants.

5.1.1 Company Demographics

The evaluation team asked survey respondents whether their company owns or leases the building where the project was completed. Figure 2 shows that 96 percent of participants with direct install projects own their building, which is somewhat unexpected as direct install programs are often targeted toward customers that rent their spaces. Eighty-nine percent of non-direct install participants also reported they own their building where the

measures were installed, which is more consistent with what the evaluation team would expect of non-direct install participants.

Figure 2: Direct Install and Non-Direct Install Participant Own or Rent



The following two figures summarize the survey respondents' building size and number of employees by whether they had direct install or non-direct install projects. Consistent with program design, Figure 3 and Figure 4 both show that the majority of larger customers get rebates through the non-direct install component of the program, with 83 percent occupying buildings of 50,000 square feet or more. Additionally, 76 percent of non-direct install participants reported having more than 500 full-time employees and represent multiple sectors including construction, healthcare, and government. Comparatively, direct install projects were more commonly completed by mid- to small-sized customers, with 93 percent of direct install participants having fewer than 500 full-time employees and representing multiple sectors including government, hospitality, non-profit, and senior housing. In addition, the majority of direct install participant firms also occupied buildings of 50,000 square feet or more; however, 27 percent occupied buildings of less than 50,000 square feet.

Figure 3: Direct Install and Non-Direct Install Participant Building Size

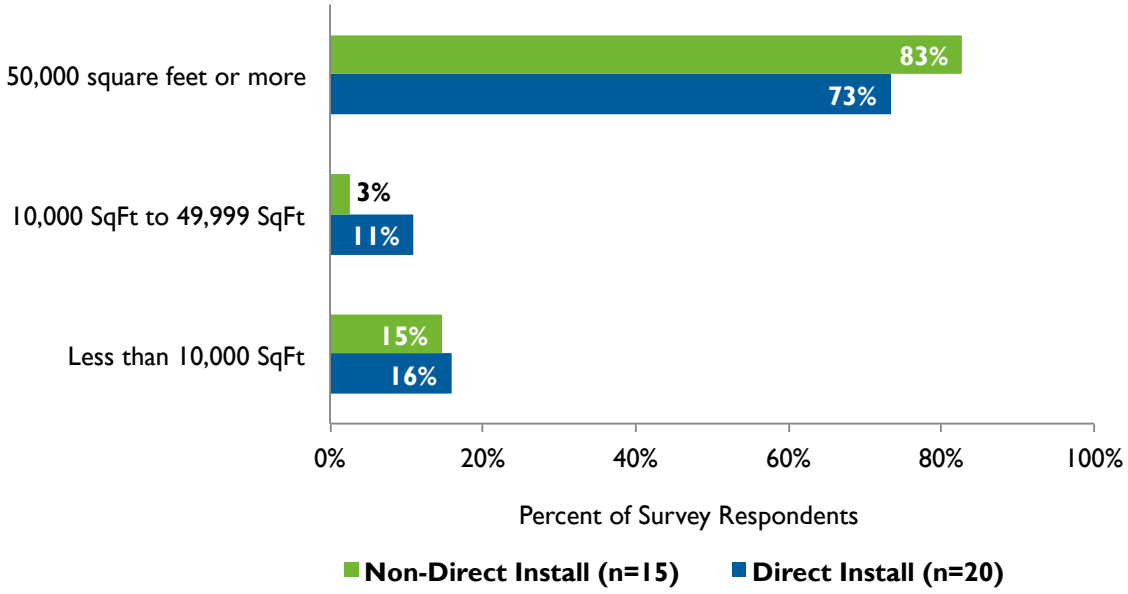
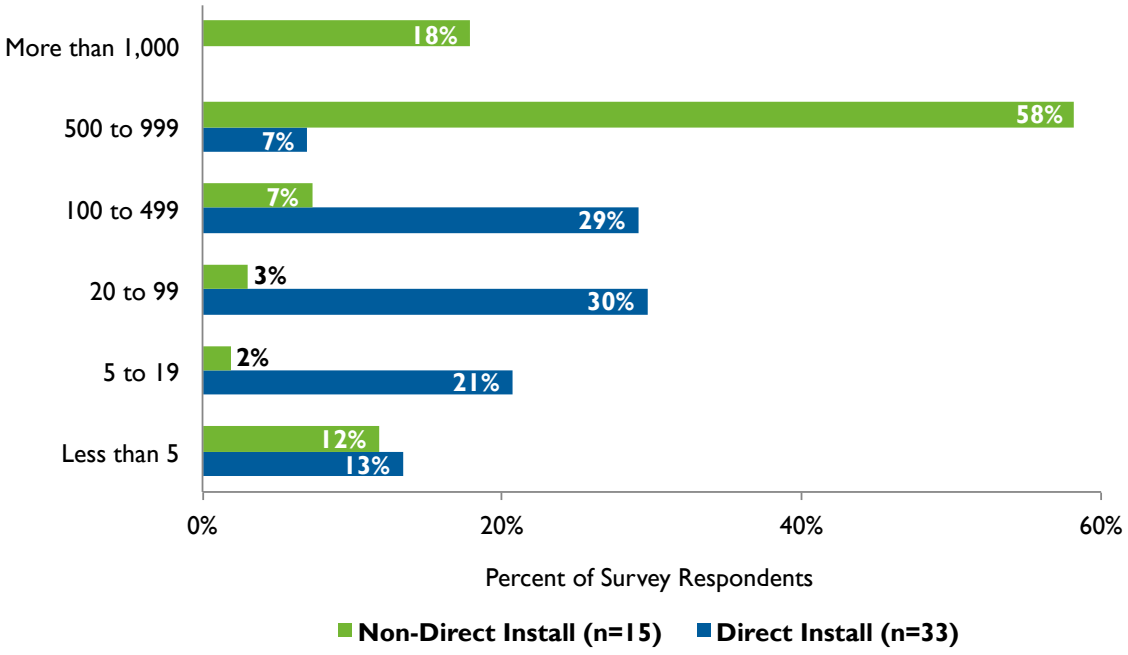


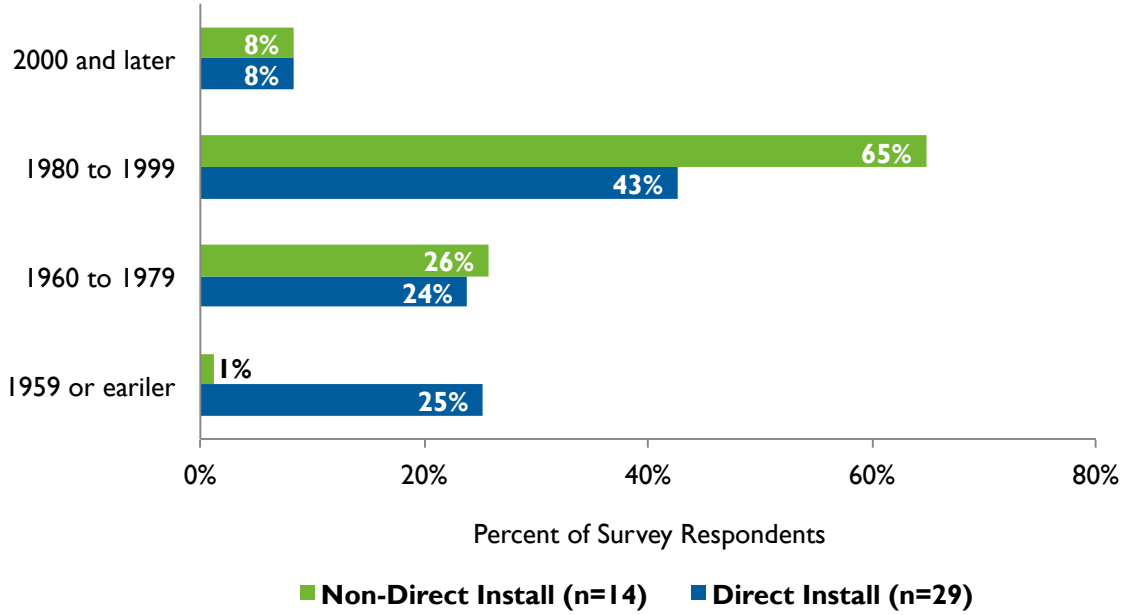
Figure 4: Direct Install and Non-Direct Install Participant Number of Employees



Additionally, Figure 5 shows that the majority of both direct install and non-direct install participants' buildings were built in 1999 or before. Direct install participants generally occupy older buildings on average, with 49 percent reporting that their buildings were built sometime before 1979, compared to 27 percent of non-direct install participants'

buildings. This suggests that the Efficient Buildings program is doing a good job at targeting older buildings where the potential for energy savings is the greatest.

Figure 5: Direct Install and Non-Direct Install Participant Building Age



5.1.2 Sources of Awareness

Efficient Buildings program participants became aware of the program rebates and assistance through a variety of channels including NMGC marketing and outreach, previous participation in an NMGC rebate program, word of mouth, and contractors and/or distributors. As shown in Figure 6, 68 percent of participants learned about the program offerings through NMGC marketing and outreach. Another 21 percent of participants learned about the program offerings through previous participation in NMGC rebate programs. Ninety-nine percent of direct install participants first learned about the program through NMGC marketing and outreach, compared to only 9 percent of non-direct install participants learning about program offerings through this channel. The majority (58%) of non-direct install participants initially became aware of the program rebates through previous participation in an NMGC rebate program.

For those who indicated that they learned about the program through multiple sources, the evaluation team asked which source was the most useful in their decision to participate. As shown in Figure 7, the vast majority of participants reported previous participation in an NMGC program as the most useful source of awareness. Additionally, NMGC marketing and outreach was also reported as being a useful source of awareness, with 8 percent of participants mentioning it. This indicates that previous participation in

NMGC rebate programs and NMGC marketing and outreach are significant drivers for the program.

Figure 6: Initial Source of Awareness (n=47)

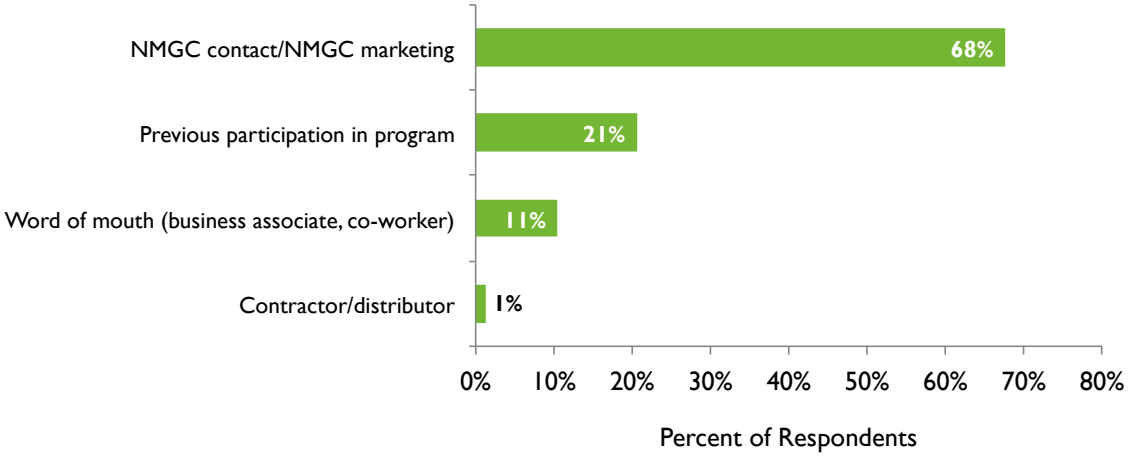
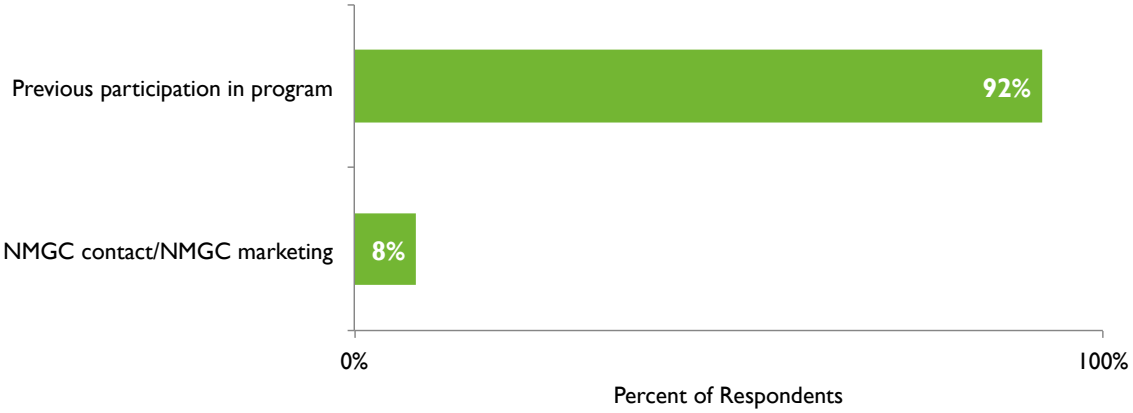


Figure 7: Most Useful Source of Awareness (n=8)

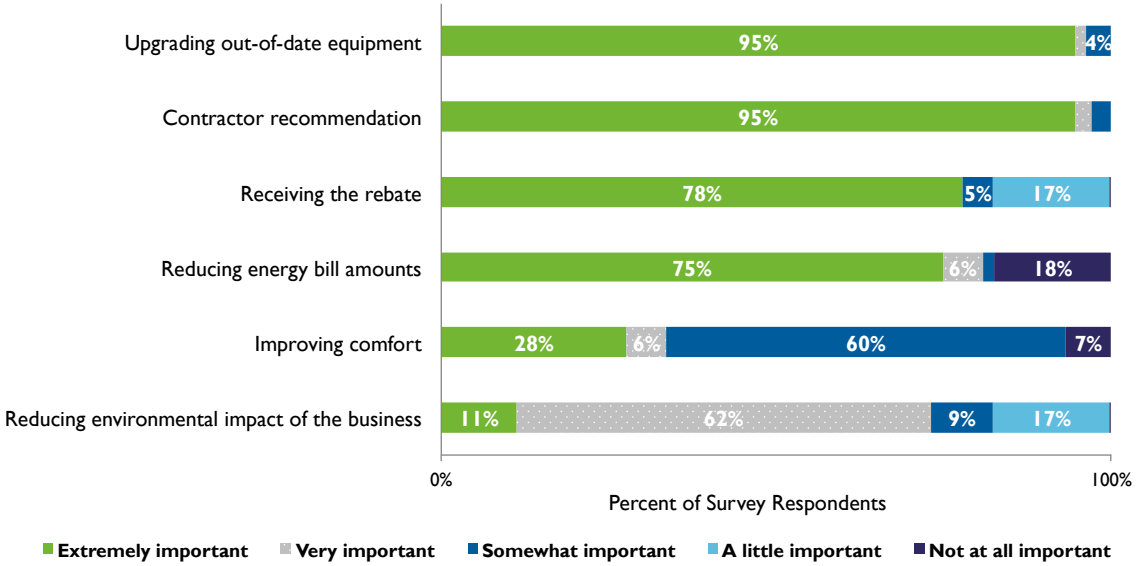


5.1.3 Motivations for Participation

Figure 8 shows the level of importance placed on a variety of factors that might be influencing customers to participate in the program.

Upgrading out-of-date equipment and the contractor recommendation were the most influential factors, with 95 percent of participants reporting that these were extremely important in their decision to participate in the program. Other factors that participants reported as being important included receiving the rebate and reducing energy bill amounts. Interestingly, improving comfort was the least important (but still important) factor in participants' decision to participate in the Efficient Buildings program, with 67 percent saying it was either somewhat or not at all important in the decision to participate.

Figure 8: Motivations for Participation (n=15)



In addition to motivations for participating, 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 and were then asked to rate their importance on a 0 to 10 point scale.[11] As shown in Figure 9, the majority of participants rated all program factors as very to extremely important (a score of 8 to 10) in their decision to determine how energy efficient their project would be. These factors include the technical assistance received from CLEAResult; the endorsement or recommendation by the contractor, vendor, distributor, or CLEAResult; previous participation in an NMGC program; the contractor who performed the work; the dollar amount of the rebate; and marketing materials from NMGC.

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

Figure 9: Importance of Program Factors (n=13)

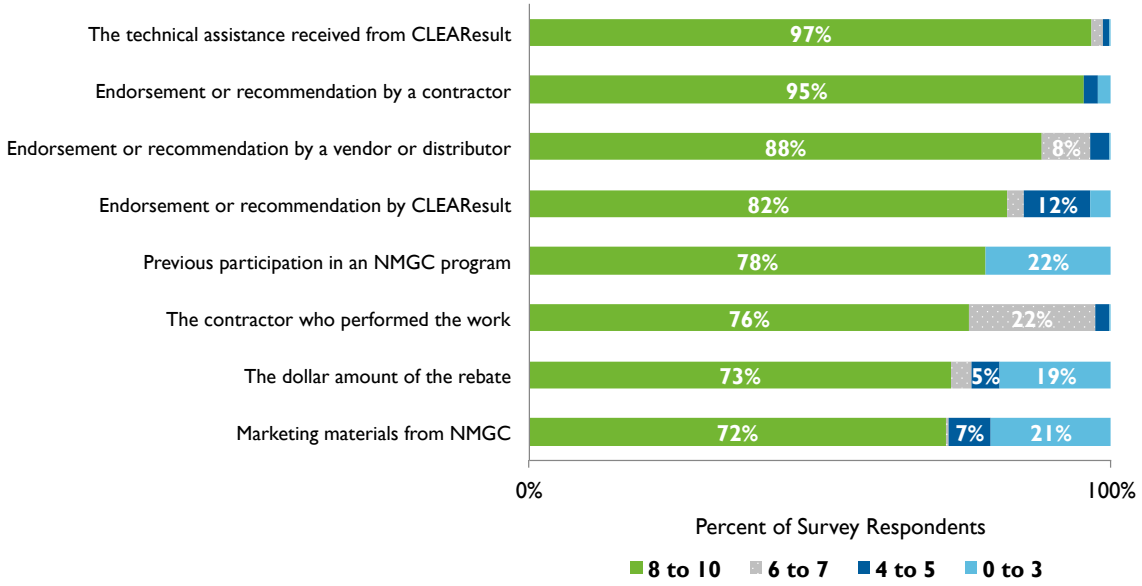
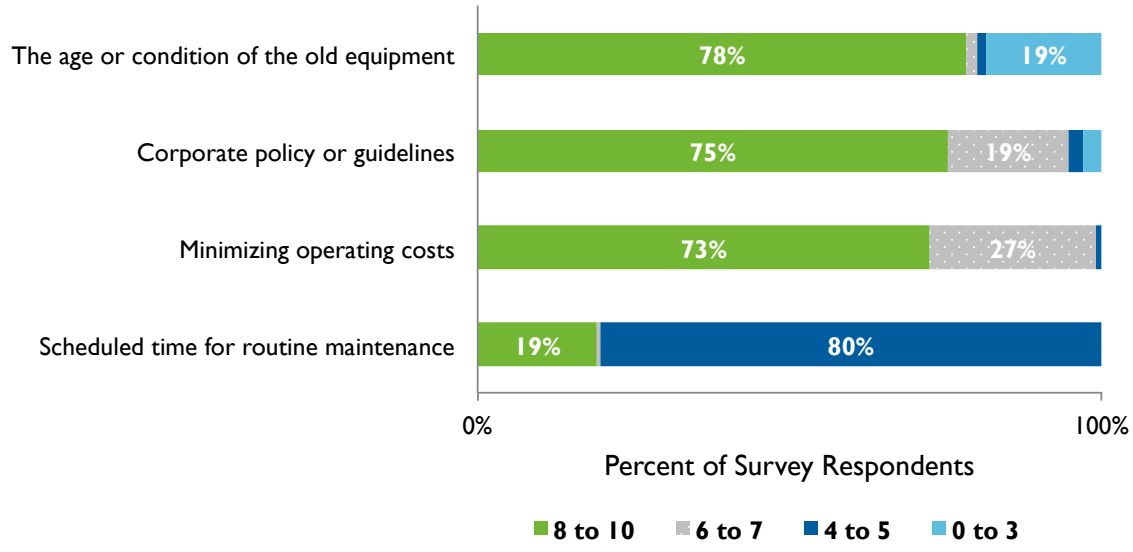


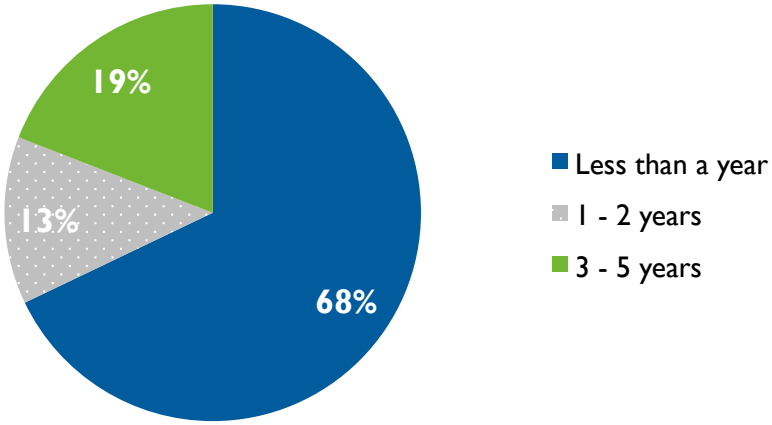
Figure 10 shows that the majority of Efficient Buildings program participants rated all but one of the non-program factors as very to extremely important (a score of 8 to 10) on the decision to determine how energy efficient their project would be. Minimizing operating costs was the most influential non-program factor in the decision regarding efficiency level of the equipment. Scheduled time for routine maintenance was reported as less influential than other non-program factors, with 81 percent of participants reporting that it was somewhat important (6 to 7) or a little important (4 to 5).

Figure 10: Importance of Non-Program Factors (n=14)



To get a sense of the condition of the existing equipment, respondents were asked approximately how much longer their equipment would have lasted if it had not been replaced. Figure 11 shows that the majority (68%) of surveyed respondents believed that their equipment would have lasted less than one year. This suggests that the program is reaching customers with equipment that would need to be replaced anyways. However, 32 percent of participants reported that their equipment would have lasted between one and five years, indicating that the program is also doing a good job of targeting customers with functioning equipment.

Figure 11: Equipment Remaining Life (n=5)



5.1.4 Participant Satisfaction

The participants evaluated their satisfaction with various components of the Efficient Buildings program on the following scale: very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, and very dissatisfied. The individual components that participants were asked to rank their satisfaction with included:

- NMGC 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 NMGC
- The overall value of the equipment for the price they paid

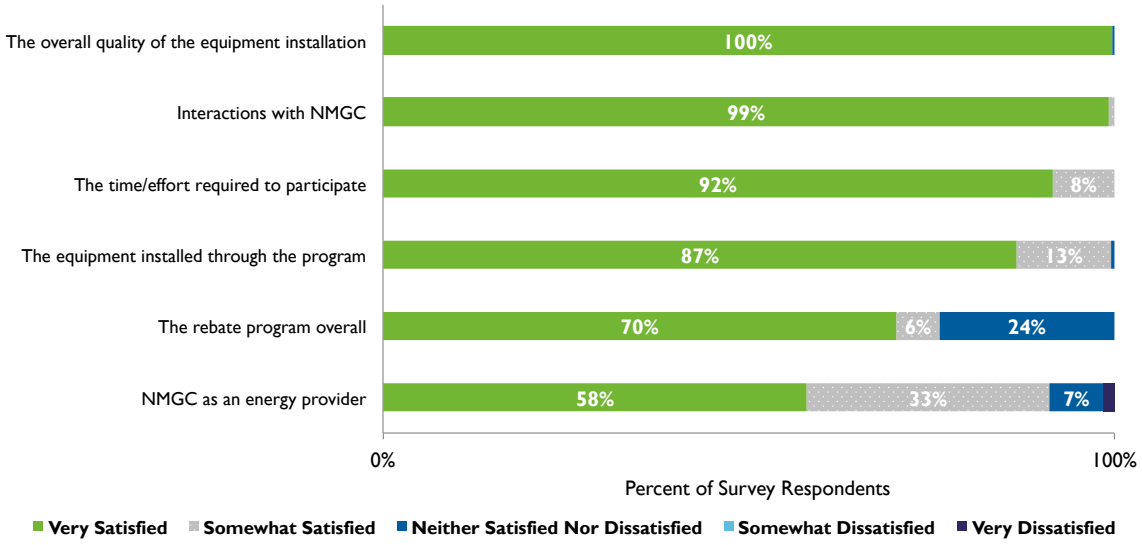
- The time and effort required to participate
- The project application process

Figure 12 and Figure 13 summarize the satisfaction levels for direct install and non-direct install rebate participants.

Overall, surveyed participants expressed high levels of satisfaction with the direct install and non-direct install program components. As shown in Figure 12, direct install participants expressed high levels of satisfaction across each individual program component, with the majority reporting being very satisfied or somewhat satisfied. A very small percentage of direct install participants reported lower satisfaction scores, primarily with NMGC as an energy provider.

Some of the justifications that direct install participants provided for their low satisfaction scores with NMGC as an energy provider were that "the energy costs are too high" and "sometimes the meter readings are not accurate."

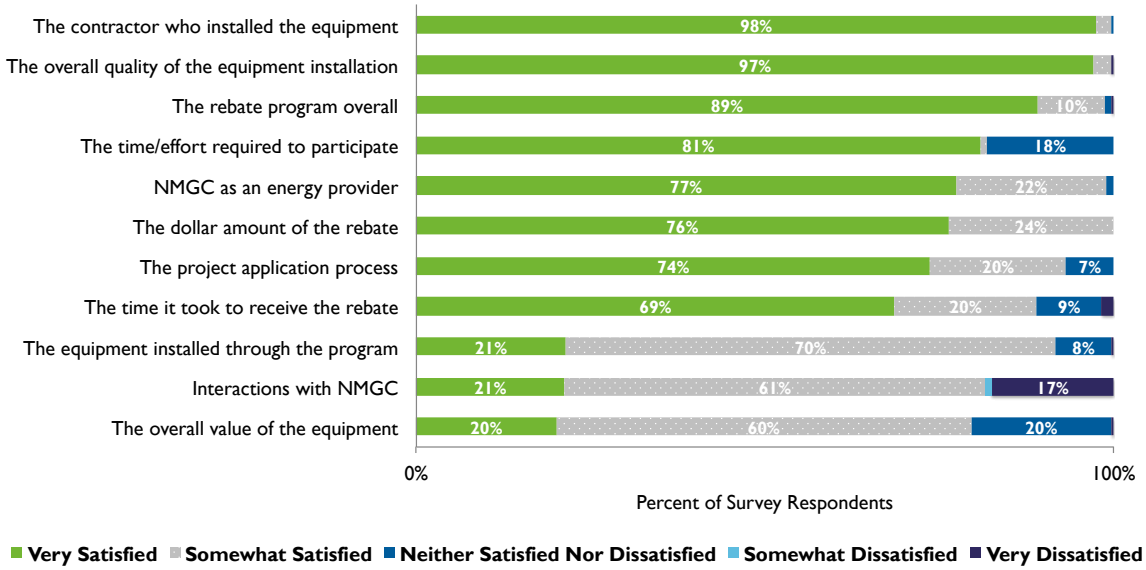
Figure 12: Direct Install Participant Program Satisfaction (n=35)



As shown in Figure 13, non-direct install participants also expressed high levels of satisfaction, with the majority of participants reporting being very satisfied with multiple program components. Ninety-eight percent reported being very satisfied with the contractor who installed the equipment, and 97 percent were very satisfied with the overall quality of the equipment installation. Contrarily, the majority of non-direct install participants reported being somewhat satisfied with the equipment installed through the program, interactions with NMGC, and the overall value of the equipment. Some reasons

provided for the lower satisfaction scores included "the equipment fell apart," "it is difficult to find information on the (NMGC) website," and "the equipment didn't last."

Figure 13: Non-Direct Install Participant Program Satisfaction (n=15)



5.2 Multi-Family Participant Interviews

The evaluation team completed five in-depth interviews with 2017 NMGC Multi-Family program participants. The interviewees represented a variety of completed projects including both market rate and low-income multifamily properties with measures such as thermostats, aerators, showerheads, domestic hot water (DHW) insulation, windows, and furnaces. Overall, the interviewees represented projects that accounted for 77 percent of 2017 program therm savings. The interviewees included the largest program participant, which completed 22 housing projects that accounted for 40 percent of the overall savings through the program .

The interviews were completed in May 2018 and focused on the following topics:

- Project context and background;
- Program satisfaction and recommendations for program improvement; and
- Role and influence of the NMGC Multi-Family program in the decision to make upgrades.

5.2.1 Project Background

Interviewees had varying levels of interaction with the NMGC Multi-Family program directly; however, all five were familiar with the recorded project and played a significant

role in their business's participation in the program. Interviewees included building owners (n=2), asset or property managers (n=2), and a capital improvement and development manager (n=1).

The types of projects varied across the participants with regards to building type, building size, and installed measures. For example, interviewees completed projects ranging from small, four-plex renovations to large, 100-plus unit apartment upgrades across low-income and senior living facilities. The vast majority of interviewees' completed projects were at multifamily properties originally built in the 1970s or early 1980s. While most of the completed projects were for multifamily buildings where the tenant pays for their own energy use, two of the interviewees said they completed projects through the Multi-Family program at low-income or senior living facilities where utilities are paid by property managers or owners (estimated to be four or five of these facilities).

As shown in Table 21, the most frequently installed measures among participants included HVAC counter weight dampers ("HVAC – Other") (n=21), bath aerators (n=16), and showerheads (n=14). Larger upgrades such as water heaters (38% of projects) and furnaces (24%) were less common, while ancillary upgrades such as window and insulation were only completed on one project. All of the program participants indicated they worked directly with ICAST as the main implementer of the program measures, while two of the participants added that their internal maintenance staff helped with the installation process.

Table 21: Frequency of Program Measures by Interviewees' Completed Projects

Program Measure	Number of Projects
HVAC – Other[12]	21
Bath Aerators	16
Showerheads	14
Kitchen Aerators	11
DHW Water Heaters	11
HVAC - Furnaces	7
DHW Tank Insulation	5
Thermostats	4
DHW Pipe Insulation	2

[12] These upgrades were described as "installing counter weight backdraft damper on furnace duct/evaporative coolers."

Windows	I
Insulation	I

5.2.2 Program Satisfaction

The evaluation team asked Multi-Family program participants to evaluate their overall level of satisfaction with the program using a 1 to 5 point scale, where 1 meant "very dissatisfied" and 5 meant "very satisfied".

Overall, all five participants expressed a high level of satisfaction with the Multi-Family program, with four out of five participants providing a score of 5 and one participant providing a score of 4. Two of the five participants specifically noted that their satisfaction would have been lower had it not been for ICAST's direct involvement with the program. As one participant noted:

> *In terms of [NMGC] getting the word out, I can't give much of a score but I am really satisfied with ICAST. Overall, I want to say 5 with the program but without ICAST, it's probably a 3...Without ICAST, it's tough to know if I ever would have known about the program.*

Despite the relatively high level of satisfaction, participants did share a few direct suggestions for improving the Multi-Family program. Most notably, three of the five participants said it would be beneficial if NMGC did more outreach to potential participants and contractors regarding the Multi-Family program to help other multifamily building owners learn more about potential savings opportunities. The participants acknowledged that ICAST does a good job of educating participants about the eligible equipment types, but added that it would be beneficial for NMGC to do more on its end to further educate building owners on potential energy efficiency upgrades.

One participant also noted that it would be beneficial for participants, or potential participants, to have access to an online tool or literature that provides savings estimates for their energy efficiency upgrades based on their past energy bills and existing equipment.

> *If we do x, y, z, we're going to get 20% [savings] on gas, 5% [savings] on electric or something like that. We did some back of the envelope calculations, but we had to wait a few months to see what we were actually saving. [NMGC] could add a disclaimer that they are not guaranteeing the estimates, but at least that gives us some ballpark estimates.*

5.2.3 Program Influence

The evaluation team asked the Multi-Family program participants a series of questions about how influential various factors—both internal to the program and independent of NMGC—were in their decision to install energy efficient equipment.

To gauge the influence of the program, the evaluation team asked interviewees how influential factors such as the NMGC rebate, ICAST's involvement in the project, any technical assistance, recommendations or information from NMGC, and their prior participation in NMGC rebate programs were in their decision to install efficiency upgrades in the multifamily facility. In evaluating the influence of non-program factors, the evaluation team asked participants how factors such as the financial benefits of the efficiency upgrade through reduced operating costs and pre-existing corporate energy efficiency targets contributed to their efficiency upgrade.

Overall, three of the five interviewees noted that the program factors played a more significant role in their decision to complete an efficiency upgrade than the non-program factors did, including two interviewees who noted explicitly that they would not have completed an energy efficiency upgrade at all without the program incentives. Conversely, the other two interviewees said that the non-program factors were slightly more influential than the program factors given the scope of their projects. These participants were most notably driven by the ongoing financial benefits of the efficiency upgrades through reduced operating costs going forward.

All five participants in both groups of interviewees—those who were more influenced by program factors and those who were more influenced by non-program factors—noted that it would have been unlikely to very unlikely that they would have completed the exact same type of efficiency project without the program. Specifically, all of the participants said they would have completed some type of upgrade but would not have been able to install all of the measures (including thermostats, showerheads, aerators, and hot water heaters) in their multifamily project. Three out of five participants added that, without the program, their projects would have been completed two to five years down the road, while one said at least part of the project would have been completed on the same timeline, and one said they were unsure.

6 Conclusions and Recommendations

Based on the results from the data collection and analysis methods described in the previous chapters, the evaluation team has developed a number of conclusions and associated recommendations to improve NMGC's programs. These are organized below by evaluation component (impact evaluation, cost effectiveness, and process evaluation) and program.

6.1 Impact Evaluation

Impact evaluation activities for the PY2017 programs included engineering desk reviews for a sample of Efficient Buildings, Income Qualified, Multi-Family, and ThermSmart New Homes program projects. This included both prescriptive and custom projects completed in these programs. Net impacts for the Efficient Buildings program were estimated using self-report responses from the participant phone survey. An NTG ratio of 1.00 was applied to both the Income Qualified and Multi-Family programs, while the *ex* ante NTG ratio of 0.80 was applied to the ThermSmart New Homes program.

6.1.1 Efficient Buildings Program

For the Efficient Buildings program desk reviews, an overall engineering adjustment factor of 1.0282 was found for therm savings. For individual projects with engineering adjustment factors that varied significantly from 1, there were a few overarching reasons for those discrepancies:

- Reported savings for commercial water heaters and cooking appliances were calculated using average values instead of project-specific values (e.g., operating hours, building type). The accuracy of the savings claimed for these measures would be improved if project-specific information shown in the project documentation was used to determine project-specific input values. While average values may be used for ease of implementation, the verified savings will be calculated based on all documented site-specific values. The use of average values is acceptable when site-specific information is not known. For the projects reviewed, the use of site-specific values resulted in verified savings estimates roughly 10 percent lower than the reported savings.
    - **Recommendation 1:** Use project-specific input values for commercial water heater and cooking appliance measures when substantiated by project documentation collected by the program.
- Weatherstripping measure savings listed on the incentive application differed from those contained in the associated workpaper, and the reported savings for weatherstripping measures differed from those calculated using either the application or workpaper values.

- **Recommendation 2:** Review program materials and savings databases to ensure that savings for weatherstripping measures are being calculated consistently and accurately.

- NMGC estimated savings for installations of boiler control measures in school projects by applying a common savings percentage to each school's estimated pre-retrofit boiler gas usage. The savings percentage was derived by taking an average of the savings calculated by IPMVP Option C analyses performed for schools participating in a pilot of this measure, which included elementary schools, middle schools, and high schools. The program implementer, CLEAResult, indicated that it plans to use a single savings percentage to estimate savings for all future projects installing this measure. Determining an average value across different school types and applying this value to all school types introduces the potential for significant variance due to differing characteristics between school types, such as daily operating hours, annual operating schedule (e.g., varying summer usage), and climate zone.
    - **Recommendation 3:** Perform an Option C analysis for each school installing this measure in order to produce site-specific savings estimates. Based on discussions with the implementer, the evaluation team understands the need to balance the analysis rigor and the speed at which rebates are processed. However, note that future evaluation of this measure will be based on site-specific billing analyses, and so variations from the average savings percentage will be reflected in the verified savings values and program realization rates.

The net impacts for the Efficient Buildings program were found to be lower than usual for PY2017 due to one large custom project with a low NTG ratio that greatly affected the total weighted average for the program. This appears to be an isolated issue, and the evaluation team does not believe that the NTG ratio found for PY2017 is indicative of what the net impacts will be in future years.

- **Recommendation 4:** NMGC should continue to use the existing *ex ante* NTG ratios in place for the Efficient Buildings program for planning purposes.

6.1.2 Income Qualified Program

Desk reviews of a sample of the Income Qualified program projects yielded a slight downward adjustment in savings with an engineering adjustment factor of 0.9770. The NTG ratio for the Income Qualified program is stipulated at 1.00, and as a result, the net realized savings are equal to the gross verified savings of 150,736 therms. The following findings and recommendations resulted from the engineering desk reviews:

- The audit report for one Income Qualified project included adjusted savings values calculated by the Weatherization Assistant software, which accounted for actual pre-retrofit gas usage as shown by customer utility bills. However, the unadjusted savings estimated by the software were claimed by the program. The adjusted savings are significantly lower than the unadjusted savings The program implementer noted that this is because the pre-retrofit billing data shows low energy consumption since this customer was heating their home to 60°F, instead of 70°F which is assumed in the analysis. This represents a "snapback" effect, as the customer is increasing the heating output of the furnace due to the lower operating cost that results from the increased efficiency of the furnace. To account for this snapback effect, the evaluation team adjusted the savings to assume a home heated to 68°F, as this assumes the home is heated to a minimum acceptable comfortable temperature per ASHRAE guidelines. This adjustment resulted in a roughly 10 percent reduction in the savings estimated for this project.
    - **Recommendation 5:** Obtain utility bills from all audited Income Qualified projects in order to adjust the estimated savings based on actual home gas usage as appropriate. The evaluation team acknowledges that utility bills for some customers may not reflect proper heating to comfortable temperatures, in which case the adjusted savings calculated by the Weatherization Assistant software may not be appropriate.
    - **Recommendation 6:** In cases in which utility bills reflect a customer heating their home to a temperature below typical comfortable conditions, savings calculations should be based on a minimally comfortable temperature of 68°F.
- For multiple Income Qualified projects, the furnace efficiency shown on the Weatherization Assistant software input report did not match the efficiency of the installed furnace as shown in the project documentation. The evaluation team adjusted savings based on the actual installed furnace efficiency, affecting both heating system savings and weatherization measure savings. Furnaces with lower efficiencies resulted in lower heating system savings and higher weatherization measure savings, and furnaces with higher efficiencies resulted in higher heating system savings and lower weatherization measure savings.
    - **Recommendation 7:** Adjust Income Qualified savings analyses to reflect the actual efficiencies of furnaces installed.
- The same savings value is used for all efficient water heater installations in the Income Qualified program, and is based on the New Mexico TRM value for tankless natural gas water heaters. However, the project documents show that not all projects install tankless natural gas water heaters, and in fact show that most water heaters installed are gas storage-type water heaters. The evaluation team revised the water heater savings to reflect the TRM values corresponding to the

installed equipment as shown in the project documents, resulting in decreased savings.

- **Recommendation 8:** Claim water heater savings based on the specific water heater type installed in each project.

6.1.3 Multi-Family Program

Desk reviews of a sample of the Multi-Family program projects yielded a slight downward adjustment in savings, with an engineering adjustment factor of 0.9273. The NTG ratio for the Multi-Family program was determined to be 1.00, due to the low-income or direct install nature of the projects. As a result, the net realized savings are equal to the gross verified savings of 149,665 therms.

- Savings for measures in the Multi-Family program are generally based on the New Mexico TRM and the program's Technical Resource Library (TRL); however, the TRL notes that adjustments may be made for site-specific conditions. The savings report provided for this program does not include details regarding site-specific adjustments, and multiple projects claim savings which differ from those derived using the TRM/TRL algorithms as presented. In these cases, the evaluation team reviewed the claimed savings and potential algorithm adjustments to ensure that savings claims were reasonable.
  - **Recommendation 9:** Clearly document site-specific adjustments made to savings calculations that result in savings different than those calculated using the TRM and TRL algorithms.
- For the Multi-Family program, specific measure details were not consistently reported in the provided savings report (e.g., water heater volume for water heater wrap measures, pipe diameter for pipe insulation measures). These details are key inputs into the algorithm used to determine measure savings. In cases where sufficient detail was not provided, the evaluation team reviewed the claimed savings and potential algorithm inputs to ensure that savings claims were reasonable and within the expected range.
  - **Recommendation 10:** Consistently report all measure details necessary to calculate savings using the TRM/TRL algorithms.

6.1.4 ThermSmart New Homes Program

Desk reviews of a sample of the ThermSmart New Homes program projects yielded a slight upward adjustment in savings, with an engineering adjustment factor of 1.0388. The original *ex ante* NTG value of 0.80 for the program was applied to realized gross savings, which yielded total net savings for the program of 177,982 therms.

- The reported savings for some ThermSmart New Homes projects do not match those obtained when executing the submitted REM/Rate models, and no explanation was provided that would explain these discrepancies.
    - **Recommendation 11:** Ensure that reported savings match those obtained by the submitted energy models. If any adjustments are made between the model savings and the reported savings, clearly document these adjustments.
- For performance homes in the ThermSmart New Homes program, the evaluation team computed energy use intensities (EUIs) for baseline and as-built models and compared them to Energy Information Administration (EIA) Residential Energy Consumption Survey (RECS) data from 2009 for similar climate zones as a way to benchmark the models. For all projects, the baseline EUI was 10 to 40 percent higher than the RECS values, which may be causing energy savings claimed by the program to be overstated. The modeled electric EUI was usually within a normal range, while the gas EUI was high. It is a known issue that the REM/Rate model often over-predicts gas usage, which may be contributing to this discrepancy. While the main baseline inputs were in compliance with the energy code, there may be some assumptions that could be further defined by the program to ensure baseline model consumption is similar to real buildings. For example, the performance path of the 2009 IECC allows projects to model the heating/cooling setpoints at 72/75, even though the code requires that all projects install a programmable thermostat set to 68/78 heating/cooling setpoints.
    - **Recommendation 12:** Consider adding QA/QC checks, conducting a baseline study to better understand baseline building assumptions, or creating prototype REM/Rate models that are calibrated to actual meter data to develop an adjustment factor that can be used to adjust savings. In addition, consider providing modeling requirements/guidelines (e.g., restrictions on thermostat assumptions and setbacks in the baseline) to ensure that the baseline building models are representative of real baseline homes in the area.
- The documentation provided for performance projects in the ThermSmart New Homes program is limited, inconsistent from project to project, and does not include information which links AHRI certificates/model numbers to actual homes.
    - **Recommendation 13:** Consider adding additional program documentation requirements such as the submission of Energy Code Compliance documentation, drawings, invoices, and/or ENERGY STAR/HERS Rating Certificates so that model inputs (e.g., conditioned area, envelope assumptions, blower door test results) can be verified.
- Many of the AHRI certificates submitted for ThermSmart New Homes projects were old, dating back as far as 2014. In all instances, there was no way to confirm

that the AHRI certificate was linked to the equipment installed in each home. If equipment was purchased in 2014 (regardless of incentives) and not installed until 2017, this may impact free ridership assumptions for the program.

- **Recommendation 14:** Require that incentivized equipment be purchased after the program application is submitted and completed. Requiring projects to provide invoices indicating that equipment purchase dates are within the program year will help to minimize free ridership.

6.2 Cost Effectiveness

Cost effectiveness was calculated using the Utility Cost Test (UCT) for each individual program, as well as for the entire portfolio of NMGC programs. The evaluation team found the following during our analysis:

- NMGC does not use the Total Resource Cost (TRC) test, and instead relies solely on the UCT to determine program and portfolio cost effectiveness.
- A 20 percent benefit adder is included in the UCT calculation for low-income projects to account for utility system economic benefits.
- The UCT revealed that all programs were cost effective (i.e., had a UCT ratio of greater than 1.00), and the NMGC portfolio overall had a UCT ratio of 1.73.

Recommendation 15: If there is a desire or need to calculate cost effectiveness using the TRC test by either NMGC or the New Mexico Public Regulation Commission (NMPRC), NMGC should track measure costs for all programs so that the TRC test can be used in future program years.

6.3 Process Evaluation

The process evaluation component of the PY2017 NMGC evaluation included surveys with Efficient Buildings program participants and interviews with Multi-Family program participants. The subchapters below summarize the evaluation team's conclusions and recommendations resulting from this research.

6.3.1 Efficient Buildings Program

Efficient Buildings program participants were found to be highly satisfied with the contractor who installed their equipment and the quality of the equipment installation, among other program factors. The technical assistance received from the implementer, CLEAResult, was reported to be the most important program factor in the customer's decision to upgrade to the efficiency level that they did. In addition, marketing and outreach from NMGC and/or CLEAResult was the most common source of program awareness.

However, the age or condition of the old equipment was also a key factor in the decision to participate for many customers, and the majority of respondents indicated that their old equipment was not likely to last more than a year. This suggests the program is reaching customers with equipment that would need to be replaced soon anyway, which could mean that some of these participants may be partial free riders.

- **Recommendation 16:** Continue direct outreach to customers to spread awareness of the program and focus on customers with still-functioning equipment.

6.3.2 Multi-Family Program

Four out of the five Multi-Family participants interviewed said they were "very satisfied" with the program, which was the highest rating available. Two participants also specifically noted the important role that the implementer, ICAST, played in their decision to make upgrades. Interviewees were approximately split in whether it was a program or non-program factor that was most influential in their decision to make an efficiency upgrade. However, all five stated that they would have been unlikely or very unlikely to complete these same upgrades without the program.