EVERGREEN ECONOMICS

Evaluation of the 2018 New Mexico Gas Company Energy Efficiency Programs

Final Report

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ECOMETRIC

RESEARCH & POLLING INC

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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 2018 (PY2018).

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 PY2018, the following NMGC programs were evaluated:

- Efficient Buildings
- Income Qualified
- Multi-Family
- ThermSmart New Homes
- Water Heating
- Space Heating

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, Water Heating, and Space Heating programs.

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

The analysis methods used for the evaluated PY2018 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 PY2018, 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 and site visits for a subset of this sample. 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 PY2018 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. The Multi-Family program provides turnkey services to install efficiency measures at a reduced cost to both market rate and low-income multi-family properties. Measures include boiler and furnace upgrades, programmable thermostats, ceiling insulation, pipe insulation, water heater tank insulation, and water conservation measures. 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.

ThermSmart New Homes. The ThermSmart New Homes program offers incentives to builders that take a whole home approach to efficiency upgrades. This program 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. To determine net impacts, interviews were conducted with participating builders to assess whether the *ex ante* net-to-gross ratio is still reasonable.

Water Heating. This program offers rebates to residential customers for tankless water heaters, faucet aerators, low flow showerheads, and pipe wrap. Gross impacts were estimated by a review of deemed savings values used for prescriptive measures. 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.

Space Heating. Similar in design to the Water Heating program, except with a focus on space heating equipment, this program offers rebates to residential customers for boiler upgrades, furnace upgrades, smart thermostats, and insulation. Gross impacts were

estimated by a review of deemed savings values. 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.

Table 1 summarizes the PY2018 evaluation methods.

Table 1: Summary of PY2018 Evaluation Methods by Program

Program	Deemed Savings Review	Phone Verification	Engineering Desk Reviews	Site Visits
Efficient Buildings	◆	◆	◆	◆
Income Qualified	◆		◆	
Multi-Family	◆		◆	
ThermSmart New Homes	◆	◆	◆	
Water Heating	◆	◆		
Space Heating	◆	◆		

The results of the PY2018 impact evaluation are shown in Table 2.

Table 2: PY2018 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	178	752,199	0.9423	708,807	0.9202	652,266
Income Qualified	478	137,223	0.9957	136,638	1.0000	136,638
Multi-Family	2,272	225,931	1.2180	275,191	0.9781	269,161
ThermSmart New Homes	782	290,372	1.0021	290,968	0.8000	232,775
Water Heating	4,135	163,338	1.0000	163,338	0.6164	100,687
Space Heating	1,381	103,309	1.0000	103,309	0.6186	63,907
Total		**1,672,372**		**1,678,251**		**1,455,434**

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: PY2018 Lifetime Savings Summary – Therms

Program	Expected Gross Lifetime Savings (therms)	Realized Gross Lifetime Savings (therms)	Realized Net Lifetime Savings (therms)
Efficient Buildings	10,756,257	10,135,765	9,327,237
Income Qualified	2,409,396	2,399,127	2,399,127
Multi-Family	2,610,646	3,179,767	3,110,101
ThermSmart New Homes	7,259,300	7,274,211	5,819,369
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Space Heating	2,097,813	2,097,813	1,297,707
Total	**26,678,894**	**26,632,165**	**22,906,227**

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 2.24.

[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: PY2018 Cost Effectiveness

Program	Utility Cost Test (UCT)
Efficient Buildings	3.46
Income Qualified	1.36
Multi-Family	2.04
ThermSmart New Homes	2.83
Water Heating	1.21
Space Heating	1.21
Overall Portfolio	**2.24**

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 typically due to the following: discrepancies due to project-specific calculation inputs being documented solely in the processing database, adjustments based on site-specific information, and adjustments based on New Mexico-specific parameters. 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.

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, Water Heating, and Space Heating program participants and interviews with ThermSmart New Homes builders and commercial and residential contractors, found very high levels of satisfaction across various aspects of the programs. Customers reported that the programs were 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 2018 (PY2018).

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 (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.

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 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 PY2018 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 details on the evaluation methods and results are included in several appendices.

2 Evaluation Methods

The analysis methods used for the evaluated PY2018 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 PY2018, 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 and site visits for a subset of this sample. 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 PY2018 evaluation methods. Additional detail on each of these evaluation methods is included in the remainder of this chapter.

Table 5: Summary of PY2018 Evaluation Methods by Program

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

2.1 Phone Surveys

Participant phone surveys were fielded in spring 2019 for participants in the Efficient Buildings, Water Heating, and Space Heating programs. In-depth phone interviews (covering similar topics) were conducted with homebuilders in the ThermSmart New Homes 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.

The original goal was to complete 50 phone surveys for the Efficient Buildings program and 100 total across the Water Heating and Space Heating programs. Given the relatively small number of participants for the Efficient Buildings program, we attempted to contact

a census of participants for the survey to try to reach our goal of 50 completed surveys. Ultimately, 39 phone surveys were completed for this program, with about one-fifth completed by participants with prescriptive or custom projects and four-fifths completed by direct install participants. 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	94	50	39
Water Heating*	70	50	20
Space Heating	335	50	80
Total	**499**	**150**	**139**

*This represents participants who installed tankless water heaters.

The final survey instrument for the Efficient Buildings program is included as Appendix A, and the final survey instrument for the Water Heating and Space Heating programs is included as Appendix B.

2.2 Engineering Desk Reviews

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.
- 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 ThermSmart 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 that 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.
- 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.
- Consideration and review for interactive effects between affected systems.

In support of the engineering desk reviews, primary data were collected for select projects through on-site verification. The evaluation team visited sites to confirm the installation of efficiency measures and operational parameters. Based on participant feedback and visual inspection of equipment and controls, the evaluation team was able to adjust the energy savings calculations to more accurately capture savings. Additional detail on the site visit selection criteria and findings can be found in the *Impact Evaluation Results* section.

2.3 Net Impact Analysis

2.3.1 Self-Report Approach

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

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

- 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)?
- 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.

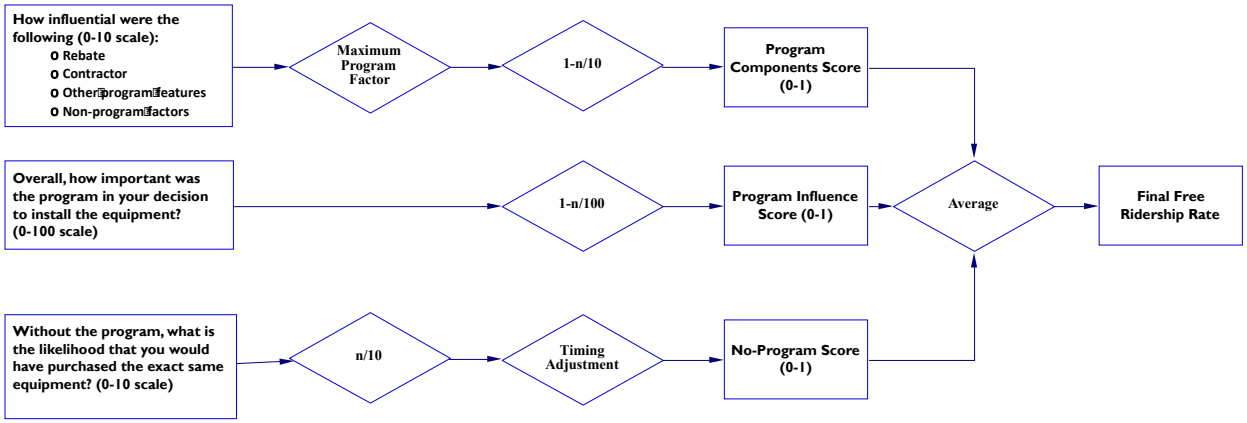
Each component was assessed using survey responses that rated the influence of various factors on the respondent's equipment choice. Since opposing biases potentially affect the main components, the *No-Program* component typically indicates higher free ridership than the *Program Component/Influence* 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

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

the program. For each of the scoring components, the question responses were scored so that they were consistent and resulted in values between 0 and 1. Once this was accomplished, the three question components were averaged to obtain the final free ridership score.

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 Gross and Net Realized Savings Calculations

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 the present value of the net energy saved, and the costs are the present value of the program's administrative costs plus incentives paid to customers. To perform the cost effectiveness analysis, the evaluation team requested the following from NMGC:

- Program costs (all expenditures associated with program delivery);
- Avoided cost of energy (costs per therm over a 20-year time horizon);
- Discount rate (percentage used to calculate the net-present value of future savings);
- Distribution loss factor (percentage used to adjust avoided cost for distribution losses);
- Proportions of programs that are targeted at low-income customers; and
- Any additional (i.e., non-low-income) assumed non-energy benefits, expressed in monetary terms or as a percentage of savings for each measure or program.

In response to the request for these data, NMGC provided its annual average avoided costs, discount rate, and program administrative costs. After discussing the base year of the avoided costs with NMGC, the evaluation team and NMGC determined the avoided costs provided were in 2017 dollars, and so an inflation rate and a discount rate provided by NMGC were applied to analyze avoided costs in terms of 2018 dollars. NMGC does not quantify the distribution loss factor separate from the avoided cost of energy.

The evaluation team obtained the program savings and effective useful life values from the final PY2018 tracking data submitted by NMGC. The final net energy savings values estimated from the PY2018 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 PY2018 impact evaluation are shown in Table 7. As noted previously, each program is required to be evaluated a minimum of once every three years. For 2018, the evaluated programs covered 100 percent of the *ex ante* therm savings.

Table 7: PY2018 Savings Summary – Therms

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
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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.

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Total	**26,678,894**	**26,632,165**	**22,906,227**

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* PY2018 impacts are summarized in Table 9 for the Efficient Buildings program. In total, the Efficient Buildings program accounted for 45 percent of energy impacts in NMGC's overall portfolio for PY2018.

Table 9: Efficient Buildings Program Savings Summary

Measure Category	# of Projects	Expected Gross Therm Savings
Custom	32	624,021
Prescriptive	51	25,265
Direct Install	95	102,913
Total	**178**	**752,199**

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 90/5.9 for the program overall. For the prescriptive water heating measure group, a census was achieved.

Table 10: Efficient Buildings Program Desk Review Sample

Measure Group	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Custom	Certainty	3	137,260	411,780	55%	3
	1	28	7,580	212,241	28%	8
Prescriptive Kitchen Appliance	1	3	1,520	4,560	1%	2
	2	14	631	8,838	1%	2
	3	29	305	8,832	1%	2
Prescriptive Water Heating	Certainty	5	698	3,035	<1%	5
Water Conservation	1	3	3,290	9,870	1%	2
	2	9	1,672	15,051	2%	2
	3	14	1,011	14,158	2%	3
	4	36	258	9,303	1%	2
Weatherstripping	Certainty	2	13,216	26,432	4%	2
	1	5	2,759	13,795	2%	2
	2	26	550	14,304	2%	3
Total		**177**	**13,135**	**752,199**	**100%**	**38**

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 and site visits for a sub-sample of projects.

For prescriptive projects in the Efficient Buildings program, 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 in the Efficient Buildings program 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 on-site verification visits from an engineer. Custom projects and certainty stratum projects were identified as candidates for on-sites. Reviewing engineers contacted selected participants by phone and email to schedule appointments to come on site and confirm installation of incentivized equipment and verify operational parameters integral to the calculation of estimated savings.

The evaluation team completed 10 site visits. At each site visited, the reviewing engineer confirmed that incentivized equipment was installed and appeared to be operating as expected, and gathered operational data relevant to the savings calculations. The evaluation team confirmed that measures were installed as expected for every project that received a site visit. The operating hours obtained through interviews with site representatives were used by the evaluation team to determine appropriate deemed savings values for prescriptive projects. The evaluation team did identify any discrepancies between expected equipment and equipment verified on site; however, the evaluation team did adjust savings for some of these projects for other reasons, as explained later in this section.

Table 11 shows the result of the desk reviews and site visits and how the resulting engineering adjustment factor was used to calculate realized savings. For the Efficient Buildings program overall, these adjustments resulted in an engineering adjustment factor of 0.9423.

Table 11: PY2018 Efficient Buildings Program Gross Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings
Efficient Buildings	178	752,199	0.9423	708,807

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

- Savings were adjusted for six projects that installed measures related to hot water: high-efficiency water heaters, low-flow faucet aerators, low-flow showerheads, and pre-rinse spray valves. NMGC claimed savings using the deemed savings value provided in the TRM for general commercial buildings. However, these general savings values are intended to be used for projects that do not fit into any of the other more specific building types listed in the TRM. As the building types for these projects were documented, the evaluator used the savings values from the TRM that most closely corresponded to the specific building types. This resulted in adjustments ranging from a 25 percent decrease in savings to a 6 percent increase in savings.
- The evaluation team adjusted the savings for the six projects in the sample that installed commercial kitchen equipment: gas fryers and gas ovens. The evaluation team used the savings documented in the "V3" CLEAResult workpapers for these measures, which do not match the savings reported by NMGC. No additional calculations were available for the evaluation team's review, so the source of these discrepancies is unknown. These adjustments ranged from a 62 percent decrease in savings to a 34 percent increase in savings.
- The evaluation team adjusted the savings for the four projects in the sample that installed weatherstripping measures. The evaluation team calculated savings by multiplying the installed linear feet listed on the application by the per-linear foot savings listed on the application. This resulted in savings that differed from the claimed savings, ranging from 44 percent lower savings to 515 percent higher savings. No additional calculations were available for the evaluation team's review, so the source of these discrepancies is unknown.
- Savings were adjusted for custom project RBT-13350030, which installed high-efficiency boilers. NMGC determined the claimed savings using a calculation based on Arkansas weather. The evaluation team adjusted the savings using a comparison of heating degree-days between Arkansas and New Mexico to create an estimate of savings specific to New Mexico's climate. Additionally, NMGC calculated the

claimed savings using a post-retrofit boiler efficiency of 96 percent; however, the evaluation team modified the calculations to use an efficiency of 98.4 percent, as shown in the AHRI certificate for the model of boiler installed. These adjustments resulted in a 33 percent increase in savings for this project.

- The evaluation team adjusted the savings for custom project RBT-1347421, which installed boiler optimizer controls at 12 sites. NMGC calculated savings for this project by first determining each site's estimated baseline heating energy consumption using a linear regression based on pre-retrofit billing data, actual weather data, and typical meteorological year (TMY3) weather data. NMGC then applied an 11.3 percent savings factor, derived from pilot installations of this measure, to the baseline values. The evaluation team determined savings for each project by creating second-order polynomial regressions for both the pre-retrofit and post-retrofit heating energy usage, using billing data, actual weather data, and TMY3 weather data. The evaluation team's calculations show an estimated average savings of 2.4 percent across all 12 sites, with overall savings 71 percent lower than the reported value.

  Six of the sites show negative verified savings (i.e., increased gas consumption). One key driver of increased gas use at these sites is increased gas usage over the summer months, observed when comparing the pre-retrofit and post-retrofit billing data. Without additional information regarding these sites (e.g., if any other operational/equipment changes occurred between the pre-retrofit and post-retrofit periods), the evaluator did not remove this gas use from the analysis of the boiler controls. Verified savings percentages range from positive 34 percent to negative 30 percent. Given the range of the savings magnitude across these sites, the evaluation team is not confident that enough information has been gathered to justify using a single deemed savings factor for this measure.
- Savings were adjusted for two custom projects by normalizing billing data to typical meteorological year (TMY3) weather data. Project RBT-1781517 installed parallel positioning on boilers, and project RBT-1781564 installed high-efficiency boilers. To calculate savings for each of these projects, NMGC determined the building's heating load using one year of gas billing data. The baseline and proposed gas consumption used for heating was then determined by applying the pre-retrofit and post-retrofit boiler system efficiencies to this heating load. As this approach is based on a single isolated year of gas usage, it is susceptible to being impacted by anomalous weather events. The evaluator normalized the billing data by comparing heating degree-days between the actual weather during the year of billing data and TMY3 typical weather to determine the heating load for a "typical" year. The evaluator made this weather adjustment to the disaggregated heating load and did not adjust the base load. This adjustment resulted in a 5 percent

increase in savings for project RBT-1781517 and an 18 percent increase in savings for project RBT-1781564.

- Savings for custom project RBT-1898314 were adjusted, which replaced failed steam traps. The evaluation team modified the steam discharge rate for three of the traps. NMGC labeled the traps as being used for "Process" but calculated savings using a discharge rate based on a "Tracer/Drip" application as input into the Armstrong steam trap calculator. The evaluator determined a new discharge rate by inputting the "Coil/Process" application into the Armstrong calculator. This adjustment resulted in a 6 percent reduction in savings.

A summary of the individual desk review findings for each of the 38 projects is included in Appendix E.

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 0.9202. This is a weighted average of the NTG ratio for custom and prescriptive projects from the participant survey and the assumed NTG ratio of 1.00 for direct install projects.

Table 12 summarizes the PY2018 net impacts for the Efficient Buildings program using the NTG ratios described above. Net realized savings for the program overall are 652,266 therms.

Table 12: PY2018 Efficient Buildings Program Net Impact Summary

Program	# of Projects	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Efficient Buildings	178	708,807	0.9202	652,266

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

[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.

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 desk 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 17 projects were reviewed, which was a sufficient sample to achieve a 90/1.87 level of relative precision.

Table 13: Income Qualified Program Desk Review Sample*

Program	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Income Qualified	1	35	100	3,517	34%	5
	2	46	63	2,883	28%	4
	3	59	42	2,497	24%	4
	4	153	10	1,572	15%	4
Total		**293**	**54**	**10,468**	**100%**	**17**

*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 made adjustments to savings for the following projects:

- For two projects in the sample, the evaluation team found that the savings for domestic hot water pipe insulation differed between the tracking data and the projects' analysis reports. The evaluation team based the verified savings on the analysis reports, resulting in a 1 percent increase in savings for both projects.
- For one project in the sample that claimed savings for the installation of a programmable thermostat, the evaluation team found that the thermostat specification sheet provided was for a non-programmable thermostat. Therefore, the evaluation team removed the programmable thermostat savings from this project, resulting in a 36 percent decrease in savings.

- For one project in the sample that claimed savings for attic insulation, NMGC claimed savings that included both heating savings and cooling savings as reported by the Weatherization Assistant software. However, since this project uses natural gas for heating and electricity for cooling, only the heating savings should be claimed by NMGC. The evaluator adjusted the savings for the attic insulation to only include heating savings, resulting in a 4 percent decrease in overall project savings.

The resulting engineering adjustment factor for the Income Qualified program overall is 0.9957. A summary of the individual desk review findings for each of the 17 projects is included in Appendix E.

In addition to desk reviews for custom measures, the evaluation team conducted a deemed savings review for the relatively small portion of prescriptive measures installed through the program. In the deemed savings review, the evaluation team attempted to verify and 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 in therms are shown in Table 14.

Table 14: Income Qualified Program PY2018 Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Income Qualified	478	137,223	0.9957	136,638	1.0000	136,638

3.3 Multi-Family Program

The Multi-Family program is implemented by International Center for Appropriate and Sustainable Technology (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 PY2018, projects consisted of low-income direct installs, market rate direct installs, and market rate deep retrofits.

For the Multi-Family program, the gross impact analysis consisted of an engineering desk 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 seven projects were reviewed, which was a sufficient sample to achieve a 90/2.77 level of relative precision.

Table 15: Multi-Family Program Desk Review Sample

Program	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Multi-Family	Certainty	2	38,167	76,334	34%	2
	1	4	20,495	81,982	36%	3
	2	8	8,452	67,616	30%	2
Total		**14**		**225,931**	**100%**	**7**

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, with others taken from sources such as the Texas TRM. The evaluation team reviewed the approaches from the New Mexico TRM to ensure that they were being applied correctly and reviewed the approaches from other sources to determine if any adjustments or alternative methods were appropriate.

Based on this review, the evaluation team made adjustments to project savings for the following reasons:

- For the five sampled projects that installed low-flow faucet aerators, the evaluation team found that NMGC multiplied the deemed aerator savings from the TRM by the total number of aerators installed. However, the TRM states that the deemed savings values are per-housing unit, not per aerator. The evaluation team adjusted the savings accordingly for five projects. The evaluation team made additional adjustments described in subsequent bullet points, with overall adjustments for these projects ranging from an 8 percent to a 3 percent decrease in savings.
- The evaluation team adjusted the savings for hot water measures not contained in the version of the New Mexico TRM that was effective during PY2018. Six of the sampled projects installed hot water pipe insulation and/or water heater tank insulation. The version of the New Mexico TRM effective during PY2018 does not contain these measures, and so NMGC referenced the Texas TRM to calculate savings for these measures. The evaluator adjusted the input parameters used by NMGC to use values specific to New Mexico instead of values derived for Texas.

The evaluator adjusted the assumed values for incoming cold water temperature, ambient air temperature, and water heater efficiency. The evaluation team made additional adjustments described in other bullet points, with overall adjustments for these projects ranging from an 8 percent decrease in savings to a 7 percent increase in savings.

- Of the six sampled projects that installed water heater tank insulation, NMGC did not initially report the tank volume for four projects. After reviewing the draft evaluation report, NMGC provided the tank volume for these projects and confirmed that tank volume would be recorded consistently moving forward.
- Four of the sampled projects installed hot water pipe insulation. The pipe insulation quantities listed by NMGC in the program tracking data appear to alternate between linear feet of insulation and number of apartments in which insulation was installed. The evaluation team calculated savings using the linear feet of insulation when this value was explicitly listed and assumed an insulation length of three feet per apartment when the quantity appeared to represent the number of apartments, based on the assumptions documented by the Multi-Family program.

In addition, the evaluation team originally could not verify the source of the savings that NMGC claimed for thermostat measures. After reviewing the draft evaluation report, NMGC clarified that the source of the *ex ante* programmable thermostat savings assumptions were Xcel Energy's 2015-2016 demand-side management plan. The evaluation team compared the *ex ante* assumptions to the programmable thermostat measure added to the New Mexico TRM in the 2018 TRM update and found that the heating energy reduction assumptions were in line with one another. Therefore, the evaluation team adjusted savings for these projects using the New Mexico TRM methodology.

The resulting engineering adjustment factor for the Multi-Family program is 1.2180. A summary of the individual desk review findings for each of the seven projects is included in Appendix E.

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] For market rate deep retrofits, the

[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.

evaluation team applied the *ex ante* value of 0.85. The overall weighted average NTG for the Multi-Family program is 0.9781 for PY2018.

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

Table 16: Multi-Family Program PY2018 Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Multi-Family	2,272	225,931	1.2180	275,191	0.9781	269,161

3.4 ThermSmart New Homes Program

The ThermSmart New Homes program was a new offering for NMGC starting 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 Home Energy Rating System (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 desk 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 14 projects were reviewed, which was a sufficient sample to achieve a 90/0.45 level of relative precision.

Table 17: ThermSmart New Homes Program Desk Review Sample

Measure Group	Stratum	Count	Average Therms	Total Therms	% of Savings	Final Sample
Performance	1	124	592	73,416	25%	4
Performance	2	166	435	72,246	25%	4
Performance	3	214	338	72,377	25%	3
Performance	4	278	260	72,333	25%	3
Total		**782**		**290,372**	**100%**	**14**

For performance projects in the ThermSmart New Homes program, the evaluation team performed the engineering desk reviews using the REM/Rate v15.7.1 software. Using the model files provided by NMGC, the evaluation team compared the proposed home

models to the User Defined Reference Home model to calculate savings. The evaluation team compared the inputs to the proposed home models to the HVAC specifications provided by NMGC and adjusted the models as necessary to achieve consistency between the models and equipment specifications.

The evaluation team checked modeled HVAC and water heating equipment against provided AHRI certificates. However, other aspects of the model (e.g., walls, windows, insulation) were not documented, and so were assumed to be consistent with the installed equipment.

The resulting engineering adjustment factor for the ThermSmart New Homes program is 1.0021. A summary of the individual desk review findings for each of the 14 projects is included in Appendix F.

Net impacts for the ThermSmart New Homes program were calculated using the *ex ante* NTG ratio. The evaluation team conducted interviews with participating homebuilders, and asked them a series of questions to determine how the program has influenced their home building practices and decisions to include energy efficient equipment and envelope measures for those homes. The responses from these interviews generally indicated that the rebates offered by NMGC are influential in the decision to build energy efficient homes, but that some builders would be making some of these upgrades anyway. We believe the *ex ante* NTG ratio of 0.80 is still a reasonable estimate of the impacts of the program on builders' decisions to incorporate efficient options into their homes.

The final realized gross and net impacts are shown below in Table 18 for the ThermSmart New Homes program.

Table 18: ThermSmart New Homes Program PY2018 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	782	290,372	1.0021	290,968	0.80	232,775

3.5 Water Heating and Space Heating Programs

3.5.1 Water Heating and Space Heating Gross Impacts

The *ex ante* 2018 impacts are summarized in Table 19 for the Water Heating and Space Heating programs. In total, the Water Heating program accounted for 10 percent of energy impacts in NMGC's overall portfolio, and the Space Heating program accounted for six

percent. Because of the similar program design and evaluation approach for these programs, we are presenting the results together in this section.

Table 19: Water Heating and Space Heating Programs Savings Summary

Program	# of Projects	Expected Gross Therm Savings
Water Heating	4,135	163,338
Space Heating	1,381	103,309
Total	**5,516**	**266,647**

The gross impact evaluation of the Water Heating and Space Heating programs consisted of a deemed savings review of per-unit savings values for each of the measures offered in the programs. We compared the per-unit values contained in the NMGC program tracking data to the New Mexico TRM to determine whether they were correct and appropriate.

For the Water Heating program, we were able to confirm the source of savings, calculations, and input assumptions for all measures. The source for the vast majority of measures was the New Mexico TRM. In two cases, the source of savings was a recommendation from the previous evaluator. No adjustments were made to the savings, so the engineering adjustment factor for the Water Heating program was 1.00.

For the Space Heating program, we were able to confirm the source of savings, calculations, and input assumptions for all measures. The source of savings for Space Heating measures was the New Mexico TRM, and no adjustments were made to the savings by the evaluation team. As a result, the engineering adjustment factor for the Space Heating program was 1.00.

Table 20 shows the summary results of the deemed savings reviews and how the resulting engineering adjustments were used to calculated realized savings.

Table 20: PY2018 Water Heating and Space Heating Gross Impact Summary

Program	# of Projects	Expected Gross Therm Savings	Engineering Adjustment Factor	Realized Gross Therm Savings
Water Heating	4,135	163,338	1.00	163,338
Space Heating	1,381	103,309	1.00	103,309
Total	**5,516**	**266,647**		**266,647**

3.5.2 Water Heating and Space Heating Net Impacts

Net impacts for the Water Heating and Space Heating programs were calculated using NTG ratios from the participant phone survey, or an assigned *ex ante* value in the case of some measures in the Water Heating program. For the Water Heating program, participants who installed tankless water heaters were surveyed; their responses were used to calculate an NTG ratio. For other measures in the Water Heating program, *ex ante* NTG ratios were applied. The overall NTG ratio for the Water Heating program is 0.6164.

For the Space Heating program, the NTG ratio was developed using the self-report method described in the *Evaluation Methods* chapter using participant phone survey data. The resulting NTG ratio for the Space Heating program is 0.6186.

Table 21 summarizes the PY2018 net impacts for the Water Heating and Space Heating programs using the NTG ratios described above. Net realized savings for the Water Heating program are 100,687 therms, and for the Space Heating program are 63,907 therms.

Table 21: PY2018 Water Heating and Space Heating Programs Net Impact Summary

Program	# of Projects	Realized Gross Therm Savings	NTG Ratio	Realized Net Therm Savings
Water Heating	4,135	163,338	0.6164	100,687
Space Heating	1,381	103,309	0.6186	63,907
Total	**5,516**	**266,647**		**164,594**

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.[8] The evaluation team conducted these tests in a manner consistent with the California Energy Efficiency Policy Manual.[9]

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 22.

Table 22: 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 23. All programs had a UCT of greater than 1.00, and the portfolio overall was found to have a UCT ratio of 2.24.

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

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

Table 23: PY2018 Cost Effectiveness

Program	Utility Cost Test (UCT)
Efficient Buildings	3.46
Income Qualified	1.36
Multi-Family	2.04
ThermSmart New Homes	2.83
Water Heating	1.21
Space Heating	1.21
Overall Portfolio	**2.24**

5 Process Evaluation Results

This chapter summarizes key methods and findings from the PY2018 process evaluation of the NMGC Efficient Buildings, Space Heating, Water Heating, and ThermSmart New Homes 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 39 participating companies that received rebates through the NMGC Efficient Buildings program. These surveys were completed in April 2019 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 program participants that had valid contact information.

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

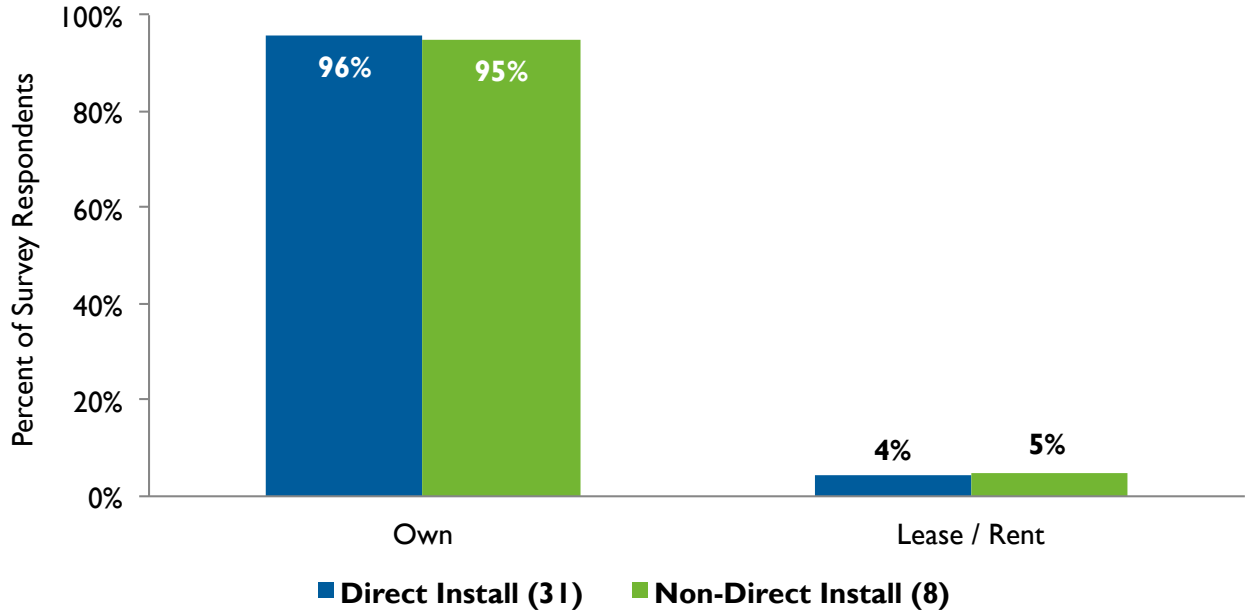
Throughout the analysis described here, the evaluation team presents the survey results as weighted percentages based on the proportion of savings represented by survey respondents relative to the total savings of all program participants.

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. Ninety-five percent of non-direct install participants also reported they own the 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 85 percent of non-direct install participants occupying buildings of 50,000 square feet or more. Additionally, 96 percent of non-direct install participants reported having more than 100 full-time employees and represent multiple sectors including schools, healthcare, and hospitality. Comparatively, direct install projects were more commonly completed by mid- to small-sized customers, with 81 percent of direct install participants having fewer than 20 full-time employees and representing multiple sectors including religious organizations, healthcare, hospitality, and retail. In addition, the majority (73%) of direct install participant firms also occupied buildings between 10,000 to 49,999 square feet; another 12 percent occupied buildings of less than 10,000 square feet.

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

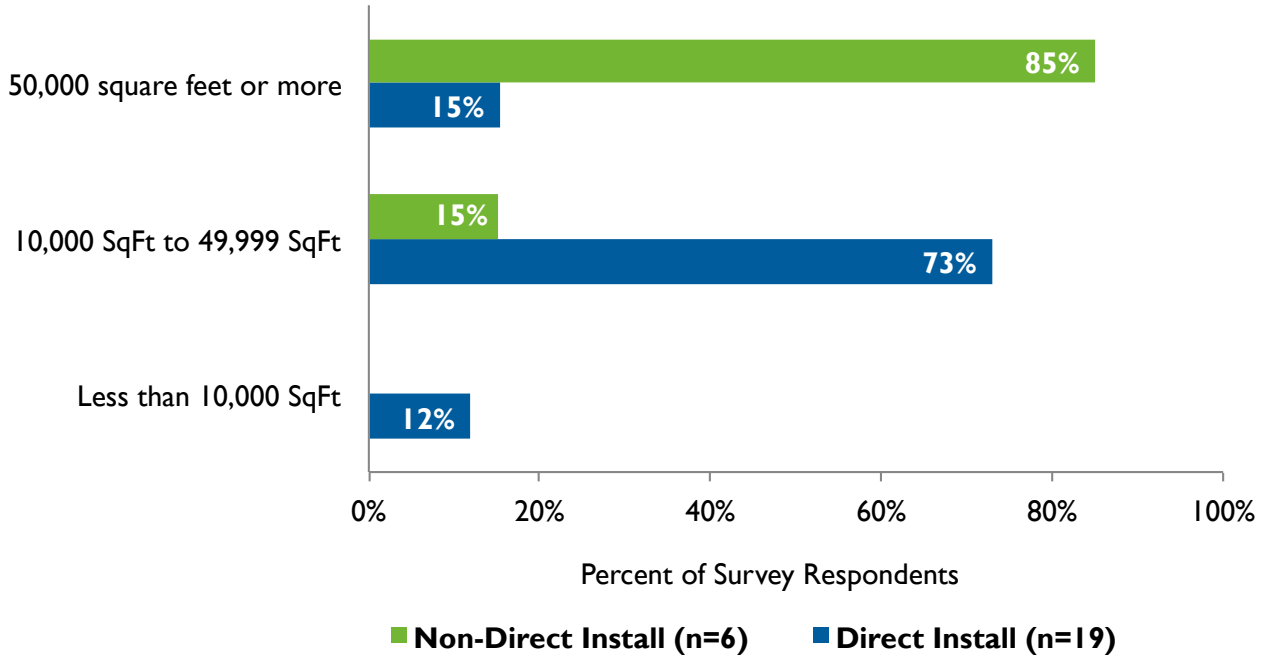
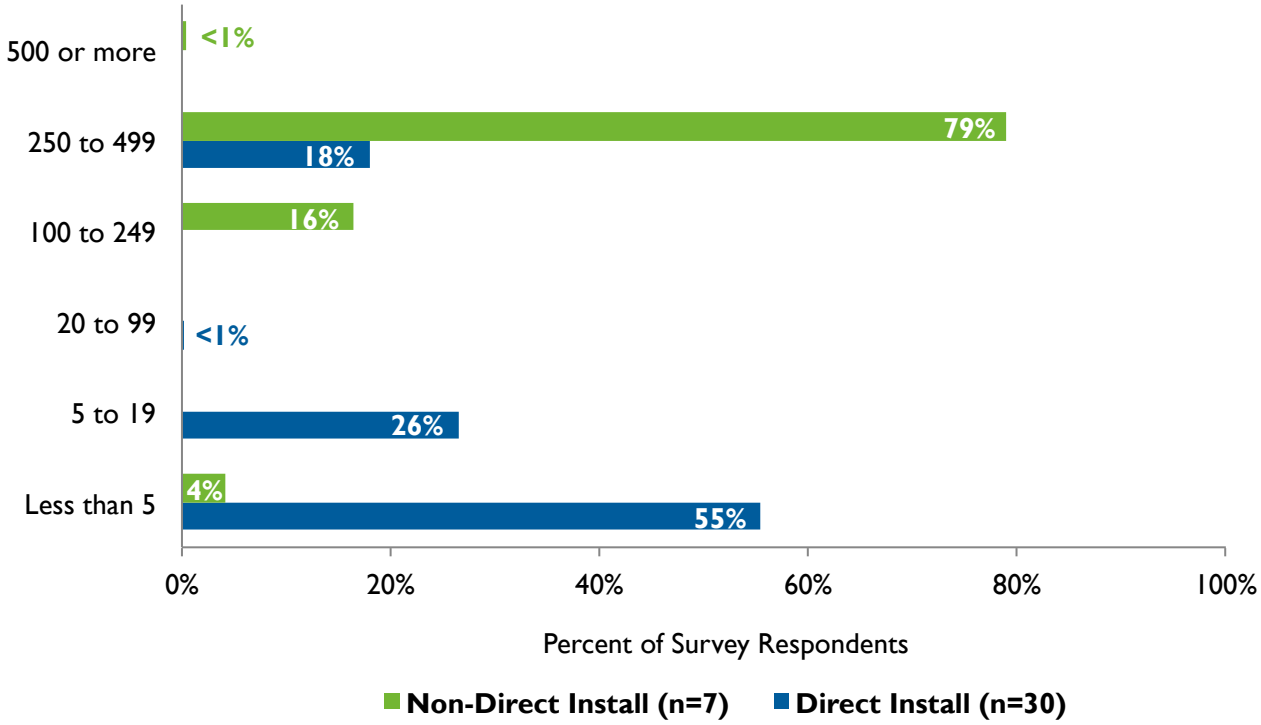
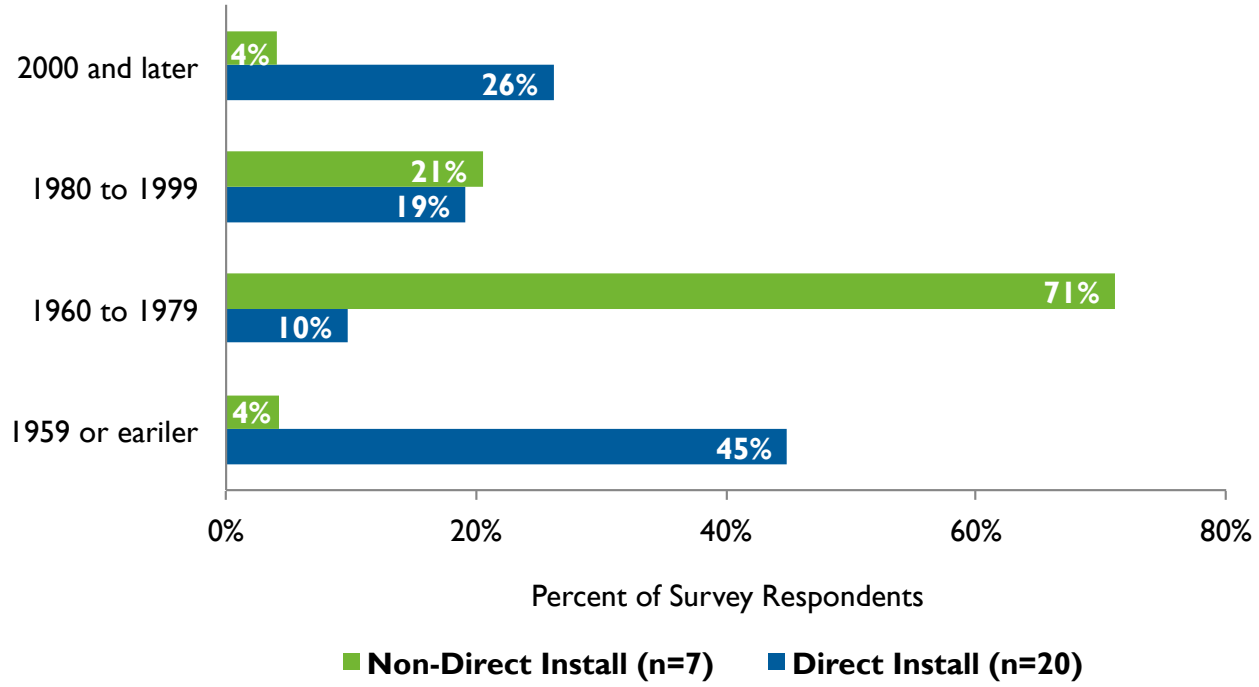


Figure 4: Direct Install and Non-Direct Install Participant Number of Employees



Additionally, Figure 5 shows that the majority of both direct install and non-direct install participants' buildings were built in 1999 or before. Non-direct install participants generally occupy older buildings on average, with 75 percent reporting that their buildings were built sometime before 1979, compared to 55 percent of 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

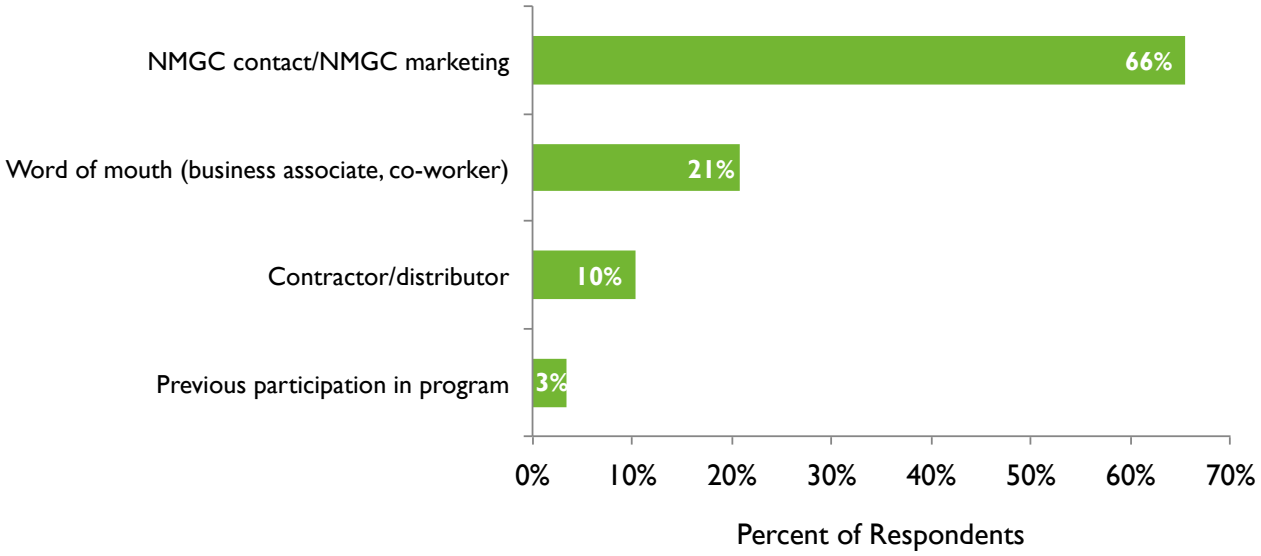


5.1.2 Sources of Awareness

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, 66 percent of participants learned about the program offerings through NMGC marketing and outreach, and another 21 percent of participants learned about the program offerings through word of mouth.

For the three respondents 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. Two of these three respondents reported that NMGC marketing and outreach was the most useful source of awareness. This indicates that previous NMGC marketing and outreach is a significant driver for the program.

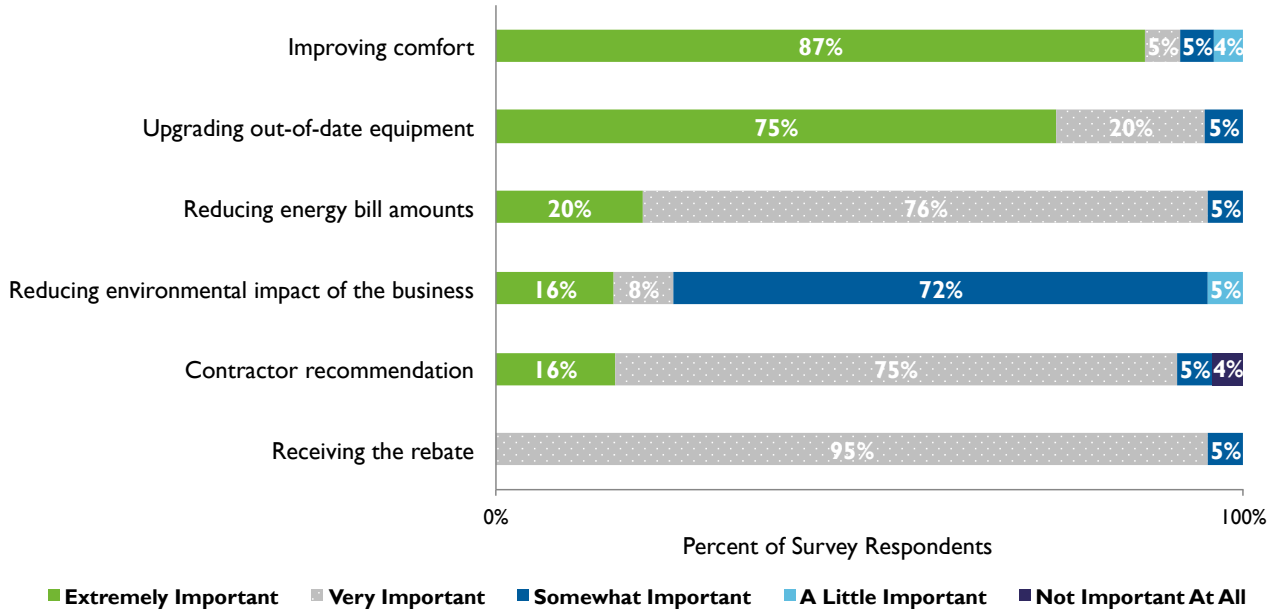
Figure 6: Initial Source of Awareness (n=36)



5.1.3 Motivations for Participation

Figure 7 shows the level of importance placed on a variety of factors that might be influencing non-direct install customers to participate in the program. Improving comfort and upgrading out-of-date equipment were the most influential factors, with 87 and 75 percent of participants reporting that these were extremely important in their decision to participate in the program, respectively. Other factors that participants reported as being important included contractor recommendations and reducing energy bill amounts. Interestingly, reducing environmental impacts had the highest proportion of low ratings of all the factors in participants' decision to participate in the Efficient Buildings program, with 77 percent saying it was only somewhat or a little important in the decision to participate.

Figure 7: Motivations for Participation (n=8)



In addition to motivations for participating, non-direct install 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.[10] As shown in Figure 8, the majority of participants rated all program factors as 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 Efficient Buildings program implementer); 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.

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

Figure 8: Importance of Program Factors (n=8)

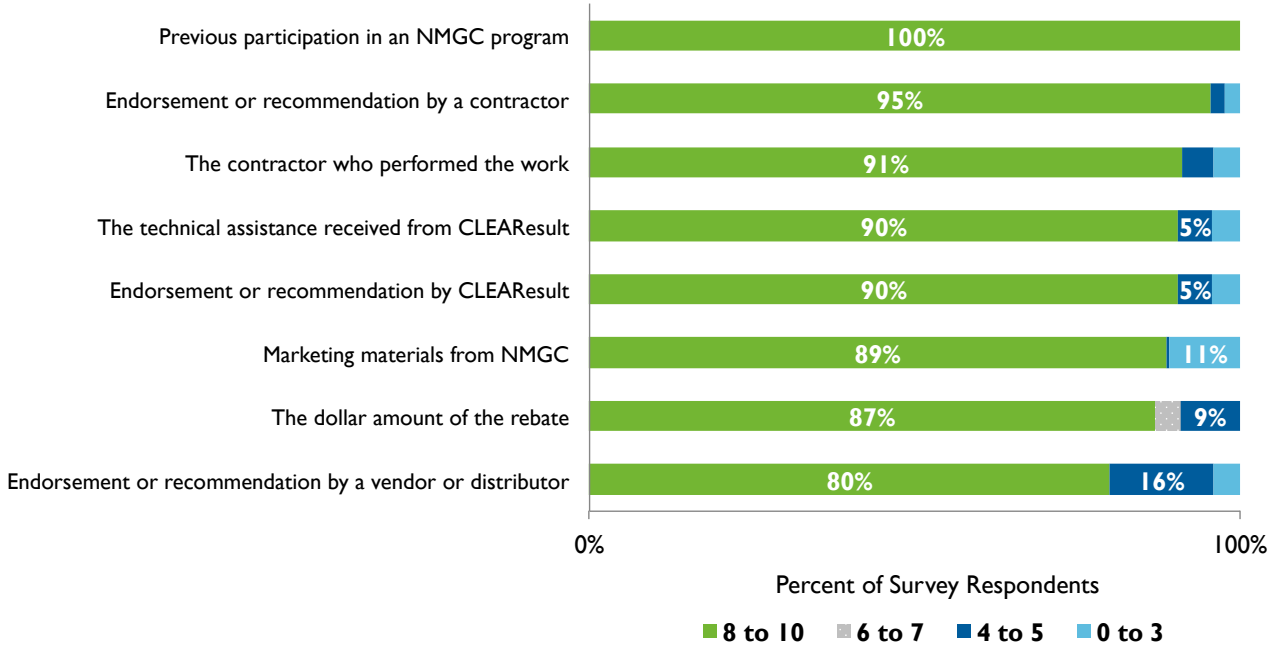
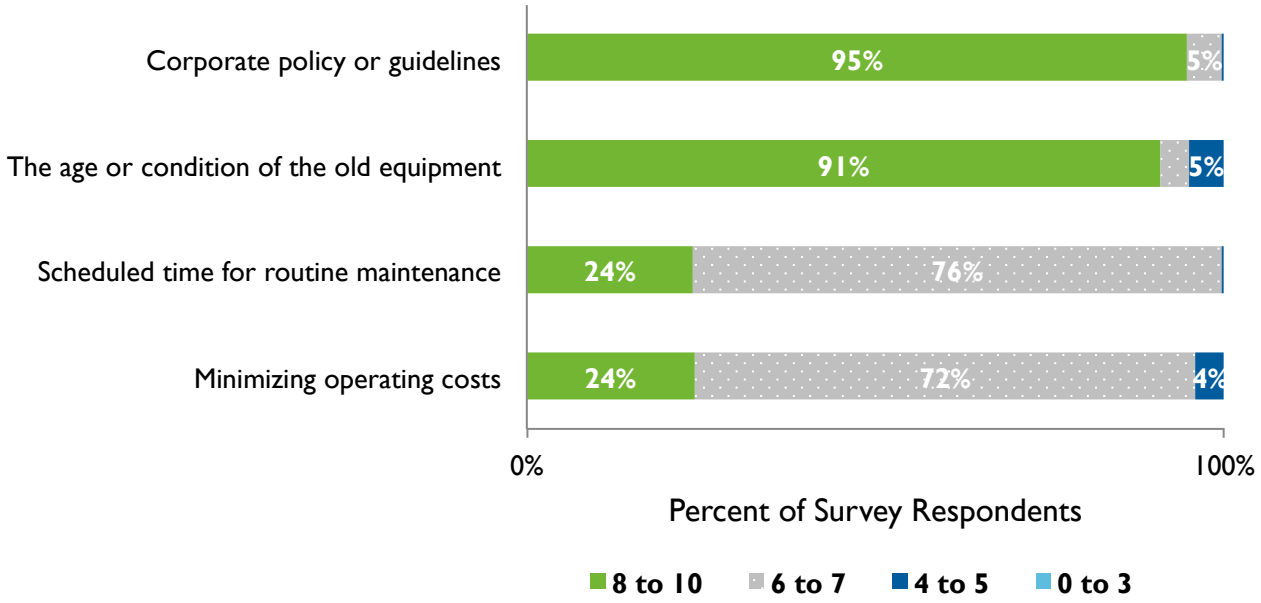


Figure 9 shows that the majority of Efficient Buildings program participants rated all of the non-program factors as very to extremely important (a score of 6 to 10) on the decision to determine how energy efficient their project would be. Corporate policy or guidelines, followed by the age or condition of the old equipment, were the most influential non-program factors in the decision regarding efficiency level of the equipment. Minimizing operating costs and scheduling time for routine maintenance were both reported as less influential than other non-program factors, with 76 percent of participants reporting that these were very important (6 to 7) or a little important (4 to 5).

Figure 9: Importance of Non-Program Factors (n=8)



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. Only three non-direct install participants were able to answer this question, and two of the three believed that their equipment would have lasted another one to two years. This suggests that the program is reaching customers with equipment that would need to be replaced soon anyway. However, the third respondent reported that their equipment would have lasted between three and five years, indicating that the program is also doing a good job of targeting customers with functioning equipment.

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

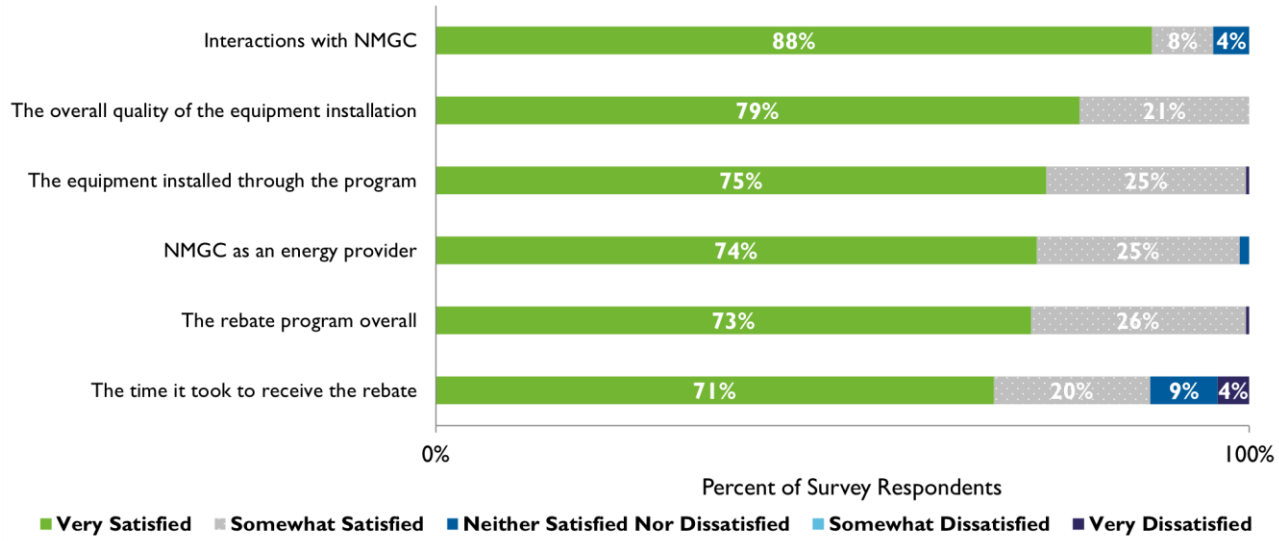
- Interactions with NMGC
- The overall value of the equipment for the price they paid
- The time and effort required to participate
- The project application process

Figure 10 and Figure 11 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 10, 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.

Some of the justifications that direct install participants provided for their low satisfaction scores were that "There was a lot of calling back and forth and it took longer than expected" and "The equipment did not provide enough water pressure."

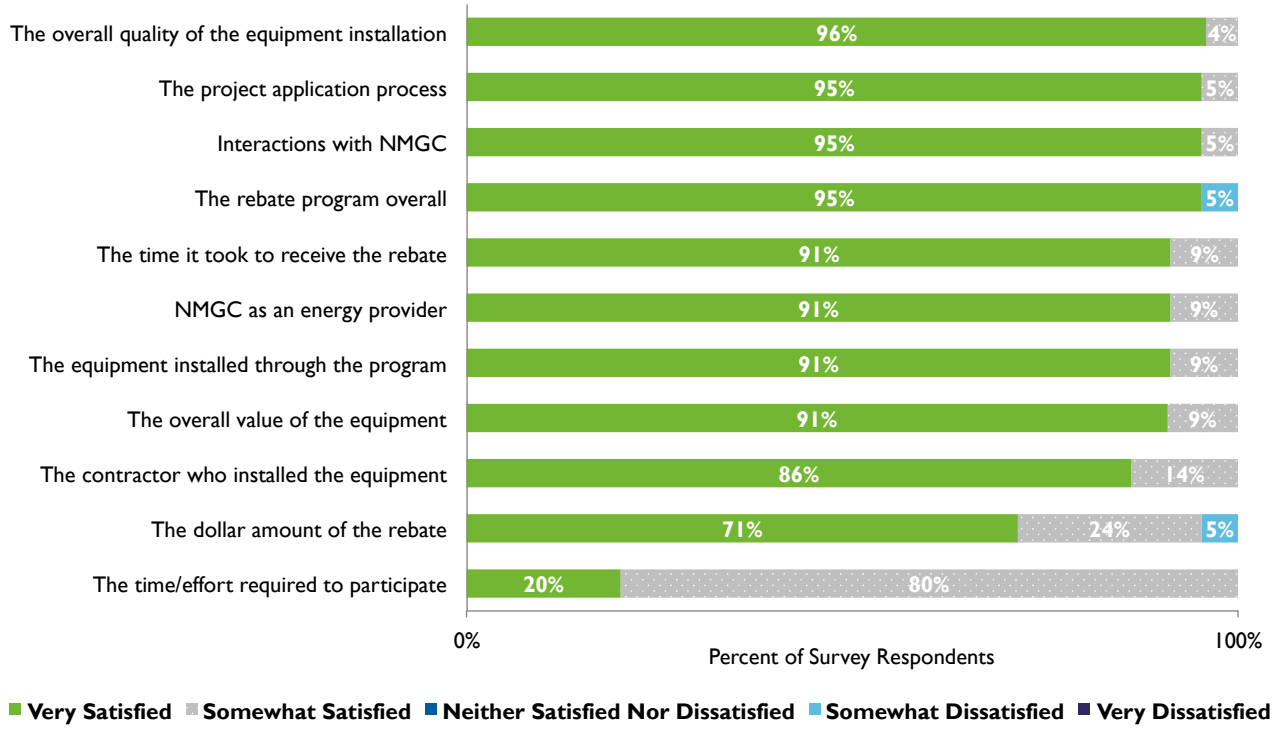
Figure 10: Direct Install Participant Program Satisfaction (n=31)



As shown in Figure 11, non-direct install participants also expressed high levels of satisfaction, with the majority of participants reporting being very satisfied with multiple program components. Ninety-six percent reported being very satisfied with the overall quality of the equipment installation, and 95 percent were very satisfied with the project application process. Contrarily, the majority of non-direct install participants reported being somewhat satisfied with the time and effort required to participate. One reason

provided for the lower satisfaction scores included "We were told that the program was giving away a large sum of money. Expected more."

Figure 11: Non-Direct Install Participant Program Satisfaction (n=7)



5.2 Space Heating and Water Heating Participant Surveys

As part of the evaluation, the evaluation team conducted phone surveys with 100 participating residential customers that received rebates through the NMGC Space Heating and Water Heating programs. Eighty Space Heating and 20 Water Heating program participants completed the survey. These surveys were completed in April 2019 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;
- Participant drivers and barriers; and
- Additional process evaluation topics.

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

The following subchapters report results on participant 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. The results for the Space Heating and Water Heating programs are presented together here, as there were not significant differences in the distribution of responses between Space Heating and Water Heating program participants.

5.2.1 Participant Demographics

We asked survey respondents a number of questions about the characteristics of their home and household, including whether they own or rent, the size of their home, the number of people in the household, and the age of their home. One hundred percent of survey respondents own their home.

The following two figures summarize the survey respondents' home and household size. As shown in Figure 12 below, 40 percent of survey respondents reported residing in homes between 2,000 and 2,999 square feet. Additionally, the majority (69%) of respondents have two or three full-time residents living in the home where the project was completed (Figure 13).

Figure 12: Residential Space and Water Heating Participant Home Size (n=100)

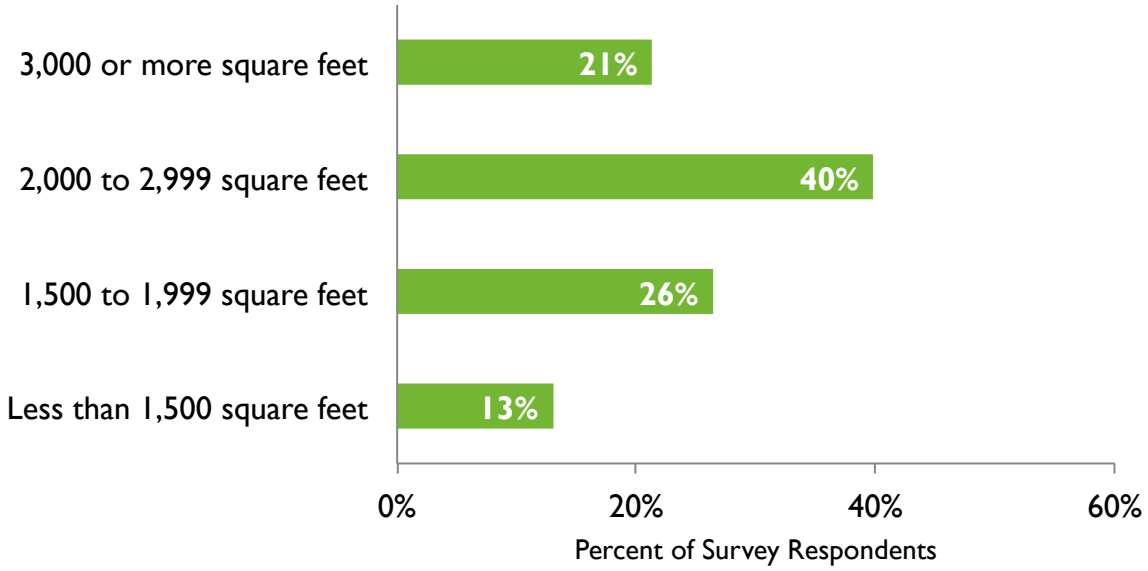
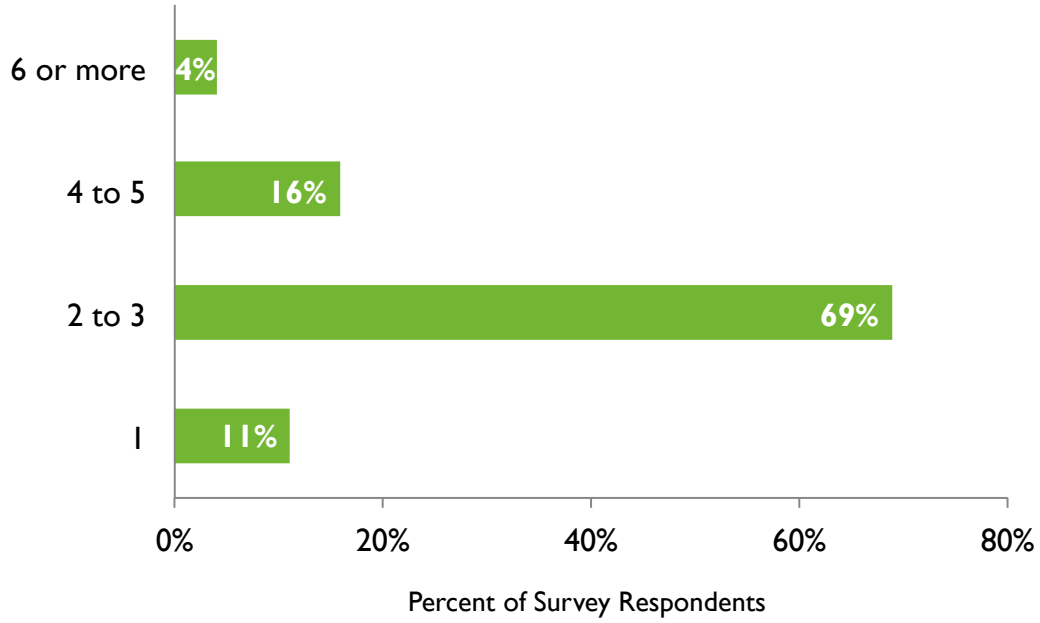
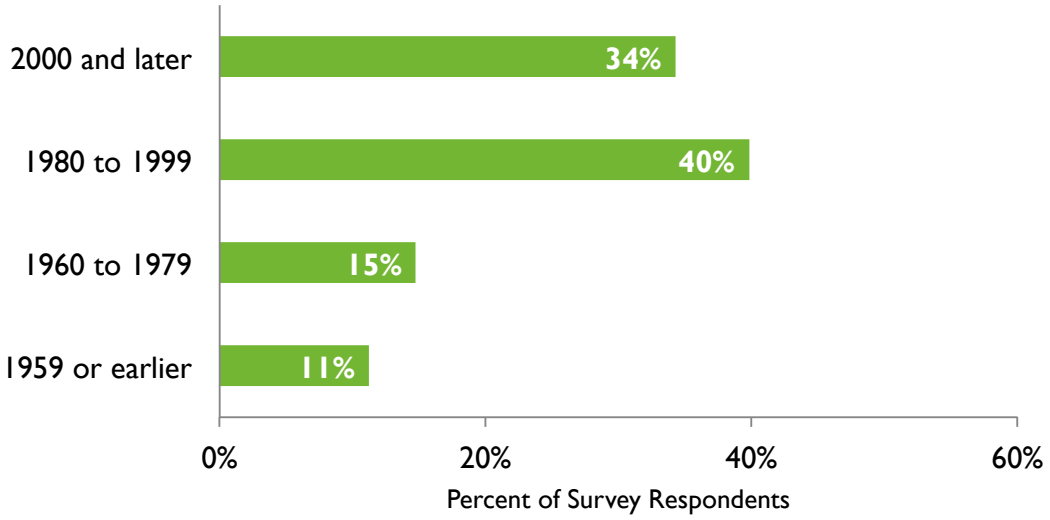


Figure 13: Residential Space and Water Heating Participant Household Size (n=100)



The majority (66%) of Space and Water Heating survey respondents reported that their homes were built sometime before 1999, as shown in Figure 14 below. This suggests that the program is effectively targeting older homes where the potential for significant energy savings is greatest.

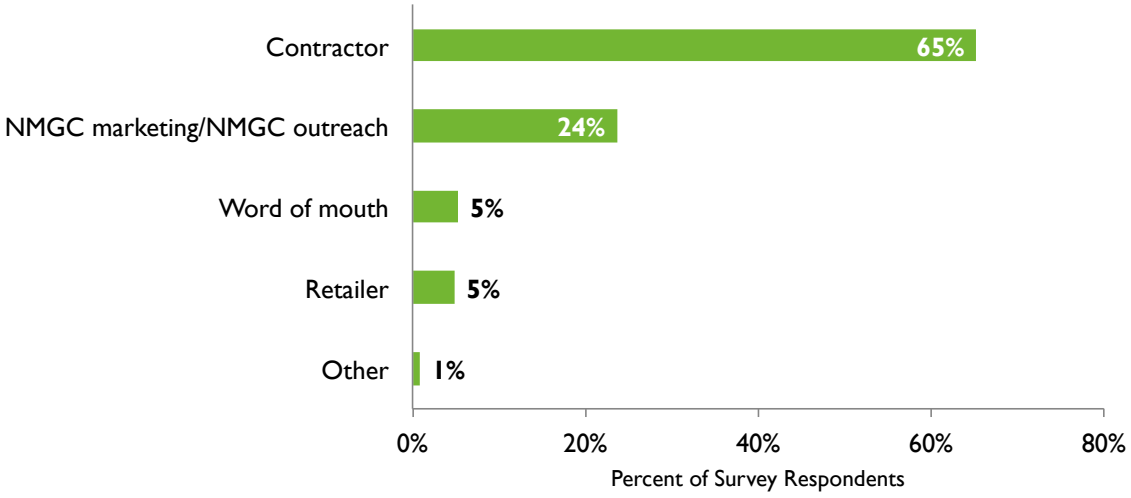
Figure 14: Residential Space and Water Heating Home Vintage (n=100)



5.2.2 Sources of Awareness

Participants became aware of the program assistance through a variety of channels, including contractors, NMGC marketing/NMGC outreach, retailers, and word of mouth. As shown in Figure 15, the majority (65%) of survey respondents learned about the program offerings through a contractor. Interactions with NMGC (either through direct contact or marketing) were also a significant source of awareness for survey respondents (24%).

Figure 15: Residential Space and Water Heating Participants' Source of Awareness (n=93*)

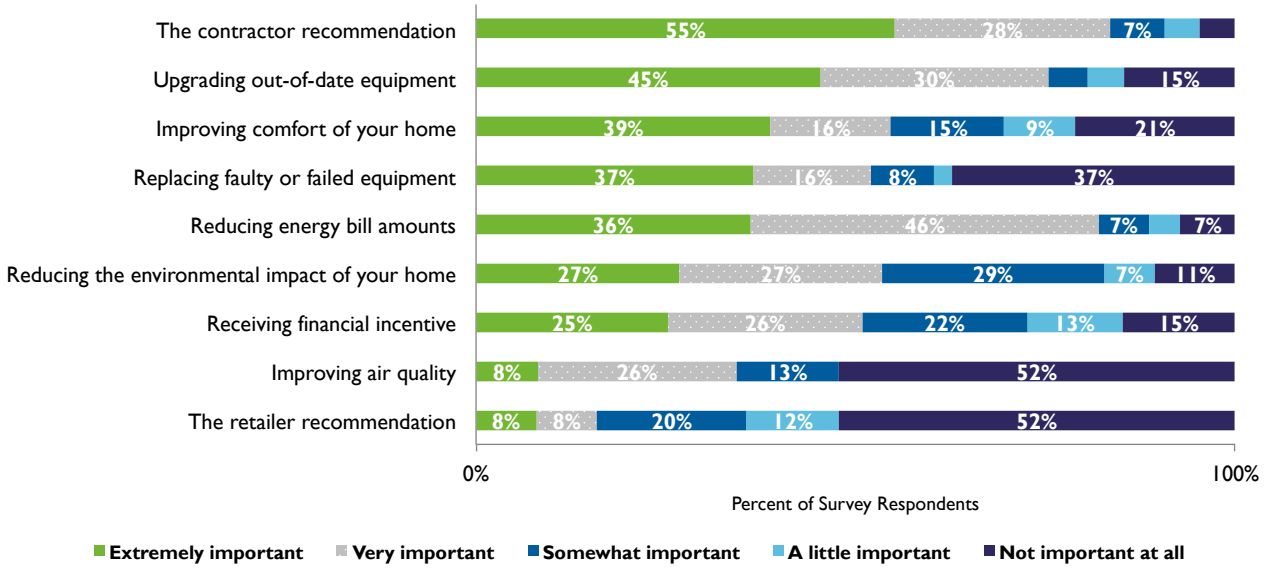


*n=93 because seven respondents could not recall how they initially became aware of the program offerings.

5.2.3 Motivations for Participation

Respondents were asked to rate a variety of factors that might have been important in their decision to participate in the Space Heating and Water Heating programs. The majority of survey respondents rated all but two factors as "very" or "extremely important" in their decision to participate in the program (Figure 16). The contractor recommendation was the most important factor, with 83 percent of respondents reporting that it was "very" or "extremely important" in their decision to participate. The retailer recommendation was the least important factor (but still important), with 16 percent reporting it as very or extremely important.

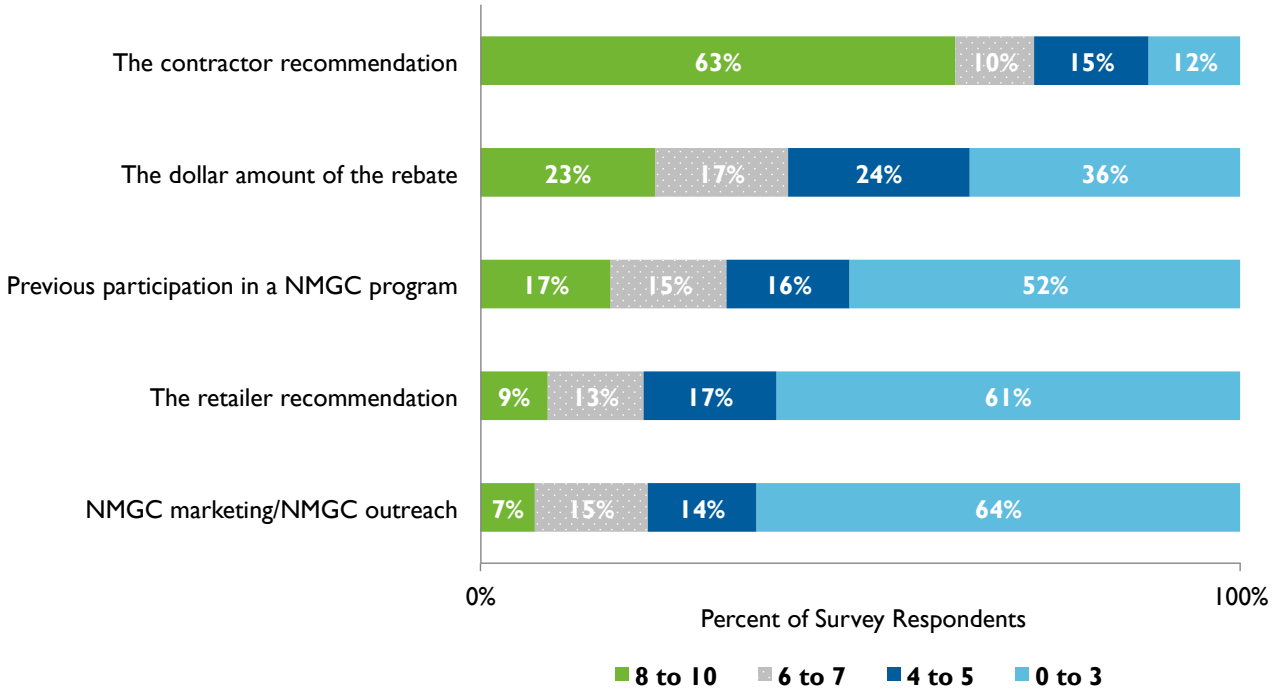
Figure 16: Residential Space and Water Heating Motivations for Participation (n=100)



In addition to motivations for participating, survey respondents were given a list of program factors that may have potentially influenced their decision to upgrade their space heating or water heating equipment and were then asked to rate the influence of those factors on a 0 to 10 point scale.[11] Consistent with what is shown in Figure 16, Figure 17 shows that the contractor recommendation was the most influential factor in respondents' decision to participate in the programs, with 63 percent of respondents reporting it as extremely influential (ratings of 8 to 10). Interactions with NMGC (either through direct contact or marketing) were the least influential, with 64 percent of respondents reporting it as not at all influential.

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

Figure 17: Residential Space and Water Heating Influence of Program Factors (n=100)



5.2.4 Participant Satisfaction

The participants evaluated their satisfaction with various components of the Space Heating and Water Heating programs 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:

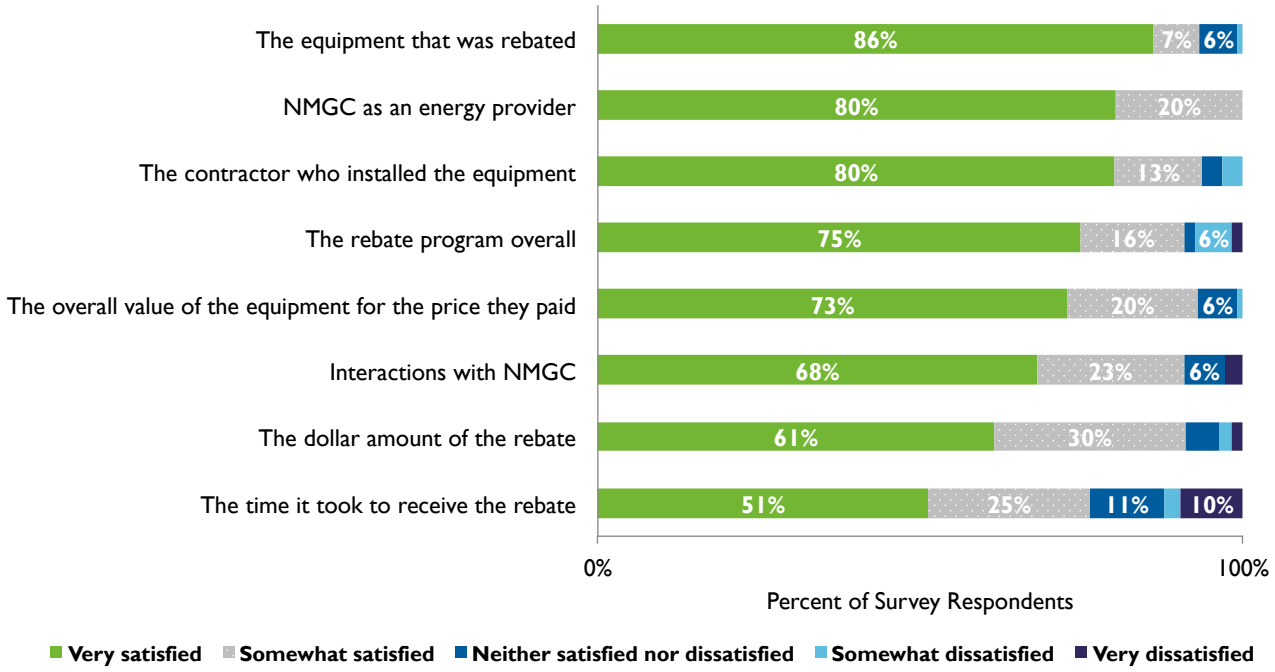
- NMGC as an energy provider
- The rebate program overall
- The equipment that was rebated
- The contractor who installed the equipment
- The time it took to receive the rebate
- The dollar amount of the rebate
- Interactions with NMGC
- The overall value of the equipment for the price they paid

Figure 18 summarizes the survey respondents' satisfaction with the Space Heating and Water Heating programs.

Overall, surveyed program participants expressed high levels of satisfaction with the Space Heating and Water Heating programs components. As shown in Figure 18, survey respondents expressed high levels of satisfaction across each individual component, with the majority being "very satisfied." Respondents gave the highest satisfaction ratings to the equipment that was rebated (86%), NMGC as an energy provider (80%), and the contractor who installed the equipment (80%). A small percentage of surveyed participants reported lower satisfaction ratings, primarily with the time it took to receive the rebate. The evaluation team heard from ICF, the program implementer, that they are looking into an updated processing system that would allow for more frequent distribution of rebate checks and potentially adding an online rebate application option in the future, both of which may improve the turnaround time for rebates.

Some of the justifications provided for the low satisfaction ratings included "it was difficult to understand what rebate level we were going to qualify for. We thought the rebate amount was going to be larger," and "I have not received my rebate."

Figure 18: Residential Space and Water Heating Program Satisfaction (n=100)



5.3 ThermSmart New Homes Builder Interviews

The evaluation team completed a total of 11 interviews with home builder participants of the New Homes programs across the three New Mexico utilities that offer a New Homes program: PNM, El Paso Electric, and New Mexico Gas Company. Of these 11 home

builders, eight had received rebates from NMGC for efficiency upgrades through the ThermSmart New Homes program. The interviews focused on the following topics:

- Project context and background;
- Role and influence of the NMGC ThermSmart New Homes program; and
- Program satisfaction.

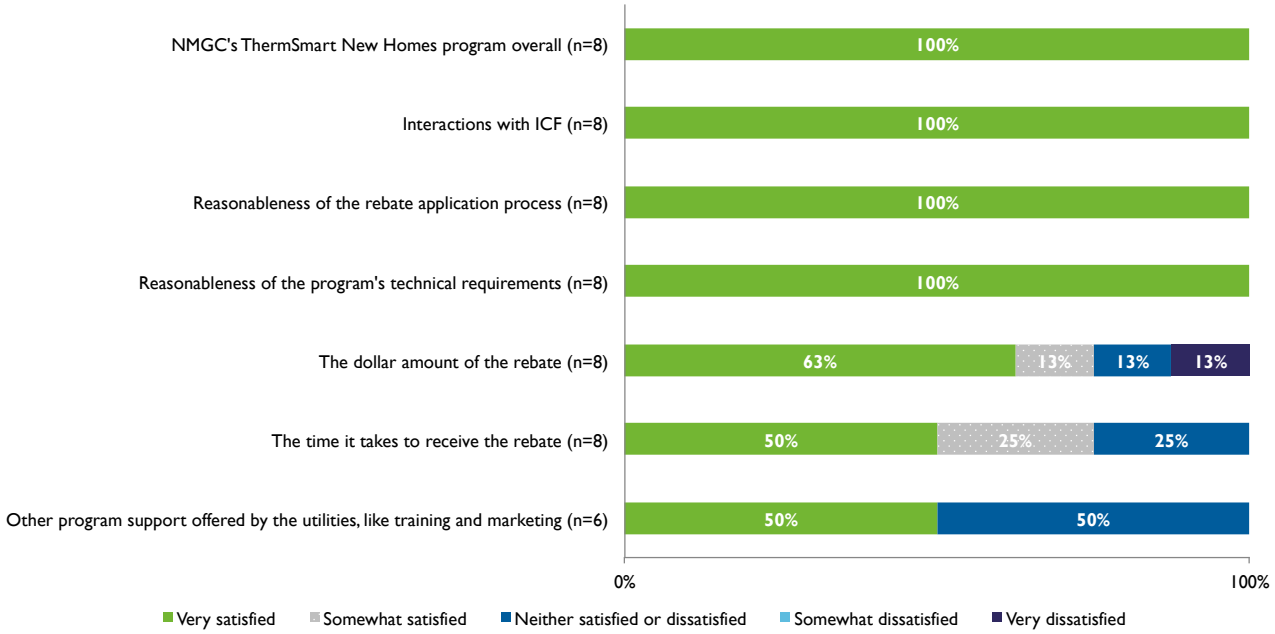
Participants were categorized into three groups based on of the number of projects completed through all of the New Mexico utilities' New Homes programs in 2018: lightly active (1 to 12 projects), moderately active (13 to 100 projects), and highly active (more than 100 projects). The evaluation team interviewed six moderately active firms and five lightly active firms. Seven of the eight NMGC respondents had completed more than one project through the ThermSmart New Homes program, including two builders with experience across more than 50 completed projects. While respondents had varying levels of interaction with the ThermSmart New Homes program directly, all eight were familiar with the eligible projects and played a significant role in their business's participation in the program.

5.3.1 Program Satisfaction

ThermSmart New Homes program interviewees were asked a series of questions to quantify their level of satisfaction with various components of the program using a 1 to 5 point scale, where 1 meant "very dissatisfied" and 5 meant "very satisfied."

Satisfaction with the ThermSmart New Homes program was very high overall, but one participant commented on the dollar amount of the rebate being low. As shown in Figure 19 below, all eight NMGC builder interviewees said they were "very satisfied" with the program overall, their interactions with ICF (the program implementer), the reasonableness of the rebate application process, and the reasonableness of the program's technical requirements. The most ratings of "neither satisfied or dissatisfied" were for the program support offered, including training and marketing. However, all three interviewees that gave this rating for training and marketing reported that it was due to their firm not utilizing that aspect of the program. One even explained why they gave this rating, saying, "Not because it's bad but it's because I haven't utilized that. The program is great." For the low satisfaction ratings related to the rebate amount, interviewees said this was because they believed the rebate amounts were too low, which is not an uncommon response to this question.

Figure 19: ThermSmart New Homes Program Builder Satisfaction



Participating builders described the ThermSmart New Homes program as being moderately influential on the scope of the energy efficiency level to which they built their homes, although some degree of upgrade would likely have happened for each of these builders even in the absence of the program offerings. The degree of program influence varied:

- For four of the eight builders, the ThermSmart New Homes program rebates were extremely important in determining the Home Energy Rating System (HERS) levels they built to overall or on the HVAC equipment, lighting, refrigeration, and insulation they included in the homes they built.
- Interviewees from the other firms claimed they would have built to similar, if not the exact same, energy efficiency levels in the absence of the program. However, the majority of interviewees reported that the rebates provided through the program were a great add-on to what they were already doing.

5.4 Commercial and Residential Contractor Interviews

The evaluation team completed six interviews with contractors involved in the 2018 Efficient Buildings program (n=3) and Space Heating and Water Heating programs (n=3). The interviews focused on the following topics:

- Contractor background and program involvement;
- Role and influence of NMGC's Efficient Buildings and Space and Water Heating programs in the market; and
- Program satisfaction.

Contractors interviewed for the Efficient Buildings program completed work in both the commercial and industrial sectors, specializing in boilers, steam operated systems, processed heat systems, insulation, and retrofits. The roles of each interviewed contractor varied from project manager to president or owner of the company.

Contractors involved in the Space and Water Heating programs identified themselves as their company's office manager, project manager, and managing partner, with one contractor having completed projects in the commercial sector as well. Other than space and water heating equipment, interviewed contractors reported additional work coming from HVAC tune-ups, plumbing, and blown-in insulation projects.

5.2.1 Program Influence

In an effort to gauge the level of influence both the Efficient Buildings program and Space and Water Heating programs had on the market for energy efficient equipment, the evaluation team explored how contractors became aware of the NMGC programs, when contractors communicate about the NMGC rebates with customers, and what role they play in the contractors' and customers' ultimate choices.

In recalling how contractors first became involved with the Efficient Buildings program, one contractor said they received a cold call from CLEAResult (the program implementer) about participating in the program, which they had reservations about at first since they were not familiar with CLEAResult and questioned the legitimacy of the program with NMGC. Another contractor stated they were aware of the Efficient Buildings program because they used to be involved in the Space and Water Heating programs on the residential side, but discontinued participation, saying

> *"There were difficulties getting projects rebated and that commercial (Efficient Buildings) has been a whole different world and much easier."*

In regard to the Space and Water Heating programs, all three contractors interviewed reported that their company was already participating in the program(s) before they started in their role, or that they could not remember how they first learned about and got involved with the program(s).

When asked to discuss the ways in which the programs are helpful to contractors in their business, responses were more emphatic and unanimous. Each contractor stressed the importance of program incentives being the difference in pushing efficiency upgrades.

Outside the focus of dollar amounts, two contractors referenced the ability to use name recognition of NMGC as a sales tool to promote the programs. One of the contractors suggested that moving towards co-branding with NMGC would help with the effectiveness of the program. Another contractor involved in the Efficient Buildings program said they would like to see more contractors working with NMGC's energy programs to introduce higher efficiency equipment to customers, continuing to say that due to the large scale of commercial and industrial projects, most customers seek the least expensive route, meaning they initially tend to avoid higher efficiency equipment. This contractor then suggested that the programs emphasize the return on investment for upgrading, claiming that

> *"Customers only look at the sticker price and don't think about potential savings. Upfront costs are the most important factor in decision-making unless the customer is shown the return on investment."*

5.2.2 Program Satisfaction

Contractors were asked to quantify their level of satisfaction with the program overall using a 1 to 5-point scale, with 1 being very dissatisfied and 5 being very satisfied. One contractor involved with the Space and Water Heating programs rated their experience with the programs as a 4 (somewhat satisfied). The remaining two contractors involved with the Space and Water Heating programs that were interviewed rated the programs a 5 (very satisfied), and all three contractors with the Efficient Buildings program rated the program a 5.

None of the interviewed contractors claimed they were dissatisfied with any aspects of the programs, but when asked how their satisfaction with the programs could be improved, they recommended including more information regarding the programs be provided to them and their customers, thereby increasing market outreach; one contractor suggested that NMGC also target smaller commercial businesses. Another contractor mentioned a shift in the Efficient Buildings program, specifically with rebate amounts not being guaranteed anymore and program funds drying up near the end of the year. This contractor added that this shift in program dynamic could be a turn off for customers getting involved, and if the program runs out of funds close to the end of the year, then contractors will stop pushing the program.

Overall, when asked to describe their efforts in completing the paperwork required for the programs, all contractors said the process and time to complete the paperwork was fine (n=6). None of them thought the paperwork was burdensome, and two Efficient Buildings contractors credited CLEAResult for taking over the paperwork altogether after the contractor and customer completed their portion. The other four contractors interviewed said they will do some or most of the paperwork required so the customers will not have to.

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 program.

6.1 Efficient Buildings Program

Impact evaluation activities for the Efficient Buildings program included engineering desk reviews for a sample of projects. A subset of sampled projects also received a site visit by an evaluation engineer. Based on these desk reviews and site visits, an overall engineering adjustment factor of 0.9423 was found for therm savings. Conclusions and recommendations resulting from these reviews are discussed below:

- The evaluation team found that in the program tracking data file "Evaluator Report 4-8-19.xlsx" provided by CLEAResult, for multiple projects, the description listed in the "Measure" field did not match the installed measures shown in the project documentation. These discrepancies did not impact the verified savings values; however, they may affect NMGC's internal reporting and tracking. For example:
    - RBT-1962467 lists the measure as "Prescriptive - Faucet Aerator," while the project installed a high-efficiency water heater.
    - RBT-2028754 lists the measures as "Prescriptive - Faucet Aerator" and "Prescriptive – Weatherstripping," while the project installed high-efficiency furnaces.
    - **Recommendation 1:** Ensure that the tracking data accurately lists the measure names for participating projects.
- The evaluation team adjusted the savings for six projects that installed measures related to hot water: high-efficiency water heaters, low-flow faucet aerators, low-flow showerheads, and pre-rinse spray valves. NMGC claimed savings using the deemed savings values provided in the TRM for general commercial buildings. However, these general savings values are intended to be used for projects that do not fit into any of the other more specific building types listed in the TRM. Since the building types for these projects were documented, the evaluator used the savings values from the TRM that most closely corresponded to the specific building types. This resulted in adjustments ranging from a 25 percent decrease in savings to a 6 percent increase in savings.
    - **Recommendation 2:** For hot water measures, use deemed savings values from the TRM corresponding to the specific building type in which the measures are being installed.

- The evaluation team adjusted the savings for the six projects in the sample that installed two types of commercial kitchen equipment: gas fryers and gas ovens. The evaluation team used the savings documented in the "V3" CLEAResult workpapers for these measures, which do not match the savings reported in the tracking data. No additional calculations were available for the evaluation team's review, so the source of these discrepancies is unknown. These adjustments ranged from a 62 percent decrease in savings to a 34 percent increase in savings.
    - **Recommendation 3:** Ensure that cooking equipment savings are being accurately claimed, consistent with documented measure workpapers.
    - **Recommendation 4:** Provide clear references to the current documents used to determine claimed savings so that savings can be traced back to the original sources.
- The evaluation team adjusted the savings for the four projects in the sample that installed weatherstripping measures. The evaluation team calculated savings by multiplying the installed linear feet listed on the application by the per-linear foot savings listed on the application. This resulted in savings that differed from the claimed savings, ranging from 44 percent lower savings to 515 percent higher savings. No additional calculations were available for the evaluation team's review, so the source of these discrepancies is unknown.
    - **Recommendation 5:** Ensure that weatherstripping savings are being accurately claimed, consistent with application documents.
- The evaluator adjusted the savings for custom project RBT-13350030, which installed high-efficiency boilers.
    - NMGC determined the claimed savings using a calculation based on Arkansas weather. The evaluator adjusted the savings using a comparison of heating degree-days between Arkansas and New Mexico to create an estimate of savings specific to New Mexico's climate.
    - Additionally, NMGC calculated the claimed savings using a post-retrofit boiler efficiency of 96 percent. The evaluator modified the calculations to use an efficiency of 98.4 percent, as shown in the AHRI certificate for the model of boiler installed.
    - These adjustments resulted in a 33 percent increase in savings for this project.
    - **Recommendation 6:** Use New Mexico weather when determining savings for weather-dependent measures installed in New Mexico.
    - **Recommendation 7:** Calculate boiler savings using efficiencies documented in AHRI certificates when available.
- The evaluator adjusted the savings for custom project RBT-1347421, which installed boiler optimizer controls at 12 sites.

- NMGC calculated savings for this project by first determining each site's estimated baseline heating energy consumption using a linear regression based on pre-retrofit billing data, actual weather data, and typical meteorological year (TMY3) weather data. NMGC then applied an 11.3 percent savings factor, derived from pilot installations of this measure, to the baseline values. The evaluation team determined savings for each project by creating second-order polynomial regressions for both the pre-retrofit and post-retrofit heating energy usage, using billing data, actual weather data, and TMY3 weather data. The evaluation team's calculations show an estimated average savings of 2.4 percent across all 12 sites, with overall savings 71 percent lower than the reported value.
- Six of the sites show negative verified savings (i.e., increased gas consumption). One key driver of increased gas use at these sites is increased gas usage over the summer months, observed when comparing the pre-retrofit and post-retrofit billing data. Without additional information regarding these sites (e.g., if any other operational/equipment changes occurred between the pre-retrofit and post-retrofit periods), the evaluator did not remove this gas use from the analysis of the boiler controls.
- Verified savings percentages range from positive 34 percent to negative 30 percent. Given the range of the savings magnitude across these sites, the evaluation team is not confident that enough information has been gathered to justify using a single deemed savings factor for this measure.
- **Recommendation 8:** Adjust savings estimates for boiler optimizers using post-retrofit billing data when available. Based on discussions with NMGC, the evaluation team acknowledges that this is not always possible within the timeframes needed to provide incentives for this measure.
- **Recommendation 9:** Provide explanations of any building changes or events that are unrelated to the boiler optimizer measure and that significantly impact the gas usage so that these can be accounted for in the regression analyses.
- **Recommendation 10:** Continue to refine the estimated savings factor for the boiler optimizer measure, collecting data from each installation to inform the expected savings impacts.

- The evaluator adjusted the savings for two custom projects by normalizing billing data to TMY3 weather data. Project RBT-1781517 installed parallel positioning on boilers, and project RBT-1781564 installed high-efficiency boilers. To calculate savings for each of these projects, NMGC determined the building's heating load using one year of gas billing data. The baseline and proposed gas consumption used for heating was then determined by applying the pre-retrofit and post-retrofit boiler system efficiencies to this heating load. As this approach is based on a single

isolated year of gas usage, it is susceptible to being impacted by anomalous weather events. The evaluator normalized the billing data by comparing heating degree-days between the actual weather of the year of billing data and TMY3 typical weather to determine the heating load for a "typical" year. The evaluator made this weather adjustment to the disaggregated heating load and did not adjust the base load. This adjustment resulted in a 5 percent increase in savings for project RBT-1781517 and an 18 percent increase in savings for project RBT-1781564.

    - **Recommendation 11:** Normalize billing data to a typical year so that estimated savings reflect expected typical conditions rather than isolated conditions from one specific year.

- The evaluator adjusted the savings for custom project RBT-1898314, which replaced failed steam traps.
    - The evaluator modified the steam discharge rate for three of the traps. NMGC labeled the traps as being used for "Process" but calculated savings using a discharge rate based on a "Tracer/Drip" application as input into the Armstrong steam trap calculator. The evaluator determined a new discharge rate by inputting the "Coil/Process" application into the Armstrong calculator. This adjustment resulted in a 6 percent reduction in savings.
    - The inlet pressure and feedwater temperature used by NMGC in the savings calculations did not exactly match the values shown in the provided project documents. Additionally, NMGC did not provide any documentation verifying the efficiency of the steam boiler associated with the steam traps. However, the values that NMGC used for these parameters appear to err on the conservative side, and so the evaluator did not adjust these values.
    - **Recommendation 12:** Ensure that steam trap discharge rates are consistent with the steam trap applications.
    - **Recommendation 13:** Verify key parameters such as inlet pressure, feedwater temperature, and boiler efficiency, and ensure that savings calculations use these verified values.
- The evaluation team published an updated version of the New Mexico TRM that is effective for PY2019 and will be referenced in the evaluation of PY2019.
    - **Recommendation 14:** Update the Technical Assumptions as needed based on the updated version of the New Mexico TRM.

6.2 Income Qualified Program

The impact evaluation activities for the Income Qualified program included engineering desk reviews of a sample of program projects. These desk reviews yielded a very slight downward adjustment in savings with an engineering adjustment factor of 0.9957. 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 136,638 therms. The following findings and recommendations resulted from the engineering desk reviews:

- For two projects in the sample, the evaluation team found that the savings for domestic hot water pipe insulation differed between the tracking data and the projects' analysis reports. The evaluation team based the verified savings on the analysis reports, resulting in a 1 percent increase in savings for both projects.
    - **Recommendation 15:** Ensure consistency between savings shown in analysis reports and claimed savings as reflected in the program tracking data.
- For one project in the sample that claimed savings for the installation of a programmable thermostat, the evaluation team found that the thermostat specification sheet provided was for a non-programmable thermostat. Therefore, the evaluation team removed the programmable thermostat savings from this project, resulting in a 36 percent decrease in savings.
    - **Recommendation 16:** Confirm that incentivized thermostats meet all functionality and setup requirements in order to ensure confidence in claimed savings.
- For one project in the sample that claimed savings for attic insulation, NMGC claimed savings that included both heating savings and cooling savings as reported by the Weatherization Assistant software. However, since this project uses natural gas for heating and electricity for cooling, only the heating savings should be claimed by NMGC. The evaluator adjusted the savings for the attic insulation to only include heating savings, resulting in a 4 percent decrease in overall project savings.
    - **Recommendation 17:** Only claim the gas portion of the savings for measures that have both gas and electric impacts.

6.3 Multi-Family Program

Desk reviews were conducted for a sample of the Multi-Family program projects, and these yielded an upward adjustment in savings, with an engineering adjustment factor of 1.2180. The NTG ratio for low-income and direct install projects in the Multi-Family program was assigned to be 1.00, and for market rate retrofit projects, the *ex ante* value of 0.85 was applied. The resulting overall NTG ratio for the program was calculated to be 0.9781. As a result, the net realized savings for the Multi-Family program were found to be 269,161 therms. Specific findings from the engineering desk reviews are described below:

- NMGC calculated savings for programmable thermostats using Xcel Energy's 2015-2016 demand-side management plan assumptions. These assumptions are based on applying a heating reduction percentage to baseline heating energy use for homes in Colorado. The evaluation team adjusted programmable thermostat savings based

on the methodology outlined in the new version of the New Mexico TRM. This new methodology has a similar percent reduction value but applies this value to baseline heating energy use that is specifically calculated for homes in New Mexico.

  - **Recommendation 18:** Update the savings claimed for programmable thermostats to align with the methodology provided in the updated version of the New Mexico TRM.

- For the five sampled projects that installed low-flow faucet aerators, the evaluation team found that NMGC multiplied the deemed aerator savings from the TRM by the total number of aerators installed. However, the TRM states that the deemed savings values are per-housing unit, not per aerator. The evaluation team adjusted the savings accordingly for five projects. The evaluation team made additional adjustments described in subsequent bullet points, with overall adjustments for these projects ranging from an 8 percent to a 3 percent decrease in savings.
  - **Recommendation 19:** The New Mexico TRM has been updated, and low-flow faucet aerator savings are now presented on a per-aerator basis. Update program assumptions for low-flow faucet aerators accordingly to align with the updated TRM.
- The evaluation team adjusted the savings for hot water measures not contained in the version of the New Mexico TRM that was effective during PY2018.
  - Six of the sampled projects installed hot water pipe insulation and/or water heater tank insulation. The version of the New Mexico TRM effective during PY2018 does not contain these measures, and so NMGC referenced the Texas TRM to calculate savings for these measures. The evaluator adjusted the input parameters used by NMGC to use values specific to New Mexico instead of values derived for Texas. The evaluator adjusted the assumed values for incoming cold water temperature, ambient air temperature, and water heater efficiency.
  - The evaluation team made additional adjustments described in other bullet points, with overall adjustments for these projects ranging from an 8 percent decrease in savings to a 7 percent increase in savings.
  - **Recommendation 20:** Calculate savings for hot water pipe insulation and water heater tank insulation using parameters specific to New Mexico installations. These measures have been added to the latest version of the New Mexico TRM, which can be referenced for key parameters.
- Key measure parameters are reported inconsistently in the Multi-Family program tracking data:
  - Of the six sampled projects that installed water heater tank insulation, NMGC did not report the tank volume for four projects. For these projects,

the evaluation team assumed a volume of 40 gallons, based on the assumptions documented by the Multi-Family program.

  - Four of the sampled projects installed hot water pipe insulation. The pipe insulation quantities listed by NMGC in the program tracking data appear to alternate between linear feet of insulation and number of apartments in which insulation was installed. The evaluation team calculated savings using the linear feet of insulation when this value was explicitly listed and assumed an insulation length of three feet per apartment when the quantity appeared to represent the number of apartments, based on the assumptions documented by the Multi-Family program.
  - **Recommendation 21:** Consistently report the tank volume used to calculate savings for water heater tank insulation.[12]
  - **Recommendation 22:** Consistently report the linear feet of insulation used to calculate savings for hot water pipe insulation.[13]
- The evaluation team published an updated version of the New Mexico TRM that is effective for PY2019 and will be referenced in the evaluation of PY2019.
  - **Recommendation 23:** Update the Technical Assumptions as needed based on the updated version of the New Mexico TRM.

6.4 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 1.0021. 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 232,775 therms.

- The evaluation team checked modeled HVAC and water heating equipment against provided AHRI certificates. However, other aspects of the model (e.g., walls, windows, insulation) were not documented, and so were assumed to be consistent with the installed equipment.
  - **Recommendation 24:** Provide additional documentation of measures (e.g., post-inspection pictures, building plans, insulation specifications) in order to verify REM/Rate model inputs.

[12] After reviewing the draft evaluation report, NMGC confirmed that tank volume would be reported consistently moving forward.
[13] After reviewing the draft evaluation report, NMGC confirmed that pipe insulation quantities would be reported consistently moving forward.

6.5 Water Heating and Space Heating Programs

The gross impact evaluation of the Water Heating and Space Heating programs comprised a review of the deemed savings values. Per unit savings values in the tracking data were compared to the New Mexico TRM to determine whether the correct savings were applied for each measure. For all measures, the source of savings and calculations (if any) were confirmed, and no adjustments were made to gross savings for either program. Net impacts for the Water Heating and Space Heating programs were calculated using the NTG ratio developed using the self-report method with participant phone survey data. The resulting NTG ratio for the Water Heating program is 0.6164, and for the Space Heating program, the NTG ratio is 0.6186.

6.6 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 2.24.

Recommendation 25: 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, NMGC should track measure costs for all programs so that the TRC test can be used in future program years.