EXHIBIT CMS-1

Oklahoma Natural Gas Evaluation of 2023 Energy Efficiency Programs

Prepared for:

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A Division of ONE Gas

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1 Executive Summary

This report is a summary of the evaluation, measurement, and verification (EM&V) effort of the 2023 program year (PY2023) portfolio of programs for Oklahoma Natural Gas (ONG), a division of ONE Gas. The evaluation was administered by ADM Associates, Inc (herein referred to as the "Evaluator").

The Evaluator collected data for the evaluation through review of program materials, acquisition of program tracking data, surveys of participating customers, residential contractors, and commercial trade allies.

Table 1-1 provides a summary of the EM&V data collection efforts. The table lists data sources used for the evaluation, the data collection method, the research objectives, and the type of analysis performed.

Table 1-1 Summary of ONG EM&V Data Collection Efforts

*Data Source**	*Method*	*Dates*	*Research Objective*	*Analysis Type*
Program documentation (5,777)	Document review	November 2023– January 2024	Program function; program marketing; quality control	Qualitative
Database analysis (25,440)	Database review	November 2023– January 2024	Number of projects; project type and details; data quality	Quantitative
Program Participants (489)	Telephone and online survey	November 2023 to January 2024	Program experiences; satisfaction with program	Quantitative and qualitative

* Sample sizes in parentheses

Table 1-2 provides a summary of evaluated savings of the ONG programs. The table presents the ex-ante, ex-post gross, and ex-post net therms savings; also included are a comparison between ex-ante and ex-post therms savings, and a comparison between ex-post gross and net therms savings.

During PY2023, the ONG energy efficiency portfolio ex-post gross energy savings totaled 4,836,315 therms, with a 118% gross realization rate.

Net savings are equal to gross savings, minus free ridership. The Evaluator completed a net program impact analysis to determine what portion of gross energy savings achieved by participants in the program are attributable to the effects of the program. The equation used to calculate net savings is the following:

Net Savings = Gross Savings – Free-ridership

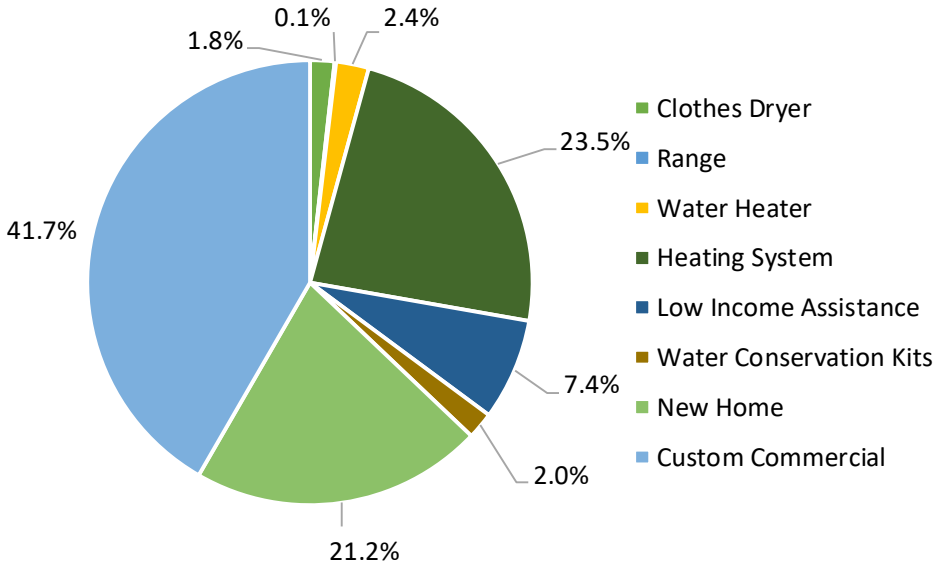
The overall estimated net-to-gross ratio for the ONG energy efficiency portfolio during 2023 is 83% with total net savings of 4,015,011 therms.

Table 1-2 Summary of Therm Energy Savings

Program	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*	*Ex-Post Net Therm Savings*	*Net-to-Gross Ratio*
Clothes Dryer	70,269	85,530	122%	59,370	69%
Range	11,386	5,818	51%	3,239	56%
Water Heater	119,596	115,409	96%	39,693	34%
Heating System	622,694	1,136,236	182%	495,790	44%
Low-income Assistance	318,077	356,525	112%	356,525	100%
Water Conservation Kits	69,025	95,223	138%	90,298	95%
New Home	875,224	1,026,992	117%	959,789	93%
Custom Commercial	2,005,508	2,014,583	100%	2,010,308	100%
Total	**4,091,779**	**4,836,315**	**118%**	**4,015,011**	**83%**

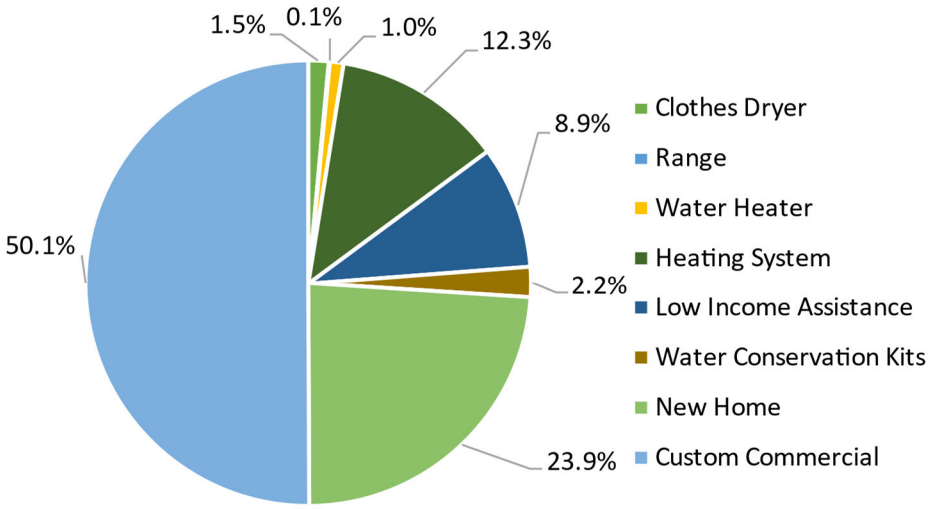
The contribution to portfolio gross ex-post therms savings by program is summarized in Figure 1-1.

Figure 1-1 Contribution to Portfolio Gross Ex-Post Savings by Program



The contribution to portfolio net ex-post therms savings by program is summarized in Figure 1-2.

Figure 1-2 Contribution to Portfolio Net Ex-Post Savings by Program



Cost-benefit analysis of the ONG programs and portfolio was conducted by The Evaluator and Energytools, LLC. The primary cost-benefit test is the Total Resource Cost (TRC) test. Table 1-3 summarizes the TRC results. More detailed results are presented in Appendix A.

Table 1-3 Total Resource Cost Results

Program	*Total Benefits*	*Total Costs*	*TRC (b/c ratio)*
Clothes Dryer	$826,949	$306,508	2.70
Range	$231,055	$13,174	17.54
Water Heater	$8,870,702	$1,954,370	4.54
Heating System	$688,086	$285,863	2.41
Low-income Assistance	$5,469,965	$974,610	5.61
Water Conservation Kits	$2,131,538	$105,624	20.18
New Home	$14,064,394	$6,492,912	2.17
Custom Commercial	$17,841,581	$3,105,644	5.74
Portfolio Non-program Costs	N/A	$2,822,279	N/A
Total	**$50,124,271**	**$16,060,985**	**3.12**

1.1 Conclusions and Recommendations

The Evaluator offers the following conclusions and recommendations for consideration in planning future program cycles.

1.1.1 Clothes Dryer Program

1.1.1.1 Conclusions

- Retailers were the primary source of program awareness, with 39% of survey participants learning of the rebate program through a retail store.
- Customer feedback was generally very positive about a variety of aspects of the program. Participants were most satisfied with the program overall (99%) and ONG as their service provider (98%).

1.1.1.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

1.1.2 Range Program

1.1.2.1 Conclusions

- 39% percent of participants found out about the rebate program through a retailer. Participants relied on radio and television advertisements (20%) and the ONG website (18%) for rebate program information.
- The majority of survey respondents were somewhat or greatly satisfied with ONG as their natural gas service provider and the program overall.

1.1.2.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

1.1.3 Water Heater Program

1.1.3.1 Conclusions

- 38% of program participants who completed the survey learned of the Water Heater program through a contractor.
- Most survey respondents reported being satisfied with program overall, equipment performance, energy savings on their bill, and ONG as their natural gas service provider.

1.1.3.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

1.1.4 Heating System Program

1.1.4.1 Conclusions

- A contractor or installation company was the most common method that program participants learned of the program according to survey responses.
- Participants were most satisfied with the equipment performance (96%), ONG as their service provide (92%), and the program overall (96%).

1.1.4.2 Recommendation

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

1.1.5 Water Conservation Kits

1.1.5.1 Conclusions

- The ONG website and bill inserts were the most common way of learning of the water conservation kits, according to the participant survey.
- Overall, satisfaction with the kit and ONG services was high.

1.1.5.2 Recommendations

- Continue to send email blasts promoting the water conservation kits in waves throughout the year to control the number of requests received.
- Track any instances of customers who requested a kit but have not yet received the kit through the program year.

1.1.6 New Home Program

1.1.6.1 Conclusions

- The New Home Program incentives influence respondents' decision to construct energy efficient homes.
- Program participation has positively impacted respondents' building practices and sales.

1.1.7 Custom Commercial Program

1.1.7.1 Conclusions

- Most Custom component participants surveyed were satisfied with the program overall, how thoroughly staff addressed questions/concerns, the facility assessment or services from the program staff, the time it took to receive the rebate, and the time it took for program staff to answer their questions/concerns.

1.1.7.2 Recommendations

- Increase marketing activities and explore new opportunities to increase awareness of the Custom Commercial programs (e.g., social media campaigns that target C&I businesses).
- Increase communication and networking opportunities with contractors to keep them up to date with the activities and progress of the Custom Commercial programs.

2 General Methodology

This chapter details general impact evaluation methodologies by program-type. This chapter will present full descriptions of:

- Glossary of terminology;
- Sampling methodologies; and
- Process evaluation methodologies.

The following sections contain a glossary of terminology used throughout the report.

2.1 Glossary of Terminology

- Ex-ante – Forecasted savings used for program and portfolio planning purposes.
- Ex-post – Savings estimates reported by an evaluator after the energy impact evaluation has been completed.
- Deemed Savings – An estimate of an energy savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources and analytical methods that are widely accepted for the measure and purpose and (b) are applicable to the situation being evaluated. (e.g., assuming 17 therms savings for a low-flow showerhead).
- Gross Savings – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.
- Gross Realization Rate – Ratio of Ex-Post Savings / Ex-ante Savings (e.g., If the Evaluator verifies 15 therms per showerhead, Gross Realization Rate = 15/17 = 86%).
- Free-Rider – A program participant who would have implemented the program measure or practice in the absence of the program. Free riders can be total, partial, or deferred.
- Net Savings – The total change in load that is attributable to an energy efficiency program. This change in load may include, implicitly or explicitly, the effects of free drivers, free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption. (e.g., if Free-Ridership for low-flow showerheads = 50%, net savings = 15 therms * 50% = 8 therms).
- Net-to-Gross-Ratio (NTGR) = 1 – Free-Ridership %, also defined as Net Savings / Gross Savings
- Ex-ante Net Savings = Ex-ante Gross Savings * (1 – Ex-ante Free-Ridership Rate)
- Ex-post Net Savings = Ex-post Gross Savings * (1 – Ex-post Free-Ridership Rate)
- Net Realization Rate = Ex-post Net Savings / Ex-ante Net Savings

- Effective Useful Life (EUL) – An estimate of the median number of years that the efficiency measures installed under a program are still in place and operable.
- Gross Lifetime Therms = Ex-post Net Savings * EUL

2.2 Sampling Methodology

This section explains the sampling methodology used for evaluating ONG's energy efficiency programs during PY2023.

2.2.1 Clothes Dryer Program

The Evaluator used simple and stratified random sampling strategies to evaluate the programs. The sampling strategies must achieve 10% relative precision at a 90% confidence level (90/10). The required sample size to meet 90/10 requirements is calculated by using the coefficient of variation of savings. The coefficient of variation (CV) is defined as:

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

Where (*x)* represents participant energy savings in each stratum. The required sample size is estimated at:

$$n_0 = \left(\frac{1.645 * CV}{RP}\right)^2$$

Where,

1.645 = Z-score for 90% confidence interval in a normal distribution

CV = Coefficient of variation

RP = Relative precision, 10%

The Evaluator, wherever applicable, used verified clothes dryer model numbers to verify each sample point in the Clothes Dryer Program. Savings calculations for a given dryer use the verified CEF, size, and fuel type. In the residential stratum of the impact evaluation, the Evaluator assumed that all installed gas dryers replaced an electric dyer. The fuel switching status of an installed dryer in the residential stratum was incorporated in the net-to-gross evaluation.

The Clothes Dryer Program's stratified random sample size is shown in Table 2-1.

Table 2-1 Ex-Ante Therm Savings for Clothes Dryer Program Sampled Projects

Stratum	*Sample Size*	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-Ante Savings in Sample*
New Construction	0	0	0	N/A
Residential	2,085	70,269	70,269	100%
Total	**2,085**	**70,269**	**70,269**	**100%**

2.2.2 Range Program

The Range Program sampling methodology is like the methodology described in Section 2.2.1.

In the residential and commercial strata of the impact evaluation, the Evaluator assumed all installed gas ranges replaced an electric range. The Evaluator assumed no fuel switching in the new construction stratum because all the ranges in this stratum are newly installed and do not replace a previous range. The fuel switching status of an installed range in the residential and commercial strata was incorporated in the net-to-gross evaluation.

The Range Program random sample is shown in Table 2-2.

Table 2-2 Ex-Ante Therm Savings for Range Program Sampled Projects

Stratum	*Sample Size*	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-Ante Savings in Sample*
Commercial	5	27	27	100%
New Construction	1,050	5,568	5,568	100%
Residential	1,092	5,791	5,791	100%
Total	**2,147**	**11,386**	**11,386**	**100%**

2.2.3 Water Heater Program

The sampling methodology for the Water Heater Program is the same as the methodology described in Section 2.2.1.

The Evaluator used survey responses and verified water heater model numbers. The Evaluator determined the storage volume, energy factor (EF), and fuel type using the verified modeled numbers. Saving calculations were completed using the verified storage volume, EF, fuel type, survey responses and a participant's zip code.

The Water Heater Program random sample is shown in Table 2-3.

Table 2-3 Ex-Ante Therm Savings for Water Heater Program Sampled Projects

Stratum	*Sample Size*	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-Ante Savings in Sample*
Condensing Water Heater	2	84	74	29%
Electric to Gas Water Heater	4	666	552	7%
Gas to Gas Water Heater	0	0	0	N/A
Tankless Water Heater	1,101	49,479	39,058	55%
Electric to Gas Tankless Water Heater	5	832	833	4%
Total	**1,112**	**51,061**	**40,516**	**43%**

2.2.4 Heating System Program

The sampling methodology for the Heating System Program is the same as the methodology described in Section 2.2.1.

The Evaluator used survey responses and verified heating equipment model numbers. Heating equipment model numbers were verified using the Air Conditioning, Heating, and Refrigeration Institute (AHRI) database and manufacture specification sheets. The Evaluator found the heating capacity, annual fuel utilization efficiency (AFUE), and fuel type using the AHRI database and manufacturer specification sheets. Saving calculations were completed using the verified capacity (equipment input/output BTUh), AFUE, fuel type, survey responses and a participant's zip code.

The Heating System Program random sample size is shown in Table 2-4.

Table 2-4 Ex-Ante Therm Savings for Heating System Program Sampled Projects

Stratum	*Sample Size*	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-Ante Savings in Sample*
Commercial	70	7,254	7,254	100%
Evaluated in New Home	0	0	0	N/A
New Construction	4,111	271,244	274,081	99%
Residential	63	11,724	341,359	3%
Total	**4,244**	**290,222**	**622,694**	**47%**

2.2.5 Low-Income Assistance Program

The Evaluator performed a census review for the Low-Income Assistance Program; no sampling strategies were used in this program.

2.2.6 Water Conservation Kit Program

The sampling methodology for the Water Conservation Kit Program is the same as the methodology described in Section 2.2.1.

The Evaluator used participant survey responses to calculate energy savings.

The Water Conservation Kit Program random sample size is shown in Table 2-5.

Table 2-5 Ex-Ante Therm Savings for Water Conservation Kit Program Sampled Projects

Equipment Type	*Sample Size*	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
Conservation Kits	**251**	**2,806**	**69,025**	**4.1%**

2.2.7 New Home Program

The sampling methodology for the New Home Program is the same as the methodology described in Section 2.2.1.

The Evaluator used energy simulation models to calculate energy savings for each sample point. The New Home Program random sample is shown in Table 2-6.

Table 2-6 Ex-Ante Therm Savings for New Home Program Sampled Projects

Sample Size	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
68	**15,148**	**875,224**	**2%**

2.2.8 Custom Commercial Program

The estimation of savings for the program is based on a ratio estimation procedure that allows the measured and verified sample to meet or exceed statistical precisions requirements and to accurately explain the annual ex-post gross savings for all completed projects. The Evaluator selected a sample with a sufficient number of projects to estimate the population ex-post gross therm savings with 10% relative precision at the 90% confidence level. The actual relative precision for the program is 9.92%.

The sample selection is from the population of projects with completion dates during PY2023. Table 2-7 and Table 2-8 show the project population from which the sample was drawn, for the Custom component and the Direct Install component. These samples fell into four or five energy savings strata; strata boundaries were based on ex-ante therm savings. Note that in this table, presentation of population statistics used for sample design, including coefficients of variation, are calculated based on final program data.

Table 2-7 Population Statistics Used for Custom Component Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*SEM*	***Totals***
Strata boundaries (Therm)	<5,000	5,000 - 9,999	10,000-19,999	20,000 - 54,999	55,000 ≥	Census	
Population Size	35	4	7	7	1	66	
Total Therm savings	50,982	28,903	93,928	274,057	77,565	101,239	**626,675**
Average Therm Savings	1,457	7,226	13,418	13,418	77,565	1,534	**23,392**
Standard deviation of Therm savings	1,072	769	2,391	10,390	0	1,308	
Coefficient of variation	0.74	0.11	0.18	0.27	0.00	0.85	
Final design sample	9	1	3	3	1	66	**83**

Table 2-8 Population Statistics Used for Direct Install Component Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	***Totals***
Strata boundaries (Therm)	<5,000	5,000 - 9,999	10,000 - 29,999	30,000 - 49,999	50,000 ≥	
Population Size	3	21	22	13	4	**63**
Total Therm savings	12,222	215,989	449,908	469,772	230,942	**1,378,833**
Average Therm Savings	4,074	10,285	20,450	36,136	57,736	**25,736**
Standard deviation of Therm savings	444	2,852	4,387	6,042	6,884	
Coefficient of variation	0.11	0.28	6.00	0.17	0.12	
Final design sample	1	5	6	4	3	**19**

The Custom component stratified sample shown in Table 2-9 resulted in samples that total 36% of the total ex-ante therm savings.

Table 2-9 Ex-Ante Therm Savings for Custom Component Sampled Projects by Stratum

Stratum	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
SEM	101,239	101,239	100%
Custom 5	77,565	77,565	100%
Custom 4	125,726	274,057	46%
Custom 3	6,546	93,928	7%
Custom 2	6,546	28,903	23%
Custom 1	11,160	50,982	22%
Total	**328,783**	**626,675**	**52%**

The Direct Install component stratified sample shown in Table 2-10 resulted in samples that total 38% of the total ex-ante therm savings.

Table 2-10 Ex-Ante Therm Savings for Direct Install Component Sampled Projects by Stratum

Stratum	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
DI 5	176,783	230,942	77%
DI 4	147,844	469,772	31%
DI 3	124,602	449,908	28%
DI 2	48,143	215,989	22%
DI 1	3,698	12,222	30%
Total	**501,070**	**1,378,833**	**36%**

2.3 Process Evaluation Approach and Data Collection

This section describes the process evaluation approach and data collection for each of the programs.

2.3.1 Residential Programs

The process evaluation focused on survey responses by program participants. The survey sample size for the residential programs is summarized by program in Table 2-11.

Table 2-11 Number of Participant Surveys Completed for Residential Programs

Program	*Number of Participant Surveys Completed*
Clothes Dryer	74
Range	49
Water Heater	53
Heating System	74
Water Conservation Kit	234
New Home	5

In addition to the participant survey responses, the Evaluator completed 8 surveys with residential contractors that were involved with the installation of water heaters and heating systems.

2.3.2 Low-Income Assistance Program

No process evaluation was performed in PY2023 for the Low-Income Assistance Program. As part of program implementation, ONG partners with electric utility service providers that share ONG's service territory. ONG provides the necessary funding for dual-fuel measure installation; however, it is assumed that low-income program participants do not have a great deal of perspective or experience with the program with ONG as program administrator.

2.3.3 Custom Commercial Program

The process evaluation focused on survey responses by program participants. The survey sample size for the Custom Commercial Program is summarized in Table 2-12.

Table 2-12 Number of Participant Surveys Completed for Custom Commercial Program

Program Component	*Number of Participant Surveys Completed*
Custom	9
Direct Install	1

In addition to the participant survey, the Evaluator completed one survey with a trade ally involved with the installation of energy efficient equipment for the Custom component of the Program.

3 Clothes Dryer Program

The Clothes Dryer Program was designed to provide financial incentives to encourage residential customers to install energy efficient natural gas clothes dryers.

3.1 Program Description

The Clothes Dryer Program provides mail-in rebates for energy efficient natural gas clothes dryers. Table 3-1 summarizes the incentives provided through the program.

Table 3-1 Clothes Dryer Program Incentives

Equipment Type	*Rebate Amount*
Clothes Dryer	$400
ENERGY STAR® Clothes Dryer	$450
Installation and/or addition of natural gas piping	Up to $100

Table 3-2 shows the number of rebated appliances and ex-ante therm savings for the Clothes Dryer Program.

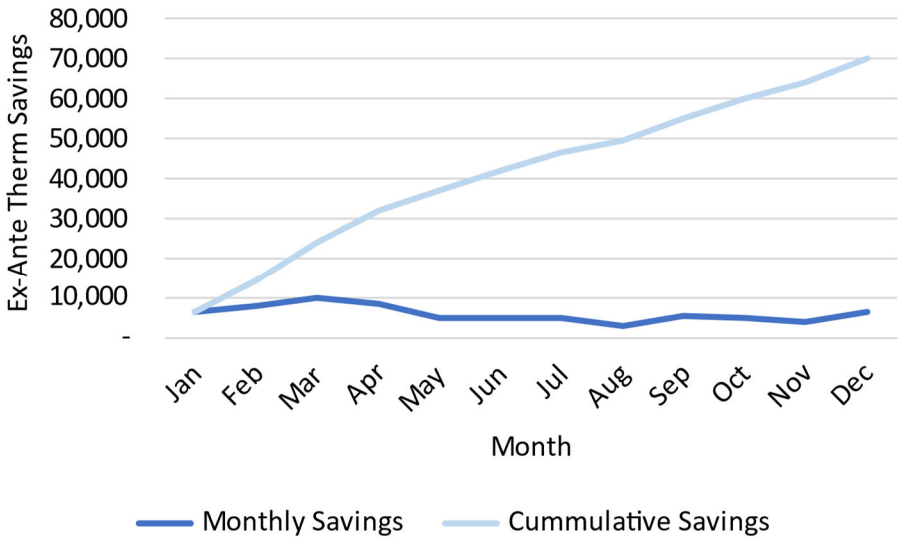
Table 3-2 Ex-Ante Therm Savings of Clothes Dryer Program by Stratum

Stratum	*Number of Clothes Dryers*	*Ex-Ante Therm Savings per unit*	*Ex-Ante Therm Savings*
New Construction	0	N/A	0
Residential	2085	33.7	70,269
Total	2,085	33.7	70,269

3.2 Program Trends in PY2023

Figure 3-1 plots the Clothes Dryer Program ex-ante therm savings by project completion month.

Figure 3-1 Clothes Dryer Program Ex-Ante Therm Savings by Project Completion



3.3 Impact Evaluation

This section describes the gross impact evaluation of the Clothes Dryer Program.

3.3.1 Gross Impact Evaluation

The estimated gross energy impacts were found using the assumptions provided in the Projected Incentive Calculation workbook provided by ONG. The provided workbook assumed that 4,500 of 5,000 predicted installed dryers had a standard energy rating and 500 installed dryers were ENERGY STAR®-rated. A standard energy rating dryer was estimated to save 33 therms and an ENERGY STAR®-rated was estimated to save 42 therms. The ex-ante unit energy savings was predicted to be:

$$therm_{ex\ ante\ savings} = \left(\left(\frac{4{,}500}{5{,}000}\right) \times 33\ therm + \left(\frac{500}{5{,}000}\right) \times 42\ therms\right)$$

$$therm_{ex\ ante\ savings} = 34\ therms$$

3.3.1.1 Review of Documentation

The combined energy factor (CEF), size, and fuel type were verified wherever possible using clothes dryer model numbers found in the program database. The Evaluator verified clothes dryer model numbers with the US Department of Energy Appliance and Equipment Standard Program Clothes Dryer database, the Energy Star Certified Clothes Dryer database, and manufacturers' websites.

3.3.1.2 Estimating Ex-Post Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the gross energy impact calculation depended on the types of measures installed. Where applicable, deemed values and algorithms from the

Pennsylvania TRM (PA TRM) were used to calculate verified gross energy impacts. The Arkansas TRM (AR TRM) does not include clothes dryers saving protocols.

To determine the quantity of measures rebated and installed, the Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

3.3.1.3 Method for Analyzing Savings from Clothes Dryer Measures

The clothes dryer savings calculation in the PA TRM is based on the ENERGY STAR Appliance Calculator.

The savings is calculated for two scenarios: with and without fuel switching.

The savings calculation with fuel switching is shown below:

$$therm_{ex\ post\ savings} = therm_{electric\ savings} - therm_{gas\ increase}$$

$$therm_{electric\ savings} = (kWh_{base} - kWh_{gas)} \times (\frac{kWh\ to\ Btu\ conversion\ factor}{Btu\ to\ therm\ conversion\ factor}) \times$$

$source\ to\ site\ ratio$, *electric to gas*

$therm_{gas\ increase}$ = $\Delta MMBtu$, Weighted average gas fuel increase ×

$(therm\ to\ MMBtu\ conversion\ factor) \times source\ to\ site\ ratio$, *gas to gas*

Where:

$kWh_{base} = 597\ kWh$

$kWh_{gas} = 30\ kWh$

$kWh\ to\ Btu\ conversion\ factor = \frac{1\ kWh}{3{,}214.14\ Btu}$

$Btu\ to\ therm\ conversion\ factor = \frac{100{,}00\ Btu}{1\ Therm}$

Source to site ratio, electric to gas = 3.36

$therm\ to\ MMBtu\ conversion\ factor$ *= 10 therm/MMBtu*

$\Delta MMBtu$, *Weighted average gas fuel increase =2.04*

The savings calculation without fuel switching is shown below:

$$therm_{ex\ post\ savings} = therm_{baseline\ gas\ dryer} - therm_{new\ gas\ dryer}$$

$$therm_{ex\ post\ savings} = Cycles_{wash} \times \%_{dry/wash} \times Load_{avg} \times \left(\frac{1}{CEF_{baseline\ gas\ dryer}} - \frac{1}{CEF_{new\ gas\ dryer}}\right) \times \left(\frac{kWh\ to\ Btu\ conversion\ factor}{Btu\ to\ therm\ conversion\ factor}\right) \times source\ to\ site\ ratio,\ \textit{gas to gas}$$

Where:

$Cycles_{wash} = 250\ cycles/yr$

$\%_{dry/wash} = 95\%$

$Load_{avg} = 8.45\ lbs\ (standard\ dryer), 3\ lbs\ (compact\ dryer)$

$CEF_{baseline\ gas\ dryer}$ = *3.3 lbs./kWh or verified with model number*

$CEF_{new\ gas\ dryer}$ = *verified with model number*

kWh to Btu conversion factor = 3,412.14 Btu/kWh

Btu to therm conversion factor = 100,000 $Btu/therm$

Source to site ratio, gas to gas = 1.09

3.3.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Clothes Dryer Program are summarized below by stratum.

Table 3-3 Ex-Ante and Ex-Post Annual Therm Savings for Clothes Dryer Program by Stratum

Stratum	*Percent of Baseline Clothes Dryers which use Electricity*	*Ex-Ante Gross Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
New Construction	0%	0	0	N/A
Residential	100%	70,269	85,530	122%
Total	100%	70,269	85,530	122%

There are several factors affecting realized savings. In the residential stratum, the PA TRM was used to calculate ex-post savings instead of using the provided ex-ante savings. Furthermore, it was assumed that all participants in the residential stratum performed fuel-switching when installing the new clothes dryer. The actual impact of fuel switching is accounted for in the net-to-gross evaluation.

Dryers installed in the new construction stratum only save energy when their CEF is greater than the baseline CEF. There are no savings from fuel switching in this stratum because these dryers are all newly installed.

3.3.3 Net Impact Evaluation

The net savings analysis is used to determine what part of the gross energy savings achieved by program participants can be attributed to the effects of the program. Furthermore, the analysis also accounts for the effects of fuel switching on energy savings. The net savings attributable to program participants were the gross savings less a combination of program participant and participating retailer free ridership. The Evaluator estimated free ridership through a survey of program participants and participating retailers.

Program participant survey respondents were asked a series of questions designed to elicit information regarding the following factors:

- Plans and intentions to implement the efficiency measure;
- The program influence on the decision to implement the efficiency measure;
- The program's influence on the timing of the measure installation.

3.3.3.1 Plans and Intentions

An indicator variable was developed based on responses to the survey question on plans and intentions. The variable corresponds to financial ability. Respondents were considered to have not been financially able to install the efficient equipment if they answered "no" to the question below:

- FR1: Would you have been financially able to purchase the [MEASURE] if there was not a rebate available through the [UTILITY_SHORT] program?

A second indicator variable was related to whether the customer had plans to implement the efficiency measure. Respondents were considered to have had plan if they answered "yes" to the following questions:

- FR2: Before learning about the [PROGRAM], did you have plans to install a new [MEASURE]?

3.3.3.2 Program Influence

Participants were asked a question about the direct influence of the program on their decision to implement the energy efficiency measure. Specifically, participants were asked:

- FR3: On a scale from one to five, where one means "not at all likely" and five means "extremely likely" how likely is it that you would have purchased and installed the same [MEASURE] that you received rebate for through participating program if the rebate was not available?

Respondents that rated their likelihood of purchasing and installing the same measure a 4 or 5 were not considered to have been influenced by the program.

3.3.3.3 Program Influence on Project Timing

To account for deferred free ridership due to the program's effect on the timing of the implementation of the efficiency measure, respondents were asked the following two questions:

- FR4a: Did you install the [MEASURE] sooner than you otherwise would have because of the rebate available through the [UTILTIY] program?
- FR4b: When would you have installed the [MEASURE] if rebates through the [UTILITY] program were not available?

Based on the responses to those questions, a timing score was determined as shown in Table 3-4.

Table 3-4 Impact on Timing Score

Timing Category	*Timing Category*
Would have still installed within one year	N
Would have still installed one year or more later	Y

The three sets of rules just described were used to construct four different indicator variables that addressed free ridership behavior. For each respondent, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were sixteen applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 3-5 shows these values.

Table 3-5 Appliances Participant Free Ridership Scoring

Indicator Variables				*Free Ridership Score*
Had Financial ability to install Measure without [Program Name]?	*Had Plans to install Measure without [Program Name]?*	*[Program Name] had influence on Decision to install Measure?*	*[Program Name] had effect on timing of Measure installation?*	
Y	N	N	N	100%
Y	N	N	Y	67%
Y	N	Y	N	67%
Y	N	Y	Y	67%
Y	Y	N	N	33%
Y	Y	N	Y	33%
Y	Y	Y	N	33%
Y	Y	Y	Y	0%
N	N	N	N	0%
N	N	N	Y	0%
N	N	Y	N	0%
N	N	Y	Y	0%
N	Y	N	N	0%
N	Y	N	Y	0%
N	Y	Y	N	0%
N	Y	Y	Y	0%

3.3.3.4 Program Influence on Appliance Sales

Participating retailers were asked a question about the direct influence of the program on their sales of energy efficient appliances. Specifically, participants were asked:

- FR5: Has the presence of the program increased the amount of [MEASURE] that you sell?

3.3.3.5 Rebate Effect on Existing Inventory Levels

Participating retailers were asked a question about the direct influence of the rebate on their existing inventory of energy efficient appliances. Specifically, participants were asked:

- FR6: Would you have stocked the same amount of [MEASURE] without the [PROGRAM] rebate?

3.3.3.6 Rebate Effect on Future Inventory Levels

Participating retailers were asked a question about the direct influence of the rebate on their existing inventory of energy efficient appliances. Specifically, participants were asked:

- FR7: Has the [PROGRAM] rebate influenced what you will stock in the future?

The three sets of rules just described were used to construct three different indicator variables that addressed retailer free ridership behavior. For each respondent, a free ridership value was assigned based on the combination of variables. With the three indicator variables, there were eight applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 3-6 shows these values.

Table 3-6 Appliances Retailer Free Ridership Scoring

Indicator Variables			*Free Ridership Score*
Has program increased the amount of [Appliance Type] sold?	*Would have stocked the same amount of [Appliance Type] without the rebate?*	*Has the rebate influenced [Appliance Type] that will be stocked in the future?*	
Y	N	Y	0%
Y	N	N	0%
Y	Y	Y	25%
Y	Y	N	50%
N	N	Y	50%
N	N	N	50%
N	Y	Y	100%
N	Y	N	100%

Lastly, the free ridership score obtained from Table 3-5 and Table 3-6 were equally averaged to calculate program-level free ridership.

3.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts for the program.

Table 3-7 summarizes the results of the estimation of free ridership. Free ridership was low for the program because there was a low incidence of participant responses indicating a high likelihood of installing energy efficient equipment without a rebate, as well as a near zero incidence of retailer responses indicating a high likelihood of stocking energy efficient equipment without a rebate.

Table 3-7 Clothes Dryer Program Free Ridership Factor

Equipment Type	*FR Factor*
Clothes Dryer	31%

Table 3-8 summarizes the gross and net ex-post therm savings for the Clothes Dryer Program.

Table 3-8 Clothes Dryer Program Summary of Gross and Net Ex-Post Therm Savings

Equipment Type	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
Clothes Dryer	**85,530**	**26,160**	**59,370**	**69%**

3.4 Process Evaluation

The following section presents the results of the process evaluation for the Clothes Dryer Program.

3.4.1 Participant Survey

The Evaluator surveyed 74 participants in the Clothes Dryer Program. These surveys were used to collect data on the participants' experience with the program including sources of program awareness, motivations for participating, and satisfaction with the program. Further, the Evaluator collected demographic information on the respondents during the survey.

3.4.1.1 Respondent Demographics

Table 3-9 outlines respondents' demographic characteristics.

Table 3-9: Respondents' Demographics (n=74)

	%	n
Homeownership		
Own	90.5%	67
Rent	4.1%	3
I don't know	1.4%	1
Prefer not to answer	4.1%	3
Housing type		

	%	n
Single-family home	93.2%	69
Manufactured or mobile home	1.4%	1
Prefer not to answer	5.4%	4
Home age		
Before 1950	4.1%	3
1950 to 1959	9.5%	7
1960 to 1969	5.4%	4
1970 to 1979	14.9%	11
1908 to 1989	18.9%	14
1990 to 1999	13.5%	10
2000 to 2009	9.5%	7
2010 to 2019	10.8%	8
After 2019	2.7%	2
I don't know	8.1%	6
Prefer not to answer	2.7%	2
People in household		
1	14.9%	11
2	47.3%	35
3	14.9%	11
4	5.4%	4
5	6.8%	5
6	5.4%	4
Prefer not to answer	5.41%	4
Age (years)		
18-24	1.4%	1
25-34	4.1%	3
35-49	25.7%	19
50-64	35.1%	26
65 or over	28.4%	21
Prefer not to answer	5.4%	4
Household status		
Single, no children	21.6%	16
Single, with children	9.5%	7
Married, no children	36.5%	27
Married, with children at home	24.3%	18
Other	1.4%	1
I don't know	1.4%	1
Prefer not to answer	5.4%	4
Household income		
Less than $20,000	1.3%	1
$20,000 to less than $40,000	6.4%	5
$40,000 to less than $60,000	7.7%	6
$60,000 to less than $80,000	11.5%	9
$80,000 to less than $100,000	11.5%	9
$100,000 to less than $150,000	10.3%	8
$150,000 to less than $200,000	3.9%	3
$200,000 or more	6.4%	5
I don't know	2.6%	2
Prefer not to answer	38.5%	30
Race/Ethnicity		

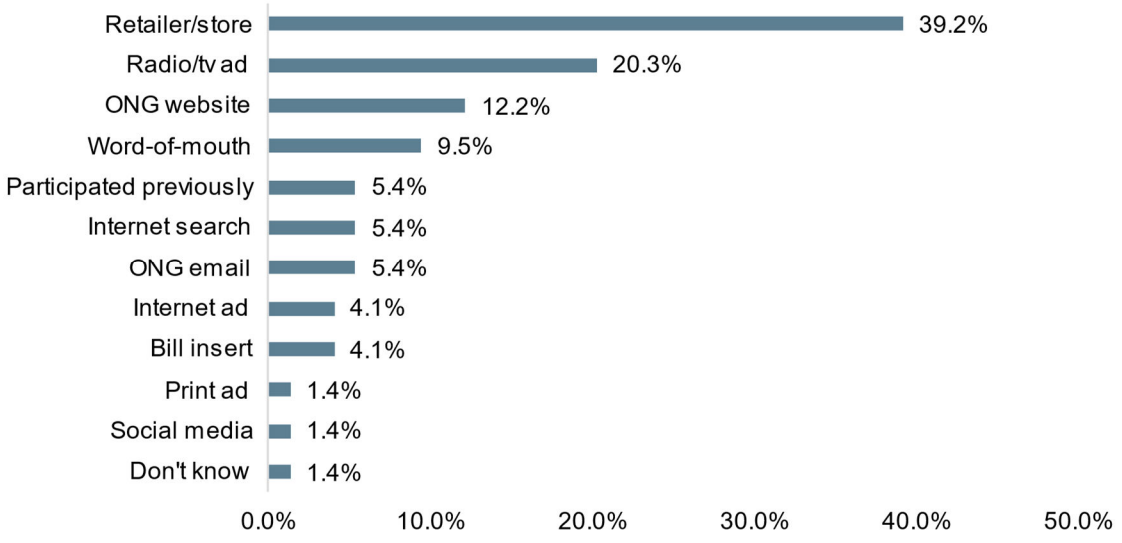
	%	n
White/Caucasian	78.4%	58
Hispanic/Latino	2.7%	2
Black/African American	2.7%	2
Asian/Pacific Islander	0.0%	0
Mixed Race	0.0%	0
Native American	8.1%	6
I don't know	1.4%	1
Education level		
High school or GED equivalent	13.5%	10
Some college	17.6%	13
Associate's degree	10.8%	8
Bachelor's college degree	35.1%	26
Master's degree	9.5%	7
Professional degree	2.7%	2
Doctorate	1.4%	1
Prefer not to answer	9.5%	7

3.4.1.2 Program Awareness and Participation

More than half of the respondents had never participated in an ONG rebate program before (60.8%, n=45). Among the respondents who had participated in other ONG programs (n=29), all had received rebates for another appliance such as furnace, range, water heater, and other dryers.

Respondents learned about the dryer rebates through a variety of avenues (Figure 3-2).

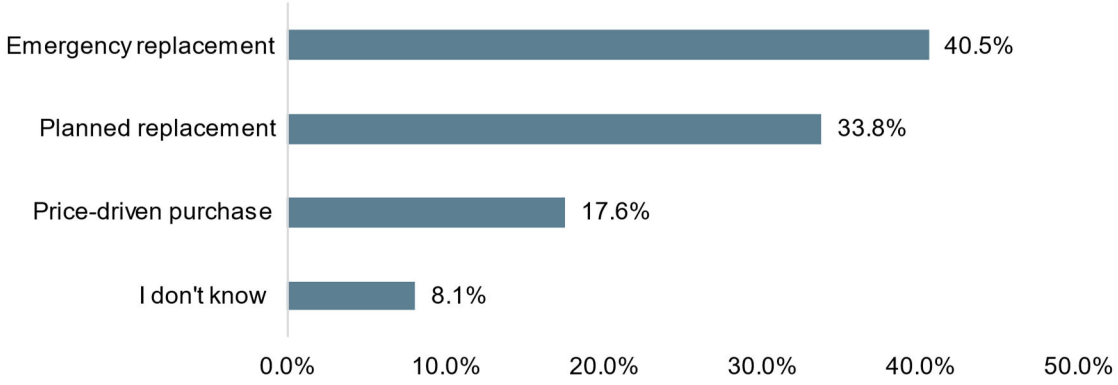
Figure 3-2: Program Awareness (n=74)



There were a variety of reasons for whether or not respondents planned to purchase a dryer (Figure 3-3). Less than half of respondents were replacing their dryer in response

to an emergency (40.5%, n=30) and one-third had been planning to replace their dryer for some time (33.8%, n=25). Less than half of respondents replaced a working dryer (46.0%, n=34). Old dryers ranged from seven to twenty years old.

Figure 3-3: Replacement Type (n=78)



Twenty-eight respondents indicated they switched to a gas dryer from an electric dryer (n=22) or unknown fuel source dryer (n=7). Most of the respondents who switched from an electric dryer to a gas dryer were satisfied with their new gas dryer (80.9%, n=17).

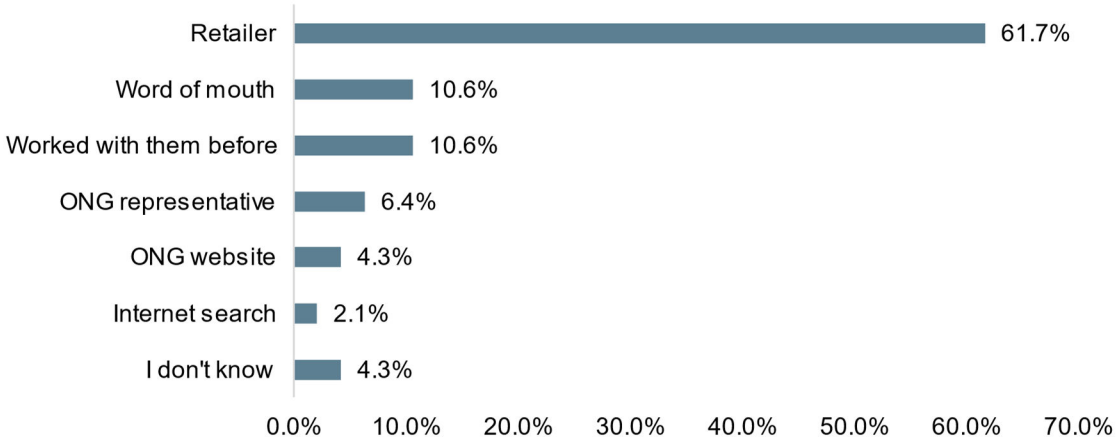
Three-quarters of respondents replaced their clothes washer along with their dryer (77.0%, n=57). Two-thirds of these respondents purchased an ENERGY STAR dryer (66.7%, n=38).

More than half of respondents planned to install a new dryer before learning about the rebate program (60.8%, n=45) and three-quarters (73.0%, n=54) said they would have been able to purchase a dryer without the rebate.

3.4.1.3 Experience with Contractor

More than half of respondents paid someone to install their dryer on their behalf (59.5%, n=44). Respondents most commonly found their contractor from working with them previously or word-of-mouth (Figure 3-4).

Figure 3-4: Contractor Awareness (n=47)



Respondents were generally satisfied with their contractor (Figure 3-5). Contractors and customers valued different dryer characteristics, with contractors most commonly emphasizing energy efficiency and steam settings and customers most commonly valuing whether the unit dries clothes effectively as well as cycle length (Table 3-10).

Figure 3-5: Satisfaction with Contractor (n=47)

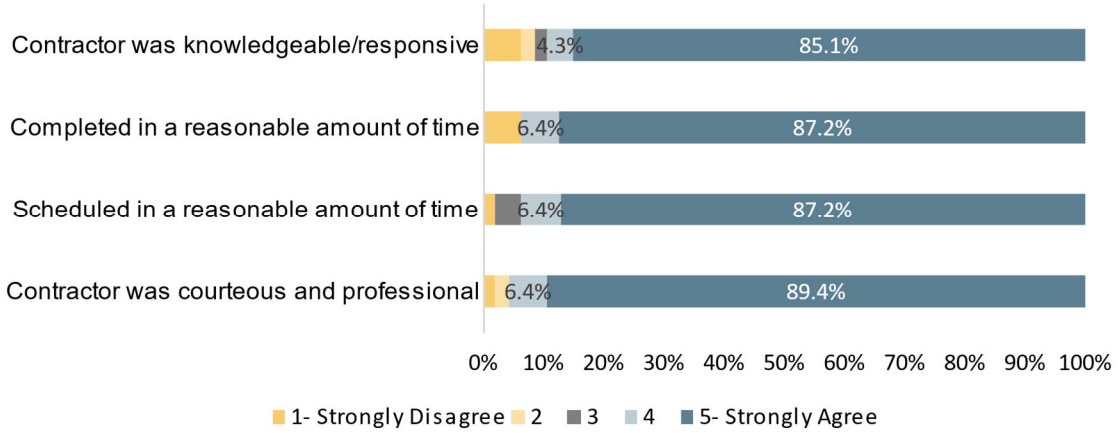


Table 3-10: Characteristics Contractor Emphasized & Customers Valued (n=47)

	Contractors (%)	Customer (%)
Energy efficiency	12.8%	31.9%
Steam setting	10.6%	2.1%
Load capacity	8.5%	0.0%
Rebate eligibility	4.3%	0.0%
Brand reputation	2.1%	0.0%
Good warranty/reliability	2.1%	2.1%
Low price	2.1%	6.4%
Dries clothes effectively	0.0%	25.5%

	Contractors (%)	Customer (%)
Dryer cycle length	0.0%	25.5%
Quiet operation	0.0%	2.1%

3.4.1.4 Program Satisfaction

Respondents were generally satisfied with the program (Figure 3-6). Twelve respondents indicated some level of dissatisfaction with the program; reasons for dissatisfaction included never receiving rebate (n=4), new equipment not better than old equipment (n=3), faulty equipment (n=3), contractor issues (n=1), and lengthy application process (n=1).

About two-thirds of respondents indicated that participation in the program positively impacted their satisfaction with ONG as their service provider (63.5%, n=47) (Figure 3-7). Three-quarters of respondents noted they were extremely or very likely to participate in another ONG program in the future (74.3%, n=55).

Figure 3-6 Program Satisfaction (n=74)

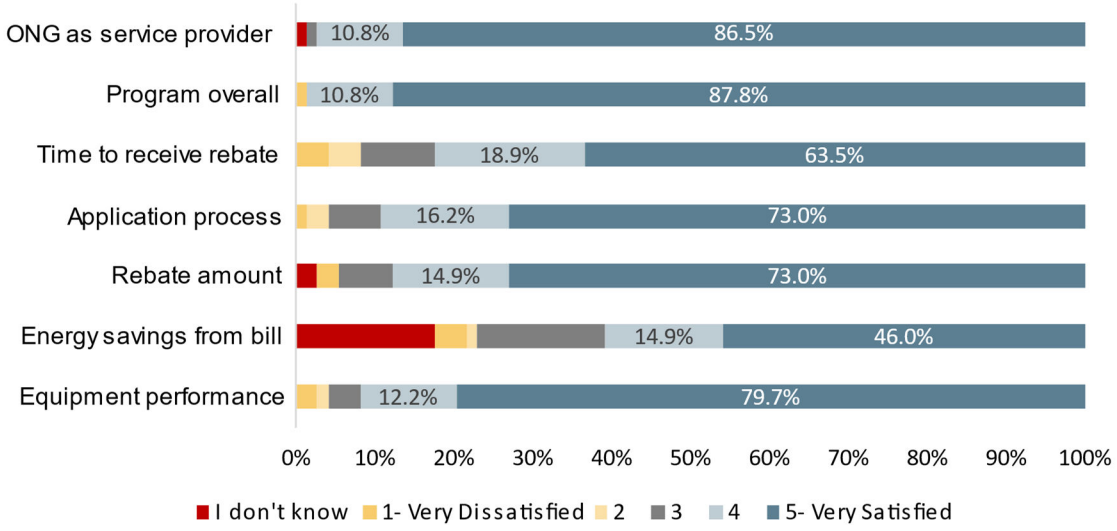
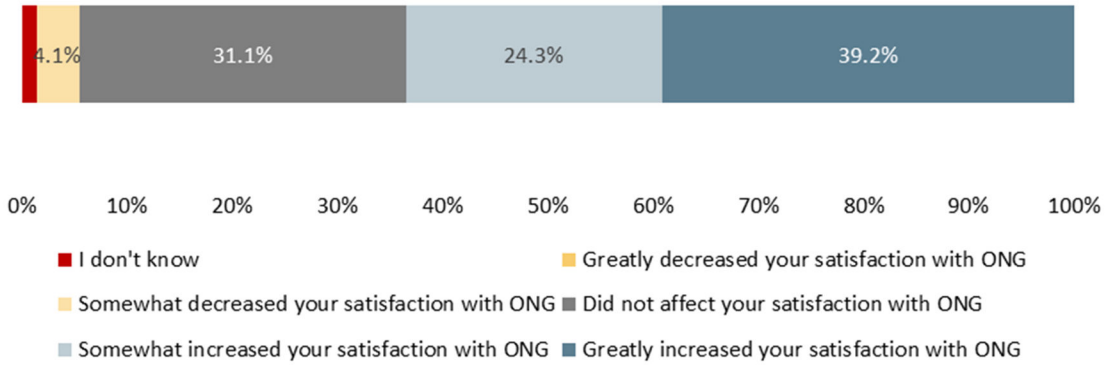


Figure 3-7: Program Impact on Satisfaction with ONG (n=74)



3.5 Conclusions and Recommendations

This section presents conclusions and recommendations for the Clothes Dryer Program.

3.5.1 Conclusions

- Retailers were the primary source of program awareness, with 39% of survey participants learning of the rebate program through a retail store.
- 41% survey respondents reported that the old dryer was broken when they replaced it.
- Twenty-two respondents reported switching from an electric to a gas dryer and the majority of these respondents were satisfied with their gas fueled dryer (n=17).
- Customer feedback was generally very positive about a variety of aspects of the program. Participants were most satisfied with the program overall (99%) and ONG as their service provider (98%).

3.5.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

4 Range Program

The Range Program provides financial incentives to encourage residential customers to install energy efficient natural gas ranges.

4.1 Program Description

The Range Program provides mail-in rebates for energy efficient natural gas ranges. Table 4-1 summarizes the incentives provided through the program.

Table 4-1 Range Program Incentives

Equipment Type	*Rebate Amount*
Range	$100
Installation and/or addition of natural gas piping	Up to $100

Table 4-2 shows the number of rebated appliances and ex-ante therm savings for the Range Program by stratum.

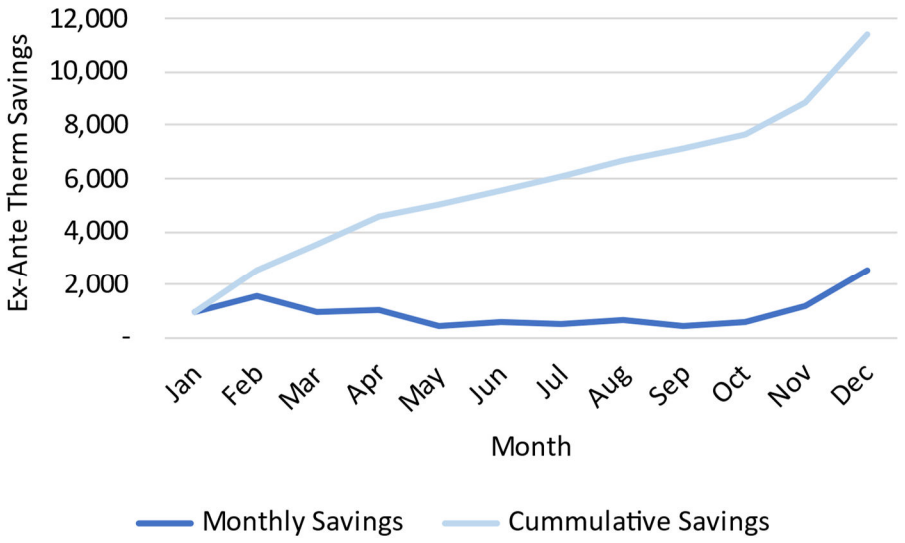
Table 4-2 Ex-Ante Therm Savings of Range Program by Stratum

Stratum	*Number of Ranges*	*Ex-Ante Therm Savings per unit*	*Ex-Ante Therm Savings*
Commercial	5	5.3	27
New Construction	1,050	5.3	5,568
Residential	1,092	5.3	5,791
Total	**2,147**	**5.3**	**11,386**

4.2 Program Trends in PY2023

Figure 4-1 plots the Range Program ex-ante therm savings by project completion month.

Figure 4-1 Range Program Ex-Ante Therm Savings by Project Completion



4.3 Impact Evaluation

This section describes the gross impact evaluation of the Range Program.

4.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Range Program.

The estimated gross energy impacts were found using the assumptions provided in Residential Building Stock Assessment: Metering Study[1]. The planned per-unit savings for gas ranges was 5.3 therms.

4.3.1.1 Review of Documentation

The gas range baseline fuel type is assumed to be an electric range in the residential and commercial strata. The baseline range type in the new construction stratum is assumed to be a gas range.

4.3.1.2 Procedures for Estimating Therm Savings from Measures Installed Through the Program

To determine the quantity of measures rebated and installed, the Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

4.3.1.3 Method for Analyzing Savings from Ranges

Ranges are not typically found in TRMs. Ranges also do not have their efficiency rated by ENERGY STAR®. Savings are only calculable in instances of fuel switching. For the

[1] Ecotope Inc. (2014). *Residential Building Stock Assessment: Metering Study*. Northwest Energy Efficiency Alliance, pp.76-77

gross impact evaluation, it was assumed that all ranges had fuel switching, unless otherwise noted.

The energy savings of a gas range is found by subtracting the energy use of the new range from the energy use of the baseline range.

$$therm_{ex\ post\ savings} = (therm_{basline\ range} - therm_{new\ range})\ X\ \%fuel\ switching$$

$$therm_{basline\ range} = kWh_{site\ requirement} \times \left(\frac{kWh\ to\ Btu\ conversion\ factor}{Btu\ to\ therm\ conversion\ factor}\right) \times (site\ to\ source\ ratio)$$

$$therm_{new\ range} = kWh_{site\ requirement} \times \left(\frac{kWh\ to\ Btu\ conversion\ factor}{Btu\ to\ therm\ conversion\ factor}\right) \times (site\ to\ source\ ratio)$$

Where:

$kWh_{site\ requirement} = 314\ kWh$[2]

kWh to Btu conversion factor = 3412.14 Btu/kWh

Btu to therm conversion factor = 100,000 $Btu/therm$

Site-to-Source ratio, electricity to gas = 3.36

Site-to-Source ratio, gas to gas = 1.09

$\%fuel\ switching =$ *100% residential stratum from survey responses*
0% new construction stratum,
100% commercial stratum.

4.3.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Range Program are summarized by stratum in Table 4-3. All participants in the residential and commercial strata were assumed to have performed fuel-switching. All participants in the new construction stratum were assumed not to have performed fuel-switching.

[2] Ecotope Inc. (2014). *Residential Building Stock Assessment: Metering Study*. Northwest Energy Efficiency Alliance, pp.76-77

Table 4-3 Ex-Ante and Ex-Post Annual Therm Savings for Range Program by Stratum

Stratum	*Percent of Baseline Ranges which use Electricity*	*Ex-Ante Gross Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
Commercial	100%	27	27	100%
New Construction	0%	5,568	-	0%
Residential	100%	5,791	5,791	100%
Total	**51%**	**11,386**	**5,818**	**51%**

The realization rate for this program was lower than expected savings because fuel switching was found to be less than expected. Savings can only be calculated when fuel switching exists. Fuel switching is not present in the new construction stratum.

4.3.3 Net Impact Evaluation

The net savings approach for the Range Program was the same as the approach described in Section 3.3.3.

4.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts for the program.

Table 4-4 summarizes the results of the estimation of free ridership. Free ridership was low for the program because there was a low incidence of participant responses indicating a high likelihood of installing energy efficient equipment without a rebate, as well as a near zero incidence of retailer responses indicating a high likelihood of stocking energy efficient equipment without a rebate.

Table 4-4 Range Program Free Ridership Factor

Equipment Type	*FR Factor*
Gas Range	44%

Table 4-5 summarizes the gross and net ex-post therm savings for the Range Program.

Table 4-5 Range Program Summary of Gross and Net Ex-Post Therm Savings

Equipment Type	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
Range	**5,818**	**2,578**	**3,239**	**56%**

4.4 Process Evaluation

The following section presents the results of the process evaluation for the Range Program.

4.4.1 Participant Survey

The Evaluator surveyed 49 customers who received a rebate for a natural gas range. These surveys were used to collect data on the participants' experience with the program including sources of program awareness, motivations for participating, and satisfaction with the program.

4.4.1.1 Respondent Demographics

Table 4-6 outlines respondents' demographic characteristics.

Table 4-6: Respondents' Demographics (n=49)

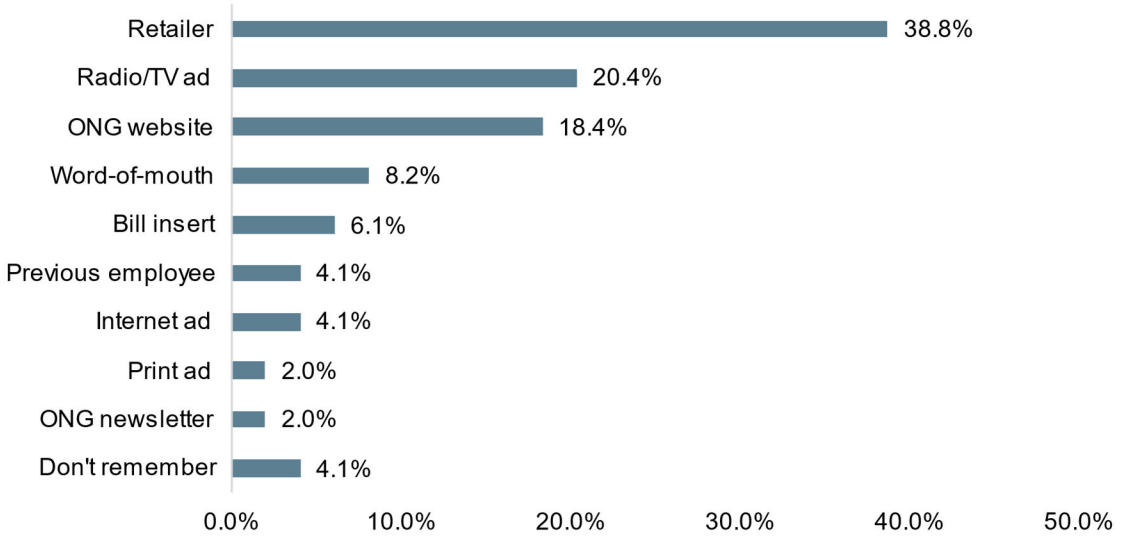
	%	n
Homeownership		
Own	93.9%	46
Rent	2.0%	1
I don't know	0.0%	0
Prefer not to answer	4.1%	2
Housing type		
Single-family home	95.9%	47
Duplex, triplex, townhome, condominium	2.0%	1
Prefer not to answer	2.0%	2
Home age		
Before 1950	4.1%	2
1950 to 1959	10.2%	5
1960 to 1969	10.2%	5
1970 to 1979	16.3%	8
1908 to 1989	14.3%	7
1990 to 1999	10.2%	5
2000 to 2009	18.4%	9
2010 to 2019	6.1%	3
After 2019	4.1%	2
I don't know	4.1%	2
Prefer not to answer	2.0%	1
People in household		
1	16.3%	8
2	49.0%	24
3	6.1%	3
4	14.3%	7
5	6.1%	3
6	4.1%	2
Prefer not to answer	4.1%	2
Age (years)		
25-34	12.2%	6
35-49	24.5%	12
50-64	28.6%	14
65 or over	30.6%	15
I don't know	0.0%	0
Prefer not to answer	4.1%	5
Household status		

	%	n
Single, no children	18.4%	9
Single, with children	0.0%	0
Married, no children	42.9%	21
Married, with children at home	32.7%	16
Prefer not to answer	6.1%	3
Household income		
Less than $20,000	0.0%	0
$20,000 to less than $40,000	6.1%	3
$40,000 to less than $60,000	10.2%	5
$60,000 to less than $80,000	14.3%	7
$80,000 to less than $100,000	14.3%	7
$100,000 to less than $150,000	20.4%	10
$150,000 to less than $200,000	6.1%	3
$200,000 or more	2.0%	1
I don't know	2.0%	1
Prefer not to answer	24.5%	12
Race/Ethnicity		
White/Caucasian	73.5%	36
Hispanic/Latino	8.2%	4
Black/African American	4.1%	2
Asian/Pacific Islander	0.0%	0
Mixed Race	0.0%	0
Native American	4.1%	2
I don't know	0.0%	0
Prefer not to say	10.2%	5
Education level		
Up to 8th grate	0.0%	0
Some high school	0.0%	0
High school or GED equivalent	18.4%	9
Some college	20.4%	10
Associate's degree	10.2%	5
Bachelor's college degree	30.6%	15
Master's degree	10.2%	5
Professional degree	0.0%	0
Doctorate	2.0%	1
Prefer not to answer	8.2%	4

4.4.1.2 Program Awareness and Participation

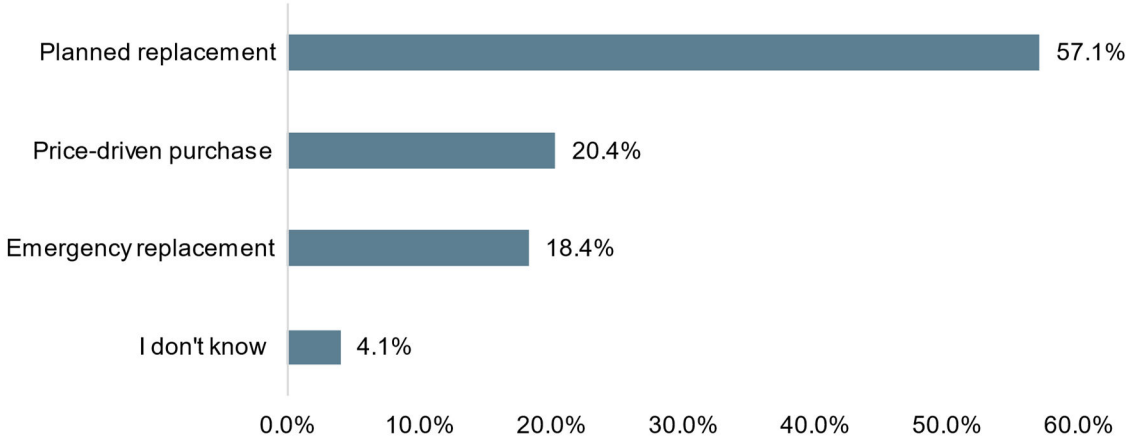
Respondents learned about the range rebates through a variety of sources, most commonly the retailer from which they purchased the range (38.8%, n=19) (Figure 4-2). About one-third of respondents had previously participated in an ONG energy efficiency program (34.7%, n=17).

Figure 4-2: Program Awareness (n=49)



There were a variety of reasons for whether or not respondents planned to purchase a range (Figure 4-7). More than half of respondents were planning to replace their range for some time (57.1%, n=28) and three-quarters of respondents indicated their range had been working when they replaced it (73.5%, n=36). Old ranges ranged from three to over 30 years old.

Table 4-7: Replacement Type (n=49)



More than half of respondents indicate the range was a standalone purchase (57.1%, n=28) (Figure 4-3); while the remaining respondents bought multiple kitchen appliances (42.9%, n=21) (Table 4-8).

Figure 4-3: Replacement Context (n=49)

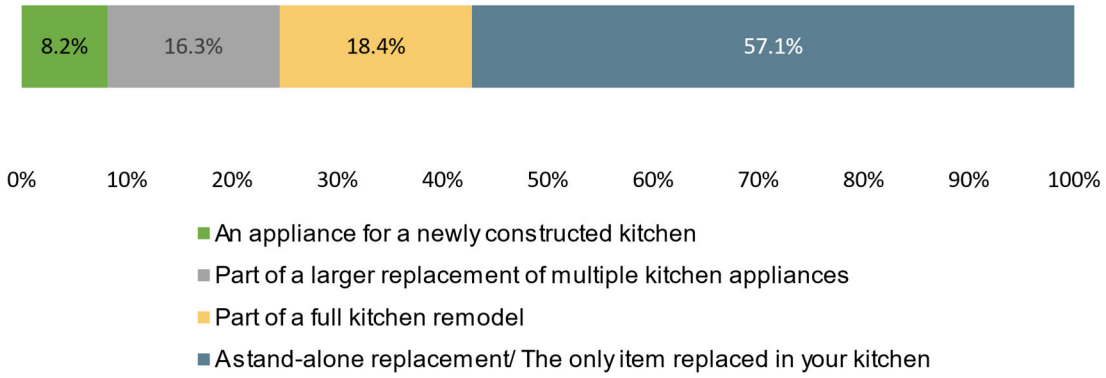


Table 4-8: Other Equipment Purchased (n=21)

	n
Dishwashers	14
Refrigerators	13
Built-in microwave	12
Ventilation hood	3
Sink	1

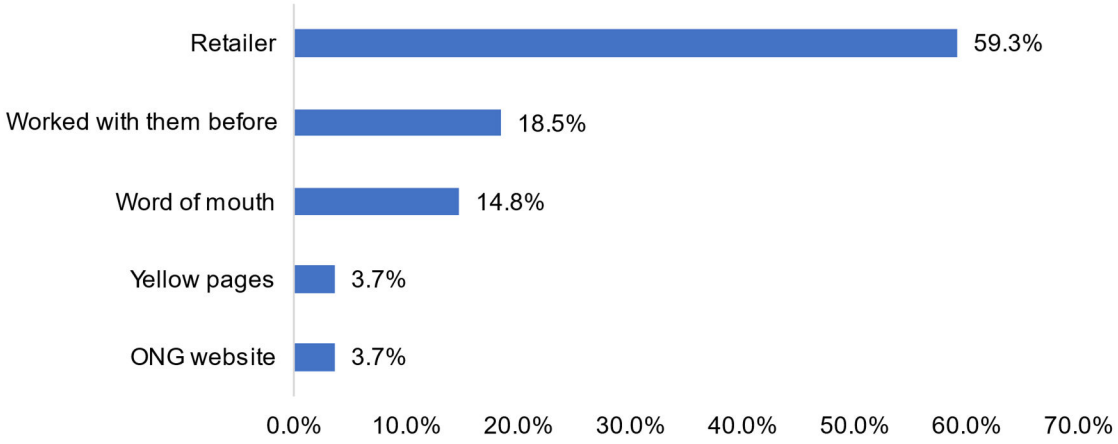
Twenty-six respondents indicated they switched to a gas range from an electric range. Most of the respondents who switched from an electric range to gas range were satisfied with their new gas range (92.3%, n=24).

Most respondents planned to install a new range before learning about the rebate program (87.8%, n=43) and said they would have been able to purchase the range without the rebate (87.8%, n=43).

4.4.1.3 Experience with Contractor

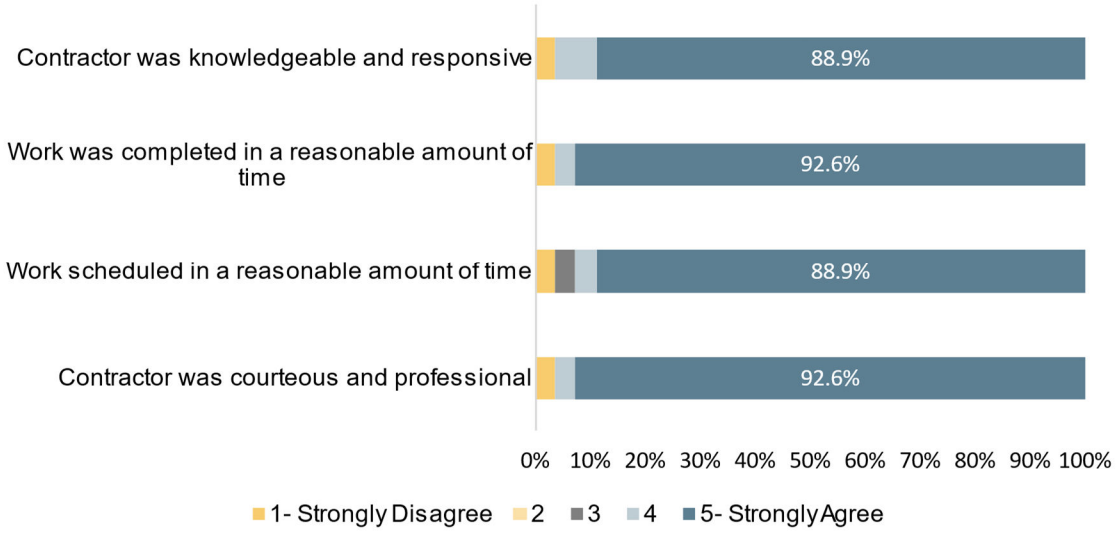
A little more than half of respondents paid someone to install the range on their behalf (55.1%, n=27). Respondents most commonly found their contractor through the same retailer from which they purchased the range (Figure 4-4).

Figure 4-4: Contractor Awareness (n=27)



Respondents were generally satisfied with their contractor (Figure 4-5). Customers were most interested in getting gas ranges because they wanted to cook using gas rather than electricity (48.1%, n=13).

Figure 4-5: Satisfaction with Contractor (n=27)



4.4.1.4 Program Satisfaction

Respondents were generally satisfied with the program (Figure 4-6). The fewest number of respondents reported satisfaction with the energy savings on their bill (40.8%, n=20), however most of the remaining respondents (n=32) did not report dissatisfaction (n=16), but rather did not know if their bill had changed (n=16).

Nine respondents indicated some level of dissatisfaction with the program; reasons for dissatisfaction included no savings on bill (n=3), not receiving their rebate (n=2), took a long time to receive rebate (n=2), rebate insufficient (n=1), and faulty equipment (n=1).

More than half of respondents indicated that participation in the program positively impacted their satisfaction with ONG as their service provider (55.1%, n=27) (Figure 4-7). Three-quarters of respondents noted they were very or extremely likely to participate in another ONG program in the future (73.5%, n=36).

Figure 4-6 Program Satisfaction (n=49)

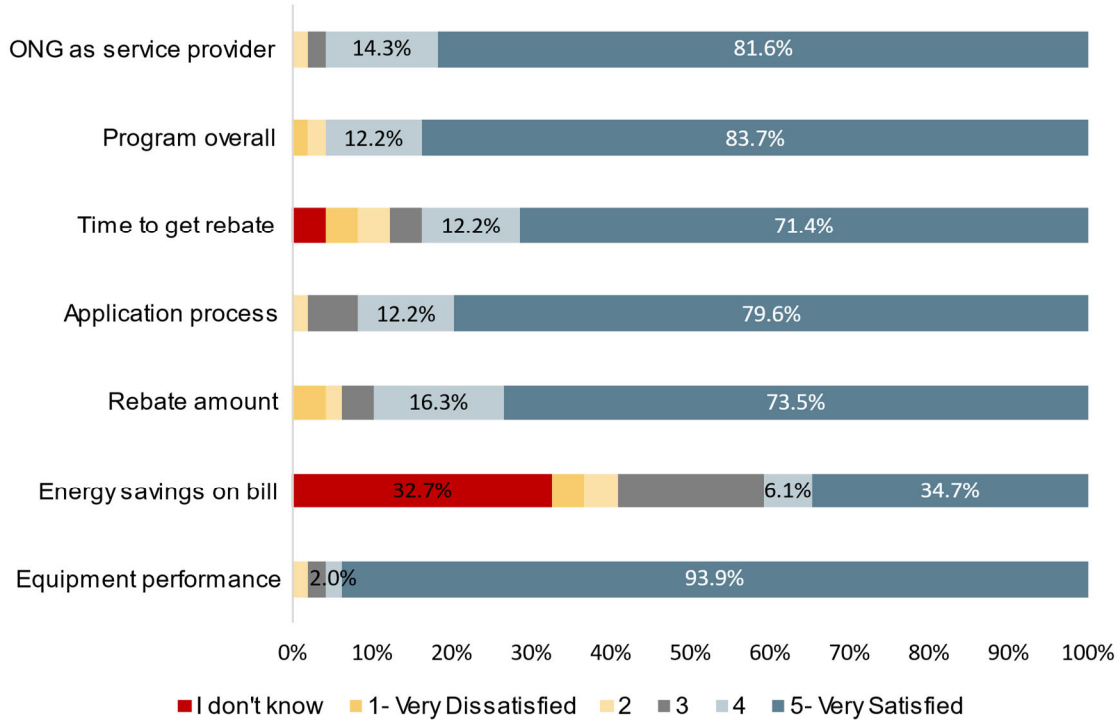
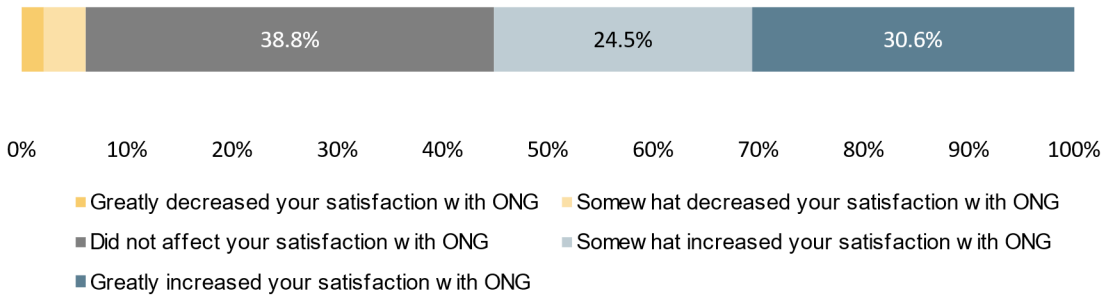


Figure 4-7: Program Impact on Satisfaction with ONG (n=49)



4.5 Conclusions and Recommendations

This section presents conclusions and recommendations for the Range Program.

4.5.1 Conclusions

- 39% percent of participants found out about the rebate program through a retailer. Participants relied on radio and television advertisements (20%) and the ONG website (18%) for rebate program information.
- 57% of survey respondents reported that they planned to replace the range.
- Twenty-six respondents indicated they switched to a gas range from an electric range. Twenty- four of these respondents were satisfied with their new gas range.
- The majority of survey respondents were somewhat or greatly satisfied with ONG as their natural gas service provider and the program overall.

4.5.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

5 Water Heater Program

The Water Heater Program was designed to provide financial incentives to encourage residential customers to install energy efficient natural gas water heaters.

5.1 Program Description

The Water Heater Program provides mail-in rebates for energy efficient natural gas water heaters. Table 5-1 summarizes the incentives provided through the program.

Table 5-1 Water Heater Program Incentives

Equipment Type	*Rebate Amount*
Tankless water heater w/ EF ≥ 0.80	$250
Condensing water heater w/ EF ≥ 0.80	$250
Electric to Natural Gas Water Heater	$850
Electric to Natural Gas Tankless Water Heater w/ EF ≥ 0.80	$1,100

Table 5-2 shows the number of completed projects and ex-ante therm savings for the Water Heater Program by stratum.

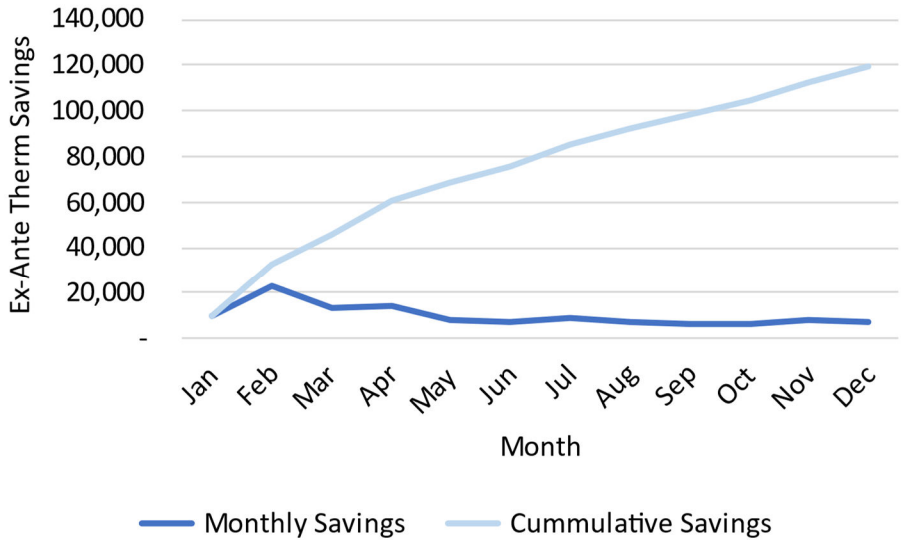
Table 5-2 Ex-Ante Therm Savings of Water Heater Program by Stratum

Equipment Type	*Number of Water Heaters*	*Ex-Ante Therm Savings per unit*	*Ex-Ante Therm Savings*
Condensing Water Heater	7	41.87	293
Electric to Gas Water Heater	58	166.44	9,654
Tankless Water Heater	2,014	44.94	90,509
Electric to Gas Tankless Water Heater	115	166.44	19,141
Total	**2,194**	**54.5**	**119,596**

5.2 Program Trends in PY2023

Figure 5-1 plots the Water Heater Program ex-ante therm savings by project completion month.

Figure 5-1 Water Heater Program Ex-Ante Therm Savings by Project Completion



5.3 Impact Evaluation

This section describes the gross impact evaluation for the Water Heater Program.

5.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Water Heater Program.

5.3.1.1 Review of Documentation

The water heater uniform energy factor (UEF), storage volume, and fuel type were found for all unique model numbers wherever possible. Water heater model numbers were verified using the AHRI directory database and manufacturer websites. Survey responses were used in the savings calculations as well.

5.3.1.2 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the calculation of gross energy impacts depended largely on the types of measures installed. Where applicable, deemed values and algorithms from the Arkansas TRM were used to calculate verified gross energy impacts.

To determine the quantity of measures rebated and installed, the Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

The Evaluator verified the baseline fuel type of the removed water heaters through process evaluation surveys and model number verification efforts.

5.3.1.3 Method for Analyzing Savings from Water Heater Measures

The energy savings of a water heater is found by subtracting the energy use of the new water heater from the energy use of the baseline water heater.

$$therm_{ex\ post\ savings} = therm_{basline\ water\ heater} - therm_{new\ water\ heater}$$

First the energy use of the new water heater was calculated using the following equation:

$$therm_{new\ water\ heater} = \rho \times Cp \times V \times (TSetPoint - TSupply) \times \frac{1}{EFpost} \times$$

$$\left(\frac{1}{Btu\ \ to\ therm\ conversion}\right) \times Source\ to\ site\ ratio$$

Where:

ρ = *Water density = 8.33 lb./gal*

Cp = *Specific heat of water = 1 BTU/lb.·°F*

V = *Calculated estimated annual hot water use (gal), based on zip code and tank size*

$T_{SetPoint}$ = *Water heater set point (default value = 120°F)*

T_{Supply} = *average supply water temperature based on climate zone and zip code*

EF_{post} = *verified Energy Factor of new water heater*

Btu to therm conversion factor = 100,000 $Btu/therm$

Source to site ratio, gas to gas = 1.09

$$therm_{electric\ baeline\ water\ heater} = \rho \times C_p \times V \times (T_{SetPoint} - T_{Supply}) \times \frac{1}{EF_{pre}} \times$$

$$\left(\frac{1}{Btu\ to\ therm\ conversion\ factor}\right) \times Source\ to\ site\ ratio, electric\ to\ gas$$

$$therm_{gas\ baeline\ water\ heater} = \rho \times C_p \times V \times (T_{SetPoint} - T_{Supply}) \times \frac{1}{EF_{pre}} \times$$

$$\left(\frac{1}{Btu\ to\ therm\ conversion\ factor}\right) \times Source\ to\ site\ ratio, gas\ \ to\ gas$$

Where:

ρ = *Water density = 8.33 lb./gal*

Cp = *Specific heat of water = 1 BTU/lb.·°F*

V = *Calculated estimated annual hot water use (gal), based on zip code and tank size*

$T_{SetPoint}$ = *Water heater set point (default value = 120°F)*

T_{Supply} = *average supply water temperature based on climate zone and zip code*

EF_{pre} = *verified Energy Factor of new water heater*

kWh to Btu conversion factor = 3,412.14 Btu/kWh

Btu to therm conversion factor = 100,000 $Btu/therm$

Source to site ratio, gas to gas = 1.09, electric to gas = 3.36

5.3.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Water Heater Program are summarized by stratum in Table 5-3.

Table 5-3 Ex-Ante and Ex-Post Annual Therm Savings for Water Heater Program by Stratum

Equipment Type	*Percent of Baseline Water Heaters which use Electricity*	*Ex-Ante Gross Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
Condensing Water Heater	0%	293.09	258	88%
Electric to Gas Water Heater	100%	9,654	9,926	103%
Tankless Water Heater	31%	90,509	82,218	91%
Electric to Gas Tankless Water Heater	75%	19,141	23,007	120%
Total		**119,596**	**115,409**	**96%**

The realization rate for this program was slightly lower due to several factors. Water usage for commercial projects were determined by building type and by facility square footage, per the AR TRM. These types of facilities oftentimes have much higher water usage compared to a single family residence. However, there was an electric to gas project and an electric to gas tankless water heater project for which the Evaluators determined that the water usage may be less than assumed in the ex-ante estimations. For both of these projects, the commercial facility type was verified to align with the AR TRM's definition of Small Office, resulting in an overall decrease in verified therms savings.

Furthermore, the baseline efficiency standard changed starting with AR TRM V8.1. A draw pattern must be determined to calculate the correct energy factor for the baseline unit; the draw pattern is calculated based on the first hour rating of the installed water heater (defined number of gallons of hot water the heater can supply per hour). The shift in equipment baseline resulted in increasing calculated energy savings.

5.3.3 Net Impact Evaluation

The net savings approach for the Water Heater Program was the same as the approach described in Section 3.3.3.

5.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net savings impacts for the program.

Table 5-4 summarizes the results of the estimation of free ridership. Free ridership was substantial for the program because there was a high incidences of participant responses indicating a high likelihood of installing energy efficient equipment without a rebate.

Table 5-4 Water Heater Program Free Ridership Factor

Equipment Type	*FR Factor*
Condensing Water Heater	66%
Electric to Gas Water Heater	66%
Tankless Water Heater	66%
Electric to Gas Tankless Water Heater	66%

Table 5-5 summarizes the gross and net ex-post therm savings for the Water Heater Program.

Table 5-5 Water Heater Summary of Gross and Net Ex-Post Therm Savings

Equipment Type	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
Condensing Water Heater	258	169	89	34%
Electric to Gas Water Heater	9,926	6,512	3,414	34%
Tankless Water Heater	82,218	53,940	28,278	34%
Electric to Gas Tankless Water Heater	23,007	15,094	7,913	34%
Total	**115,409**	**75,716**	**39,693**	**34%**

5.4 Process Evaluation

The following section presents the results of the process evaluation for the Water Heater Program.

5.4.1 Participant Surveys

The Evaluator surveyed 53 participants in the Water Heating Program. These surveys were used to collect data on the participants' experience with the program including sources of program awareness, motivations for participating, and satisfaction with the program. Further, the Evaluator collected demographic information on the respondents during the survey.

5.4.1.1 Respondent Demographics

Table 5-6 outlines respondents' demographic characteristics.

Table 5-6: Respondents' Demographics (n=53)

	%	n
Homeownership		
Own	96.2%	51
Rent	1.9%	1

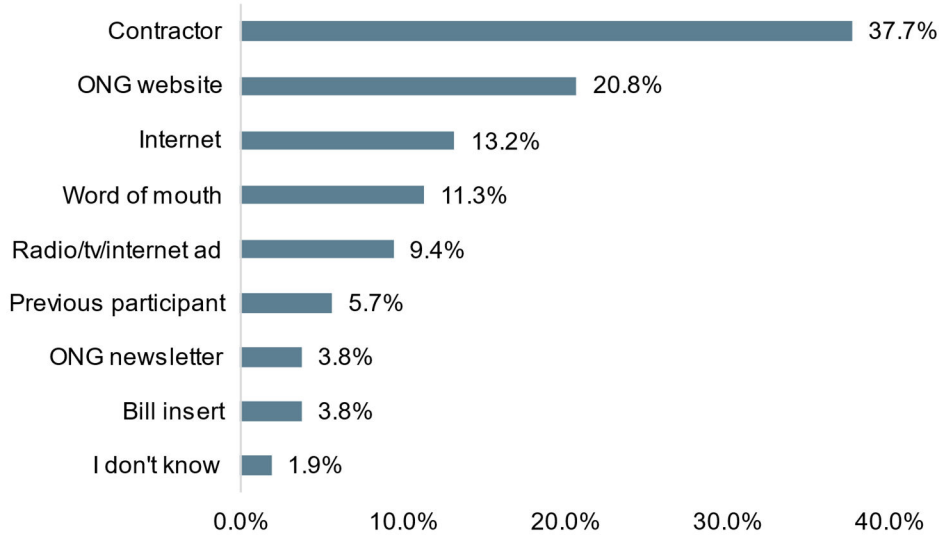
	%	n
I don't know	0.0%	0
Prefer not to answer	1.9%	1
Housing type		
Single-family home	94.3%	50
Duplex, triplex, townhome, condominium	1.9%	1
Manufactured home	1.9%	1
Prefer not to answer	1.9%	1
Home age		
Before 1950	1.9%	1
1950 to 1959	9.4%	5
1960 to 1969	3.8%	2
1970 to 1979	18.9%	10
1908 to 1989	17.0%	9
1990 to 1999	15.1%	8
2000 to 2009	17.0%	9
2010 to 2019	5.7%	3
After 2019	5.7%	3
I don't know	3.8%	2
Prefer not to answer	1.9%	1
People in household		
1	13.2%	7
2	39.6%	21
3	13.2%	7
4	17.0%	9
5	9.4%	5
6	5.7%	3
Prefer not to answer	1.9%	1
Age (years)		
18-24	1.9	1
25-34	13.2%	7
35-49	30.2%	16
50-64	28.3%	15
65 or over	24.5%	13
Prefer not to answer	1.9%	1
Household status		
Single, no children	17.0%	9
Single, with children	3.8%	2
Married, no children	37.7%	20
Married, with children at home	37.7%	20
Prefer not to answer	3.8%	2
Household income		
Less than $20,000	1.9%	1
$20,000 to less than $40,000	3.8%	2
$40,000 to less than $60,000	9.4%	5
$60,000 to less than $80,000	11.3%	6
$80,000 to less than $100,000	13.2%	7

	%	n
$100,000 to less than $150,000	20.8%	11
$150,000 to less than $200,000	5.7%	3
$200,000 or more	11.3%	6
Prefer not to answer	22.6%	12
Race/Ethnicity		
White/Caucasian	75.5%	40
Hispanic/Latino	0.0%	0
Black/African American	1.9%	1
Asian/Pacific Islander	0.0%	0
Mixed Race	3.8%	2
Native American	7.6%	4
I don't know	1.9%	1
Prefer not to say	9.4%	5
Education level		
Up to 8th grate	0.0%	0
Some high school	0.0%	0
High school or GED equivalent	17.0%	9
Some college	18.9%	10
Associate's degree	9.4%	5
Bachelor's college degree	32.1%	17
Master's degree	17.0%	9
Professional degree	0.0%	0
Doctorate	1.9%	1
Prefer not to answer	3.8%	2

5.4.1.2 Program Awareness and Participation

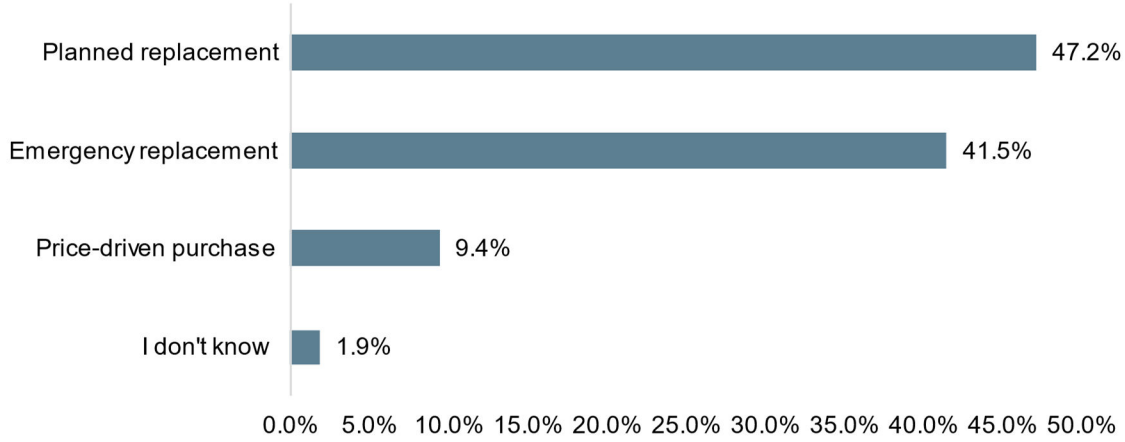
Respondents learned about the rebates through a variety of ways, most commonly through the contractor or person who installed the water heater (37.1%, n=20) (Figure 5-2). Half of respondents had previously participated in one of ONG's rebate programs (50.9%, n=27).

Figure 5-2: Program Awareness (n=53)



There were a variety of reasons for whether or not respondents planned to purchase a water heater (Figure 5-3). Less than half of respondents had been planning to replace their water heater for some time (47.2%, n=25) and 41.5% (n=22) were replacing their water heater in an emergency. Less than half of respondents replaced a working water heater (43.4%, n=23). Old water heaters ranged from 3 to over 40 years old.

Figure 5-3: Replacement Type (n=53)



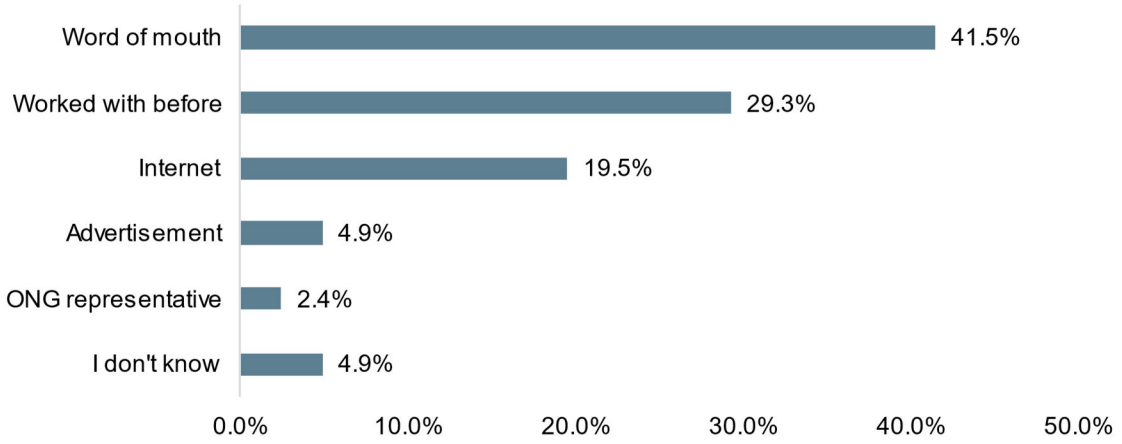
Thirteen respondents indicated they switched to a gas water heater from an electric water heater. Most of the respondents who switched from an electric water heater to a gas water heater were satisfied with their new gas water heater (61.5%, n=8).

About two-thirds of respondents planned to install a new water heater before learning about the rebate program (67.9%, n=36) and most (81.1%, n=43) said they would have been able to purchase the water heater without the rebate.

5.4.1.3 Experience with Contractor

Three-quarters of respondents hired a contractor to install their water heater (77.4%, n=41). Respondents most commonly found their contractor from working with them previously or by word-of-mouth (Figure 5-4).

Figure 5-4: Contractor Awareness (n=41)



Respondents were generally satisfied with their contractor (Figure 5-5). Contractors and customers both highly valued the energy efficiency of the water heaters, and that the equipment did not run out of hot water (Table 5-7).

Figure 5-5: Satisfaction with Contractor (n=41)

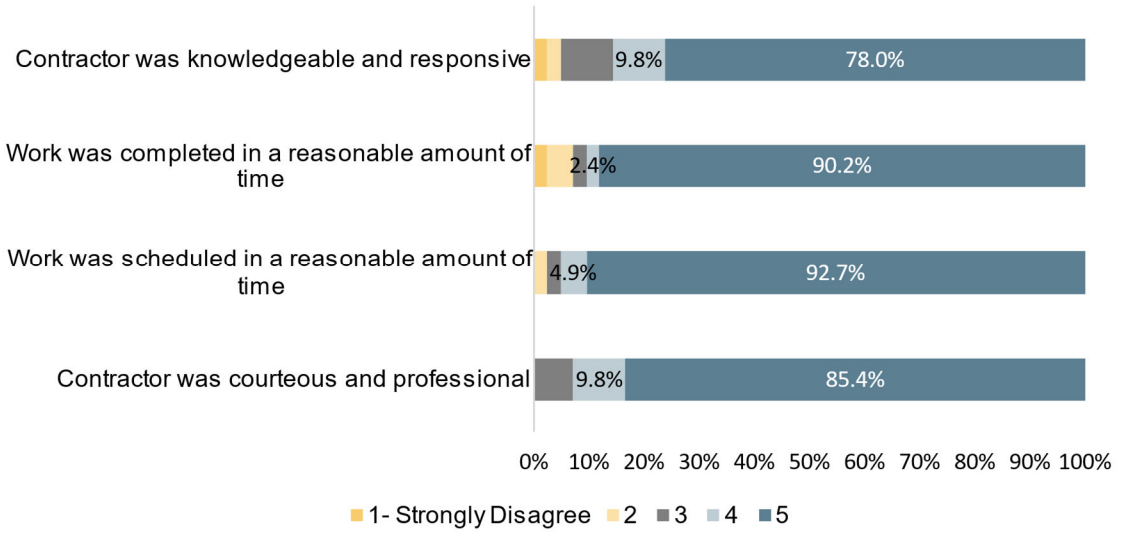


Table 5-7: Characteristics Contractor Emphasized & Customers Valued (n=41)

	Contractor	Customer
Energy Efficiency	46.3%	39.0%
Never running out of hot water	39.0%	46.3%
Size of the equipment	9.8%	0.0%
Low price	7.3%	2.4%
Recirculating	4.9%	0.0%
Tankless	4.9%	2.4%
Comfort	4.9%	0.0%
Lifespan	4.9%	2.4%
Model/brand	2.4%	0.0%
Good warranty/reliability	0.0%	7.3%
I don't know	7.3%	0.0%

5.4.1.4 Program Satisfaction

Respondents were generally satisfied with the program (Figure 5-6). Seventeen respondents indicated some level of dissatisfaction with the program for a variety of reasons.

Figure 5-6 Program Satisfaction (n=53)

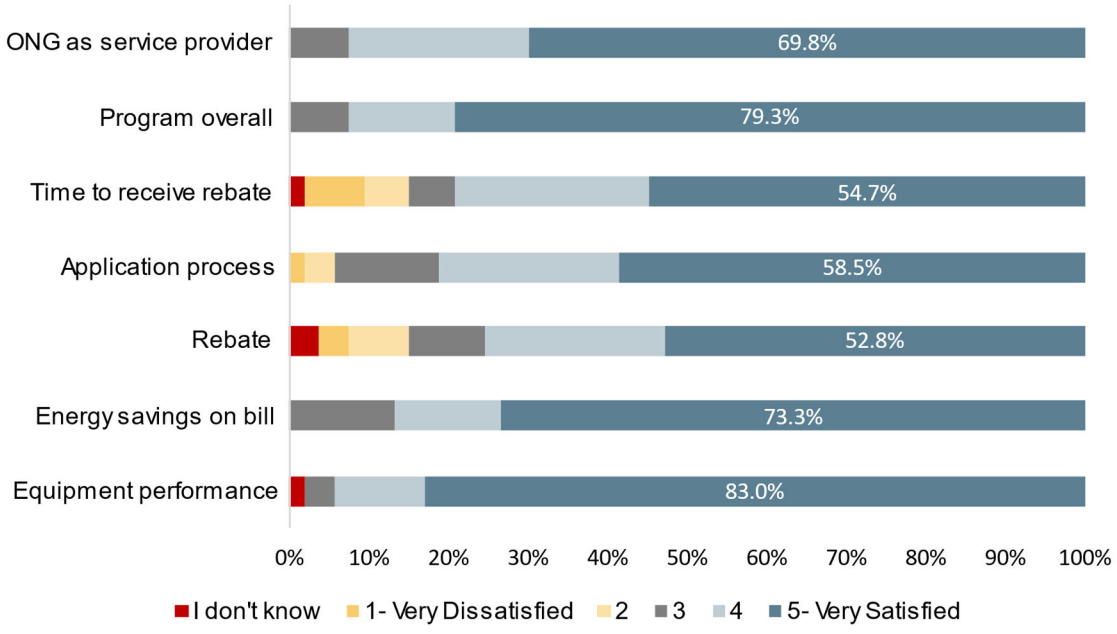
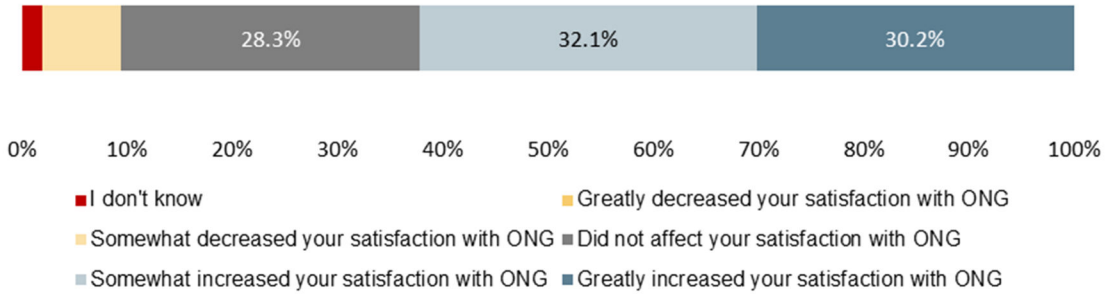


Table 5-8: Reasons for Dissatisfaction (n=17)

	n
Rebate took too long to arrive	5
Rebate was too small	3
Application too complicated	3
Poor equipment quality	3
No change in energy bill	2

More than half of respondents indicated that participation in the program positively impacted their satisfaction with ONG as their service provider (62.3%, n=33) (Figure 5-7). Many respondents noted they were very or extremely likely to participate in another ONG program in the future (71.7%, n=38).

Figure 5-7: Program Impact on Satisfaction with ONG (n=53)



5.5 Conclusions and Recommendations

This section presents conclusions and recommendations for the Water Heater Program.

5.5.1 Conclusions

- 38% of program participants who completed the survey learned of the Water Heater program through a contractor.
- 47% of survey respondents indicated they were planning to replace their water heater.
- Thirteen survey respondents reported switching from an electric to a natural gas water heater.
- Most survey respondents reported being satisfied with program overall, equipment performance, energy savings on their bill, and ONG as their natural gas service provider.

5.5.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

6 Heating System Program

The Heating System Program was designed to provide financial incentives to encourage residential customers to install energy efficient natural gas furnaces.

6.1 Program Description

The Heating System Program provides mail-in rebates for energy efficient natural gas furnaces. Table 6-1 summarizes the incentives provided through the program.

Table 6-1 Heating System Program Incentives

Equipment Type	*Rebate Amount*
Natural Gas Furnace w/ AFUE ≥.95	$550
Electric Furnace to Natural Gas Furnace	$1,950
Heat Pump to Natural Gas Furnace	$1,950
Electric Furnace to Natural Gas Furnace w/ AFUE ≥.95	$2,500
Electric to Natural Gas Water Heater	$850

Table 6-2 shows the number of completed projects and ex-ante therm savings for the Heating System Program by stratum.

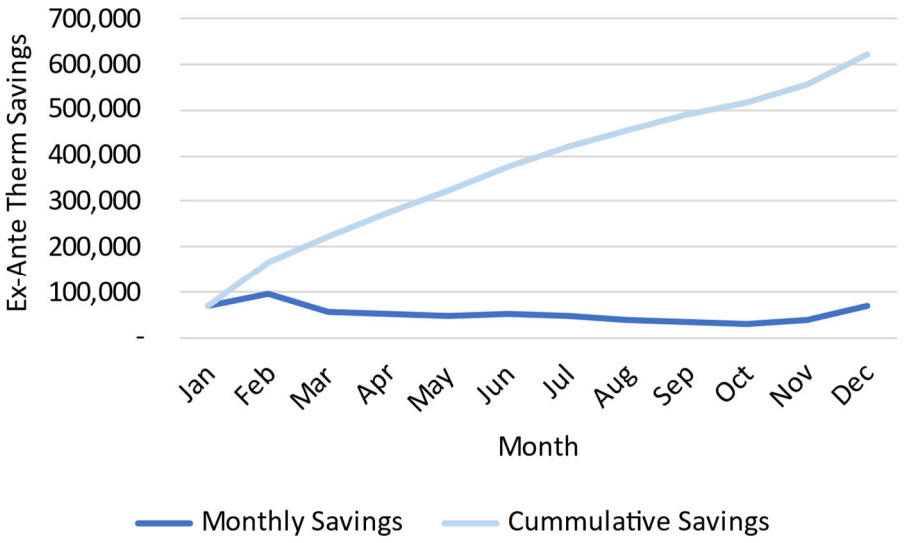
Table 6-2 Ex-Ante Therm Savings of Heating System Program by Stratum

Stratum	*Number of Heating Systems*	*Average Ex-Ante Therm Savings per Unit*	*Ex-Ante Therm Savings*
Commercial	70	103.624	7,254
Evaluated in New Home	0	N/A	0
New Construction	4,154	65.980	274,081
Residential	2,657	128.475	341,359
Total	**6,881**	**90.495**	**622,694**

6.2 Program Trends in PY2023

Figure 6-1 plots the Heating System Program ex-ante therm savings by project completion month.

Figure 6-1 Heating System Program Ex-Ante Therm Savings by Project Completion



6.3 Impact Evaluation

This section describes the gross impact evaluation of the Heating System Program.

6.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Heating System Program.

6.3.1.1 Review of Documentation

The annual fuel utilization efficiency (AFUE) rated heating capacity, and fuel type for each unique heating systems were verified using the AHRI directory database and manufacturer websites. Also, participant surveys and building research were used to verify a building's age and size.

6.3.1.2 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the calculation of gross energy impacts depended largely on the types of measures installed. Where applicable, deemed values and algorithms from the Arkansas TRM were used to calculate verified gross energy impacts.

To determine the quantity of measures rebated and installed, the Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

The Evaluator verified the baseline fuel type of the replaced heating systems through process evaluation surveys. The heating system baseline fuel type for each stratum is shown in Table 6-3.

Table 6-3 Baseline Heating System Fuel Type by Stratum and Equipment Type

Stratum	*Equipment Type*	*Percent of Baseline Heating Systems which use Gas*	*Percent of Baseline Heating Systems which use Electricity*
Commercial	Commercial	100%	0%
Evaluated in ONG New Home	Evaluated in ONG New Home	NA	NA
New Construction	New Construction	100%	0%
Residential	95% Eff Heater	100%	0%

The Evaluator verified the year homes were built using participant surveys and building research. These results are shown in Table 6-4.

Table 6-4 Building Age of Sample Sites by Stratum

Stratum	*Year Home was Built*	*Number of Sample Sites*
Commercial	NA	70
Evaluated in ONG New Home	NA	0
New Construction	2000 - Present	4,111
Residential	Pre-1970 - 1979	34
Residential	1980 - 1989	3
Residential	1990 - 1999	11
Residential	2000 - Present	15

6.3.1.3 Method for Analyzing Savings from Heating System Measures

The energy savings of a gas furnace is found by subtraction the energy use of the new furnace from the energy use of the baseline furnace.

$$therm_{ex\ post\ savings} = therm_{baseline\ heating\ system} - therm_{new\ heating\ system}$$

First the energy use of the new heating system was found.

$$therm_{new\ heating\ system} = \text{Heat load} \times \left(\frac{1}{\text{AFUE}_{\text{new heating system}}}\right) \times 1.09$$

$$\textit{Heat Load} = \left(\frac{\frac{\text{therms}}{\text{site area}}}{\text{yr}}\right) \times \text{site area}$$

Where:

$\frac{therms}{site\ area}$ *=based on age of building and weather zone*

Site area = square footage of building

$\text{AFUE}_{\text{new heating system}}$ = *verified by the Evaluator with AHRI number*

Source to site ratio, gas to gas = 1.09

Below is the energy calculation for early replacement gas baseline heating system.

$$therm_{baseline\ gas\ heating\ system} = \text{Heat load} \times \left(\frac{1}{\text{AFUE}_{\text{baseline heating system}}}\right) \times 1.09$$

$$\textit{Heat Load} = \left(\frac{\frac{\text{therms}}{\text{site area}}}{\text{yr}}\right) \times \text{site area}$$

$$\text{AFUE}_{\text{baseline heating system}} = \text{AFUE}_{\text{base}} \times (1\text{-}M)^{age}$$

Where:

$\frac{\frac{therms}{site\ area}}{yr}$ *=based on age of building and weather zone*

Site area = square footage of building

$\text{AFUE}_{\text{base}}$ = *.8*

$\text{M} = \text{Maintenance Factor} = 0.01$

$\text{Age} = \text{age of replaced furnace}$

Source to site ratio, gas to gas = 1.09

Below is the energy calculation for replace-on-burnout or new construction gas baseline heating system.

$$therm_{baseline\ gas\ heating\ system} = \text{Heat load} \times \left(\frac{1}{\text{AFUE}_{\text{baseline heating system}}}\right) \times 1.09$$

$$\textit{Heat Load} = \left(\frac{\frac{\text{therms}}{\text{site area}}}{\text{yr}}\right) \times \text{site area}$$

Where:

$\frac{\frac{therms}{site\ area}}{yr}$ *=based on age of building and weather zone*

Site area = square footage of building

$\text{AFUE}_{\text{baseline heating system}}$ = *0.8*

Source to site ratio, gas to gas = 1.09

Below is the energy calculation for electric baseline heating system.

$$therm_{baseline\ electric\ heating\ system} = \text{CAP}_{\text{heating}} \times \left(\frac{1\text{ kW}}{1{,}000\text{ W}}\right) \times \text{EFLH}_{\text{H}} \times \left(\frac{1}{\text{HSPF}_{\text{base}}}\right) \times \left(\frac{kWh\ to\ Btu\ conversion\ factor}{Btu\ to\ therm\ conversion\ factor}\right) \times Source\ to\ site\ ratio, electric\ to\ gas$$

Where:

$\text{CAP}_{\text{H}}\left(\frac{\text{Btu}}{\text{hr}}\right)$ = *rated heating capacity = new furnace heating capacity, see above*

EFLHh = *based on weather using zip code lookup*

HSPFbase = 6.8 ($\frac{\text{Btu}}{\text{W}-\text{hr}}$) ASHP early replacement (baseline before 2006), 7.7 ($\frac{\text{Btu}}{\text{W}-\text{hr}}$) ASHP early replacement (baseline after 2006), 8.2 ($\frac{\text{Btu}}{\text{W}-\text{hr}}$) ASHP replace on burnout, 3.41 ($\frac{\text{Btu}}{\text{W}-\text{hr}}$) electric furnace early replacement or early replacement

kWh to Btu conversion factor = 3,412.14 Btu/kWh

Btu to therm conversion factor = 100,000 $Btu/therm$

Source to site ratio, electric to gas = 3.36

6.3.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Heating System Program are summarized by equipment type in Table 6-5.

Table 6-5 Ex-Ante and Ex-Post Annual Therm Savings for Heating System Program by Stratum

Stratum	*Ex-Ante Therm Savings*	*Ex-Post Therm Savings*	*Gross Therm Savings Realization Rate*
Commercial	7,254	24,560	339%
Evaluated in New Home	0	0	N/A
New Construction	274,081	324,701	118%
Residential	341,359	786,975	231%
Total	**622,694**	**1,136,236**	**182%**

The realization rate for this program was higher than expected; there are several factors affecting realized savings.

Firstly, the ex-ante savings values are not calculated with the same methodology as the Arkansas TRM. For residential projects, the Arkansas TRM employs square feet of home and age to calculate savings. Many homes were built before 1970. Many large homes also participated in the program. A home's heat load increases with age and size.

Furthermore, the Evaluator found that there were a handful of sampled residential projects that were determined to be early retirement retrofits. These types of retrofits have significantly lower base AFUE values (~ 0.64 AFUE) than the verified efficient AFUE values (~ 0.96 AFUE). The combination of large homes, built in the 70's, which replaced their furnaces early, greatly contributed to the overall realized savings.

Additionally, for commercial projects, the Arkansas TRM employs the use of equipment output BTUh. Equipment outputs were verified through the AHRI database, and the heat loads for sampled commercial projects were calculated. In addition, the heat loads for commercial projects are based on the facility type as described in the AR TRM. The Evaluators reviewed commercial projects to determine facility types to calculate the appropriate heat loads based on weather zone EFLH for heating. Finally, many large commercial buildings with large heat loads participated in the program.

6.3.3 Net Impact Evaluation

The net savings approach for the Heating System Program was the same as the approach described in Section 5.3.3.

6.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts of the program.

Table 6-6 summarizes the results of the estimation of free ridership. Free ridership was substantial for the program because there was a high incidences of participant responses indicating a high likelihood of installing energy efficient equipment without a rebate.

Table 6-6 Heating System Program Free Ridership Factor

Equipment Type	*FR Factor*
95% Eff Heater	56%
Electric to Gas 95+ Heater	56%
Electric to Gas Heater	56%

Table 6-7 summarizes the gross and net ex-post therm savings for the Heating System Program.

Table 6-7 Heating System Summary of Gross and Net Ex-Post Therm Savings

Equipment Type	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
95% Eff Heater	666,345	375,589	290,756	44%
Electric to Gas 95+ Heater	164,210	92,558	71,652	44%
Electric to Gas Heater	305,681	172,299	133,382	44%
Total	**1,136,236**	**640,446**	**495,790**	**44%**

6.4 Process Evaluation

The following section presents the results of the process evaluation for the Heating System Program.

6.4.1 Participant Surveys

The Evaluator surveyed 78 participants in the Heating System Program. These surveys were used to collect data on the participants' experience with the program including sources of program awareness, motivations for participating, and satisfaction with the program. Further, the Evaluator collected demographic information on the respondents during the survey.

6.4.1.1 Respondent Demographics

Table 6-8 outlines respondents' demographic characteristics.

Table 6-8: Respondents' Demographics (n=74)

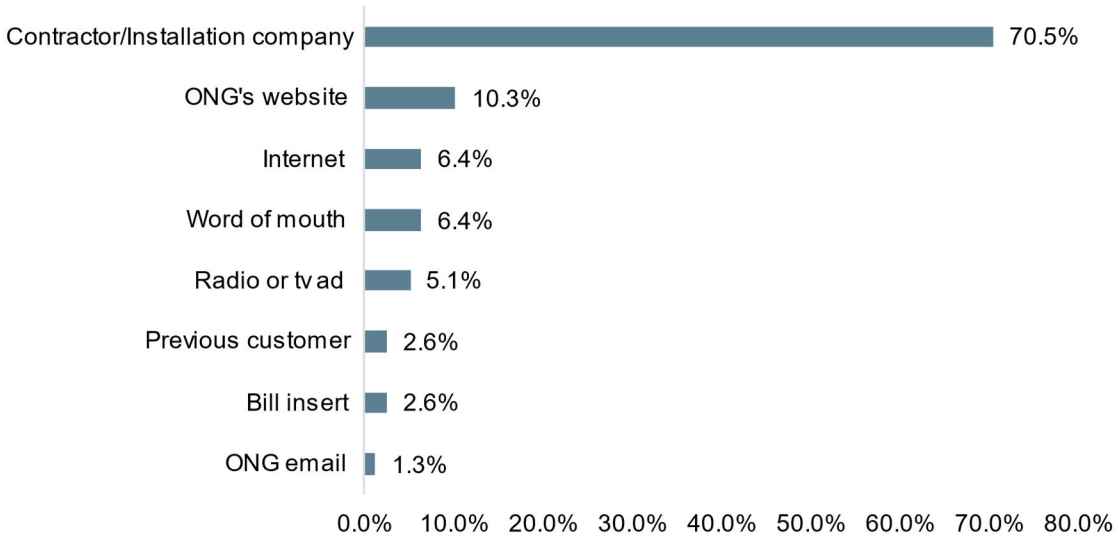
	%	n
Homeownership		
Own	97.4%	76
Rent	0.0%	0
I don't know	0.0%	0
Prefer not to answer	2.6%	2
Housing type		
Single-family home	96.2%	75
Duplex, triplex, townhome, condominium	1.3%	1
Prefer not to answer	2.6%	2
Home age		
Before 1950	14.1%	11
1950 to 1959	9.0%	7
1960 to 1969	10.3%	8
1970 to 1979	11.5%	9
1908 to 1989	11.5%	9
1990 to 1999	16.7%	13
2000 to 2009	11.5%	9
2010 to 2019	2.6%	2
After 2019	5.1%	4
I don't know	3.9%	3
Prefer not to answer	3.9%	3
People in household		
1	23.1%	18
2	44.9%	35
3	12.8%	10
4	9.0%	7
5	5.1%	4
6	1.3%	1
Prefer not to answer	3.9%	3
Age (years)		
25-34	11.5%	9
35-49	15.4%	12
50-64	34.6%	27
65 or over	30.8%	24
I don't know	1.3%	1
Prefer not to answer	6.4%	5
Household status		
Single, no children	28.4%	21
Single, with children	6.4%	5
Married, no children	37.2%	29
Married, with children at home	21.8%	17
Prefer not to answer	7.7%	6
Household income		
Less than $20,000	1.3%	1
$20,000 to less than $40,000	6.4%	5
$40,000 to less than $60,000	7.7%	6
$60,000 to less than $80,000	11.5%	9

	%	n
$80,000 to less than $100,000	11.5%	9
$100,000 to less than $150,000	10.3%	8
$150,000 to less than $200,000	3.9%	3
$200,000 or more	6.4%	5
I don't know	2.6%	2
Prefer not to answer	38.5%	30
Race/Ethnicity		
White/Caucasian	77.0%	57
Hispanic/Latino	1.3%	1
Black/African American	0.0%	0
Asian/Pacific Islander	1.3%	1
Mixed Race	0.0%	0
Native American	6.8%	6
I don't know	2.6%	2
Prefer not to say	15.4%	12
Education level		
Up to 8th grate	0.0%	0
Some high school	1.3%	1
High school or GED equivalent	14.1%	11
Some college	14.1%	11
Associate's degree	9.0%	7
Bachelor's college degree	28.2%	22
Master's degree	18.0%	14
Professional degree	2.6%	2
Doctorate	3.9%	3
Prefer not to answer	9.0%	7

6.4.1.2 Program Awareness and Participation

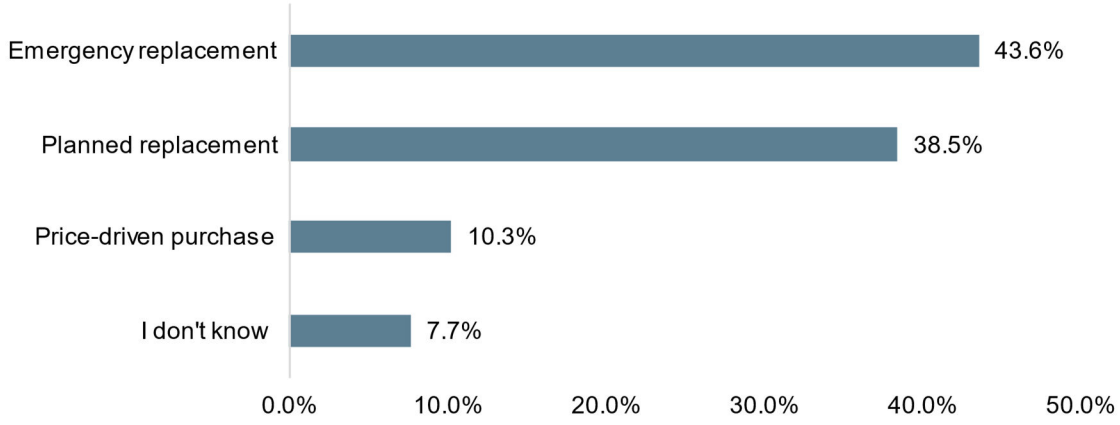
Most respondents learned about the rebates through their contractor or person who installed the equipment (70.5%, n=55) (Figure 6-2).

Figure 6-2: Program Awareness (n=78)



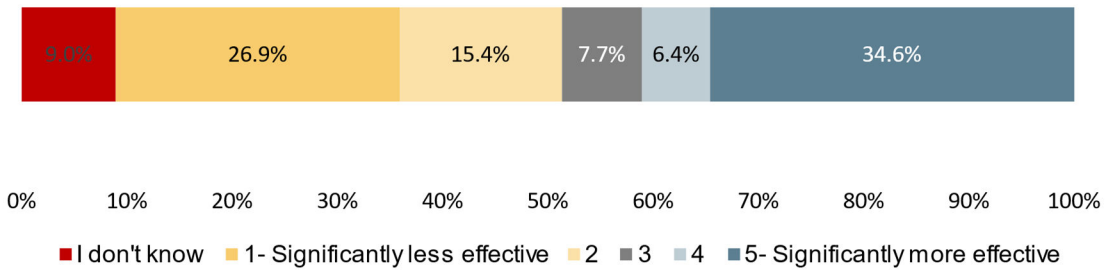
There were a variety of reasons for whether or not respondents planned to purchase a furnace (Figure 6-3). Less than half of respondents were replacing their furnace in response to an emergency (43.5%, n=34) and more than one-third had been planning to replace their furnace for some time (38.5%, n=30). More than half of respondents replaced a working furnace (62.8%, n=49); these furnaces ranged from 13 to over 25 years old.

Figure 6-3: Replacement Type (n=78)



Fourteen respondents indicated they switched to a gas furnace from an electric (n=10) or unknown fuel source furnace (n=4). Most of the respondents who switched from an electric furnace to a gas furnace were satisfied with their new gas furnace (80.0%, n=8). Forty-one percent of respondents found their new furnace to be more effective at keeping their home comfortable than their previous furnace (Figure 6-4).

Figure 6-4: Effectiveness of New Furnace (n=78)



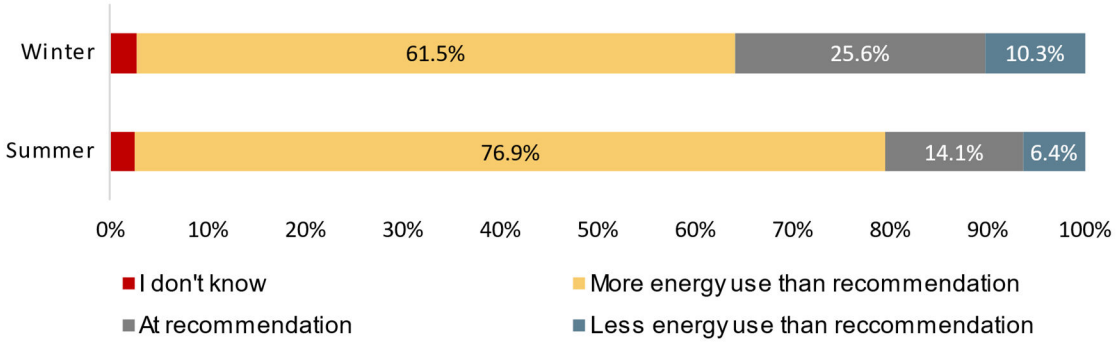
More than two-thirds of the new furnaces used a smart (37.2%, n=29) or programmable (39.7%, n=31) thermostat. Many of these respondents used the Wi-Fi connectivity and the scheduling functions of their thermostats (Table 6-9). More than two-thirds of the thermostat were installed with the new furnace (69.7%, n=53).

Table 6-9: Thermostat Type (n=78)

Equipment Type	Total		Use Thermostat Programming Functions	
	n	%	n	%
Smart thermostat	29	37.2%	22	75.9%
Programmable thermostat	31	39.7%	15	48.4%
Standard thermostat	16	20.5%	x	x
Don't know	2	2.6%	x	x

More respondents set their thermostats to the Energy.gov and ONG recommended levels in winter (68 degrees or lower) than in the summer (78 degrees or higher) (Figure 6-5).

Figure 6-5: Follow Energy.gov and ONG Thermostat Recommendations (n=78)



*More energy use than recommended represents thermostat set above 68 degrees in winter and below 78 degrees in summer

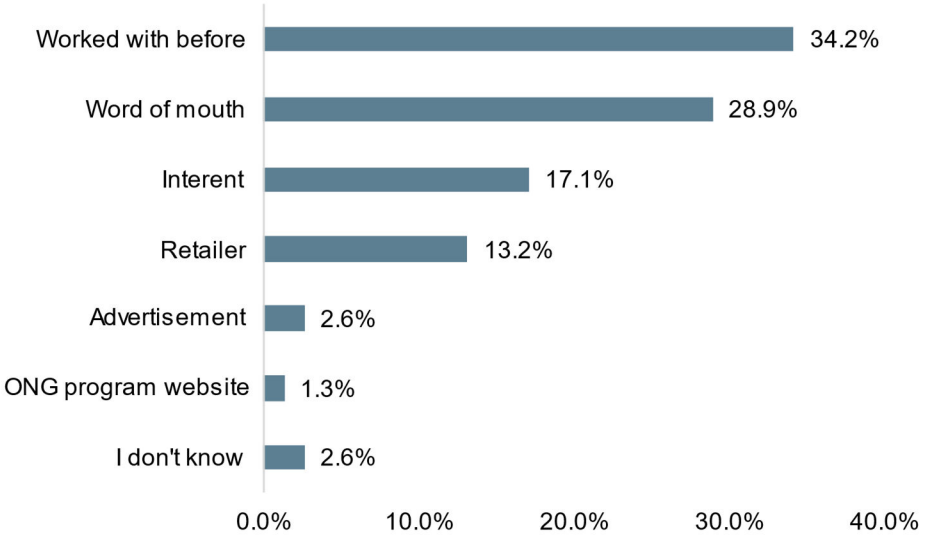
*Less energy use than recommended represents below 68 degrees in winter and above 78 degrees in summer

About half of respondents planned to install a new furnace before learning about the rebate program (55.1%, n=43) and three-quarters (78.2%, n=61) said they would have been able to purchase a furnace without the rebate.

6.4.1.3 Experience with Contractor

Almost all respondents paid someone to install their furnace for them (97.4%, n=76). Respondents most commonly found their contractor from working with them previously or by word-of-mouth (Figure 6-6).

Figure 6-6: Contractor Awareness (n=76)



Respondents were generally satisfied with their contractor (Figure 6-7). Contractors and customers typically valued the same characteristics of the furnaces, with contractors most commonly emphasizing energy efficiency (72.4%, n=55) and customers most commonly valuing a unit's energy efficiency (42.1%, n=32) (Figure 6-8).

Figure 6-7: Satisfaction with Contractor (n=76)

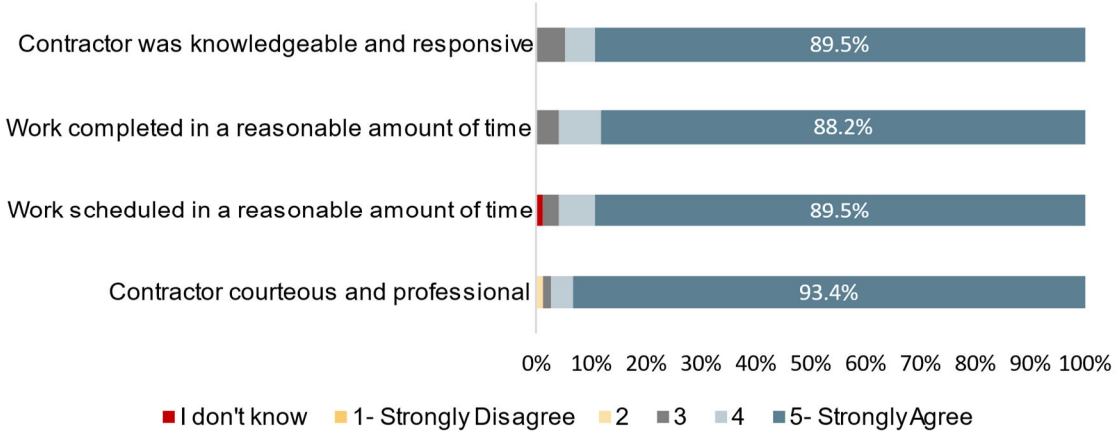
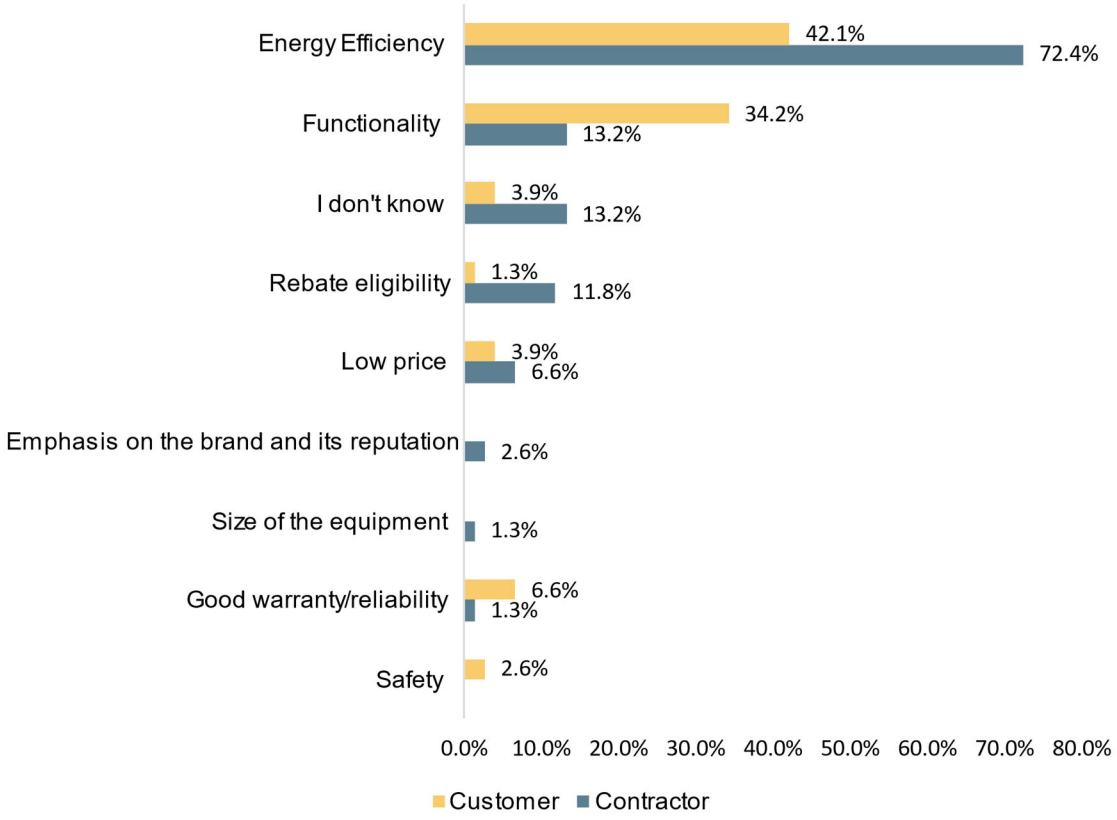


Figure 6-8: Characteristics Contractor Emphasized & Customers Valued (n=76)



6.4.1.4 Program Satisfaction

Respondents were generally satisfied with the program (Figure 6-9). Fifteen respondents indicated some level of dissatisfaction with the program; reasons for dissatisfaction included application was lengthy process (n=11), rebate insufficient (n=3), poor equipment quality (n=1), no savings on bill (n=1).

Many respondents indicated that participation in the program positively impacted their satisfaction with ONG as their service provider (70.5%, n=55) (Figure 6-10). Two-thirds of respondents noted they were very or extremely likely to participate in another ONG program in the future (65.4%, n=51).

Figure 6-9 Program Satisfaction (n=78)

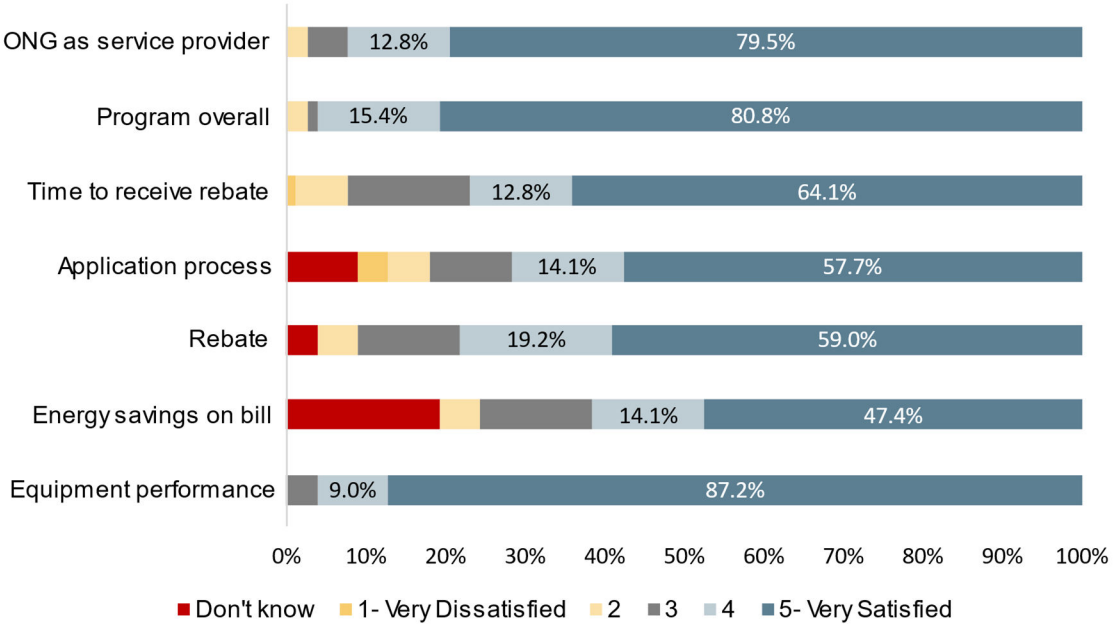
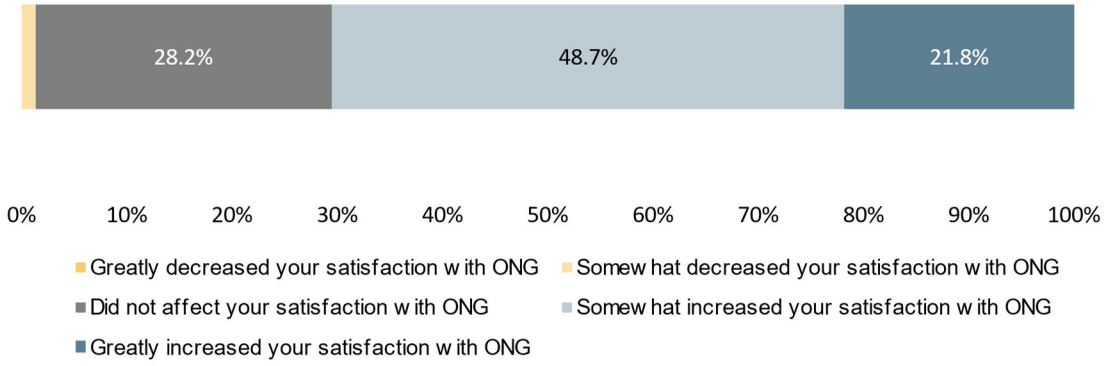


Figure 6-10: Program Impact on Satisfaction with ONG (n=78)



6.5 Conclusions and Recommendations

This section presents conclusions and recommendations for the Heating System Program.

6.5.1 Conclusions

- A contractor or installation company was the most common method that program participants learned of the program according to survey responses.
- 44% of surveyed program participants reported that the old heating system was broken when they replaced it.

- Fourteen surveyed program participants indicated they replaced a heating system that was fueled by electric or unknown fuel source.
- Participants were most satisfied with the equipment performance (96%), ONG as their service provide (92%), and the program overall (96%).

6.5.2 Recommendations

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.

7 Low-Income Assistance Program

The Low-Income Assistance Program was designed to provide residential energy efficiency improvements to customers that live on a low or fixed income. The program operates in partnership with Oklahoma Gas & Electric (OG&E) and Public Service Company of Oklahoma (PSO).

7.1 Program Description

The Low-Income Assistance Program provides residential energy efficiency improvements free of charge to low-income or fixed income customers. The program is available to all residential customers who own or lease a single-family, duplex, or mobile home and have an income of less than $60,000 per year for OG&E and $55,000 per year for PSO. Weatherization services are also available to tenants of rental properties if the eligible tenant has approval from a property owner. Home improvements include the following:

- Attic Insulation;
- Air Sealing; and
- Duct Sealing.

Table 7-1 shows the number of homes where projects were completed as well as Ex-Ante Therm savings by cross-participating electric utility.

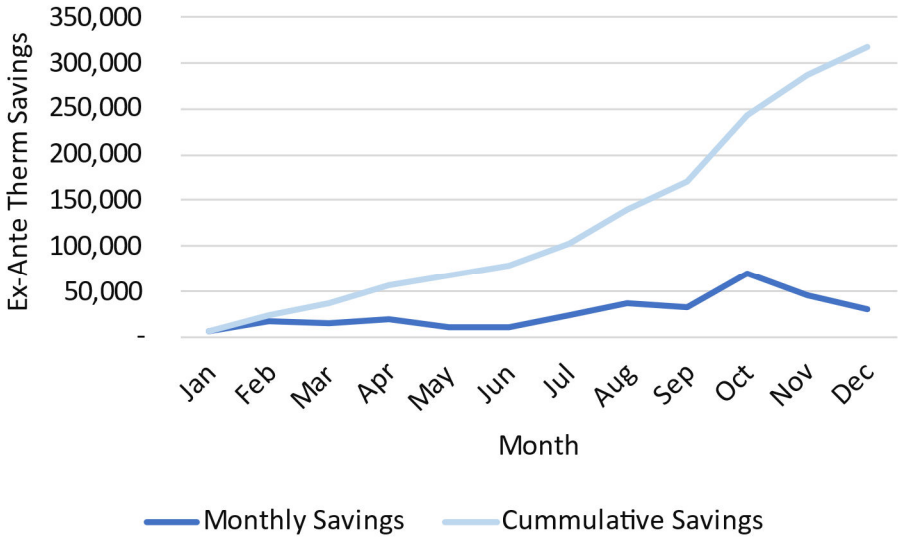
Table 7-1 Ex-Ante Therm Savings of Low-Income Assistance Program by Equipment Type

Cross-Participating Electric Utility	*Number of Homes*	*Ex-Ante Therm Savings*
OG&E	443	170,540
PSO	390	147,537
Total	**833**	**318,077**

7.2 Program Trends in PY2023

Figure 7-1 plots the Low-Income Assistance Program ex-ante therm savings by project completion month.

Figure 7-1 Low-Income Assistance Program Ex-Ante Therm Savings by Project Completion



7.3 Impact Evaluation

7.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Low-Income Assistance Program.

The estimated gross energy impacts were found using the databases provided by PSO and OG&E. The planned savings for the low-income program is shown below.

Table 7-2 Ex-Ante Therm Savings by Partner Electric Utility

Cross-Participating Electric Utility	*Number of Homes*	*Therm Savings per Home*	*Ex-Ante Therm Savings*
OG&E	443	385.0	170,540
PSO	390	378.3	147,537
Total	**833**	**763.3**	**318,077**

7.3.2 Review of Documentation

The Evaluator performed a census review of tracking data. No other documentation was utilized for the evaluation.

7.3.2.1 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the calculation of gross energy impacts depended largely on the types of measures installed. Where applicable, deemed values and algorithms

from the Arkansas TRM and Frontier Associates' 2018 Updated Oklahoma Deemed Savings were used to calculate verified gross energy impacts.

To determine the quantity of measures rebated and installed, The Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

The Evaluator assumed all participating homes used gas for heating.

7.3.2.2 Method for Analyzing Savings from Low-income Measures

This section describes the various savings methodologies used to evaluate measures in the program.

7.3.2.2.1 Air Sealing

First, participant's homes were traced to a climate zone using the participant's zip code. Once the climate weather zone was determined, the infiltration reduction deemed savings value was found using the table below.

Table 7-3 Infiltration Reduction Deemed Savings by Zone

Zone	*Annual Gas Savings (Therms/ΔCFM50)*
	Gas Heat
Zone 9	0.08
Zone 8A	0.09
Zone 8B	0.09
Zone 7	0.07
Zone 6	0.04

Next, the energy savings were calculated using the equation below.

$$therm_{air\ sealing} = \Delta CFM_{50} \times V$$

Where:

$\Delta CFM_{50} = CFM_{pre50} - CFM_{post50}$

V (Therms/ΔCFM50) = value found in Table 7-3

7.3.2.2.2 Attic Insulation

First, a participant's home was traced to an appropriate climate zone using the participant's zip code. Once the climate weather zone was determined, the infiltration reduction deemed savings value could be found using Table 7-4. It was assumed that all retrofit ceiling insulation R-value was R-38.

Table 7-4 Ceiling Insulation Deemed Savings by Climate Zone and Pre-existing Ceiling Insulation

Climate Zone	*Pre-existing Ceiling Insulation R-Value*	*Annual Gas Savings (Therms/sq. ft.)*
9	R0	0.23
9	R-1 to R-4	0.19
9	R-5 to R-8	0.1
9	R-9 to R-14	0.06
9	R-15 to R-22	0.03
8a	R0	0.22
8a	R-1 to R-4	0.18
8a	R-5 to R-8	0.09
8a	R-9 to R-14	0.05
8a	R-15 to R-22	0.03
8b	R0	0.21
8b	R-1 to R-4	0.18
8b	R-5 to R-8	0.09
8b	R-9 to R-14	0.05
8b	R-15 to R-22	0.02
7	R0	0.18
7	R-1 to R-4	0.15
7	R-5 to R-8	0.08
7	R-9 to R-14	0.04
7	R-15 to R-22	0.02
6	R0	0.15
6	R-1 to R-4	0.13
6	R-5 to R-8	0.06
6	R-9 to R-14	0.04
6	R-15 to R-22	0.02

Next the energy savings were calculated using the equation below.

$$therm_{air\ sealing} = \Delta CFM_{50} \times V$$

7.3.2.2.3 Duct Sealing

First, a participant's home was traced to a climate zone using the participant's zip code. Once the climate weather zone was determined, the HDD could be found. Next, the following equation was used:

$$Therms_{savings,H} = \frac{(DL_{pre} - DL_{post}) \times 60\,x\,HDD \times 24 \times 0.018}{100{,}000 \times AFUE}$$

Where:

DLpre = Pre-improvement duct leakage at 25 Pa (ft3/min) reported in database

DLpost = Post-improvement duct leakage at 25 Pa (ft3/min) reported in database

60 = Constant to convert from minutes to hours

HDD = Heating degree days found via zip code lookup

24 = Constant to convert from days to hours

0.018 = Volumetric heat capacity of air (Btu/ft3°F)

100,000 = Constant to convert from Btu to therms

AFUE = Annual Fuel Utilization Efficiency of existing system = 0.78 (default)

7.3.3 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Low-Income Assistance Program are summarized by measure type and with OG&E as the cross-participating electric utility in Table 7-5.

Table 7-5 ONG & OG&E Ex-ante and Ex-Post Annual Therm Savings for Low-Income Assistance Program by Equipment Type

Measure Type	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
Air Sealing	54,506	59,606	109%
Attic Insulation	14,419	15,759	109%
Duct Sealing	101,614	109,887	108%
Total	**170,540**	**185,253**	**109%**

The ex-ante and ex-post gross therm savings of the Low-Income Assistance Program are summarized by measure type with PSO as the cross-participating electric utility in Table 7-6.

Table 7-6 ONG & PSO Ex-Ante and Ex-Post Annual Therm Savings for Low-Income Assistance Program by Equipment Type

Measure Type	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
Air Sealing	36,573	42,823	117%
Attic Insulation	23,040	23,500	102%
Duct Sealing	87,924	104,950	119%
Total	**147,537**	**171,272**	**116%**

The Program realization rate was slightly greater than expected. The Evaluator included a source-to-site ratio of 1.09 in the savings ex-post calculations and therefore increased the realized savings from the installed measures. Ex-ante calculations did not include source to site ratios in savings estimates.

Additionally, there were a handful of line items for which the weather zone may have been incorrectly assumed for ex-ante calculations. This usually occurred for projects that may have been assumed to be in weather zone 7, but were then determined to be in 8a, 8b weather zones.

7.3.4 Net Impact Evaluation

Because the Low-Income Assistance Program targeted energy efficiency improvements in low-income residential housing, free ridership is assumed to be zero; therefore, net ex-post savings are equal to gross ex-post savings.

7.3.5 Results of Net Savings Estimation

For the Low-Income Assistance Program, The Evaluator assumed a net-to-gross ratio of 1. This is a normal assumption for low-income programs as participants cannot afford the improvements without program assistance.

Table 7-7 summarizes the gross and net ex-post therm savings for the Low-Income Assistance Program.

Table 7-7 Heating System Summary of Gross and Net Ex-Post Therm Savings

Cross-Participating Electric Utility	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
OG&E	185,253	0%	185,253	100%
PSO	171,272	0%	171,272	100%
Total	**356,525**	**0%**	**356,525**	**100%**

7.4 Process Evaluation

No process evaluation was performed in PY2023 for the Low-Income Assistance Program. As part of program implementation, ONG partners with electric utility service providers that share ONG's service territory. ONG provides the necessary funding for dual-fuel measure installation; however, it is assumed that low-income program participants do not have a great deal of perspective or experience with the program with ONG as program administrator.

8 Water Conservation Kit Program

The Water Conservation Kit Program was designed to provide water-efficient direct install equipment, free of charge, to residential customers who have natural gas water heating.

8.1 Program Description

Residential customers can complete an online application to receive a water conservation kit. The kit includes one showerhead, one kitchen faucet aerator, and two bathroom faucet aerators. Program implementation is performed by Energy Federation, Inc (EFI), which is the firm responsible for shipping the kits to participants who have completed an online application.

Table 8-1 shows the number of completed projects and ex-ante therm savings for the Water Conservation Kit Program by equipment type.

Table 8-1 Ex-Ante Therm Savings of Water Conservation Kits Program by Equipment Type

Equipment Type	*Number of Components*	*Ex-Ante Therm Savings per unit*	*Ex-Ante Therm Savings*
Bathroom Aerator	12,350	1.4	17,369
Kitchen Aerator	6,175	0.8	5,211
Low-Flow Showerhead	6,175	7.5	46,445
Total	**24,700**	**2.8**	**69,025**

8.2 Impact Evaluation

8.2.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Water Conservation Kit Program.

8.2.1.1 Review of Documentation

The Evaluator performed a census review of tracking data. Communications between ONG and EFI, the program implementation contractor, were also reviewed to determine kit contents and specifications. No other documentation was utilized for the evaluation.

8.2.1.2 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the calculation of gross energy impacts depended largely on the types of measures installed. Where applicable, deemed values and algorithms from the Arkansas TRM were used to calculate verified gross energy impacts.

To determine the quantity of measures rebated and installed, The Evaluator reviewed all entries in the tracking system to ensure (a) each measure is program eligible, (b) each measure was purchased and rebated in PY2023, and (c) there were no duplicate or otherwise erroneous entries.

8.2.1.3 Method for Analyzing Savings from Measures in the Conservation kits

The conservation kit consists of one showerhead, one kitchen faucet aerator and two bathroom faucet aerators. In-service rates (ISRs) were developed for each measure using the program participant survey; ISRs are shown below.

Table 8-2 Measure ISRs

Equipment Type	*ISR*
Bathroom Aerator	54%
Kitchen Aerator	49%
Low-Flow Showerhead	66%

Per-unit energy savings calculations are shown below:

Showerhead:

$$Annual\ Energy\ Savings = \frac{\rho \times C_P \times V \times (T_{Mixed} - T_{Supply}) \times (1/RE)}{\text{Conversion Factor}} \times \text{ISR} \times \%\text{Water Heater fuel type x source to site ratio}$$

ρ = Water density = 8.33 lb./gallon

C_P = Specific heat of water = 1 BTU/lb.·°F

V = ($Gallons/Shower$_base × $Showers\ per\ Person/Day$ _base - $Gallons/Shower$_post × $Showers\ per\ Person/Day$_post) × (365 $Days/Year$) × ($Occupants\ per\ Home/\ Showerheads\ per\ Home$)

Occupants per home = 2.82 persons, survey results

Shower per home = 1.75 showers, survey results

V = (20.7 × 0.69 – 12.4 × 0.72) × (365) × (2.82) / (1.75) = 3,143.38gal

$Tmixed$ = from AR TRM, based on climate zone

$TSupply$ = from AR TRM, based on climate zone

RE = 0.79 gas water heater, 0.98 electric water heater

$Conversion\ Factor$ = 100,000 Btu/therm

ISR = see above table

%Water heater fuel type = 88.94% gas water heater, 11.06% electric water heater

Source to site ratio = 1.09 gas, 3.36 electric to gas

Faucet Aerator:

$$Annual\ Energy\ Savings = \frac{\rho \times CP \times V \times (TMixed - TSupply) \times (1/RE)}{\text{Conversion Factor}} \times \text{ISR} \times \%\text{Gas Water Heater x source to site ratio}$$

ρ = Water density = 8.33 lb./gallon

CP = Specific heat of water = 1 BTU/lb.·°F

V = ($Faucet\ Use\ per\ Person/Day$_base - $Faucet\ Use\ per\ Person/Day$_post) × ($Occupants\ per\ Home$) × (365 $Days/Year$) × / (Faucets $per\ Home$)

Occupants per home = 2.39 persons, survey results

Number of faucets per home = 2.21, survey results

$Faucet\ Use\ per\ Person/Day$_post = 8.2 kitchen aerator, 7.2 bathroom aerator

V = (9-7 –8.2 or 7.2) × (2.7) x (365) × / (3.41) = 674.29 gal. kitchen aerator, 1,123.81 gal. bathroom aerator

Tmixed= from AR TRM, based on climate zone

$TSupply$ = from AR TRM, based on climate zone

RE= 0.79 gas water heater, 0.98 electric water heater

$Conversion\ Factor$ =100,000 Btu/therm

ISR = see above table

Source to site ratio = 1.09 gas, 3.36 electric to gas

8.2.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the Water Conservation Kit Program are summarized by equipment type in Table 8-3.

Table 8-3 Ex-Ante and Ex-Post Annual Therm Savings for Water Conservation Kit Program by Equipment Type

Equipment Type	*Ex-ante Gross Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
Bathroom Aerator	17,369	33,659	194%
Kitchen Aerator	5,211	9,144	175%
Low-Flow Showerhead	46,445	52,421	113%
Total	**69,025**	**95,223**	**138%**

The savings realization rate for the Water Conservation Kits Program is higher than expected because ex-ante calculations did not account for source to site ratios and ex-ante may have assumed slightly different ISRs. Also, the kit contents were installed less frequently than expected, leading to lower ISRs and fewer realized savings. Measure ISRs have slightly decreased compared to last year with bathroom aerator ISR down 5% from 59%, kitchen aerators ISR down about 8% from 57%, and showerheads ISR down about 4% from 70%.

8.2.3 Net Impact Evaluation

The calculation of free ridership is based on the responses to questions on the following topics:

- Prior experience with similar energy saving equipment;

- Prior planning to purchase energy efficiency measures provided through the program; and
- Likelihood of installing similar equipment without the program.

8.2.3.1 Prior Experience

The program is designed to encourage customers to use efficiency measures that they previously did not have experience with by providing them at no cost to the customer. As such, a primary indicator of the likelihood that a participant is a free rider, is whether he or she has previously purchased a similar measure. Previous experience is used as an indicator of whether the customer would have coincidently purchased a similar measure on their own.

Prior experience is assessed through the following question:

- FR1: "Thinking back to before you completed the Online Energy Check-up, had you purchased any of the following items in the last three years? "

Respondents indicating that they had not purchased a given measure in the past three years are considered to have minimal to no prior experience with that measure, meaning that the intervention of the program is likely significantly influential in the energy savings resulting from the measure. These respondents receive an overall free ridership score of 0 for this measure. Otherwise, free ridership is assessed using the following factors.

8.2.3.2 Prior Plans and Intentions

Customers were asked as to any plans they had to purchase any of the measures. This is addressed in the following question:

- FR2: “Before you heard of the Water Conservation Kit Program, did you have specific plans to purchase any of these kit items that were sent to you? For each of the following items, please answer if you had plans to buy the item within 12 months of when you ordered the free Energy Efficiency Kit.”

For bathroom aerators, customers that respond that they planned to install the measures are asked the following question:

- FR3: How many of the two bathroom faucet aerators that you received did you plan to purchase?"

Respondents who indicate that they had plans to purchase the measure on FR2, are given a plans score of 1. Respondents who said they did not have plans (responded “Don’t Know” or “No” to FR2) were assigned a plans score of 0. Those that did not answer this question were not assigned a plans score. The response to FR3 is used to adjust the plans score to reflect the number of items the respondent planned to purchase. For example, if the respondent planned to purchase one of the two items received, the plans score is adjusted to .5.

8.2.3.3 Likelihood of Purchasing Measure

Once customers learn of the program, it is possible that this knowledge will sway their decision-making process to install these energy efficient measures in their homes. Additionally, the information and measures provided through the program may help to overcome existing barriers to energy efficiency improvements. To address this, participants were asked the following questions:

- FR4: If you had not requested the Water Conservation Kit, how likely would you have been to purchase any of the following items on your own within 12 months of when you received them?
- FR5: [IF FR4 > Not at all likely] Based on your response, there is some likelihood that you would have purchased some of the kit items in the next 12 months. Given that, we would like to know why you had not already purchased the items on your own. Had you not already purchased [MEASURE] because 1) you didn't want to spend the money, 2) you had not gotten around to it, 3) you didn't know where to purchase [MEASURE], 4) you didn't know enough about [MEASURE], or 6) another reason?

Respondents who indicated in FR4 that they had not already purchased a given measure because they did not want to spend the money, did not know where to purchase the measure, or did not know enough about the measure are considered to have had significant barriers to implementing these energy efficiency improvements and receive a score of 0% free ridership for the measure under this component. Otherwise, the likelihood of purchasing is scored as:

- Not at all likely (0)
- Somewhat likely (.25)
- Moderately likely (0.5)
- Very likely (0.75)
- Extremely likely (1)

8.2.3.4 Free Ridership Scoring

For respondents who demonstrated prior experience with a measure, the scores for the prior plans and likelihood of purchasing the measures were averaged to assign a measure-level free ridership score to each respondent.

8.2.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts.

Table 8-4 summarizes the results of the estimation of free ridership. Overall, free ridership was low for the program.

Table 8-4 Water Conservation Kits Program Free Ridership Factor

Equipment Type	*FR Factor*
Bathroom Aerator	4%
Kitchen Aerator	4%
Low-Flow Showerhead	6%

Table 8-5 summarizes the gross and net ex-post therm savings for the Water Conservation Kit Program.

Table 8-5 Water Conservation Kit Program Summary of Gross and Net Ex-Post Therm Savings

Equipment Type	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
Bathroom Aerator	33,659	1,262	32,397	96%
Kitchen Aerator	9,144	387	8,756	96%
Low-Flow Showerhead	52,421	3,276	49,145	94%
Total	**95,223**	**4,926**	**90,298**	**95%**

Table 8-6 summarizes the gross and net ex-post water savings for the Water Conservation Kit Program.

Table 8-6 Water Conservation Kit Program Summary of Gross and Net Water Savings

Equipment Type	*Gross Water Savings (gal)*	*Estimated Free Ridership*	*Net Water Savings (gal)*	*Net to Gross Ratio*
Bathroom Aerator	3,266,915	122,509	3,144,405	96%
Kitchen Aerator	1,774,939	75,188	1,699,751	96%
Low-Flow Showerhead	10,175,887	635,993	9,539,894	94%
Total	**15,217,741**	**833,691**	**14,384,050**	**95%**

8.3 Process Evaluation

The following section presents the results of the process evaluation for the Water Conservation Kits Program.

8.3.1 Participant Survey

The Evaluator conducted a survey of Water Conservation Kit customers to gather feedback about customers' opinions towards the kits. Surveys were sent to 3,683 customers who received a kit during 2023. Two-hundred-fifty-one customers responded to the survey; 234 of these respondents indicated they requested the kit. This survey analysis focuses on the 234 respondents who requested the kit from ONG.

8.3.1.1 Demographics

Table 8-7 highlights the demographic distribution of survey respondents.

Table 8-7: Demographics (n=234)

Answer	%	Count
Home ownership (n=234)		
Own	83.30%	195
Rent	15.40%	36
Own and rent to someone else	0.00%	0
Don't know	0.00%	0
Prefer not to answer	1.30%	3
Building type (n=234)		
Manufactured home	3.40%	8
Single-family house detached from any other house	88.90%	208
Single family house attached to one or more other houses, for example, duplex, row house, or townhome	4.70%	11
Apartment in a building with 2 to 3 units	0.90%	2
Apartment in a building with 4 or more units	0.90%	2
Other	0.00%	0
Don't know	0.40%	1
Prefer not to answer	0.90%	2
Building age (n=234)		
Before 1950	15.80%	37
1950 to 1959	9.00%	21
1960 to 1969	13.20%	31
1970 to 1979	19.20%	45
1980 to 1989	11.50%	27
1990 to 1999	8.50%	20
2000 to 2009	7.30%	17
2010 to 2016	4.30%	10
Don't know	6.40%	15
Prefer not to answer	0.00%	0
2017 to present	4.70%	11
Building size (ft2) (n=184)		
less than 1,000 ft	8.70%	16
1000 to 1500	28.80%	53
1500 to 2000	32.60%	60
2000 to 2500	18.50%	34
2500 to 3000	5.40%	10
greater than or equal to 3000	6.00%	11
Primary heating fuel (n=234)		
Electricity	10.30%	24

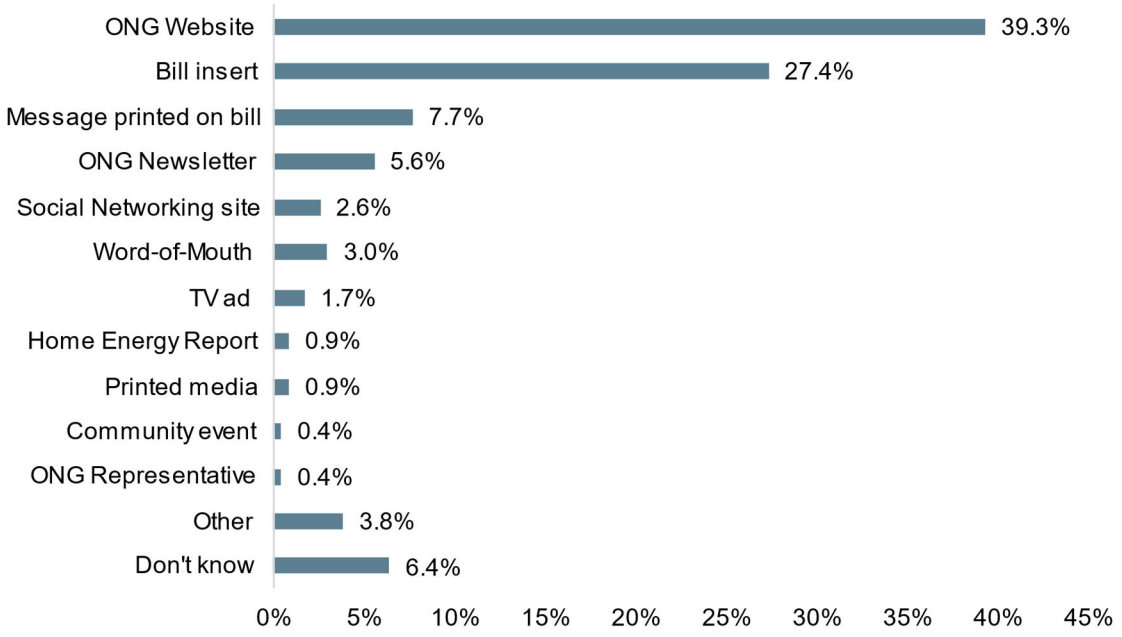
Answer	%	Count
Natural Gas	86.80%	203
Propane	0.00%	0
Something else (Specify)	0.40%	1
Don't heat home	0.40%	1
Don't know	1.30%	3
Prefer not to answer	0.90%	2
Water heating fuel (n=234)		
Electricity	10.70%	25
Natural Gas	85.90%	201
Propane	0.00%	0
Something else (Specify)	0.40%	1
Don't heat home	0.00%	0
Don't know	1.70%	4
Prefer not to answer	1.30%	3
Household size (n=234)		
1	25.60%	60
2	39.30%	92
3	14.50%	34
4	8.10%	19
5	8.10%	19
6	2.10%	5
Prefer not to answer	2.10%	5
Bathroom faucets quantity (n=234)		
1	17.90%	42
2	50.40%	118
3	20.10%	47
4	6.80%	16
5	1.30%	3
6	1.30%	3
7	0.00%	0
8 or more	0.40%	1
Don't know	0.00%	0
Prefer not to answer	1.70%	4
Shower quantity (n=234)		
1	26.10%	61
2	63.70%	149
3	7.70%	18
4	0.90%	2
5	0.40%	1

Answer	%	Count
6	0.40%	1
7	0.00%	0
8 or more	0.00%	0
Don't know	0.00%	0
Prefer not to answer	0.90%	2
Annual household income (n=234)		
Less than $10,000	4.30%	10
$10,000 to less than $20,000	7.30%	17
$20,000 to less than $30,000	10.30%	24
$30,000 to less than $40,000	6.40%	15
$40,000 to less than $50,000	12.00%	28
$50,000 to less than $75,000	13.20%	31
$75,000 to less than $100,000	9.40%	22
$100,000 to less than $150,000	7.30%	17
$150,000 to less than $200,000	2.60%	6
$200,000 or more	2.10%	5
Don't know	1.70%	4
Prefer not to answer	23.50%	55
Educational attainment (n=234)		
Did not graduate from high school	2.60%	6
High school graduate	18.40%	43
Associate's degree, vocational/technical school, or some college	29.10%	68
Four-year college degree	23.90%	56
Graduate or professional degree	17.90%	42
Don't know	0.00%	0
Prefer not to answer	8.10%	19

8.3.1.2 Program participation

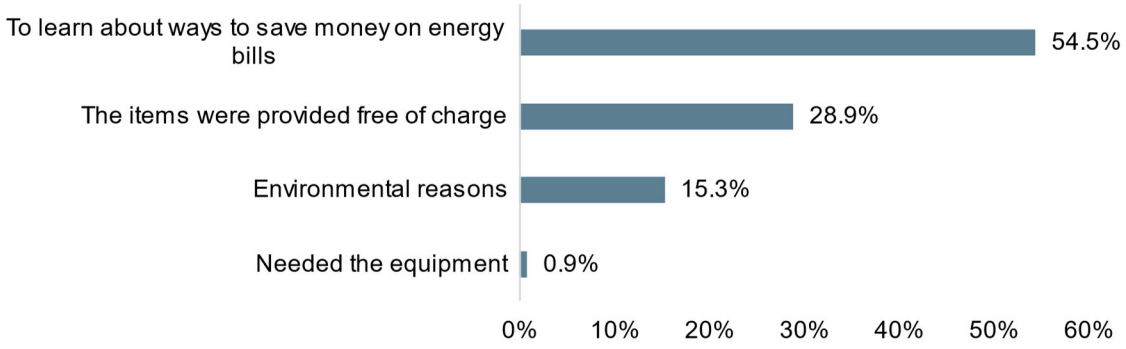
The majority of respondents learned about the kits directly from ONG (80.3%, n=188). Popular ONG sources included the website (39.3%, n=92) and bill inserts (27.4%, n=64) (Figure 8-1).

Figure 8-1: Program awareness (n=234)



Respondents were motivated to participate in the program to learn about how to save on energy bills (53.8%, n=126) and because the products were provided for free (27.8%, n=65) (Figure 8-2).

Figure 8-2: Participation reasoning (n=234)



More respondents installed the low-flow showerheads (64.5%, n=151) and at least one bathroom faucet aerators (63.2%, n=148) compared with the kitchen faucet aerators (46.6%, n=109) (Figure 8-3). About one third of respondents installed both bathroom faucet aerators (35.0%, n=82).

Reasons for not installing the equipment varied by equipment type (Table 8-8).

Figure 8-3: Product installation (n=234)

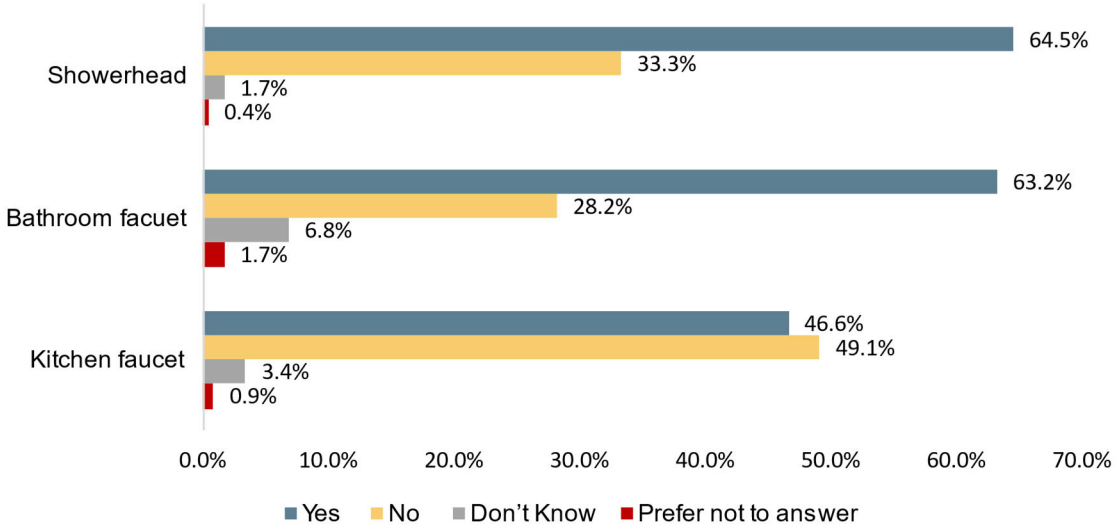


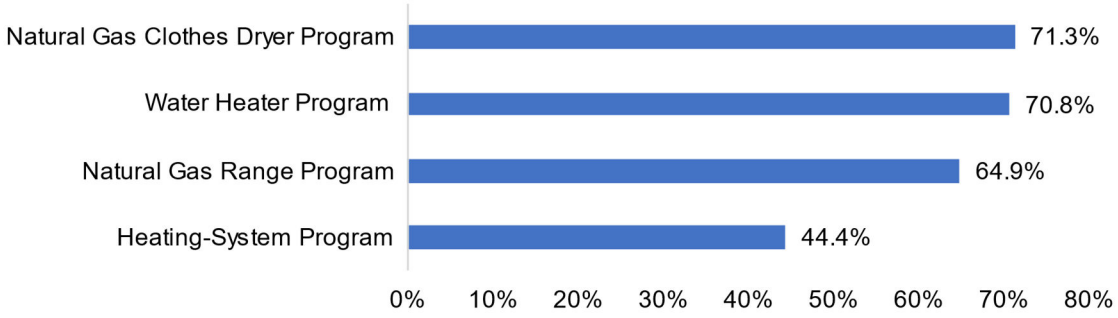
Table 8-8: Reason for Non-installation (n=162)

Response	Showerhead	Kitchen Aerator	Bathroom Aerator	Total
Compatibility Issue	4	46	31	81
Did not like the equipment	32	16	9	57
Didn't need	5	6	38	49
No time to install	13	12	13	38
Installation Issue	10	9	8	27
Not in kit	1	9	16	26
Unrelated Issue	8	7	10	25
Lost the equipment	1	1	0	2
Equipment did not work	1	1	0	2
Don't Know	0	7	5	12

8.3.1.3 Other ONG Programs

Three-quarters of respondents were aware that ONG offered rebate and discount programs for high-efficiency natural gas products (73.1%, n=171). Respondents were most familiar with the clothes dryer program (71.0%, n=121) and water heater program (71.0%, n=121) (Figure 8-4). About 12% of respondents first learned about ONG's other rebate programs through the conservation kit (11.7%, n=20).

Figure 8-4: Awareness of other ONG Programs (n=171)

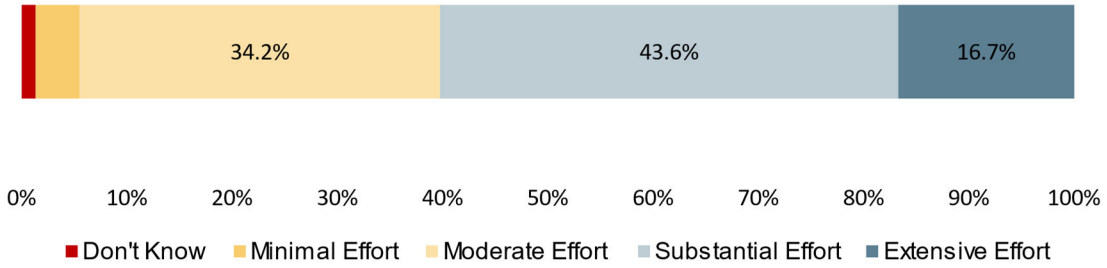


Most respondents did not purchase more energy efficient equipment as a result of their receipt of the water conservation kit (80.8%, n=189).

8.3.1.4 Energy Saving Behaviors

More than half of respondents indicated they have made substantial (43.6%, n=102) or extensive efforts (16.7%, n= 39) to reduce their household's energy usage (60.3%, n=141) (Figure 8-5).

Figure 8-5: Effort Made Towards Reducing Energy Usage (n=234)



8.3.1.5 Program Satisfaction

Most respondents were satisfied with the conservation kits program and ONG as their service provider (Figure 8-6). More than three-quarters of respondents were satisfied with the kits (77.0%, n=179) and 86.0% (n=202) were satisfied with the process of requesting the kit. Thirty-seven respondents expressed dissatisfaction with some aspect of the program; reasons for dissatisfaction included high energy bills, product quality, and shipping times (Table 8-9).

Figure 8-6: Program Satisfaction (n=234)

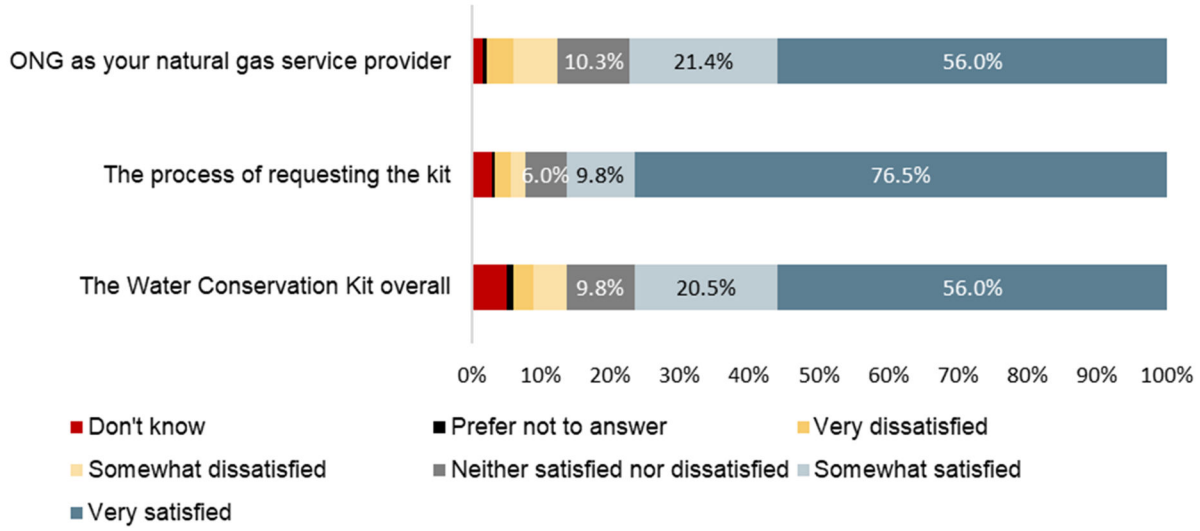


Table 8-9: Reason with Dissatisfaction (n=37)

Response	n
Utility costs	17
Product quality	6
Shipping time	5
Limited information in kit	1
Transparency	1
Don't Know	6

8.4 Conclusions and Recommendations

8.4.1 Conclusions

- Most participants learned about the program through ONG (80%), specifically the website and bill inserts.
- More than half of respondents requested a kit to learn how to save energy on their bills.
- Two-thirds of respondents installed low-flow showerheads.
- Thirty-eight respondents indicated they did not need two-bathroom faucets.
- Most respondents had not purchased similar products in the past three years (71%).
- Overall, satisfaction with the kit and ONG services was high.

8.4.2 Recommendations

- Continue to send email blasts promoting the water conservation kits in waves throughout the year to control the number of requests received.

- Track any instances of customers who requested a kit but have not yet received the kit through the program year.

9 New Home Program

The New Home Program was designed to provide financial incentives to encourage home builders to build energy efficient homes.

9.1 Program Description

The objective of the New Home Program is to elicit homebuilders to include energy efficient measures in the construction of new homes built within ONG's service area. The program also educates participants about the benefits of energy efficient homes and tries to influence home buying decisions.

ONG utilized a third-party Home Energy Rater (HERS rater) to create an energy model and generate a HERS score for each home in the program. A User Defined Reference Home (UDRH) is incorporated with the energy model. The UDRH represents Oklahoma's code minimum home. The HERS raters perform inspections during and after a home's construction to support the HERS score and the energy models.

Table 9-1 summarizes the incentives provided through the program.

Table 9-1 New Home Program Incentive

Home Type	*Rebate Amount*
2000 sq. ft. or greater home w/ minimum four natural gas outlets, including natural gas space and water heating, and one other natural gas appliance.	$750

Table 9-2 Shows the number of completed projects and ex-ante therm savings for the New Home Program by strata.

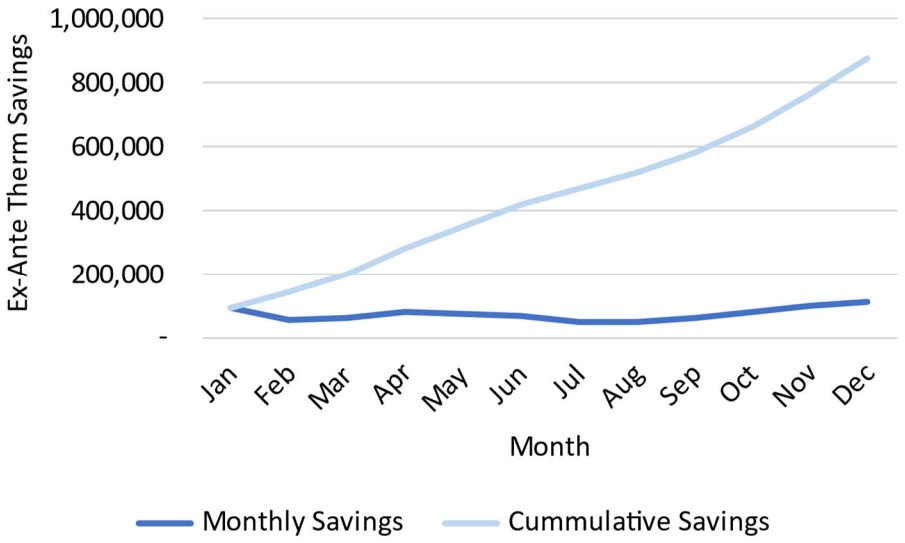
Table 9-2 Ex-Ante Therm Savings of New Home Program

Number of Homes	*Ex-Ante Therm Savings per unit*	*Ex-Ante Therm Savings*
3,929	**222.76**	**875,224**

9.2 Program Trends in PY2023

Figure 9-1 plots the New Home Program ex-ante therm savings by project completion month.

Figure 9-1 New Home Program Ex-Ante Therm Savings by Project Completion



9.3 Impact Evaluation

9.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the New Home Program.

9.3.1.1 Review of Documentation

The Evaluator received a sample of energy models from program HERS raters as well as application materials via ONG. All data was reviewed for consistency and accuracy.

9.3.1.2 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator's approach for the calculation of gross energy impacts depended largely on the types of measures installed. This program incentivizes builders to improve the energy efficiency of participating homes. Energy models were created for participating homes and then were compared to Oklahoma's baseline code minimum home to calculate energy savings.

9.3.1.3 Method for Analyzing Savings from New Home

HERS raters created energy models of the as-built house to model the energy use of the actual house. This model was compared to the UDRH. The UDRH reflects Oklahoma's energy code minimum house. The UDRH was developed by inspecting building codes, HVAC equipment codes, and appliance codes. The as-built home saves energy because its building envelope and ducts are sealed tighter, walls and attic have more insulation, and HVAC and appliances are more efficient than the code minimum house.

9.3.1.4 UDRH Baseline Homes

There is one UDRH house used in the program. The UDRH represents Oklahoma's code minimum house. Some of the key UDRH assumption are shown in Table 9-3.

Table 9-3 UDRH Key Assumptions

Input	*UDRH Assumption*	*Source*
Attic Insulation	R-30	2009 IRC Table N1102.1 values.
Wall Insulation	R-13	2009 IRC Table N1102.1 values.
Door R	R-2	2009 IRC Table N1102.1 fenestration requirements.
Window U	0.5	2009 IRC Table N1102.1 values.
Window SHGC	0.35	2009 IRC Table N1102.1 values.
Infiltration	0.00036 F-L-A	2009 IECC Reference home, Table 405.5.2(1).
Slab Edge Insulation	None	2009 IRC Table N1102.1 values.
Gas Instant Water Heater (%)	82	2009 IRC Table N1102.1 values.
Conventional Gas Water Heater (%)	58	2009 IRC Table N1102.1 values.

9.3.1.5 Desk Review Verification Procedure

The primary goal of the desk review verification effort is to verify as much data as possible using supporting documentation. The Evaluator can verify the following metrics through a desk review:

- Efficiency of HVAC equipment, water heaters, and appliances;
- Thermal properties of windows, walls, floor, and ceilings; and
- Area of walls, ceilings, floor, windows, and doors.

The Evaluator received several energy models from program HERS raters via ONG.

9.3.1.6 Sampling Plan

The Evaluator developed a sampling plan to achieve the required relative precision at the required confidence level. Table 9-4 shows the evaluation sampling strategy.

Table 9-4 New Home Sampling Plan

Gross Ex-Post Therm Savings	*Coefficient of Variation*	*Number of Sampled Homes*	*Number of Homes*	*Relative Precision (90% Confidence Interval)*
1,026,991	**0.5**	**68**	**3,929**	**9.89%**

9.3.2 Results of Ex-Post Gross Savings Estimation

The ex-ante and ex-post gross therm savings of the New Home Program are summarized in Table 9-5. The method by which ex-post gross savings were estimated is described in section 9.3.1.3.

Table 9-5 Ex-ante and Ex-Post Annual Therm Savings for New Home Program

Number of Sampled Homes	*Gross Ex-Ante Therm Savings*	*Gross Ex-Post Therm Savings*	*Gross Therm Savings Realization Rate*
68	**875,224**	**1,026,991**	**117%**

The Evaluator incorporated a User Defined Reference Home (UDRH) into the energy models provided by the HERS raters. The UDRH reflects Oklahoma's code minimum house. The homes in the program are more efficient than the code minimum. Participating homes have increased air sealing and duct sealing, more insulation in the walls and in the attic, and have more efficient furnaces and appliances.

The ex-ante and ex-post gross therm savings of the New Home Program are summarized in Table 9-6. About 85% of gross program savings are represented in the table below.

Table 9-6 Ex-Ante and Ex-Post Annual Therm Savings for New Home Program by Top 10 Builders

Builder	*Number of Homes*	*Gross Ex-Ante Therm Savings per Builder*	*Gross Ex-Post Therm Savings per Builder*	*Gross Therm Savings Realization Rate*
Builder 1	1,396	310,973	364,897	117%
Builder 2	441	98,237	115,272	117%
Builder 3	392	87,322	102,464	117%
Builder 4	320	71,283	83,644	117%
Builder 5	184	40,988	48,095	117%
Builder 6	147	32,746	38,424	117%
Builder 7	145	32,300	37,901	117%
Builder 8	130	28,959	33,980	117%
Builder 9	115	25,617	30,060	117%
Builder 10	71	15,816	18,559	117%
Program Total	**3,929**	**875,224**	**1,026,991**	**117%**

9.3.3 Net Impact Evaluation

Survey responses of participating builders were collected to estimate a net-to-gross ratio for the program. Free ridership scores were developed for each interviewee by analyzing responses to two lines of questioning: program influence and building practices in the absence of the program. The scoring for each line of questioning is detailed below, followed by the algorithm for calculating the overall net-to-gross ratio.

ADM used results from builder interviews from 2017-2023 to assign free ridership scores. Builder's NTG responses were weighted by total number of homes completed through the program in 2023 to develop a program level NTG estimate. Only responses from builders that participated in 2023 were used to estimate a score. On the occasion that a

builder was interviewed multiple times from 2017-2023, the more recent response was used. Survey question wording and score assignment for the survey that was administered from 2021 to 2023 is displayed here. From 2017 to 2020, questions used scales from 0 to 10, rather than 1 to 5. To be able to consistently score the builders, ADM scaled the responses and scores.

9.3.3.1 Program Influence

The Program Influence indicator variable was calculated using the response to the following:

- FR1: We would like to identify which, if any, aspects of the program were important in your decision to build homes to a higher efficiency standard than is required by code. Please rate each of the following factors on a scale of 1 to 5, where 1 means that the factor was not at all important in your decision to build energy efficient homes, and 5 means that the factor was extremely important in your decision to build energy efficient homes.
- FR2: How, if at all, have any of the resources offered by the program affected your success in selling energy efficient homes?
- FR3: Could you please tell me, in your own words, the influence the ONG New Home Program had on your building practices?

Question FR1 provided respondents with a list of factors that were associated with the ONG program; respondents were to rate the importance of each of them in their decision-making process. These factors included:

- Information from ONG staff;
- Technical assistance from HERS raters;
- The incentive provided by the program; and
- Program marketing and program informational literature.

A score was assigned to each of the ratings in the following manner:

- 1 - Not at all important (1)
- 2 (0.75)
- 3 (0.5)
- 4 (0.25)
- 5 - Extremely important (0)

Respondents that provided open-ended commentary indicating that the program had positively influenced their sales of efficient homes, or had affected their building practices, receive a 50% decrease in the program influence free ridership score. Thus, the program influence mitigation variable FR4 was defined as:

Program Influence Mitigation Variable

- Comment indicates program influence on sales (0.5)
- Comments do not indicate program influence or positive influence on sales (1)

The program influence score was calculated by multiplying FR1 by the mitigation score.

9.3.3.2 Absence of Program Score

The Absence of Program Score was calculated using the response to the following:

- FR5: On a scale of 1 to 5, where 1 represents "not at all likely" and 5 represents "extremely likely", if the ONG New Home Program and incentive were not available, how likely would your company be to build your homes to the same efficiency standard?"; and
- FR6: On a scale of 1 to 5, where 1 represents "not at all likely" and 5 represents "extremely likely", if the ONG New Home Program and incentive were not available, how likely would your company be to build FEWER homes to the same efficiency standard?
- FR7: What factors influence decisions to include energy efficient equipment/materials/construction practices which exceed IECC 2009 building code requirements?

A score was assigned using the response to FR5 as follows:

- 1 - Not at all likely (0)
- 2 (0.25)
- 3 (0.5)
- 4 (0.75)
- 5 – Extremely likely (1)

FR6 and FR7 served to define a mitigation variable for the behavior absent program score. Respondents that provided a score of 3 or greater to FR6 received a 50% reduction to the behavior in the absence of the program score. Further, respondents providing an open-ended response to FR7 indicating that their decision to build efficient homes was affected by financial factors received another 50% reduction to the absence of the program score. Thus, the absence of program mitigation variables were defined as:

Absence of Program Mitigation Variable 1

- FR6 scored 3 or greater (0.5)
- FR6 scored less than 3 (1)

Absence of Program Mitigation Variable 2

- FR7 response indicates financial factors affected decision to build efficient homes (0.5)

- FR7 response indicates financial factors did not affect decision to build efficient homes (1)

The absence of the program score was calculated by multiplying the FR5 score by the Absence of Program Mitigation Variables.

Net-to-gross ratios for the respondents were based on the Program Influence Score and the Behavior Absent Program Score, as follows, where Program Influence accounts for 60% of the net-to-gross score and Behavior Absent Program accounts for 40% of the net-to-gross score:

*Free Ridership Score = (0.6 * Program Influence Score) + (0.4 * Absence of Program Score)*

The scores were then weighted by the number of participating homes that each responding respondent had in the program.

9.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts.

Table 9-7 summarizes the results of the estimation of free ridership. Free ridership was low for the program because there was a low incidences of participant responses indicating a high likelihood of building energy efficient homes in the absence of the program.

Table 9-7 New Home Program Free Ridership Factor

Program	*FR Factor*
New Home	7%

Table 9-8 summarizes the gross and net ex-post therm savings for the New Home Program by Stratum.

Table 9-8 New Home Summary of Gross and Net Ex-Post Therm Savings

Ex-Post Gross Therm Savings	*Estimated Free Ridership*	*Ex-Post Net Therm Savings*	*Net to Gross Ratio*
1,026,991	**67,203**	**959,789**	**93%**

Total overall ex post savings have slightly decreased compared to last year due to a slight decrease in participation. Last year, there were 5,505 new home projects completed while there were 3,929 new home projects in 2023.

9.4 Process Evaluation

The following section presents the results of the process evaluation for the New Home Program

9.4.1 Participant Survey

The Evaluator conducted a survey with five New Homes Program participants to gather feedback about their engagement with and experience of the program. The tracking data included 15 unique New Homes Program participants. Each participant was contacted three times via phone inviting them to take the survey; participants who provided email addresses were emailed a survey link. Five participants responded to the survey with a response rate of 33.3%.

9.4.1.1 Program Participation

Respondents learned about the program from different sources including a Home Energy Rating System (HERS) rater (n=2) and an equipment vendor or contractor (n=1) (Table 9-9).

Table 9-9: Program Awareness (n=5)

Source	n
HERS contractor	2
Equipment vendor/contractor	1
Don't know	2

Three of the five respondents noted that they received some support from ONG since engaging with the New Homes Program (Table 9-10). Respondents did not recall when they received the various services, as all three of them have participated in the program for multiple years.

Table 9-10 Support or Services Received Since Program Enrollment (n=5)

	n
Training on program processes and procedures	3
Technical training or assistance on new construction design and energy efficiency	3
Marketing support	1
Don't know	1

9.4.1.2 Building Practices

All five respondents explained that they decide what level of efficiency they will build a home to – high efficiency or standard efficiency. Respondents indicated that a variety of factors contribute to their decision to build efficient homes, most notably the availability of program incentives (Figure 9-2). Once enrolled in the program, respondents build homes that meet the program's requirements because they want to provide their customers a high-quality product (Figure 9-3). Additionally, respondents explained that customers are interested in energy efficient homes to reduce energy costs (n=3) and increase home quality (n=2).

Figure 9-2: Program Aspects Most Important in Decision to Build Homes to a Higher Efficiency Standard Than is Required (n=5)

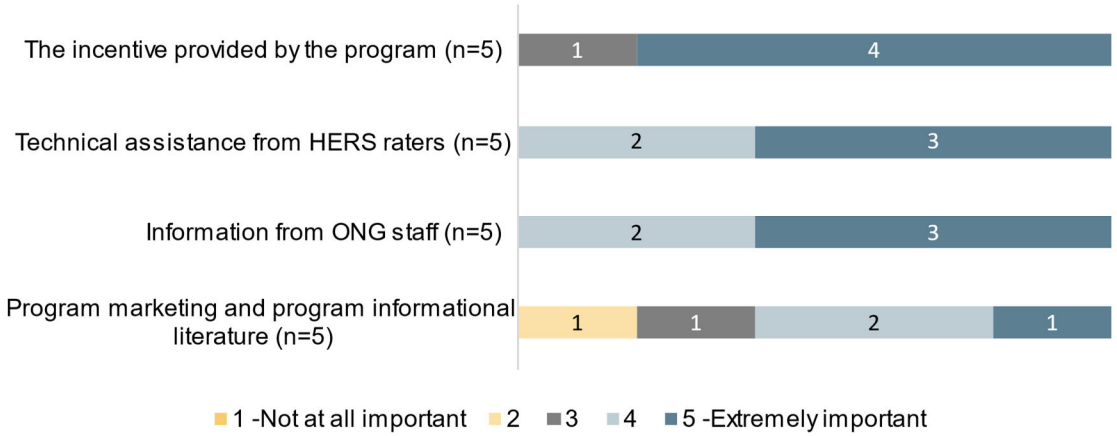
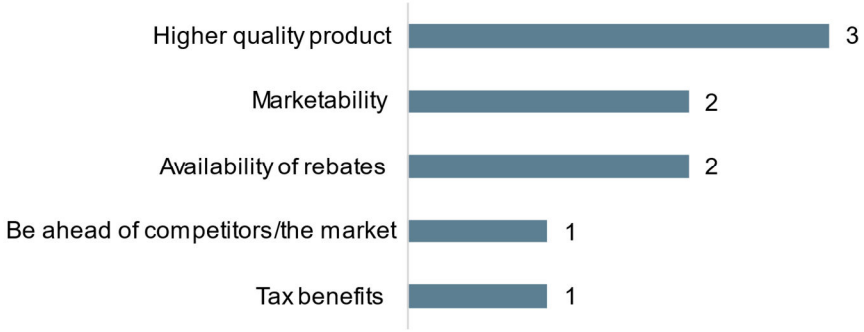


Figure 9-3 Motivation to Meet Program Energy Efficiency Requirements (n=5)



All five respondents indicated that their company performs duct leakage testing on all their homes; two respondents noted that they perform infiltration tests on all their homes. Additionally, prior to enrolling in the New Home program, two respondents utilized a HERS rater.

Three respondents commented on the ways in which the program has impacted their building (n=3) and sales (n=3) practices (Table 9-11).

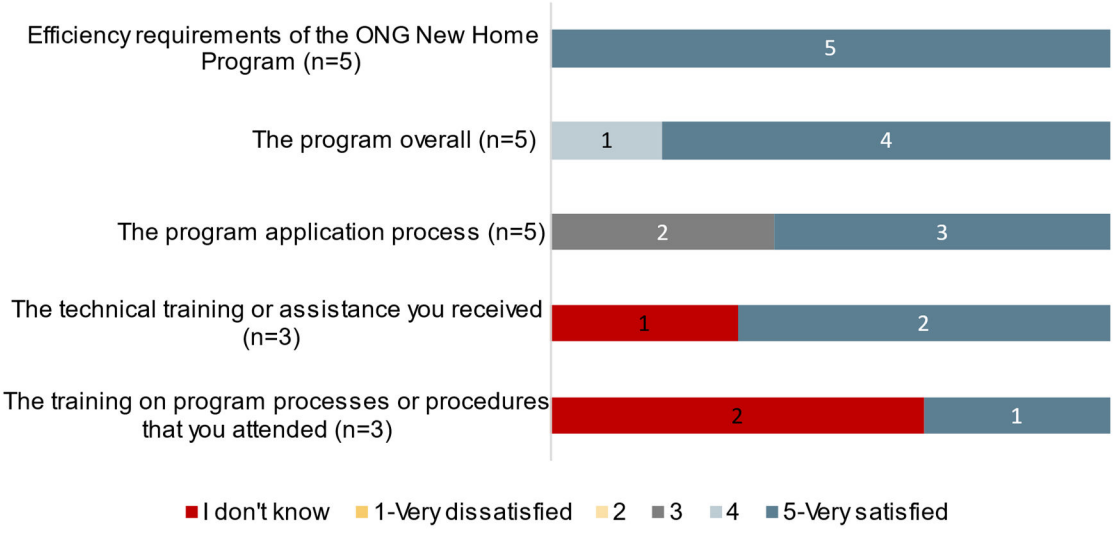
Table 9-11 Program Impact on Building Practices (n=3)

Program Impact on Building Practices (n=3)	n
Include energy efficient features in every home built	1
Install the highest efficiency equipment	1
Provide a higher quality product	1
Program Impact on Success in Selling Homes (n=3)	**n**
Market energy efficiency features to buyers	2
Market HERS scores to buyers	1

9.4.1.3 Program Satisfaction

All five respondents reported high levels of satisfaction with the New Home program. Respondents were most satisfied with the program's efficiency requirements (n=5) (Figure 9-4).

Figure 9-4 Program Satisfaction (n=varies)



9.5 Conclusions and Recommendations

9.5.1 Conclusions

- All five respondents have participated in the New Homes Program for multiple years.
- Program incentives influence respondents' decision to construct energy efficient homes.
- Program participation has positively impacted respondents' building practices and sales.
- Respondents are satisfied with the New Homes Program.

9.5.2 Recommendations

- Continue attending meetings/events to increase awareness and to promote the program, as well as to develop networking opportunities.
- Consider making the application easier for builders with multiple projects by offering a spreadsheet option. When building multiple homes in the same design and style with the same equipment profile, builders would prefer to submit one workbook with all relevant details rather than individual applications.

10 Custom Commercial Program

The Custom Commercial Program was designed to provide financial incentives and technical services to encourage non-residential customers to implement energy saving measures.

10.1 Program Description

The implementation contractor for the Custom Commercial Program is CLEAResult.

The design of the Custom Commercial Program is twofold. First, the Direct Install component is designed to provide energy saving measures free of charge to ONG's commercial sector customers. The available direct install measures are:

- Low Flow Spray Valves;
- Faucet Aerators;
- Showerheads;
- Commercial Door Weather Stripping;
- Drysmart Units; and
- Steam Traps.

Second, the Custom component offers rebates to ONG's commercial sector customers toward high-efficiency equipment and energy-saving processes. Eligible energy efficient equipment is dependent on facility type, and operating characteristics. Financial incentives are based on expected savings for the measure implemented and vary by end–use.

Table 10-1 shows the number of completed projects and ex-ante therm savings for the Custom and Direct Install component of the Commercial Program.

Table 10-1 Ex-Ante Therm Savings of Custom Commercial Program

Program	*Number of Projects*	*Ex Ante Therm Savings*
Custom	54	525,436
Direct Install	63	1,378,833
SEM	66	101,239
Total	**183**	**2,005,508**

10.2 Program Trends in PY2023

Figure 10-1 plots the Custom component ex-ante therm savings by project completion month.

Figure 10-1 Custom Component Ex-Ante Therm Savings by Project Completion

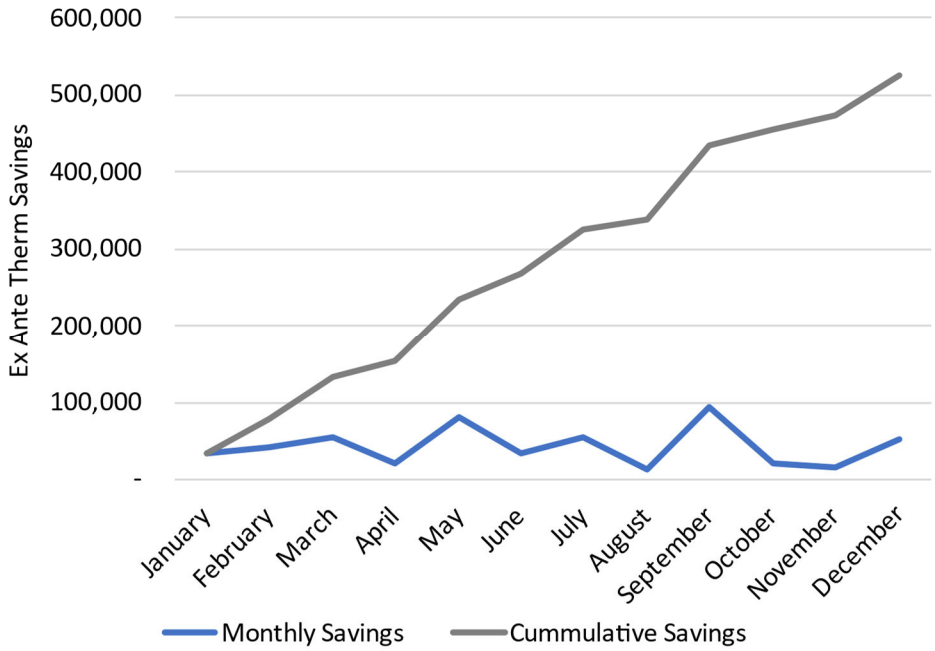
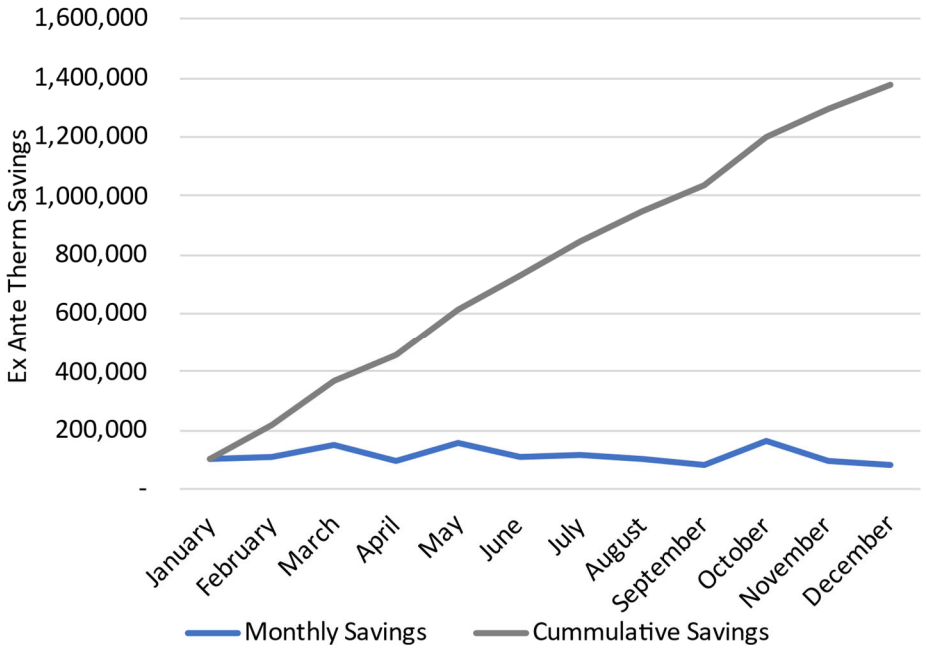


Figure 10-2 plots the Direct Install component ex-ante therm savings by project completion month.

Figure 10-2 Direct Install Component Ex-Ante Therm Savings by Project Completion Month



10.3 Impact Evaluation

10.3.1 Gross Impact Evaluation

The following section presents the methodology that was used for estimating gross energy impacts resulting from the Custom Commercial Program.

10.3.1.1 Sampling Methodology

The estimation of savings for the program is based on a ratio estimation procedure that allows the measured and verified sample to meet or exceed statistical precisions requirements and to accurately explain the annual ex-post gross savings for all completed projects. The Evaluator selected a sample with a sufficient number of projects to estimate the population ex-post gross therm savings with 10% relative precision at the 90% confidence level. The actual relative precision for the program is 5.17%.

The sample selection is from the population of projects with completion dates during PY2023. Table 10-2 and Table 10-3 show the project population from which the sample was drawn, for the Custom component and the Direct Install component. These samples fell into three or five energy savings strata; strata boundaries were based on ex-ante therm savings. Note that in this table, presentation of population statistics used for sample design, including coefficients of variation, are calculated based on final program data.

Table 10-2 Population Statistics Used for Custom Component Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	*SEM*	***Totals***
Strata boundaries (Therm)	<5,000	5,000 - 9,999	10,000- 19,999	20,000 - 54,999	55,000 ≥	Census	
Population Size	35	4	7	7	1	66	
Total Therm savings	50,982	28,903	93,928	274,057	77,565	101,239	**626,675**
Average Therm Savings	1,457	7,226	13,418	13,418	77,565	1,534	**23,392**
Standard deviation of Therm savings	1,072	769	2,391	10,390	0	1,308	
Coefficient of variation	0.74	0.11	0.18	0.27	0.00	0.85	
Final design sample	9	1	3	3	1	66	**83**

Table 10-3 Population Statistics Used for Direct Install Component Sample Design

	Stratum 1	*Stratum 2*	*Stratum 3*	*Stratum 4*	*Stratum 5*	***Totals***
Strata boundaries (Therm)	<5,000	5,000 - 9,999	10,000 - 29,999	30,000 - 49,999	50,000 ≥	
Population Size	3	21	22	13	4	**63**
Total Therm savings	12,222	215,989	449,908	469,772	230,942	**1,378,833**
Average Therm Savings	4,074	10,285	20,450	36,136	57,736	**25,736**
Standard deviation of Therm savings	444	2,852	4,387	6,042	6,884	
Coefficient of variation	0.11	0.28	6.00	0.17	0.12	
Final design sample	1	5	6	4	3	**19**

The Custom component stratified sample shown in Table 10-4 resulted in samples encompassing 52% of the total ex-ante therm savings.

Table 10-4 Ex-Ante Therm Savings for Custom Component Sampled Projects by Stratum

Stratum	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
SEM	101,239	101,239	100%
Custom 5	77,565	77,565	100%
Custom 4	125,726	274,057	46%
Custom 3	6,546	93,928	7%
Custom 2	6,546	28,903	23%
Custom 1	11,160	50,982	22%
Total	**328,783**	**626,675**	**52%**

The Direct Install component stratified sample shown in Table 10-5 resulted in samples totaling 36% of the total Ex-Ante Therm savings.

Table 10-5 Ex-Ante Therm Savings for Direct Install Component Sampled Projects by Stratum

Stratum	*Sample Ex-Ante Therm Savings*	*Total Ex-Ante Therm Savings*	*Percentage of Ex-ante Savings in Sample*
DI 5	176,783	230,942	77%
DI 4	147,844	469,772	31%
DI 3	124,602	449,908	28%
DI 2	48,143	215,989	22%
DI 1	3,698	12,222	30%
Total	**501,070**	**1,378,833**	**36%**

10.3.1.2 Review of Documentation

ONG's program implementation contractor, CLEAResult, provided documentation for the projects completed during the program year. The first step in the evaluation effort was to review this documentation and other relevant program materials.

For each sampled project, the available documentation (audit reports, savings calculation workbooks, invoices, etc.) for each rebated measure was reviewed. Documentation reviewed for all sampled projects included program forms, databases, reports, weather data, and any other potentially useful data.

10.3.1.3 Procedures for Estimating Therm Savings from Measures Installed Through the Program

The Evaluator reviewed the natural gas energy savings algorithms to verify that the assumptions were reasonable, the algorithms were correct for assigning gross ex-ante therm savings per measure, and the procedures used aligned with the methodologies outlined in the Arkansas TRM Version 8.1. In cases where project documentation was incomplete or unclear, the Evaluator contacted CLEAResult to seek further information.

The Evaluator calculated annual energy savings for each sampled measure per the formula given in the Arkansas TRM. Engineering calculation using industry standards were used to calculate energy savings for measures where savings could be more accurately estimated using methodology not described in the TRM.

10.3.1.3.1 Method for Analyzing Savings from Program Measures

Appendix B of this report presents the specific, applied methodologies used to estimate ex-post gross natural gas savings and the savings estimation results for each sampled measure.

10.3.2 Results of Ex-Post Gross Savings Estimation

Energy savings were estimated using proven techniques, including engineering calculations using industry standards to determine energy savings.

Sampling for evaluation of the Custom Commercial Program was developed using the Stratified Random Sampling procedure. This procedure provides 90% confidence and ±10% precision with a significantly reduced sample than random sampling would require, by selecting the highest saving facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results.

Sites chosen within each stratum are reviewed to confirm installation of rebated measures and to process data needed for calculation of ex-post verified savings. The realization rates for sites within each stratum are then applied to the non-sampled sites within their respective stratum.

The ex-ante and ex-post gross therm savings of the Custom and Direct Install components are summarized by sampling stratum in Table 10-6 and Table 10-7.

Table 10-6 Ex-Ante and Ex-Post Annual Therm Savings for Custom Component by Sample Stratum

Stratum	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
SEM	101,239	101,239	100%
Custom 5	77,565	79,141	102%
Custom 4	274,057	280,564	102%
Custom 3	93,928	93,916	100%
Custom 2	28,903	28,903	100%
Custom 1	50,982	51,897	102%
Total	**626,675**	**635,660**	**101%**

Table 10-7 Ex-Ante and Ex-Post Annual Therm Savings for Direct Install Component by Sample

Stratum	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
DI 5	230,942	230,963	100%
DI 4	469,772	469,795	100%
DI 3	449,908	449,908	100%
DI 2	215,989	216,035	100%
DI 1	12,222	12,222	100%
Total	**1,378,833**	**1,378,923**	**100%**

Table 10-8 and Table 10-9 show the expected and realized energy savings by project for the Custom and Direct Install components.

Table 10-8 Ex-Ante and Ex-Post Annual Therm Savings for Custom Component by Project

Project ID	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
PRJ-3262042	1,105	1,105	100%
PRJ-3240238	933	933	100%
PRJ-3275686	346	346	100%
PRJ-2949855	6,546	6,546	100%
PRJ-3279986	46,581	46,977	101%
PRJ-3216111	12,012	12,010	100%
PRJ-3262701	376	376	100%
PRJ-3240252	1,473	1,541	105%
PRJ-3263106	3,092	3,221	104%
PRJ-3245550	3,083	3,084	100%
PRJ-3148369	12,012	12,010	100%
PRJ-3118799	27,372	29,962	109%
EA-0001730677	51,773	51,773	100%
EA-0001333275	12,272	12,272	100%
EA-0001419712	77,565	79,141	102%
EA-0001489161	442	442	100%
EA-0001677410	310	310	100%
Non-Sampled Projects	268,141	272,372	102%
Total	**525,436**	**534,421**	**102%**

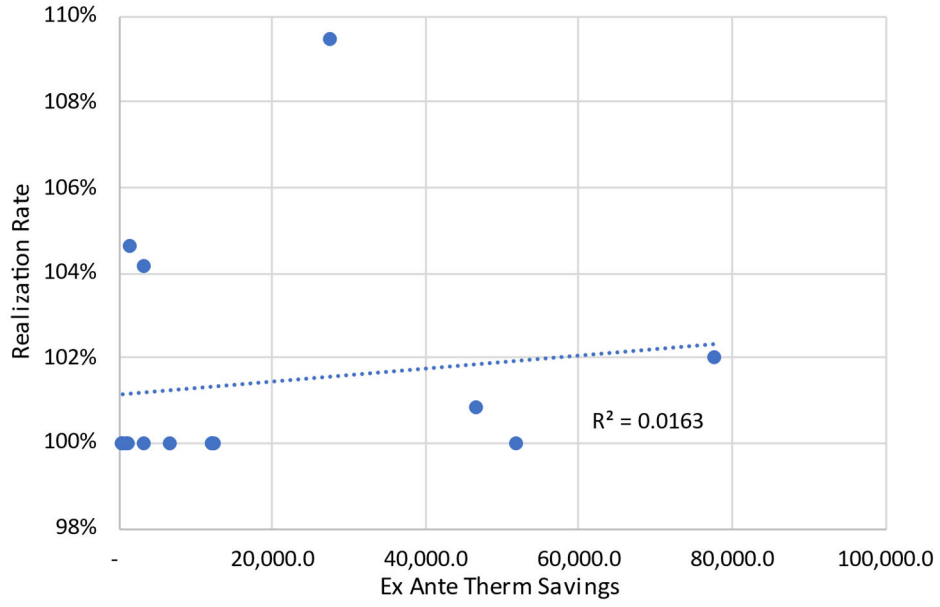
Table 10-9 Ex-Ante and Ex-Post Annual Therm Savings for Direct Install Component by Project

Project ID	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
PRJ-3062098	485	485	100%

Project ID	*Ex-Ante Therm Savings*	*Ex-Post Gross Therm Savings*	*Gross Therm Savings Realization Rate*
PRJ-3264661	15,360	15,360	100%
PRJ-3259814	30,927	30,934	100%
PRJ-3259845	6,042	6,042	100%
PRJ-3234757	3,698	3,698	100%
PRJ-3234775	15,533	15,533	100%
PRJ-3264975	11,445	11,445	100%
PRJ-3234748	8,026	8,026	100%
PRJ-3267271	61,093	61,101	100%
PRJ-3284706	29,912	29,912	100%
PRJ-3264656	12,413	12,413	100%
PRJ-3234767	31,067	31,066	100%
PRJ-3274795	29,032	29,032	100%
PRJ-3264652	19,232	19,232	100%
PRJ-3280692	50,160	50,161	100%
EA-0001443188	10,217	10,229	100%
EA-0001551348	15,533	15,533	100%
EA-0001236804	38,140	38,140	100%
EA-0001062947	47,711	47,711	100%
EA-0001236516	65,529	65,534	100%
Non-Sampled Projects	877,763	877,821	100%
Total	1,378,833	1,378,923	100%

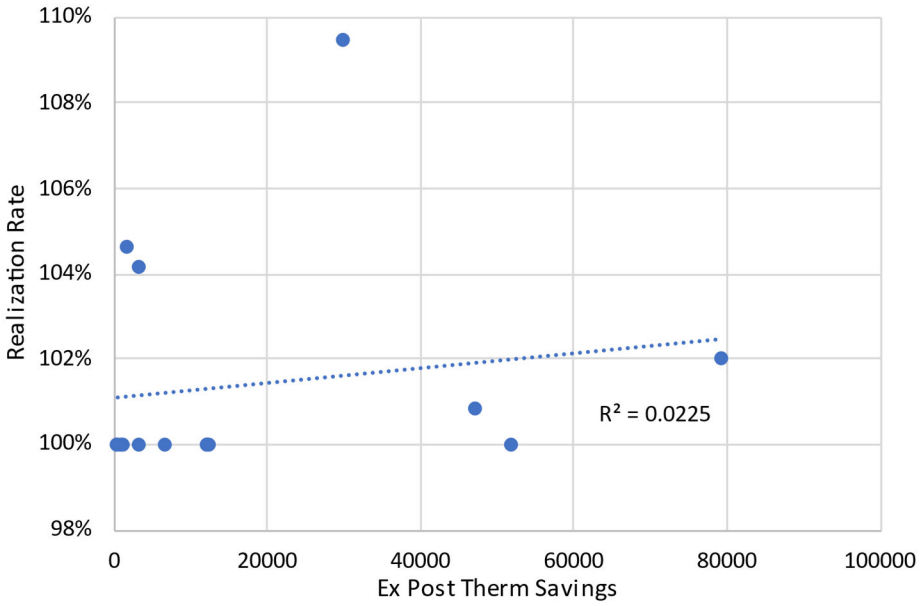
Custom component gross therm savings realization rate and ex-ante therm savings are plotted in Figure 10-3 for sample projects.

Figure 10-3 Custom Component Sample Project Gross Therm Savings Realization Rate Versus Ex-Ante Therm Savings



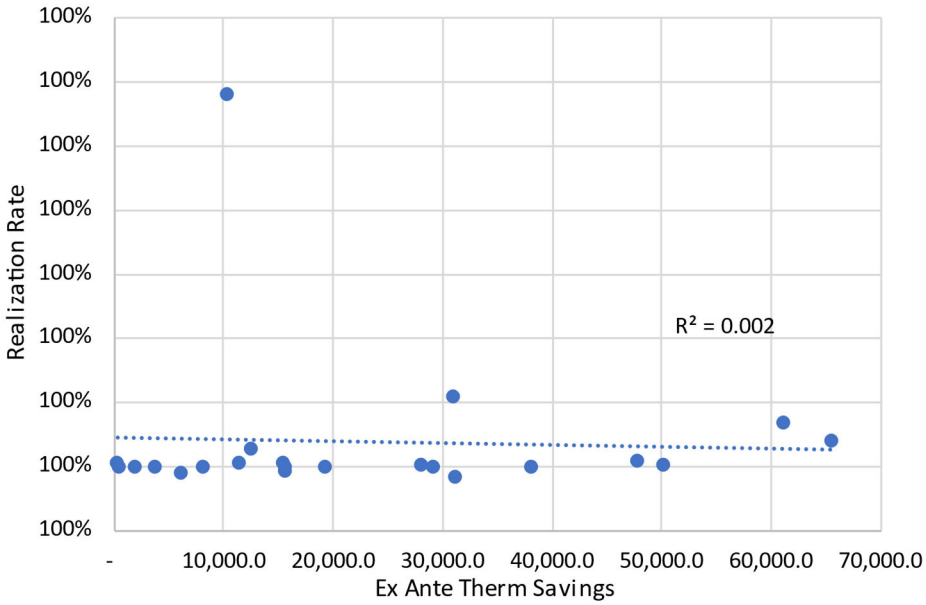
Custom component ex-ante energy savings and ex-post energy savings are plotted in Figure 10-4 for each sample project.

Figure 10-4 Custom Component Sample Project Gross Ex-Post Therm Savings versus Ex-Ante Therm Savings



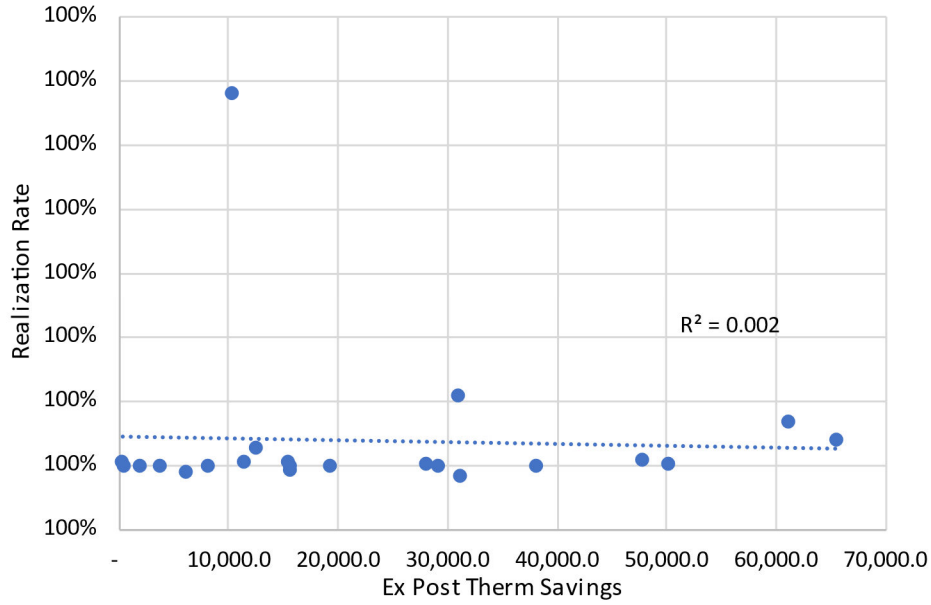
Direct Install component gross therm savings realization rate and ex-ante therm savings are plotted in Figure 10-5 for sample projects.

Figure 10-5 Direct Install Component Sample Project Gross Therm Savings Realization Rate Versus Ex-Ante Therm Savings



Custom component ex-ante energy savings and ex-post energy savings are plotted in Figure 10-6 for each sample project.

Figure 10-6 Direct Install Component Sample Project Gross Ex-Post Therm Savings versus Ex-Ante Therm Savings



As the figures above show, there was no strong relationship between project size and energy savings for the Direct Install and Custom components.

10.3.3 Net Impact Evaluation

Information collected through a survey of a sample of program participants was used for the net-to-gross analysis.

10.3.3.1 Custom Component

All survey response data was systematically reviewed by a researcher who is familiar with the program, the individual project, and the social science theory underlying the decision maker survey instrument. As part of this review, the researcher determined whether the available information justified modifying the free ridership score calculated in accordance with the algorithm outlined below.

Several factors were considered in the determination of the presence of free ridership. These included:

- Financial ability to afford the installed measure without a program rebate;
- Plans and intentions of the firm to install a measure even without support from the program;
- Influence that the program had on the decision to install a measure; and
- A firm's previous experience with a measure installed under the program.

To assess these factors, program participants were asked a series of questions about the decision to implement the program project. Based on their responses, respondents were assigned a free ridership score used to estimate the extent of project free ridership.

Several criteria were used to determine what portion of a customer's savings for a project should be attributed to free ridership. The first criterion was based on the response to the following two questions:

- If it were not provided free-of-charge by the program, would your organization have been financially able to install…
- If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have install the same equipment anyway? Would you say…

If a customer answered "No" to the first question and "Yes, that is correct" to the second, a free ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the program to undertake a project, then that customer was not deemed a free rider.

For decision makers that indicated that they were able to undertake energy efficiency projects without financial assistance from the program, three factors were analyzed to determine what percentage of savings may be attributable to free ridership. The three factors were:

- Plans and intentions of firm to install a measure even without support from the program;
- Influence that the program had on the decision to install a measure; and
- A firm's previous experience with a measure installed under the program.

For each of these factors, rules were applied to develop binary variables indicating whether a participant's behavior shows free ridership. These rules made use of answers to questions on the decision maker survey questionnaire.

The first factor required determining if a participant's intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions were used with a set of rules to determine whether a participant's behavior indicated likely free ridership. Two binary variables accounted for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signified free ridership were as follows:

- The respondent answered "yes" to the following two questions: "Before participating in the program, did you have plans to install…?" and "Would you have gone ahead with this planned project even if you had not participated in the program?"
- The respondent answered, "definitely would have installed" to the following question: "If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have install the same equipment anyway?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the following two questions: "Before participating in the program, did you have plans to install…?" and "Would you have gone ahead with this planned project even if you had not participated in the program?"
- The respondent answered, "definitely would have installed" or "probably would have installed" to the following question: "If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have install the same equipment anyway?"

The second factor required determining if a customer reported that a recommendation from a Program representative or past experience with the program was influential in the decision to install a piece of equipment or measure.

The criterion indicating that program influence may signify a lower likelihood of free ridership is that either of the following conditions were true:

- The respondent answered "yes" to the following question: "Did a [PROGRAM] or other [UTILITY] representative recommend that you install the [PROJECT_DESCRIPTION] at this location?"
- The respondent answered, "very important" to the following question: "If the [PROGRAM] program representative had not recommended installing the [PROJECT_DESCRIPTION], how likely is it that you would have installed it anyway?"

The third factor required determining if a participant in the program indicated that he or she had previously installed an energy efficiency measure similar to one that they installed under the program without an energy efficiency program incentive during the last three years. A participant indicating that he or she had installed a similar measure is considered to have a likelihood of free ridership.

The criteria indicating that previous experience may signify a higher likelihood of free ridership are as follows:

- The respondent answered "yes" to the following question: "Thinking about all of the projects you completed in the last three years, did you implement any energy efficient equipment or projects similar to the [MEASURE1] that you [IMPLEMENTED1] at your facility…?"
- The respondent answered "yes" to the following question: "Not including the project that your organization received an incentive for in [YEAR], has your organization completed any significant energy efficiency projects in the last three years?"

The four sets of rules just described were used to construct four different indicator variables that addressed free ridership behavior. For each respondent, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were eleven applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables. Table 10-10 shows these values.

Table 10-10 Custom Commercial Free Ridership Scoring

Indicator Variables				*Free Ridership Score*
Had Plans and Intentions to Install Measure without [Program Name]? (Definition 1)	*Had Plans and Intentions to Install Measure without [Program Name]? (Definition 2)*	*[Program Name] had influence on Decision to Install Measure?*	*Had Previous Experience with Program?*	
Y	Y	Y	Y	100%
Y	Y	N	N	100%
Y	Y	N	Y	100%
Y	Y	Y	N	67%
N	Y	N	Y	67%
N	N	N	Y	33%
N	Y	N	N	33%
N	Y	Y	N	0%
N	N	N	N	0%
N	N	Y	N	0%
N	N	Y	Y	0%

10.3.3.2 Direct Install Component

All survey response data was systematically reviewed by a researcher who was familiar with the program, the individual project, and the social science theory underlying the decision maker survey instrument. As part of this review, the researcher determined whether the available information justified modifying the free ridership score calculated in accordance with the algorithm outlined below.

Several factors were considered in the determination of the presence of free ridership. These included:

- Financial ability to afford the installed measure without a program rebate;
- Plans and intentions of the firm to install a measure even without support from the program;
- Influence that the program had on the decision to install a measure; and
- A firm's previous experience with a measure installed under the program.

To assess these factors, program participants were asked a series of questions about the decision to implement the program project. Based on their responses, respondents were assigned a free ridership score used to estimate the extent of project free ridership.

Several criteria were used to determine what portion of a customer's savings for a particular project should be attributed to free ridership. The first criterion was based on the response to the following two questions:

- If it were not provided free-of-charge by the program, would your organization have been financially able to install…

- If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have install the same equipment anyway? Would you say…

If a customer answered "No" to the first question and "Yes, that is correct" to the second, a free ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the program to undertake a project, then that customer was not deemed a free rider.

For decision makers that indicated that they were able to undertake energy efficiency projects without financial assistance from the program, three factors were analyzed to determine what percentage of savings may be attributable to free ridership. The three factors were:

- Plans and intentions of firm to install a measure even without support from the program;
- Influence that the program had on the decision to install a measure; and
- A firm's previous experience with a measure installed under the program.

For each of these factors, rules were applied to develop binary variables indicating whether a participant's behavior shows free ridership. These rules made use of answers to questions on the decision maker survey questionnaire.

The first factor required determining if a participant's intention was to install an energy efficiency measure even without the program. The answers to a combination of several questions were used with a set of rules to determine whether a participant's behavior indicated likely free ridership. Two binary variables accounted for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signified free ridership were as follows:

- The respondent answered "yes" to the following two questions: "Before participating in the program, did you have plans to install…?" and "Would you have gone ahead with this planned project even if you had not participated in the program?"
- The respondent answered, "definitely would have installed" to the following question: "If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have install the same equipment anyway?"

The second, less restrictive criteria indicating customer plans and intentions that likely signify free ridership are as follows:

- The respondent answered "yes" to the following two questions: "Before participating in the program, did you have plans to install…?" and "Would you have

gone ahead with this planned project even if you had not participated in the program?"

- The respondent answered, "definitely would have installed" or "probably would have installed" to the following question: "If the financial incentive from the [PROGRAM] program had not been available, how likely is it that you would have installed the same equipment anyway?"

The second factor required determining if a customer reported that a recommendation from a Program representative with the program was influential in the decision to install a particular piece of equipment or measure.

The criterion indicating that program influence may have signified a lower likelihood of free ridership is that either of the following conditions were true:

- The respondent answered "yes" to the following question: "Did a [PROGRAM] or other [UTILITY] representative recommend that you install the [PROJECT_DESCRIPTION] at this location?"
- The respondent answered, "Definitely would have installed" to the following question: "If the [PROGRAM] program representative had not recommended installing the [PROJECT_DESCRIPTION], how likely is it that you would have installed it anyway?"

The third factor required determining if a customer reported that past experience with the program was influential in the decision to install a particular piece of equipment or measure.

The criterion indicating that program influence may have signified a lower likelihood of free ridership is that either of the following conditions were true:

- The respondent answered "yes" to the following question: "Prior to this project, did your organization participate in any [UTILITY] energy efficiency programs?"
- The respondent answered, "very important" to the following question: "How important was previous experience with [UTILITY] programs in making your decision to install the [PROJECT_DESCRIPTION]?"

The four sets of rules just described were used to construct four different indicator variables that addressed free ridership behavior. For each respondent, a free ridership value was assigned based on the combination of variables. With the four indicator variables, there were eleven applicable combinations for assigning free ridership scores for each respondent, depending on the combination of answers to the questions creating the indicator variables.

10.3.4 Results of Net Savings Estimation

This section discusses the results of estimating net impacts.

Table 10-11 summarizes the results of the estimation of free ridership. Free ridership was low for both components of the program.

Table 10-11 Custom Commercial Program Free Ridership as a Percent of Gross Ex-Post Therm Savings

Program Component	*FR Factor*
Custom	0.8
SEM	0.0%
Direct Install	0.0%

Table 10-12 summarizes the gross and net ex-post therm savings for the Custom Commercial Program.

Table 10-12 Custom Commercial Program Summary of Gross and Net Ex-Post Therm Savings

Program Component	*Ex-Post Gross Therm Savings*	*Estimated Free Ridership*	*Net Ex-Post Therm Savings*	*Estimated Net-to-Gross Ratio*
Custom	534,421	4,275	530,145	99.2%
SEM	101,239	0	101,239	100.0%
DI	1,378,923	0	1,378,923	100.0%
Total	2,014,583	4,275	2,010,308	99.8%

Table 10-13 summarizes the gross and net water savings for the Custom Commercial Program.

Table 10-13 Custom Commercial Program Summary of Gross and Net Water Savings

Program Component	*Gross Water Savings*	*Estimated Free Ridership*	*Net Water Savings*	*Estimated Net-to-Gross Ratio*
Custom	31,487	252	31,235	99%
Total	31,487	84	31,235	99%

Table 10-14 summarizes the gross and net kWh savings for the Custom Commercial Program.

Table 10-14 Custom Commercial Program Summary of Gross and Net kWh Savings

Program Component	*Gross kWh Savings*	*Estimated Free Ridership*	*Net kWh Savings*	*Estimated Net-to-Gross Ratio*
DI	270,724	0	270,724	100%

Total	270,724	0	270,724	100%

Table 10-15 summarizes the gross and net kW savings for the Custom Commercial Program.

Table 10-15 Custom Commercial Program Summary of Gross and Net kW Savings

Program Component	*Gross kW Savings*	*Estimated Free Ridership*	*Net kW Savings*	*Estimated Net-to-Gross Ratio*
DI	197.39	0	197.39	100%
Total	197.39	0	197.39	100%

10.4 Process Evaluation

The following section presents the results of the process evaluation for the Custom Commercial Program.

10.4.1 Direct Install Participant Survey Responses

CLEAResult provided the Evaluator contact information for nineteen Commercial Direct Install program participants who received rebates for energy efficient equipment upgrades. The Evaluator reached out to all participants three times via email with a link to the survey. Table 10-16 describes survey response rates. Due to the low response rate, the Evaluator did not summarize the results of the Direct Install component in order to avoid generalizing based on one respondent's experience.

Table 10-16: Recruitment Efforts (n=19)

	n
Contact attempts	3
Emailed contacts	19
Invalid emails	2
Responses	1

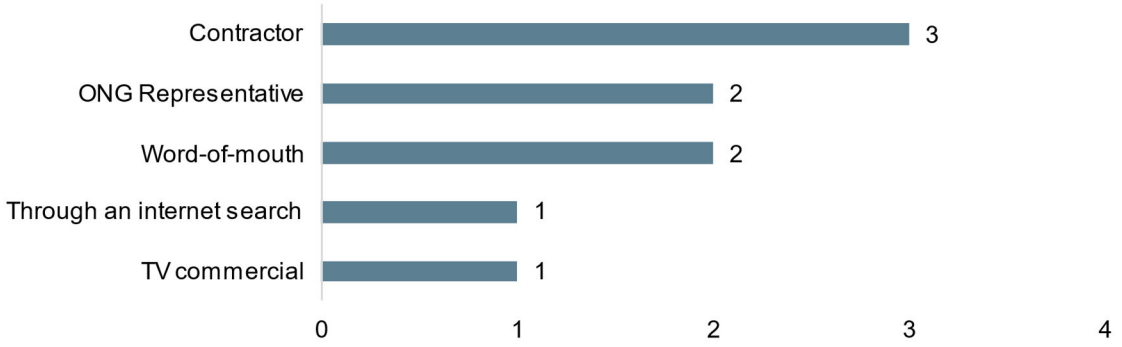
10.4.2 Custom Commercial Participant Survey Responses

The Evaluator conducted a survey of Custom Commercial participants to gather feedback about customers' engagement with and experience of the program. Tracking data indicated 56 unique customers participated in the program in 2023. Participants were contacted via email four times and invited to complete the survey. Nine participants responded to the survey for a response rate of 16.1%.

10.4.2.1 Program Participation

Respondents most commonly learned about the Custom Commercial Program from a contractor, program representative, or word-of-mouth (Figure 10-7).

Figure 10-7 Program Awareness (n=9)

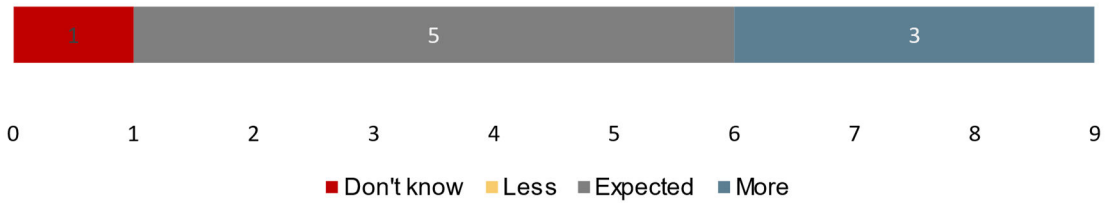


Half of the respondents explained contractors (n=5) and retailers (n=4) played an important role in their decision to participate in the program. Five respondents also indicated that they reviewed ONG marketing materials before deciding to enroll and that these materials were useful.

Three respondents remembered receiving a facility assessment as part of their participation in the program; all three respondents expressed satisfaction with this assessment. Additionally, five respondents noted that they spoke with an ONG representative during their program participation and that ONG staff answered their questions in a timely and thorough manner. Seven respondents noted they completed the program application themselves and that it was clear and easy.

Most respondents believed the current program incentives were comprehensive enough to meet their needs (n=8); the remaining respondent did not have an opinion regarding the comprehensiveness of the incentives. Additionally, half of respondents (n=5) noted the incentive levels were about what they expected (Figure 10-8).

Figure 10-8 Expectations of Incentive Amounts (n=9)



10.4.2.2 Prior Energy Efficiency Experience

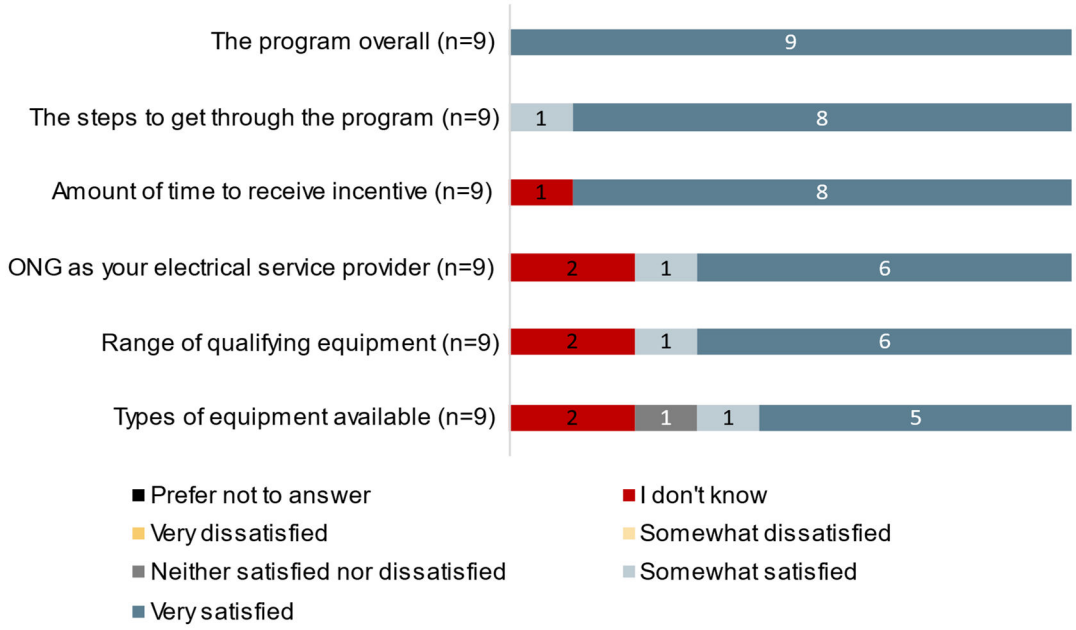
Half of the respondents noted that they had previously completed energy efficiency projects and that they had not received incentives nor rebates for these upgrades (n=4). Three of these four respondents noted their previous upgrades were similar to those implemented through the Custom C&I program.

Three respondents noted they consider finances – like equipment costs (n=2), lifecycle cost (n=2), and payback period (n=1) – when deciding whether or not to pursue energy efficient upgrades.

10.4.2.3 Program Satisfaction

In general, respondents were satisfied with the Custom C&I program (Figure 10-9). Eight of the nine survey respondents indicated that their participation in the program increased their satisfaction with ONG as their service provider. Two respondents provided suggestions for improvement; suggestions included simplifying the application process (n=1) and enhancing program brochures and marketing materials (n=1).

Figure 10-9 Satisfaction (n=9)



10.4.2.4 Respondent Firmographics

Firmographics for the respondents represented are in Table 10-17.

Table 10-17: Firmographics (n=9)

	n
Building ownership	
Own and occupy	7
Own and rent to someone else	1
Rent	1
Responsible for gas bill	
Yes	8
No	1
Business type	
Apartment complex	2
Industrial/Manufacturing	2

	n
Car wash	1
Gathering or event space	1
Laundromat	1
Office	1
Restaurant	1

10.4.3 Custom Commercial Trade Ally Interviews

The Evaluators conducted a phone interview with one of seven participating commercial trade allies. Evaluators contacted all participating trade allies up to three times via phone and email.

10.4.3.1 Background and Program Tenure

The responding trade ally specializes in weatherization services for both residential and commercial customers, across multiple states, including Texas and Louisiana. They have been working with the ONG commercial program for over a year after being invited to join by a program representative.

10.4.3.2 Program Participation and Satisfaction

The respondent relies on referrals for commercial projects, mainly through word-of-mouth and program representatives. However, the slow pace of project referrals from program staff is a significant challenge. While not responsible for rebate applications, the respondent provides customers with necessary paperwork. Respondent indicated the program incentives are comparable to other programs. Overall, the respondent is satisfied with the program, praising effective communication, organization, and helpful incentives. They also appreciate the quality control specialist who provides helpful feedback and tips during field visits.

10.5 Conclusions and Recommendations

10.5.1 Conclusions

- Most Custom component participants surveyed were satisfied with the program overall, how thoroughly staff addressed questions/concerns, the facility assessment or services from the program staff, the time it took to receive the rebate, and the time it took for program staff to answer their questions/concerns.

10.5.2 Recommendations

- Increase marketing activities and explore new opportunities to increase awareness of the Custom Commercial programs (e.g., social media campaigns that target C&I businesses).
- Simplify the custom application process to make it easier for customers to engage in the program.

11 Residential Cross-Program Research

This chapter describes the process evaluation research that was performed for the residential programs.

11.1 Residential Contractor Survey

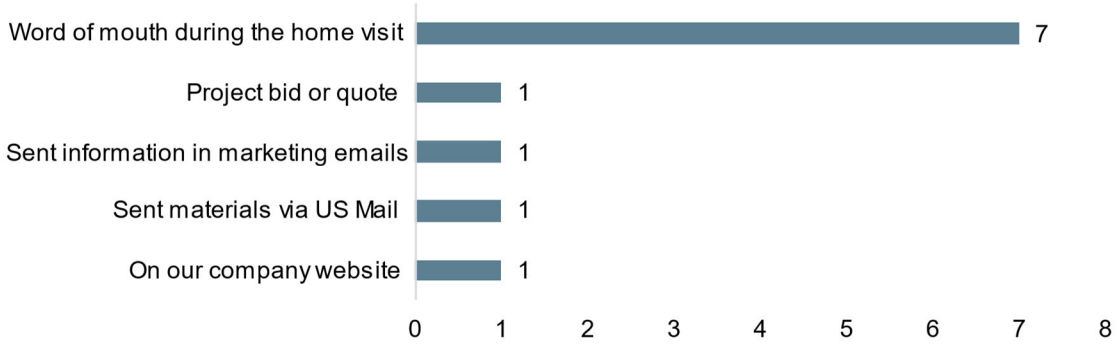
The Evaluator identified 72 unique contractors with valid email addresses who participated in the residential programs in 2023. Contractors were contacted four times via email and invited to complete a survey. Eight contractors responded for a response rate of 11.1%.

All eight respondents specialize in HVAC equipment; two contractors also work with water heaters. Responding trade allies learned about the program through previous program participation (n=6) and word-of-mouth (n=2).

11.1.1.1 Customer Engagement

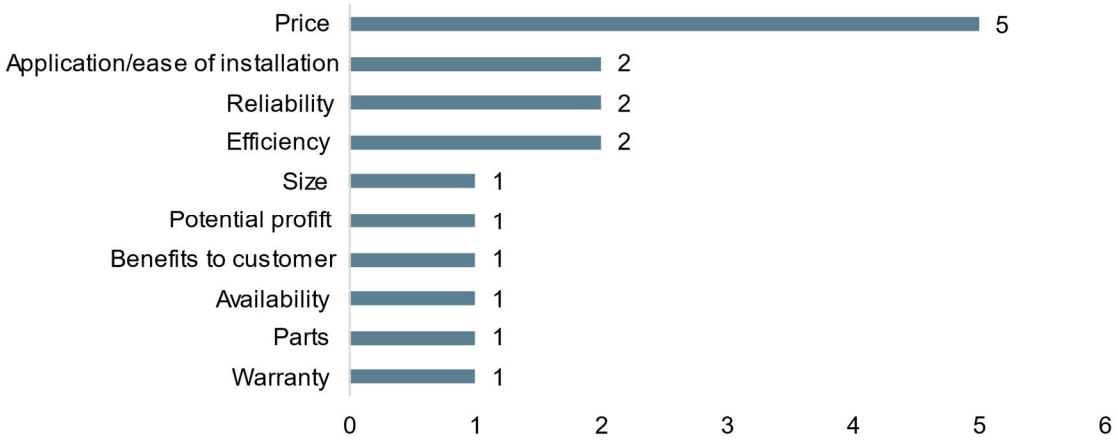
All but one of the respondents market the program to their customers via word-of-mouth (n=7) (Figure 11-1).

Figure 11-1: Program Marketing (n=8)



When recommending equipment to their customers, respondents consider equipment cost, as well as ease of installation or application, reliability, and efficiency (Figure 11-2). Respondents noted that customers typically care most about equipment cost (n=2) and efficiency (n=2) when making their decisions. All but one respondent noted that cost is the biggest barrier preventing their customers from choosing efficient equipment (n=7). Six respondents focus on specific types of equipment or brands.

Figure 11-2 Considerations When Recommending Equipment to Customers (n=8)

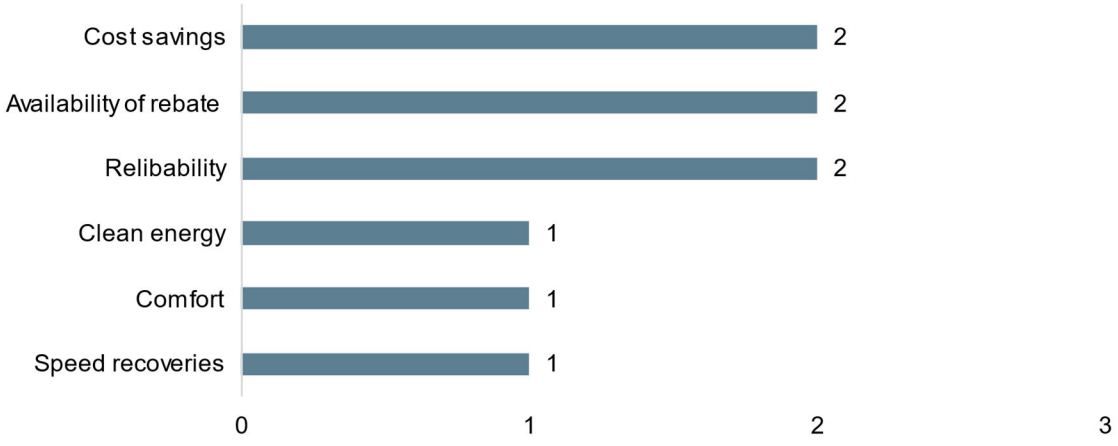


11.1.1.2 Program Participation

Four of the respondents completed the program application on behalf of their customers. These respondents requested higher incentives for both customers (n=1) and contractors (n=1).

Six respondents promote fuel-switching to their customers by highlighting the various outcomes of fuel-switching including cost-savings, rebate availability, and equipment reliability (Figure 11-3). Half of the fuel-switching promoting respondents indicated that the incentives help encourage their customers to switch (n=3). Three fuel switching proponents recommended ONG increase the current fuel-switching rebate by $500-$1,000 to further promote gas.

Figure 11-3 Benefits of Fuel-Switching (n=6)

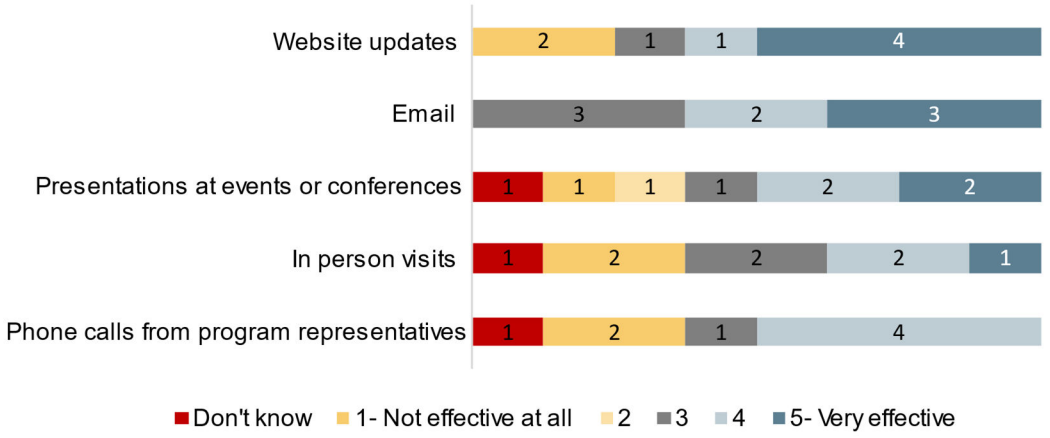


In addition to requesting fuel-switching rebate increases, respondents recommended increases in incentive amounts for gas furnaces, gas dryers, gas ovens, and tankless

water heaters. One respondent also requested insulation be added as an eligible measure.

Respondents explained that that website updates are the most effective way to let them know about program changes (n=5) (Figure 11-4).

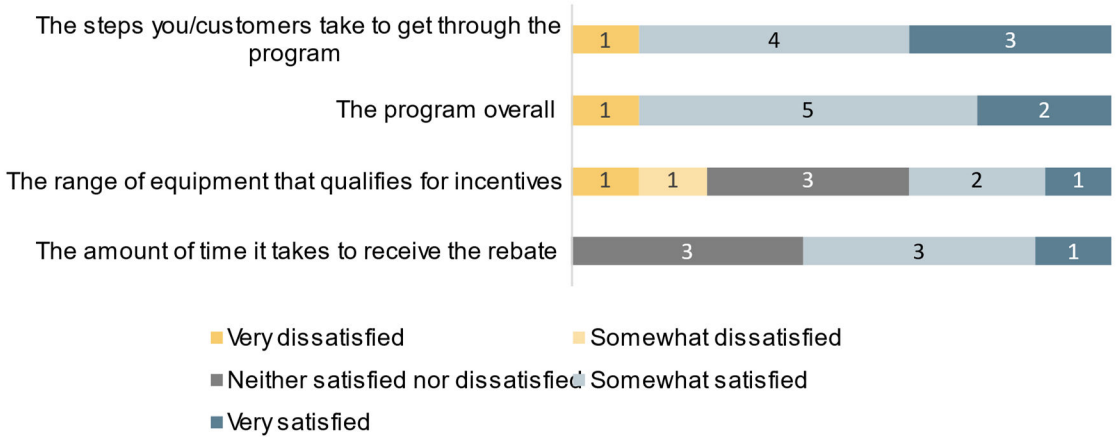
Figure 11-4 Most Effective Way to Communicate About Program Changes (n=8)



11.1.1.3 Program Satisfaction

All but one respondent expressed satisfaction with the program (Figure 11-5). The one dissatisfied respondent noted that the program can be confusing for customers.

Figure 11-5 Program Satisfaction (n=8)



Participation in the program has positively impacted half of the survey respondents' (n=4) business and the services they provide. Two respondents explained that they have installed more furnaces since engaging in the program and two other respondents indicated they have installed more high efficiency equipment in general.

11.2 Conclusions and Recommendations

11.2.1 Conclusions

- Most contractors learn about ONG's residential rebate programs through word of mouth.
- Respondents consider equipment cost and ease of installation when deciding whether or not to promote energy efficient equipment to customers.
- Respondents promote fuel-switching by highlighting the various outcomes of fuel-switching including cost-savings, rebate availability, and equipment reliability.
- Participation in the program positively impacted half of the survey respondents' businesses and the services provided.

11.2.2 Recommendations

- Consider increasing incentive amounts for fuel-switching, gas furnaces, gas dryers, gas ovens, and tankless water heaters.
- Continue to update trade allies about the program requirements and components via website updated.

12 Appendix A: Cost-Benefit Analysis

This appendix provides an overview of each program's participation, verified therm savings, annual administrative costs, total program costs, as well as a summary of the cost effectiveness analysis. Costs include program costs incurred in the implementation of ONG's PY2023 energy efficiency portfolio from January 1, 2023, through December 31, 2023.

12.1 Cost Effectiveness Summary

The cost-effectiveness of ONG's PY2023 programs was calculated based on reported total spending and verified net energy savings for each of the energy efficiency programs. ONG provided all spending estimates. The Evaluator used incentive amounts from program tracking data. The methods used to calculate cost-effectiveness are informed by the California Standard Practice Manual.[3]

To calculate the cost-effectiveness of each program, measure lives were assigned on a measure-by-measure basis. When available, measure life values came from the Arkansas Technical Reference Manual 8.0 (TRM).[4] Additionally, assumptions regarding incremental/full measure costs were necessary.

Avoided energy, capacity, and transmission/distribution costs used to calculate cost-effectiveness were provided by ONG. Residential and commercial rates used to estimate certain cost-effectiveness tests were also provided by ONG.

Table 12-1 lists each program included in this analysis, along with the final verified net savings estimates, total expenditures, and Total Resource Cost (TRC) test results.

In addition to TRC results, results from the Program Administrator Cost Test (PACT), the Rate-payer Impact Measure (RIM) test, and Participant Cost Test (PCT) are included in the body of this appendix.

Table 12-1 Cost Effectiveness by Program

Program	*Total Benefits*	*Total Program Expenditures*	*TRC (b/c ratio)*
Clothes Dryer	$826,949	$306,508	2.70
Range	$231,055	$13,174	17.54
Water Heater	$8,870,702	$1,954,370	4.54
Heating System	$688,086	$285,863	2.41
Low-Income Assistance	$5,469,965	$974,610	5.61
Water Conservation Kits	$2,131,538	$105,624	20.18
New Home	$14,064,394	$6,492,912	2.17

[3] California Standard Practice Manuel: Economic Analysis of Demand Side Management Programs, October 2001. Available at: http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf

[4] http://www.apscservices.info/EEInfo/TRM.pdf

Program	*Total Benefits*	*Total Program Expenditures*	*TRC (b/c ratio)*
Custom Commercial	$17,841,581	$3,105,644	5.74
Portfolio Non-incentive Costs	N/A	$2,822,279	N/A
Total	**$50,124,271**	**$16,060,985**	**3.12**

12.2 Energy Efficiency Program Results

ONG's energy efficiency portfolio in PY2023 consisted of eight programs with verified net therm savings of 4,015,011 therms. Total spending in PY2023 equaled $16,060,985. Table 12-2 provides a summary of program costs.

Table 12-2 Reported Costs by Program

Program	*Incentives*	*Program Overhead Costs*
Clothes Dryer	$940,859	$955,014
Range	$214,700	$227,874
Water Heater	$4,254,400	$4,564,951
Heating System	$649,050	$714,336
Low-income Assistance	$927,521	$974,610
Water Conservation Kits	$84,037	$105,624
New Home	$3,026,450	$3,065,877
Custom Commercial	$1,523,478	$2,599,895
Portfolio Non-incentive Costs	N/A	$2,822,279
Total	**$11,620,496**	**$16,030,460**

In the tables that follow, total costs and benefits, and cost-effectiveness test results are provided for each energy efficiency program in the PY2023 portfolio.

Table 12-3 Clothes Dryer Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$826,949	$826,949	$826,949	$1,363,666	$1,236,284
Total Costs	$955,014	$306,508	$1,491,865	$292,353	$306,508
Benefit/Cost Ratio	**0.87**	**2.70**	**0.55**	**4.66**	**4.03**

Table 12-4 Range Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$47,468	$231,055	$47,468	$362,171	$280,745
Total Costs	$227,874	$13,174	$258,726	$-	$13,174
Benefit/Cost Ratio	**0.21**	**17.54**	**0.18**	**-**	**21.31**

Table 12-5 Water Heater Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$688,086	$688,086	$688,086	$973,675	$1,075,359
Total Costs	$714,336	$285,863	$1,164,738	$220,577	$285,863
Benefit/Cost Ratio	**0.96**	**2.41**	**0.59**	**4.41**	**3.76**

Table 12-6 Heating System Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$8,870,702	$8,870,702	$8,870,702	$8,402,321	$13,922,542
Total Costs	$4,564,951	$1,954,370	$10,375,731	$1,643,819	$1,954,370
Benefit/Cost Ratio	**1.94**	**4.54**	**0.85**	**5.11**	**7.12**

Table 12-7 Low-income Assistance Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$5,469,965	$5,469,965	$5,469,965	$3,616,596	$8,363,255
Total Costs	$974,610	$974,610	$4,540,258	$927,521	$974,610
Benefit/Cost Ratio	**5.61**	**5.61**	**1.20**	**3.90**	**8.58**

Table 12-8 Water Conservation Kits Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$970,156	$2,131,538	$970,156	$1,058,314	$1,399,921
Total Costs	$105,624	$105,624	$733,750	$84,037	$105,624
Benefit/Cost Ratio	**9.19**	**20.18**	**1.32**	**12.59**	**13.25**

Table 12-9 New Home Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$14,064,394	$14,064,394	$14,064,394	$10,101,539	$21,204,229
Total Costs	$3,065,877	$6,492,912	$12,207,262	$6,453,486	$6,492,912
Benefit/Cost Ratio	**4.59**	**2.17**	**1.15**	**1.57**	**3.27**

Table 12-10 Custom Commercial Benefit/Cost Tests

Program	*Program Administrator Cost Test*	*Total Resource Cost Test*	*Ratepayer Impact Measure*	*Participant Cost Test*	*Societal Cost Test*
Total Benefits	$16,914,460	$17,841,581	$16,914,460	$14,686,394	$28,844,202
Total Costs	$2,599,895	$3,105,644	$18,865,543	$2,029,228	$3,105,644
Benefit/Cost Ratio	**6.51**	**5.74**	**0.90**	**7.24**	**9.29**

13 Appendix B: Site-Level Estimation of Ex-Post Gross Savings

The following sections present site-level reports for the Custom and Direct Install components of the Custom Commercial Program.

13.1 Custom Component Site-Level Reports

Project Number PRJ-2949855

Program Oklahoma Natural Gas Commercial & Industrial

Project Background

The participant received incentives from Oklahoma Natural Gas for replacing their hot water boiler with a high efficiency boiler.

M&V Methodology

Savings for the heat recovery measure was calculated using the sensible heat equation and deemed values from the AR TRM v8.2. The remaining values used in the calculations were in the ex-ante review or are from a customer testimony.

Savings Calculations

Using deemed values, the evaluators calculated energy savings as followed:

$$Therm_{savings} = \frac{Capacity \times EFLH_H \times \left(\frac{1}{\eta_{pre}} - \frac{1}{\eta_{post}}\right)}{Therm\ Conversion\ Factor}$$

Where:

Capacity = Rated equipment heating capacity, BTU/h

EFLHH = Deemed Effective Full Load Hours

ηpre = Deemed baseline efficiency

ηpost = Nameplate Efficiency of the new boiler

Therm Conversion Factor = 100,000 BTU/therm

Boiler Replacement Therm Savings

Measure	Expected Therms Savings	Realized Therms Savings	Realization Rate
Boiler Replacement	6,546	6,546	100%
Total	6,546	6,546	100%

Results

The therm realization rate 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Boiler Replacement	6,546	6,546	100%
Total	6,546	6,546	100%

Project Number PRJ-3118799

Program Custom Commercial Program

Project Background

The participant is an apartment complex which performed a duct sealing measure in 63 apartment units. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

During a desk review, the evaluators verified that the participant had implemented:

- Duct Sealing
- Air Sealing

M&V Methodology

Savings for the air sealing are outlined in Arkansas TRM V8.2 section 2.2.9, along with the measurement techniques. Similarly, duct sealing measures were evaluated using guidelines outlined under section 2.3.4 of the ONG Commercial Deemed Savings Guidebook PY2022. Pre-installation and post-installation testing should be performed using identical measurement procedures. ADM used IPMVP option A, Key Parameter Measurement and provided leakage testing rates to estimate the savings using deemed savings formulas.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated duct sealing savings and air sealing savings as follows:

$$Therms_{savings,duct} = \frac{\left(DL_{pre} - DL_{post}\right)\frac{ft^3}{min} * 60\frac{min}{hour} * HDD * 24\frac{hours}{day} * \frac{0.018Btu}{ft^3 - F}}{\frac{100{,}000Btu}{Therm} * AFUE}$$

Table 11: Parameters for Therms Savings Calculation of Duct Sealing and Air Sealing

Parameter	Description
DL_{pre}	Minimum value of Pre-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
DL_{post}	Post-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
HDD	Heating degree days
$\frac{0.018Btu}{ft^3 - F}$	Volumetric heat capacity of air
$AFUE$	Annual fuel utilization efficiency of existing system (default = 0.8)

The EUL for duct sealing is 18 years.

Results

The participant performed the duct sealing measure in 63 units. The total therms saved realization rate for this site was 103%.

Table 12: Duct Sealing Therms Savings Calculations

Measure	Expected therms Savings	Realized therms Savings	% of Total Savings
Duct Sealing	23,544	23,794	79%
Air Sealing	5,618	6,168	21%
Total	29,162	29,962	100%

Project Number PRJ-3216111

Program Custom Commercial Program

Project Background

The participant is a drycleaning facility that received incentives from Oklahoma Natural Gas for installing pipe insulation.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Annual operating hours for the on-site steam system are 3,120 hours
- Combustion efficiency is 80% (for both pre-retrofit and post-retrofit condition)

Through this method, energy savings are calculated using key data and through the North American Insulation Manufacturers Association's 3E Plus software:

(http://www.pipeinsulation.org/).

Measurement and verification activities are based on the following assumptions:

- Insulation thickness varies
- Insulation material type: 850F Min.Fiber Pipe and Tank, Type IIIB, C1393-14 & 850F MF BLANKET, Type IV, C553-13
- Jacket: All service Jacket or Canvas
- Process and ambient air temperature varied based on the measure. See table below.

The 3E Plus software was used to calculate heat loss (btu/hr/ft) for bare piping (pre-retrofit) and piping with 1.5-in insulation (post-retrofit). The software required these inputs: process temperature, ambient temperature, pipe size, base metal, insulation, and jacket material. Annual therms savings was calculated using the following equation:

Equation 1

Table 1. Pipe/Valve Insulation Parameters

Entry #	Description	Object To Insulate	Pipe Length	Pipe Diameter	Valve or Fitting Total Length	Valve Fitting Size	Tank Surface Area
1	30' - 1.5" Pipe	Pipe	30	1.5			
2	60' - 1.25" Pipe	Pipe	60	1.25			
3	200' - 1" Pipe	Pipe	200	1			
4	250' - 0.75" Pipe	Pipe	250	0.75			
5	400' -0.5" Pipe	Pipe	400	0.5			
6	Ells & Tees - 0.5"	Valve or Fitting			225	0.5	
7	Ells & Tees - 0.75"	Valve or Fitting			240	0.75	
8	Ells & Tees - 1"	Valve or Fitting			45	1	
9	Ells & Tees - 1.25"	Valve or Fitting			25	1.25	

. Pipe Insulation Installation Annual Energy Savings

$$Annual\ Therms\ Savings = \frac{Heat\ Loss\ \left(\frac{Btu}{hr}\right)\ x\ Annual\ Operating\ Hours\ \left(\frac{hrs}{yr}\right)}{Boiler\ Efficiency\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)}$$

Where:

Annual Operating Hours = number of hours facility operates annually

Boiler Efficiency

100,000 Btu/CCF = conversion factor (BTU/yr to CCF/yr)

Savings Calculations

Table 6. Pipe Insulation Annual Energy Savings

Entry #	Description	Object to Insulate	Temperature (°F)	Pre Heat Loss	Post Heat Loss	Therms Savings
1	30' - 1.5" Pipe	Pipe	350.1	435	66	432
2	60' - 1.25" Pipe	Pipe	350.1	384	65	746
3	200' - 1" Pipe	Pipe	350.1	311	51	2,027
4	250' - 0.75" Pipe	Pipe	350.1	254	49	1,996
5	400' -0.5" Pipe	Pipe	350.1	208	41	2,612
6	Ells & Tees - 0.5"	Valve or Fitting	350.1	208	39	1,485
7	Ells & Tees - 0.75"	Valve or Fitting	350.1	254	47	1,937

Entry #	Description	Object to Insulate	Temperature (°F)	Pre Heat Loss	Post Heat Loss	Therms Savings
8	Ells & Tees - 1"	Valve or Fitting	350.1	311	48	460
Total						12,010

Results

The total therms saved realization rate for this site was 100%.

Measure	Expected Annual therms Savings	Realized Annual therms Savings	Realization Rate
Steam System Insulation	12,012	12,010	100%
TOTAL	12,012	12,010	100%

Project Number PRJ-3240252

Program Custom Commercial Program

Project Background

The participant is a restaurant facility that received incentives from Oklahoma Natural Gas for installing a new High efficiency and griddle insulation.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement and the Arkansas TRM v8.2.

Griddle

$$\Delta Btu = Btu_{base} - Btu_{eff}$$

$$\Delta Therms = \frac{\Delta Btu}{100{,}000}$$

$$Btu_{(base\ or\ eff)} = \left(Btu_{cooking} + Btu_{idle} + Btu_{preheat}\right) \times ft^2$$

$$Btu_{cooking} = \left(LB_{food} \times \frac{E_{food}}{CookEff}\right) \times Days$$

$$Btu_{idle} = IdleEnergy \times \left(DailyHrs - \frac{LB_{food}}{Capacity} - \frac{PreheatTime}{60}\right) \times Days$$

$$Btu_{preheat} = PreheatEnergy \times Days$$

Where:

base = Pertaining to the baseline equipment being replaced or removed

eff = Pertaining to the efficient equipment being retrofitted or installed

LBfood = Pounds of food cooked per day per linear foot of griddle

Capacity= Pounds of food per hour per linear foot of griddle (lb/hr-ft)

Efood= Efficiency of griddle in Btu per pound of food cooked (btu/lb)

PreheatTime= Number of minutes griddle spends preheating each day

PreheatEnergy= Energy used per day to preheat griddle (btu/day)

CookEff= Cooking Efficiency (%)

DailyHrs= Daily operating hours for griddle

IdleEnergy= Energy use per hour per linear foot while idle (btu/hr-ft)

Days= Number of days per year griddle is running

ft2= Square feet of griddle space being replaced or installed

Fryer

$$\Delta Btu = Btu_{base} - Btu_{eff}$$

$$\Delta Therms = \frac{\Delta Btu}{100{,}000}$$

$$Btu_{(base\ or\ eff)} = Btu_{cooking} + Btu_{idle} + Btu_{preheat}$$

$$Btu_{cooking} = \left(LB_{food} \times \frac{E_{food}}{CookEff}\right) \times Days$$

$$Btu_{idle} = IdleEnergy \times \left(DailyHrs - \frac{LB_{food}}{Capacity} - \frac{PreheatTime}{60}\right) \times Days$$

$$Btu_{preheat} = PreheatEnergy \times Days$$

Where:

base = Pertaining to the baseline equipment being replaced or removed

eff = Pertaining to the efficient equipment being retrofitted or installed

LBfood = Pounds of food cooked per day (lb/day)

Capacity= Pounds of food per hour (lb/hr)

Efood= Efficiency of fryer in Btu per pound of food cooked (btu/lb)

PreheatTime= Number of minutes fryer spends preheating each day

PreheatEnergy= Energy used per day to preheat fryer (btu/day)

CookEff= Cooking Efficiency (%)

DailyHrs= Daily operating hours for fryer

IdleEnergy= Energy use per hour while idle (btu/hr)

Days= Number of days per year fryer is running

Results

The total therms saved realization rate for this site was 105%.

Measure	Expected Annual therms Savings	Realized Annual therms Savings	Realization Rate
Griddle	811	978	121%
Fryer	662	563	85%
TOTAL	12,012	12,010	100%

Project Number PRJ-3245550

Program Custom Commercial Program

Project Background

The participant is an apartment complex which performed a duct sealing measure in 6 apartment units. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

During a desk review, the evaluators verified that the participant had implemented:

- Duct Sealing
- Air Sealing

M&V Methodology

Savings for the air sealing are outlined in Arkansas TRM V8.2 section 2.2.9, along with the measurement techniques. Similarly, duct sealing measures were evaluated using guidelines outlined under section 2.3.4 of the ONG Commercial Deemed Savings Guidebook PY2022. Pre-installation and post-installation testing should be performed using identical measurement procedures. ADM used IPMVP option A, Key Parameter Measurement and provided leakage testing rates to estimate the savings using deemed savings formulas.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated duct sealing savings and air sealing savings as follows:

$$Therms_{savings,duct} = \frac{\left(DL_{pre} - DL_{post}\right)\frac{ft^3}{min} * 60\frac{min}{hour} * HDD * 24\frac{hours}{day} * \frac{0.018Btu}{ft^3 - F}}{\frac{100{,}000Btu}{Therm} * AFUE}$$

Table 13: Parameters for Therms Savings Calculation of Duct Sealing and Air Sealing

Parameter	Description
DL_{pre}	Minimum value of Pre-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
DL_{post}	Post-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
HDD	Heating degree days
$\frac{0.018Btu}{ft^3 - F}$	Volumetric heat capacity of air
$AFUE$	Annual fuel utilization efficiency of existing system (default = 0.8)

The EUL for duct sealing is 18 years.

Results

The participant performed the duct sealing measure in 6 units. The total therms saved realization rate for this site was 100%.

Table 14: Duct Sealing Therms Savings Calculations

Measure	Expected therms Savings	Realized therms Savings	% of Total Savings
Duct Sealing	2,290	2,290	74%
Air Sealing	793	793	26%
Total	3,090	3,090	100%

Project Number PRJ-3262042

Program Custom Commercial Program

Project Background

The participant is an religious worship facility which installed a new high efficiency furnace. The participants received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement and Arkansas TRM v8.2.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated savings below:

Equation 1. Furnace Annual Energy Savings

$$Therm\ Savings = EFLHh\ x\ Capacity\left(\frac{BTU}{hr}\right)\ x\ \left(\frac{1}{EC_{base}} - \frac{1}{EC_{Post}}\right)\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Results

Measure	Expected Annual therms Savings	Realized Annual therms Savings	Realization Rate
Furnace Replacement	1,104	1,104	100%
TOTAL	1,104	1,104	100%

Project Number PRJ-3262701

Program Oklahoma Natural Gas Commercial & Industrial

Project Background

The participant received incentives from Oklahoma Natural Gas for replacing their hot water boiler with a high efficiency boiler.

M&V Methodology

Savings for the heat recovery measure was calculated using the sensible heat equation and deemed values from the AR TRM v8.2. The remaining values used in the calculations were in the ex-ante review or are from a customer testimony.

Savings Calculations

Using deemed values, the evaluators calculated energy savings as followed:

$$Therm_{savings} = \frac{Capacity \times EFLH_H \times \left(\frac{1}{\eta_{pre}} - \frac{1}{\eta_{post}}\right)}{Therm\ Conversion\ Factor}$$

Where:

Capacity = Rated equipment heating capacity, BTU/h

EFLHH = Deemed Effective Full Load Hours

ηpre = Deemed baseline efficiency

ηpost = Nameplate Efficiency of the new boiler

Therm Conversion Factor = 100,000 BTU/therm

Boiler Replacement Therm Savings

Measure	Expected Therms Savings	Realized Therms Savings	Realization Rate
Boiler Replacement	376	376	100%
Total	376	376	100%

Results

The therm realization rate 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Boiler Replacement	376	376	100%
Total	376	376	100%

Project Number PRJ-3263106

Program Oklahoma Natural Gas Commercial & Industrial

Project Background

The participant is a dry-cleaning facility received incentives from Oklahoma Natural Gas for replacing their failed steam traps.

M&V Methodology

ADM performed a desk review to verify the installation of new steam traps. The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A – Retrofit Isolation (Key Parameter Measurement) and prescriptive values from AR TRM V8.2. The following equations were used to calculate the annual energy savings from the retrofit:

Savings Calculations

Using deemed values, the evaluators calculated energy savings as followed:

$$Therm_{savings} = DR \times AOH \times F\% \times \frac{H_{steam} - H_{feedwater}}{Eff_{boiler} \times 100{,}000}$$

Where:

DR = Discharge Rate of steam (lb/hr)

AOH = Annual Operating Hours

F% = Percent that trap has failed (100% = complete failure)

Hsteam = Steam Enthalpy

Hfeedwater= Feedwater Enthalpy

Effboiler = Efficiency of boiler

Results

The therm realization rate 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Boiler Replacement	3,092	3,221	104%
Total	3,092	3,221	104%

Project Number PRJ-3275686

Program Custom Commercial Program

Project Background

The participant facility installed a new high efficiency furnace. The participants received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement and Arkansas TRM v8.2.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated savings below:

Equation 1. Furnace Annual Energy Savings

$$Therm\ Savings = EFLHh\ x\ Capacity\left(\frac{BTU}{hr}\right)\ x\ \left(\frac{1}{EC_{base}} - \frac{1}{EC_{Post}}\right)\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Results

Measure	Expected Annual therms Savings	Realized Annual therms Savings	Realization Rate
Furnace Replacement	346	346	100%
TOTAL	346	346	100%

Project Number PRJ-3279986

Program Custom Commercial Program

Project Background

The participant is an apartment complex which performed a duct sealing measure in 131 apartment units. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

During a desk review, the evaluators verified that the participant had implemented:

- Duct Sealing
- Air Sealing

M&V Methodology

Savings for the air sealing are outlined in Arkansas TRM V8.2 section 2.2.9, along with the measurement techniques. Similarly, duct sealing measures were evaluated using guidelines outlined under section 2.3.4 of the ONG Commercial Deemed Savings Guidebook PY2022. Pre-installation and post-installation testing should be performed using identical measurement procedures. ADM used IPMVP option A, Key Parameter Measurement and provided leakage testing rates to estimate the savings using deemed savings formulas.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated duct sealing savings and air sealing savings as follows:

$$Therms_{savings,duct} = \frac{\left(DL_{pre} - DL_{post}\right)\frac{ft^3}{min} * 60\frac{min}{hour} * HDD * 24\frac{hours}{day} * \frac{0.018Btu}{ft^3 - F}}{\frac{100{,}000Btu}{Therm} * AFUE}$$

Table 15: Parameters for Therms Savings Calculation of Duct Sealing and Air Sealing

Parameter	Description
DL_{pre}	Minimum value of Pre-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
DL_{post}	Post-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
HDD	Heating degree days
$\frac{0.018Btu}{ft^3 - F}$	Volumetric heat capacity of air
$AFUE$	Annual fuel utilization efficiency of existing system (default = 0.8)

The EUL for duct sealing is 18 years.

Results

The participant performed the duct sealing measure in 131 units. The total therms saved realization rate for this site was 100%.

Table 16: Duct Sealing Therms Savings Calculations

Measure	Expected therms Savings	Realized therms Savings	% of Total Savings
Duct Sealing	38,971	39,367	84%
Air Sealing	7,610	7,610	16%
Total	46,581	46,977	100%

Project Number PRJ-3279986

Program Custom Commercial Program

Project Background

The participant is a laundromat which performed installed new high efficiency dryers. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

M&V Methodology

Savings for the air sealing are outlined in Arkansas TRM V8.2 section 2.2.9, along with the measurement techniques. Similarly, duct sealing measures were evaluated using guidelines outlined in the ONG Commercial Deemed Savings Guidebook PY2022. ADM used IPMVP option A, Key Parameter Measurement and provided leakage testing rates to estimate the savings using deemed savings formulas.

Savings Calculations

Using deemed values, the evaluators calculated savings as follows:

$$\Delta Therms = \left(\frac{N_{cycles} \times Days \times Capacity \times RMC \times h_e}{Eff_{dryer} \times 100{,}000 \frac{BTU}{Therm}} \right) \times DryerUse \times LF$$

Results

The total therms saved realization rate for this site was 100%.

Table 17: Therms Savings Calculations

Measure	Expected therms Savings	Realized therms Savings	Realization Rate
Dryers	12,272	12,272	100%
Total	12,272	12,272	100%

Project Number EA-0001419712

Program Custom Commercial Program

Project Background

The participant is an apartment complex which performed a duct sealing measure in 176 apartment units. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

During a desk review, the evaluators verified that the participant had implemented:

- Duct Sealing
- Air Sealing

M&V Methodology

Savings for the air sealing are outlined in Arkansas TRM V8.2 section 2.2.9, along with the measurement techniques. Similarly, duct sealing measures were evaluated using guidelines outlined under section 2.3.4 of the ONG Commercial Deemed Savings Guidebook PY2022. Pre-installation and post-installation testing should be performed using identical measurement procedures. ADM used IPMVP option A, Key Parameter Measurement and provided leakage testing rates to estimate the savings using deemed savings formulas.

Savings Calculations

Using deemed values and measured leakage rates, the evaluators calculated duct sealing savings and air sealing savings as follows:

$$Therms_{savings,duct} = \frac{\left(DL_{pre} - DL_{post}\right)\frac{ft^3}{min} * 60\frac{min}{hour} * HDD * 24\frac{hours}{day} * \frac{0.018Btu}{ft^3 - F}}{\frac{100{,}000Btu}{Therm} * AFUE}$$

Table 18: Parameters for Therms Savings Calculation of Duct Sealing and Air Sealing

Parameter	Description
DL_{pre}	Minimum value of Pre-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
DL_{post}	Post-improvement duct leakage at 25 Pa or air leakage at 50 Pa.
HDD	Heating degree days
$\frac{0.018Btu}{ft^3 - F}$	Volumetric heat capacity of air
$AFUE$	Annual fuel utilization efficiency of existing system (default = 0.8)

The EUL for duct sealing is 18 years.

Results

The participant performed the duct sealing measure in 176 units. The total therms saved realization rate for this site was 100%.

Table 19: Duct Sealing Therms Savings Calculations

Measure	Expected therms Savings	Realized therms Savings	Realization Rate
Duct Sealing	14,563	14,594	100%
Air Sealing	64,577	64,577	100%
Total	79,141	79,171	100%

13.2 Direct Install Component Site-Level Reports

Project Number PRJ-3234748

Program Custom Commercial Program

Project Background

The participant is an service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 42 Linear Feet Weather Stripping, 1” Gap
- 46 Linear Feet Weather Stripping, 1” Gap
- 44 Linear Feet Weather Stripping, 1” Gap
- 42 Linear Feet Weather Stripping, 1” Gap
- 17 Linear Feet Weather Stripping, 1/4” Gap
- 3 Linear Feet Weather Stripping Sweeps, 1/4” Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	42	1	8b	-	1883	-
Weather Stripping	46	1	8b	-	2062	-
Weather Stripping	44	1	8b	-	1973	-
Weather Stripping	42	1	8b	-	1883	-
Weather Stripping	17	1/4	8b	-	192	-
Weather Stripping Sweeps	3	1/4	8b	-	34	-
Total				8,026	8,026	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	-	7,992	-
Weather Stripping Sweeps	-	34	-
Total		8,026	100%

Project Number PRJ-3259845

Program Custom Commercial Program

Project Background

The participant is an auto that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 80 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	80	1	8b	3,698	3,698	100%
Total				3,698	3,698	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	3,698	3,698	100%
Total		3,698	100%

Project Number PRJ-3234767

Program Custom Commercial Program

Project Background

The participant is an auto shop that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk reivew, the evaluators verified the participant had installed:

- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
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- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Total				31,067	31,067	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	31,067	31,067	100%

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Total		31,067	100%

Project Number PRJ-3259845

Program Custom Commercial Program

Project Background

The participant is an auto shop that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 336 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	336	1	8a	15,533	15,533	100%
Total				15,533	15,533	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	15,533	15,533	100%
Total		15,533	100%

Project Number PRJ-3259814

Program Custom Commercial Program

Project Background

The participant is an auto shop that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 40 Linear Feet Weather Stripping, 5/8" Gap
- 120 Linear Feet Weather Stripping, 7/8" Gap
- 80 Linear Feet Weather Stripping, 1-1/4" Gap
- 292 Linear Feet Weather Stripping, 1" Gap
- 196 Linear Feet Weather Stripping, 3/4" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	40	5/8"	8a	-	1,156	-
Weather Stripping	120	7/8"	8a	-	4,854	-
Weather Stripping	80	1-1/4"	8a	-	4,623	-
Weather Stripping	292	1"	8a	-	13,499	-
Weather Stripping	196	3/4"	8a	-	6,801	-
Total				30,927	30,934	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	30,927	30,934	100%
Total		30,934	100%

Project Number PRJ-3259845

Program Custom Commercial Program

Project Background

The participant is an auto shop that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 23 Linear Feet Weather Stripping, 1/4" Gap
- 32 Linear Feet Weather Stripping, 1-5/8" Gap
- 44 Linear Feet Weather Stripping, 1-3/4" Gap

M&V Methodology

Savings for the weather-stripping measure were calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	1/4"	20	8a	-	226	-
Weather Stripping	1/4"	3	8a	-	34	-
Weather Stripping	1 5/8"	32	8a	-	2,331	-
Weather Stripping	1-3/4"	44	8a	-	3,452	-
Total				6,042	6,042	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	6,042	6,042	100%
Total		6,042	100%

Project Number PRJ-3274795

Program Custom Commercial Program

Project Background

The participant is a rental service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Weather Stripping	52	1	8a	-	2,404	-
Total				19,232	19,232	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	19,232	19,232	100%
Total		19,232	100%

Project Number PRJ-3264656

Program Custom Commercial Program

Project Background

The participant is a retail facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 64 Linear Feet Weather Stripping, 7/8" Gap
- 64 Linear Feet Weather Stripping, 7/8" Gap
- 44 Linear Feet Weather Stripping, 1 1/4" Gap
- 44 Linear Feet Weather Stripping, 1 1/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	7/8	1	1 1/8	1 1/4
Atlus	32.15	36.75	41.34	45.93
Clinton/Sherman	47.36	54.12	60.89	67.66
Gage	44.52	50.87	57.24	63.59
McAlester	26.15	30.12	33.63	37.65
Oklahoma City	40.45	46.23	52.01	57.79
Ponca City	34.49	39.41	44.35	49.27
Tulsa	39.22	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	64	7/8	8a	-	2,589	-
Weather Stripping	64	7/8	8a	-	2,589	-
Weather Stripping	44	1 1/4	8a	-	2,543	-
Weather Stripping	44	1 1/8	8a	-	2,289	-
Weather Stripping	52	1	8a	-	2,404	-
Total				12,413	12,413	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	12,413	12,413	100%
Total		12,413	100%

Project Number PRJ-3264661

Program Custom Commercial Program

Project Background

The participant is a retail facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 64 Linear Feet Weather Stripping, 7/8" Gap
- 64 Linear Feet Weather Stripping, 7/8" Gap
- 44 Linear Feet Weather Stripping, 1 1/4" Gap
- 44 Linear Feet Weather Stripping, 1 1/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	7/8	1	1 1/8	1 1/4
Atlus	32.15	36.75	41.34	45.93
Clinton/Sherman	47.36	54.12	60.89	67.66
Gage	44.52	50.87	57.24	63.59
McAlester	26.15	30.12	33.63	37.65
Oklahoma City	40.45	46.23	52.01	57.79
Ponca City	34.49	39.41	44.35	49.27
Tulsa	39.22	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	1"	146	8a	-	6,749	-
Weather Stripping	1 1/8"	52	8a	-	2,705	-
Weather Stripping	7/8"	146	8a	-	5,907	-
Total				15,360	15,361	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	15,360	15,361	100%
Total		15,361	100%

Project Number PRJ-3264975

Program Custom Commercial Program

Project Background

The participant is a service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 17 Linear Feet Weather Stripping, 1/4" Gap
- 17 Linear Feet Weather Stripping, 1/4" Gap
- 36 Linear Feet Weather Stripping, 1 1/8" Gap
- 38 Linear Feet Weather Stripping, 1 1/8" Gap
- 44 Linear Feet Weather Stripping, 1 1/8" Gap
- 44 Linear Feet Weather Stripping, 1 1/4" Gap
- 46 Linear Feet Weather Stripping, 1 1/4" Gap
- 3 Linear Feet Weather Stripping Sweeps, 1/4" Gap
- 3 Linear Feet Weather Stripping Sweeps, 1/4" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1 1/8	1 1/4
Atlus	4.58	9.25	41.34	45.93
Clinton/Sherman	6.76	13.62	60.89	67.66
Gage	6.35	12.8	57.24	63.59
McAlester	3.34	6.77	33.63	37.65
Oklahoma City	5.77	11.63	52.01	57.79
Ponca City	4.92	9.94	44.35	49.27
Tulsa	5.59	11.28	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	17	1/4	8b	-	192	-
Weather Stripping	17	1/4	8b	-	192	-
Weather Stripping	36	1 1/8	8b	-	1816	-
Weather Stripping	38	1 1/8	8b	-	1916	-
Weather Stripping	44	1 1/8	8b	-	2219	-
Weather Stripping	44	1 1/4	8b	-	2465	-
Weather Stripping	46	1 1/4	8b	-	2577	-
Weather Stripping Sweeps	3	1/4	8b	-	33	-
Weather Stripping Sweeps	3	1/4	8b	-	33	-
Total				11,445	11,445	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	-	11,377	-
Weather Stripping Sweeps	-	68	-
Total		11,445	100%

Project Number PRJ-3267271

Program Custom Commercial Program

Project Background

The participant is a retail facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 1 1/4” Gap
- 60 Linear Feet Weather Stripping, 2” Gap
- 36 Linear Feet Weather Stripping, 7/8” Gap
- 40 Linear Feet Weather Stripping, 1 1/4” Gap
- 60 Linear Feet Weather Stripping, 1 1/8” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 60 Linear Feet Weather Stripping, 1 1/2” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 1 1/4” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 1 1/4” Gap
- 40 Linear Feet Weather Stripping, 1 1/2” Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)					
	3/4	7/8	1	1 1/8	1 1/4	2
Atlus	27.56	32.15	36.75	41.34	45.93	73.49
Clinton/Sherman	40.62	47.36	54.12	60.89	67.66	108.25
Gage	38.18	44.52	50.87	57.24	63.59	101.75
McAlester	20.16	26.15	30.12	33.63	37.65	60.23
Oklahoma City	34.7	40.45	46.23	52.01	57.79	92.46
Ponca City	29.62	34.49	39.41	44.35	49.27	78.83
Tulsa	33.62	39.22	44.83	50.43	56.03	89.65

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	60	3/4	8a	-	2,082	-
Weather Stripping	60	3/4	8a	-	2,082	-
Weather Stripping	60	1	8a	-	2,774	-
Weather Stripping	60	1 1/4	8a	-	3,467	-
Weather Stripping	60	2	8a	-	5,548	-
Weather Stripping	36	7/8	8a	-	1,456	-
Weather Stripping	40	1 1/4	8a	-	2,312	-
Weather Stripping	60	1 1/8	8a	-	3,121	-
Weather Stripping	60	1	8a	-	2,774	-
Weather Stripping	60	7/8	8a	-	2,427	-
Weather Stripping	60	1 1/2	8a	-	4,161	-
Weather Stripping	40	1	8a	-	1,849	-

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	60	3/4	8a	-	2,082	-
Weather Stripping	60	1	8a	-	2,774	-
Weather Stripping	60	3/4"	8a	-	2,082	-
Weather Stripping	60	1"	8a	-	2,774	-
Weather Stripping	60	1-1/4"	8a	-	3,467	-
Weather Stripping	60	7/8"	8a	-	2,427	-
Weather Stripping	60	7/8"	8a	-	2,427	-
Weather Stripping	60	1"	8a	-	2,774	-
Weather Stripping	60	1-1/4"	8a	-	3,467	-
Weather Stripping	40	1-1/2"	8a	-	2,774	-
Total				61,093	61,101	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	61,093	61,101	100%
Total		61,101	100%

Project Number PRJ-3274795

Program Custom Commercial Program

Project Background

The participant is a rental service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap
- 58 Linear Feet Weather Stripping, 1" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1/4	1/2	1
Atlus	4.58	9.25	18.36	36.75
Clinton/Sherman	6.76	13.62	27.06	54.12
Gage	6.35	12.8	25.43	50.87
McAlester	3.34	6.77	13.43	30.12
Oklahoma City	5.77	11.63	23.11	46.23
Ponca City	4.92	9.94	19.73	39.41
Tulsa	5.59	11.28	22.4	44.83

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Weather Stripping	58	1	8a	-	2,681	-
Total				29,032	29,032	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	29,032	29,032	100%
Total		29,032	100%

Project Number PRJ-3284706

Program Custom Commercial Program

Project Background

The participant is a car wash facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 36 Linear Feet Weather Stripping, 1 1/8” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1 1/4” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1 1/8” Gap
- 48 Linear Feet Weather Stripping, 1 1/4” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1” Gap
- 48 Linear Feet Weather Stripping, 1 1/4” Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	36	1 1/8	8a	-	1,872	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1-1/4	8a	-	2,774	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1 1/8	8a	-	2,497	-
Weather Stripping	48	1-1/4	8a	-	2,774	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1	8a	-	2,219	-
Weather Stripping	48	1-1/4	8a	-	2,774	-
Total				28,224	28,224	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	28,224	28,224	100%
Total		28,224	100%

Project Number PRJ-3280692

Program Custom Commercial Program

Project Background

The participant is a car wash facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 658 Linear Feet Weather Stripping, 1" Gap
- 112 Linear Feet Weather Stripping, 1 1/8" Gap
- 112 Linear Feet Weather Stripping, 1 1/4" Gap
- 56 Linear Feet Weather Stripping, 1 3/8" Gap
- 56 Linear Feet Weather Stripping, 1 1/2" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	658	1"	8a	-	30,419	-
Weather Stripping	112	1 1/8"	8a	-	5,825	-
Weather Stripping	112	1-1/4"	8a	-	6,472	-
Weather Stripping	56	1 3/8"	8a	-	3,560	-
Weather Stripping	56	1-1/2"	8a	-	3,884	-
Total				50,160	50,161	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	50,160	50,161	100%
Total		50,161	100%

Project Number EA-0001062947

Program Custom Commercial Program

Project Background

The participant is a service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 256 Linear Feet Weather Stripping, 1" Gap
- 256 Linear Feet Weather Stripping, 1 1/8" Gap
- 320 Linear Feet Weather Stripping, 1 1/4" Gap
- 64 Linear Feet Weather Stripping, 1 3/8" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	256	1"	8a	-	11,835	-
Weather Stripping	256	1 1/8"	8a	-	13,315	-
Weather Stripping	320	1-1/4"	8a	-	18,493	-
Weather Stripping	64	1 3/8"	8a	-	4,069	-
Total				47,711	47,711	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	47,711	47,711	100%
Total		47,711	100%

Project Number EA-001236516

Program Custom Commercial Program

Project Background

The participant is a service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 728 Linear Feet Weather Stripping, 1” Gap
- 280 Linear Feet Weather Stripping, 1 1/4” Gap
- 92 Linear Feet Weather Stripping, 3/4” Gap
- 52 Linear Feet Weather Stripping, 7/8” Gap
- 180 Linear Feet Weather Stripping, 1/2” Gap
- 120 Linear Feet Weather Stripping, 1 1/8” Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	728	1"	8a	-	33,655	-
Weather Stripping	280	1-1/4"	8a	-	16,181	-
Weather Stripping	92	3/4"	8a	-	3,192	-
Weather Stripping	52	7/8"	8a	-	2,104	-
Weather Stripping	180	1/2"	8a	-	4,160	-
Weather Stripping	120	1 1/8"	8a	-	6,241	-
Weather Stripping	728	1"	8a	-	33,655	-
Total				65,529	65,534	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	65,529	65,529	65,534
Total		65,529	65,534

Project Number EA-001236804

Program Custom Commercial Program

Project Background

The participant is a service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 540 Linear Feet Weather Stripping, 1" Gap
- 120 Linear Feet Weather Stripping, 7/8" Gap
- 60 Linear Feet Weather Stripping, 3/4" Gap
- 120 Linear Feet Weather Stripping, 1 1/8" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	540	1"	8a	-	24,964	-
Weather Stripping	120	7/8"	8a	-	4,854	-
Weather Stripping	60	3/4"	8a	-	2,082	-
Weather Stripping	120	1 1/8"	8a	-	6,241	-
Total				38,140	38,142	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	38,140	38,142	100%
Total		38,142	100%

Project Number EA-0001443188

Program Custom Commercial Program

Project Background

The participant is a service facility that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping. During a desk review, the evaluators verified the participant had installed:

- 177 Linear Feet Weather Stripping, 1 1/4" Gap

M&V Methodology

Savings for the weather-stripping measure was calculated using Oklahoma stipulated deemed values. The deemed values were formulated using methodologies in the Oklahoma C&I Natural Gas Guidebook V1. The deemed values used in calculating savings are presented in the table below.

Deemed Savings Parameters

Area	Gap Width (inches)			
	1/8	1	1 1/8	1 1/4
Atlus	4.58	36.75	41.34	45.93
Clinton/Sherman	6.76	54.12	60.89	67.66
Gage	6.35	50.87	57.24	63.59
McAlester	3.34	30.12	33.63	37.65
Oklahoma City	5.77	46.23	52.01	57.79
Ponca City	4.92	39.41	44.35	49.27
Tulsa	5.59	44.83	50.43	56.03

Savings Calculations

Using deemed values from the table above, the evaluators calculated weather stripping savings as follows:

$$Annual\ Therms\ Savings = Length * Heating\ Savings$$

Parameters for Therms Savings Calculation of Weather Stripping Retrofit

Length	Total length of installed door weather stripping
Heating Savings	Deemed heating savings per foot of installed weather stripping

Weather Stripping Retrofit Therms Savings Calculations

Measure	Length	Gap	Area	Expected therms Savings	Realized therms Savings	Realization Rate
	Feet	Inches				
Weather Stripping	177	1 1/4"	8a	-	10,229	-
Total				10,217	10,229	100%

Results

The total therms saved realization rate for this project is 100%.

Verified Gross Savings & Realization Rates

Measure	Expected Therms Savings	Verified	
		Therms Savings	Therms Realization Rate
Weather Stripping	10,217	10,229	100%
Total		10,229	100%