# Oklahoma Natural Gas Evaluation of 2024 Energy Efficiency Programs

Prepared for:

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# 1 Executive Summary

This report is a summary of the evaluation, measurement, and verification (EM&V) effort of the 2024 program year (PY2024) 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 (153) | Document review | November 2024– January 2025 | Program function; program marketing; quality control | Qualitative |
| Database analysis (10,905) | Database review | November 2024– January 2025 | Number of projects; project type and details; data quality | Quantitative |
| Program Participants (709) | Telephone and online survey | November 2024 to January 2025 | 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 PY2024, the ONG energy efficiency portfolio ex-post gross energy savings totaled 4,635,080 therms, with a 123% 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*

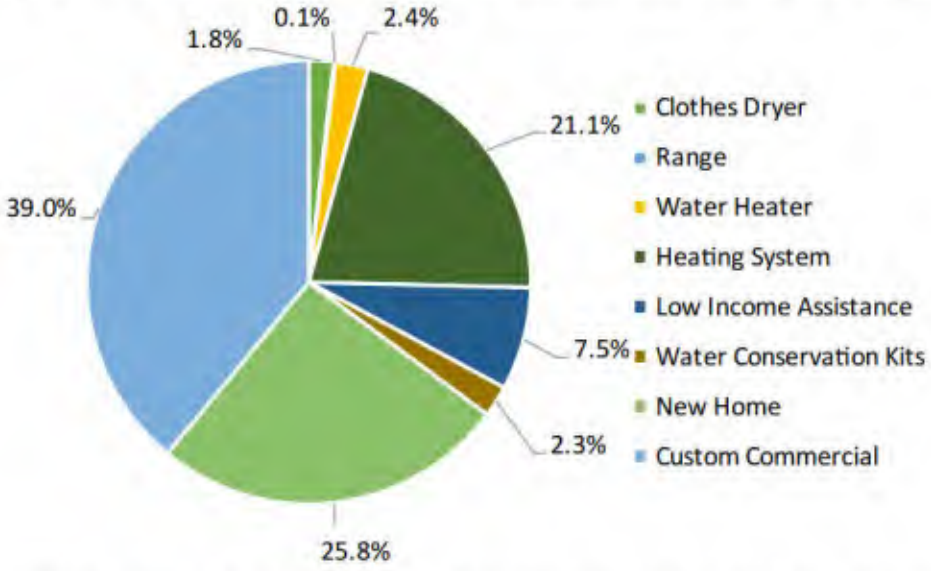
The overall estimated net-to-gross ratio for the ONG energy efficiency portfolio during 2024 is 86% with total net savings of 3,987,866 therms.

*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 | 69,628 | 83,848 | 120% | 55,198 | 66% |
| Range | 18,625 | 5,346 | 29% | 3,441 | 64% |
| Water Heater | 109,108 | 109,900 | 100.7% | 76,066 | 69.2% |
| Heating System | 509,318 | 977,443 | 191.9% | 662,155 | 67.7% |
| Low-income Assistance | 308,478 | 347,841 | 113% | 347,841 | 100% |
| Water Conservation Kits | 59,669 | 105,891 | 177% | 98,472 | 93% |
| New Home | 887,476 | 1,196,228 | 135% | 1,120,793 | 94% |
| Custom Commercial | 1,813,325 | 1,808,584 | 100% | 1,623,901 | 90% |
| **Total** | **3,775,628** | **4,635,080** | **123%** | **3,987,866** | **86%** |

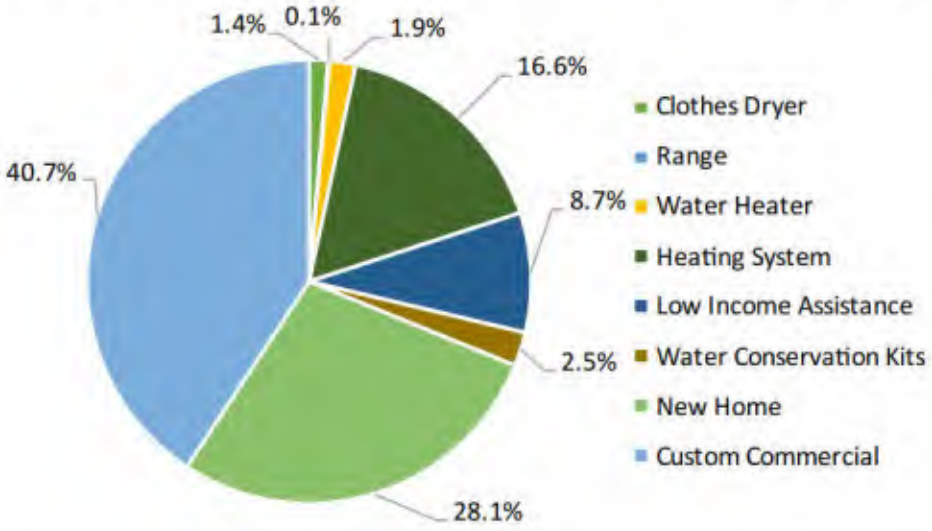
The contribution to portfolio gross ex-post therms savings by program is summarized in Figure 1-1.

*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 | $779,178 | $296,148 | 2.63 |
| Range | $347,532 | $25,654 | 13.55 |
| Water Heater | $11,995,593 | $2,536,986 | 4.73 |
| Heating System | $1,323,331 | $524,528 | 2.52 |
| Low-income Assistance | $5,415,205 | $1,084,350 | 4.99 |
| Water Conservation Kits | $2,413,176 | $95,822 | 25.18 |
| New Home | $16,648,966 | $6,635,554 | 2.51 |
| Custom Commercial | $12,001,868 | $2,958,008 | 4.06 |
| Portfolio Non-program Costs | N/A | $2,803,457 | N/A |
| **Total** | **$50,924,847** | **$16,960,506** | **3.00** |

## 1.1 Conclusions and Recommendations

The Evaluator offers program-specific conclusions and recommendations at the end of the individual program chapters.

# 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 PY2024.

### 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 | 22 | 741 | 741 | 100% |
| Residential | 2,044 | 68,887 | 68,887 | 100% |
| **Total** | **2,066** | **69,628** | **69,628** | **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 | 8 | 42 | 42 | 100% |
| New Construction | 2,504 | 13,279 | 13,279 | 100% |
| Residential | 1,000 | 5,303 | 5,303 | 100% |
| **Total** | **3,512** | **18,625** | **18,625** | **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 | 5 | 209 | 209 | 100% |
| Electric to Gas Water Heater | 29 | 4,827 | 9,487 | 51% |
| Gas to Gas Water Heater | 0 | 0 | 0 | N/A |
| Tankless Water Heater | 1,044 | 24,942 | 85,431 | 29% |
| Electric to Gas Tankless Water Heater | 29 | 4,827 | 13,981 | 35% |
| **Total** | **1,107** | **34,805** | **109,108** | **32%** |

### 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 | 36 | 3,471 | 3,967 | 87.5% |
| Evaluated in New Home | 2,335 | 0 | 154,063 | 0.0% |
| New Construction | 1,155 | 76,207 | 76,273 | 99.9% |
| Residential | 39 | 7,348 | 275,015 | 2.7% |
| **Total** | **3,565** | **87,026** | **509,318** | **17.1%** |

### 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** | **482** | **5,388** | **59,669** | **9.0%** |

### 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* |
|---|---|---|---|
| **69** | **15,370** | **887,476** | **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 8.45%.

The sample selection is from the population of projects with completion dates during PY2024. 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) | <1,000 | 1,000 - 2,999 | 3,000- 9,999 | 10,000 - 39,999 | 40,000 ≥ | Census | |
| Population Size | 29 | 11 | 6 | 6 | 1 | 60 | |
| Total Therm savings | 17,814 | 20,631 | 33,298 | 145,162 | 45,779 | 97,231 | **359,915** |
| Average Therm Savings | 614 | 1,876 | 5,550 | 5,550 | 45,779 | 1,621 | **13,272** |
| Standard deviation of Therm savings | 310 | 468 | 1,640 | 9,626 | 0 | 1,549 | |
| Coefficient of variation | 0.50 | 0.25 | 0.30 | 0.40 | 0.00 | 0.96 | |
| Final design sample | 3 | 2 | 4 | 2 | 1 | 60 | **72** |

*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 - 14,999 | 15,000 - 29,999 | 30,000 - 49,999 | 50,000 ≥ | |
| Population Size | 21 | 45 | 17 | 8 | 5 | **96** |
| Total Therm savings | 36,468 | 457,051 | 328,563 | 325,382 | 305,948 | **1,453,411** |
| Average Therm Savings | 1,737 | 10,157 | 19,327 | 40,673 | 61,190 | **26,617** |
| Standard deviation of Therm savings | 1,756 | 2,988 | 3,721 | 6,081 | 4,868 | |
| Coefficient of variation | 1.01 | 0.29 | 2.00 | 0.15 | 0.08 | |
| Final design sample | 2 | 4 | 2 | 2 | 2 | **12** |

The Custom component stratified sample shown in Table 2-9 resulted in samples that total 55% of the total ex-ante 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 | 97,231 | 97,231 | 100% |
| Custom 5 | 45,779 | 45,779 | 100% |
| Custom 4 | 45,207 | 145,162 | 31% |
| Custom 3 | 3,337 | 33,298 | 10% |
| Custom 2 | 3,337 | 20,631 | 16% |
| Custom 1 | 2,002 | 17,814 | 11% |
| **Total** | **196,894** | **359,915** | **55%** |

The Direct Install component stratified sample shown in Table 2-10 resulted in samples that total 19% 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 | 118,768 | 305,948 | 39% |
| DI 4 | 75,309 | 325,382 | 23% |
| DI 3 | 35,326 | 328,563 | 11% |
| DI 2 | 44,119 | 457,051 | 10% |
| DI 1 | 5,608 | 36,468 | 15% |
| **Total** | **279,130** | **1,453,411** | **19%** |

## 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 | 65 |
| Range | 40 |
| Water Heater | 42 |
| Heating System | 39 |
| Water Conservation Kit | 482 |
| New Home | 12 |

### 2.3.2 Low-Income Assistance Program

No process evaluation was performed in PY2024 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 | 7 |
| Direct Install | 22 |

# 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 |

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 | 22 | 33.7 | 741 |
| Residential | 2,044 | 33.7 | 68,887 |
| **Total** | **2,066** | **33.7** | **69,628** |

## 3.2 Program Trends in PY2024

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:

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

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

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

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

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

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

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

*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% | 741 | 0 | 0% |
| Residential | 100% | 68,887 | 83,848 | 122% |
| **Total** | **100%** | **69,628** | **83,848** | **120%** |

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 | 34% |

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** | **83,848** | **28,650** | **55,198** | **66%** |

## 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 65 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. Most respondents own a single family home, built between 1960 and 2010. Most households have more than one resident aged between 25 and 65, and most respondents stated they are married. Most respondents are white/Caucasian, have some college education, or have completed an associate or bachelor's degree.

*Table 3-9: Respondents' Demographics (n=65)*

| | % | n |
|---|---|---|
| Homeownership | | |
| Own | 95.4% | 62 |

| | % | n |
|---|---|---|
| Rent | 3.1% | 2 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 1.5% | 1 |
| **Housing type** | | |
| Single-family home | 96.9% | 63 |
| Manufactured or mobile home | 1.5% | 1 |
| Prefer not to answer | 1.5% | 1 |
| **Home age** | | |
| Before 1950 | 9.2% | 6 |
| 1950 to 1959 | 7.7% | 5 |
| 1960 to 1969 | 15.4% | 10 |
| 1970 to 1979 | 10.8% | 7 |
| 1980 to 1989 | 9.2% | 6 |
| 1990 to 1999 | 13.9% | 9 |
| 2000 to 2009 | 12.3% | 8 |
| 2010 to 2019 | 6.2% | 4 |
| After 2019 | 7.7% | 5 |
| I don't know | 6.2% | 4 |
| Prefer not to answer | 1.5% | 1 |
| **People in household** | | |
| 1 | 16.9% | 11 |
| 2 | 29.2% | 19 |
| 3 | 16.9% | 11 |
| 4 | 12.3% | 8 |
| 5 | 13.9% | 9 |
| 6 + | 6.2% | 4 |
| Prefer not to answer | 4.6% | 3 |
| **Age (years)** | | |
| 18-24 | 7.7% | 5 |
| 25-34 | 33.9% | 22 |
| 35-49 | 23.1% | 15 |
| 50-64 | 26.2% | 17 |
| 65 or over | 0.0% | 0 |
| Prefer not to answer | 9.2% | 6 |
| **Household status** | | |
| Single, no children | 15.4% | 10 |
| Single, with children | 6.2% | 4 |
| Married, no children | 24.6% | 16 |
| Married, with children at home | 44.6% | 29 |
| All adults | 1.5% | 1 |
| I don't know | 1.5% | 1 |
| Prefer not to answer | 6.2% | 4 |
| **Household income** | | |
| Less than $20,000 | 0.0% | 0 |
| $20,000 to less than $40,000 | 4.6% | 3 |

| | % | n |
|---|---|---|
| $40,000 to less than $60,000 | 7.7% | 5 |
| $60,000 to less than $80,000 | 13.9% | 9 |
| $80,000 to less than $100,000 | 3.1% | 2 |
| $100,000 to less than $150,000 | 15.4% | 10 |
| $150,000 to less than $200,000 | 4.6% | 3 |
| $200,000 or more | 6.2% | 4 |
| I don't know | 4.6% | 3 |
| Prefer not to answer | 40.0% | 26 |
| Race/Ethnicity | | |
| White/Caucasian | 73.9% | 48 |
| Hispanic/Latino | 4.6% | 3 |
| Black/African American | 6.2% | 4 |
| Asian/Pacific Islander | 0.0% | 0 |
| Mixed Race | 1.5% | 1 |
| Native American | 4.6% | 3 |
| I don't know | 0.0% | 0 |
| Prefer not to say | 9.2% | 6 |
| Education level | | |
| Up to 8th grade | 0.0% | 0 |
| Some high school | 0.0% | 0 |
| High school or GED equivalent | 23.1% | 15 |
| Some college | 13.9% | 9 |
| e's d | 7.7% | 5 |
| Ba ' de | 30.8% | 20 |
| r's d | 12.3% | 8 |
| Professional degree | 0.0% | 0 |
| Doctorate | 0.0% | 0 |
| Prefer not to answer | 12.3% | 8 |

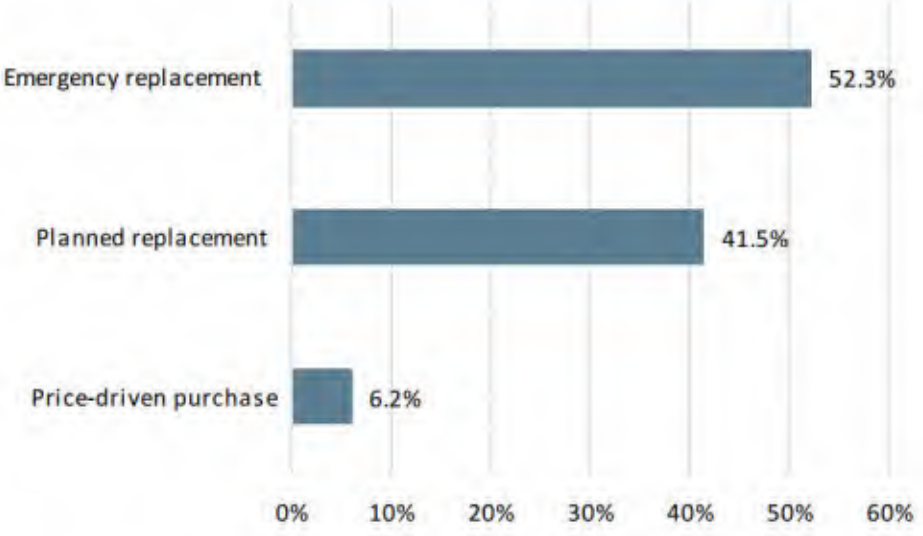
#### *3.4.1.2 Program Awareness and Participation*

**Respondents became aware of the dryer rebate program through a variety of methods, including vendors, word-of-mouth, and ONG's website** (Figure 3-2). Nearly three quarters of participants had never participated in an ONG program prior to the dryer program (72.3%).

*Figure 3-2: Program Awareness (n=65)*


**Respondents were somewhat split on whether they had planned to replace their dryer, or it was an emergency replacement** (Figure 3-3). Over half of respondents replaced a functioning dryer (56.9%). Old dryers ranged from one to thirty years old, with an average age of eleven years.

*Figure 3-3: Replacement Type (n=65)*




**Over half of respondents previously had a gas dryer, versus an electric dryer (52.3%)**. Greater than half of respondents who switched from an electric dryer to a gas dryer were satisfied with their new gas dryer (69.2%).

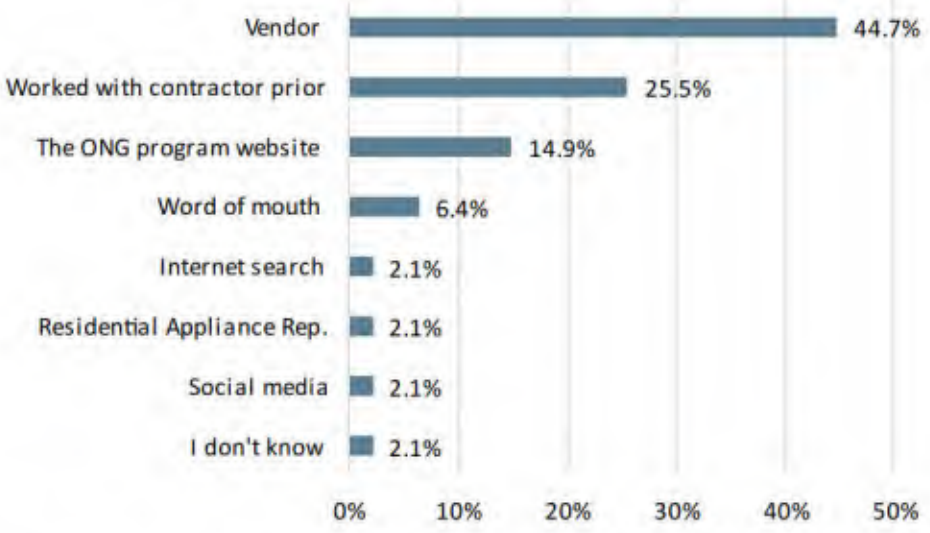
Sixty-four percent of respondents replaced their clothes washer along with the dryer. Nearly three quarters of respondents own an Energy Star label clothes washer (71.4%).

Before learning of the program, three quarters of respondents had plans to install a new clothes dryer (76.9%) and most would have been financially able to purchase the new clothes dryer if the rebate was not available through ONG (89.2%).

*3.4.1.3 Experience with Contractor*

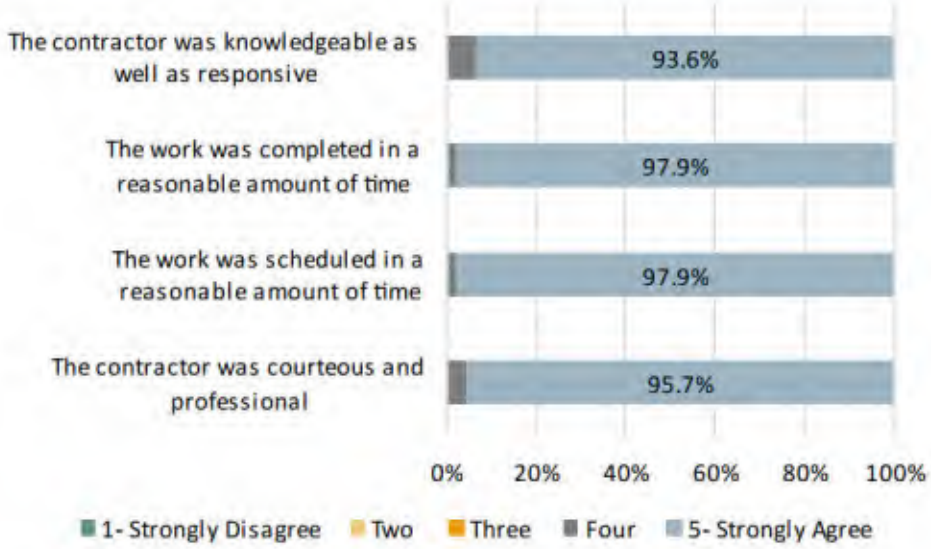
**Nearly three quarters of respondents paid someone to install their new clothes dryer (72.3%).** Contractors were identified through vendors, previous contact, and the ONG website (Figure 3-4).

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




**Respondents were very satisfied with their contractor experience** (Figure 3-5). Respondents were very satisfied with the amount of time to schedule and complete installation of the new dryer.

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




**Contractors and customers agreed on the top three most important characteristics of the new dryer** (Table 3-10).

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

| | Contractors (%) | Customer (%) |
|---|---|---|
| Energy efficiency | 46.8% | 27.7% |
| Good warranty/reliability | 40.4% | 17.0% |
| Rebate eligibility | 40.4% | 14.9% |
| Low price | 14.9% | 8.5% |
| Emphasis on the brand reputation | 23.4% | 4.3% |
| Size of the equipment | 0.0% | 6.4% |
| Gas | 0.0% | 4.3% |
| Quiet operation | 8.5% | 0.0% |
| Dryer cycle length | 4.3% | 0.0% |

### *3.4.1.4 Program Satisfaction*

**Respondents were overall satisfied with the dryer program** (Figure 3-6). One respondent indicated dissatisfaction with the process of applying for the rebate. 70.8% of respondents indicated that their participation in the program increased their satisfaction with ONG (Figure 3-7). ). All 65 respondents stated that they would likely participate in another ONG program in the future.

*Figure 3-6 Program Satisfaction (n=65)*

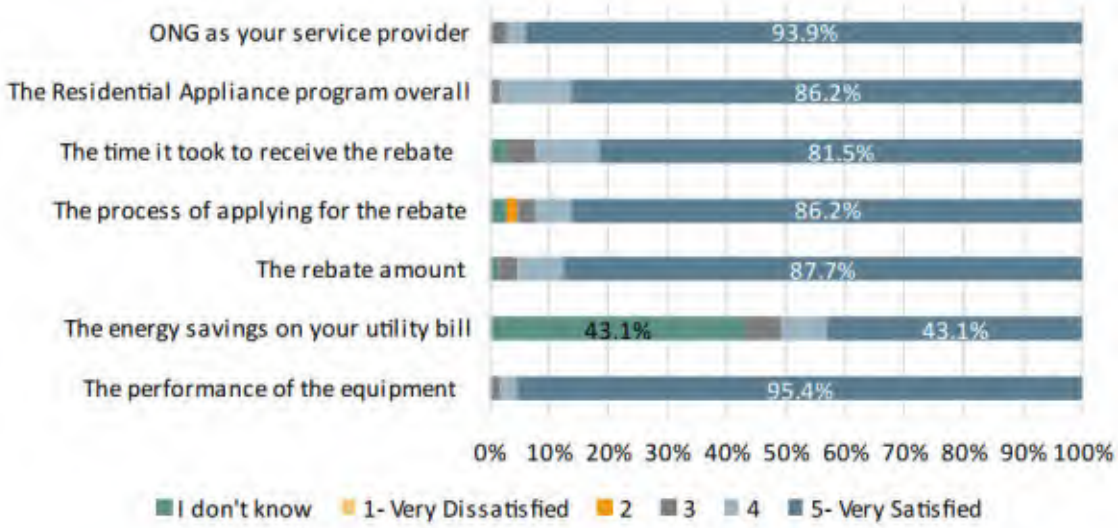
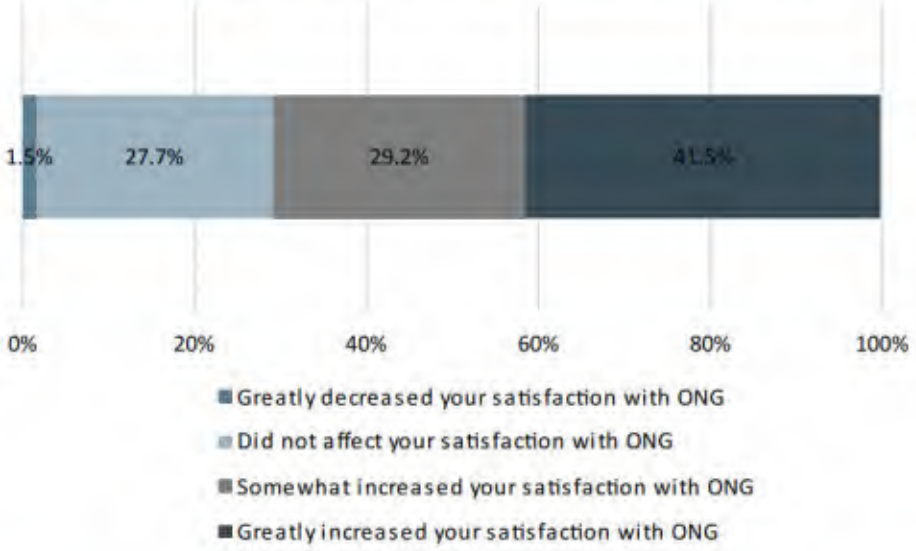



*Figure 3-7: Program Impact on Satisfaction with ONG (n=65)*




## 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 43% of survey participants learning of the rebate program through a retail store.
- Fifty two percent of survey respondents reported that the old dryer was broken when they replaced it.

- Customer feedback was generally very positive about a variety of aspects of the program. Participants were most satisfied with the performance of the equipment and ONG as their service provider.

### 3.5.2 Recommendations

- Expand Outreach and Awareness: Increase efforts to raise awareness of the program and its benefits, particularly targeting apartment complexes and property owners who may benefit from expanded offerings.
- Focus on Low-Income and High-Impact Audiences: Provide tailored support for low to moderate income households, who comprise a notable portion of respondents (14%).
- Sustain High-Performing Elements: Continue to emphasize the ease of submitting the application and the program's ability to address immediate participant needs, as these aspects are core strengths. Share respondent testimonials to build trust and encourage wider adoption by non-participants.
-

# 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 |

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

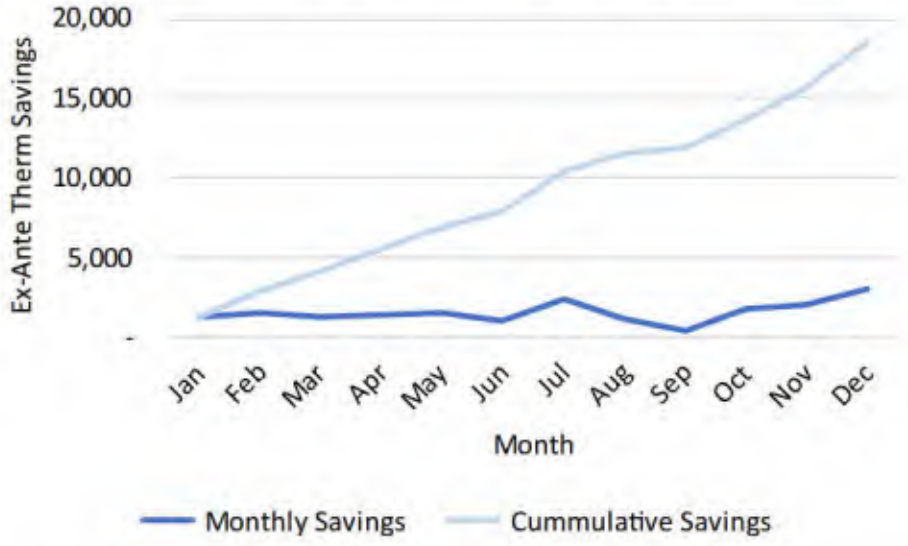
*Table 4-2 Ex-Ante Therm Savings of Range Program by Stratum*

| *Stratum* | *Number of Ranges* | *Ex-Ante Therm Savings per unit* | *Ex-Ante Therm Savings* |
|---|---|---|---|
| Commercial | 8 | 5.3 | 42 |
| New Construction | 2,504 | 5.3 | 13,279 |
| Residential | 1,000 | 5.3 | 5,303 |
| **Total** | **3,512** | **5.3** | **18,625** |

## 4.2 Program Trends in PY2024

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.

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

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

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

*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% | 42 | 42 | 100% |
| New Construction | 0% | 13,279 | - | 0% |
| Residential | 100% | 5,303 | 5,303 | 100% |
| **Total** | **29%** | **18,625** | **5,346** | **29%** |

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 | 36% |

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** | **5,346** | **1,904** | **3,441** | **64%** |

## 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 40 customers who received a rebate through the Range 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.

#### *4.4.1.1 Respondent Demographics*

Table 4-6 outlines respondents' demographic characteristics. Most respondents own a single family home, built between 1960 and 2010. Most households have more than one resident aged 35 and older, and most respondents stated they are married. Most respondents are white/ Caucasian, have some college education, or have completed an associate or bachelor's degree.

*Table 4-6: Respondents' Demographics (n=40)*

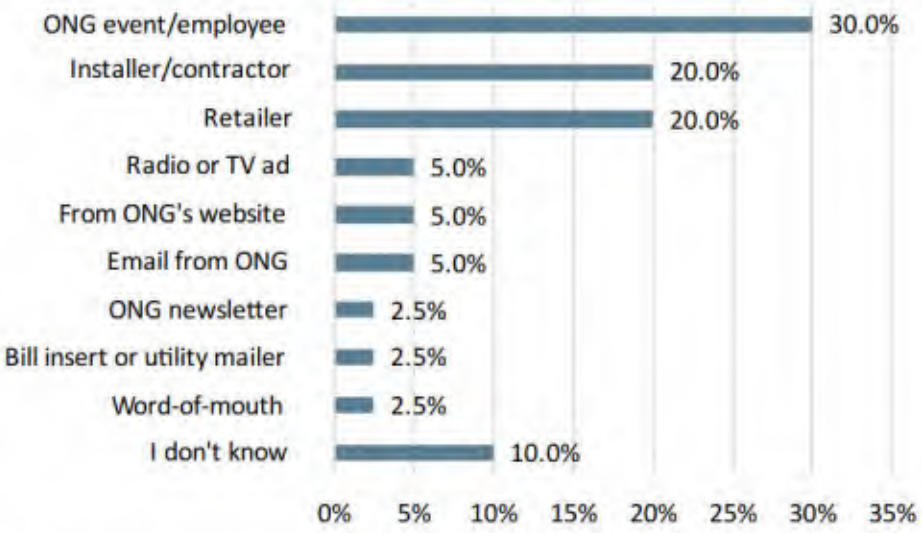
| | % | n |
|---|---|---|
| Homeownership | | |
| Own | 100.0% | 40 |
| Rent | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| Housing type | | |
| Single-family home | 97.5% | 39 |
| Manufactured or mobile home | 2.5% | 1 |
| Prefer not to answer | 0.0% | 0 |
| Home age | | |
| Before 1950 | 17.5% | 7 |
| 1950 to 1959 | 7.5% | 3 |
| 1960 to 1969 | 7.5% | 3 |
| 1970 to 1979 | 10.0% | 4 |
| 1980 to 1989 | 15.0% | 6 |
| 1990 to 1999 | 12.5% | 5 |
| 2000 to 2009 | 12.5% | 5 |
| 2010 to 2019 | 7.5% | 3 |
| After 2019 | 2.5% | 1 |
| I don't know | 7.5% | 3 |
| Prefer not to answer | 0.0% | 0 |
| People in household | | |
| 1 | 25.0% | 10 |
| 2 | 32.5% | 13 |
| 3 | 17.5% | 7 |
| 4 | 12.5% | 5 |
| 5 | 5.0% | 2 |
| 6 + | 5.0% | 2 |
| Prefer not to answer | 2.5% | 1 |
| Age (years) | | |
| 18-24 | 10.0% | 4 |

| | % | n |
|---|---|---|
| 25-34 | 37.5% | 15 |
| 35-49 | 20.0% | 8 |
| 50-64 | 27.5% | 11 |
| 65 or over | 0.0% | 0 |
| Prefer not to answer | 5.0% | 2 |
| Household status | | |
| Single, no children | 30.0% | 12 |
| Single, with children | 5.0% | 2 |
| Married, no children | 27.5% | 11 |
| Married, with children at home | 25.0% | 10 |
| Single with adult kids | 2.5% | 1 |
| I don't know | 2.5% | 1 |
| Prefer not to answer | 7.5% | 3 |
| Household income | | |
| Less than $20,000 | 0.0% | 0 |
| $20,000 to less than $40,000 | 7.5% | 3 |
| $40,000 to less than $60,000 | 0.0% | 0 |
| $60,000 to less than $80,000 | 22.5% | 9 |
| $80,000 to less than $100,000 | 7.5% | 3 |
| $100,000 to less than $150,000 | 5.0% | 2 |
| $150,000 to less than $200,000 | 5.0% | 2 |
| $200,000 or more | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 52.5% | 21 |
| Race/Ethnicity | | |
| White/Caucasian | 70.0% | 28 |
| Hispanic/Latino | 7.5% | 3 |
| Black/African American | 17.5% | 7 |
| Asian/Pacific Islander | 0.0% | 0 |
| Mixed Race | 0.0% | 0 |
| Native American | 2.5% | 1 |
| I don't know | 0.0% | 0 |
| Prefer not to say | 2.5% | 1 |
| Education level | | |
| Up to 8th grade | 0.0% | 0 |
| Some high school | 5.0% | 2 |
| High school or GED equivalent | 15.0% | 6 |
| Some college | 35.0% | 14 |
| e’s d | 10.0% | 4 |
| Ba ’ de | 20.0% | 8 |
| r’s d | 10.0% | 4 |
| Professional degree | 0.0% | 0 |
| Doctorate | 0.0% | 0 |
| Prefer not to answer | 5.0% | 2 |

#### *4.4.1.2 Program Awareness and Participation*

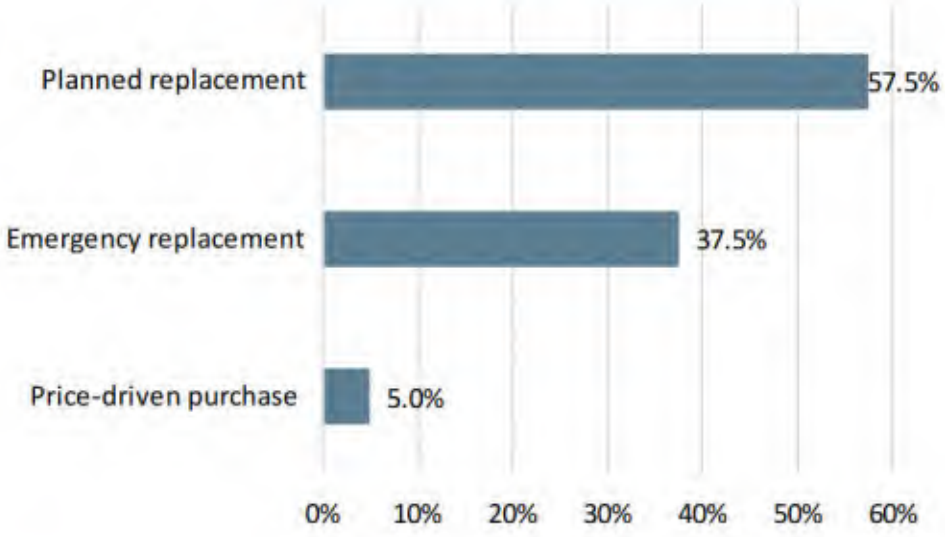
**Respondents learned about the range rebate program through a variety of sources, most commonly an ONG event or employee** (Figure 4-2). About three quarters of respondents had never previously participated in an ONG energy efficiency program (72.5%).

*Figure 4-2: Program Awareness (n=40)*




**Over half of participants planned to replace their range** (Figure 4-7). More than 35% of respondents replaced their range due to an emergency and over half of participants stated that their old range was still functioning at the time the range was replaced (57.5%). Ages of pre-existing ranges spanned one to thirty years.

*Table 4-7: Replacement Type (n=40)*



More than 60% of participants replaced their range as a stand-alone item and it was the only item replaced in their kitchen (Figure 4-3); while the remaining respondents bought multiple kitchen appliances (Table 4-8).

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

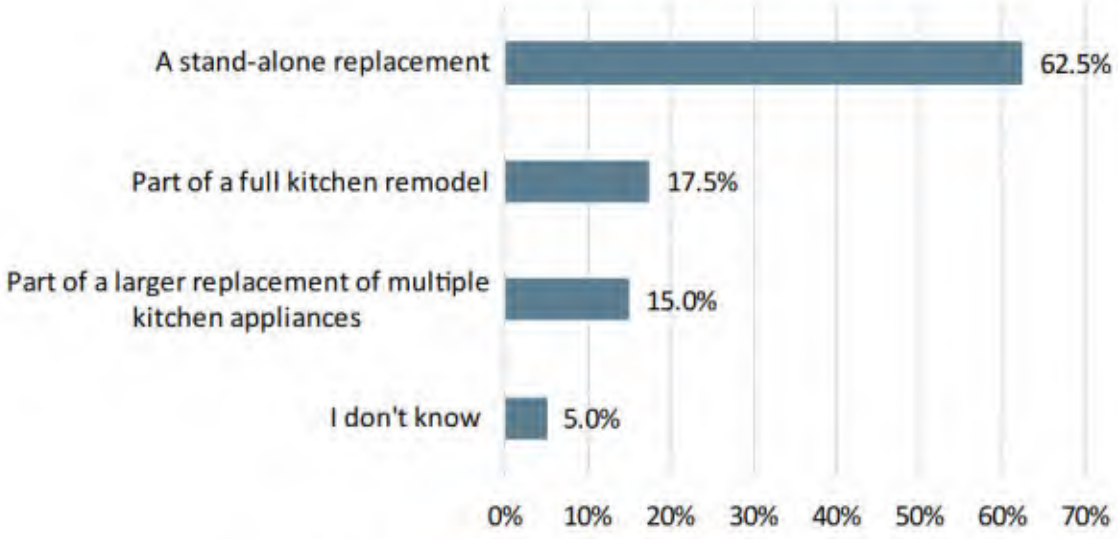



*Table 4-8: Other Equipment Purchased (n=16)*

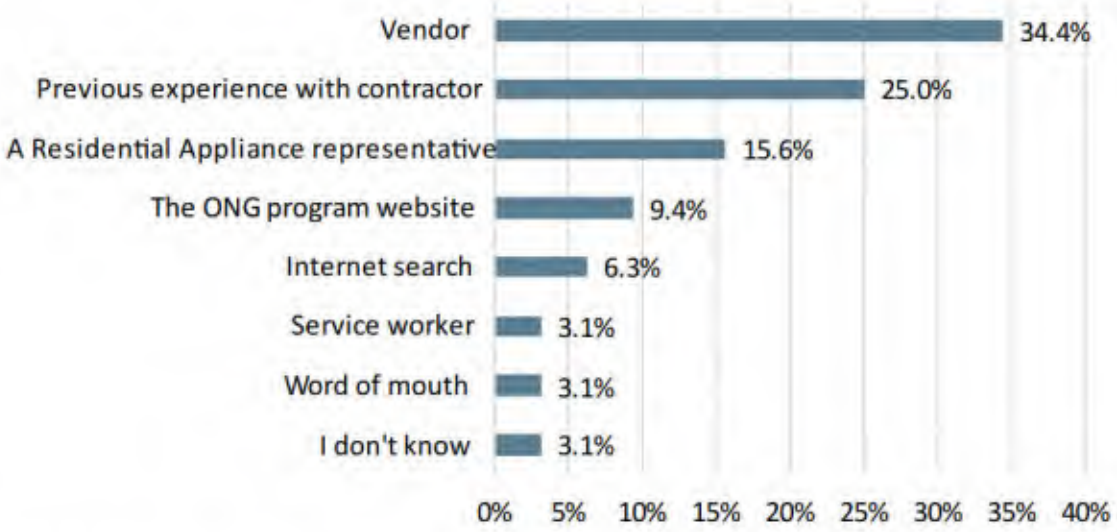
| | n |
|---|---|
| Refrigerator | 12 |
| Dishwasher | 11 |
| Built-in microwave | 7 |
| Oven | 6 |
| Ventilation hood | 2 |
| Hot-holding cabinet/food warming cabinet | 1 |
| Water heater | 1 |
| Freezer | 1 |

Less than half of respondents (42.5%) indicated they switched to a gas range from an electric range, and 52.5% of respondents indicated the pre-existing range was gas.

#### *4.4.1.3 Experience with Contractor*

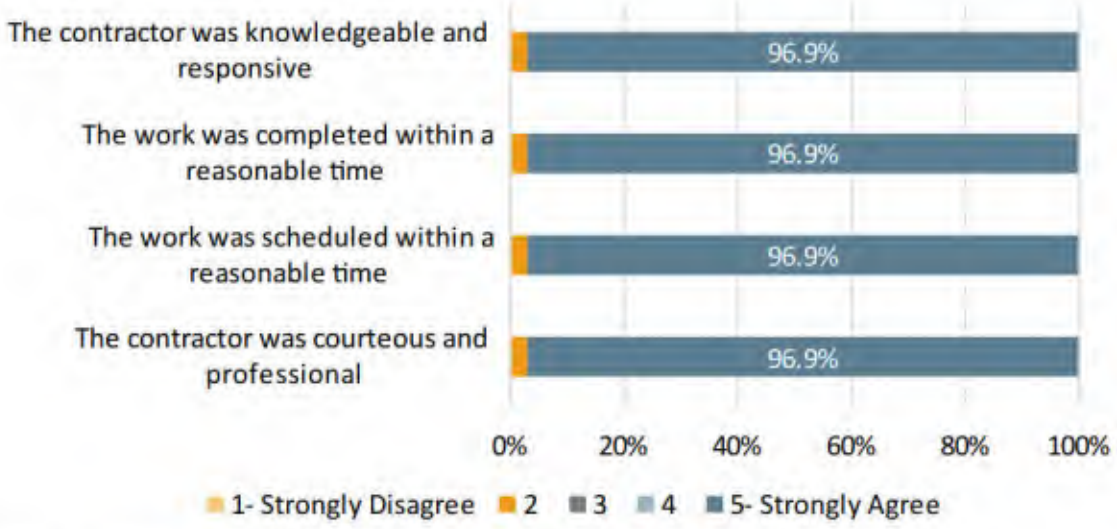
Eighty percent of respondents paid someone to install the new range. Respondents discovered the contractor who installed their range through the vendor who sold the range, previous contractors, and a residential appliance representative (Figure 4-4).

*Figure 4-4: Contractor Awareness (n=32)*




**Respondents were generally satisfied with their contractor** (Figure 4-5). Three-quarters of respondents had no interaction with ONG program staff (77.5%)

*Figure 4-5: Satisfaction with Contractor (n=32)*




#### *4.4.1.4 Program Satisfaction*

**Respondents were generally satisfied with the program** (Figure 4-6). ). Two participants noted some dissatisfaction with the program regarding difficulty filling out the application.

Sixty percent of respondents indicated that their participation in the program increased their satisfaction with ONG (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=40)*

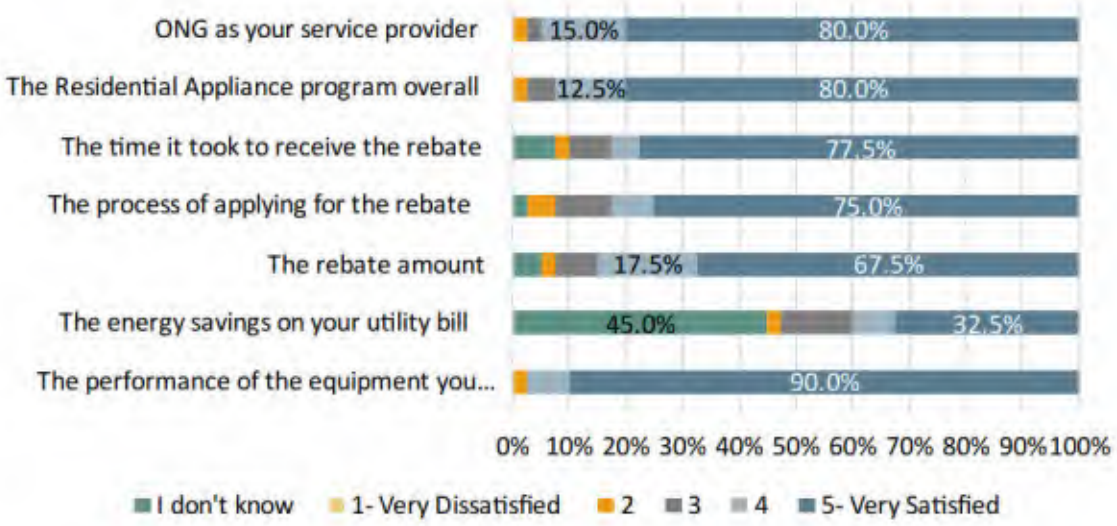
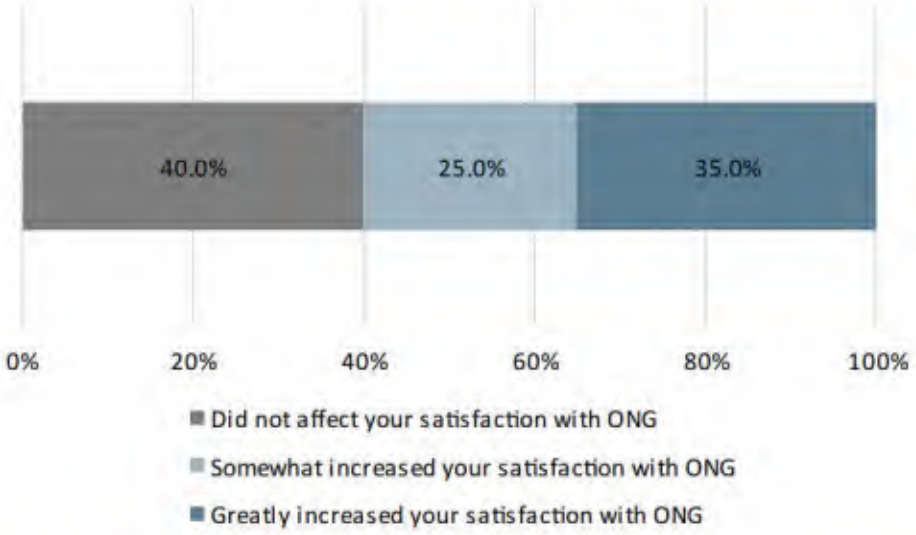



*Figure 4-7: Program Impact on Satisfaction with ONG (n=40)*




## 4.5 Conclusions and Recommendations

This section presents conclusions and recommendations for the Range Program.

### 4.5.1 Conclusions

- Thirty percent of participants found out about the rebate program through an ONG employee or event.
- Fifty seven percent of survey respondents reported that they planned to replace the range.

- The majority of survey respondents were somewhat or greatly satisfied with ONG as their natural gas service provider, the program overall, and the performance of the new equipment.

### 4.5.2 Recommendations

- Expand Outreach and Awareness: Increase efforts to raise awareness of the program and its benefits, particularly targeting apartment complexes and property owners who may benefit from expanded offerings.
- Focus on Low-Income and High-Impact Audiences: Provide tailored support for low to moderate income households, who comprise a notable portion of respondents (8%).
- Sustain High-Performing Elements: Continue to emphasize the ease of submitting the application and the program's ability to address immediate participant needs, as these aspects are core strengths. Share respondent testimonials to build trust and encourage wider adoption by non-participants.

# 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.

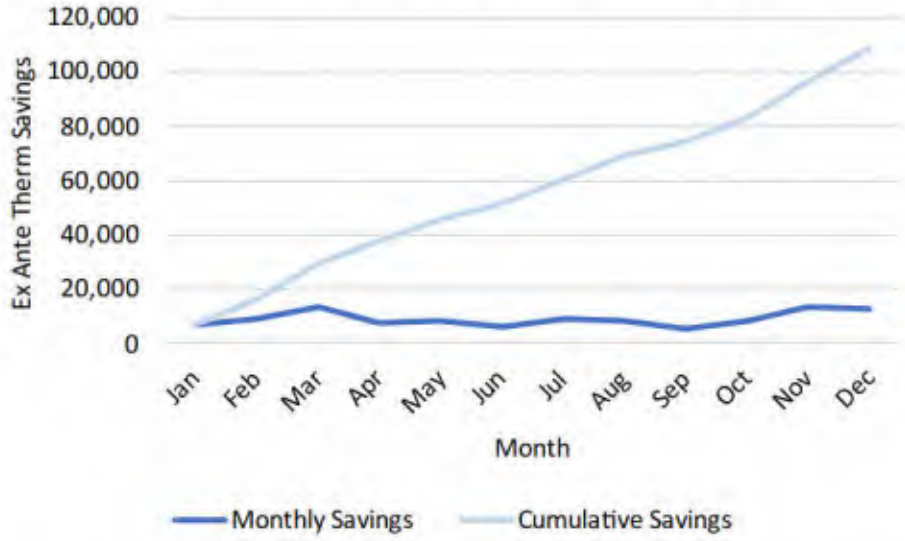
*Table 5-2 Ex-Ante Therm Savings of Water Heater Program by Stratum*

| *Equipment Type* | *Number of Water Heaters* | *Ex-Ante Therm Savings per unit* | *Ex-Ante Therm Savings* |
|---|---|---|---|
| Condensing Water Heater | 5 | 42 | 209 |
| Electric to Gas Water Heater | 57 | 166 | 9,487 |
| Tankless Water Heater | 1,901 | 45 | 85,431 |
| Electric to Gas Tankless Water Heater | 84 | 166 | 13,981 |
| **Total** | **2,047** | **53.3** | **109,108** |

## 5.2 Program Trends in PY2024

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:*

$\rho$ = *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:*

$\rho$ = *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 | 0.0% | 209 | 2,278 | 1088% |
| Electric to Gas Water Heater | 100.0% | 9,487 | 10,083 | 106% |
| Tankless Water Heater | 5.7% | 85,431 | 72,000 | 84% |
| Electric to Gas Tankless Water Heater | 100.0% | 13,981 | 25,539 | 183% |
| **Total** | | **109,108** | **109,900** | **101%** |

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 | 31% |
| Electric to Gas Water Heater | 31% |
| Tankless Water Heater | 31% |
| Electric to Gas Tankless Water Heater | 31% |

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 | 2,278 | 701 | 1,577 | 69% |
| Electric to Gas Water Heater | 10,083 | 3,104 | 6,979 | 69% |
| Tankless Water Heater | 72,000 | 22,166 | 49,835 | 69% |
| Electric to Gas Tankless Water Heater | 25,539 | 7,862 | 17,677 | 69% |
| **Total** | **109,900** | **33,833** | **76,066** | **69%** |

## 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 42 participants in the Water Heater 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. Most respondents own a single family home, built between 1980 and 2020. Most households have more than one resident aged 35 and older, and most respondents stated they are married. Most respondents are white/Caucasian, have some college education, or have completed an associate or bachelor's degree.

*Table 5-6: Respondents' Demographics (n=42)*

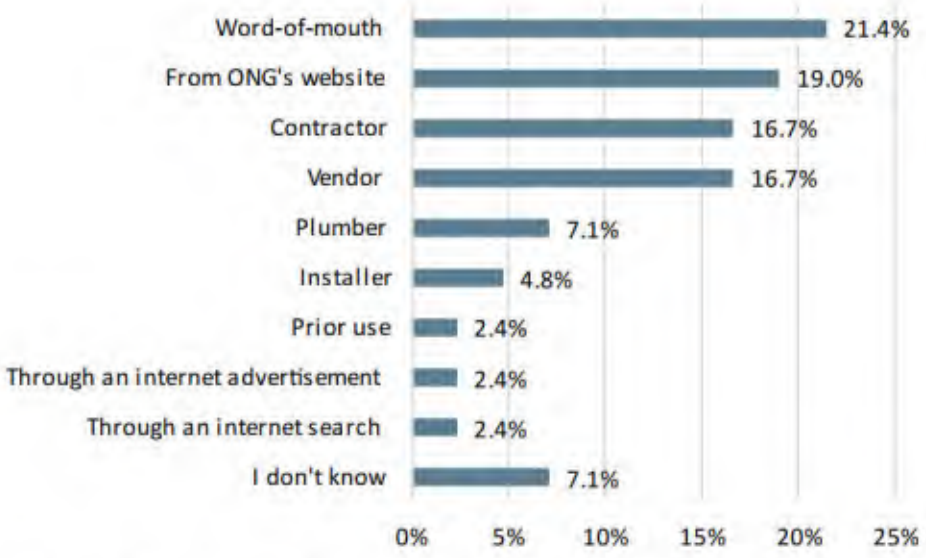
| | % | n |
|---|---|---|
| **Homeownership** | | |
| Own | 100.0% | 42 |
| Rent | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| **Housing type** | | |
| Single-family home | 97.6% | 41 |
| Duplex, triplex, townhome, condo | 2.4% | 1 |
| Prefer not to answer | 0.0% | 0 |
| **Home age** | | |
| Before 1950 | 7.1% | 3 |
| 1950 to 1959 | 11.9% | 5 |
| 1960 to 1969 | 2.4% | 1 |
| 1970 to 1979 | 2.4% | 1 |
| 1980 to 1989 | 19.1% | 8 |
| 1990 to 1999 | 19.1% | 8 |
| 2000 to 2009 | 19.1% | 8 |
| 2010 to 2019 | 19.1% | 8 |
| After 2019 | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| **People in household** | | |
| 1 | 11.9% | 5 |
| 2 | 31.0% | 13 |
| 3 | 19.1% | 8 |
| 4 | 23.8% | 10 |
| 5 | 7.1% | 3 |
| 6 + | 4.8% | 2 |
| Prefer not to answer | 2.4% | 1 |
| **Age (years)** | | |
| 25-34 | 0.0% | 0 |
| 35-49 | 52.4% | 22 |
| 50-64 | 16.7% | 7 |
| 65 or over | 26.2% | 11 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 4.8% | 2 |
| **Household status** | | |
| Single, no children | 11.9% | 5 |
| Single, with children | 4.8% | 2 |
| Married, no children | 28.6% | 12 |
| Married, with children at home | 50.0% | 21 |
| Prefer not to answer | 4.8% | 2 |
| **Household income** | | |
| Less than $20,000 | 0.0% | 0 |

| | % | n |
|---|---|---|
| $20,000 to less than $40,000 | 0.0% | 0 |
| $40,000 to less than $60,000 | 2.4% | 1 |
| $60,000 to less than $80,000 | 4.8% | 2 |
| $80,000 to less than $100,000 | 11.9% | 5 |
| $100,000 to less than $150,000 | 14.3% | 6 |
| $150,000 to less than $200,000 | 9.5% | 4 |
| $200,000 or more | 11.9% | 5 |
| I don't know | 2.4% | 1 |
| Prefer not to answer | 42.9% | 18 |
| Race/Ethnicity | | |
| White/Caucasian | 88.1% | 37 |
| Hispanic/Latino | 0.0% | 0 |
| Black/African American | 0.0% | 0 |
| Asian/Pacific Islander | 0.0% | 0 |
| Mixed Race | 0.0% | 0 |
| Native American | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to say | 11.9% | 5 |
| Education level | | |
| Up to 8th grade | 0.0% | 0 |
| Some high school | 0.0% | 0 |
| High school or GED equivalent | 7.1% | 3 |
| Some college | 11.9% | 5 |
| e's d | 9.5% | 4 |
| Ba ' de | 42.9% | 18 |
| r's d | 11.9% | 5 |
| Professional degree | 2.4% | 1 |
| Doctorate | 4.8% | 2 |
| Prefer not to answer | 9.5% | 4 |

*5.4.1.2 Program Awareness and Participation*

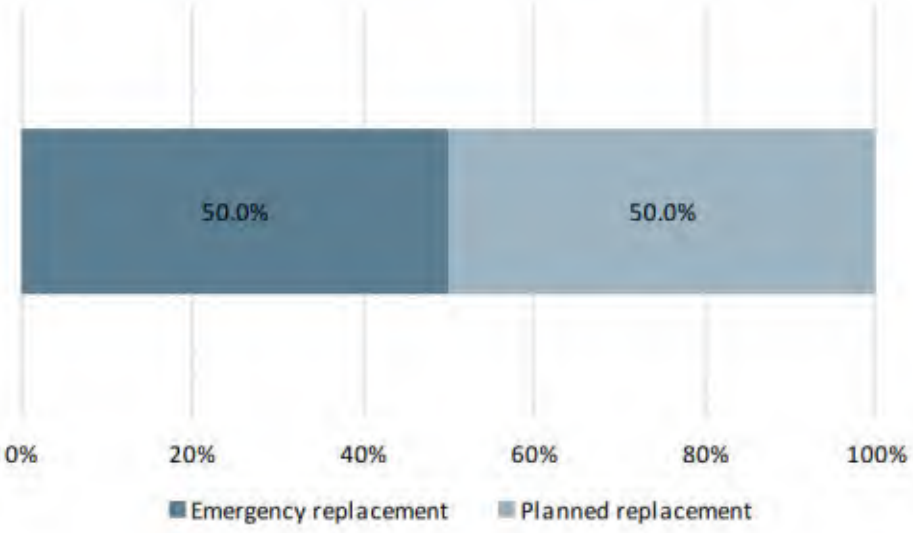
**Respondents learned about the water heater rebate program a variety of ways, most notably through word-of-mouth and ONG's website** (Figure 5-2). More than three quarters of participants (78.6%) had never participated in an ONG program prior to the water heater rebate program.

*Figure 5-2: Program Awareness (n=42)*




**Respondents were evenly split on whether they had planned to replace their water heater, or it was an emergency purchase.** Greater than half of respondents replaced a working water heater (57.1%). Old water heaters ranged from two to 21 years.

*Figure 5-3: Replacement Type (n=42)*

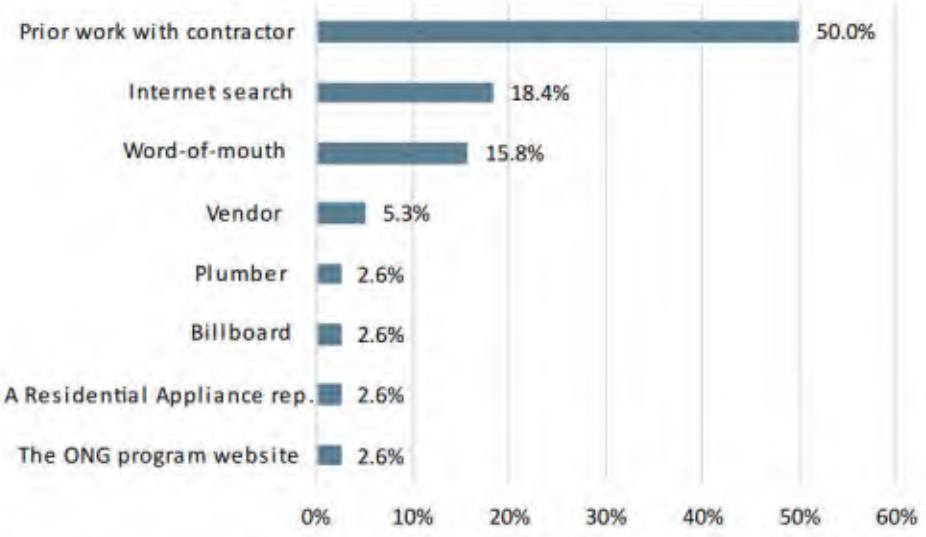



Three quarters of participants (78.6%) had an old water heater that used gas and the remainder reported having an old electric water heater. Many respondents had planned to install a new water heater prior to learning about the residential appliance program (83.3%) and stated they would have been financially able to purchase the new water heater even if the rebate was not available (80.1%).

*5.4.1.3 Experience with Contractor*

**Most respondents hired a contractor to install their water heater** (90.5%). Respondents most commonly found their contractor from working with them previously or an internet search (Figure 5-4).

*Figure 5-4: Contractor Awareness (n=38)*




**Respondents were overall satisfied with their contractor** (Figure 5-5). Contractors and customers both highly valued the energy efficiency of the water heaters, the warranty and reliability of the product and that it did not run out of hot water.

*Figure 5-5: Satisfaction with Contractor (n=38)*

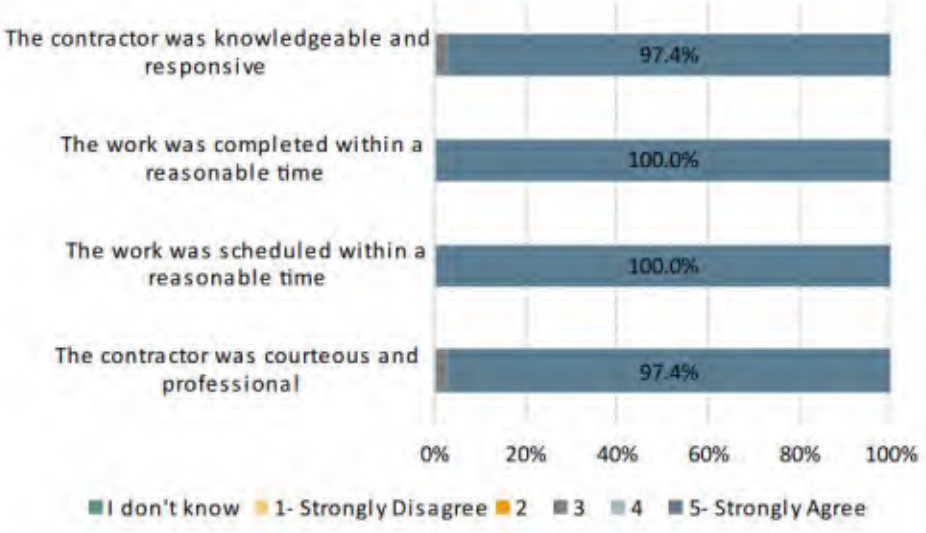
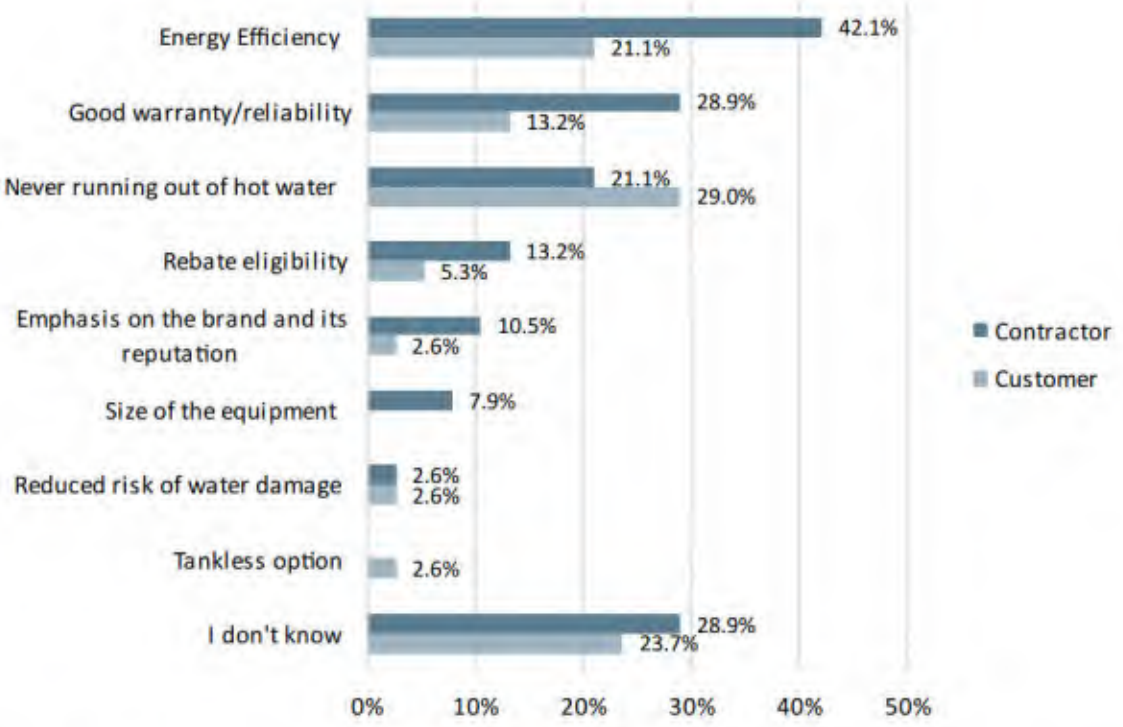


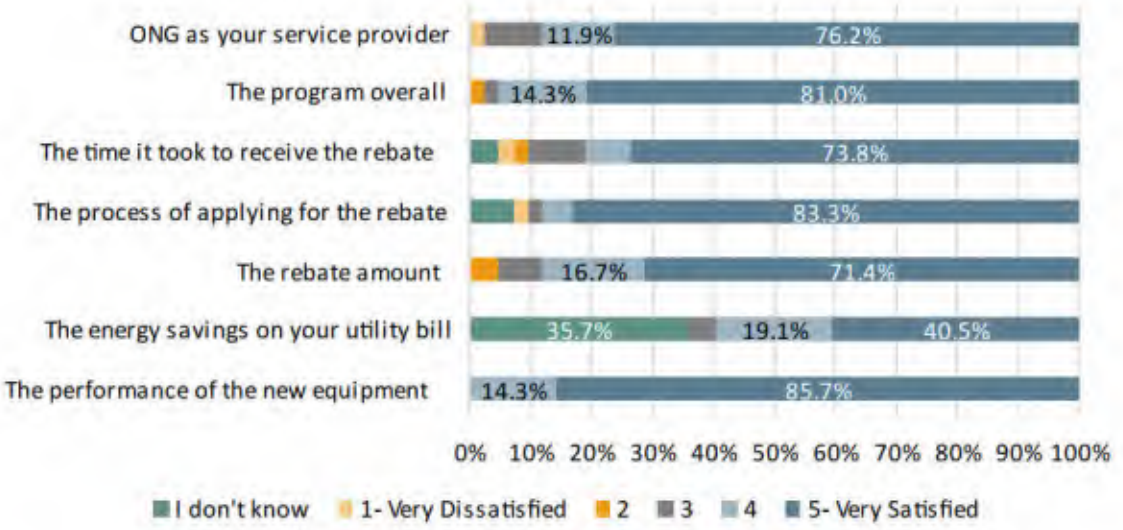
*Figure 5-6: Satisfaction with Contractor (n=38)*




### 5.4.1.4 Program Satisfaction

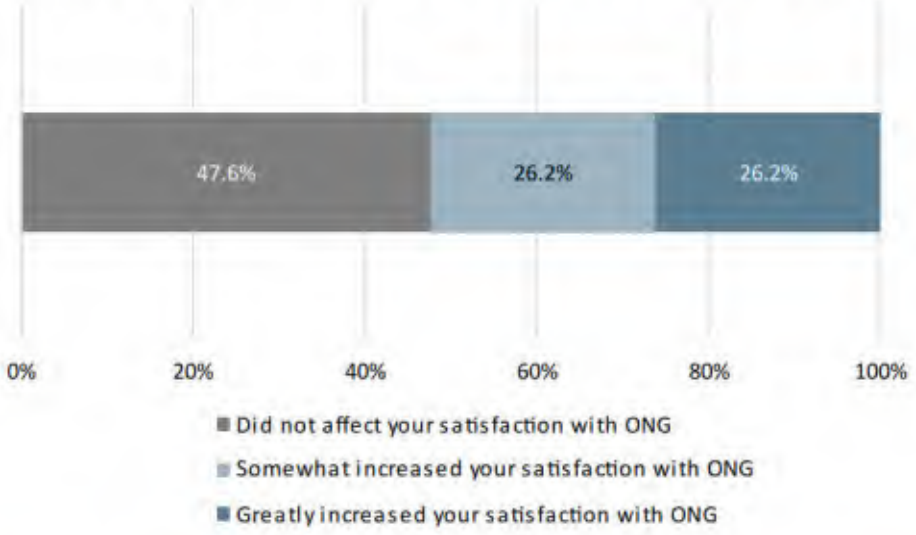
**Respondents were overall satisfied with the program** (Figure 5-7). Four participants expressed some dissatisfaction; two of the participants mentioned that it took a long time to get the rebate, and two other participants thought that the rebate amount seemed too low.

*Figure 5-7 Program Satisfaction (n=42)*



**More than half of respondents indicated that participation in the program positively impacted their satisfaction with ONG as their service provider (52.4%)** (Figure 5-8). Most respondents noted they were very or extremely likely to participate in another ONG program in the future (92.9%).

*Figure 5-8: Program Impact on Satisfaction with ONG (n=42)*




## 5.5 Conclusions and Recommendations

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

### 5.5.1 Conclusions

- Twenty-one percent of program participants who completed the survey learned of the Water Heater program through word-of-mouth.
- Fifty percent of survey respondents indicated they were planning to replace their water heater.
- Most survey respondents reported being satisfied with program overall, equipment performance, and ONG as their natural gas service provider.

### 5.5.2 Recommendations

- Expand Outreach and Awareness: Increase efforts to raise awareness of the program and its benefits, particularly targeting apartment complexes and property owners who may benefit from expanded offerings.
- Sustain High-Performing Elements: Continue to emphasize the ease of submitting the application and the program's ability to address immediate participant needs, as these aspects are core strengths. Share respondent testimonials to build trust and encourage wider adoption by non-participants
-

# 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 |
| Heat Pump to Natural Gas Furnace w/ AFUE ≥.95 | $2,500 |

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 | 36 | 110 | 3,967 |
| Evaluated in New Home | 2,335 | 66 | 154,063 |
| New Construction | 1,156 | 66 | 76,273 |
| Residential | 2,398 | 115 | 275,015 |
| **Total** | **5,925** | **86.0** | **509,318** |

## 6.2 Program Trends in PY2024

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 | Furnace | 8% | 92% |
| Evaluated in ONG New Home | Furnace | 0% | 100% |
| New Construction | Furnace | 0% | 100% |
| Residential | Furnace | 9% | 91% |

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 | 36 |
| Evaluated in ONG New Home | NA | 2,335 |
| New Construction | 2000 - Present | 1,155 |
| Residential | Pre-1970 - 1979 | 16 |
| Residential | 1980 - 1989 | 5 |
| Residential | 1990 - 1999 | 1 |
| Residential | 2000 - Present | 17 |

### *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:*

$\frac{therms}{\frac{site\ area}{yr}}$ *=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.

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

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

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

*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*

$\text{EFLHh}$ = *based on weather using zip code lookup*

HSPFbase = *6.8* ($\frac{\text{Btu}}{\text{W-hr}}$) *ASHP early replacement (baseline before 2006), 7.7* ($\frac{\text{Btu}}{\text{W-hr}}$) *ASHP early replacement (baseline after 2006), 8.2* ($\frac{\text{Btu}}{\text{W-hr}}$) *ASHP replace on burnout, 3.41* ($\frac{\text{Btu}}{\text{W-hr}}$) *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 | 3,967 | 8,941 | 225% |
| Evaluated in New Home | 154,063 | 0 | 0% |
| New Construction | 76,273 | 80,964 | 106% |
| Residential | 275,015 | 887,539 | 323% |
| **Total** | **509,318** | **977,443** | **192%** |

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 | 32% |
| Electric to Gas 95+ Heater | 32% |
| Electric to Gas Heater | 32% |

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 | 595,851 | 192,200 | 403,651 | 68% |
| Electric to Gas 95+ Heater | 302,237 | 97,491 | 204,746 | 68% |
| Electric to Gas Heater | 79,355 | 25,597 | 53,758 | 68% |
| **Total** | **977,443** | **315,288** | **662,155** | **68%** |

## 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 39 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. Most respondents own a single family home, built between 1970 and 2020. Most households have more than one resident aged 35 and older, and most respondents stated they are married. Most

respondents are white/Caucasian, have some college education, or have completed an associate, bachelor, or master's degree.

*Table 6-8: Respondents' Demographics (n=39)*

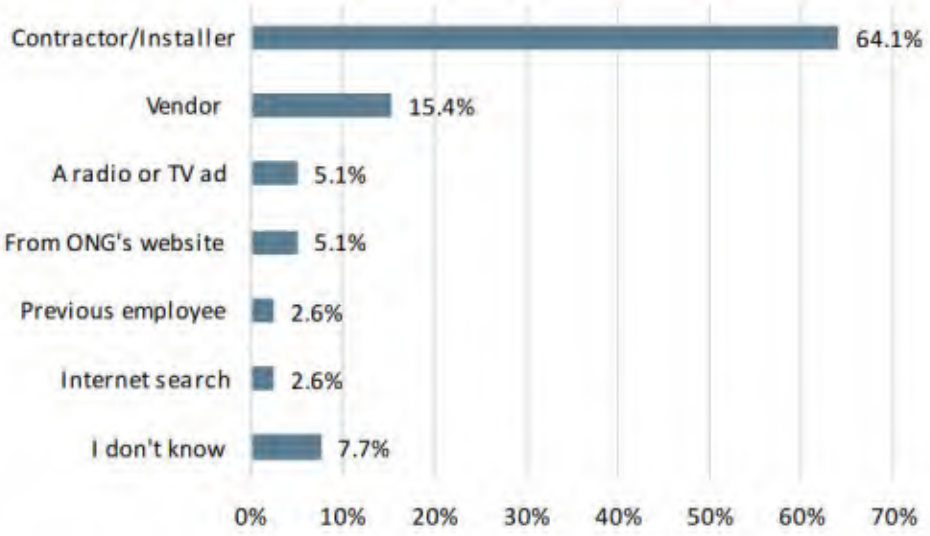
| | % | n |
|---|---|---|
| Homeownership | | |
| Own | 100.0% | 39 |
| Rent | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| Housing type | | |
| Single-family home | 100.0% | 39 |
| Duplex, triplex, townhome, condo | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| Home age | | |
| Before 1950 | 7.7% | 3 |
| 1950 to 1959 | 10.3% | 4 |
| 1960 to 1969 | 2.6% | 1 |
| 1970 to 1979 | 15.4% | 6 |
| 1980 to 1989 | 15.4% | 6 |
| 1990 to 1999 | 5.1% | 2 |
| 2000 to 2009 | 23.1% | 9 |
| 2010 to 2019 | 15.4% | 6 |
| After 2019 | 5.1% | 2 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 0.0% | 0 |
| People in household | | |
| 1 | 18.0% | 7 |
| 2 | 43.6% | 17 |
| 3 | 15.4% | 6 |
| 4 | 5.1% | 2 |
| 5 | 7.7% | 3 |
| 6 + | 2.6% | 1 |
| Prefer not to answer | 7.7% | 3 |
| Age (years) | | |
| 25-34 | 0.0% | 0 |
| 35-49 | 33.3% | 13 |
| 50-64 | 28.2% | 11 |
| 65 or over | 28.2% | 11 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 10.3% | 4 |
| Household status | | |
| Single, no children | 15.4% | 6 |
| Single, with children | 5.1% | 2 |
| Married, no children | 43.6% | 17 |
| Married, with children at home | 25.6% | 10 |

| | % | n |
|---|---|---|
| Prefer not to answer | 10.3% | 4 |
| Household income | | |
| Less than $20,000 | 2.6% | 1 |
| $20,000 to less than $40,000 | 0.0% | 0 |
| $40,000 to less than $60,000 | 7.7% | 3 |
| $60,000 to less than $80,000 | 5.1% | 2 |
| $80,000 to less than $100,000 | 5.1% | 2 |
| $100,000 to less than $150,000 | 10.3% | 4 |
| $150,000 to less than $200,000 | 5.1% | 2 |
| $200,000 or more | 23.1% | 9 |
| I don't know | 0.0% | 0 |
| Prefer not to answer | 41.0% | 16 |
| Race/Ethnicity | | |
| White/Caucasian | 87.2% | 34 |
| Hispanic/Latino | 0.0% | 0 |
| Black/African American | 2.6% | 1 |
| Asian/Pacific Islander | 0.0% | 0 |
| Mixed Race | 0.0% | 0 |
| Other | 0.0% | 0 |
| I don't know | 0.0% | 0 |
| Prefer not to say | 10.3% | 4 |
| Education level | | |
| Up to 8th grade | 0.0% | 0 |
| Some high school | 0.0% | 0 |
| High school or GED equivalent | 10.3% | 4 |
| Some college | 18.0% | 7 |
| e’s d | 2.6% | 1 |
| Ba ’ de | 30.8% | 12 |
| r’s d | 18.0% | 7 |
| Professional degree | 7.7% | 3 |
| Doctorate | 5.1% | 2 |
| Prefer not to answer | 7.7% | 3 |

#### *6.4.1.2 Program Awareness and Participation*

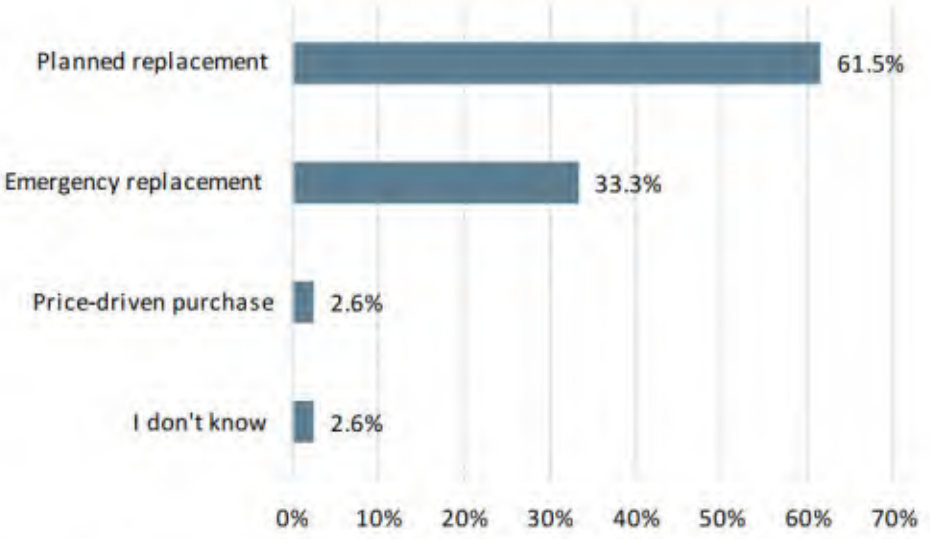
**Over half of respondents learned about the furnace rebate program through their contractor or the person who installed their furnace (64.1%)** (Figure 6-2). Three quarters of respondents had never participated in an ONG program prior to the furnace rebate program (74.4%).

*Figure 6-2: Program Awareness (n=39)*



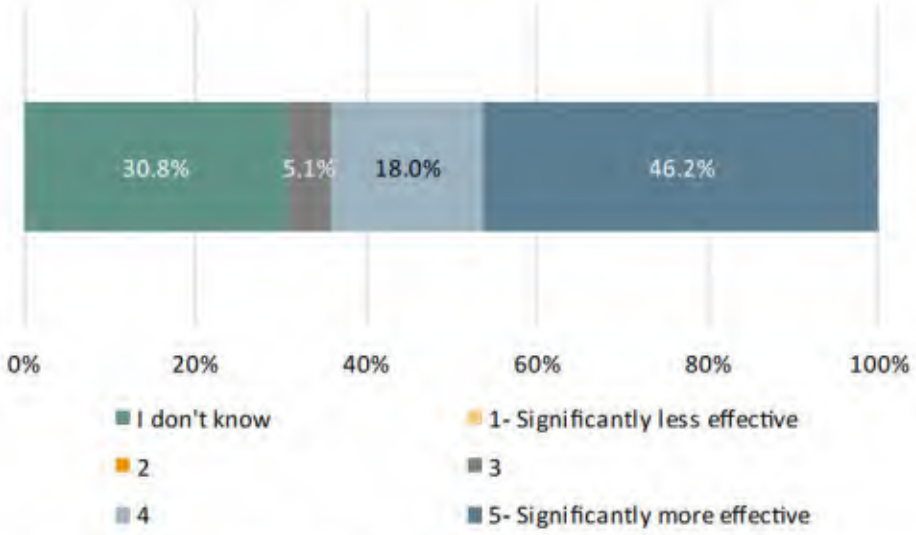

**Over half of respondents planned to replace their furnace (61.5%)** (Figure 6-3). More than sixty % of respondents (61.5%) had a functioning furnace at the time of replacement. The age of the pre-existing furnaces ranged from nine to sixty years.

*Figure 6-3: Replacement Type (n=39)*




Sixty-four percent of respondents found their new furnace to be more effective at keeping their home comfortable than their old furnace (Figure 6-4).

Figure 6-4: Effectiveness of New Furnace (n=39)



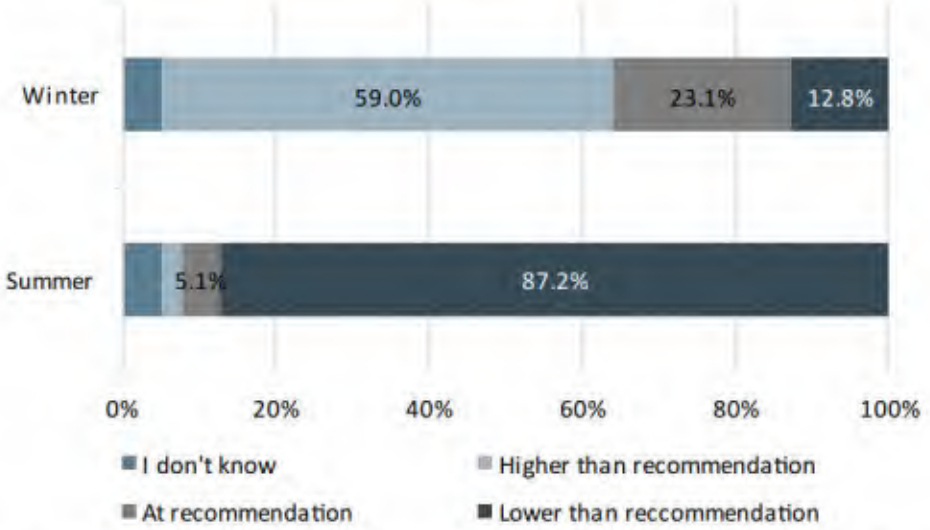

**Over half of respondents use a Wi-Fi connected smart thermostat with their new furnace and all smart thermostat users utilize their programming functions** (Table 6-9). Seventy percent of thermostats were installed while installing the furnace.

*Table 6-9: Thermostat Type (n=39)*

| Equipment Type | Total | | Use Thermostat Programming Functions | |
|---|---|---|---|---|
| | n | % | n | % |
| A Wi-Fi connected smart thermostat | 21 | 53.9% | 21 | 100.0% |
| A programmable thermostat | 11 | 28.2% | 3 | 27.3% |
| A standard, manual thermostat | 5 | 12.8% | x | x |
| I don't know | 2 | 5.1% | 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=39)*



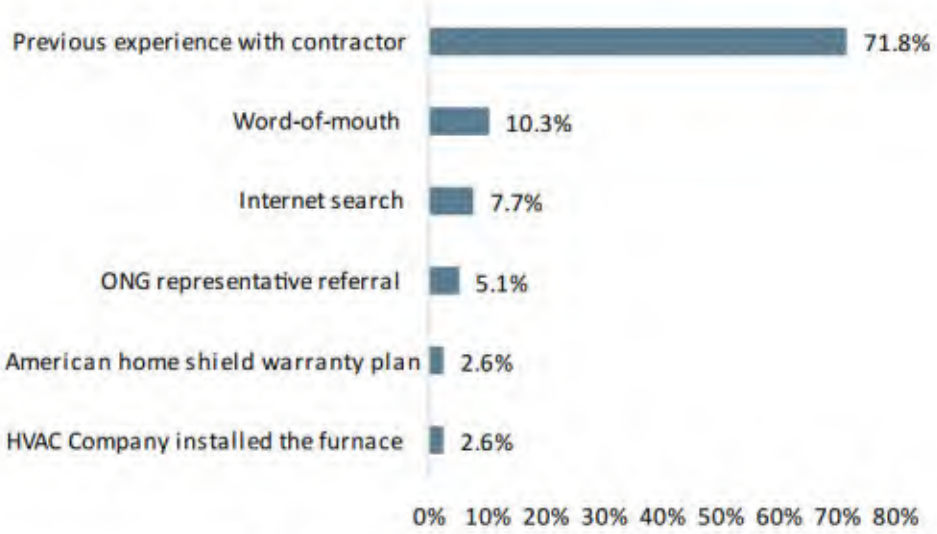

*More energy use than recommended represents thermostat set above 68 degrees in winter and below 78 degrees in summer
*Less energy use than recommended represents below 68 degrees in winter and above 78 degrees in summer

**Most respondents planned to install a new furnace before learning about the residential appliance program (84.6%).** 87.2% of respondents would have been financially able to purchase the new furnace and over half of respondents would have purchased and installed the same furnace if the rebate program was not available (61.5%).

#### *6.4.1.3 Experience with Contractor*

**All 39 respondents paid someone to install the new furnace.** Respondents mainly found their contractor from working with them previously (Figure 6-6).

*Figure 6-6: Contractor Awareness (n=39)*




**All respondents were satisfied with their contractor** (Figure 6-7). Contractors and customers differed on the characteristics of the new furnace that were most important.

*Figure 6-7: Satisfaction with Contractor (n=39)*

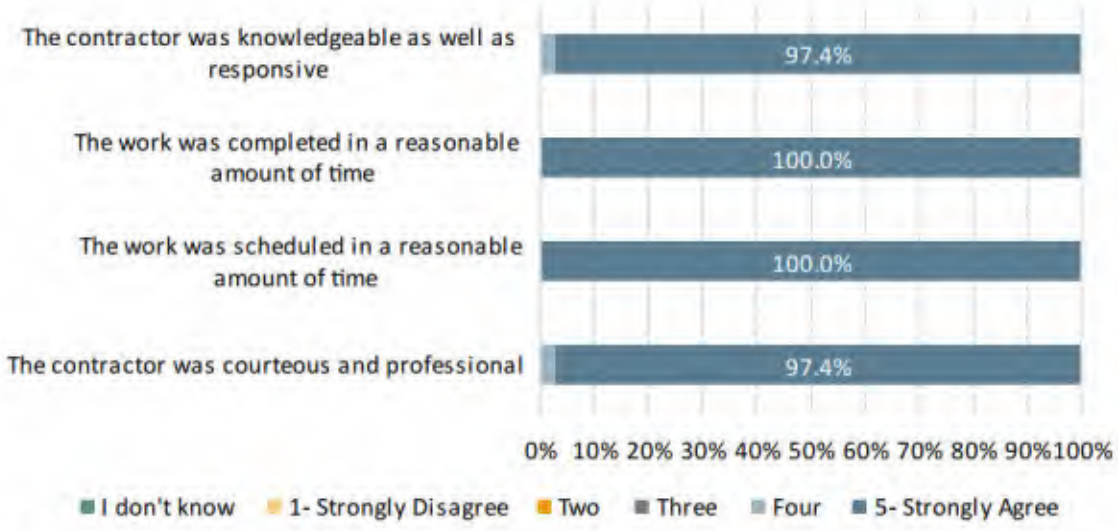



*Table 6-10: Characteristics Contractor Emphasized & Customers Valued (n=39)*

| | Contractors (%) | Customer (%) |
|---|---|---|
| Energy efficiency | 38.5% | 2.6% |
| Rebate eligibility | 17.9% | 2.6% |
| Good warranty/reliability | 15.4% | 2.6% |

| | Contractors (%) | Customer (%) |
|---|---|---|
| Emphasis on the brand reputation | 12.8% | 5.1% |
| Size of the equipment | 5.1% | 7.7% |
| Simple to use | 0.0% | 30.8% |
| I don't know | 56.4% | 46.2% |

#### *6.4.1.4 Program Satisfaction*

**Respondents were overall satisfied with the program** (Figure 6-8). Eight respondents indicated some dissatisfaction with the program. Four of the respondents mentioned that the application was confusing, while three mentioned that it took a long time to receive the rebate. Two mentioned they were dissatisfied with the cost of the furnace.

**Over half of participants stated that participating in the furnace rebate program increased their satisfaction with ONG** (Figure 6-9). All respondents mentioned they were likely to participate in another ONG program in the future.

*Figure 6-8 Program Satisfaction (n=39)*

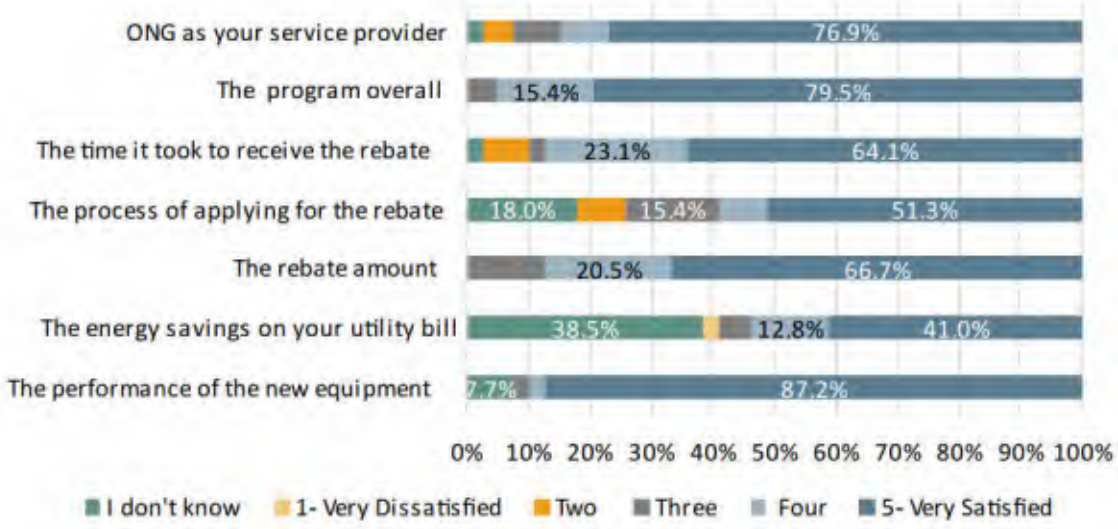
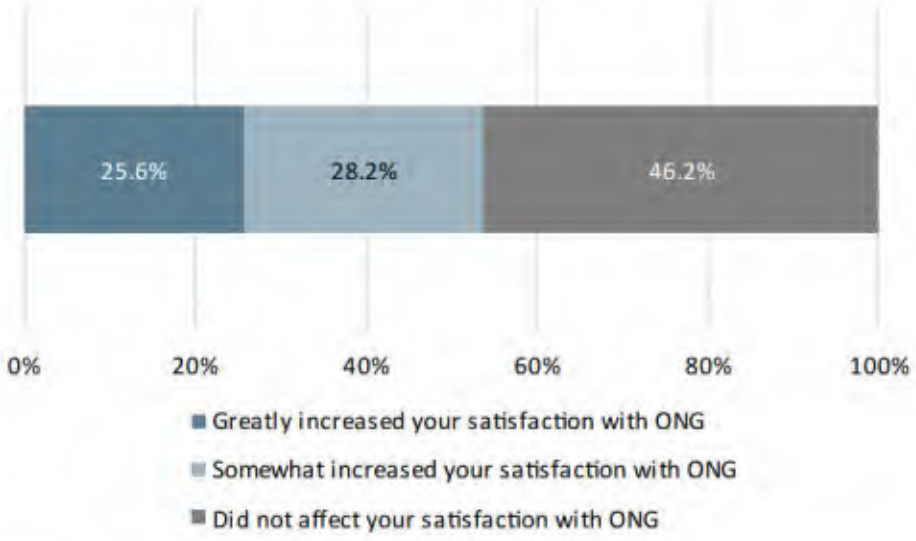


*Figure 6-9: Program Impact on Satisfaction with ONG (n=39)*




## 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.
- Thirty-three percent of surveyed program participants reported that the old heating system was broken when they replaced it.
- Participants were most satisfied with the rebate amount, ONG as their service provide, and the program overall.

### 6.5.2 Recommendations

- Expand Outreach and Awareness: Increase efforts to raise awareness of the program and its benefits, particularly targeting apartment complexes and property owners who may benefit from expanded offerings.
- Focus on Low-Income and High-Impact Audiences: Provide tailored support for low to moderate income households, who comprise a notable portion of respondents (8%).
- Sustain High-Performing Elements: Continue to emphasize the ease of submitting the application and the program's ability to address immediate participant needs, as these aspects are core strengths. Share respondent testimonials to build trust and encourage wider adoption by non-participants.

# 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 | 402 | 148,552 |
| PSO | 381 | 159,927 |
| **Total** | **783** | **308,478** |

## 7.2 Program Trends in PY2024

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 | 402 | 369.5 | 148,552 |
| PSO | 381 | 419.8 | 159,927 |
| **Total** | **783** | **789.3** | **308,478** |

### 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 | 43,726 | 47,776 | 109% |
| Attic Insulation | 16,040 | 17,526 | 109% |
| Duct Sealing | 88,785 | 96,205 | 108% |
| **Total** | **148,552** | **161,507** | **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 | 44,692 | 52,483 | 117% |
| Attic Insulation | 27,413 | 29,512 | 108% |
| Duct Sealing | 87,821 | 104,339 | 119% |
| **Total** | **159,927** | **186,334** | **117%** |

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 Low-Income Assistance 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 | 161,507 | 0% | 161,507 | 100% |
| PSO | 186,334 | 0% | 186,334 | 100% |
| **Total** | **347,841** | **0%** | **347,841** | **100%** |

## 7.4 Process Evaluation

No process evaluation was performed in PY2024 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 | 10,676 | 1.4 | 15,015 |
| Kitchen Aerator | 5,338 | 0.8 | 4,505 |
| Low-Flow Showerhead | 5,338 | 7.5 | 40,150 |
| **Total** | **21,352** | **2.8** | **59,669** |

## 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 | 50% |
| Kitchen Aerator | 60% |
| Low-Flow Showerhead | 71% |

Per-unit energy savings calculations are shown below:

Showerhead:

$$Annual\ Energy\ Savings = \frac{\rho \times C_P \times V \times (T_{Mixed} - T_{Supply}) \times (1/RE)}{\text{Conversion Factor}} \times \text{ISR} \times$$

%Water Heater fuel type x source to site ratio

$\rho$ = 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

$\rho$ = 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 | 15,015 | 31,181 | 208% |
| Kitchen Aerator | 4,505 | 11,316 | 251% |
| Low-Flow Showerhead | 40,150 | 63,394 | 158% |
| **Total** | **59,669** | **105,891** | **177%** |

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 | 5% |
| Kitchen Aerator | 5% |
| Low-Flow Showerhead | 9% |

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 | 31,181 | 1,435 | 29,746 | 95% |
| Kitchen Aerator | 11,316 | 543 | 10,773 | 95% |
| Low-Flow Showerhead | 63,394 | 5,441 | 57,952 | 91% |
| **Total** | **105,891** | **7,419** | **98,472** | **93%** |

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 | 3,060,256 | 140,828 | 2,919,428 | 95% |
| Kitchen Aerator | 2,221,219 | 106,566 | 2,114,653 | 95% |
| Low-Flow Showerhead | 12,443,456 | 1,068,090 | 11,375,366 | 91% |
| **Total** | **17,724,931** | **1,315,484** | **16,409,447** | **93%** |

## 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 4,587 customers who received a kit during 2024. Four hundred eighty two customers responded to and completed the survey; which is a 10.5% response rate.

#### *8.3.1.1 Demographics*

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

*Table 8-7: Demographics (n=486)*

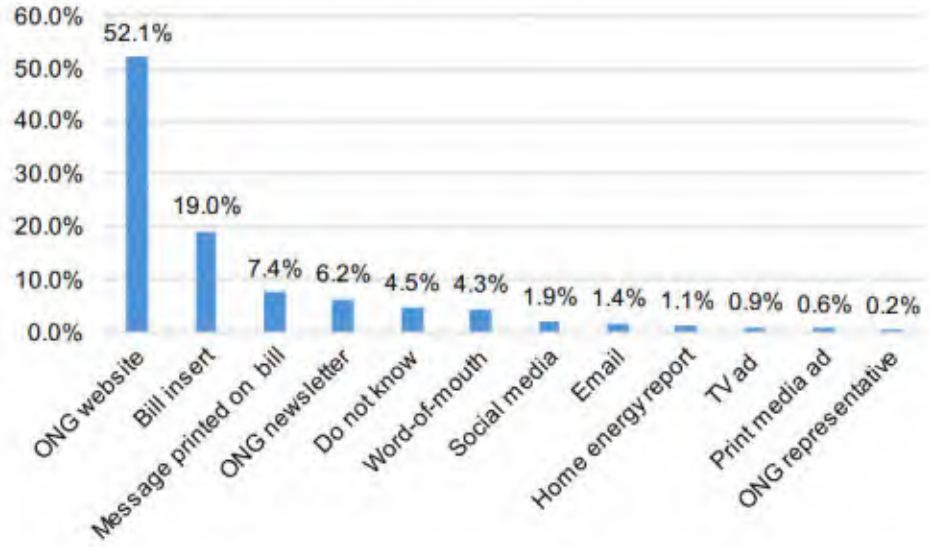
| Answer | % | Count |
|---|---|---|
| **Home ownership** | | |
| Rent | 36.8% | 172 |
| Own | 60.7% | 284 |
| Own but rent to someone else | 0.4% | 2 |
| Do not know | 0.4% | 2 |
| Prefer not to answer | 1.7% | 8 |
| **Home type** | | |
| Detached single-family home | 81.6% | 382 |
| Attached single-family home | 7.3% | 34 |
| Manufactured home | 4.7% | 22 |
| Apartment building | 3.0% | 14 |
| Do not know | 0.4% | 2 |
| Prefer not to answer | 3.0% | 14 |
| **Year Home Built** | | |
| Before 1950 | 10.7% | 50 |
| 1960 to 1969 | 14.1% | 66 |
| 1960 to 1969 | 12.8% | 60 |
| 1970 to 1979 | 14.3% | 67 |
| 1980 to 1989 | 12.8% | 60 |
| 1990 to 1999 | 6.6% | 31 |
| 2000 to 2009 | 8.3% | 39 |
| 2010 to 2016 | 4.1% | 19 |
| 2017 or later | 3.2% | 15 |
| Do not know | 12.6% | 59 |
| Prefer not to answer | 0.4% | 2 |
| **Water heating fuel** | | |
| Natural Gas | 85.9% | 402 |
| Electricity | 9.8% | 46 |
| Propane | 0.2% | 1 |
| Do not know | 3.4% | 16 |
| Prefer not to answer | 0.6% | 3 |
| **Household size** | | |
| 1 person | 18.6% | 87 |
| 2 people | 28.0% | 131 |
| 3 people | 20.3% | 95 |
| 4 people | 15.8% | 74 |
| 5 people | 9.6% | 45 |

| Answer | % | Count |
|---|---|---|
| 6 people or more | 6.0% | 28 |
| Do not know | 0.2% | 1 |
| Prefer not to answer | 1.5% | 7 |
| Annual household income | | |
| $0–$19,999 | 16.0% | 75 |
| $20,000–$49,999 | 35.2% | 165 |
| $50,000–$99,999 | 25.0% | 117 |
| $100,000–$199,999 | 6.0% | 28 |
| $200,000+ | 1.5% | 7 |
| Do not know | 2.1% | 10 |
| Prefer not to answer | 14.1% | 66 |
| Educational attainment | | |
| Did not graduate from high school | 3.8% | 18 |
| High school graduate | 25.6% | 120 |
| Some college or associate degree | 34.8% | 163 |
| Four-year college degree | 20.5% | 96 |
| Graduate or professional degree | 11.5% | 54 |
| Do not know | 0.2% | 1 |
| Prefer not to answer | 3.4% | 16 |

*8.3.1.2 Program participation*

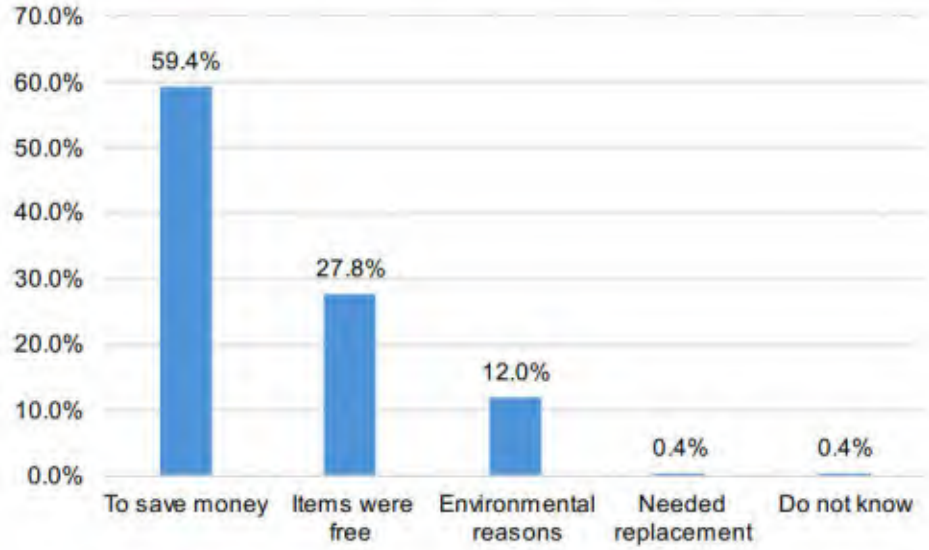
ONG's website is the primary source of program awareness, with over half of respondents (52.1%, n=244) citing it, followed by bill inserts (19.0%, n=89) and printed messages on bills (7.4%, n=36) (Figure 8-1).

*Figure 8-1: Program awareness (n=468)*




Respondents' motivations for requesting the water conservation kit reflect a blend of financial, practical, and environmental considerations, with cost savings emerging as the largest driver (Figure 8-2). The primary motivation was to save money, cited by 59.4% of respondents (n=278), followed by the appeal of the items being free, which motivated 27.8% (n=130). Environmental reasons were also a notable factor, influencing 12.0% of respondents

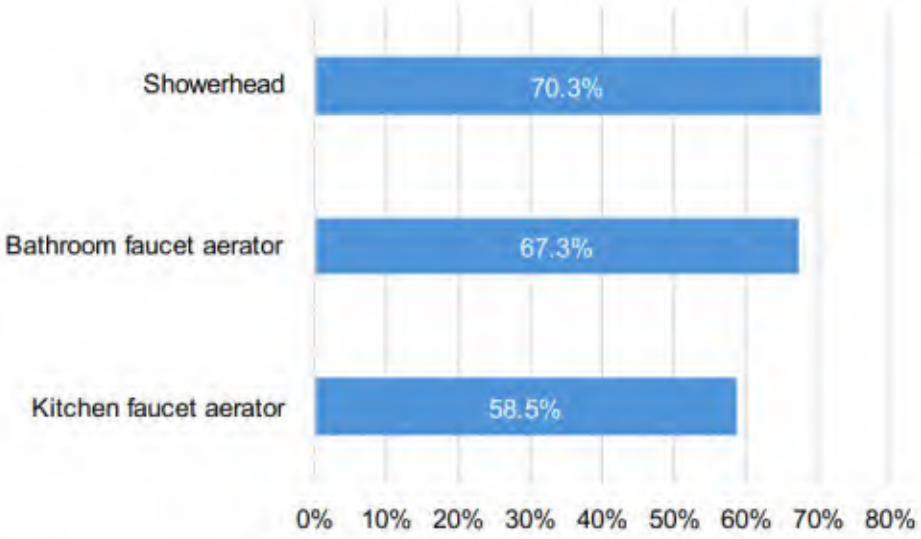
*Figure 8-2: Participation reasoning (n=468)*




The showerhead had the highest installation rate, with 70.3% (n=329) of respondents reporting it was installed. The bathroom faucet aerator followed at 67.3% (n=315) installation. The kitchen faucet aerator had the lowest installation rate at 58.5% (n=274),

highlighting it as a measure that may require additional attention to encourage adoption (Figure 8-3).

*Figure 8-3: Product installation (n=468)*




Barriers to installation highlight the importance of addressing compatibility issues and providing additional support for respondents. Across all three measures, compatibility concerns were the most cited reason for non-installation (n=158), particularly for the kitchen and bathroom faucet aerators. Secondary barriers varied, with "delayed due to personal reasons" (n=136) and "not needed" (n=131) being prominent reasons across all measures (Table 8-8).

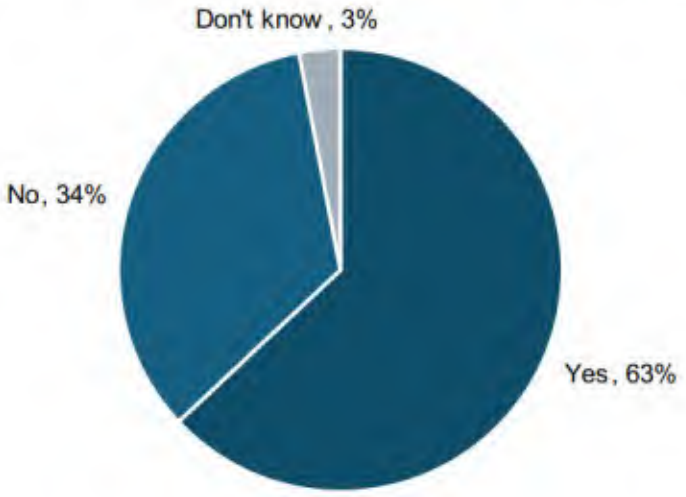
*Table 8-8: Reason for Non-installation*

| Response | Showerhead | Kitchen Aerator | Bathroom Aerator | Total |
|---|---|---|---|---|
| Compatibility issue | 12 | 73 | 73 | 158 |
| Delayed due to personal reasons | 37 | 45 | 54 | 136 |
| Not needed | 24 | 10 | 97 | 131 |
| Missing from kit | 2 | 20 | 31 | 53 |
| Disliked the equipment | 30 | 10 | 6 | 46 |
| Needed instructions or assistance | 18 | 12 | 13 | 43 |
| Lost or gave away equipment | 4 | 3 | 4 | 11 |
| Broken or malfunctioning equipment | 1 | 3 | 5 | 9 |
| Restricted by landlord | 3 | 3 | 2 | 8 |
| Unknown or unspecified | 1 | 2 | 14 | 17 |

*8.3.1.3 Other ONG Programs*

Additionally, most respondents (63.5%, n=297) were aware of ONG's other energy efficiency programs, though 33.8% (n=158) were unaware, and 2.8% (n=13) were unsure (Figure 8-4). While the overall level of awareness is strong, reaching the other one-third of respondents could help broaden program participation and maximize the impact of ONG's offerings on energy and cost savings.

*Figure 8-4: Awareness of other ONG Programs (n=468)*

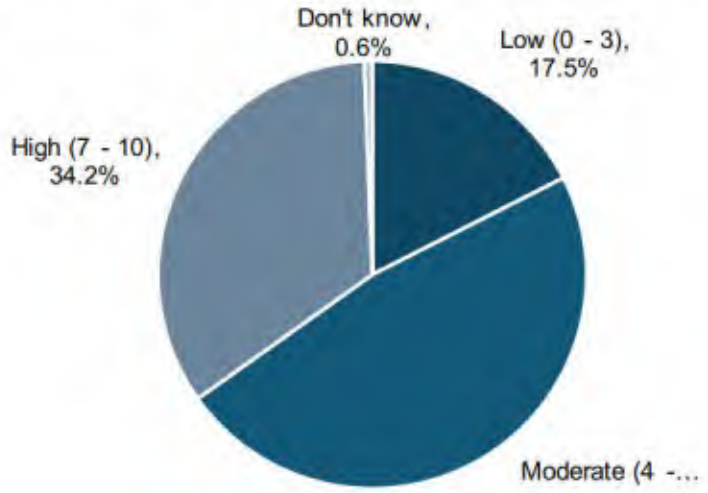



Overall, the findings highlight strong awareness of ONG programs among respondents, driven primarily by the website and supported by key offerings like appliance rebates. Enhancing communication strategies and promoting lesser-known programs could help broaden participation and increase the impact of energy efficiency initiatives.

*8.3.1.4 Energy Saving Behaviors*

Respondents rated their current household's efforts to save energy on a 10-point scale. 34.2% (n=160) respondents rated their efforts as "high" (7–10 on a 10-point scale), compared to 17.5% (n=82) who rated them as "low" (0–3), and 47.6% (n=223) as "moderate." These ratings align with the relatively low pre-program purchase rates, highlighting the program's role in enabling broader adoption of conservation measures (Figure 8-5).

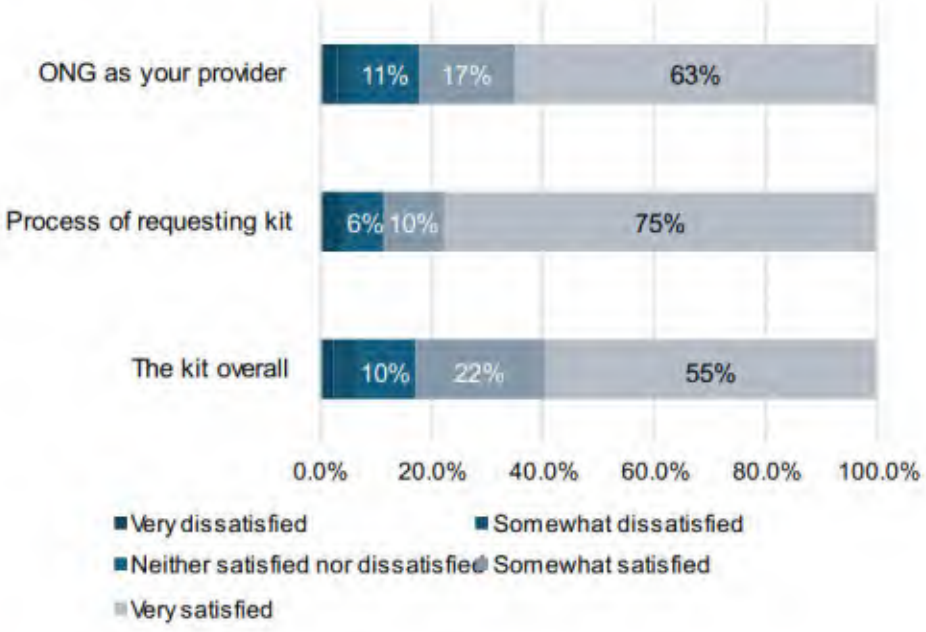
*Figure 8-5: Effort Made Towards Reducing Energy Usage (n=468)*




### *8.3.1.5 Program Satisfaction*

Respondents expressed high levels of satisfaction with the water conservation kit and its associated processes. Overall, 77.1% (n=361) were "somewhat satisfied" or "very satisfied" with the kit, while only 6.2% (n=29) reported dissatisfaction. Satisfaction with the process of requesting the kit was even higher, with 85.7% (n=401) expressing positive feedback and only 4.7% (n=22) dissatisfied. Regarding ONG as a service provider, 79.9% (n=374) were satisfied, suggesting a strong overall perception of the utility, with some room for improvement (Figure 8-6).

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



Among the 44 respondents who reported dissatisfaction, the primary reason was utility costs, cited by 40.9% (n=18). Other concerns included product quality (18.2%, n=8), compatibility issues (9.1%, n=4), and shipping time (6.8%, n=3) (Table 8-9).

*Table 8-9: Reason with Dissatisfaction (n=44)*

| Response | % | n |
|---|---|---|
| Utility costs | 40.9% | 18 |
| Product quality | 18.2% | 8 |
| Compatibility issue | 9.1% | 4 |
| Shipping time | 6.8% | 3 |
| Limited information in kit | 4.5% | 2 |
| Missing product | 4.5% | 2 |
| Weather disruption to service | 4.5% | 2 |
| Excess product | 2.3% | 1 |
| Unknown or unspecified | 9.1% | 4 |

## 8.4 Conclusions and Recommendations

### 8.4.1 Conclusions

- High Satisfaction Levels: Most respondents expressed satisfaction with the kit overall (77.1%, n=361) and the request process (85.7%, n=401). Satisfaction with ONG as a service provider was similarly high (79.9%, n=374), reflecting the program's positive influence on respondent perceptions.
- Barriers Addressed: The program reduced barriers to adoption by providing needed measures at no cost, addressing common challenges such as cost concerns and accessibility.
- Room for Improvement: While satisfaction rates were high, areas for improvement include product compatibility and outreach. Specific feedback highlighted compatibility issues with older fixtures (e.g., showerheads).

### 8.4.2 Recommendations

- Enhance Product Compatibility and Instructions: Address product compatibility issues by offering more versatile options for older homes (e.g., showerhead adapters). Include clearer instructions for installation to minimize usability challenges and ensure respondents can fully utilize the provided measures.
- Expand Outreach and Awareness: Increase efforts to raise awareness of the program and its benefits, as many respondents suggested improving outreach. Highlight rebates and additional programs, particularly targeting apartment complexes and renters (36.8%, n=172) who may benefit from expanded offerings.
- Focus on Low-Income and High-Impact Audiences: Provide tailored support for low-income households, who comprise a large portion of respondents (35.2%).
- Sustain High-Performing Elements: Continue to emphasize the ease of requesting the kit and the program's ability to address immediate needs, as these aspects are

core strengths. Share respondent testimonials to build trust and encourage wider adoption.

# 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* |
|---|---|
| Less than 2000 sq. ft. home w/ minimum three natural gas outlets, including natural gas space and water heating, and one other natural gas appliance. | $750 |
| Greater than or equal to 2000 sq. ft. 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* |
|---|---|---|
| **3,984** | **222.76** | **887,476** |

## 9.2 Program Trends in PY2024

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)* |
|---|---|---|---|---|
| **1,196,228** | **0.5** | **69** | **3,984** | **9.82%** |

### 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* |
|---|---|---|---|
| **69** | **887,476** | **1,196,228** | **135%** |

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 minimum code. 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 | 1,090 | 242,808 | 327,281 | 135% |
| Builder 2 | 677 | 150,809 | 203,275 | 135% |
| Builder 3 | 443 | 98,683 | 133,014 | 135% |
| Builder 4 | 299 | 66,605 | 89,777 | 135% |
| Builder 5 | 251 | 55,913 | 75,365 | 135% |
| Builder 6 | 228 | 50,789 | 68,459 | 135% |
| Builder 7 | 167 | 37,201 | 50,143 | 135% |
| Builder 8 | 154 | 34,305 | 46,240 | 135% |
| Builder 9 | 124 | 27,622 | 37,232 | 135% |
| Builder 10 | 90 | 20,048 | 27,023 | 135% |
| **Program Total** | **3,984** | **887,476** | **1,196,228** | **135%** |

### 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 | 6% |

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* |
|---|---|---|---|
| **1,196,228** | **75,435** | **1,120,793** | **94%** |

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. Each participant was contacted three times via phone inviting them to take the survey; participants who provided email addresses were emailed a survey link. Eight participants responded to the survey with a response rate of 8.3%.

#### *9.4.1.1 Program Participation*

Respondents first learned about the program through an ONG staff member, equipment vendor, home building assistant, the ONG website, and a HERS rater (Table 9-9).

*Table 9-9: Program Awareness (n=8)*

| Source | n |
|---|---|
| ONG staff member | 3 |
| Equipment vendor/contractor | 1 |
| Home building assistant | 1 |
| ONG website | 1 |
| HERs rater | 1 |
| Don't know | 1 |

Four of the eight respondents noted that they received some support from ONG since engaging with the New Homes Program (Table 9-10). Two respondents received the various services in 2024, while the remaining respondents did not recall when they received the various services.

*Table 9-10 Support or Services Received Since Program Enrollment (n=8)*

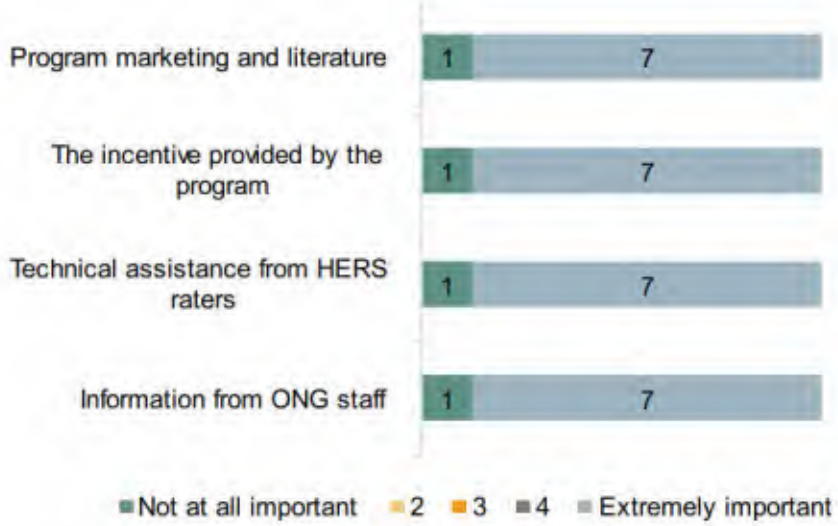
| | n |
|---|---|
| Technical training or assistance on new construction design and energy efficiency | 2 |
| Marketing support | 2 |
| Don't know | 4 |

#### *9.4.1.2 Building Practices*

All respondents noted that the homes they work with are designed and built before becoming available to buyers (n=8). Over half of respondents indicated that buyers are interested in reducing energy costs when looking into energy efficient construction (n=5). Three quarters of respondents stated that their company performs duct leakage testing on all their homes (n=6), while over half stated that their company performs infiltration testing (n=5). Over half also stated that their company utilized a HERS rater in ONG's service territory prior to enrolling in the program (n=5). Many factors were important when companies were deciding to build energy efficient homes, including marketing, incentives, technical assistance, and information from ONG staff (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. Additionally, respondents

explained that customers are interested in energy efficient homes to reduce energy costs and increase home quality.

*Figure 9-2: Program Aspects Most Important in Decision to Build Homes to a Higher Efficiency Standard Than is Required (n=8)*




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

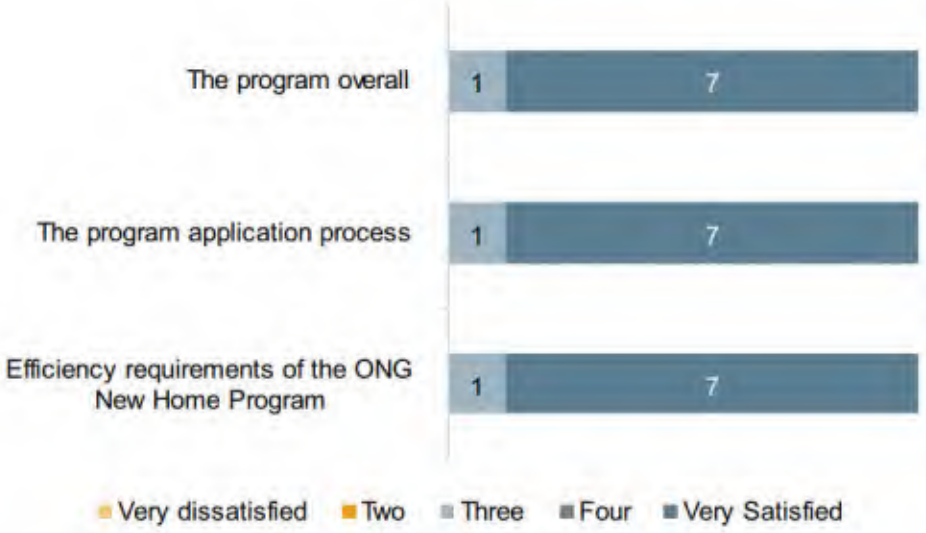
*9.4.1.3 Program Satisfaction*

Half of respondents stated that they participated in the EPA's "Energy Star New Homes" program (n=4). Two respondents received technical training on new construction design and energy efficiency and another two received marketing support as part of the ONG New Home program.

Most respondents believed there were no barriers to ONG's New Home Program that would discourage builders from participating in it (n=7). Most respondents also planned to participate in the next available New Home program (n=7).

Respondents were overall very satisfied with all aspects of the program, including the program overall, the program application process, and the energy efficiency requirements of the ONG New Home program (Figure 9-3).

*Figure 9-3 Program Satisfaction (n=varies)*




## 9.5 Conclusions and Recommendations

### 9.5.1 Conclusions

- Program participation has positively impacted respondents' building practices and sales.
- Respondents are satisfied with the New Home Program overall.

### 9.5.2 Recommendations

- Sustain High-Performing Elements: Continue to emphasize the ease of participating in the New Home Program as well as the high level of responsiveness by program staff, to build trust and encourage wider adoption by non-participating builders.

# 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 | 53 | 262,684 |
| Direct Install | 96 | 1,453,411 |
| SEM | 60 | 97,231 |
| **Total** | **209** | **1,813,325** |

## 10.2 Program Trends in PY2024

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*

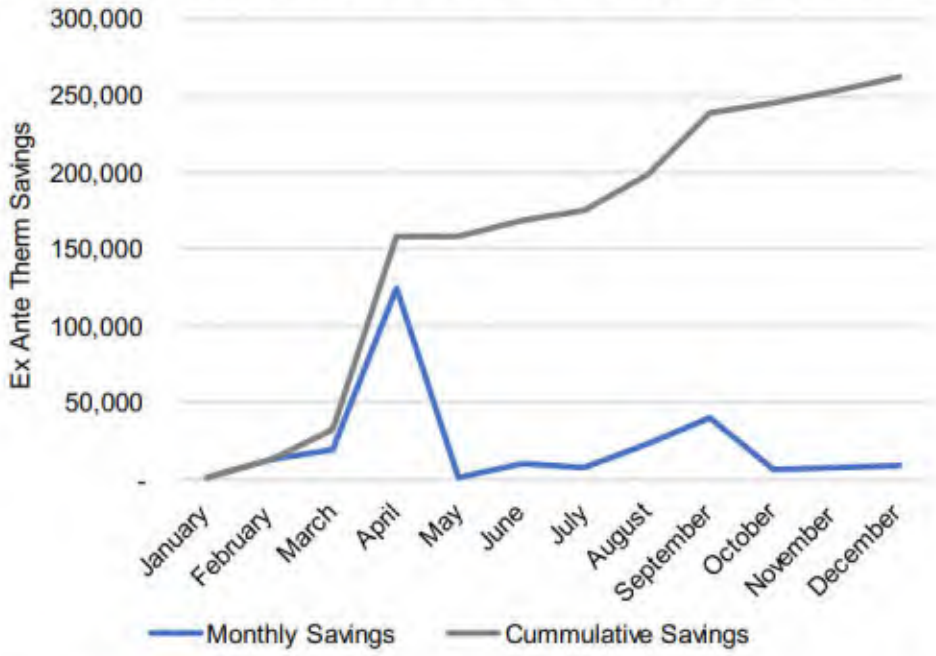
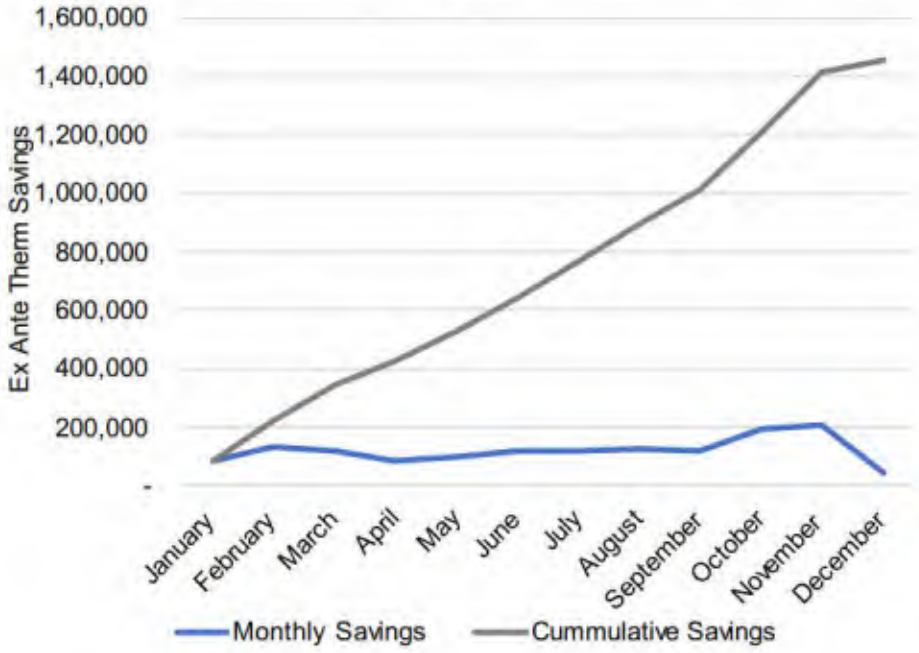



Figure 10-2 plots the Direct Install component ex-ante therm savings by project completion month.

*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 8.45%.

The sample selection is from the population of projects with completion dates during PY2024. 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) | <1,000 | 1,000 - 2,999 | 3,000- 9,999 | 10,000 - 39,999 | 40,000 ≥ | Census | |
| Population Size | 29 | 11 | 6 | 6 | 1 | 60 | |
| Total Therm savings | 17,814 | 20,631 | 33,298 | 145,162 | 45,779 | 97,231 | **359,915** |
| Average Therm Savings | 614 | 1,876 | 5,550 | 5,550 | 45,779 | 1,621 | **13,272** |
| Standard deviation of Therm savings | 310 | 468 | 1,640 | 9,626 | 0 | 1,549 | |
| Coefficient of variation | 0.50 | 0.25 | 0.30 | 0.40 | 0.00 | 0.96 | |
| Final design sample | 3 | 2 | 4 | 2 | 1 | 60 | **72** |

*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 - 14,999 | 15,000 - 29,999 | 30,000 - 49,999 | 50,000 ≥ | |
| Population Size | 21 | 45 | 17 | 8 | 5 | **96** |
| Total Therm savings | 36,468 | 457,051 | 328,563 | 325,382 | 305,948 | **1,453,411** |
| Average Therm Savings | 1,737 | 10,157 | 19,327 | 40,673 | 61,190 | **26,617** |
| Standard deviation of Therm savings | 1,756 | 2,988 | 3,721 | 6,081 | 4,868 | |
| Coefficient of variation | 1.01 | 0.29 | 2.00 | 0.15 | 0.08 | |
| Final design sample | 2 | 4 | 2 | 2 | 2 | **12** |

The Custom component stratified sample shown in Table 10-4 resulted in samples encompassing 55% 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 | 97,231 | 97,231 | 100% |
| Custom 5 | 45,779 | 45,779 | 100% |
| Custom 4 | 45,207 | 145,162 | 31% |
| Custom 3 | 3,337 | 33,298 | 10% |
| Custom 2 | 3,337 | 20,631 | 16% |
| Custom 1 | 2,002 | 17,814 | 11% |
| **Total** | **196,894** | **359,915** | **55%** |

The Direct Install component stratified sample shown in Table 10-5 resulted in samples totaling 19% 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 | 118,768 | 305,948 | 39% |
| DI 4 | 75,309 | 325,382 | 23% |
| DI 3 | 35,326 | 328,563 | 11% |
| DI 2 | 44,119 | 457,051 | 10% |
| DI 1 | 5,608 | 36,468 | 15% |
| **Total** | **279,130** | **1,453,411** | **19%** |

#### *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 | 97,231 | 97,231 | 100% |
| Custom 5 | 45,779 | 45,779 | 100% |
| Custom 4 | 145,162 | 145,162 | 100% |
| Custom 3 | 33,298 | 28,506 | 86% |
| Custom 2 | 20,631 | 20,631 | 100% |
| Custom 1 | 17,814 | 17,814 | 100% |
| **Total** | **359,915** | **355,123** | **99%** |

*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 | 305,948 | 305,982 | 100% |
| DI 4 | 325,382 | 325,406 | 100% |
| DI 3 | 328,563 | 328,556 | 100% |
| DI 2 | 457,051 | 457,052 | 100% |
| DI 1 | 36,468 | 36,466 | 100% |
| **Total** | **1,453,411** | **1,453,461** | **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 |
|---|---|---|---|
| EA-0003269200 | 209 | 209 | 100% |
| EA-0002577312 | 2,059 | 2,059 | 100% |
| EA-0003280411 | 8,307 | 4,119 | 50% |
| EA-0003211397 | 25,941 | 25,941 | 100% |
| EA-0003211404 | 19,266 | 19,266 | 100% |
| EA-0003211410 | 45,779 | 45,779 | 100% |
| EA-0003282258 | 925 | 925 | 100% |
| EA-0002917846 | 1,278 | 1,278 | 100% |
| EA-0003199896 | 4,784 | 4,784 | 100% |
| EA-0003345302 | 5,123 | 5,567 | 109% |
| EA-0003985548 | 5,762 | 5,762 | 100% |
| EA-0003478951 | 868 | 868 | 100% |
| Non-Sampled Projects | 142,382 | 141,334 | 99% |
| **Total** | **262,684** | **257,892** | **98%** |

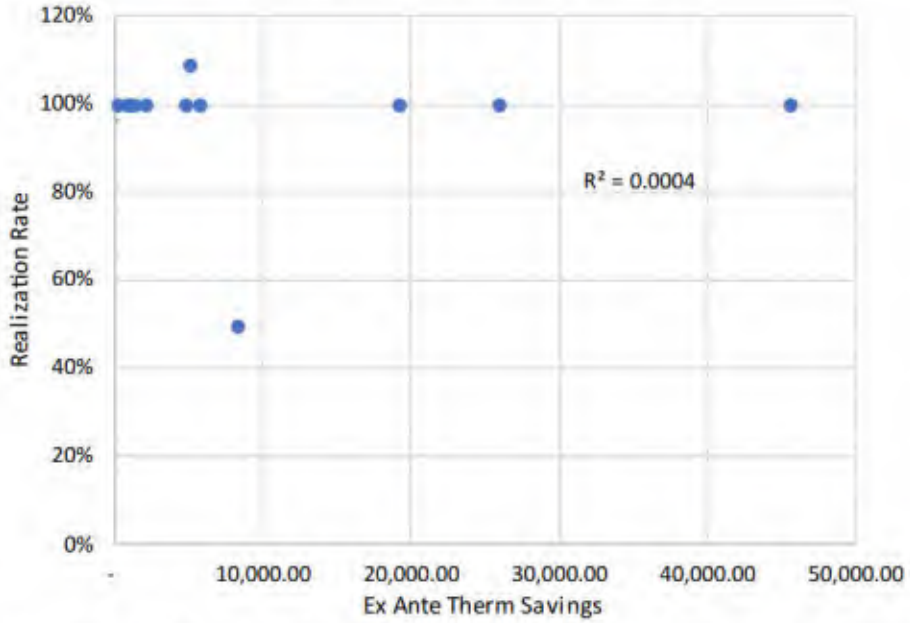
*Table 10-9 Ex-Ante and Ex-Post Annual Therm Savings for Direct Install Component by Project*

| Project ID | Ex-Ante Therm Savings | Ex-Post Gross Therm Savings | Gross Therm Savings Realization Rate |
|---|---|---|---|
| EA-0003220198 | 11,341 | 11,341 | 100% |
| EA-0003044820 | 12,462 | 12,462 | 100% |
| EA-0003213960 | 5,581 | 5,581 | 100% |
| EA-0003198197 | 14,735 | 14,735 | 100% |
| EA-0003273213 | 15,009 | 15,009 | 100% |
| EA-0003273677 | 20,317 | 20,316 | 100% |

| *Project ID* | *Ex-Ante Therm Savings* | *Ex-Post Gross Therm Savings* | *Gross Therm Savings Realization Rate* |
|---|---|---|---|
| EA-0003241385 | 38,463 | 38,465 | 100% |
| EA-0003198240 | 61,906 | 61,907 | 100% |
| EA-0003483328 | 670 | 670 | 100% |
| EA-0003834573 | 4,938 | 4,937 | 100% |
| EA-0003614347 | 36,845 | 36,850 | 100% |
| EA-0003863385 | 56,862 | 56,875 | 100% |
| Non-Sampled Projects | 1,174,281 | 1,174,313 | 100% |
| Total | **1,453,411** | **1,453,461** | **100%** |

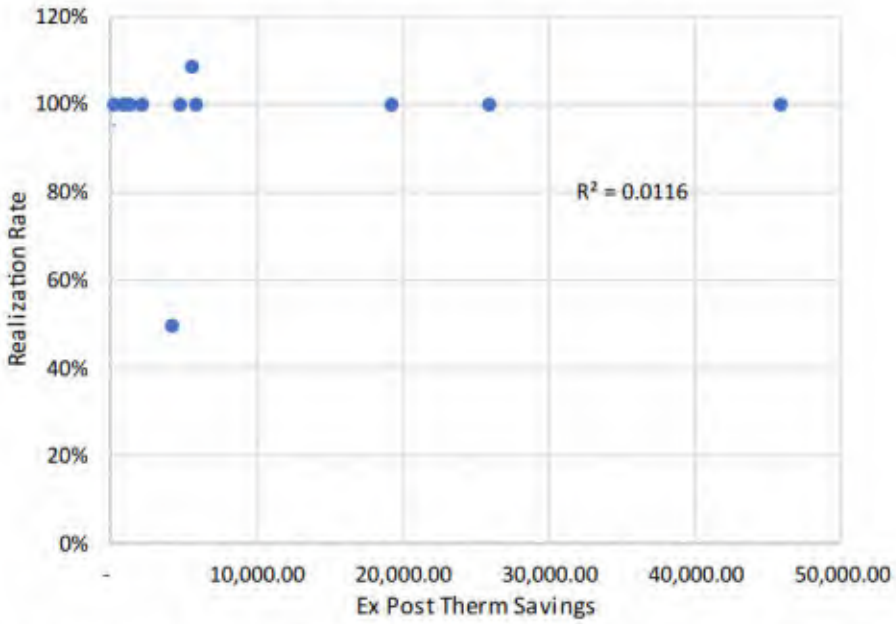
Custom component gross therm savings realization rate and ex-ante therm savings are plotted in Figure 10-3 for sample projects.

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



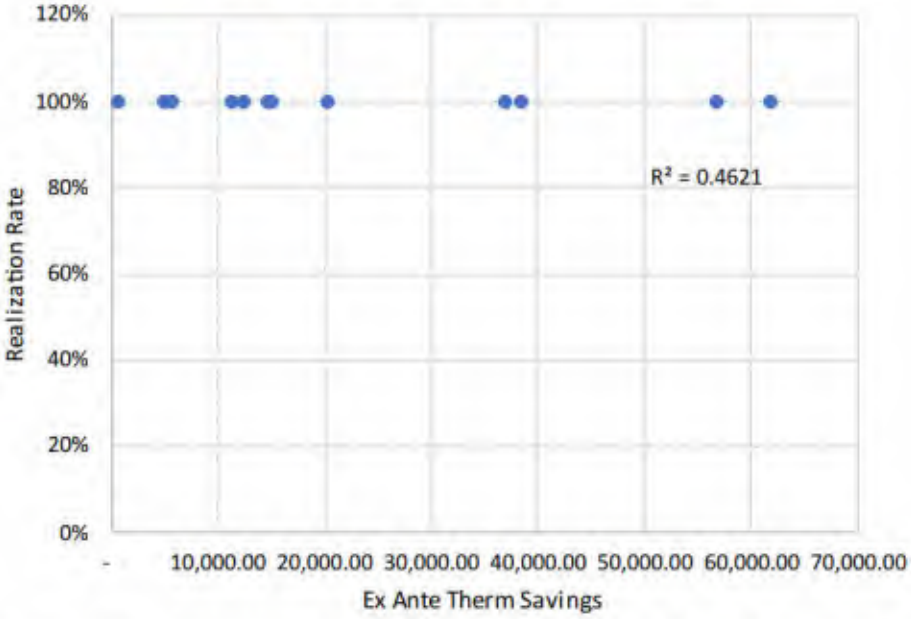

Custom component gross therm savings realization rate and ex-post energy savings are plotted in Figure 10-4 for each sample project.

*Figure 10-4 Custom Component Sample Project Gross Therm Savings Realization Rate Versus Ex-Post Therm Savings*



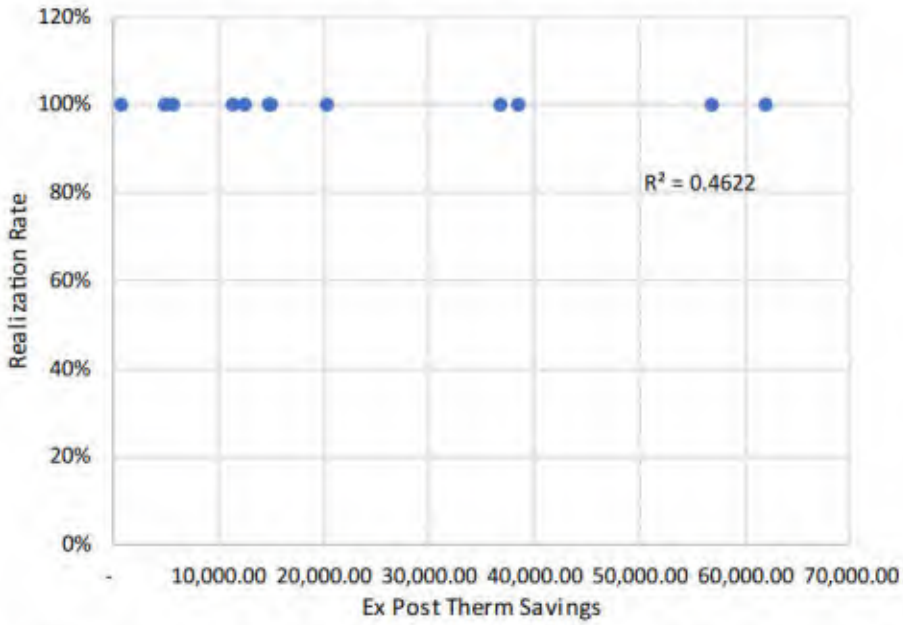

Direct Install component gross therm savings realization rate and ex-ante therm savings are plotted in Figure 10-5 for sample projects.

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




Direct Install component gross therm savings realization rate and ex-post therm savings are plotted in Figure 10-6 for each sample project.

*Figure 10-6 Direct Install Component Sample Project Gross Therm Savings Realization Rate Versus Ex-Post 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 [ ROGRAM] 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_DESCR TION] 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 [ ROGRAM] 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_DESCR TION] at this location?"
- The respondent answered, "Definitely would have installed" to the following question: "If the [ ROGRAM] 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 [UT IT ] 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 [ ROJECT_DESCR TION]?"

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 | 36.67% |
| SEM | 0.0% |
| Direct Install | 6.2% |

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 | 257,892 | 94,569 | 163,323 | 63.3% |
| SEM | 97,231 | 0 | 97,231 | 100.0% |
| DI | 1,453,461 | 90,115 | 1,363,347 | 93.8% |
| Total | 1,808,584 | 184,683 | 1,623,901 | 89.8% |

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 | 11,995 | 4,399 | 7,596 | 63% |
| Total | **11,995** | **4,399** | **7,596** | **63%** |

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 | 8,733 | 541 | 8,191 | 94% |

| | | | | |
|---|---|---|---|---|
| Total | **8,733** | **541** | **8,191** | **94%** |

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 | 6.36 | 0.39 | 5.97 | 94% |
| Total | **6.36** | **0.39** | **5.97** | **94%** |

## 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

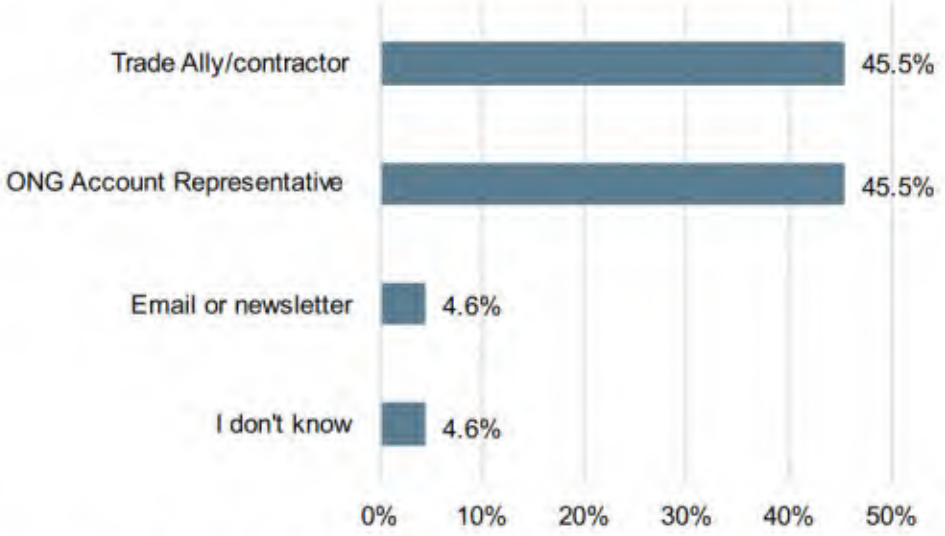
CLEAResult provided the Evaluator contact information for Commercial Direct Install program participants who received rebates for energy efficient equipment upgrades. The Evaluator reached out to all participants at least three times to request an interview or survey. Among those participants who were contacted, 22 provided their feedback. The following summary outlines those participants' responses to survey questions.

Respondents included company owners (n=7), managers (n=14), and vice presidents (n=1).

#### *10.4.1.1 Program Awareness and Participation*

Twenty of the respondents (91%) learned about the Direct Install program through an ONG program representative or trade ally.

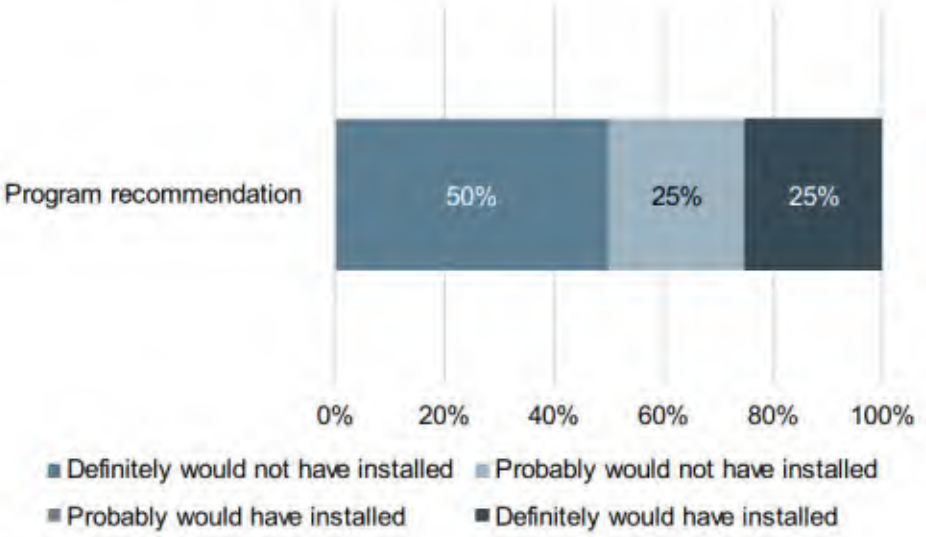
*Figure 10-7 Program Awareness (n=22)*




All of the respondents who had received overhead door weatherstripping indicated they did not have plans to install similar materials prior to their participation in the program. One of the 22 respondents indicated they removed the weatherstripping or door weatherstripping they had received through the program because it fell off due to door clearance issues.

Eight out of 22 respondents (36.4%) noted that a program representative recommended they install the energy efficient equipment they received through the program. Three quarters of those respondents indicated they likely would not have installed the upgrades without the recommendation by the program representative.

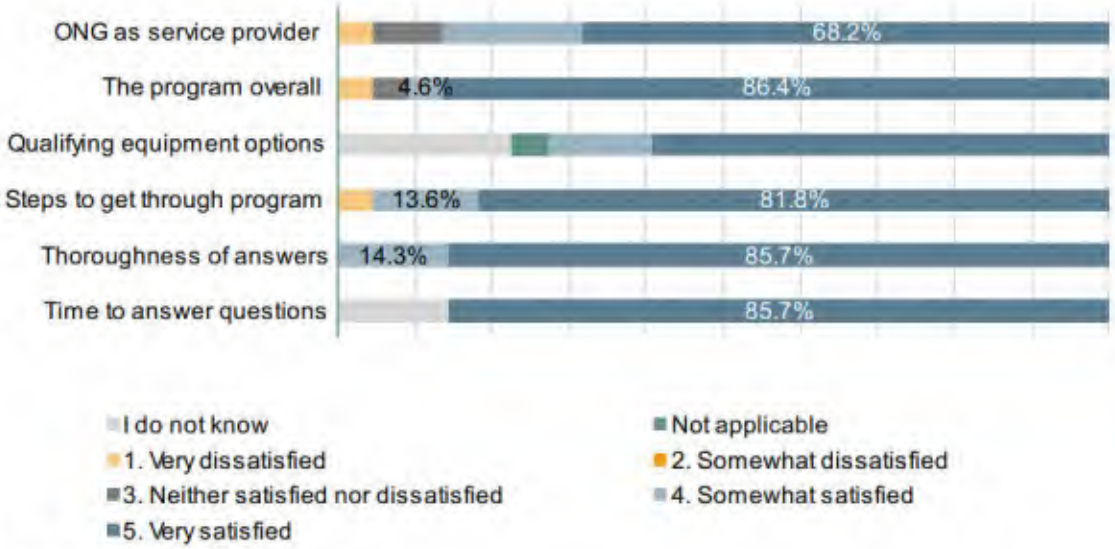
*Figure 10-8 Likelihood of Installing (n=22)*



#### *10.4.1.2 Program Satisfaction*

In general, respondents were satisfied with various aspects of the program, reporting high satisfaction rates across all categories.

*Figure 10-9 Program Satisfaction (n=22)*




#### *10.4.1.3 Firmographics*

The majority of respondents own and occupy the building that received the upgrades (73%, n=16). Nearly half of respondents (46%, n=10) are apartment complex operators; the other respondents represented industrial/manufacturing, services, office, and restaurant facilities.

*Table 10-16: Firmographics (n=22)*

| | % | n |
|---|---|---|
| **Building ownership** | | |
| Own and occupy | 72.7% | 16 |
| Rent | 27.3% | 6 |
| **Business type** | | |
| Apartment complex | 45.6% | 10 |
| Industrial/Manufacturing | 27.3% | 6 |
| Car wash | 9.1% | 2 |
| Gathering or event space | 9.1% | 2 |
| Office | 4.6% | 1 |
| Restaurant | 4.6% | 1 |

### 10.4.2 Custom Commercial Participant Survey Responses

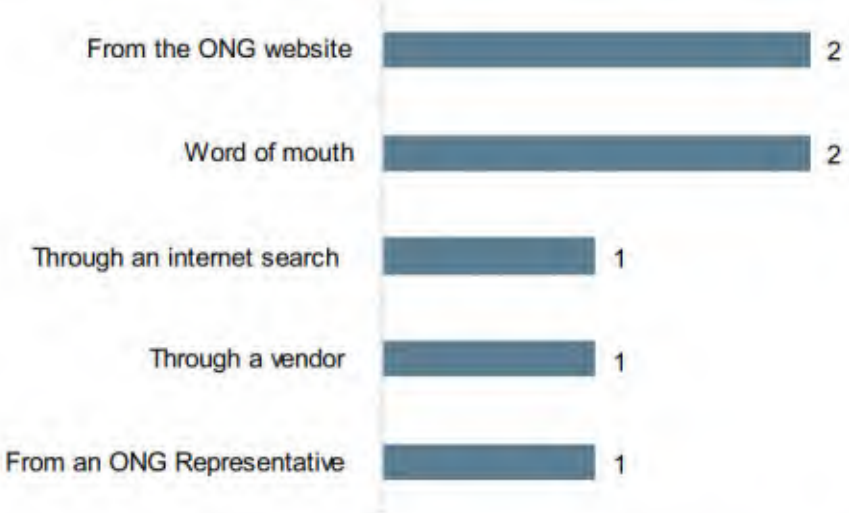
The Evaluator conducted a survey of Custom Commercial participants to gather feedback about customers' engagement with and experience of the program. Tracking data indicated 22 unique customers participated in the program in 2024. Participants were

contacted by phone two times and invited to complete the survey. Eight participants responded to the survey for a response rate of 32%.

#### *10.4.2.1 Program Participation*

Respondents most commonly learned about the Custom Commercial Program from the ONG website, or word-of-mouth (Figure 10-10).

*Figure 10-10 Program Awareness (n=7)*




All respondents indicated they had no concerns with participating in the program (n=7). Over half of respondents did not receive technical services or other assistance while selecting equipment from the program (n=4). Most respondents indicated that the range of incentive options offered through the program fit their needs (n=6). Three-quarters of respondents noted that the incentive amount was what they had expected (n=5).

Respondents were mixed on the influence others had on their decision to install program equipment (Figure 10-11).

*Figure 10-11 Expectations of Incentive Amounts (n=7)*

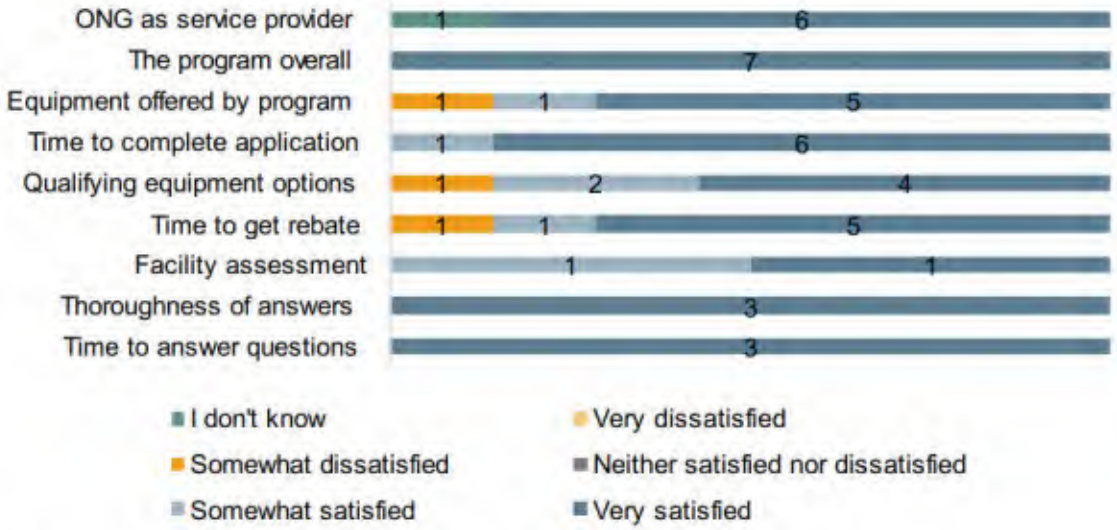

#### *10.4.2.2 Prior Energy Efficiency Experience*

Respondents were also mixed on whether their organization had completed any significant energy efficiency projects within the last three years, with less than half indicating yes (n=3). Three-quarters of respondents noted they had previous experience with the Commercial Custom program prior to installing equipment (n=5).

#### *10.4.2.3 Program Satisfaction*

Respondents were overall satisfied with all elements of the program, specifically with the program overall and ONG as their service provider (Figure 10-12). One respondent noted that there was an issue with their rebate amount, but it was later fixed; another respondent had issues with the range of equipment that qualified through the program. Most respondents indicated that participating in the program increased their satisfaction with ONG (n=5).

*Figure 10-12 Program Satisfaction (n=7)*




#### *10.4.2.4 Respondent Firmographics*

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

*Table 10-17: Firmographics (n=7)*

| | n |
|---|---|
| **Building ownership** | |
| Own and occupy | 4 |
| Own and rent to someone else | 1 |
| Rent | 2 |
| **Business type** | |
| Hotel/Motel | 1 |
| Restaurant | 1 |
| Retail | 1 |
| Multi-family housing | 1 |
| Commercial building | 1 |
| Laundromat | 2 |

## 10.5 Conclusions and Recommendations

### 10.5.1 Conclusions

- Direct Install Program respondents were satisfied with various aspects of the program, reporting high satisfaction rates across all categories.
- 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 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 PY2024 energy efficiency portfolio from January 1, 2024, through December 31, 2024.

## 11.1 Cost Effectiveness Summary

The cost-effectiveness of ONG's PY2024 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 11-1 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 11-1 Cost Effectiveness by Program*

| *Program* | *Total Benefits* | *Total Program Expenditures* | *TRC (b/c ratio)* |
|---|---|---|---|
| Clothes Dryer | $779,178 | $296,148 | 2.63 |
| Range | $347,532 | $25,654 | 13.55 |
| Water Heater | $11,995,593 | $2,536,986 | 4.73 |
| Heating System | $1,323,331 | $524,528 | 2.52 |
| Low-Income Assistance | $5,415,205 | $1,084,350 | 4.99 |
| Water Conservation Kits | $2,413,176 | $95,822 | 25.18 |
| New Home | $16,648,966 | $6,635,554 | 2.51 |

[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 | $12,001,868 | $2,958,008 | 4.06 |
| Portfolio Non-incentive Costs | N/A | $2,803,457 | N/A |
| **Total** | **$50,924,847** | **$16,960,506** | **3.00** |

## 11.2 Energy Efficiency Program Results

ONG's energy efficiency portfolio in PY2024 consisted of eight programs with verified net therm savings of 3,987,866 therms. Total spending in PY2024 equaled $15,768,182. Table 11-2 provides a summary of program costs.

*Table 11-2 Reported Costs by Program*

| *Program* | *Incentives* | *Program Overhead Costs* |
|---|---|---|
| Clothes Dryer | $960,734 | $21,415 |
| Range | $351,200 | $25,654 |
| Water Heater | $3,576,650 | $310,361 |
| Heating System | $612,800 | $108,588 |
| Low-income Assistance | $427,967 | $656,382 |
| Water Conservation Kits | $70,737 | $25,085 |
| New Home | $3,058,300 | $75,093 |
| Custom Commercial | $1,568,194 | $1,115,563 |
| Portfolio Non-incentive Costs | N/A | $2,803,457 |
| **Total** | **$10,626,583** | **$5,141,599** |

In the tables that follow, total costs and benefits, and cost-effectiveness test results are provided for each energy efficiency program in the PY2024 portfolio.

*Table 11-3 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 | $779,178 | $779,178 | $779,178 | $1,430,718 | $2,112,447 |
| Total Costs | $982,150 | $296,148 | $1,586,898 | $274,733 | $296,148 |
| **Benefit/Cost Ratio** | **0.79** | **2.63** | **0.49** | **5.21** | **7.13** |

*Table 11-4 Range Benefit/Cost Tests*

| *Program* | *Program Administrator Cost Test* | *Total Resource Cost Test* | *Ratepayer Impact Measure* | *Participant Cost Test* | *Societal Cost Test* |
|---|---|---|---|---|---|
| Total Benefits | $51,119 | $347,532 | $51,119 | $581,335 | $495,779 |
| Total Costs | $376,854 | $25,654 | $416,709 | $- | $25,654 |
| **Benefit/Cost Ratio** | **0.14** | **13.55** | **0.12** | **-** | **19.33** |

*Table 11-5 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 | $1,323,331 | $1,323,331 | $1,323,331 | $1,357,603 | $3,818,451 |
| Total Costs | $721,388 | $524,528 | $1,766,678 | $415,939 | $524,528 |
| **Benefit/Cost Ratio** | **1.83** | **2.52** | **0.75** | **3.26** | **7.28** |

*Table 11-6 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 | $11,995,593 | $11,995,593 | $11,995,593 | $10,262,444 | $34,881,755 |
| Total Costs | $3,887,011 | $2,536,986 | $13,386,279 | $2,226,625 | $2,536,986 |
| **Benefit/Cost Ratio** | **3.09** | **4.73** | **0.90** | **4.61** | **13.75** |

*Table 11-7 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 | $5,415,205 | $5,415,205 | $5,415,205 | $3,579,846 | $15,175,892 |
| Total Costs | $1,084,350 | $1,084,350 | $5,327,569 | $427,967 | $1,084,350 |
| **Benefit/Cost Ratio** | **4.99** | **4.99** | **1.02** | **8.36** | **14.00** |

*Table 11-8 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 | $1,069,790 | $2,413,176 | $1,069,790 | $1,265,638 | $2,758,716 |
| Total Costs | $95,822 | $95,822 | $910,490 | $70,737 | $95,822 |
| **Benefit/Cost Ratio** | **11.16** | **25.18** | **1.17** | **17.89** | **28.79** |

*Table 11-9 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 | $16,648,966 | $16,648,966 | $16,648,966 | $12,965,799 | $45,676,745 |
| Total Costs | $3,133,393 | $6,635,554 | $16,113,476 | $6,560,461 | $6,635,554 |
| **Benefit/Cost Ratio** | **5.31** | **2.51** | **1.03** | **1.98** | **6.88** |

*Table 11-10 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 | $11,973,573 | $12,001,868 | $11,973,573 | $12,901,730 | $41,692,826 |
| Total Costs | $2,683,757 | $2,958,008 | $16,554,961 | $1,842,445 | $2,958,008 |
| **Benefit/Cost Ratio** | **4.46** | **4.06** | **0.72** | **7.00** | **14.09** |

# 12 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.

## 12.1 Custom Component Site-Level Reports

**Project Number** EA-0003269200
**Program** Custom Commercial Program

### Project Background

The participant is a community service provider which installed new high efficiency washers. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

### M&V Methodology

Savings for the high efficiency washers are outlined in Illinois TRM V7.0 section 4.8.5. The 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 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 11: Therms Savings Calculations

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Washer | 209 | 209 | 100% |
| **Total** | **209** | **209** | **100%** |

**Project Number** EA-0002577312
**Program** Oklahoma Natural Gas Commercial & Industrial

## Project Background

The participant is a hotel that received incentives from Oklahoma Natural Gas for installing Hot Water Circulation Pump Controls.

## M&V Methodology

Savings for the Hot Water Circulation Pump Control are outlined in Natural Gas C&I Deemed Savings Guidebook PY2022 section 2.1.4. The 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 savings as follows:

$$Annual\ Therm\ Savings = Qty_{Dwells} \times (50.522e^{-.009 \times Qty_{Dwells}})$$

## Results

The total therms saved realization rate for this site was 100%.

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Hot Water Circulation Pump Controls | 2,059 | 2,059 | 100% |
| **Total** | **2,059** | **2,059** | **100%** |

**Project Number** EA-0003211404
**Program** Oklahoma Natural Gas Commercial & Industrial

## Project Background

The participant is an apartment complex which performed an air and duct sealing measure. 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 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, the evaluators calculated savings as follows:

### Air Infiltration

$$Annual\ Therm\ Savings = \left(CFM_{50,pre} - CFM_{50,post}\right) \times GSF$$

### Duct Sealing

$$\text{Therms}_{\text{savings,H}} = \frac{\left(\text{DL}_{\text{pre}} - \text{DL}_{\text{post}}\right)\frac{ft^3}{min} \times 60\frac{min}{hour} \times \text{HDD} \times 24\frac{hours}{day} \times 0.018\frac{Btu}{ft^3 - °F}}{100{,}000\frac{BTU}{Therm} \times \text{AFUE}}$$

## Results

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Air Infiltration | 3,992.64 | 3,992.64 | 100% |
| Duct Sealing | 15,273.44 | 15,273.44 | 100% |
| **Total** | **19,266.1** | **19,266.1** | **100%** |

**Project Number** EA-0003199896
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a fast-food restaurant which performed a gas fryer measure and 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 the Arkansas TRM v8.2.

## Savings Calculations

Using deemed values, the evaluators calculated savings as follows:

$$\Delta Btu = BTU_{base} - BTU_{eff}$$

$$\Delta Therms = \frac{\Delta Btu}{100{,}000}$$

$$BTU(base\ or\ eff) = BTU_{Cooking} + BTU_{Idle} + BTU_{Preheat}$$

$$BTU_{Cooking} = \left(LB_{Food} \times \frac{E_{Food}}{Cooking\ Efficiency}\right) \times Days$$

$$BTU_{Idle} = IdleEnergy \times \left(Daily\ Hrs - \frac{LB_{Food}}{Capacity} - \frac{PreheatTime}{60}\right) \times Days$$

$$BTU_{Preheat} = PreheatEnergy \times Days$$

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 100%.

| *Measure* | *Expected Annual therms Savings* | *Realized Annual therms Savings* | *Realization Rate* |
|---|---|---|---|
| Fryer | 4,784 | 4,784 | 100% |
| **TOTAL** | **4,784** | **4,784** | **100%** |

**Project Number** EA-0003985548
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a large office building that 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

## Results

The total therms saved realization rate for this site was 100%.

| Measure | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Boiler Replacement | 5,762 | 5,762 | 100% |
| **Total** | **5,762** | **5,762** | **100%** |

**Project Number** EA-0003282258
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a restaurant which performed a gas fryer measure and 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 the Arkansas TRM v8.2.

## Savings Calculations

Using deemed values, the evaluators calculated savings as follows:

$$\Delta Btu = BTU_{base} - BTU_{eff}$$

$$\Delta Therms = \frac{\Delta Btu}{100{,}000}$$

$$BTU(base\ or\ eff) = BTU_{Cooking} + BTU_{Idle} + BTU_{Preheat}$$

$$BTU_{Cooking} = \left(LB_{Food} \times \frac{E_{Food}}{Cooking\ Efficiency}\right) \times Days$$

$$BTU_{Idle} = IdleEnergy \times \left(Daily\ Hrs - \frac{LB_{Food}}{Capacity} - \frac{PreheatTime}{60}\right) \times Days$$

$$BTU_{Preheat} = PreheatEnergy \times Days$$

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 100%.

| *Measure* | *Expected Annual therms Savings* | *Realized Annual therms Savings* | *Realization Rate* |
|---|---|---|---|
| Fryer | 925 | 925 | 100% |
| **TOTAL** | **925** | **925** | **100%** |

**Project Number** EA-0003280411
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a dry cleaner which installed new high efficiency washers and a water heater. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

## M&V Methodology

Savings for the high efficiency washers are outlined in Illinois TRM V7.0 section 4.8.5. while methodology for the water heater can be found in the Natural Gas C&I Deemed Savings Guidebook PY2022 section 2.1.5. The 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 savings as follows:

### High Speed Clothes Washer

$$\Delta Therms = \left( \frac{N_{cycles} \times Days \times Capacity \times RMC \times h_e}{Eff_{dryer} \times 100{,}000 \frac{BTU}{Therm}} \right) \times DryerUse \times LF$$

### Water Heater

$$\Delta Therms = \frac{\rho \times C_p \times GPD \times \left(T_{SetPoint} - T_{Supply}\right) \times \left(\frac{1}{Eff_{pre}} - \frac{1}{Eff_{post}}\right) \times \frac{Days}{Year}}{100{,}000 \frac{Btu}{Therm}}$$

## Results

The total therms saved realization rate for this site was 50%. The discrepancy is caused by the implementer using 10^4 for BTU to therms conversion when it should be 10^5.

| *Measure* | *Expected Annual therms Savings* | *Realized Annual therms Savings* | *Realization Rate* |
|---|---|---|---|
| Washer | 3654 | 3654 | 100% |
| Water Heater | 4653 | 465 | 10% |
| **TOTAL** | **8,307** | **4,119** | **50%** |

**Project Number** EA-0003478951
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a dry-cleaning facility which has installed a water heater. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

## M&V Methodology

Savings for the water heater can be found in the Natural Gas C&I Deemed Savings Guidebook PY2022 section 2.1.5. The 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 savings as follows:

$$\Delta Therms = \frac{\rho \times C_p \times GPD \times (T_{SetPoint} - T_{Supply}) \times \left(\frac{1}{Eff_{pre}} - \frac{1}{Eff_{post}}\right) \times \frac{Days}{Year}}{100{,}000 \frac{Btu}{Therm}}$$

## Results

The total therms saved realization rate for this site was 100%.

| *Measure* | *Expected Annual therms Savings* | *Realized Annual therms Savings* | *Realization Rate* |
|---|---|---|---|
| Water Heater | 868 | 868 | 100% |
| **TOTAL** | **868** | **868** | **100%** |

**Project Number** EA-0003345302
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a dry-cleaning facility that replaced 7 steam traps and repaired 1 steam trap leak. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

## 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 follows:

**Steam Trap replacement**

$$Therm_{savings} = DR \times AOH \times F\% \times \frac{H_{steam} - H_{feedwater}}{Eff_{boiler} \times 100{,}000}$$

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

**Steam Trap Leak**

$$Annual\ Therm\ Savings = \frac{Heat\ Loss\ \times \frac{Hours}{Year}}{E_c\ x\ 100{,}000\ \frac{Btu}{Therm}}$$

Where:

Heat Loss = The amount of heat lost to the system in one hour $\frac{Btu}{hr}$

Hours/Years = annual hours the steam system is pressurized

Ec = Combustion efficiency for boiler

100,000 $\frac{BTU}{Therm}$ = Constant to covert from Btu to Therm

## Results

The therm realization rate 109%. This is due to ex-ante capping savings to 30% total annual usage (16,480 CCF) to reduce the claimed savings.

| *Measure* | *Expected Annual therms Savings* | *Realized Annual therms Savings* | *Realization Rate* |
|---|---|---|---|
| Steam Traps | 4,944 | 5,388 | 109% |
| Steam Leaks | 179 | 179 | 100% |
| **TOTAL** | **5,123** | **5,567** | **109%** |

**Project Number** EA-0003211410
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is an apartment complex which performed an air and duct sealing measure on 105 apartments. 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 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, the evaluators calculated savings as follows:

### Air Infiltration

$$Annual\ Therm\ Savings = \left(CFM_{50,pre} - CFM_{50,post}\right) \times GSF$$

### Duct Sealing

$$\text{Therms}_{\text{savings,H}} = \frac{\left(\text{DL}_{\text{pre}} - \text{DL}_{\text{post}}\right)\frac{ft^3}{min} \times 60\frac{min}{hour} \times \text{HDD} \times 24\frac{hours}{day} \times 0.018\frac{Btu}{ft^3 - °F}}{100{,}000\frac{BTU}{Therm} \times \text{AFUE}}$$

## Results

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Air Infiltration | 13,045 | 13,045 | 100% |
| Duct Sealing | 32,734 | 32,734 | 100% |
| **Total** | **45,778.7** | **45,778.7** | **100%** |

**Project Number** EA-0002917846
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is a community service provider which installed new high efficiency washers. The participant received incentives from Oklahoma Natural Gas for implementing energy efficient measures.

## M&V Methodology

Savings for the high efficiency washers are outlined in Illinois TRM V7.0 section 4.8.5. The 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 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 12: Therms Savings Calculations

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Washers | 1,278 | 1,278 | 100% |
| **Total** | **1,278** | **1,278** | **100%** |

**Project Number** EA-0003211397
**Program** Oklahoma Natural Gas C&I Solutions

## Project Background

The participant is an apartment complex which performed an air and duct sealing measure on 61 apartments. 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 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, the evaluators calculated savings as follows:

### Air Infiltration

$$Annual\ Therm\ Savings = \left(CFM_{50,pre} - CFM_{50,post}\right) \times GSF$$

### Duct Sealing

$$\text{Therms}_{\text{savings,H}} = \frac{\left(\text{DL}_{\text{pre}} - \text{DL}_{\text{post}}\right)\frac{ft^3}{min} \times 60\frac{min}{hour} \times \text{HDD} \times 24\frac{hours}{day} \times 0.018\frac{Btu}{ft^3 - °F}}{100{,}000\frac{BTU}{Therm} \times \text{AFUE}}$$

## Results

| *Measure* | *Expected Therms Savings* | *Realized Therms Savings* | *Realization Rate* |
|---|---|---|---|
| Air Infiltration | 4,078 | 4,078 | 100% |
| Duct Sealing | 21,863 | 21,863 | 100% |
| **Total** | **25,941** | **25,941** | **100%** |

**Project Number** EA-0003044820

**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:

- 44 Linear Feet Weather Stripping, 1-1/2" Gap
- 44 Linear Feet Weather Stripping, 1" Gap
- 44 Linear Feet Weather Stripping, 1-1/4" Gap
- 40 Linear Feet Weather Stripping, 7/8" Gap
- 42 Linear Feet Weather Stripping, 1" Gap
- 48 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 | 44 | 1-1/2 | 8b | - | 2,959 | - |
| Weather Stripping | 44 | 1 | 8b | - | 1,973 | - |
| Weather Stripping | 44 | 1-1/4 | 8b | - | 2,465 | - |
| Weather Stripping | 40 | 7/8 | 8b | - | 1,569 | - |
| Weather Stripping | 42 | 1 | 8b | - | 1,883 | - |
| Weather Stripping | 48 | 3/4 | 8b | - | 1,614 | - |
| **Total** | | | | **12,462** | **12,462** | **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 | 12,462 | 12,462 | - |
| **Total** | | **12,462** | **100%** |

**Project Number** EA-0003198197

**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:

- 60 Linear Feet Weather Stripping, 7/8" Gap
- 60 Linear Feet Weather Stripping, 3/4" Gap
- 56 Linear Feet Weather Stripping, 5/8" Gap
- 56 Linear Feet Weather Stripping, 4/2" Gap
- 56 Linear Feet Weather Stripping, 5/8" Gap
- 52 Linear Feet Weather Stripping, 1/2" Gap
- 78 Linear Feet Weather Stripping, 7/8" Gap
- 52 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 | 60 | 7/8" | 8b | | 2,353 | |
| Weather Stripping | 60 | 3/4" | 8b | | 2,017 | |
| Weather Stripping | 56 | 5/8" | 8b | | 1,569 | |
| Weather Stripping | 56 | 1/2" | 8b | | 1,254 | |
| Weather Stripping | 56 | 5/8" | 8b | | 1,569 | |
| Weather Stripping | 52 | 1/2" | 8b | | 1,165 | |
| Weather Stripping | 78 | 7/8" | 8b | | 3,059 | |
| Weather Stripping | 52 | 3/4" | 8b | | 1,748 | |
| **Total** | | | | **14,735** | **14,735** | **100%** |

## Results

The total therms saved realization rate for this project is 100%.

*Verified Gross Savings & Realization Rates*

| Measure | | Verified |
|---|---|---|

| | *Expected Therms Savings* | *Therms Savings* | *Therms Realization Rate* |
|---|---|---|---|
| Weather Stripping | 14,735 | 14,735 | 100% |
| **Total** | | **14,735** | **100%** |

**Project Number** EA-0003198240

**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:

- 52 Linear Feet Weather Stripping, 1” Gap
- 52 Linear Feet Weather Stripping, 1-1/2” Gap
- 52 Linear Feet Weather Stripping, 1-1/2” Gap
- 52 Linear Feet Weather Stripping, 1-3/8” Gap
- 52 Linear Feet Weather Stripping, 1-3/4” Gap
- 52 Linear Feet Weather Stripping, 1-3/4” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 7/8” Gap
- 40 Linear Feet Weather Stripping, 1-1/8” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 28 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 1-1/4” Gap
- 52 Linear Feet Weather Stripping, 1-1/2” Gap
- 52 Linear Feet Weather Stripping, 1-1/4” Gap
- 52 Linear Feet Weather Stripping, 1-1/8” Gap
- 52 Linear Feet Weather Stripping, 7/8” Gap
- 52 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 7/8” Gap
- 52 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 7/8” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 40 Linear Feet Weather Stripping, 1-1/4” Gap
- 40 Linear Feet Weather Stripping, 1-1/8” Gap
- 40 Linear Feet Weather Stripping, 1” Gap
- 52 Linear Feet Weather Stripping, 7/8” 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 | 1/4 | 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" | 8b | - | 2,331 | - |
| Weather Stripping | 52 | 1-1/2" | 8b | - | 3,496 | - |
| Weather Stripping | 52 | 1-1/2" | 8b | - | 3,496 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weather Stripping | 52 | 1 3/8" | 8b | - | 3,205 | - |
| Weather Stripping | 52 | 1-3/4" | 8b | - | 4,079 | - |
| Weather Stripping | 52 | 1-3/4" | 8b | - | 4,079 | - |
| Weather Stripping | 40 | 1" | 8b | - | 1,793 | - |
| Weather Stripping | 40 | 7/8" | 8b | - | 1,569 | - |
| Weather Stripping | 40 | 1 1/8" | 8b | - | 2,017 | - |
| Weather Stripping | 40 | 1" | 8b | - | 1,793 | - |
| Weather Stripping | 40 | 1" | 8b | - | 1,793 | - |
| Weather Stripping | 28 | 1" | 8b | - | 1,255 | - |
| Weather Stripping | 40 | 1-1/4" | 8b | - | 2,241 | - |
| Weather Stripping | 52 | 1-1/2" | 8b | - | 3,496 | - |
| Weather Stripping | 52 | 1-1/4" | 8b | - | 2,914 | - |
| Weather Stripping | 52 | 1 1/8" | 8b | - | 2,622 | - |
| Weather Stripping | 52 | 7/8" | 8b | - | 2,040 | - |
| Weather Stripping | 52 | 1" | 8b | - | 2,331 | - |
| Weather Stripping | 40 | 7/8" | 8b | - | 1,569 | - |
| Weather Stripping | 52 | 1" | 8b | - | 2,331 | - |
| Weather Stripping | 40 | 7/8" | 8b | - | 1,569 | - |
| Weather Stripping | 40 | 1" | 8b | - | 1,793 | - |
| Weather Stripping | 40 | 1-1/4" | 8b | - | 2,241 | - |
| Weather Stripping | 40 | 1 1/8" | 8b | - | 2,017 | - |
| Weather Stripping | 40 | 1" | 8b | - | 1,793 | - |
| Weather Stripping | 52 | 7/8" | 8b | - | 2,040 | - |
| **Total** | | | | **61,907** | **61,907** | **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 | 61,907 | 61,907 | 100% |
| **Total** | | **61,907** | **100%** |

**Project Number** EA-0003213960

**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:

- 44 Linear Feet Weather Stripping, 1" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 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 | 1/4 | 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 | 44 | 1" | 8b | - | 1,973 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 40 | 1/2" | 8b | - | 896 | - |
| **Total** | | | | **5,581** | **5,581** | **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 | 5,581 | 5,581 | 100% |
| **Total** | | **5,581** | **100%** |

**Project Number** EA-0003220198

**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:

- 44 Linear Feet Weather Stripping, 7/8" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 7/8" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 5/8" 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 | 1/4 | 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 | 44 | 7/8" | 8b | - | 1,726 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 7/8"" | 8b | - | 1,726 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| **Total** | | | | **11,341** | **11,341** | **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 | 11,341 | 11,341 | 100% |
| **Total** | | **11,341** | **100%** |

**Project Number** EA-0003241385

**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:

- 52 Linear Feet Weather Stripping, 1-1/8" Gap
- 52 Linear Feet Weather Stripping, 7/8" Gap
- 52 Linear Feet Weather Stripping, 1-1/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 7/8" Gap
- 52 Linear Feet Weather Stripping, 7/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 7/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1-1/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1-1/8" Gap
- 52 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 1" 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 | 52 | 1 1/8" | 8a | - | 2,705 | - |
| Weather Stripping | 52 | 7/8" | 8a | - | 2,104 | - |
| Weather Stripping | 52 | 1 1/8" | 8a | - | 2,705 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 7/8" | 8a | - | 2,104 | - |
| Weather Stripping | 52 | 7/8" | 8a | - | 2,104 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 7/8" | 8a | - | 2,104 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 1 1/8" | 8a | - | 2,705 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 1 1/8" | 8a | - | 2,705 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| Weather Stripping | 52 | 1" | 8a | - | 2,404 | - |
| **Total** | | | | **38,465** | **38,465** | **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 | 38,465 | 38,465 | 100% |
| **Total** | | **38,465** | **100%** |

**Project Number** EA-0003273213

**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 and sweeps. During a desk review, the evaluators verified the participant had installed:

- 48 Linear Feet Weather Stripping, 1" Gap
- 48 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 3/8" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 60 Linear Feet Weather Stripping, 1" Gap
- 17 Linear Feet Weather Stripping Sweep, 3/8" Gap
- 3 Linear Feet Weather Stripping Sweep, 3/8" Gap
- 48 Linear Feet Weather Stripping, 3/4" Gap
- 48 Linear Feet Weather Stripping, 1/2" Gap
- 17 Linear Feet Weather Stripping Sweep, 1/8" Gap
- 3 Linear Feet Weather Stripping Sweep, 3/8" Gap
- 60 Linear Feet Weather Stripping, 5/8" Gap
- 3 Linear Feet Weather Stripping Sweep, 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 | 1/4 | 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" | 8b | - | 2,152 | - |
| Weather Stripping | 48 | 1/2" | 8b | - | 1,075 | - |
| Weather Stripping | 44 | 3/8" | 8b | - | 740 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 60 | 1" | 8b | - | 2,690 | - |
| Weather Stripping Sweep | 17 | 3/8" | 8b | - | 286 | - |
| Weather Stripping Sweep | 3 | 3/8" | 8b | - | 50 | - |
| Weather Stripping | 48 | 3/4" | 8b | - | 1,614 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weather Stripping | 48 | 1/2" | 8b | - | 1,075 | - |
| Weather Stripping Sweep | 17 | 1/8" | 8b | - | 95 | - |
| Weather Stripping Sweep | 3 | 3/8" | 8b | - | 50 | - |
| Weather Stripping | 60 | 5/8" | 8b | - | 1,681 | - |
| Weather Stripping Sweep | 3 | 3/8" | 8b | - | 50 | - |
| **Total** | | | | **15,009** | **15,009** | **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 | 14,478 | 14,478 | 100% |
| Weather Stripping Sweep | 531 | 531 | 100% |
| **Total** | | **15,009** | **100%** |

**Project Number** EA-0003273677

**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 and sweeps. During a desk review, the evaluators verified the participant had installed:

- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 1-3/8" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 3/8" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 3 Linear Feet Weather Stripping Sweep, 1/4" Gap
- 17 Linear Feet Weather Stripping Sweep, 1/2" Gap
- 44 Linear Feet Weather Stripping, 3/4" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 1/2" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 60 Linear Feet Weather Stripping, 5/8" Gap
- 17 Linear Feet Weather Stripping Sweep, 1/4" Gap
- 3 Linear Feet Weather Stripping Sweep, 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) | | | |
|---|---|---|---|---|
| | 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 | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 1 3/8" | 8b | - | 2,712 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 3/8" | 8b | - | 740 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weather Stripping Sweep | 3 | 1/4" | 8b | - | 34 | - |
| Weather Stripping Sweep | 17 | 1/2" | 8b | - | 381 | - |
| Weather Stripping | 44 | 3/4" | 8b | - | 1,479 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 1/2" | 8b | - | 986 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 60 | 5/8" | 8b | - | 1,681 | - |
| Weather Stripping Sweep | 17 | 1/4" | 8b | - | 192 | - |
| Weather Stripping Sweep | 3 | 1/4" | 8b | - | 34 | - |
| **Total** | | | | **20,316** | **20,316** | **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 | 19,675 | 19,675 | 100% |
| Weather Stripping Sweep | 641 | 641 | 100% |
| **Total** | | **20,316** | **100%** |

**Project Number** EA-00031614347

**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:

- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 3/8" Gap
- 44 Linear Feet Weather Stripping, 3/8" Gap
- 44 Linear Feet Weather Stripping, 5/8" Gap
- 44 Linear Feet Weather Stripping, 1/4" Gap
- 44 Linear Feet Weather Stripping, 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) | | | |
|---|---|---|---|---|
| | 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 | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 3/8" | 8b | - | 740 | - |
| Weather Stripping | 44 | 3/8" | 8b | - | 740 | - |
| Weather Stripping | 44 | 5/8" | 8b | - | 1,233 | - |
| Weather Stripping | 44 | 1/4" | 8b | - | 496 | - |
| Weather Stripping | 44 | 1/4" | 8b | - | 496 | - |
| **Total** | | | | **4,937** | **4,937** | **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 | 4,937 | 4,937 | 100% |
| **Total** | | **4,937** | **100%** |

**Project Number** EA-0003614347

**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:

- 32 Linear Feet Weather Stripping, 7/8" Gap
- 32 Linear Feet Weather Stripping, 1-1/4" Gap
- 32 Linear Feet Weather Stripping, 7/8" Gap
- 32 Linear Feet Weather Stripping, 1" Gap
- 52 Linear Feet Weather Stripping, 3/4" Gap
- 56 Linear Feet Weather Stripping, 1-3/8" Gap
- 56 Linear Feet Weather Stripping, 1" Gap
- 56 Linear Feet Weather Stripping, 1-3/4" Gap
- 56 Linear Feet Weather Stripping, 1-1/8" Gap
- 56 Linear Feet Weather Stripping, 1-1/8" Gap
- 56 Linear Feet Weather Stripping, 1" Gap
- 56 Linear Feet Weather Stripping, 3/4" Gap
- 56 Linear Feet Weather Stripping, 5/8" Gap
- 56 Linear Feet Weather Stripping, 1-3/8" Gap
- 56 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) | | | |
|---|---|---|---|---|
| | 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 | 32 | 7/8" | 8a | - | 1,295 | - |
| Weather Stripping | 32 | 1-1/4" | 8a | - | 1,849 | - |
| Weather Stripping | 32 | 7/8" | 8a | - | 1,295 | - |
| Weather Stripping | 32 | 1" | 8a | - | 1,479 | - |
| Weather Stripping | 52 | 3/4" | 8a | - | 1,804 | - |
| Weather Stripping | 56 | 1 3/8" | 8a | - | 3,560 | - |
| Weather Stripping | 56 | 1" | 8a | - | 2,589 | - |
| Weather Stripping | 56 | 1-3/4" | 8a | - | 4,530 | - |
| Weather Stripping | 56 | 1 1/8" | 8a | - | 2,913 | - |
| Weather Stripping | 56 | 1 1/8" | 8a | - | 2,913 | - |
| Weather Stripping | 56 | 1" | 8a | - | 2,589 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Weather Stripping | 56 | 3/4" | 8a | - | 1,943 | - |
| Weather Stripping | 56 | 5/8" | 8a | - | 1,618 | - |
| Weather Stripping | 56 | 1 3/8" | 8a | - | 3,560 | - |
| Weather Stripping | 56 | 1 1/8" | 8a | - | 2,913 | - |
| **Total** | | | | **36,850** | **36,850** | **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 | 36,850 | 36,850 | 100% |
| **Total** | | **36,850** | **100%** |

**Project Number** EA-0003863385

**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:

- 60 Linear Feet Weather Stripping, 7/8” 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, 1” Gap
- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 60 Linear Feet Weather Stripping, 1-1/8” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 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, 3/4” 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, 7/8” Gap
- 60 Linear Feet Weather Stripping, 3/4” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 1” Gap
- 60 Linear Feet Weather Stripping, 7/8” Gap
- 60 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) | | | |
|---|---|---|---|---|
| | 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* | | | |
|---|---|---|---|---|---|---|

| | *Feet* | *Inches* | | *Expected therms Savings* | *Realized therms Savings* | *Realization Rate* |
|---|---|---|---|---|---|---|
| Weather Stripping | 60 | 7/8" | 8a | - | 2,427 | - |
| 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 | 1" | 8a | - | 2,774 | - |
| Weather Stripping | 60 | 3/4" | 8a | - | 2,082 | - |
| Weather Stripping | 60 | 7/8" | 8a | - | 2,427 | - |
| Weather Stripping | 60 | 1 1/8" | 8a | - | 3,121 | - |
| Weather Stripping | 60 | 7/8" | 8a | - | 2,427 | - |
| 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 | 3/4" | 8a | - | 2,082 | - |
| 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 | 7/8" | 8a | - | 2,427 | - |
| Weather Stripping | 60 | 3/4" | 8a | - | 2,082 | - |
| Weather Stripping | 60 | 1" | 8a | - | 2,774 | - |
| Weather Stripping | 60 | 1" | 8a | - | 2,774 | - |
| Weather Stripping | 60 | 7/8" | 8a | - | 2,427 | - |
| Weather Stripping | 60 | 1-1/4" | 8a | - | 3,467 | - |
| **Total** | | | | **56,875** | **56,875** | **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 | 56,875 | 56,875 | 100% |
| **Total** | | **56,875** | **100%** |

**Project Number** EA-0003483328

**Program** Custom Commercial Program

## Project Background

The participant is a school that received incentives from Oklahoma Natural Gas for implementing energy efficient door weather stripping, sweeps and a faucet aerator. During a desk review, the evaluators verified the participant had installed:

- 6 Linear Feet Weather Stripping Sweep, 3/4" Gap
- 20 Linear Feet Weather Stripping, 1/4" Gap
- 6 Linear Feet Weather Stripping Sweep, 1/4" Gap
- 4 Linear Feet Weather Stripping, 1/4" Gap
- 3 Linear Feet Weather Stripping Sweep, 3/8" Gap
- 3 Linear Feet Weather Stripping, 3/8" Gap
- 1 GPM Faucet Aerator

## 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 for the faucet aerator measures were evaluated using guidelines outlined under section 2.1.1 of the ONG Commercial Deemed Savings Guidebook PY2022. Annual gas savings can be calculated by using the following equation

$$\Delta Therms = \frac{\rho \times C_p \times U \times (F_B - F_P) \times (T_H - T_{Supply}) \times \frac{1}{E_t} \times \frac{Days}{Year}}{100{,}000 \frac{BTU}{Therm}}$$

## Savings Calculations

Weather-stripping and sweeps savings determined by 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 Sweep | 6 | 3/4" | 8b | - | 202 | - |
| Weather Stripping | 20 | 1/4" | 8b | - | 226 | - |
| Weather Stripping Sweep | 6 | 1/4" | 8b | - | 68 | - |
| Weather Stripping | 4 | 1/4" | 8b | - | 45 | - |
| Weather Stripping Sweep | 3 | 3/8" | 8b | - | 50 | - |
| Weather Stripping | 3 | 3/8" | 8b | - | 50 | - |
| **Total** | | | | **641** | **641** | **100%** |

Faucet aerator savings determined by using the formula from above, the evaluators calculated faucet aerator savings as follows:

*Faucet Aerator Retrofit Therms Savings Calculations*

| Measure | Quantity | $F_P$ GPM | Area | Expected therms Savings | Realized therms Savings | Realization Rate |
|---|---|---|---|---|---|---|
| Faucet Aerator | 1 | 1 | 8b | 29 | 29 | 100% |
| **Total** | | | | **29** | **29** | **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 | 321 | 321 | 100% |
| Weather Stripping Sweep | 320 | 320 | 100% |
| Faucet Aerator | 29 | 29 | 100% |
| **Total** | | **670** | **100%** |