

# Partners in Energy Savings DSM Program Evaluation

**Prepared for:**

Partners in Energy Savings

Kevin Kerrigan, Atmos Energy  
1200 11th Avenue  
Greeley, CO 80631-3828

Lisa Pfitzinger, Black Hills Gas Distribution  
1515 Wynkoop Street, 5<sup>th</sup> Floor  
Denver, CO 80202

Jeffrey Black, Colorado Natural Gas  
7810 Shaffer Pkwy, Suite 120  
Littleton, CO 80127



**Prepared by: Johnson Consulting Group**

Dr. Katherine Johnson, President  
Johnson Consulting Group  
1033 Lindfield Drive, Frederick, MD 21702  
Email: [kjohnson@johnsonconsults.com](mailto:kjohnson@johnsonconsults.com)



With



FINAL REPORT- April 29, 2016

# Table of Contents

<b>Executive Summary .....</b>	<b>v</b>
<b>1 Introduction.....</b>	<b>1</b>
1.1 Program Descriptions.....	3
1.2 Scope of EM&V Activities .....	7
<b>2 Process Evaluation Results .....</b>	<b>10</b>
2.1 Review Program Materials .....	10
2.2 Review Program Tracking Methods .....	13
2.3 Summary of Program Staff Interviews .....	25
2.4 Summary of Program Implementer Interviews .....	31
2.5 Summary of Custom Program Interviews.....	39
2.6 Customer Survey Findings .....	41
<b>3 Impact Evaluation Findings .....</b>	<b>45</b>
3.1 Methodology.....	45
3.2 Impact Evaluation Findings .....	49
<b>4 Conclusions and Recommendations .....</b>	<b>71</b>

## List of Figures

Figure 1: Analysis of New vs. Returning Website Visitors .....	11
Figure 2: Analysis of Device Used to View the Website .....	12
Figure 3: Distribution of Participation in the Residential Energy Audit Program by Utility .....	14
Figure 4: Residential Energy Audit Program by Month in 2014-2015 .....	15
Figure 5: Distribution of Direct Install Measures by Year .....	15
Figure 6: Distribution of Direct Install Measures for Income Qualified Program in PY2015.....	17
Figure 7: Distribution of School Kits by Location.....	18
Figure 8: Distribution Efficient Natural Gas Equipment Measures by Utility in PY2014 .....	19
Figure 9: Distribution of Efficient Natural Gas Equipment Program Measures by Utility in PY2015 .....	20
Figure 10: Comparison of Measure Installation Rates for the Equipment Program from PY2014 to PY2015 .....	21
Figure 11: Comparison of the Commercial Equipment Installed in 2014-2015.....	22
Figure 12: Equipment Rebate Processing Activity.....	22

Figure 13: Summary of Commercial Efficient Natural Gas Equipment Installed in PY2014-PY2015 .....	24
Figure 14: Custom Project Savings in 2014 and 2015 .....	67
Figure 15: Atmos Custom Projects by Facility Type .....	69
Figure 16: Black Hills Custom Projects by Facility Type .....	70

## List of Tables

Table E- 1: Summary of Completed EM&V Activities .....	vi
Table E- 2: Comparison of PY 2015 Participation Rates Across All PIES Utilities .....	vii
Table E- 3: Summary of Energy Savings (Therms) - All PIES Utilities .....	vii
Table E- 4: Recommended NTG Estimates .....	x
Table 1: Summary of Completed EM&V Activities .....	3
Table 2: Summary of the Residential Energy Audit Program Components .....	4
Table 3: Summary of the Income Qualified Program Components .....	5
Table 4: Summary of Eligible Measures for the Residential and Commercial Efficient Natural Gas Program .....	6
Table 5: Key Research Questions .....	7
Table 6: Data Sources for Impact Evaluation .....	8
Table 7: Surveys Contributing to Process Evaluation and Savings Estimates .....	8
Table 8: Summary of Process Evaluation Activities .....	9
Table 9: Summary of <i>Excess is Out</i> Media Campaign for 2015 .....	10
Table 10: Summary of Participants by Utility and Year .....	13
Table 11: Summary of Program Participants by Type for Income Qualified Program (2015) .....	16
Table 12: Summary of Contractor Activity for the Efficient Natural Gas Equipment Program .....	23
Table 13: Analysis of Number of Jobs Completed by Measure .....	23
Table 14: Summary of Custom Projects (2014-2015) .....	24
Table 15: Summary of In-Depth Interviews by Organization .....	31
Table 16: Satisfaction Ratings for Custom Program .....	40
Table 17: Number of Residential Participating Surveys Completed for Process Evaluations .....	42
Table 18: Overview of Programs and Measures .....	47
Table 19: <i>Ex Ante</i> per Unit Gross Annual Therm Savings Values by Measure, Residential Energy Audit Program .....	49
Table 20: Realization Rates, per unit by Measure, Atmos Residential Energy Audit Program .....	51

Table 21: Realization Rates, by Measure, BH Distribution Residential Energy Audit Program.....	51
Table 22: Realization Rates, per unit by Measure, CNG Residential Energy Audit Program .....	51
Table 23: Summary of Measure and Persistence Rates for the In-Home Audit Direct Install Measures...	52
Table 24: Audit Program - Direct Install Measures .....	53
Table 25: Free Ridership, Spillover, and NTG Estimates, Residential Energy Audit Program .....	54
Table 26: <i>Ex Ante</i> per Unit Gross Savings Values by Measure, Income Qualified Program (Annual Therms) .....	55
Table 27: Realization Rates by per unit Measure, Atmos Income Qualified Program .....	56
Table 28: Realization Rates by Measure, CNG Income Qualified Program.....	57
Table 29: Realization Rates by Measure, BH Distribution Income Qualified Program .....	58
Table 30: <i>Ex Ante</i> per Unit Gross Savings Values by Measure, Energy Efficiency Kits Program (Annual Therms).....	59
Table 31: Realization Rates from Energy Efficiency Kits by Measure .....	60
Table 32: <i>Ex Ante</i> Per Unit Gross Annual Therm Savings, Residential Equipment Program .....	60
Table 33: <i>Ex Ante</i> Per Unit Gross Annual Therm Savings, Commercial Equipment Program .....	61
Table 34: Realization Rates, per unit by Measure - Atmos Efficient Natural Gas Equipment Program .....	63
Table 35: Realization Rates, per unit by Measure - CNG Efficient Natural Gas Equipment Program .....	64
Table 36: Realization Rates, per unit by Measure - BH Distribution Efficient Natural Gas Equipment Program .....	65
Table 37: Free Ridership, Spillover, and NTG Estimates, Efficient Natural Gas Equipment Program .....	66
Table 38: Atmos Custom Program Goals and Results (YTD).....	67
Table 39: Black Hills Custom Program Goals and Results.....	68
Table 40: Measure Installations – Atmos.....	68
Table 41: Measure Installations – BH Distribution.....	69

## Executive Summary

The three natural gas utilities in Colorado: Atmos Energy Corporation (Atmos), Black Hills Gas Distribution (BH Distribution or Black Hills), and Colorado Natural Gas (CNG) fund a portfolio of energy efficiency programs through the Partners in Energy Savings (PIES), otherwise known as the Collaborative. The goals of these programs are to:

- Reduce end-use natural gas consumption in a cost-effective manner to save money for consumers and conserve non-renewable resources;
- Protect the environment by encouraging installation of efficiency measures that help reduce carbon dioxide emissions and air pollutants;
- Increase residential and commercial customer awareness of available energy efficiency opportunities including equipment upgrades and behavioral changes;
- Generate customer awareness of energy efficiency programs available through the PIES programs to support their energy efficiency objectives;
- Identify cost-effective natural gas savings measures for energy audit participants;
- Improve relationships with customers, trade allies and stakeholders by providing value-added energy efficiency services, training and education, hardware, verification and support; and
- Support a more robust local and statewide economy by using local labor (when possible), and helping Colorado residents reduce monthly energy expenses.

Under this collaborative approach, the PIES utilities offered the following programs during 2014-2015, marketed under the common brand, *Excess is Out*:

- Home Energy Evaluation Program with Direct Installation of Energy Savings Measures (Residential Energy Audit Program);
- Efficient Natural Gas Equipment Program (Residential and Non Residential);
- Energy Efficiency Kits Program (which includes both opt-in and school kit components);
- Income Qualified Program; and
- Custom Energy Efficiency Program

The PIES utilities hired the Johnson Consulting Group Team (Evaluation Team) to conduct Evaluation, Measurement & Verification (EM&V). This report summarizes the key findings from these activities. Supporting appendices are provided separately with detailed information regarding the analysis and findings from the desk review of the custom programs, the customer surveys, and review of engineering algorithms.

For the impact evaluation, the Evaluation Team calculated the energy savings values on a per unit measure basis, rather than calculating the total annual savings values for all measures installed at the program level. This approach was driven by the timing of the EM&V work relative to the Annual Reporting schedule; the savings impacts will be applied in the upcoming Program Year 2016 annual report for each PIES utility in April 2016. So, the PIES Collaborative utilities will perform quantity calculations (i.e., total assumed vs. evaluated savings) as part of the annual reporting process.

Table E-1 summarizes the key EM&V activities completed as part of this program evaluation.

**Table E- 1: Summary of Completed EM&V Activities**

EM&V Activity	Residential Programs				Commercial Programs	
	Home Energy Evaluation (Audit)	Efficient Natural Gas Equipment Program	Energy Efficiency Kits	Income Qualified Program	Efficient Natural Gas Equipment Program	Custom Program
Review of Program Materials	✓	✓	✓	✓	✓	✓
Review of Program Tracking Database	✓	✓	✓	✓	✓	✓
Conduct Program Staff In-Depth Interviews	✓	✓	✓	✓	✓	✓
Conduct Participant Surveys	✓	✓				✓
Review <i>ex ante</i> Estimates	✓	✓	✓	✓	✓	✓
Determine Installation Rates	✓	✓		✓	✓	✓
Determine Gross/Net Savings by Measure	✓	✓			✓	
Review Engineering Assumptions						✓

## Key Conclusions and Recommendations

The program evaluation activities yielded the following conclusions and recommendations on ways to enhance and improve the PIES program portfolio.

### Conclusions

#### ***Program Results***

**Performance relative to goals:** The PIES programs performed unevenly during the two-year evaluation period and did not achieve their participation or energy savings goals at the portfolio level in PY15. Table E-2 summarizes the overall participation rates for the PIES programs during PY15. Due to the lack of availability of critical data, the total number of participants could not be determined for the two-year evaluation period. However, this table shows that overall, the PIES program portfolio across the three utilities met 84 percent of its participation goal. Furthermore, the participation rates were highest in PY15 for the Income Qualified Program (119%) and Residential Energy Audit Program (96%). Participation rates

were also high for the Energy Efficiency Kits Program, however that result is primarily driven by Atmos' program as BH Distribution did not include energy efficiency kits in its PY2015 program offerings.

**Table E- 2: Comparison of PY 2015 Participation Rates Across All PIES Utilities**

Total	Planned 2015	Actual 2015	% of Goal 2015
Total Portfolio-All Programs	3,786	3,179	84%
Residential Energy Audit Program	315	302	96%
Efficient Natural Gas Equipment Program	1,418	596	42%
Residential	1,226	583	48%
Nonresidential	192	13	7%
Income Qualified Program	800	953	119%
Energy Efficiency Kit Program	1,234	1,310	106%
Custom Energy Efficiency Program	19	18	95%
<b>Total</b>	<b>8,990</b>	<b>6,954</b>	<b>77%</b>

As Table E-3 shows, the total portfolio achieved just 62 percent of its energy savings (therms) goal across the entire portfolio in PY15. Again, the Income Qualified and Energy Savings Kits Programs achieved the highest savings; however, this was largely due to Atmos' efforts to promote the Energy Savings Kits both directly to customers and through its schools-kit program. As mentioned previously, BH Distribution did not include energy efficiency kits in its PY2015 program portfolio.

**Table E- 3: Summary of Energy Savings (Therms) - All PIES Utilities**

Total	Planned 2015	Actual 2015	% of Goal 2015
<b>Total Portfolio (all programs)</b>	445,420	276,026	62%
Energy Audit Program	13,670	3,081	23%
Efficient Natural Gas Equipment Program	132,050	46,224	35%
Residential	n/a	44,560	n/a
Nonresidential	n/a	1,664	n/a
Income Qualified Program	142,020	135,278	95%
Energy Efficiency Kit Program	17,780	27,870	157%
Custom Energy Efficiency Program	139,900	63,573	45%
<b>Total</b>	<b>890,840</b>	<b>598,276</b>	<b>67%</b>

**Realization rates<sup>1</sup> for the individual programs vary significantly by both utility and measure.**

<sup>1</sup> The realization rate is used to adjust the gross savings (as calculated by the savings algorithms) based on impact evaluation studies. The realization rate is equal to the ratio of measure savings developed from an impact evaluation to the estimated measure savings derived from the savings algorithms.

- For the Residential Energy Audit Program, realization rates varied significantly across measures with the rates for faucet aerators, pipe insulation, programmable thermostats and water heater blankets. Realization rates were well only 59 percent for low-flow showerheads.
- The Income Qualified Program also produced mixed results by measure varying from 45 to 250 percent across the three PIES utilities.
- The Energy Efficiency Kits Program achieved significantly high realization rates for all measures distributed by Atmos and CNG, except faucet kitchen aerators.
- For the Efficient Equipment Natural Gas Equipment Program, the realization rates were around or above 100 percent for air sealing, boilers, furnaces, programmable thermostats and proper sizing of furnaces/boilers for the residential measures. In contrast, the realization rates were significantly below 100 percent for duct sealing, insulation measures (attic, basement, floor and wall), furnace maintenance and water heaters.
- For the Custom Program, Atmos closely followed its expected goals in both gas savings and participation numbers. The majority of projects were at multifamily facilities; other participating facilities included schools and industrial buildings. However, BH Distribution fell short of savings goals in both 2014 and 2015. In participation, it closely met its goal in 2014 and exceeded goals in 2015. While custom projects were installed in a variety of building types, most were at lodging facilities.

### ***Customer Satisfaction***

- **Customer satisfaction continues to be high among program participants.** The customer surveys found that respondents reported high satisfaction levels with both Energy Audit Program and Efficient Natural Gas Equipment Program as well as with the three PIES utilities.

### ***Program Awareness***

- **Most participants learned about these programs indirectly rather than as a result of the marketing or outreach strategies.** For example, most Residential Energy Audit Program participants learned about the program through non-profit agencies (29%) compared to the other types of marketing and outreach tactics used to promote the program. The contractors continue to play an important role in promoting the Efficient Natural Gas Equipment Program. In contrast, many fewer respondents reported learning about the program from other sources, including social media, online or from radio or television advertising.

### ***Program Operations***

- **Program operations varied significantly throughout the two-year evaluation period.** For example, Residential Energy Audit Program participation rates increased slightly in the Spring of 2014 and then dropped off again until the Winter of 2015. For the Efficient Natural Gas Equipment Program, the overall number of incented measures installed through the program declined 14 percent from PY2014 to PY2015.

## ***Program Tracking***

Program tracking remains a critical and ongoing challenge for both program operations and evaluation. Since each PIES energy efficiency program is tracked in a separate database, there is no consistency between or among program implementers regarding tracking critical program metrics such as the number of participants, location, or specific participant data.

The evaluation team also faced several challenges in receiving complete and accurate information from the income-qualified program administrator, CORE otherwise known as Energy Smart Colorado. Due to the lack of complete information for PY2014, our analysis only focused on the results from PY2015. In addition, it required several iterations of data requests to receive the full and complete set of data from the program implementer.

- **The PIES utilities may be missing saving opportunities in the Residential Energy Audit Program in several ways.** While this program can provide a stepping-stone into additional energy efficiency purchases and behaviors, these audits may not be maximizing their full potential while in the home. BH Distribution was the only utility that had rebated projects as a result from the assessment.
- **The PIES programs are still facing some serious barriers to program implementation.** According to program staff and implementers, these barriers include the diversity of each of the natural gas service territories in that they are not homogeneous. The customer demographics are also challenging as the price for the audit may be too high for some customers living in poor, rural areas of the state.

The commercial component of the Efficient Natural Gas Equipment Program and the custom program also face several barriers include a lack of engaged or informed trade allies, especially for the commercial projects that make it difficult to implement projects for BH Distribution and CNG.

## **Areas for Program Improvement**

- **The evaluation identified several areas for program improvement** including increased communication among the program implementers, improved reporting on the marketing activities so the implementers can coordinate with the utility staff on marketing and outreach.
- **The program implementers also wanted some additional clarity regarding the savings assumptions used to estimate savings for the installed measures.** This will help them better track the savings for each project and monitor their progress.

## ***Free Ridership and Spillover***

- While the free ridership for the Efficient Natural Gas Equipment Program was high (42%), this was somewhat offset by spillover (10%) for a NTG value of 68 percent.
- The Residential Energy Audit Program had lower free ridership (15%), which was more than offset by spillover, yielding an estimated NTG ratio of 100 percent.

**Table E- 4: Recommended NTG Estimates<sup>2</sup>**

Program	Free Ridership	Spillover	NTG
Residential Energy Audit Program	15%	>100%	100%
Efficient Natural Gas Equipment Program	42%	10%	68%

## Recommendations

These program evaluation activities also led to the following recommendations from the Evaluation Team.

### *Program Results*

- **The PIES utilities should review the realization rates achieved by each program measure and adjust its portfolio offerings accordingly to maximize energy savings.** These may include changes in the energy efficient direct install measures, such as kitchen aerators and low-flow showerheads, as well as reviewing the cost-effectiveness of the insulation measures offered in its Efficient Natural Gas Equipment Program.

### *Program Operations*

- **The PIES utilities should continue to work to improve the program tracking databases developed by each of the program implementer.**
- **The Residential Energy Audit program should attempt to increase savings by increasing direct installation measures and/or encouraging participation in other PIES Collaborative energy efficiency programs by providing information about these savings opportunities in the materials provided during the in-home audit.**
- **The direct install measure mix needs to be updated in order to increase overall installation rates of these measures. The Custom Efficiency Program can be improved by implementing the improving engineering analysis and review for measure identification, project selection and increase marketing and outreach.**

### *Marketing*

- **Some of the current marketing activities need to be improved and refreshed.** Less emphasis should be placed on direct customer outreach and instead the marketing should focus on engaging and recruiting trade allies to participate in the program.
- **The Residential Energy Audit Program should continue to be positioned as the “gateway” program to promote the Efficient Natural Gas Equipment Program.**

---

<sup>2</sup> The income qualified programs have an assumed NTG of 100%

- The advertising agency should be required to track and report critical metrics regarding the program's overall success in its various activities as a way to better monitor and improve the performance of these marketing activities.

#### ***Enhancing Savings Calculations***

- The PEs utilities should update savings algorithms and values to those present in this report. Future savings claims and goals should be based on these new values.

#### ***Spillover***

- *Spillover* rates are highest for non-natural gas measures, which is not beneficial to the sponsoring gas utilities.

# 1 Introduction

The three natural gas utilities in Colorado: Atmos Energy Corporation (Atmos), Black Hills Gas Distribution (BH Distribution or Black Hills) (formerly known as SourceGas Distribution) and Colorado Natural Gas (CNG) fund a portfolio of energy efficiency programs through the Partners in Energy Savings (PIES) otherwise known as the Collaborative. On March 7, 2008, the Public Utilities Commission (PUC) of the State of Colorado issued a Decision No. C08-02481 related to gas efficiency programs in these utility territories in Docket No. 07R-371G.

This portfolio of programs is both cost-effective based on the assumptions made in the filings by the individual utilities and satisfies the Public Utility Commission (PUC) and Colorado state energy efficiency goals. Specifically, the goals articulated for these programs are to:

- Reduce end-use natural gas consumption in a cost-effective manner to save money for consumers and conserve non-renewable resources;
- Protect the environment by encouraging installation of efficiency measures that help reduce carbon dioxide emissions and air pollutants;
- Increase residential and commercial customer awareness of available energy efficiency opportunities including equipment upgrades and behavioral changes;
- Generate customer awareness of energy efficiency programs available through the PIES programs to support their energy efficiency objectives;
- Identify cost-effective natural gas savings measures for energy audit participants;
- Improve relationships with customers, trade allies and stakeholders by providing value-added energy efficiency services, training and education, hardware, verification and support; and
- Support a more robust local and statewide economy by using local labor (when possible), and helping Colorado residents reduce monthly energy expenses.

The cost savings associated with using a collaborative approach allows each utility to direct more of its Demand Side Management (DSM) program dollars toward maximizing the installation of energy efficiency measures in its respective service territory. Additionally, designing collaborative programs with integrated marketing activities, efficiency measures and Equipment structures permit consistent messaging by these utilities, which may lessen the potential for confusion among natural gas consumers in the utilities' service areas that could result from the implementation of substantially different DSM portfolios. These programs were delivered and administrated collaboratively; however, each utility partner tracked, documented, and reported program impacts, budgets, costs and other metrics separately

Under this collaborative approach, the PIES utilities offer the following programs:

- Residential Energy Audit Program with Direct Installation of Energy Savings Measures
- Efficient Natural Gas Equipment Program (both Residential and Non Residential)
- Income Qualified Program
- Energy Efficiency Kits Program
- Custom Energy-Efficiency Program

To maximize program efficiency, the three Colorado natural gas utilities worked collaboratively to implement and market efficiency programs. The benefits associated with this collaboration included:

- Economies of scale associated with program marketing, administration, delivery, tracking, and bulk purchases of program materials;
- Integrated marketing, efficiency measures and rebate structures supporting a consistent message and less confusion among Colorado customers;
- Integrated, consistent training on program protocols, guidelines, and installation best practices;
- Development of a unique working partnership and cost savings benefits that have allowed the collaborating utilities to set among the most attractive rebate levels in the state, establish a good living wage for its service providers, and direct more of its DSM program dollars toward the installation of energy efficiency measures

The programs are marketed under a common brand, *Excess is Out*, and are implemented by the following contractors:

- **Blue Onion:** leads joint marketing efforts and launched the *Excess is Out* campaign.
- **Energy Outreach Colorado (EOC):** supports all components of the Income Qualified Program.
- **CORE:** performs program delivery and administrative functions for the Energy Audit Program.
- **AM Conservation:** provides the opt-in kits and components.
- **EGIA:** performs program delivery and administrative functions for the Efficient Natural Gas Equipment Program.
- **Mesa Point Energy:** administers the Custom Energy Efficiency Program.

The three Colorado Utilities (PIES) hired the Johnson Consulting Group team (Evaluation Team) to conduct a complete analysis of its energy efficiency portfolio using Evaluation, Measurement & Verification (EM&V) methodologies. The report summarizes the key findings from these activities. Supporting appendices are provided separately with detailed information regarding the findings from the customer surveys, desk review of the custom programs, and review of engineering algorithms. Table 1 summarizes the key EM&V activities completed as part of this program evaluation.

**Table 1: Summary of Completed EM&V Activities**

EM&V Activity	Residential Programs				Commercial Programs	
	Home Energy Evaluation (Audit)	Efficient Natural Gas Equipment Program	Energy Efficiency Kits	Income Qualified Program	Efficient Natural Gas Equipment Program	Custom Program
Review of Program Materials	✓	✓	✓	✓	✓	✓
Review of Program Tracking Database	✓	✓	✓	✓	✓	✓
Conduct Program Staff In-Depth Interviews	✓	✓	✓	✓	✓	✓
Conduct Participant Surveys	✓	✓				✓
Review <i>ex ante</i> Estimates	✓	✓	✓	✓	✓	✓
Determine Installation Rates	✓	✓		✓	✓	✓
Determine Gross/Net Savings by Measure	✓	✓			✓	
Review Engineering Assumptions						✓

### **1.1 Program Descriptions**

This section provides a brief summary of the scope of each PIES program offering.

#### **Residential Energy Audit Program**

This program was available to all residential customers in existing homes who purchase their heating fuel directly from one of the participating gas utilities. The audit includes an assessment of the building envelope, mechanical systems, and other energy uses. Certified Home Energy Rating System energy raters make improvement suggestions and offer to install low-cost conservation measures at the time of evaluation. These measures include low-flow showerheads, faucet aerators, hot water heater blanket and pipe insulation, and programmable thermostats. In addition, the audit includes infrared imaging and/or a blower door test along with the energy evaluation. Infrared imaging detects inconsistencies in wall insulation and allows the auditor and the customer to see areas of air leakage. The blower door testing measures the home’s air infiltration rate and helps the auditor identify leakage areas. Table 2 summarizes the program components.

**Table 2: Summary of the Residential Energy Audit Program Components**

Component	Measure	Eligibility Rating	Incentive*
Energy Audit	Site evaluation	n/a	\$150
	Site evaluation + infrared imaging and/or blower door test	n/a	
Direct Installation	Low-flow showerhead	2.0 gallons per minute (GPM)	Full cost
	Low-flow faucet aerators	1.5 GPM	Full cost
	Hot water blanket	n/a	Full cost
	Water pipe insulation	R-4 insulation	Full cost
	Programmable thermostat	All	Full cost, less customer co-pay
	Water heater setback	All	Full cost
	Weather-stripping	Up to 2 Doors	Full cost

\*Maximum incentive of \$50 for direct installation measures.

### **Income Qualified Program**

The Income Qualified Program promotes energy efficiency for income qualified residential customers in existing homes. The program includes three components:

1. Targets income qualified single-family<sup>3</sup> and mobile home<sup>4</sup> residents. This component includes energy education, on-site energy audits, direct installation of low-cost natural gas water heating measures, and weatherization measures. It can include more extensive efficiency upgrades if needed.
2. Offers energy efficiency kits, which contain a range of low-cost natural gas savings measures that are distributed free to income qualified customers
3. Offers subsidized propane-to-natural gas conversion services to income qualified customers.

#### *Single-Family Weatherization*

In 2012, Energy Outreach Colorado (EOC) began implementing this program on behalf of the Colorado gas utilities. They coordinate activities with eight regional income qualified weatherization agencies throughout Colorado. These agencies qualify participants, conduct marketing, procure materials, manage auditors and equipment installation subcontractors, and track results.

#### *Energy Efficiency Kits*

To enhance overall energy savings, the program also offers energy efficiency kits with customized energy efficiency measures, educational materials, and labels to help customers self-install the measures.

<sup>3</sup> Single- family homes are defined those with up to four individual dwelling units.

<sup>4</sup> In order to be eligible, mobile homes must be on a permanent foundation.

*Propane-to-Gas Conversion*

In this component of the Income Qualified Program, also administered by EOC, the three Colorado gas utilities offer subsidies to income qualified customers to help them overcome the initial cost barrier of converting from propane to natural gas service. This allows customers to immediately begin saving on their monthly utility expenses.

The Income Qualified Program promotes energy efficiency for existing low income residential customers. The program targets single family and manufactured homes through its residential program offering and multifamily facilities for commercial customers (see Table 3). Both components provide energy education, on-site energy audits, direct installation of low-cost natural gas water heating and weatherization measures to program participants. Both types of installations may also qualify for more extensive efficiency upgrades if needed.

**Table 3: Summary of the Income Qualified Program Components**

Component	Measure	Incentive
Direct Installation for Single Family and Multifamily Projects	Attic Insulation	Full cost
	Crawlspace Insulation	
	Wall Insulation	
	Duct Insulation	
	Floor Insulation	
	Rim/Boxsill Insulation	
	Heat Pipe	
	Furnace System	
	Programmable Thermostats	
	Domestic Hot Water Systems	

**Energy Efficiency Kits**

The Energy Efficiency Kit Program was introduced in the 2014–2016 program implementation plan. It promotes the installation of low-cost energy efficiency measures and disseminates efficiency education to existing residential customers. This plan features two components: the opt-in kit and the energy education kit. The energy education kit is coupled with in-class activities to promote conservation and energy efficiency in the home, and is implemented through Resource Action Programs (RAP).

In 2015, Atmos distributed opt-in kits while attending home and garden shows as well as energy forums throughout the state, and using kits as marketing/talking points. Customers signed up for the kits at events and received the kits via mail after Atmos confirmed them as customers. CNG distributed 416 Energy Education Kits and 14 Opt-In Kits. BH Distribution did not include energy efficiency kits in its PY2015 energy portfolio.

## Efficient Natural Gas Equipment Program

The Efficient Natural Gas Equipment Program offers prescriptive rebates for a range of high-efficiency natural gas heating and hot water systems (see Table 4). The program is available to all residential and commercial customers in existing homes and businesses or for new construction who purchase their heating fuel directly from one of the three Colorado gas utilities. Throughout 2015, the collaborative continued to work with EGIA to administer the program and process rebates.

**Table 4: Summary of Eligible Measures for the Residential and Commercial Efficient Natural Gas Program**

Measure	Efficiency Level	Incentive
Air Sealing	All	30% of cost, up to \$300 <sup>a</sup>
Attic Insulation	All (requires R-11 maximum base value)	30% of cost, up to \$300 <sup>a</sup>
Boiler	85% ≤ annual fuel utilization efficiency (AFUE) ≤ 94.9%	\$100
	AFUE ≥ 95%	\$300
Crawlspace/Basement Perimeter Insulation	All (requires no existing insulation)	30% of cost, up to \$300 <sup>a</sup>
Floor Insulation	All (requires no existing insulation)	30% of cost, up to \$300 <sup>a</sup>
Furnace	AFUE ≥ 95%	\$300 <sup>a</sup>
Low-Flow Sprayer (pre-rinse spray valve [PRSV]) <sup>b</sup>	n/a	\$25
Miscellaneous Hot Water and Infiltration	Tank wrap, pipe wrap, caulk, etc.	\$25
Programmable Thermostat	All	\$25
Proper Sizing of Boiler/Furnace	Proper sizing criteria	\$50
Wall Insulation	All (requires zero existing insulation)	30% of cost, up to \$300 <sup>a</sup>
Water Heater	Tankless, energy factor (EF) ≥ 0.82	\$300

<sup>a</sup> Participants who have also had an energy audit and upgrade their furnace or install recommended air-sealing and insulation measures are eligible for an additional rebate to cover the full cost of the Basic Energy Evaluation (\$100), thus extending the rebate cap for these participants up to \$400.

<sup>b</sup> Low-flow sprayers are available only to commercial customers.

## Custom Program

In 2014, the Colorado gas utilities hired Mesa Point Energy (MPE) to administer the Custom Energy Efficiency Program (CEEP) for the two natural gas utilities in Colorado. The CEEP offers an incentive based program that targets larger commercial customers and multifamily residences. Incentives are offered for energy efficient equipment, controls, insulation, and other energy saving strategies. In addition, incentives are available for technical studies. CNG started offering the program in PY2015, but to date, has not had any participants.

Customers receive technical assistance through the program. These services range from basic assistance to completing the application forms to a comprehensive engineering review. The assistance is provided to help evaluate eligibility for incentives and to ensure quality projects are identified and achieved.

The custom program targets multifamily residences, larger commercial and industrial (C&I) customers, and very large homes. The program process begins with a walk-through of the facility, followed by a more technical evaluation if necessary.

## 1.2 Scope of EM&V Activities

A process evaluation gathers information from a variety of sources, including program staff, program implementers, trade allies and program participants. This approach, which gathers data from multiple sources and then “triangulates” the data, and compares it across multiple groups, increases the validity of the findings. Table 5 identifies key researchable issues that were explored during this process evaluation.

**Table 5: Key Research Questions**

Research Area	Key Research Questions
Specific Program Characteristics	<ul style="list-style-type: none"> <li>What are the demographic profiles of the residential program participants?</li> <li>What are the differences among program participants?</li> <li>What are the installation rates for each measure?</li> <li>What are the persistence and spillover rates for these measures?</li> </ul>
Effectiveness of Program Operations & Delivery	<ul style="list-style-type: none"> <li>What is the average time from initial application to project completion for each program?</li> <li>Has this changed since program launch?</li> <li>Is the program performing as expected based on the perceptions from the staff/key stakeholders?</li> <li>How satisfied are trade allies with the program implementation and delivery?</li> <li>Overall, how satisfied are customers with the program delivery?</li> <li>What are customer satisfaction levels for various program components, such as the eligibility requirements, deadlines, application process, etc.? Are any of these components perceived as too burdensome?</li> </ul>
Effectiveness of Marketing and Outreach Activities	<ul style="list-style-type: none"> <li>What is the general awareness of the programs among customer groups?</li> <li>Which marketing and outreach activities are the most effective?</li> <li>Which ones are least effective?</li> <li>What key messages appear to appeal best to customers? Which ones are least effective?</li> <li>How can these materials and outreach activities be improved?</li> </ul>
Participant Decision-Making Process	<ul style="list-style-type: none"> <li>Please describe the participation process for each program.</li> <li>Why do program participants decide to participate?</li> </ul>
Barriers to Program Participation	<ul style="list-style-type: none"> <li>What are the barriers to program participation?</li> <li>What has been the effect of program changes on reducing identified barriers?</li> </ul>
Areas for Program Improvement	<ul style="list-style-type: none"> <li>How can the PIES improve its programs, in terms of design and delivery?</li> <li>What other types of offerings or delivery strategies should IPC consider?</li> </ul>
Key Customer Demographics	<ul style="list-style-type: none"> <li>What is the customer breakdown between owner-occupied buildings and leased space?</li> <li>What is the average household income among the different participant groups?</li> </ul>

The key researchable issues for the impact evaluation are:

- What percent of incented measures were actually installed by the participants?
- What are the gross impacts for the measures?
- What percent of the incented measures can be attributed (i.e., net savings) to the program?
- Did the program encourage energy efficient purchases outside of the programs?

To maximize the usefulness of this evaluation, the effort focused on measures with the highest per unit savings, areas with the most uncertainty, and the highest potential during the 2014-2016 program period. Table 6 shows the data sources used for the impact evaluation.

**Table 6: Data Sources for Impact Evaluation**

Source	Details
Tracking data	Review of program tracking databases to assess completeness of data
Engineering algorithms	Review of the savings assumptions and algorithms that comprise up the expected measure savings.
Participant Surveys	Surveys conducted as part of the process evaluation will include questions about the installation of measures, demographic information, inputs for the engineering analysis (e.g., size and vintage of home), as well as free-ridership and spill over estimates.

The 2014-2015 program evaluation also included completing telephone surveys with program participants for two programs: The Residential Energy Audit Program and the Efficient Natural Gas Equipment Program. The Residential Energy Audit Program was selected because the program had a new implementation contractor, plus far lower than planned participation and savings. The Efficient Natural Gas Equipment Program was selected because it had a large number of participants and represented a larger percentage of portfolio savings. The total number of completed surveys are summarized in Table 7.

**Table 7: Surveys Contributing to Process Evaluation and Savings Estimates**

Program	Customer Surveys/Interviews
Residential Energy Audit Program	52
Efficient Natural Gas Equipment Program	62
Custom Program	2

Table 8 summarizes the process evaluation activities that the Evaluation Team conducted to complete its assessment of the PIES utilities program portfolio.

**Table 8: Summary of Process Evaluation Activities**

<b>Program</b>	<b>Program/ Document Review</b>	<b>Program Database</b>	<b>Implementation Contractors/ Staff Interviews</b>	<b>Participating Customer Surveys</b>
Residential Energy Efficient Audit	✓	✓	✓	✓
Income Qualified	✓	✓	✓	
Energy Efficiency Kits	✓	✓		
Efficient Natural Gas Equipment Program	✓	✓	✓	✓
Custom Program			✓	✓

## 2 Process Evaluation Results

This section summarizes the key findings from the process evaluation that was completed for all of the PIES utilities. More detailed findings from the customer surveys for each evaluated program are provided in Appendices A and B provided in Volume 2 of this report.

### 2.1 Review Program Materials

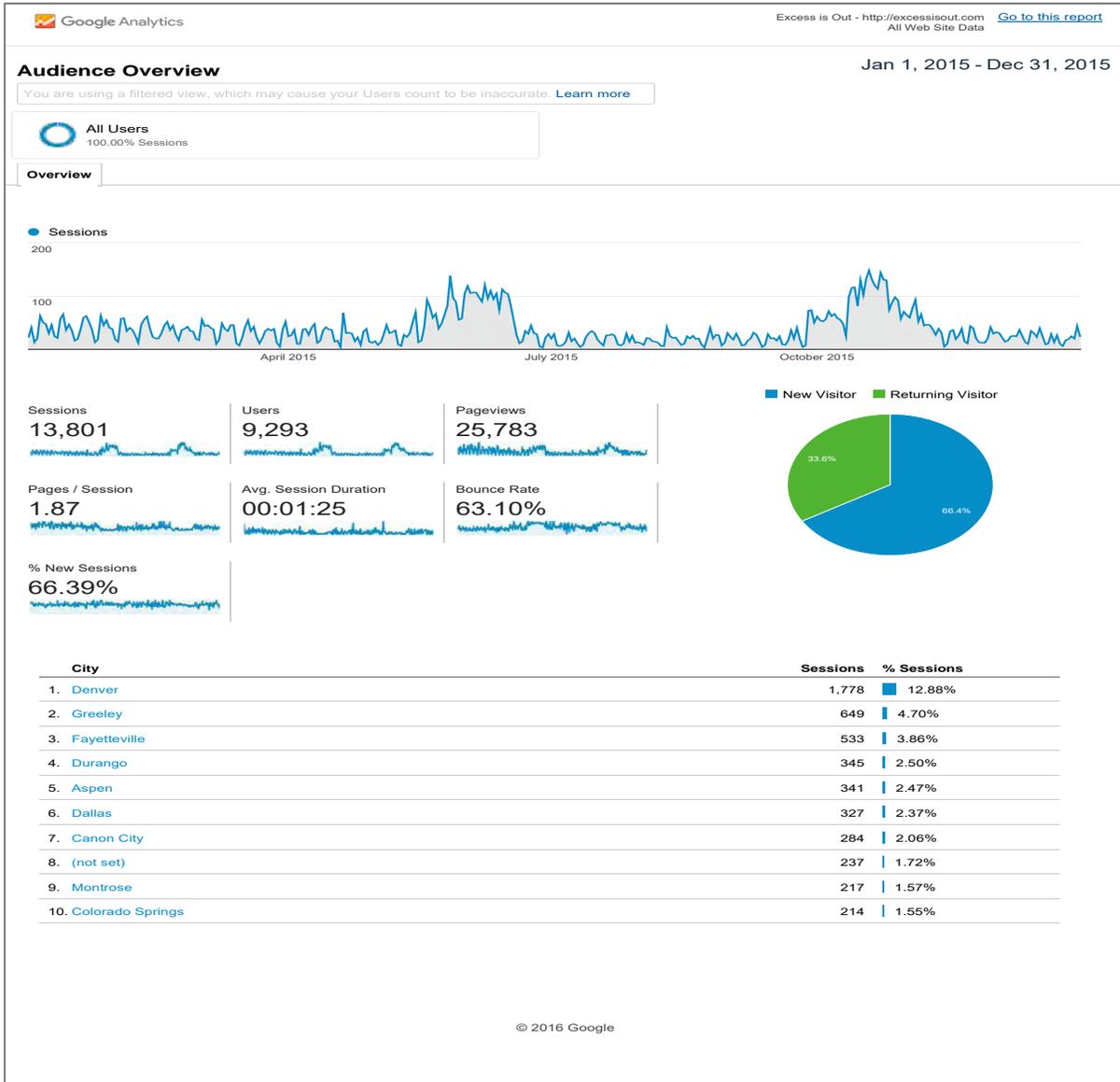
The program is marketed as the *Excess is Out* Program. The process evaluation included a review of the marketing activities including the program website, television and radio advertisements, bill inserts, marketing materials and media outreach materials used to reach both customers and trade allies. The materials are easy to read, memorable, and convey a difficult message in easy-to-understand language (see Table 9).

The PIES utilities’ advertising agency, Blue Onion, continues to use the *Excess is Out* theme to emphasize the importance of not using too much energy. In 2014-2015, the agency promoted this message in a variety of ways including a new social media campaign, television and radio commercials, and that illustrates different ways in which customers can perceive “excess” thereby cleverly demonstrating that this type of behavior is no longer in fashion.

**Table 9: Summary of *Excess is Out* Media Campaign for 2015**

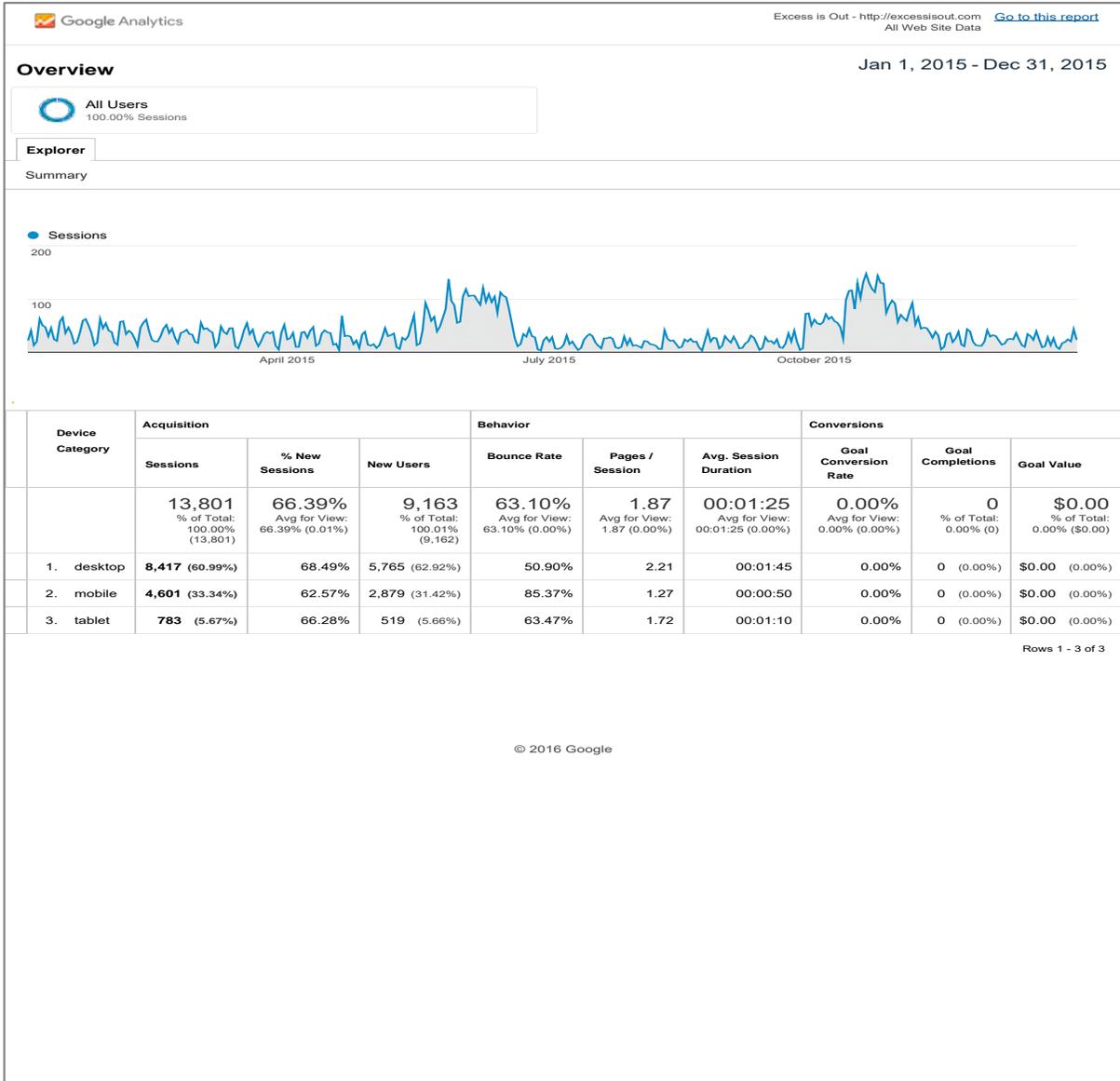
Utility	Radio	TV	Internet Web Analytics
Atmos	1,408 radio spots across 9 stations	1,124 cable TV spots across 5 Comcast cable zones	
CNG	No radio	1,589 cable TV spots across 8 Comcast cable zones	
Black Hills	823 radio spots across 8 stations	430 cable TV spots across 2 Comcast cable zones	
Total Program			13,801 unique visitors to the <i>Excess is Out</i> website with a 12.3% click through from the rebates page to Residential Energy Auditor or Efficient Natural Gas Equipment Page

Although Blue Onion did not track website traffic in 2015, the PIES utilities were able to provide the following information regarding the *Excess is Out* campaign. According to the information provided by the PIES utilities, the number of visits to the website increased during promotional periods, which suggests that the ads are driving traffic to the website. Moreover, most of these are new visitors, further suggesting that the advertising is helping to generate interest in the program. These findings are illustrated in the following screen shots provided by the utilities using Google Analytics.



**Figure 1: Analysis of New vs. Returning Website Visitors**

Figure 1 illustrates that the overall website activity increased compared from 2014 to 2015. Overall, there was an increase in the number of sessions (38.7%) and users (40.7%) for the website.



**Figure 2: Analysis of Device Used to View the Website**

Figure 2 illustrates that most visitors used their desktop computer to view the website (61%) compared to either viewing the website on their mobile phone (33%) or tablet (6%).

These findings are consistent with the feedback from the customer surveys and program implementers. Therefore, the website content needs to be refreshed and reinvigorated to improve its overall appeal. To encourage return visits, the website content should be updated periodically with new tips or advice as a way to more fully engage both current and potential program participants.

In addition, the advertising agency should be required to track and report critical metrics regarding the program’s overall success in its various activities as a way to better monitor and improve the performance of these marketing activities.

## 2.2 Review Program Tracking Methods

The second critical task was to review the program databases. The review determined if each program database is adequately capturing the key metrics necessary to document installation rates for each qualifying measure; summarize the key metrics regarding program operations; and number of participants by measure type, region, and average measure costs; and estimated savings impacts.

One of the more complex aspects for both program operations and program evaluation is that each PIES energy efficiency program is tracked in a separate database. Therefore, there is no consistency between or among program implementers regarding tracking critical program metrics such as the number of participants, location, or even the critical participant data. To perform this evaluation required extensive merging of separate program databases to generate samples for the residential surveys,

The key findings from this review are summarized next. However, as this review notes, several key data sets are either incomplete or missing, which limited the scope of this review.

### Residential Energy Audit Program Database Review

This section summarizes the findings from a review of the program records for the Residential Energy Audit Program. Even though these programs are run collaboratively, all of the individual utility programs are tracked separately by the program administrator, Energy Smart Colorado (also known as CORE). While this process may be helpful for some of the utilities, our evaluation determined that critical information was missing from these databases. Specifically, the number of actual energy audits completed for BH Distribution was not recorded for PY2014 (see Table 10). Therefore, this limited the scope of our review and suggests that the tracking systems for this program need to be revised and updated to ensure that all three utilities' program activities are accurately tracked.

**Table 10: Summary of Participants by Utility and Year**

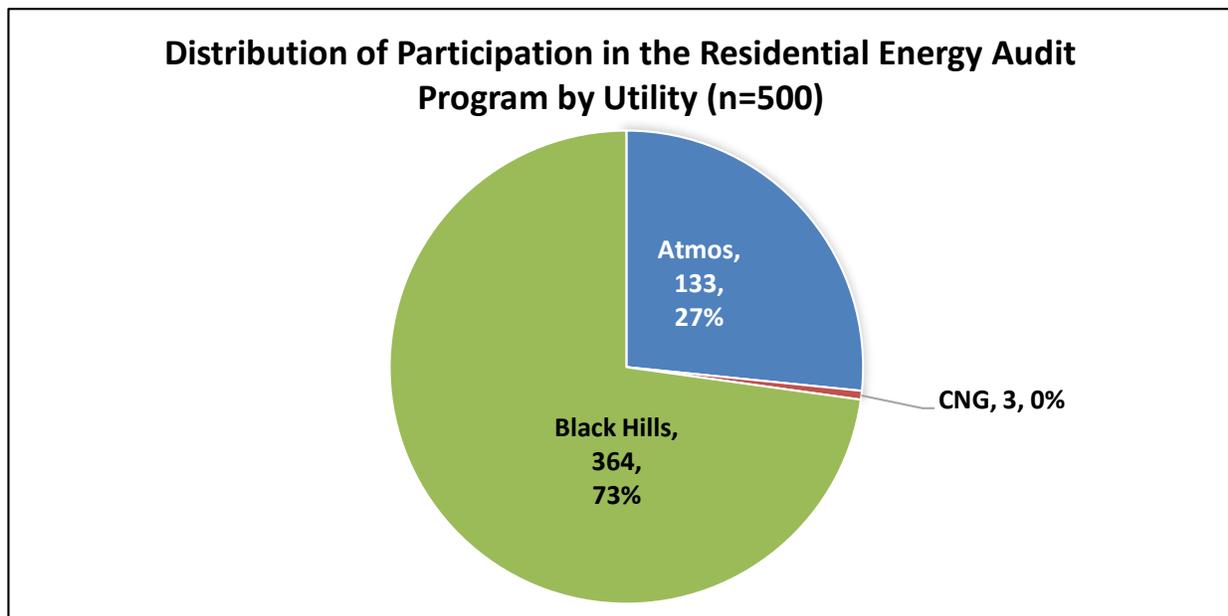
Utility	2014	2015	Total
Atmos	49	84	133
Black Hills	150 <sup>5</sup>	214	364
CNG	1	2	3
Total	199	301	500

(Source: Residential Energy Audit Program Database PY2014-PY2015)

---

<sup>5</sup> This is the planned not actual number of completed audits for Black Hills for 2014.

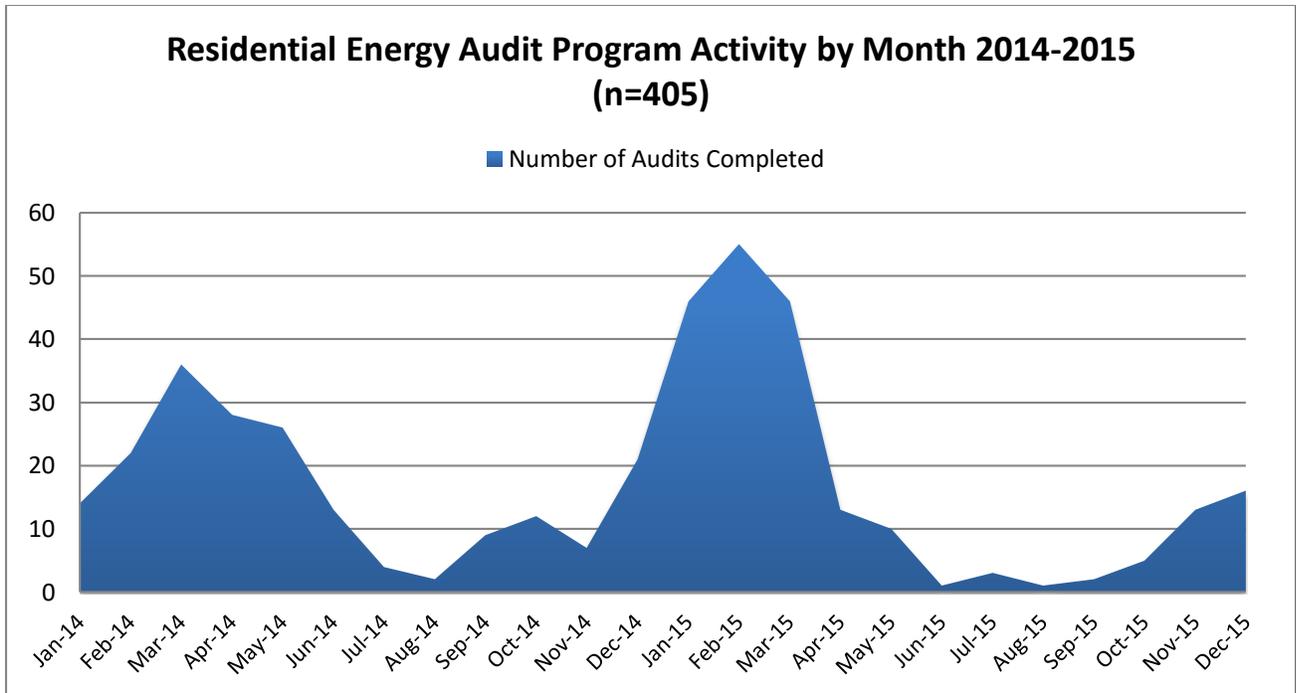
As Figure 3 shows, BH Distribution customers accounted for 73 percent of the participation in the program during the past two years, Atmos customers accounted for 27 percent of the completed audits while just three CNG customers received an energy efficiency audit from EOC during this two-year period.



(Source: Residential Energy Audit Program Database PY2014-PY2015)

**Figure 3: Distribution of Participation in the Residential Energy Audit Program by Utility**

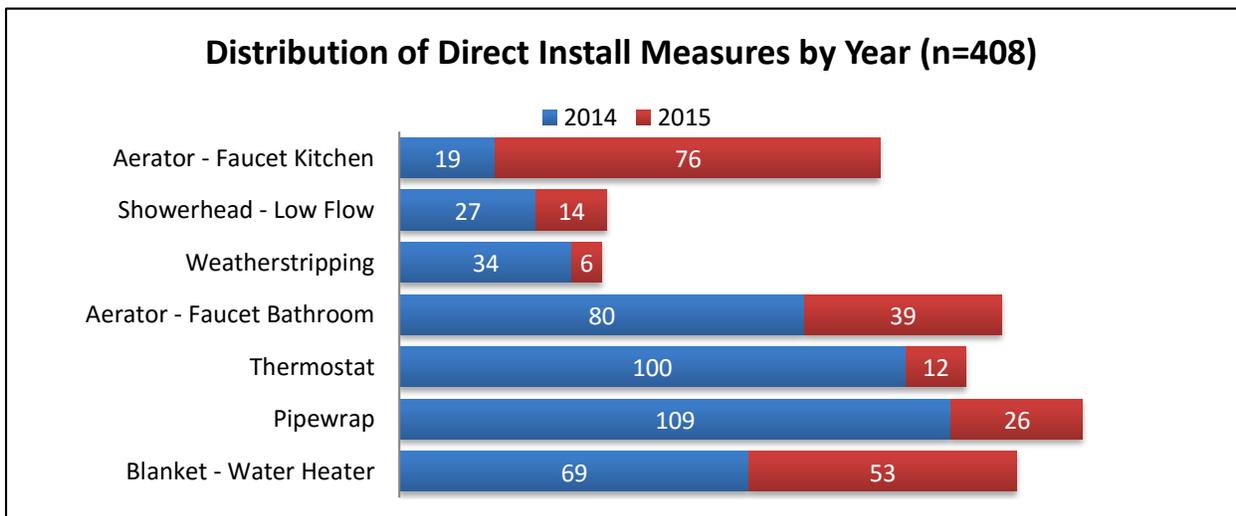
Program activity from PY2014 through PY2015 was fairly uneven as the following figure shows. Participation rates increased slightly in the Spring of 2014 and then dropped off again until the winter of 2015. Program activity was very low during the spring and summer of 2015, primarily due to a lack of funding available as explained by the program implementers in Section 2.4.



(Source: Residential Energy Audit Program Database PY2014-PY2015)

**Figure 4: Residential Energy Audit Program by Month in 2014-2015**

The following figure summarizes the total number of measures installed through the program. However, as this figure shows, not every program participant received a direct install measure. Rather, measures were installed in approximately two-thirds of customer homes. The reasons for not installing energy efficiency measures in all homes is explored more fully in the customer surveys, summarized in Section 2.6.



(Source: Residential Energy Audit Program Database PY2014-PY2015)

**Figure 5: Distribution of Direct Install Measures by Year**

### Income Qualified Program Database Review

The evaluation team also reviewed the program database which tracks the activities related to the low-income program. However, this database review was complicated due to the lack of complete information for PY2014, so our analysis only focused on the results from PY2015. In addition, it required several iterations of data requests to receive the full and complete set of data from the program implementer, Energy Outreach Colorado (EOC).

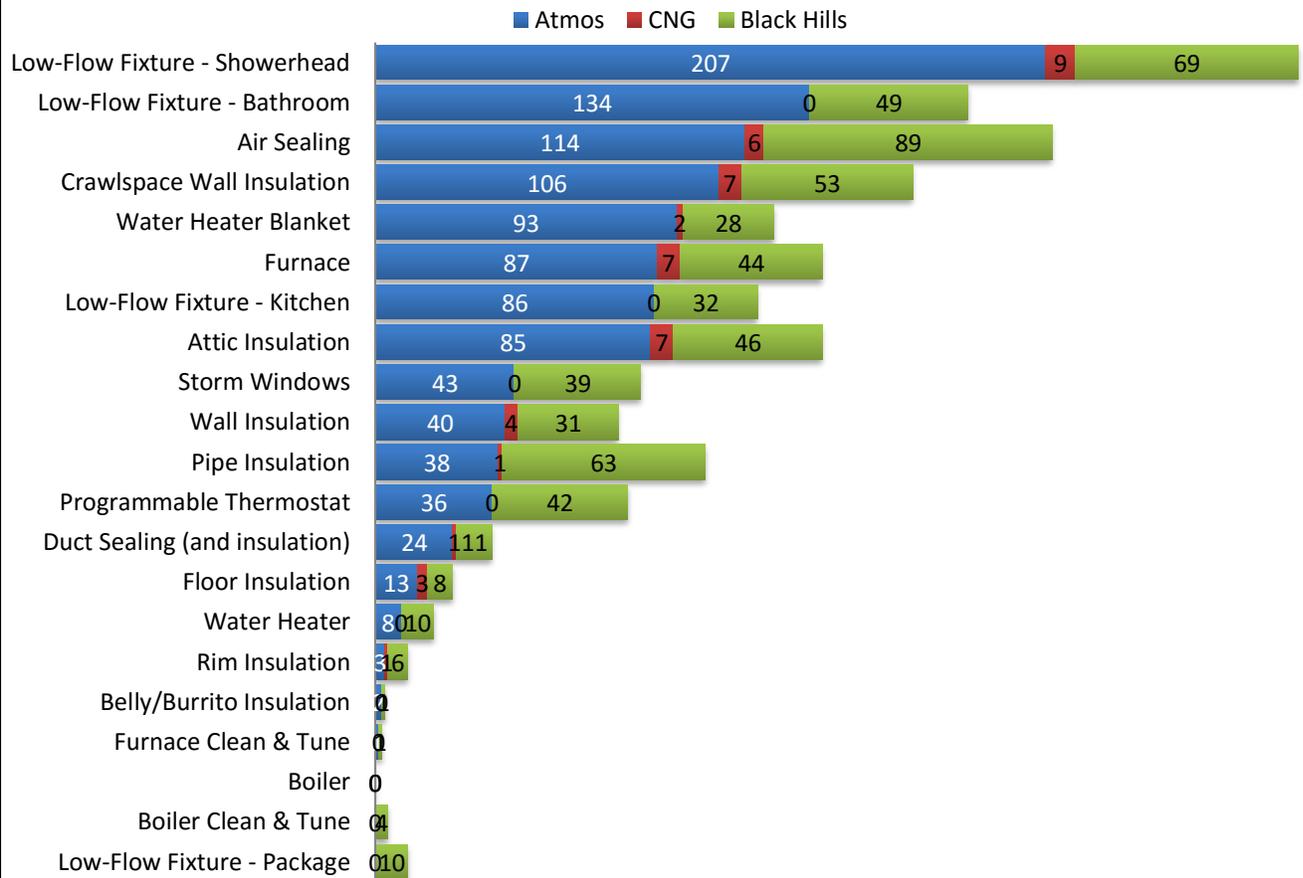
**Table 11: Summary of Program Participants by Type for Income Qualified Program (2015)**

Income Qualified Programs	Atmos	Black Hills	CNG
Single Family Weatherization	300	317	20
CIP	26	13	---
Multi-Family Weatherization	163	98	---
Energy Efficiency Kits	23	27	3
CARE	---	143	---

(Source: EOC Program Database PY2015)

Figure 6 summarizes the distribution installed measures during the one-year period. Overall, Atmos customers received a total of 1,120 measures or 62 percent, while BH Distribution customers received 636 measures representing 35 percent of all measures. CNG customers received a total of 48 measures, representing about 3 percent of all measures installed through this program.

### Distribution of Direct Install Measures for Income Qualified Measures in PY2015 (n= 1,804)

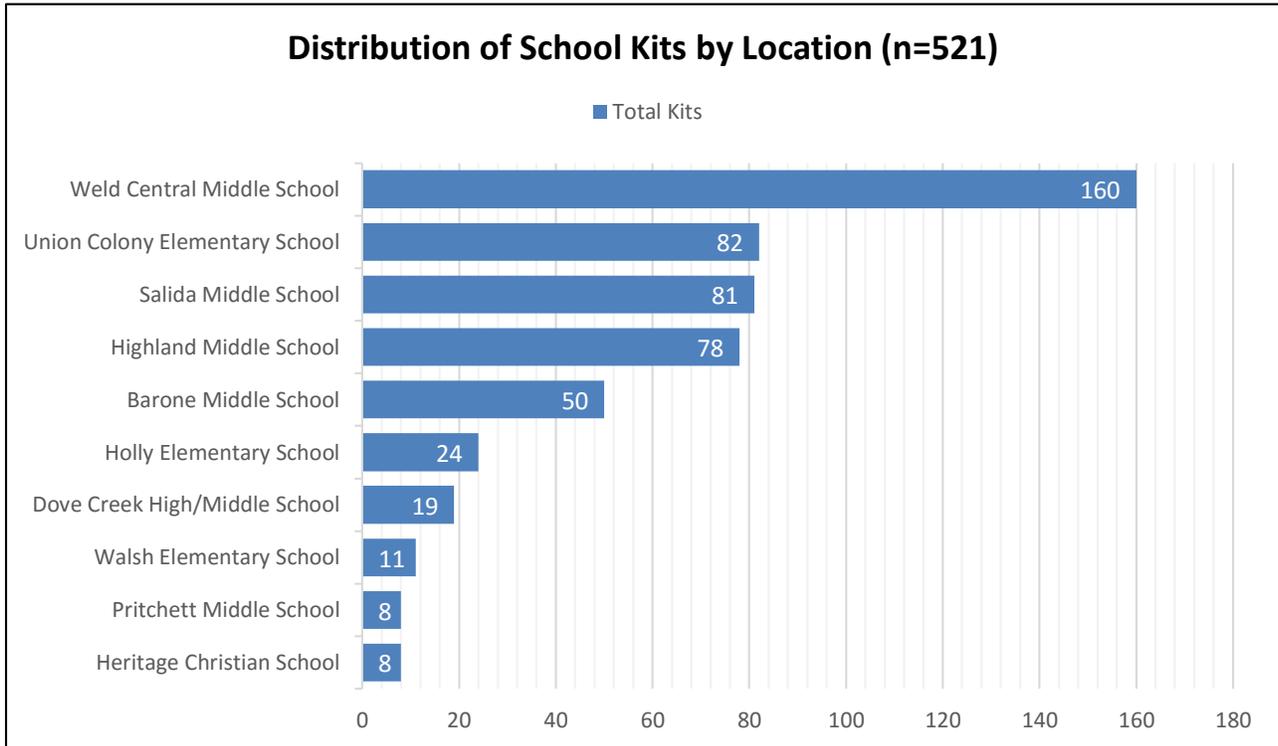


(Source: EOC Program Database PY2015)

**Figure 6: Distribution of Direct Install Measures for Income Qualified Program in PY2015**

## Energy Efficiency Kits Program

The Energy Efficiency Kits Program was only actively promoted by Atmos during PY2015. This utility distributed a total of 315 kits based on customer requests. For its school program, Atmos distributed the 521 kits to ten schools and 13 teachers throughout its service territory as Figure 7 shows. CNG distributed 416 kits to thirteen schools throughout its service territory.



(Source: Atmos Efficient Kit Database PY2015)

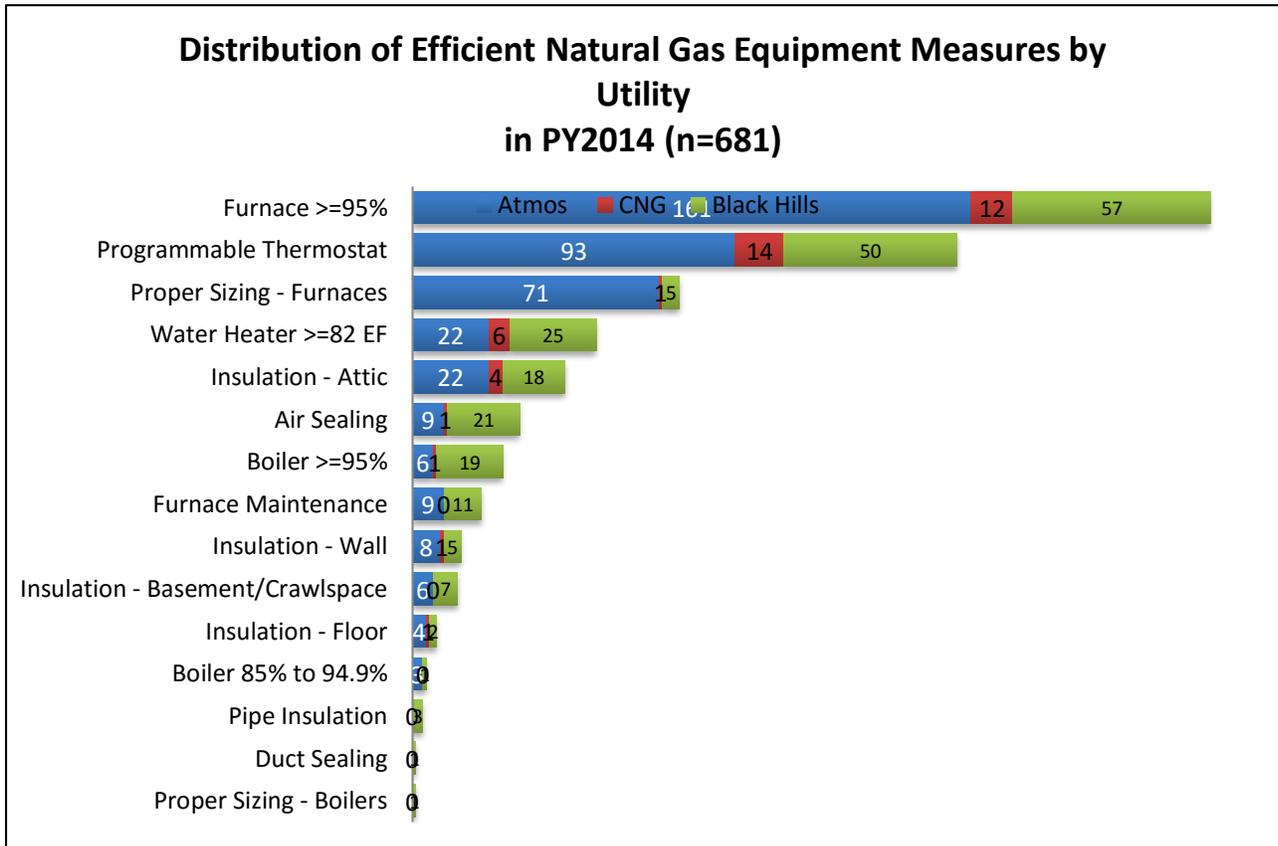
**Figure 7: Distribution of School Kits by Location**

## Efficient Natural Gas Equipment Program

EGIA manages the program databases for both the residential and commercial components of this program. However, the focus of these databases are on actual measures and therefore, the number of unique customers for Atmos for PY2015 could not be determined. All of the information is summarized on a per measure basis for both the residential and commercial program components. This meant that the evaluation team could not determine the number of program participants for both years by utility.

*Residential Measures*

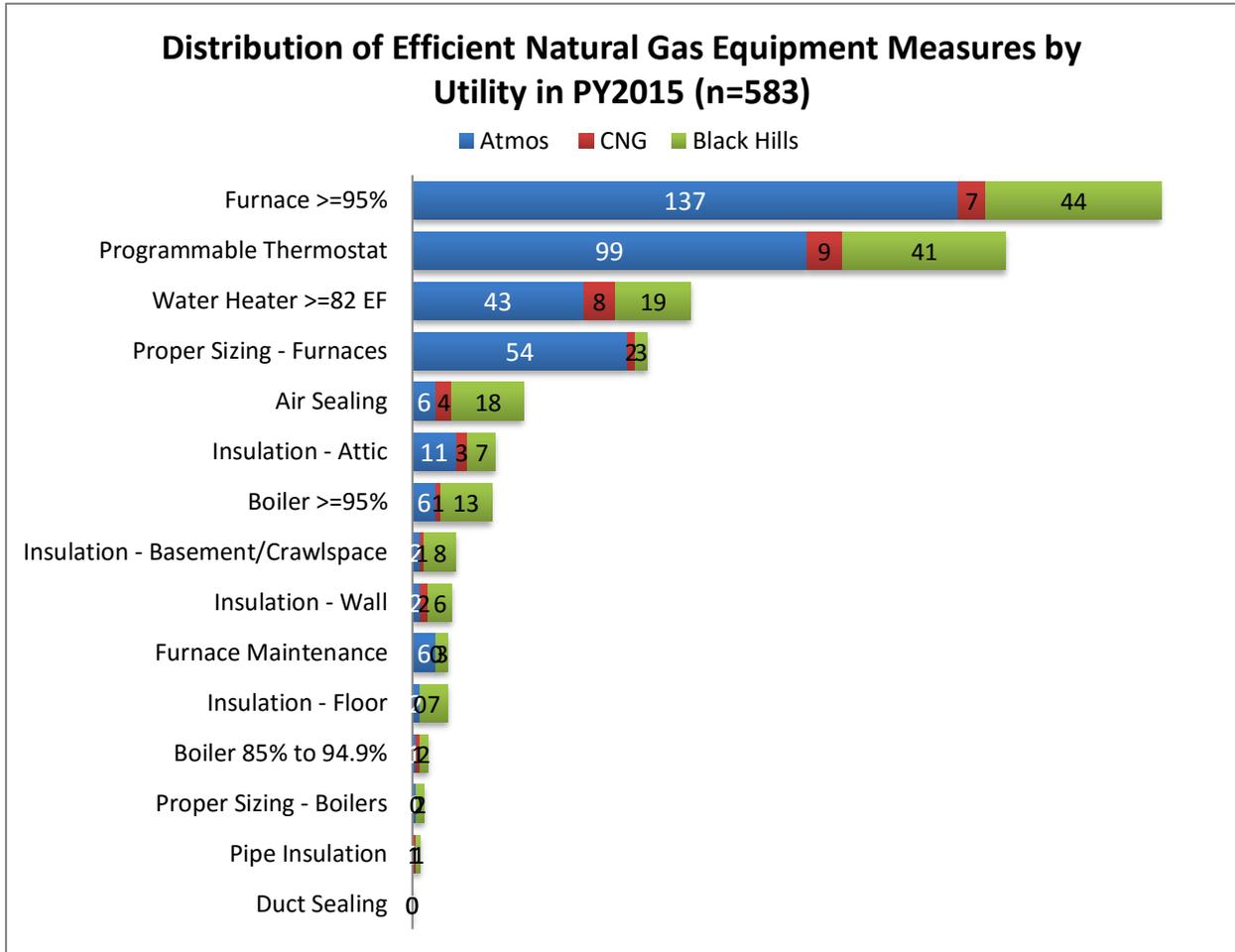
The next two figures illustrate the distribution of energy efficient natural gas rebates by utility. As these findings show, Atmos customers accounted for the largest percentage of measures installed in PY2014 (61%) compared to 33 percent for BH Distribution customers and six percent for CNG customers. This figure also shows that furnaces accounted for the 34 percent (n=230) of measures rebated through this program for all three utilities in PY2014.



(Source: PY2014 – PY2015 EGIA Program Database)

**Figure 8: Distribution Efficient Natural Gas Equipment Measures by Utility in PY2014**

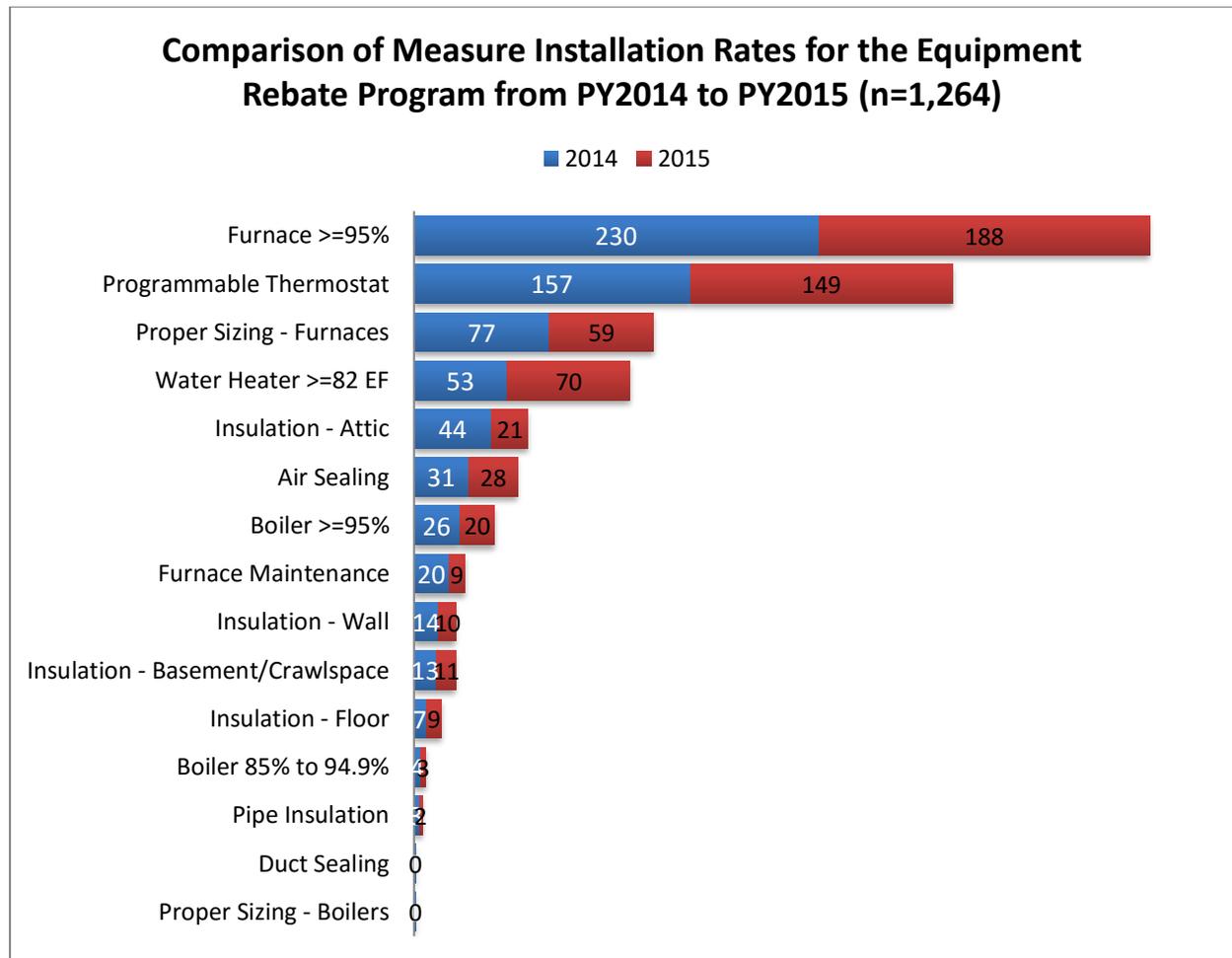
Figure 9 illustrates these findings for PY2015. Similar to the PY2014 results, Atmos customers accounted for the majority of rebates (63%; n=370 measures) compared to CNG (7%) and BH Distribution (30%) customers. Energy efficient furnaces accounted for the largest number of installations as well in PY2015, 188 were installed throughout the PIES utilities' customers.



(Source: PY2014 – PY2015 EGIA Program Database)

**Figure 9: Distribution of Efficient Natural Gas Equipment Program Measures by Utility in PY2015**

According to the program database, the program has rebated a total of 1,264 measures during the past two years. Overall, there were 681 rebates for measures in PY2014 and 583 in PY2015, which reflected a decline of 14 percent year by year. Furthermore, the number of installations for attic insulation dropped 52 percent from 44 to 21 measures, while the number of water heater installations increased by 32 percent from PY2014 to PY2015.

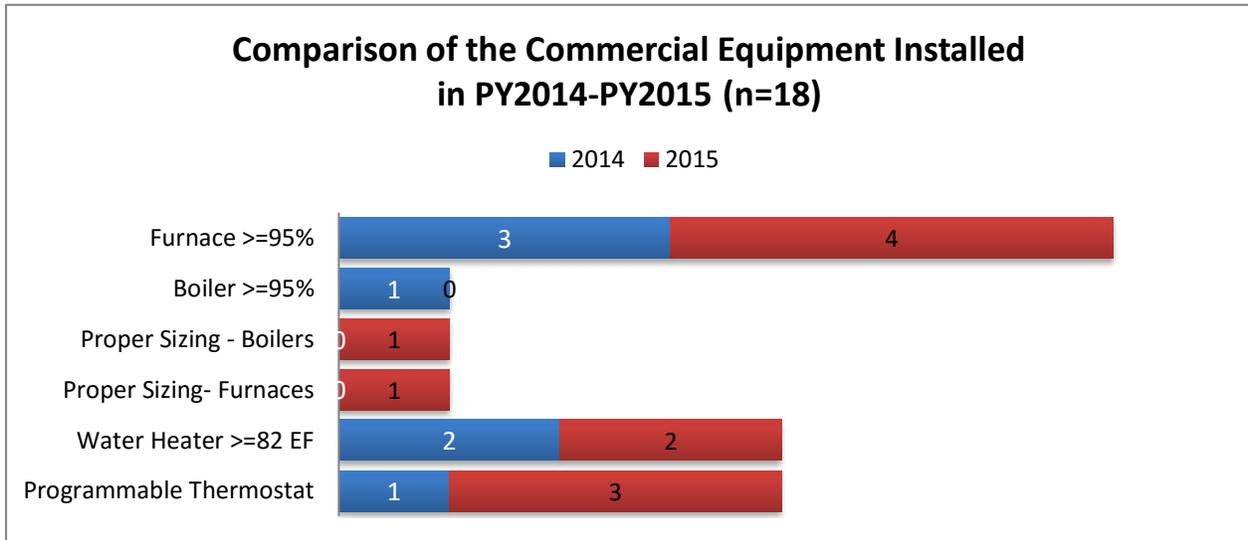


(Source: PY2014 – PY2015 EGIA Program Database)

**Figure 10: Comparison of Measure Installation Rates for the Equipment Program from PY2014 to PY2015**

These findings suggest that the Efficient Natural Gas Equipment Program continues to attract customers from all three utilities; however, there has been a slight drop off in the installation of critical measures like natural gas furnaces. Therefore, the program should continue to promote this program, especially focusing on those measures that offer the largest energy savings to customers across the three utility service territories.

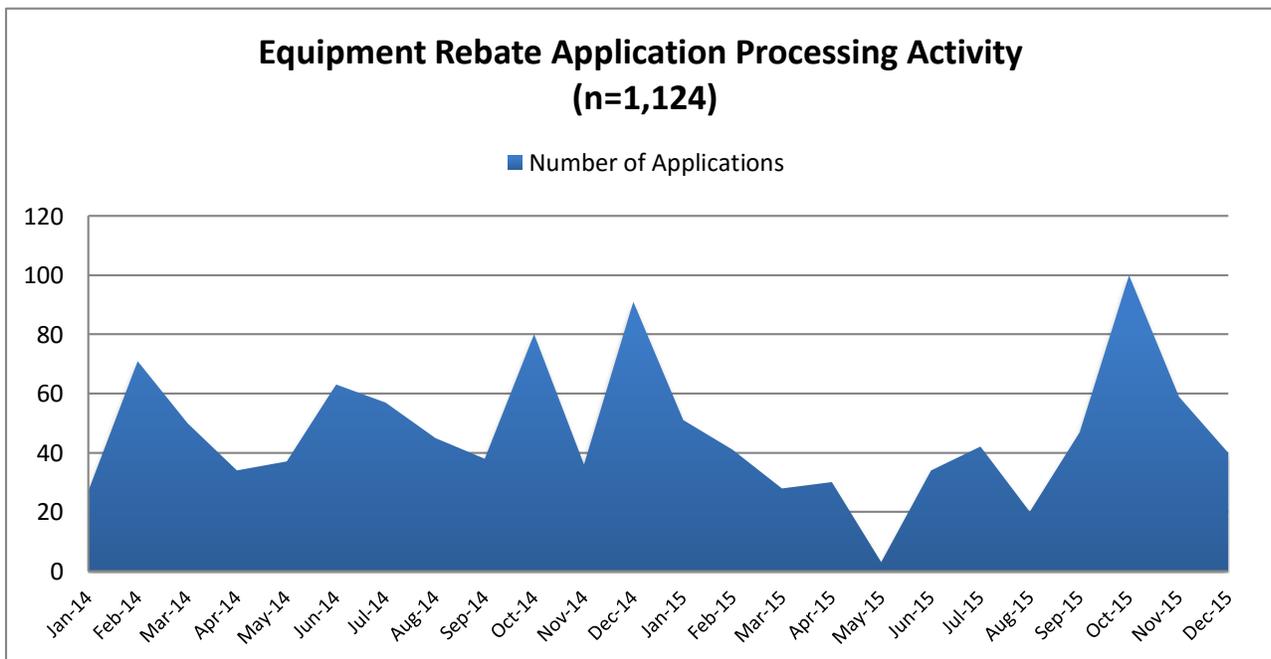
Figure 11 compares the commercial equipment rebated by the program during the 2014-2015 period. As this figure shows, there were very few rebates for commercial equipment (18 measures) over the two-year period.



(Source: PY2014-PY2015 Program Database)

**Figure 11: Comparison of the Commercial Equipment Installed in 2014-2015**

As Figure 12 illustrates, rebate application activity shows a spike in applications that coincided with the increased interest in the program during the end of the year for both program years.



(Source: Equipment Program Rebate Database 2014-2015)

**Figure 12: Equipment Rebate Processing Activity**

The following analysis was based only on PY2014 data, as this information was not provided fully for PY2015. As this analysis shows, the top five contractors accounted for 37 percent of the installations with Greeley Furnace accounting for the largest number of installations through the program (24%).

**Table 12: Summary of Contractor Activity for the Efficient Natural Gas Equipment Program**

Contractor	Number of Installations	% of Total
Greeley Furnace Co	259	24%
Alliance Development	44	4%
Self Installed	35	3%
One Hour Heating and Air Conditioning	34	3%
Canon Supply Company	32	3%

(Source: Equipment Program Rebate Database 2014-2015)

The program database also recorded the projects completed by each contractor in PY2014. As Table 13 shows, most of the activity is focused on furnace replacements, programmable thermostats, and proper sizing of equipment.

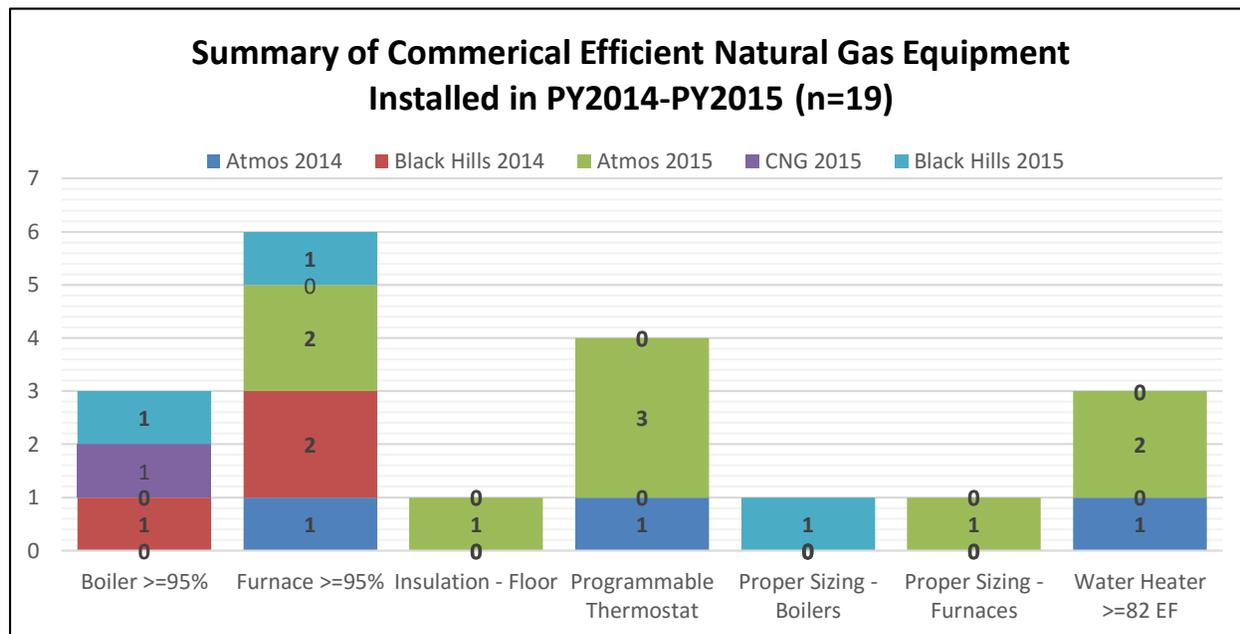
**Table 13: Analysis of Number of Jobs Completed by Measure**

Measure Installed	Number of Contractors	Total Jobs Completed
Furnace	126	393
Programmable Thermostat	83	220
Proper Sizing	24	137
Water Heater	73	98
Attic Insulation	32	61
Boiler	40	46
Air Sealing	18	42
Furnace Maintenance	11	27
Crawlspace/Basement Perimeter Insulation	10	20
Wall insulation	11	19
Floor Insulation	11	11
Pipe Insulation	3	3
Duct Sealing	1	1

(Source: Equipment Program Rebate Database 2014-2015)

### Commercial Measures

During the program evaluation period of PY2014-PY2015, there were only 19 rebates for the commercial equipment measures. As the following figure shows, most of these were for energy efficiency furnaces (n=6). Participation rates across the PIES utilities are relatively low among commercial customers. In fact, CNG had no commercial rebates in PY2014 and only one in PY2015. The other two utilities also experienced relatively low installation rates for qualifying measures in their service territories as well.



(Source: PY2014 – PY2015 EGIA Program Database)

**Figure 13: Summary of Commercial Efficient Natural Gas Equipment Installed in PY2014-PY2015**

### Custom Program

Mesa Point Energy (MPE) manages the program database for the custom projects. Overall, its records were well organized and expedited the evaluation of the Custom Program activities. According to its records, there were a total of 16 projects completed for Atmos and BH Distribution customers during the two-year evaluation period and six technical studies which may lead to future projects.

**Table 14: Summary of Custom Projects (2014-2015)**

Utility	Projects	Technical Studies	Incentive Paid
Atmos	11	0	\$106,532.66
Black Hills	21	4	\$91,313.36

(Source: MPE Custom Program PY2014-PY2015 Database)

Together, these utilities have paid a total of \$197,846.02 in program incentives.

## 2.3 Summary of Program Staff Interviews

The process evaluation team conducted in-depth interviews with the utility staff and program implementers involved in delivering the Partners in Energy Savings (PIES) program.

### Program Staff

Interviews with the program staff were completed in October and November 2015 and included representatives from each of the three participating utilities: Atmos Energy; BH Distribution and CNG.

### Current Roles and Responsibilities

Two of the program staff has been working for the PIES program for several years while one has just assumed responsibilities for the PIES program in April 2015. However, all of these staff members have other responsibilities and none of them spend more than 15 percent of their time on these programs.

For example, one utility staff member is located out of state, and therefore is not able to be fully involved in the program. The staff member explained that her responsibilities in other jurisdictions require more time and attention, as the programs are more active in other states.

But for the other utility staff, managing the DSM program “comes under the umbrella of his responsibilities.” He added that, “DSM is becoming a very important part of what we do. Offering incentives to be more efficient- attend a lot of Home and Garden Shows and Energy fairs and helps the customers tell them a good story about energy.”

One utility manager estimated he spent about 15 percent of his time on the PIES programs; however, this varies depending on the time of year. He also added that his administrative assistant spends about five percent of her time on the program. There is also another analyst available to provide additional support and assists with the administrative functions with rebates and answering questions.

However, due to their other responsibilities, none of these staff members indicated that the PIES program was a “top priority.”

*“This program can’t be a top priority compared to the other responsibilities I have.” (Program Staff)*

Program staff’s duties include managing program operations and the contractors who deliver the program. It also includes ordering the energy savings kits. However, their management duties are only part of their overall job responsibilities. They also indicated that the program responsibilities vary throughout the year, as some time periods are more urgent than others.

*“There is no body to delegate anything to or done by a third-party contractor.” (Program Staff)*

As the program has grown and evolved, the managers also reported becoming more familiar and comfortable with their responsibilities for the PIES program.

*“We didn’t have all that much knowledge in the beginning and we had some trials by fire. But now we are doing pretty well in our sixth year.” (Program Staff)*

However, one utility staff member said that it was important to have a local presence to manage the PIES program, something that cannot be done due to her other responsibilities.

*“The program manager position needs to be in Colorado. Colorado does not have a devoted project manager for the programs and for this program to grow, there needs to be somebody there to worry about the program. Based in Arkansas, the current program manager can’t meet with local managers; introduce people, so the program limps along.”* (Program Staff)

### **Overall “Excess is Out” Marketing Outreach Activities**

The program staff also provided their assessments of the current marketing and outreach activities, which are executed by the Blue Onion advertising agency. However, the three utility staff members differed on their overall assessment of the effectiveness of the current advertising strategy.

Two staff members were pleased with the current efforts, including a redesign of the program website in 2014. In addition, Blue Onion also began running a Facebook ad, which the staff member viewed as “fantastic.” He added, “Blue Onion is taking advantage as much synergies we can do with the other two utilities.”

Two of the staff members indicated that Blue Onion’s marketing tactics have been “effective” even though the newspaper advertising has been scaled back in 2015. Instead, the outreach has focused on radio and local cable television stations in 2014, and a social media advertising campaign in the Spring of 2015.

However, none of the PIES staff have received any updates regarding the overall effectiveness of this media campaign.

*“It seems to have gotten a lot of click-throughs and a few people have seen the ad and gone to the next step. Blue Onion is tracking the data.”* (Program Staff)

One PIES staff member did create some specialized television marketing on the cable channels.

*“We are trying to focus the TV commercials. I wanted to find out why am I not reaching service areas and I can’t afford a lot of media in the greater Denver area. So I completely revamped the media advertising in 2015, taking the radio out and went to more TV ads that have specific costs and linked to certain outlets like HGTV. I spent \$15,000 for certain spots to reach my customers.”* (Program Staff)

However, the staff member has not yet seen the results from information tracked by Blue Onion.

But another staff member did not endorse the current marketing strategy of relying on television advertising for program marketing. The staff member added that the radio spots were appropriate and she wants to increase the number of spots that air on radio stations feature sports news as a way to reach contractors.

*“That is what the contractors listen to...We did some radio spots in the Roaring Fork Valley and there was a big push towards the Front Range, but not sure how successful it was.”* (Program Staff)

The staff member added that the program spends money in marketing but is not leading to program participation. Rather, she recommends allocating the marketing outreach to having dedicated program staff who can recruit the contractors directly to participate in the program.

*“We need to have tailored marketing but right our marketing is tied in with the current agency.”* (Program Staff)

## Program Specific Activities

The program staff also provided updates regarding each PIES program offering, which are summarized next.

### *Income Qualified Program- Energy Outreach Colorado*

The Income-Qualified Program is currently being implemented under the direction of EOC. However, the utility program staff reported mixed results with the program to date. Two utility staff members indicated that while the auditors are completing the in-home audits, they are not installing the free measures as directed in the program design.

But the staff member added that the “low income implementer has done a lot of work with the (CAP) agencies in the service territory.”

However, one utility program staff member said that the “low income program is doing spectacularly compared to goals,” even when the energy savings goals were modified and scaled back.

*“EOC still exceeded the (program goals) and stayed within the budget and provided energy efficiency measures. We are very pleased with the program.”* (Program Staff)

Another staff member indicated that program participation does not usually ramp up until the fourth quarter, but reported receiving summary reports each quarter.

*“In my experience, most of the reporting and activity happens in Q4. It seems the income qualified work all hits at year end. Low income is the most successful program we have and we have spent the most money on it. It is giving us the most savings. If it weren’t for low income program, we would be having even lower participation rates.”* (Program Staff)

*“The staff are great to work with. We have spent about \$5,000 and have 750 participants.”* (Program Staff)

### *Residential Energy Audit Program/ Energy Smart Colorado*

CORE runs the energy audit program. The customers apply for a home assessment, sign up to participate and customer pays \$150 and the utility pays the other \$150. In addition, CORE also offers a free coaching service which helps to prequalify customers for the program.

However, program staff reported that this program is still struggling to gain traction in the market, despite outreach activities conducted both by PIES and the program implementer.

The staff reported that Energy Smart Colorado had an employee promoting the program at a local home and garden show, but could not get any customers to sign up for the program.

*“We don’t know if the customers are not willing to pay the \$150 audit fee.”* (Program Staff)

But, the utility staff would like CORE to provide more information regarding their program participation rates, the basis for the energy efficiency savings assumptions, and the reasons for not installing the qualifying measures.

Two staff members indicated that Energy Smart Colorado is not tracking the recommended improvements made by the auditors in their worksheets and “simple measures are not being installed during the audit.”

*“We are lacking information and details—not installing measures. We think if they are walking into the home to do audits, then the auditors should be installing measures.” (Program Staff)*

*“For the audit program- don’t always install the measures and don’t always follow up on the recommendations, (so difficult to know what is going on). There is no tracking of recommendations.” (Program Staff)*

*“We always have an issue with CORE. We have to have to remind them to install the measures. We need to remind them that those items are part of the process.” (Program Staff)*

### *Efficiency Kits Program*

In 2015, Atmos introduced the Energy Education Kits as part of the Energy Efficiency Kits Program, distributing more 500 kits to sixth-grade students in the Atmos’ service territory. In addition, Atmos continued to offer the opt-in kits, attending home and garden shows as well as energy forums throughout the state and using kits as marketing/talking points. More than 300 customers signed up for the kits at events and received the kits via mail after the utility confirmed them as customers.

The program staff reported that as a way customer interest through attending Home and Garden Shows, the staff implemented a sign up to receive a free kit of energy savings measures.

*“We purposely did not have the kits there, but rather mailed the kits to customers afterwards. We used that approach and have sent out about 400 kits to customers in 2014, and another 400 kits in 2015. It gives me a chance to talk about energy efficiency and encourage customers to make wise decisions. It gives ability to the utility and pleased to be able to have something to give customers.” (Program Staff)*

### *Efficient Natural Gas Equipment Program*

EGIA continues to process the applications for the natural gas rebate program. Overall, the staff reported that the program continues to “do well” even though it did not quite meet its overall savings goals in 2014.

*“There are no major concerns. The program is working fine... we people to participate in them... The program keeps moving along but there are never big jumps in program participation.” (Program Staff)*

The program staff explained that at the beginning of 2014, offered an additional incentive to audit customers of \$100 rebate to purchase energy efficient equipment was added.

*“If customers who got an audit then used the rebate to purchase equipment, would get another \$100 increasing the total rebate from \$300 to \$400. But only about five customers took advantage of that additional incentive.” (Program Staff)*

In 2014, EGIA also made some changes to the program website to make it more “transparent to the customer.” These changes were designed to help the customer navigate more easily between EGIA’s and the *Excess is Out* Website.

*“The new website is updated and has the same look and feel as the Excess is Out website.” (Program Staff)*

EGIA also made several changes to the program applications to make it easier for home builders to participate in the program, even though only one builder has participated in the program.

*“We are trying to remind the home builders that new construction is part of the program but it has not come to fruition yet.”*

### **Custom Program**

The custom program also had mixed results for the two active PIES utilities. For Atmos, the custom program helped them achieve their overall program goals in PY2014, coming within 96 percent of its target while spending only 84 percent of the budget.

*“The program implementer, Mesa Point Energy, had done an amazing job and collaborated with us very well. They get engaged with the sales reps and take advantage of the custom program.”* (Program Staff)

Atmos program staff also indicated that one large and successful program started out as a high bill complaint. The project evolved upgrading several critical measures, including the boilers, and installing energy efficiency kits into the apartments of this multiuse building.

But the other utility staff reported that the custom program has not lead to any projects.

*“Mesa Point generates leads, but we do have any active participants yet-. We are working with associations to find customers. Currently, we currently just have a couple of leads for the Custom Program- nothing much yet. But (it is) likely that Custom Program won’t meet its goals.”* (Program Staff)

The relationship with the program implementer has also evolved over the past two years, with MPE spending more time generating leads than relying on utility staff for back-end support.

*“I did what I could to steer them (in the right direction) and gave the information if I had it.”* (Program Staff)

However, Atmos staff reported that the custom program was the major reason they achieved their energy goals and qualified for a bonus for the first time.

*“We got a \$21,000 bonus. It’s not a big amount, but it’s more about doing a good job and acknowledging that we achieved it.”* (Program Staff)

### **Contractor/Customer Feedback**

The program staff also provided some feedback regarding the contractors.

*“There are two very active contractors who are very much connected to both the EOC program and the rebate program-and are doing the retrofits for the multifamily program. One contractor understands the benefits of DSM. Another contractor is also pretty connected and alerted program staff to an error in the application file, which was immediately corrected.”* (Program Staff)

## Barriers to Participation

Lack of awareness about the benefits of energy efficiency, or even awareness of the PIES program, continues to be a major barrier mentioned by all three staff members. For example, as part of some ongoing market research and customer satisfaction surveys to determine customers' overall interest in energy efficiency programs, one utility compared the Colorado results with customer responses in other jurisdictions. The staff noted that Colorado customers' awareness of these issues were much lower compared to customers in states which have no current energy efficiency programs.

In addition, there are limited opportunities for commercial and industrial projects beyond Atmos' territory.

*"Mesa Point has been beating the bushes but the industry is so lacking. We have snow melt, ski resorts, but it is harder to get to that point (custom projects)." (Program Staff)*

Another barrier is the lack of resources available in the area to support the program, including both physical staff and funding to support additional marketing and outreach activities.

*"We need more resources. We are trying to do better next year." (Program Staff)*

## Suggestion for Improvement

The utility program staff members also provided several suggestions on ways in which the PIES program could improve going forward.

The staff would like to see the program implementers invest in marketing and outreach as well, especially for the audit program.

*"We are thinking about co-op advertising, but corporate is pretty particular about the use of the logo and the work becomes more scrutinized so not sure if it is worth the hassle to do that... We want the implementer to have some 'skin in the game' in terms of promotion and the audit firm should be invested in promoting the program." (Program Staff)*

The upcoming merger between Black Hills Energy and SourceGas introduces additional uncertainty into the program, and none of the program staff are sure if the PIES program will even continue to operate.

*"We are hoping everything changes next year with the Black Hills, but everything is up in the air right now." (Program Staff)*

One program staff member also wants the PIES program to have a more updated database that is based on the actual savings rather than a deemed value. But this change is unlikely, given the overall uncertainty of the future of the PIES collaboration going forward.

*"We are excited to see what happens when Black Hills is involved, but I don't think we will be involved in PIES anymore." (Program Staff)*

Another area for program improvement included sending more targeted follow-up emails to customers who participated in the rebate program. This would include sending them out thank-you cards or congratulations notes as a way to keep customers engaged with the program activities.

## 2.4 Summary of Program Implementer Interviews

### Respondent Background

The Evaluation Team conducted in-depth interviews with the program implementers who provide the services offered through the Excess is Out Program on behalf of the three Colorado natural gas utilities. The respondents included representatives from the following organizations, as summarized in Table 15.

**Table 15: Summary of In-Depth Interviews by Organization**

Organization	Role in Excess is Out Program
Blue Onion	Advertising/website management
CORE	Implements the home audit and direct install program
EGIA	Rebate and application processor for equipment rebate program
Energy Outreach Colorado	Implements the low-income program
Mesa Point Energy	Implements the custom program

### Roles and Responsibilities

The program implementers work closely with the PIES utility program staff to manage and direct each of the programs offered through this collaborative. Two program implementers are new additions to the PIES portfolio: CORE which is responsible for the in-home audits and Mesa Point Energy which implements the custom program. However, all the program implementers have specific goals and provide support to the PIES program in different ways.

The PIES utility staff also has conference calls with the program implementation staff, usually on a monthly basis for some implementers, and twice a year for the others. All of the program implementers reported that the PIES staff was “enjoyable to work with,” but they would like additional communication with the other program implementers periodically throughout the year to gauge progress towards key program objectives.

*“We don’t have any issues with utilities in general the turnaround for the rebates are prompt and if there is a slow processing, it communicated to the utility. If it is slow, it is usually due to customer issues or delays.” (Program Implementer)*

The specific responsibilities for each program implementer are described more fully next.

### Income Qualified Program

Energy Outreach Colorado (EOC) is a private, statewide, nonprofit organization that helps limited-income Coloradans afford energy for their homes. EOC works with the PIES utilities to manage the installation of energy efficiency improvements in single and multifamily homes throughout Colorado.

For the PIES utilities, EOC runs the single family and multifamily program and is coordinated with the Weatherization Assistance Program run through local Community Action Partnership (CAP) agencies in the gas utilities’ service territories. Their responsibilities include conducting program outreach, and helping to deliver services to customers, who are on the wait list to receive services at the Federal level. They also seek to leverage the available funding from grants to handle the reporting requirements for the

Colorado Energy Office, assist with administrative tasks, and acts as a bundler of utility rebates with matching grants from the EOC to install weatherization measures in low-income homes.

However, as the EOC staff explained,

*“Its approach is designed to go outside the traditional WAP program and develop a relationship with other nonprofit agencies to deliver weatherization services- not to rely on WAP – have been doing this for six months and have the ground work. (They are) also working with agencies such as CLEER in Carbondale and assisting in delivering the weatherization services. (Program Implementer)”*

This program also targets customers who make too much income to qualify for the traditional program at 200% of the federal poverty level, but are still low-income, with household incomes at 80% of the federal poverty level.

This program is trying to help them access weatherization services and trying to close the gap and get more market penetration. The weatherization program is targeting gaps in the low to moderate income market and providing assistance to customers living in the mountain areas.

*“This population doesn’t qualify for the WAP rebates and trying to put that money through grants to nonprofits to create sustainable energy efficiency programs. We don’t want the customers to be constrained by the requirements of the WAP program and want to give additional access to the program.”*

Since this population does not have disposable income to make weatherization improvements on their own, so the EOC has committed \$350,000 in grant money to issue funds to nonprofits and leverage the rebate funds from the PIES utilities.

According to the program staff, the program is doing well in reaching customers in the single-family market. Their services include offering a subsidized energy audit and developing a priority list of measures to be installed based on the cost effectiveness criteria and rebates available from the utility. The auditor completes the audit and also direct installs some energy savings measures at no cost to the home owner or resident.

*“The audit identifies what needs to be done; the contractor puts together a priority list – and the applies the PIES rebate to cover that cost- and the EOC funding picks up the difference. Each single family home is capped at \$3,000.” (Program Implementer)*

In 2014, there was also a misunderstanding of regarding what should be the estimated savings for each measures, as the EOC and the PIES were working from a different set of assumptions.

*“We were using a different calculation methodology but moved to a prescriptive approach but we were not aware of the savings that Apex created. At that point the savings estimates were different, but now we are on the same page and using the actual deemed savings values.” (Program Implementer)*

However, the changes in the savings estimates meant that the savings goals increased, but the program budget did not.

*“Our biggest concern was the spend-to-save-ratio, which was lower than the market rebate levels and we were concerned with that- while the goal had increased, the budget did not. The budget was not adjusted to the market conditions. The budget doesn’t match the goal- and is the opposite of what the low income program design should be.” (Program Implementer)*

EOC also tries to leverage other community initiatives that are available through the electric utilities such as one initiative in the Roaring Fork area of Colorado.

### **Residential Energy Audit Program with Direct Installation of Energy Savings Measures**

CORE is responsible for overseeing the home audit program, and is in charge of recruiting participating home energy auditors throughout the PIES service territory. Each utility has an assigned goal of completed energy audits based on their overall size, with the goal of 150 completed audits for both BH Distribution Energy and Atmos and 15 for CNG.

*“The auditors have a defined assignment (in the service territory). They complete a blower door and a CAS test- climate zone testing and combustion safety.” (Program Implementer)*

The CORE program staff explained the participation process is available online as interested customers are directed to sign up for an audit on the Excess is Out website. CORE has recruited nine energy auditor partners to deliver these services to the PIES customers.

However, the participation costs vary. In some cases, grants from local community agencies subsidize the customers the price of \$150 audit cost, while other customers will pay the \$150 out of pocket. In addition, customers may also receive additional coaching for customers *“who want us to review contractor bids- for PIES customers. But it is pretty rare and we include those in the quarterly reports.”*

### **Efficient Natural Gas Equipment Program**

EGIA continues to provide application processing to support this program through application review, approval and issuing rebate checks. The Excess is Out application is submitted directly to EGIA and the application is housed with EGIA.

In 2014, EGIA redesigned its company interface for the online application. The customer can complete the application online or over the phone with an EGIA Customer Service Agent.

*“The customer enters the information online into the system and scans the invoice/receipt which is proof of purchase. The customer also enters the information regarding the equipment characteristics, such as the model number online. Some customers have the contractors fill out the application and submit it through the website.” (Program Implementer)*

EGIA verifies the application to ensure that the equipment is eligible. If the equipment is not eligible, the customer is notified via letter. For eligible equipment, customers receive their rebate check within 4 to 6 weeks. However, the savings are calculated using the utility’s deemed values.

### **Custom Program**

In 2014, the program implementer, MPE, developed the custom program and implements it on behalf of the PIES utilities. Its responsibilities included marketing and outreach, administration, program design and program implementation.

According to the program implementer, the PIES utilities have had varying degrees of success with meeting their CEEP program goals. In 2014, the first year MPE administered the program only one of the utilities, Atmos met its energy savings goal (114%). BH Distribution Energy met 16 percent of its goal and CNG did not meet its goal.

MPE designed the based on the regulatory filing to “exactly meet those custom program filing requirements.” In addition, MPE also developed an internal manual for program operations and a user’s manual.

*“We also helped design the application and link it to the Excess is Out program website.”* (Program Implementer)

MPE staff also indicated that the PIES utilities have been assisting them in outreach and marketing and also helping customers navigate the application process, identifying potential projects and go onsite inspections.

*“There are multifaceted different paths for program participation. Some customers contact the utility directly and other times we were doing cold calling and we were targeting the top 20% energy users.”* (Program Implementer)

A critical part of the custom program is to complete a technical study identifying opportunities for energy efficient installations.

*“The process for participation is to send out to eligible customers’ assessment form and ask for two years of billing history. We provide a simple estimate and potential savings, confirm eligibility and give a ball park estimate of incentives. We have to convince them that the incremental cost is worth the investment and the customers complete the implementation/installation form.”* (Program Implementer)

Once a project is approved, MPE reviews the equipment selections and price quotes, compares the expected energy consumption pre and post installation. They also conduct a site visit either before or after project installation.

*“We are driving the utility to release the check before the site visit.”* (Program Implementer)

The three PIES utilities have had differing levels of engagement in the Custom Program. The program was new to both CNG and BH Distribution Energy, which required additional coaching and assistance from the implementer. However, Atmos’ program has been successful as “we hit the goals in 2014 and they received a bonus.”

CNG did not have a contract for the Custom Program in 2014, which also delayed their start up. Since there are not a lot of large customers in CNG’s territory, the implementer works directly with the smaller customers, who need additional help and guidance. The program is also new for BH Distribution Energy as well.

Although the program got off to a slow start, especially for CNG, the staff reports that there is a project pipeline, especially for Atmos customers.

*“We have a pipeline with a lead sheet of projects not yet started and also a project sheet with projects in pipeline.”* (Program Implementer)

*“We have one lead for a project with CNG. Black Hills Energy technical study paid for 28 projects in the pipeline—still are waiting for information but three projects have been paid. There tends to be a backlog a bit and hoping the project will get built this year. We see a good ramp up- in the first year with Atmos. Black Hills Energy didn’t do great in the first year, but think it will be better in 2015.”* (Program Implementer)

More recently, MPE has been starting to look into higher value projects such as school districts, hospitals and ski areas. They are also partnering with CORE and CLEAR to target multifamily buildings.

*“There are some high end large users, like ski areas, that are getting interested in the program via word of mouth but not really through trade allies.”* (Program Implementer)

## **Program Marketing**

Blue Onion continues to manage the marketing and outreach activities for the PIES program. In 2014, they used the same approach and in 2015 added a social media campaign.

*“We are proceeding as we have. The PIES group meets twice a year to discuss what the goals are, revise and keep strategies in place and make tactical modifications and changes.”* (Program Implementer)

Blue Onion develops the marketing materials for the entire PIES portfolio and added a commercial element to the program website. The theme is also the same “saving money-saving energy.”

The marketing approach still relies heavily on radio advertising, but there have been some modifications made by individual PIES utilities. For example, CNG opted out of the social media campaign because it is not appropriate for their rural location. In addition, both BH Distribution Energy and CNG changed some of the radio buys and changed their television advertising.

Of note, CNG modified the television commercial to air on cable stations featuring home and garden themes.

*“We also redesigned the website and placed the TV and radio ads placed media for that. We modified the print brochures and each utility has its own version of brochures and EGIA update/modify the website.”* (Program Implementer)

In addition, they are identifying the target areas for the TV ads that will provide the best value for the utilities. Blue Onion also reported that the Facebook add is doing well for BH Distribution Energy as “we have seen an uptick in direct media spend and participation.”

The agency reports that they continue to try to maximize the budget, but it is a challenge using the traditional media. It is likely they will look for more digital advertising going forward.

*“We did develop a specific landing page...We are always trying to help the get better ROI for specific stations.”* (Program Implementer)

## **Program Tracking**

All of the program implementers track their progress for the PIES programs in specific databases. However, the tracking efforts and capabilities differ significantly among the program implementers.

EOC tracks the rebate applications it receives for the low-income programs and aggregates this information into monthly reports for the PIES utilities.

The CORE program provides similar reporting metrics for the PIES utilities on a quarterly basis including reporting the number of audits in progress and completed. CORE also tries to encourage customers to take the next step by following up with customers and asking if they received the report. However, they do not track the recommendations provided during the assessments.

Blue Onion does not track the number of impressions for the radio or TV spots, as this requires additional budget and has not been requested in the past. They do provide some Google Analytics for the digital campaign however.

EGIA tracks the application process from the initial submittal through the rebate distribution. They have also noted some fluctuations in program activities, usually in the Fall season, which may be tied to the advertising campaigns. Currently, not all of the program database fields have been completed as that was not a requirement for the 2014-2015 program.

### **Customer Feedback**

Overall, the program implementers reported that they have received very positive feedback from the customers about the PIES program.

*“The reaction to the website has been very positive and customers can go now directly from the Excess is Out to the EGIA website. The feedback is that the application process is working really well- positive and flowing well- no issues.”* (Program Implementer)

*“Feedback from the customers is good.”* (Program Implementer)

### **Challenges with Program Implementation**

The interviews with the program implementers also identified areas where the program is not being executed as planned. For example, the in-home energy auditors do not always install the direct savings measures as part of the energy audit. However, the auditors do not report the reasons for not installing these measures.

*“Not every customer receives the measures. That is the analyst’s job and some have a higher rate of installation than others...some analysts are less engaged or new to the business and don’t have a good comfort level installing the measures”* (Program Implementer)

Two other program implementers cited difficulties with the program application process. One indicated that the marketing of the commercial program was misdirected to residential customers, which created some customer confusion.

The current program budgets also limit what the program implementers can offer. Three of the program implementers indicated that the tight budgets made it difficult for them to accomplish all their goals. The current advertising budget also limited the options available for cross-marketing and promotion among the implementers as well as the ability to use more advanced digital marketing such as Search Engine Optimization (SEO).

*“The biggest concern we have is that the savings goals have increased but the rebate amounts have not. The contract says the savings goals do not need to be met- but that isn’t appropriate. The budget doesn’t match the goal.”* (Program Implementer)

The implementers also acknowledged that the future of the program is uncertain, given that SourceGas has been acquired by Black Hills Gas Distribution.

## **Barriers**

The program implementers also identified several major barriers to the current PIES program.

These include a lack of interest or awareness in the PIES program offerings.

*“The deferrals of projects are pretty serious. Some projects have to be approved by the City Councils... We can’t get one ski area to return phone calls because they are not interested in the program but we know they are replacing boilers.”* (Program Implementer)

*“For the income-qualified program, there is a lack of participation. In each little community- like Aspen or Vail have taxes and that money is available to use for these programs, but it isn’t being used.”* (Program Implementer)

*“There is a lack of sophistication among the customers and contractors. Some (commercial customers) have no skills in filling forms, so a lot of handholding required. There is also a lack of customer understanding about the program.”* (Program Implementer)

The diversity of service territories is another barrier to program implementation.

*“One of the biggest barriers is the fractured rural areas. The territory is not homogeneous. Each Colorado utility has unique reach and it is continually challenging.”* (Program Implementer)

*“The demographics of the customers are working against us. The audit costs \$150 and that is too high for some rural areas. When we have access to marketing and can place ads, there has been a success rate in increasing the number of audits (but only) when there are marketed and free assessments.”* (Program Implementer)

There is also a lack of engaged or informed trade allies, especially for the commercial projects that make it difficult to implement projects for BH Distribution and CNG.

*“DSM is new to some trade allies in commercial space. We don’t have that many trade allies, not sophisticated trade allies and there are not that many consulting engineers.”* (Program Implementer)

There are also several unique barriers for the custom program according to the implementer which include the lengthy budget cycle for large organizations such as school districts and governmental entities and the perception that paperwork is too complicated from either previous experience, or from similar programs.

## **Areas for Program Improvement**

The program implementers also identified several ways in which the PIES program could be improved, should it continue. These recommendations are summarized next.

The implementers would like to have more ongoing and increased communication among the program implementers regarding the status of the PIES activities. Several of the implementers requested to be kept in the loop regarding the status of the Spring and Fall marketing and outreach activities.

*“We need a partnership with EGIA. It would be nice to know by zip code where the rebates are going. We have a limited marketing budget and limited assessment capabilities.”* (Program Implementer)

*“We would definitely like to know when ads are run and what the ads are-. We would want some notification. I think there could be better communication between the ad agency and the implementers.”* (Program Implementer)

*“The hardest part is to get some correlation (with the advertising) to the traffic to website. We don’t know what happened, so it would better to have a link more real time reporting. It will help to refine marketing tactics with better communication and project updates.”* (Program Implementer)

*“We want to drive traffic to the EGIA website, but we do lose the thread of what happens once the customer goes to the EGIA website. We would like to know updates on the participation trends throughout the year and EGIA would like to the timing for the specific campaigns.”* (Program Implementer)

The program implementers also provided some suggestions on ways to improve the current marketing and outreach activities including jointly marketing the services to customers.

*“We want some control over the marketing and giving the homeowners a kit. The challenge is there are two separate programs that customers may not know about and so we want to work with EGIA to figure out a solution.”* (Program Implementer)

*“We would like to get more utility branding and promotional materials available. We want to approach the PIES utilities for co-branding the materials with the electric utilities. We could also provide leave behinds with information about the installed measures.”* (Program Implementer)

*“There was some unintentional cross marketing and there needs some improvement in website for programs.”* (Program Implementer)

The program implementers also wanted some additional clarity regarding the savings assumptions used to estimate savings for the installed measures.

*“We do an assessment and estimate the savings from the demand calculations. We want to incorporate the best practices of direct install programs.”* (Program Implementer)

*“We need to do some improvements with data tracking. We need to understand the program and... want consistent data collection and savings estimates using Apex’s templates to determine savings per measure.”* (Program Implementer)

Several program implementers also indicated they needed to do a better job of monitoring and tracking the measures installed through their programs.

*“We need to communicate more to the installers ask them what will it take to complete the measure installations and what are the barriers. We need to dig deeper with the installers/implementers.”* (Program Implementer)

## 2.5 Summary of Custom Program Interviews

### Project Background

The Johnson Consulting Group team was only able to interview two organizations that participated in the Custom Program. However, both of these organizations completed multiple projects during the 2014-2015 program years. In order to better understand the scope of these projects, the decision-making process, and the extent of the program influence on their decision to participate, our team conducted in-depth interviews with representatives from each organization.

Both organizations are ski resorts operating in Colorado; one is in BH Distribution and one is located in Atmos' service territory. However, these projects were very different. One focused on optimizing snow melting equipment and focused primarily on completing a technical study and then using that information to optimize the equipment operation. The second project involved adding insulation as part of a larger renovation to a roof of a commercial building.

Since both of these customers operate ski resorts, usage is highly seasonal. The facilities are operating seven days a week during ski season, but not operational during the off-season. The roof replacement was on a building that was constructed in the mid-1950s while the snowmelt equipment had been installed through stages since the 1990s.

### Program Awareness

Both of these organizations found out about the program, and the availability of grants, through a combination of direct outreach and from their colleagues looking to promote green efficiency projects.

*"We found out about the project from our Director of Environmental Services staff who found about the program, filled out the forms and got the grant application completed."*

*"We found out about the program from CORE- put us in touch with (the program implementer) who then conducted a building walk through (assessment)."*

One organization used the funds to cover the cost of the snowmelt optimization study

*"The snowmelts operate in each of the pedestrian plazas throughout (the area) and we have been putting in snowmelt for years. The goal was trying to get some efficiency out these systems."*

Both projects started in the summer of 2015 and were completed prior to the ski season beginning in early December 2015. The roofing project was completed in less than two months, while the snowmelt optimization study took a bit longer.

*"The project started after June 2015. The optimization research helps us understand and educate our staff. No equipment was replaced but we worked with an engineering firm. My staff went through each room where the boilers were located – as built. The staff got education on how the systems were supposed to work, set up maintenance program for us. We also worked with the local plumbers before but we didn't know what they were doing."*

Overall, staff from both organizations were pleased with all aspects of the project. They believed the incentive amount was fair and the project proceeded in a timely manner. The respondents rated their satisfaction with various program components on a ten-point scale, where “5” meant “Extremely Satisfied” and “1” meant “Not at all Satisfied.” These qualitative ratings are summarized in Table 16.

**Table 16: Satisfaction Ratings for Custom Program**

Satisfaction Ratings for Custom Program	Average Satisfaction Rating
Custom Energy-Efficiency Program	4
Technical Study (if completed)	4
Program contact	4.25
Efficiency Measure installed	4.5
Length of time to complete the installation	5
Amount of rebate	4.25
Time to receive the incentive	4.75
Responsiveness of utility staff	5
Utility overall	3.75

*“(The implementation contractor) has been really good to work with and looks at how we have been documenting it... I thought the incentive was plenty and was very pleased with the results for what we are trying to do.... We got a lot of work for \$3,000.”*

*“The timing was good and (the implementer) was very easy to work with... We learned so much because of them. He was very knowledgeable.”*

*“I think receiving a grant was very simple and working with (the implementer) was good, but he was too pushy at times.”*

### **Program Influence**

The respondents provided mixed results regarding the extent of program influence in that they would have installed the measures, on their own, without a rebate.

For the roof replacement project, the participant knew about the rebate prior to applying to the program. The participant also indicated that the roof needed to be replaced anyway, but the rebate did pay for some additional insulation. However, rebate did not influence the decision to install the roof or insulation, as the organization had already set aside funds to make these improvements.

In contrast, for the snowmelt project, program implementer educated the organization about the technical study and they would not have done the project without the utility rebate and technical study information. Furthermore, the respondent indicated that his ski resort would definitely not have installed any equipment without the rebate.

While both of the respondents indicated that the program incentive was influential, one indicated that the rebate represented only three percent of the total project costs.

However, the recommendations from the program implementation staff did have a high degree of influence in their program participation. In fact, the respondent said he required some persuasion to participate in the technical study. But the marketing materials were not influential in the decision to install the measures.

### **Spillover**

One organization did install additional equipment at other locations, but neither participant was sure that this equipment would have qualified for incentives.

*“Two snowmelt systems are in construction for the controls... and we also did some control work and insulation. But I am not sure we would have gotten the rebates. We are not sure if the equipment was eligible.”*

*“Yes, but the problem is that we are transport customers (in some of our other locations) so we don’t qualify for the rebate for some of our other locations.”*

But one respondent indicated that energy efficiency is a primary goal for these projects—even if they do not qualify for rebates. He indicated that his organization has installed many energy efficient measures including ECM motors, snowmelt controls and new boilers.

### **Project Results**

Since both projects were installed during the summer, it has been too early for these customers to see any demonstrated savings. However, both respondents are confident that these projects will lead to energy savings in 2016.

*“We have not yet noticed any improvements yet. The snowmelt equipment is temperamental equipment. It will take several years to see the benefits—but right now after everything seems to be running better.”*

### **Areas for Program Improvement**

The respondents only offered one suggestion for program improvement- to streamline the application process to reduce repetition and make the application process online. As this respondent indicated, online applications are commonly used for other programs, such as the CORE programs.

*“It seems that we had to fill out the same paperwork a bunch of times – they ask for the same information on the different forms. It should be more streamlined.”*

But overall, these respondents are happy with the program and believe that the implementer is doing a good job in educating them about program opportunities.

## **2.6 Customer Survey Findings**

The Evaluation Team also fielded two surveys to participating residential customers to measure overall satisfaction with the program, the contractors and PIES utilities. The customer surveys also addressed other critical areas to determine program impacts such as free ridership, spillover of measures and measure persistence. The surveys also captured key demographic information for residential customers such as size of home annual income/education levels, and number of occupants.

Table 17 summarizes the number of surveys that were completed for each residential program.

**Table 17: Number of Residential Participating Surveys Completed for Process Evaluations**

Program	Customer Surveys
Residential Energy Audit Program	52
Efficient Natural Gas Equipment Program	62

Appendix A provides detailed findings from the Residential Energy Audit Program. Appendix B contains the detailed findings from the Efficient Natural Gas Equipment Survey; key findings from these surveys are summarized next.

## Conclusions and Recommendations from the Residential Energy Audit Customer Surveys

The results from the Residential Energy Audit Program customer surveys have led to the following conclusions and recommendations.

### Conclusions

- Most (94%) of the Residential Energy Audit Program participants opted for the Advanced Energy Evaluation; as 42 percent participated in the program to save energy.
- Most participants learned about the program through non-profit agencies (29%) compared to the other types of marketing and outreach tactics used to promote the program.
- Installation rates of the direct measures are low, with only 69 percent reporting receiving at least one free measure. According to the survey respondents, only a total of 70 measures were offered to 52 survey respondents, while a 16 reported not receiving any free measures at all.
- The major reasons for not installing the free measures were that they were already in place or that the customer refused them. These findings are consistent with the results recorded in the program database, suggesting that the measure mix may no longer be appropriate for these customers. However, measure persistence is very high with nearly all the measures remaining in place after the Energy audit.
- The most common recommendation from the auditors was to install insulation (70%) which was subsequently implemented by 48 percent of the respondents. This is a good example of leveraging the Energy audit to participate in the Efficient Natural Gas Equipment Program.
- Cost is the major reason for not implementing all recommendations, mentioned by 52 percent of the program participants. Eighteen percent of respondents said they had already installed recommended measures, while 14 percent said they were still working on it.
- Free ridership rates are relatively low with 24 respondents (46%) indicated they would not have installed these measures on their own. Furthermore, only six respondents said they would have installed these measures on their own within six months and 11 would have purchased fewer energy efficiency measures. This suggests that overall free ridership for this program is 15 percent.
- Spillover was quite high, especially for non-natural gas measures. A total of 30 Energy Audit Program participants reported installing additional measures on their own; one-half of these respondents reported installing a total of 196 energy efficient light bulbs.

- Most respondents rated the audit rebate (62%), program information (42%) and the recommendation from the Energy Auditor (44%) as “Very Influential” suggesting that these program elements are all critical to program success.
- Overall, the respondents reported high satisfaction levels with both Energy Audit Program and their natural gas utilities with average ratings of 4.44 for the Energy audit program and 4.27 for their natural gas utility.
- In addition, most participants did not offer many suggestions for program improvement.

### **Recommendations**

- The non-profit agencies and energy auditors play a critical role in both enrolling customers in the program initially, and then encouraging them to follow through on the recommended improvements. In addition, there is a good cross-over between the recommendations from the Residential Energy Audit and the Efficient Natural Gas Equipment Program suggesting that this program should continue to be positioned as a the “gateway” program for these natural gas customers. However, it remains important for the Energy auditors to continue to provide follow up with the recommendations to encourage customers to complete the recommended actions in a timely manner.
- The direct install measure mix needs to be updated in order to increase overall installation rates of these measures. Currently, a large percentage of these measures are not installed either because they are already in place or the respondents do not like them. Therefore, the PIES utilities should research other types of direct install measures that could be offered to customers through the Energy audits as a way to further maximize energy savings for this program.
- Spillover rates are highest for non-natural gas measures, which is not beneficial to the sponsoring gas utilities. This is due in part to the fact that the energy auditors offer the program to customers who can receive both electric and natural gas measures. While it is important to leverage the other programs available to natural gas customers, the program should continue to provide information to encourage customers to install potentially fuel-neutral measures, such as insulation and weather-stripping.

## **Conclusions and Recommendations from the Efficient Natural Gas Equipment Program Customer Surveys**

The results from the Efficient Natural Gas Equipment Program surveys have led to the following conclusions and recommendations.

### **Conclusions**

- The contractors continue to play an important role in promoting the program this was the most frequently mentioned way of learning about the program (31%). In contrast, many fewer respondents reported learning about the program from other sources, including social media, online or from radio or television advertising.
- There was very little cross-program awareness as most (85%) survey respondents were unaware of any other programs offered by the natural gas utilities. Only 11 percent of these respondents mentioned the Residential Energy Audit Program,

- Saving money remains the most compelling reason for customers to participate in this program mentioned by 39 percent of the respondents while 34 percent wanted a rebate and 31 percent needed new equipment.
- Furnaces accounted for 35 percent of all equipment installed by the survey respondents. However, there is a rather large drop for the remainder of the eligible equipment as only 17 percent installed programmable thermostats and 16 percent used the rebate to purchase a new water heater. Not surprisingly, all the measures installed were still in place, given that these are large and complex measures that would be difficult to remove
- More than 58 percent of the survey respondents indicated they would have purchased the same equipment without the rebate. Furthermore, two-thirds (66%) of the respondents who purchased furnaces or boilers indicated they were “Very Likely” to have purchased the exact same measure without a rebate. Digging deeper reveals that 30 respondents or 63 percent reported that they would have purchased their equipment immediately since the current equipment was broken, with 17 (55%) of these respondents purchasing either furnaces or boilers.
- The contractor recommendation had the most influence on the participants’ decision to install the energy efficiency equipment, even if they had already made a purchase decision.
- There is a fairly high level of spillover attributed to the program as 30 respondents (48%) reported installing additional energy efficiency measures or taking actions on their own without receiving a rebate.
- Satisfaction rates with respondents providing the highest average satisfaction rating for the contractor (mean of 4.66) and the length of time to receive the rebate received an average 4.30 rating, while the ease of participating in the program received a 3.94 average rating.
- Overall, the respondents are satisfied with their utility, with an average rating of 4.34
- While nearly half (44%) of the respondents had no suggestions for program improvement, a few did suggest increasing the publicity of the program (18%) and simplifying the paperwork (16%).

## **Recommendations**

- The current media campaign should be revisited to focus more on ways to trade ally and contractor outreach strategies rather than marketing the campaign via mass media to customers.
- In addition, customers are most interested in “saving money” or “getting the rebate,” while the other more environmentally “green” messages are not a factor driving program participation. Therefore, the marketing themes should continue a focus on these messages.
- The utilities should continue to promote cross-promotion in the Residential Energy Audit Program as this has been an effective strategy to encourage customers to install recommended measures.

## 3 Impact Evaluation Findings

The primary purpose of an impact analysis is to assess gross and net energy savings of the incented measures. An impact evaluation verifies measure installations, identifies key energy assumptions, and calculates *defensible and accurate savings* attributable to the program. Evaluation priorities are based on a combination of the relative size of the savings achieved, the degree of uncertainty with *ex ante*<sup>6</sup> estimates of the savings, and where future program growth is expected. The impact evaluation employs the following four tasks to determine net savings estimates:

1. Review *ex ante* Savings Estimates,
2. Determine Installation Rates,
3. Determine Per Measure Gross Savings Values, and
4. Estimate Net to Gross Ratios.

For this evaluation, the Evaluation Team calculated per unit savings values on a per measure basis rather than calculating the total annual savings values for all measures installed. This is because the values from this evaluation will be applied in the upcoming program year 2016 utility annual reports due to be filed in April 2017. The PIES utilities will perform quantity calculations (i.e., total assumed vs. evaluated savings) as part of the annual reporting process.

### 3.1 Methodology

This section describes the approaches used to calculate net and gross savings estimates for the PIES programs. To determine inputs for installation rates, gross savings algorithms, and net to gross estimates, the evaluation conducted

#### Review *Ex Ante* Savings Estimates

The task included a review of the measures incented and savings claimed for each program and utility. These data are used as a basis for comparison with the *ex post* values determined in this evaluation. The *ex ante* savings values are taken from both the 2014-2016 utility DSM Plans and the most recent (2014) evaluation.<sup>7</sup>

---

<sup>6</sup> *ex ante*, as viewed in advance. The *ex ante* value of a variable is what the person or organization responsible expects it to be. *Ex ante* is contrasted with *ex post*, meaning as viewed after the event. *ex post*. The value of a variable as it appears after the event, that is, what actually occurred. *Ex post* is contrasted with *ex ante*, which means looking at things before the event.

<sup>7</sup> Only some measures received savings updates as part of the 2014 evaluation; for measures that were not updated in the evaluation the planning estimates for 2014-2016 remained as the *ex ante* values.

## Determine Installation Rates

This task included an assessment to determine whether an incented measure was installed within the service territory and remained installed for at least one year. Questions to determine measure level installation were included in the participant surveys, specifically:

*According to our records, you received a rebate for the following measures, is that correct?*

*Was this measure installed at [address]?*

*Is this measure still in place? If no, why not?*

Measures removed due to equipment failure do not affect installation rate estimates, as early equipment failures are captured in the Expected Useful Life (EUL) estimates that are used in cost effectiveness calculations. For measures not surveyed due to relatively small savings contributions, an installation rate of 100 percent is assumed.

## Calculate Gross Savings by Measure

This task addressed the determination of *ex post* savings at the gross level (i.e., not adjusted for installation, free ridership, or spillover). For the estimate of gross savings, the Evaluation Team used calibrated engineering algorithms for all measures.

The Evaluation Team also estimated water and electricity savings for measures with significant secondary fuel and water benefits, such as faucet aerators and low-flow showerheads. While these secondary fuel benefits cannot be claimed against the Collaborative savings goals, they can affect the cost-effectiveness calculations in their Annual Reports. Details into the calculated secondary fuel and water benefits are provided in Appendix D.

**Calibrated Engineering Algorithms.** The Evaluation Team developed engineering algorithms to estimate savings for the prescriptive (non-custom) measures. These algorithms leveraged the work that was recently conducted as part of the 2014-2016 PIES Collaborative DSM Plans and the 2014 evaluation, which updated many of the measure savings assumptions from the prior plan based on algorithms from sources such as the 2016 Illinois Technical Reference Manual (TRM), the Database for Energy Efficient Resources (DEER), and the 2015 Arkansas TRM. For this evaluation effort, the engineering algorithms were calibrated to the actual characteristics of the program participants (e.g., home size, number of household members, etc.), where possible, based on the participant surveys. Measures that relied on heating loads, including the furnace, furnace maintenance, furnace proper sizing, boiler, boiler proper sizing and programmable thermostat measures, were based on the heating load derived as part of the 2014 evaluation effort, which included a billing analysis of participant data. The heating loads presented in this report were updated to reflect the heating degree days based on the 2014-2015 geographic location of the program participants.

Details into the algorithms and inputs used for these calculations are provided in Appendix D.

**Custom Engineering Analysis.** For the Custom Program, the Evaluation Team approached the impact evaluation for this program by conducting an extensive desk review of all associated custom project forms, analysis spreadsheets, technical studies and manufacturer cut sheets. Additional details on the Custom Program evaluation are presented in Appendix C of this report.

Table 18 identifies the measures associated with each utility program.

**Table 18: Overview of Programs and Measures**

Measure	Residential Energy Audit Program	Income Qualified Program	Energy Efficient Kit Program	Efficient Natural Gas Equipment Program (Sector)	
				Residential	C&I
Air Sealing		✓		✓	
Attic Insulation		✓		✓	
Boiler		✓		✓	
Broiler					✓
Caulk and Weather-stripping		✓		✓	
Convection Oven					✓
Conveyor Oven					✓
Crawlspace Insulation		✓		✓	
Duct Insulation		✓		✓	
Faucet Aerator	✓	✓	✓		
Floor Insulation		✓		✓	
Fryer		✓			✓
Furnace		✓		✓	
Furnace Maintenance		✓		✓	
Infrared Heating					✓
Integrated Hot Water and Space Heating		✓		✓	
Low-Flow Showerhead	✓	✓	✓		
Low-Flow Sprayer					✓
Oven and Range					✓
Pipe Insulation	✓	✓		✓	
Programmable Thermostat	✓	✓		✓	
Proper Sizing (Furnace/Boiler)		✓		✓	
Steam Cooker					✓
Wall Insulation		✓		✓	
Water Heater		✓		✓	
Water Heater Blanket	✓	✓			

## Estimate Net to Gross Ratios

Net Savings are the total change in load that is attributable to an energy efficiency program.<sup>8</sup> For this evaluation, net savings are calculated by assessing the impacts that would have occurred without the assistance of the program (free riders) and impacts that occurred as a result of the program but not captured in the program participation databases (spillover). To assess net savings, the evaluation team used a self-report approach based on surveys with participants. Additional details into the methodology, scoring, and results of the Net-to-Gross estimates are provided in Appendix E.

Trade allies can add significant context to participant self-reported values, specifically when dealing with contractor driven measures like furnaces and insulation. In these situations, the end-user may over-estimate free-ridership estimates, claiming that this is the measure that would have been purchased in absence of any incentive. In reality, the contractor only offered this particular model due to the program rebate, and would have offered a less efficient unit if the program incentives had not been available. Therefore, the study accounted for this by asking about – and accounting for – the importance of the trade ally recommendation in the decision to install the program measure.

**Free Riders.** For the free ridership measurement, the evaluation utilized self-reported data from participants. For the self-report estimate, the team used the information gathered in the customer surveys to assign each respondent both an influence score and an intention score, similar to the “Fast Feedback” approach used by the Energy Trust of Oregon and refined for use in the Illinois TRM.<sup>9</sup>

The influence score measures the effect of program activities on the decision to purchase a specific program measure. Influence scores assess the impact of the rebate, contractor, and marketing materials on the participant’s decision. The influence score is adjusted to account for those participants that indicated plans to purchase the high efficiency measures before learning of the rebate. The intention score represents a self-reported likelihood that the respondent would have installed the same high efficiency measure even in absence of a program rebate. The intention score is adjusted to account for timing (if the participant would have purchased within a six-month period or later) and quantity (if participant would have purchased fewer efficient items without the rebate).

For the Efficient Natural Gas Equipment and Residential Energy Audit Programs, the evaluation team used both the influence and intention scores. However, the evaluation team found that some respondents showed strong rebate and contractor influence on their decision to install energy efficient equipment, yet inconsistently also stated that they would have installed the measure in absence of the program. These respondents were not included in the analysis.

---

<sup>8</sup> National Action Plan for Energy Efficiency (2007). *Model Energy Efficiency Program Impact Evaluation Guide*. Prepared by Steven R. Schiller, Schiller Consulting, Inc. <[www.epa.gov/eeactionplan](http://www.epa.gov/eeactionplan)>

<sup>9</sup> A similar algorithm has now been proposed in Illinois as part of a statewide, consistent approach to NTG and documented in the TRM. Please see the full logic documented here: [http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Version\\_5/Comparison\\_IL\\_NTG\\_Methods\\_Update\\_02\\_24\\_15\\_and\\_10-02-2015.docx](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Comparison_IL_NTG_Methods_Update_02_24_15_and_10-02-2015.docx)

**Spillover.** Spillover occurs when customers take additional actions to reduce energy consumption because of the program, but without the benefit of an incentive from the utility. Spillover can be internal (within the home or facility that participated in the program) or external where it extends to other facilities within the organization. The approach to quantifying spill over depends on a multi-question survey approach similar and was asked of both trade allies and participants. In order for a measure to qualify for spillover, the respondent must:

1. Have not received a rebate for the additional energy efficient equipment, and
2. Claim that the program was “Extremely” or “Very” influential in the decision to add the energy efficient equipment.

**Net-to-Gross (NTG).** The net-to-gross ratio is calculated as follows:

$$\text{NTG Ratio} = 100\% - \text{Free Rider \%} + \text{Spillover \%}$$

Participants were asked free ridership questions for each measure installed. The free ridership scores were combined into a single, program level estimate based on a participant-level savings-weighted average.

### 3.2 Impact Evaluation Findings

As mentioned previously, the evaluation team reviewed *ex ante* savings values, calculated installation rates and gross savings values, and estimated net to gross for each program. The results of these studies, by program, are detailed in the sections and tables below.

#### Residential Energy Audit Program

Table 19 documents the per unit gross *ex ante* savings for the Residential Energy Audit program. These values are used as a basis for comparison to the evaluated, *ex post* savings estimates.

**Table 19: Ex Ante per Unit Gross Annual Therm Savings Values by Measure, Residential Energy Audit Program**

	Atmos	Black Hills	CNG
Faucet Aerator – Kitchen	11	11	11
Faucet Aerator – Bathroom	2	2	2
Low-flow Showerhead	17	17	17
Pipe Insulation	7	7	7
Programmable Thermostat	42	42	42
Water Heater Blanket	5	5	5

The energy audit databases were provided for all three utilities. Databases provided information on “Quick Fix” installations (Direct Install Measures) as well as core assessments conducted. In some cases, an assessment was done but no measures installed. When measures were installed, they either contributed to gas, electric or both for savings. If assessments led to “projects” then upgrades would be done and rebated through the Efficient Natural Gas Equipment Program.

Our determination of savings from the Residential Energy Audit Program involved reviewing the program database and determining the following:

- Did the utility co-pay for the Energy Audit?
- If so, what participants had a direct install measure provided (referred to as Quick Fix in the database) after the Energy Audits?
- Did that measure installation result in therm savings?
- Did the participant have gas fuel for space and water heating to verify claimed therm savings based on the affected end use of the direct install measure?
- What assessments were conducted if any?
- Did any projects result through rebates for gas related measures?

Databases were complete but in the case of BH Distribution, 23 projects in 2015 had therm savings reported after a “quick fix” but no direct installation measure was selected in the database. These projects were not included in our determination of savings due to a lack of information on how to determine impacts.

### **Ex Post Savings Analysis – Residential Energy Audit Program**

Realization rates between *ex ante* and *ex post* gross savings values can be found in Tables 20-22 for each utility. Details on the engineering algorithms applied can be found in Appendix D. Realization rates were above or around 100% for faucet aerators, pipe insulation, programmable thermostats and water heater blankets. Adjustments were made to previous algorithms that increased deemed savings when compared with previous *ex ante* savings. In the case of water heater blankets, an algorithm was applied as opposed to the *ex ante* approach of using a deemed value based on water heater size. The algorithm approach allowed the evaluation team to apply program assumptions and parameters that were applied for the other water heating related measures based on Colorado specific values.

Realization rates were well below 100% for low-flow showerheads (59 percent). Low-flow showerheads savings were updated based on the 2016 Illinois TRM that the Evaluation Team believes is the most robust savings estimate for this measure based on the transparency in parameters applied and their citations, which were based on actual field research. Savings were reduced from *ex ante* values by assuming a recovery efficiency of existing water heaters at 78 percent. Previously, 67 percent was applied but a review of the AHRI database found that value to be too low compared existing inventory. Additional modifications were made in the water saved per year values. Revised values reflected the use of Colorado specific values and well-cited sources for typical water usage.

**Table 20: Realization Rates, per unit by Measure, Atmos Residential Energy Audit Program**

Direct Install Measures	<i>Ex Ante</i> Savings (Therms)	<i>Ex Post</i> Savings (Therms)	Gross Realization Rate
Faucet Aerator – Kitchen	11	14	127%
Faucet Aerator – Bathroom	2	2	100%
Low-flow Showerhead	17	10	59%
Pipe Insulation	7	8	114%
Programmable Thermostat	42	42	100%
Water Heater Blanket	5	7	140%

**Table 21: Realization Rates, by Measure, BH Distribution Residential Energy Audit Program**

Direct Install Measures	<i>Ex Ante</i> Savings (Therms)	<i>Ex Post</i> Savings (Therms)	Gross Realization Rate
Faucet Aerator – Kitchen	11	14	127%
Faucet Aerator – Bathroom	2	2	100%
Low-flow Showerhead	17	10	59%
Pipe Insulation	7	8	114%
Programmable Thermostat	42	40	95%
Water Heater Blanket	5	7	140%

**Table 22: Realization Rates, per unit by Measure, CNG Residential Energy Audit Program**

Direct Install Measures	<i>Ex Ante</i> Savings (Therms)	<i>Ex Post</i> Savings (Therms)	Gross Realization Rate
Programmable Thermostat	42	36	86%
Water Heater Blanket	5	7	140%

These tables also provide the installation rates calculated from the Residential Energy Audit Program participant survey. All respondents reported to have installed the rebated measure(s) and had not removed them at the time of the survey, leading to an overall installation rate of 100 percent.

While not all of the possible measures were installed during the in-home audit, the measures that were installed did tend to remain in place. Given the small sample sizes at the measure level, which were not meant to be statistically significant, the evaluation team recommends using a persistence (ISR) rate for the whole program, which is 97 percent if the LEDs are included, or 98 percent if limited to gas measures only.

**Table 23: Summary of Measure and Persistence Rates for the In-Home Audit Direct Install Measures**

Measure	Measure Received	Measure Installed	Measure Still in Place	Persistence Rate
Water Heater Blanket	18	17	17	100%
Pipe Wrap	10	10	10	100%
Programmable Thermostat	9	9	8	88%
Caulking and Weather Stripping	5	5	5	100%
Low-Flow Kitchen Faucet Aerator	10	10	10	100%
Low-Flow Bath Faucet Aerator	6	6	6	100%
Low-Flow Showerhead	2	2	2	100%
Other-LED Bulbs	10	10	9	90%
Total Measures Received	70	69	67	97%

A much smaller group of respondents (n=6) reported the reasons why they declined to have the measures installed. In addition, nine (17%) respondents said they were not even offered the free measures, which further reduces the savings opportunities for these programs. Besides updating the measure offerings, the utilities should work with the in-home auditors to ensure that all measures are offered during the assessment.

The most common recommendation was to install insulation (70%), which was subsequently implemented by 48 percent of the respondents (n=15). Of note, this is a good example of leveraging the in-home energy audit to participate in the Efficient Natural Gas Equipment Program.

As indicated in the program database review, the Residential Energy Audit Program had a limited number of direct install measures compared to the number of completed audits. During 2014 and 2015, 62 percent of Atmos participants, 15 percent of CNG participants, and 87 percent of BH Distribution participants received any direct install measures. However, the average audit visit cost the utility over \$150<sup>10</sup> in customer incentives, including the cost of the audit. Of those that did install measures, the most common measures were programmable thermostats and water heater blankets (see Table 24).

---

<sup>10</sup> 2015 Atmos Energy Annual Report

**Table 24: Audit Program - Direct Install Measures**

Measure	Atmos		CNG		Black Hills	
	% of Total Households	% of Measures	% of Total Households	% of Measures	% of Total Households	% of Measures
Faucet Aerators – Bathroom	14%	23%	0%	0%	6%	12%
Faucet Aerators - Kitchen	2%	2%	0%	0%	1%	2%
Low-Flow Showerheads	12%	13%	0%	0%	3%	3%
Pipe Wrap	1%	1%	0%	0%	29%	25%
Programmable Thermostat	26%	33%	8%	33%	20%	21%
Water Heater Blankets	26%	28%	15%	28%	30%	26%
Weatherstripping	0%	0%	0%	0%	7%	11%
% Households with One or More Direct Installs from Energy Audits	62%		15%		87%	

While this program can provide a stepping-stone into additional energy efficiency purchases and behaviors, these audits may not be maximizing their full potential while in the home. Based on our review of all the databases from the Residential Energy Audit Program, BH Distribution was the only one that had rebated projects as a result from the assessment. In fact, a total of 35 equipment rebates were paid as a result of the assessments in 2015. While some of the rebated customers were found in the Efficient Natural Gas Equipment Program, a few projects were indicated as rebated but not noted in that database. The program database claimed savings from these projects as Annual Therm Savings from “Retrofits” which is separate from the Quick Fix Annual Savings in the program database. A total of 26,723 therms were claimed in 2015 from retrofit projects for BH Distribution.

The PIEs utilities should continue exploring additional ways to maximize this time with customers to increase savings for this program. This can be achieved either through increases in measure installation during the audit or increases in referrals and participation in other programs.

**Residential Energy Audit Program Net-to-Gross (NTG)**

As noted in the methods section, the Residential Energy Audit Program received the same overarching logic as the rebate program, including the intention and influence scoring components, but with a few minor adjustments to account for the different program delivery type and decision making process. The differences between the rebate and audit algorithms are reviewed in greater detail in Appendix D. Similar to the rebate program, the intention component of the free ridership score showed greater free ridership (28%) relative to the influence score (4%). Consistency checked ensured responses were not included that showed significant differences between the intention and influence scoring. The savings-weighted average free ridership score across the two components was 15 percent.

On top of results pointing to low free ridership, the overall NTG was also offset by large spillover savings. For spillover savings, the team found 10 respondents (19% of respondents) installed additional measures outside of the program that were attributed to participating in the program. Although a minority of participants showed spillover savings, the magnitude of the savings was quite large, and in most cases larger than the program measures. For example, over half of the ten spillover respondents indicated installing insulation measures, reported as strongly influenced by program. The survey asked participants to verify they did not receive a rebate (i.e., the evaluation team verified no rebates were paid to these participants via cross-checking tracking database), and the team believes these participants may not have applied for a rebate because their homes did not meet the more stringent delta R requirements. Combined savings from these spillover measures would lead to spillover of more than 100 percent, and given this large magnitude the team determined that capping the NTG at 100 percent was a conservative decision. The following table summarizes the recommended FR, SO, and overall NTG ratios.

**Table 25: Free Ridership, Spillover, and NTG Estimates, Residential Energy Audit Program**

	<i>Ex Ante</i>	<i>Ex Post</i>		
	NTG	Free Ridership %	Spillover %	NTG
Residential Energy Audit Program	80%	15%	>100%	100%

### **Income Qualified Program**

The Income Qualified Program involved the installation of energy efficiency measures in single family and multi-family homes. Table 26 documents the *ex ante* per unit savings values for the Income-Qualified program. These values are used as a basis for comparison to the evaluated, *ex post* savings estimates.

*Ex post* savings were determined by reviewing the program database from EOC for PY2014 and PY2015 participation. The program database was provided to the evaluation team by Energy Outreach Colorado (EOC). This database includes a compilation of measures that were installed by regional participating weatherization agencies including participant information.

#### *Ex Post Savings Analysis – Income Qualified Program*

Engineering algorithms were also reviewed and updated by applying specific assumptions based on income qualified participation. Our revised savings approaches are explained and defined in Appendix D.

The evaluation team’s review of the EOC databases found that while measure names were tracked as well as number of faucet aerators and low-flow showerheads, insulation details were not provided such as square feet and R values. *Ex ante* values assumed previous insulation values mapping to those from the Efficient Natural Gas Equipment Program which assumed little or no insulation. Previously, *ex ante* values assumed a higher pre-existing R old value which resulted in higher realization rates for this program.

For furnaces, model information or AFUE ratings were not consistently provided. Two databases were provided to the Evaluation Team in different formats. One database included information from all three utilities including detailed measure information but PY2014 data was mixed with PY2013. Another separate database was provided for PY2015 but the breakdown on measure specific information was limited or missing.

Our review of the PY2013/PY2014 combined database found that some of the furnaces installed had an AFUE rating of less than the program requirement of 94 percent. We were unable to confirm this for all the furnace installations.

Due to the unique nature of Income Qualified programs, no free ridership is assumed, so the NTG ratio is 100 percent.

**Table 26: Ex Ante per Unit Gross Savings Values by Measure, Income Qualified Program (Annual Therms)**

	Atmos	CNG	Black Hills
Air Sealing	79	78	78
Attic Insulation	130	84	122
Belly/Burrito Insulation	170	170	170
Boiler	240	240	240
Boiler Controls	67	67	67
Crawlspace/Basement Insulation	208	170	182
Duct Insulation	133	133	133
Energy Efficiency Kit	16	16	16
Furnace	114	99	111
Furnace Clean & Tune	27	27	27
SF Low-Flow Aerator - Bathroom	2	2	2
MF Low-Flow Aerator – Bathroom	3	3	3
SF Low-Flow Aerator – Kitchen	17	17	17
MF Low-Flow Aerator – Kitchen	14	14	14
Low-Flow Showerhead	17	17	17
Pipe Insulation	7	7	7
Programmable Thermostat	35	30	33
Rim and Joist/Boxsill Insulation	64	64	64
Storm Windows	197	197	197
Wall Insulation	214	174	187
Water Heater	16	16	13
Water Heater Blanket	5	5	5
Water Heater Setback	6	6	6

The following sections provide details on the realization rates from the Income Qualified Program for each utility. Across all three programs, the notable realization rate outliers are in air/duct sealing and insulation measures. For low income programs, belly insulation of mobile homes was reviewed and adjusted based

on the low base R-value prior to insulation. As discussed previously, the engineering algorithms have been updated and revised to reflect more accuracy in estimations from all insulation measures.

**Atmos – Income Qualified Program Results**

In 2015, a total of 556 single family weatherization measures were installed and 538 multi-family measures. The Crisis Intervention Program resulted in 26 furnaces being repaired or replaced. Realization rates were found to vary between 51 – 208 percent.

**Table 27: Realization Rates by per unit Measure, Atmos Income Qualified Program**

Income Qualified Measures	Ex Ante Savings (Therms)	Ex Post Savings (Therms)	Gross Realization Rate
Air Sealing	79	56	71%
Attic Insulation	102	130	127%
Belly/Burrito Insulation	170	354	208%
Boiler Controls	67	67	100%
Crawlspace/Basement Insulation	208	151	73%
Duct Sealing (and insulation)	133	80	60%
Energy Efficiency Kit	22	19	86%
Floor Insulation	259	165	64%
Furnace	114	93	82%
Furnace Clean & Tune	27	17	63%
MF Low-Flow Bathroom Aerator	3	3	100%
MF Low-Flow Kitchen Aerator	14	13	93%
Low-Flow Showerhead	17	10	59%
Pipe Insulation	7	8	114%
Programmable Thermostat	35	35	100%
Rim Insulation	64	64	100%
Storm Windows	197	198	101%
Wall Insulation	214	153	71%
Water Heater	16	13	81%
Water Heater Blanket	5	7	140%
Water Heater Setback	6	6	100%

### **CNG – Income Qualified Results**

In 2015, a total of 44 single family weatherization measures were installed and 48 multi-family measures. The Crisis Intervention Program resulted in four furnaces being repaired or replaced. Realization rates were found to vary between 45 – 154%.

**Table 28: Realization Rates by Measure, CNG Income Qualified Program**

<b>Income Qualified Measures</b>	<b>Ex Ante Savings (Therms)</b>	<b>Ex Post Savings (Therms)</b>	<b>Gross Realization Rate</b>
Air Sealing	78	35	45%
Attic Insulation	84	129	154%
Crawlspace Basement Insulation	170	187	110%
Duct Sealing (and insulation)	133	69	52%
Energy Efficiency Kit	22	19	86%
Floor Insulation	212	148	70%
Furnace	99	79	80%
Low-Flow Showerhead	17	10	59%
Pipe Insulation	7	8	114%
Rim Insulation	64	85	133%
Storm Windows	197	205	104%
Wall Insulation	174	158	91%
Water Heater	16	16	100%
Water Heater Blanket	5	7	140%

### ***BH Distribution – Income Qualified Results***

In 2015, a total of 359 single family weatherization measures were installed and 121 multi-family measures. The Crisis Intervention Program resulted in 13 furnaces being repaired or replaced. The Colorado’s Affordable Residential Energy (CARE) program resulted in 163 measures being installed. Realization rates were found to vary between 51 – 250 percent.

**Table 29: Realization Rates by Measure, BH Distribution Income Qualified Program**

<b>Income Qualified Measures</b>	<b><i>Ex ante</i> Savings (Therms)</b>	<b><i>Ex Post</i> Savings (Therms)</b>	<b>Gross Realization Rate</b>
Air Sealing	78	40	51%
Attic Insulation	122	152	125%
Belly/Burrito Insulation	170	425	250%
Boiler Controls	67	67	100%
Crawlspace Wall Insulation	182	187	103%
Duct Sealing (and insulation)	133	78	59%
Energy Efficiency Kit	22	19	86%
Floor Insulation	227	205	90%
Furnace	111	92	83%
Furnace Clean & Tune	26	16	62%
MF Low-Flow Bathroom Aerator	3	3	100%
MF Low-Flow Kitchen Aerator	14	13	93%
Low-Flow Showerhead	17	10	59%
Pipe Insulation	7	8	114%
Programmable Thermostat	33	35	106%
Rim Insulation	64	87	136%
Storm Windows	197	198	101%
Wall Insulation	187	153	82%
Water Heater	13	13	100%
Water Heater Blanket	5	7	140%

## Energy Efficiency Kits Program

The Energy Efficiency Kit Program includes two components; “Opt-In Kits” and “Energy Education Kits”. The *ex ante* energy savings, as reported in the 2013 evaluation, can be seen for each kit in Table 30.

**Table 30: Ex Ante per Unit Gross Savings Values by Measure, Energy Efficiency Kits Program (Annual Therms)**

Energy Efficiency Kits	Measure	Total Annual Therms (per measure)
<b>Opt-In Kits</b>	Showerhead 1.5 GPM (1)	9
	Kitchen Aerator 1.5 GPM (1)	7
	Bathroom Aerator 1.0 GPM (2)	2
	Water Temperature Card	3
<b>Energy Education Kits</b>	Showerhead 1.35 GPM (1)	9
	Kitchen Aerator 1.5 GPM (1)	7
	Bathroom Aerator 1.0 GPM (1)	1
	Water Temperature Card	3

In 2015, Atmos distributed 521 Energy Education Kits and 315 Opt-In Kits. CNG distributed 416 Energy Education Kits and 14 Opt-In Kits. BH Distribution did not distribute any kits as it was not part of its PY2015 program portfolio.

*Ex post* savings were determined by reviewing what contents were distributed in the kits and what the savings would be based on the in service rates due to the nature of their distribution.

*Ex ante* and *ex post savings* by measure for Opt-In Kits and Energy Education Kits can be seen in Table 30. Realization rates varied significantly across many of the measures. The major outlier in realization rate was kitchen aerators. The algorithms available from the Illinois TRM provides savings algorithms for kitchen, bathroom or general faucet. For *ex ante* savings for kitchen faucet, the general savings algorithm for faucet was previously applied. This was adjusted in the *ex post* analysis which resulted in a significant difference in savings. Other measures were slightly adjusted based on Colorado specific data while applying detailed algorithms as presented in the Illinois TRM. Details are available on the engineering algorithms and assumptions in Appendix D.

**Table 31: Realization Rates from Energy Efficiency Kits by Measure**

Energy Efficiency Kits	Measure	Ex Ante Savings (Therms)	Ex Post Savings (Therms)	Realization Rate
<b>Opt-In Kits</b>	Showerhead 1.5 GPM (1)	9	6	68%
	Kitchen Aerator 1.5 GPM (1)	7	10	147%
	Bathroom Aerator 1.0 GPM (2)	2	2	106%
	Water Temperature Card	3	3	100%
<b>Energy Education Kits</b>	Showerhead 1.35 GPM (1)	9	7	80%
	Kitchen Aerator 1.5 GPM (1)	7	8	114%
	Bathroom Aerator 1.0 GPM (1)	1	1	82%
	Water Temperature Card	3	3	100%

***Efficient Natural Gas Equipment Program***

Table 32 and Table 33 document the *ex ante* gross per unit savings values used by each of the PIES utilities. These were largely based on the most recent impact evaluation for measures in the residential and commercial equipment rebate program. These values are used as a basis for comparison to the evaluated, *ex post* savings estimates.

**Table 32: Ex Ante Per Unit Gross Annual Therm Savings, Residential Equipment Program**

Residential Measures	Atmos	CNG	BH Distribution
Air Sealing	64	70	79
Attic Insulation	184	224	260
Boiler (85% - 94.9%)	42	30	29
Boiler (>=95%)	126	104	124
Boiler - Proper Sizing	24	26	24
Crawlspace/Basement Insulation	399	300	320
Duct Sealing	47	37	40
Floor Insulation	319	372	399
Furnace (AFUE ≥ 95%)	137	123	134
Furnace Maintenance	33	32	31
Furnace – Proper Sizing	24	22	24
Pipe Insulation	7	7	7
Programmable Thermostat	24	20	22
Wall Insulation	336	257	98
Water Heater (>= 82 EF)	60	60	62

**Table 33: Ex Ante Per Unit Gross Annual Therm Savings, Commercial Equipment Program**

Commercial Measures	Atmos	CNG	BH Distribution
Commercial Attic Insulation	184	224	260
Commercial Boiler (Condensing; AFUE ≥ 92%)	240	240	240
Commercial Boiler – Proper Sizing	64	65	65
Commercial Crawlspace/Basement Insulation	399	300	320
Commercial Floor Insulation	319	372	399
Commercial Furnace (AFUE ≥ 94%)	281	297	297
Commercial Furnace – Proper Sizing	65	65	65
Commercial Pre-Rinse Spray Valve	204	204	204
Commercial Programmable Thermostat	38	38	38
Commercial Wall Insulation	336	257	98
Commercial Water Heater (Tankless)	60	60	62

**Ex Post Savings Analysis – Efficient Natural Gas Equipment Program**

In determining *ex post* savings, a review of recently updated Technical Reference Manuals (TRM) in other jurisdictions was conducted. Colorado region specific parameters were applied where necessary. Realization rates were then calculated based on revisions made to deemed savings per measure as compared with previous *ex ante* numbers. Details on the algorithms and assumptions used to determine *ex post* savings can be found in Appendix D. Based upon revised deemed savings values, realization rates were calculated and are provided in Table 3, 4 and 5 by utility.

For residential measures, realization rates were around or above 100 percent for air sealing, boilers, furnaces, programmable thermostats and proper sizing of furnaces/boilers. Slight adjustments were made to algorithms with minimal impact on previous *ex ante* savings.

Realization rates well below 100 percent were duct sealing, insulation measures (attic, basement, floor and wall), furnace maintenance and water heaters. These measures involved significant adjustments as described briefly below for each measure.

Duct sealing *ex post* savings were based on the updated algorithm from the Illinois TRM. Differences are due to modifications made from previous approaches that applied system heating efficiency. The revised algorithm applies a ratio that takes into account the system heating efficiency as a ratio with pre-duct sealing efficiency. Equivalent Full Load Hours (EFLH) for heating were derived from heating load values from 2011-2013 Colorado PIES billing analysis.

For insulation measures, algorithms were updated to include a 60 percent correction factor that reflects the uncertainty aspect of applying an algorithm approach for deemed savings from insulation upgrades. This figure also comes from the IL TRM, and is based on recent billing analyses that are finding that the existing algorithms overstate the actual savings. In fact, most jurisdictions have updated insulation measures with modeling results to report a therms per square foot deemed value. While there are no

modeled deemed therms per square foot for Colorado, the engineering algorithm approach continues to make sense with the correction factor applied.

Other factors that impact the *ex post* results from insulation measures relate to the heating degree days applied. For basement insulation, the previous algorithm applied HDD values at a base temperature of 70 degrees. Our calculations applied a smaller HDD value using a base temperature of 55 degrees to reflect the ground temperature that naturally insulates basements. Floor insulation and attic insulation savings were updated to reflect the average of installed insulation as well as square footage from 2014 and 2015 program databases. This resulted in differences in savings between the three utilities; i.e. Atmos had an *ex post* per unit savings of 190 therms for attic insulation due to the average R new value in the database at R-45 and CNG had an *ex post* per unit savings of 107 therms due to an average R new value of R-38.

*Ex ante* furnace maintenance savings applied a three percent improvement in efficiency from maintenance activities. The evaluation team reviewed other sources for maintenance savings and found that a two percent improvement factor over current efficiency ratings for deemed savings was more commonly applied when project specific data was not available. This adjustment was applied for deriving *ex post* savings from furnace maintenance.

Water heater savings were revised to reflect the most current Illinois algorithm which provides transparency and flexibility in parameter inputs. Savings were slightly reduced from previous deemed savings by the use of 125 degrees as opposed to 130 degrees for hot water output temperature settings. 125 degrees is the value that is used by most TRMs and reflects the reduced need for high water temperatures from newer appliances such as dishwashers.

Commercial measures were reviewed and updated to reflect current engineering algorithms; however, due to the significant variance in savings based on installed capacity, equipment specific data should be applied for calculating savings. Due to low participation in the commercial portion of the rebate program, future calculations can be conducted by applying the engineering algorithms with project specific data (i.e., calibrated engineering algorithms).

Realization rates were low for insulation measures, for similar reasons described above for Residential measures.

### ***Atmos Results***

A total of 418 measures were installed in 2014 and 379 measures installed in 2015. The realization rates for Atmos residential measures range between 38 and 136 percent. For commercial measures, there were only nine measures installed in 2014 and nine measures in 2015. The realization rates ranged from 51 to 128 percent (see Table 34).

All respondents reported to have installed the rebated measure(s) and had not removed them at the time of the survey, leading to an overall installation rate of 100 percent. Not surprisingly, all the measures installed were still in place, given that these are large and complex measures that would be difficult to remove.

**Table 34: Realization Rates, per unit by Measure - Atmos Efficient Natural Gas Equipment Program**

<b>Equipment Measures</b>	<b><i>Ex Ante</i> Savings (Therms)</b>	<b><i>Ex Post</i> Savings (Therms)</b>	<b>Gross Realization Rate</b>
Air Sealing	64	73	114%
Attic Insulation	184	190	103%
Boiler (85% - 94.9%)	42	57	136%
Boiler (>=95%)	126	123	98%
Boilers – Proper Sizing	24	24	100%
Crawlspace/Basement Insulation	399	151	38%
Floor Insulation	319	185	58%
Furnace (AFUE ≥ 95%)	137	138	101%
Furnace – Proper Sizing	24	24	100%
Furnace Maintenance	33	21	64%
Programmable Thermostat	24	23	96%
Wall Insulation	336	276	82%
Water Heater >=82 EF	60	48	80%
Commercial Furnace	281	343	122%
Commercial Furnace – Proper Sizing	65	62	95%
Commercial Floor Insulation	319	163	51%
Commercial Programmable Thermostat	38	45	118%
Commercial Water Heaters	60	77	128%

## CNG Results

A total of 40 measures were installed in 2014 and 37 measures in 2015. The realization rates for CNG residential measures range between 48 percent and 157 percent due to differences in algorithms and inputs. There was only one commercial installation in 2015 which resulted in a realization rate of 101 percent.

**Table 35: Realization Rates, per unit by Measure - CNG Efficient Natural Gas Equipment Program**

Equipment Measures	<i>Ex Ante</i> Savings (Therms)	<i>Ex Post</i> Savings (Therms)	Gross Realization Rate
Air Sealing	70	76	109%
Attic Insulation	224	107	48%
Boiler (85% - 94.9%)	30	47	157%
Boiler (>=95%)	104	101	97%
Floor Insulation	372	187	50%
Furnace (AFUE ≥ 95%)	123	117	95%
Furnace – Proper Sizing	22	22	100%
Pipe Insulation	7	7	100%
Programmable Thermostat	20	22	110%
Wall Insulation	257	302	118%
Water Heater >=82 EF	60	48	80%
Commercial Furnace	297	300	101%

### **BH Distribution Results**

A total of 222 measures were installed in 2014 and 177 measures in 2015. The realization rates for BH Distribution residential measures range between 49 percent and 195 percent. For commercial measures, four measures were installed in 2014 and three measures in 2015 with realization rates ranging from 94 to 128 percent.

**Table 36: Realization Rates, per unit by Measure - BH Distribution Efficient Natural Gas Equipment Program**

<b>Equipment Measures</b>	<b>Ex Ante Savings (Therms)</b>	<b>Ex Post Savings (Therms)</b>	<b>Gross Realization Rate</b>
Air Sealing	79	87	110%
Attic Insulation	260	128	49%
Boiler (85% - 94.9%)	29	56	193%
Boiler (>=95%)	124	121	98%
Boilers – Proper Sizing	24	24	100%
Crawlspace/Basement Insulation	320	187	58%
Duct Sealing	40	78	195%
Floor Insulation	399	255	64%
Furnace (AFUE ≥ 95%)	134	134	100%
Furnace – Proper Sizing	24	24	100%
Furnace Maintenance	31	20	65%
Pipe Insulation	7	7	100%
Programmable Thermostat	22	22	100%
Wall Insulation	198	302	153%
Water Heater >=82 EF	62	48	77%
Commercial Boiler (>=95%)	240	283	118%
Commercial Boiler – Proper Sizing	65	61	94%
Commercial Furnace	297	335	113%
Commercial Water Heater	60	77	128%

### **Efficient Natural Gas Equipment Program Net-to-Gross Results**

According to the survey respondents, 58 percent indicated they would have purchased the same equipment without the rebate. Furthermore, two-thirds (66%) of the respondents who purchased furnaces or boilers indicated they were “Very Likely” to have purchased the exact same measure without a rebate. In addition, 50 percent of the respondents said they are “Very Likely” to have made the exact same purchase within six months, without a rebate. However, 34 percent of these participants indicated

they would not have made as many purchases without the program. This was especially true for those respondents (n=15: 38%) who purchased insulation instead of furnaces or boilers.

Though a total of 40 respondents (65%) reported that they had already made a decision to install the equipment before learning about the rebate program, the free rider algorithm uses this response as an offset and consistency check for program influence scoring. As a way to explore this issue more fully, the respondents were also asked to rate the level of influence that each program component had on their decision to install the equipment prior to learning about the program. The respondents rated the level of influence on a five-point scale where “1” meant Not at all Influential and “5” meant “Very Influential.” The results showed that the influence component of free ridership was considerably impacted by those that had indicated making the decision to install before learning of the rebate – the savings-weighted free ridership declined from 43% to 59% due to this adjustment factor.

The following table summarizes free ridership, spillover, and associated net to gross ratios estimated for the PIES rebate programs. Due to small sample sizes at the individual measure level, measure specific NTG ratios were combined to the program level. The Evaluation Team implemented a consistency check across all survey responses and excluded respondents where their response to “likelihood to install measure on their own” and their response to “how influential was the program in your installed measure” were inconsistent. Even with the inconsistent respondents excluded from the results, the influence score showed lower free ridership (38%) relative to the intention score (46%), though these two component scores were close enough to not raise any flags for additional scrutiny. The Evaluation Team found a free ridership rate of 42 percent and a spillover rate of 10 percent, resulting in an overall NTG estimate for the rebate program of 68 percent.

**Table 37: Free Ridership, Spillover, and NTG Estimates, Efficient Natural Gas Equipment Program**

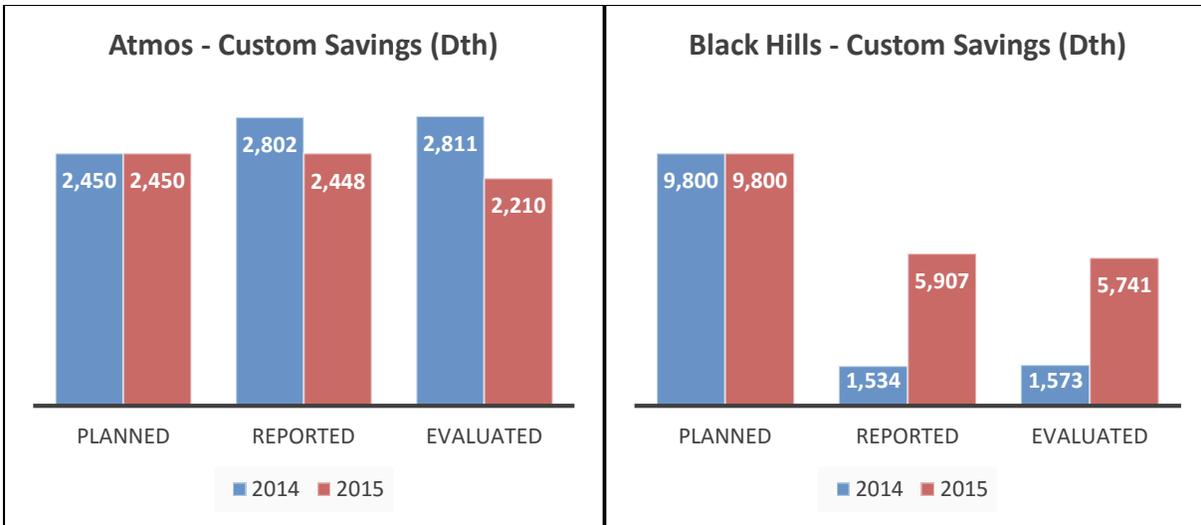
	<i>Ex Ante</i>	<i>Ex Post</i>		
	NTG	Free Ridership %	Spillover %	NTG
Efficient Natural Gas Equipment Program	81%	42%	10%	68%

(Source: 2015 Evaluation Analysis)

### Custom Program

The evaluation team approached the impact evaluation for this program by conducting an extensive desk review of all associated custom project forms, analysis spreadsheets, technical studies and manufacturer cut sheets.

- Atmos closely followed their expected goals in both gas savings and participation numbers. The majority of projects were at multifamily facilities; other participating facilities included schools and industrial buildings.
- BH Distribution fell short of savings goals in both 2014 and 2015. In participation, they closely met their goal in 2014 and exceeded goals in 2015. Custom projects were found at a variety of building types with most focusing on lodging facilities.



**Figure 14: Custom Project Savings in 2014 and 2015**

The results of our review are summarized in the following sections.

**2014 and 2015 Program Savings and Participation**

In 2014, Atmos achieved 15 percent over its gas savings target and in 2015 it fell 10 percent short of savings goals. Collectively, the two-year program results show that the custom program exceeded the target goal of 4,900 Dth with an evaluated result of 5,021 Dth. Program participation was at 80 percent of target for 2014 and at 100% target for 2015.

Table 38 shows the evaluated results on participation and savings from 2014 and 2015 projects for Atmos.

**Table 38: Atmos Custom Program Goals and Results (YTD)**

	2014	2015	Total	2014	2015	Total
	Energy Savings (Dth)			Participation (Projects)		
Planned	2,450	2,450	4,900	5	6	11
Reported ( <i>Ex Ante</i> )	2,802	2,448	5,250	4	6	10
Evaluated ( <i>Ex Post</i> )	2,811	2,210	5,021	5	6	11
Realization rate	100%	90%	96%	---	---	---
% Reported	114%	100%	107%	80%	100%	91%
% Evaluated	115%	90%	102%	100%	100%	100%

In 2014, BH Distribution achieved only 16 percent of its gas savings target with program participation at 90 percent. In 2015, 60 percent of savings goals were reached with participation exceeding goals by 40 percent. Collectively, the two-year program results show that the custom program is at 40 percent of the target goal of 19,600 Dth with an evaluated result of 7,351 Dth (see Table 39).

**Table 39: Black Hills Custom Program Goals and Results**

	2014	2015	Total	2014	2015	Total
	Energy Savings (Dth)			Participation (Projects)		
Planned	9,800	9,800	19,600	9	9	18
Reported ( <i>Ex ante</i> )	1,534	5,907	7,441	8	15	23
Evaluated ( <i>Ex post</i> )	1,573	5,741	7,351	8	13	21
Realization rate	103%	97%	99%	---	---	---
% Reported	16%	60%	38%	89%	167%	128%
% Evaluated	16%	59%	38%	89%	144%	117%

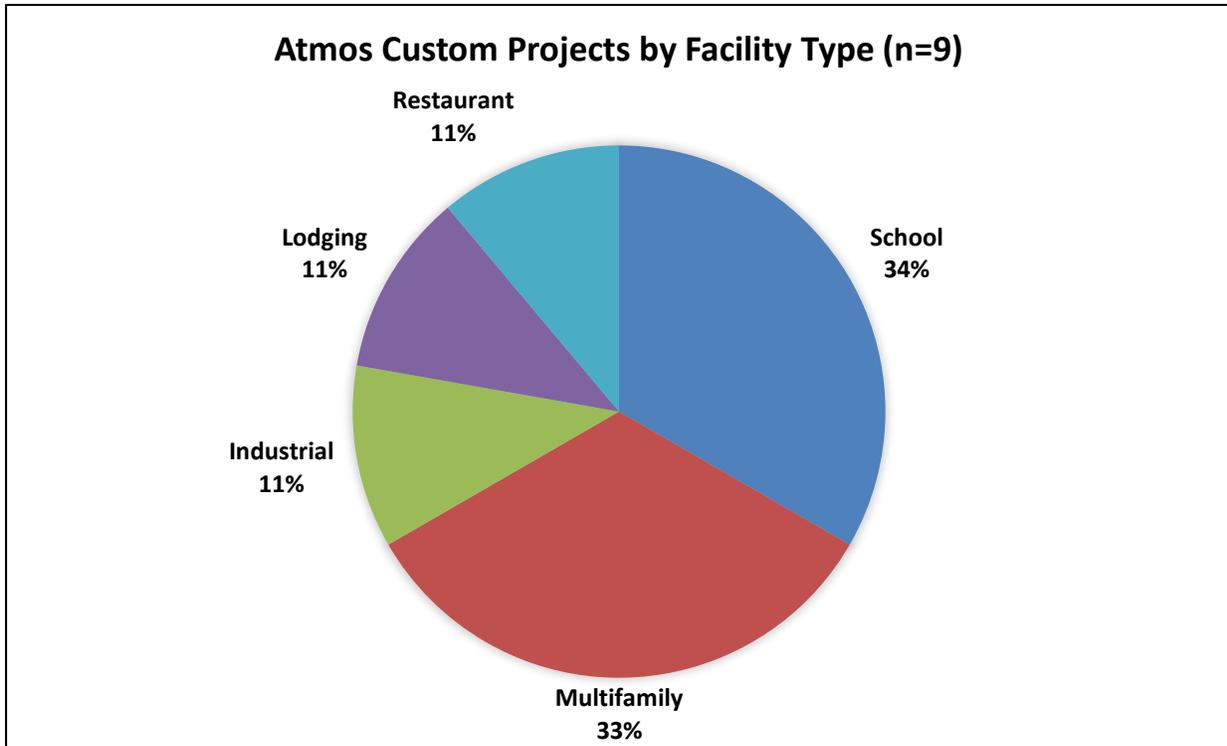
**Installed Measures and Realization Rates**

A total of 32 custom projects were assessed across Atmos and BH Distribution. CNG did not have any custom projects for 2014 and 2015. The majority of custom projects consisted of large boiler replacements. Other custom measures included insulation upgrades, infrared unit heaters, and snowmelt optimization systems. The detailed findings from our review of each custom project are provided in Appendix C.

A comprehensive listing of measures by program year and savings are tabulated by utility in the following tables. Realization rates were found to vary based on the measure. Evaluated results were adjusted to reflect more accuracy in determining savings from insulation, infrared unit heaters and high efficiency fryers. Additional modifications were made when reviewing annual billing consumption data and reflecting the appropriate baseline and efficiency values for boiler replacement projects (see Table 40). These realization rates are based on the total reported versus evaluated results

**Table 40: Measure Installations – Atmos**

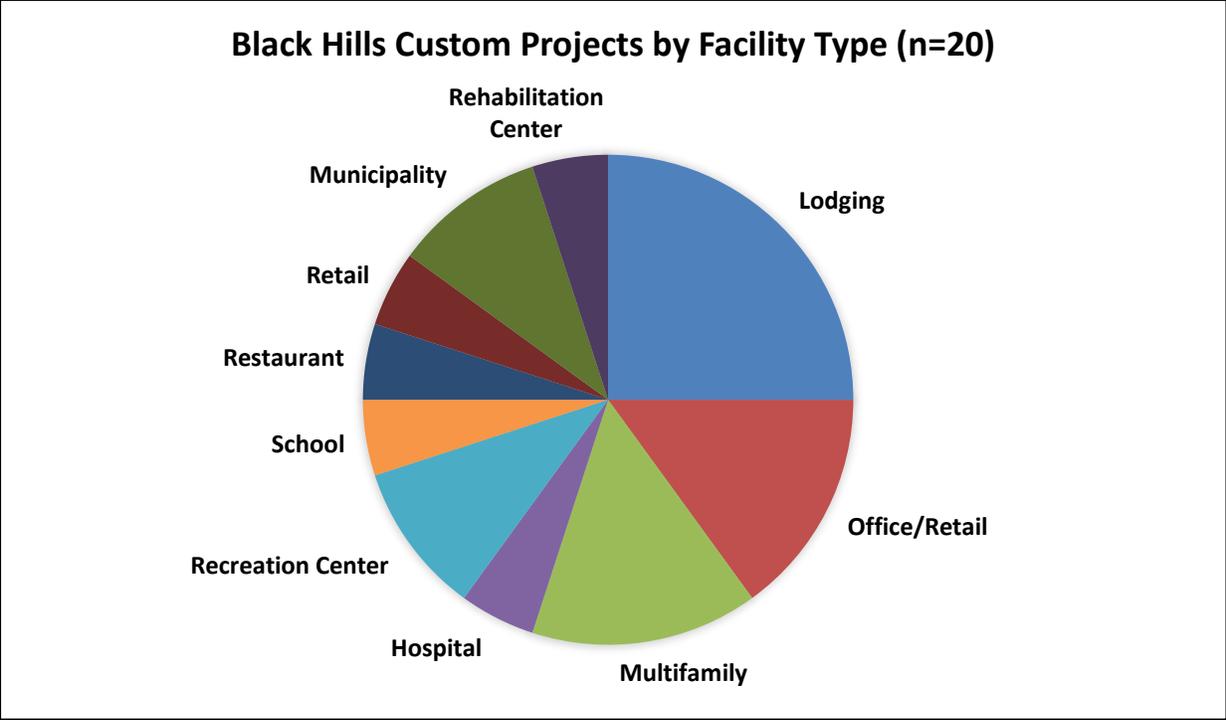
Measure	# installed		Reported Savings, Dth		Evaluated Savings, Dth		Realization Rate	
	2014	2015	2014	2015	2014	2015	2014	2015
Boilers	4	3	2728.7	1133.6	2529.2	999.2	93%	88%
Fryers	---	1	---	216	---	281	---	130%
Infrared Unit Heater	1	1	73.2	91.8	81.9	144.9	112%	158%
Insulation – Roof/Attic	---	1	---	19.6	---	19.6	---	100%
System Controls	---	1	---	987.5	---	764.2	---	77%
TOTAL	5	7	2,802	2,449	2,611	2,209	93%	90%



**Figure 15: Atmos Custom Projects by Facility Type**

**Table 41: Measure Installations – BH Distribution**

Measure	# Installed		Reported Savings, Dth		Evaluated Savings, Dth		Realization Rate	
	2014	2015	2014	2015	2014	2015	2014	2015
Boilers	3	9	328.4	2200.2	345	2095	105%	95%
Boiler Optimization	1	1	101.5	46.9	101.5	46.9	100%	100%
DHW	1	---	3.8	---	0	---	0%	---
Furnaces	---	1	---	119.4	---	119.4	---	100%
Infrared Unit Heater	1	---	107.9	---	181.4	---	168%	---
Insulation - Attic	2	2	185.7	434.1	172.6	406.8	93%	94%
Insulation - Floor	2	---	217.5	---	172.7	---	79%	---
Insulation - Wall	2	---	191.6	---	202.5	---	106%	---
Programmable Thermostats	---	1	---	130.2	---	96.6	---	100%
Snowmelt Optimization	1	1	65.9	2036.4	65.9	2036.4	100%	100%
System Controls	1	2	331.3	939.5	331.3	939.5	100%	100%
<b>TOTAL</b>	<b>14</b>	<b>17</b>	<b>1,534</b>	<b>5,907</b>	<b>1,573</b>	<b>5,741</b>	<b>103%</b>	<b>97%</b>



**Figure 16: Black Hills Custom Projects by Facility Type**

**Evaluation Findings and Recommendations**

Much of the success and traction in 2014 and 2015 can be attributed to a combination of marketing and communication efforts. Custom projects were also identified by EOC from their income qualified programs which can assist in partnering financial support and savings with the utilities. In fact, Atmos and BH Distribution both had custom projects completed through this partnership in 2014.

Technical studies also provided an avenue to custom program participation. While Atmos did not have any technical studies that were incentivized through the CEEP, two studies were conducted in 2014 and two studies in 2015 for BH Distribution customers. All the studies completed resulted in the completion of custom projects.

The online portal developed and managed by the implementation contractor, MPE continues to streamline the process for accessing required applications and approvals.

For our evaluation, Mesa Point provided project files and all associated completed forms. Billing data was collected for all projects and made available to the evaluation team. Our review found that for the most part, all the data and information associated with each project was provided for each custom project to replicate savings. The only situations where savings were not reproducible were projects where savings were from third party energy audits that included results from energy audit software.

MPE captures all details associated with custom projects in a single database for each utility; Atmos and BH Distribution. This database was easily accessed and transparent for the purpose of this evaluation.

## 4 Conclusions and Recommendations

### Key Conclusions and Recommendations

The program evaluation activities yielded the following conclusions and recommendations on ways to enhance and improve the PIES program portfolio.

#### Conclusions

##### *Program Results*

**Performance relative to goals:** The PIES programs performed unevenly during the two-year evaluation period and did not achieve their participation or energy savings goals at the portfolio level in PY15. The participation rates were highest in PY15 for the Income Qualified Program (119%) and Residential Energy Audit Program (96%). Participation rates were also high for the Energy Efficiency Kits Program, however that result is primarily driven by Atmos' program as BH Distribution did not distribute energy efficiency kits in 2015.

The total portfolio achieved just 62 percent of its energy savings (therms) goal across the entire portfolio in PY15. Again, the Income Qualified and Energy Savings Kits Programs achieved the highest savings; however, this was largely due to Atmos' efforts to promote in the Energy Savings Kits both directly to customers and through its schools- kit program.

##### **Realization rates for the individual programs vary significantly by both utility and measure.**

- For the Residential Energy Audit Program, realization rates were at or near 100 percent for faucet aerators, pipe insulation, programmable thermostats and water heater blankets. Realization rates were 59 percent for low-flow showerheads.
- The Income Qualified Program also produced mixed results by measure varying from 45 to 250 percent across the three PIES utilities.
- The Energy Efficiency Kits Program achieved significantly high realization rates for all measures distributed by Atmos and CNG, except faucet kitchen aerators.
- For the Efficient Equipment Natural Gas Equipment Program, the realization rates were approximately 100 percent for air sealing, boilers, furnaces, programmable thermostats, and proper sizing of furnaces/boilers for the residential measures. In contrast, the realization rates were significantly below 100 percent for duct sealing, insulation measures (attic, basement, floor and wall), furnace maintenance and water heaters.
- For the Custom Program, Atmos closely followed their expected goals in both gas savings and participation numbers. The majority of projects were at multifamily facilities; other participating facilities included schools and industrial buildings. However, BH Distribution fell short of savings goals in both 2014 and 2015. In participation, they closely met their goal in 2014 and exceeded goals in 2015. Custom projects were mostly installed at lodging facilities.

### ***Customer Satisfaction***

- **Customer satisfaction continues to be high among program participants.** The customer surveys found that respondents reported high satisfaction levels with both Energy Audit Program and Efficient Natural Gas Equipment Program as well as the three PIES utilities.

### ***Program Awareness***

- **Most participants learned about these programs indirectly rather than as a result of the marketing or outreach strategies.** For example, most Residential Energy Audit Program participants learned about the program through non-profit agencies (29%) compared to the other types of marketing and outreach tactics used to promote the program. The contractors continue to play an important role in promoting the Efficient Natural Gas Equipment Program. In contrast, many fewer respondents reported learning about the program from other sources, including social media, online or from radio or television advertising.

### ***Program Operations***

- **Program operations varied significantly throughout the two-year evaluation period.** For example, Residential Energy Audit Program participation rates increased slightly in the Spring of 2014 and then dropped off again until the Winter of 2015. For the Efficient Natural Gas Equipment Program, the overall number of incented measures installed through the program declined 14 percent from 2014 to 2015.

### ***Program Tracking***

Program tracking remains a critical and ongoing challenge for both program operations and evaluation. Since each PIES energy efficiency program is tracked in a separate database, there is no consistency between or among program implementers regarding tracking critical program metrics such as the number of participants, location, or specific participant data.

The evaluation team also faced several challenges in receiving complete and accurate information from the low-income program administrator, CORE. Due to the lack of complete information for PY2014, our analysis only focused on the results from PY2015. In addition, it required several iterations of data requests to receive the full and complete set of data from the program implementer.

- **The PIES utilities may be missing saving opportunities in the Residential Energy Audit Program in several ways.** While this program can provide a stepping-stone into additional energy efficiency purchases and behaviors, these audits may not be maximizing their full potential while in the home. BH Distribution was the only utility that had rebated projects as a result from the assessment.

Furthermore, not every program participant received a direct install measure. Installation rates of the direct measures are low, with only 69 percent reporting receiving at least one free measure. However, the major reasons for not installing the free measures were that they were already in place or that the customer refused them.

- **The PIES programs are still facing some serious barriers to program implementation.** According to program staff and implementers, these barriers include the diversity of each of the natural gas service territories in that they are not homogeneous. The customer demographics are also challenging as the price for the audit may be too high for some customers living in poor, rural areas of the state.

The commercial component of the Efficient Natural Gas Equipment Program and the custom program also face several barriers include a lack of engaged or informed trade allies, especially for the commercial projects that make it difficult to implement projects for BH Distribution and CNG. In addition, the approval process for the custom projects is perceived to be overly burdensome by some participants or potential participants.

## Areas for Program Improvement

- **The evaluation identified several areas for program improvement** including increased communication among the program implementers, improved reporting on the marketing activities so the implementers can coordinate with the utility staff on marketing and outreach.
- **The program implementers also wanted some additional clarity regarding the savings assumptions used to estimate savings for the installed measures.** This will help them better track the savings for each project and monitor their progress.

### *Free Ridership and Spillover*

- While the free ridership for the Efficient Natural Gas Equipment Program was high (42%), this was somewhat offset by spillover (10%) for a NTG value of 68%.
- The Residential Energy Audit Program had lower free ridership (15%), which was more than offset by spillover, yielding an estimated NTG ratio of 100%.

## Recommendations

These program evaluation activities also led to the following recommendations from the Evaluation Team.

### *Program Results*

- **The PIES utilities should review the realization rates achieved by each program measure and adjust its portfolio offerings accordingly to maximize energy savings.** These may include changes in the energy efficient direct install measures, such as kitchen aerators and low-flow showerheads, as well as reviewing the cost-effectiveness of the insulation measures offered in its Efficient Natural Gas Equipment Program.

### *Program Operations*

- **The PIES utilities should continue to work to improve the program tracking databases developed by each of the program implementer.** These improvements should focus on capturing critical program metrics, such as project details, customer information, project personnel and related fields that will assist in QA/QC for these programs.

- **The Residential Energy Audit program should attempt to increase savings by increasing direct installation measures and/or encouraging participation in other PIES energy efficiency programs by providing information about these savings opportunities in the materials provided during the in-home audit.**
- **The direct install measure mix needs to be updated in order to increase overall installation rates of these measures.** Currently, a large percentage of these measures are not installed either because they are already in place or the respondents do not like them. Therefore, the PIES utilities should research other types of direct install measures that could be offered to customers through the Energy Audits as a way to further maximize energy savings for this program.
- **The Custom Efficiency Program can be improved by implementing the following recommended changes:**
  - Improve engineering analysis and review for measure identification or performance prediction;
  - Select projects based on likely economic performance;
  - Improve project tracking and documentation; and
  - Improve program marketing and outreach.

### ***Marketing***

- **Some of the current marketing activities need to be improved and refreshed.** Since most customers learn about these programs indirectly, less emphasis should be placed on direct customer outreach and instead the marketing should focus on engaging and recruiting trade allies to participate in the program.
- **The Residential Energy Audit Program should continue to be positioned as a the “gateway” program to promote the Efficient Natural Gas Equipment Program.** However, the Energy Auditors should continue to provide follow up with the recommendations to encourage customers to complete the recommended actions in a timely manner.
- **The advertising agency should be required to track and report critical metrics regarding the program’s overall success in its various activities as a way to better monitor and improve the performance of these marketing activities.**

### ***Enhancing Savings Calculations***

- **The PIES utilities should update savings algorithms and values to those present in this report. Future savings claims and goals should be based off these new values.**

### ***Spillover***

- ***Spillover* rates are highest for non-natural gas measures, which is not beneficial to the sponsoring gas utilities.** Energy auditors offer the program to customers who can receive both electric and natural gas measures. However, the program should continue to provide information to encourage customers to install potentially fuel-neutral measures, such as insulation and weatherstripping.