

City of Austin - Program Benchmarking, Cost  
Effectiveness Testing, and Best Practices  
Recommendations of Texas Gas Service Energy  
Efficiency Programs

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Final Report

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## Executive Summary

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This report presents research performed for the City of Austin (the City) and covers a variety of topics related to natural gas conservation program activity conducted by Texas Gas Service (TGS), a Division of ONE Gas, in the Central Texas Service Area. The research activities were performed by ADM Associates, Inc. (ADM). The research topics included performing a utility benchmarking study, reviewing cost effectiveness test results from 2018, and providing recommendations for best practices and methodologies to help improve the implementation of natural gas conservation programs offered by TGS.

This report focuses on program activity from Program Year 2018 (PY2018). The following sections summarize research objectives, research findings, and recommendations.

### ES.1. Summary of Research Objectives

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ADM had the following research objectives:

- Perform utility benchmarking involving other natural gas utilities to support a comparison and assessment of TGS energy efficiency program performance and achievements;
- Perform an independent review of final, post-implementation cost effectiveness of each equipment type offered in the programs, and the overall cost effectiveness of the energy efficiency portfolio for the 2018 program year; and
- Provide recommendations and best practices for methodologies used to conduct program evaluation, measurement, and verification.

### ES.2. Summary of Research Findings

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In the sections below, we present key research findings from the utility benchmarking comparison, cost effectiveness review, and non-participant customer survey.

#### ES.2.1. Utility Benchmark Comparison Key Research Findings

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- Partnerships with electric utilities can continue to be beneficial when marketing and implementing the programs. TGS currently partners with Austin Energy for dual-fuel saving measure installations. The natural gas utilities interviewed recommended that working with the electric utility in the same territory will provide customers with more rebate options and better services.
- A third-party implementer is common among natural gas utilities. The utilities discussed their relationship with their third-party implementer. The implementer helped the utilities with a range of activities including program implementation, data tracking, marketing, and engineering savings calculations.
- Flexibility in the rebate program and making the application process simple for the customer are practices implemented by two of the gas utilities. Flexibility and

simple processes have helped these utilities achieve success in terms of reaching savings and program participation goals.

### **ES.2.2. Cost Effectiveness Comparison Key Research Findings**

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- ADM performed cost effectiveness testing of TGS program activity in 2018, and overall for the Total Resource Cost Test, the results showed that the 2018 portfolio of programs was cost effective.
- The testing assumptions used by the TGS outside expert were considered reasonable as they closely aligned with the testing assumptions used by ADM.
- Incentive levels for residential replacement water heating equipment are on the high end compared to other similar natural gas utilities. However, the TGS program offering remains cost effective.

### **ES.2.3. Non-participating Customer Survey Key Research Findings**

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- Generally, TGS customers are not aware of the rebates offered by TGS. For residential customers, over fifty percent of respondents were unaware of the rebate programs offered. For non-residential customers, 52% of respondents stated that they were unaware that TGS provides rebates for energy efficient equipment purchases as well as free of charge direct installation equipment. Raising customer awareness of programs is an ongoing challenge for natural gas utilities.
- The majority of residential customers were interested in getting additional information on energy savings tips and energy efficiency rebate programs. Close to 65% of customers were “moderately interested” or “very interested” in getting these tips.
- Generally, non-residential customers have not upgraded or replaced natural gas equipment in the last three years and do not expect to receive a rebate from TGS for future replacements. Twelve respondents stated that they do not expect to receive a rebate from TGS or to have to replace or upgrade natural gas equipment at their organization.

### **ES.3. Summary of Recommendations**

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Overall, TGS has had success in implementing the natural gas conservation programs. Based on the key research findings, ADM recommends the following suggestions so that program offerings and services can continue to be improved:

- Continue to explore opportunities for collaboration with the electric utility to help market the programs, provide improved services, and provide rebate offerings.
- Continue to offer flexibility in the rebate application process and explore additional ways for customers to participate in the natural gas conservation programs.

- Consider offering a midstream program for residential appliances, where participating retailers offer already-discounted energy efficient appliances in an effort to further develop working relationships with local retailers.
- If pursuing a food service equipment pilot program, consider offering a midstream delivery channel as well as the traditional rebate application process.
- Consider lowering the incentive for residential replacement tankless water heaters (a reasonable rebate amount would be in the \$500 range).
- TGS should increase their marketing of equipment rebates due to the lack of rebate awareness that customers reported. Since customers seemed to learn about the rebates from email, the website, and mailed brochures, these communication channels should be the focal point.
- Marketing should be aimed at residential customers due to their interest in energy efficiency programs and actions. Contacting these customers can best be done via utility bill inserts, the utility website, or email communications.
- Increase energy efficiency education and marketing efforts for non-residential customers who own the business premise. All non-residential customers who responded stated that they have not upgraded natural gas equipment in the last 3 years. This could be due to a lack of energy efficiency education, or lack of outreach efforts by the utility or program implementor.
- For non-residential customers, contact the primary energy decision maker for the premise about offering a free walk through rather than a tenant who leases the space. Typically, premise tenants cannot make energy efficiency decisions, so the premise owner should be contacted. It would be beneficial for TGS to investigate who the primary decision maker is of non-residential accounts, and attempt to build that relationship. Alternatively, business owner relationship-building could be handled by the commercial program implementor, CLEARResult.

# 1 Natural Gas Utility Benchmark Research

In this section ADM presents utility benchmark findings based on in-depth interviews with key utility staff. The research findings were used to provide recommendations for improving TGS energy efficiency programs as well as identify areas of program implementation where TGS is performing well.

## 1.1 Standard Benchmarking

Utilities use benchmarking of other utility program offerings to improve program design and other aspects of program implementation and administration. To support a thorough assessment of TGS’ achievements, we have selected benchmarking of utilities that share common factors with TGS such as natural gas annual sales, customer demographics, conservation program tenure, regulatory guidelines, and similar climate zone.

Twelve other utilities were contacted by email to participate in the benchmarking study, in addition to TGS. A follow up email was sent to those who did not initially respond. Six utilities, including TGS, participated in an interview about their programs and current practices. Five out of the six utilities are in the southwest or west coast regions. One of six utilities (Philadelphia Gas Works) is located on the east coast. ADM understands that there is likely no single natural gas utility that approaches all key attributes of TGS, but we believe each of the utilities listed allowed for benchmarking of the most critical utility attributes. Table 1-1 below summarizes the utilities that participated in interviews.

*Table 1-1 Utilities Considered for Benchmarking*

<i>Utility Name</i>	<i>Interviewed (Yes/No)</i>
Texas Gas Service	Yes
New Mexico Gas Company	Yes
Unisource Energy Services	Yes
Anonymous Natural Gas Utility	Yes
Black Hills Energy	Yes
Philadelphia Gas Works	Yes
Oklahoma Natural Gas	No
CenterPoint Arkansas	No
CenterPoint Oklahoma	No
Spire Energy (Laclede Gas Missouri)	No
Florida Public Utilities	No
Florida City Gas	No
Atmos Energy-Mid Texas	No

Utility staff were interviewed on a variety of topics:

- Roles and responsibilities;
- Energy efficiency program processes;
- Key performance indicators;
- Trade allies and other program partners;
- Data management and tracking; and
- Quality control and assurance.

Summaries of the utility staff benchmarking interviews are provided in the sections below. All information provided in the sections that follow is intended for informational purposes and not for comparative purposes. The benchmarking research is intended to inform TGS on possible ways to build on or improve energy efficiency program implementation and processes.

### 1.1.1 New Mexico Gas Company Research Findings

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Three internal employees work on the energy efficiency programs at New Mexico Gas Company. They are a project developer, manager, and administrator, with the project developer being the primary person who oversees the programs. The external staff that work on the utilities' portfolio include the implementers for various energy efficiency programs, and there are at least 80 supporting staff for the implementers.

The energy efficiency programs that the project developer oversees include programs in the following sectors: residential, income-qualified, multifamily, new construction, and commercial.

The residential programs include a space heating program and water heating program. The space heating program includes rebates for energy star furnaces, boilers, smart thermostats, and attic insulation. The water heating sector includes rebates for energy star tankless water heaters as well as offering of low flow kits that include 1.5 GPM showerheads, 1.0 GPM bathroom faucet aerators, and 1.0 GPM kitchen faucet aerators.

The income qualified program uses 20-25% of the program budget. New Mexico Gas Company pays for the home improvements made after the participants receive home weatherization improvements. Multifamily homes can be routed to the income qualified or non-low-income programs. Further, the multifamily program is run by an implementer who has a great relationship with the low-income apartment landlord community and thus is able to channel the majority of the work from that community into the low-income program. The project developer mentioned that hard to reach customer groups include those customers that are right above the 200% federal poverty limit. For low-income single-family dwellings, this can present a challenge in promoting the availability of energy efficiency improvements.

For residential new construction, there are approximately 60-75 new home builders enrolled in the program. Residential new construction programs truly benefit from high rates of home builder participation, and New Mexico Gas has done a good job of builder recruitment.

The commercial programs have an implementer and consist of direct install, prescriptive, midstream food service, and custom equipment. The commercial food service program was formerly a customer direct program but was then changed to a mid-stream program (the equipment discount is built into the cost of the equipment). This administrative change has positively impacted participation over the last two years.

There are some equipment types that have been retired due to cost-ineffectiveness such as a Water Heater Tank Wrap and EnergyStar Residential Storage Water Heaters. However, in recent years, the New Mexico TRM has been updated, and the storage water heater energy savings calculation has been revised resulting in a more cost-effective offering. New Mexico Gas Company has requested that this program be added into their program offerings in 2020.

New Mexico Gas has a good working relationship with its trade allies. One hundred sixty contractors participate in the trade ally program, and they are required to be state licensed. In the residential and commercial program, incentives can be paid directly to the contractors.

In terms of program quality control and data tracking, implementers quality-control 5% of all jobs complete. The program's data is tracked and managed through the channels provided by the implementers.

### 1.1.2 Anonymous Natural Gas Utility Research Findings

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An Anonymous Natural Gas Utility (utility) was interviewed and chose to remain anonymous for this benchmarking study. The utility offers prescriptive rebate programs for the residential and commercial sectors. The current equipment offerings in the portfolio include low flow aerators and showerheads, clothes dryers, combination water heaters (storage and tankless), pool heaters, and fire-place inserts. Although low flow, water-saving equipment is rebated in the residential program, the utility notes that those devices do not generate a large amount of energy savings. The utility is interested in identifying efficient residential cooking equipment as a possible program offering in the future.

In the commercial sector, the utility offers rebates for cooking equipment (fryers) and for commercial water heating. The commercial fryer rebates are popular with fast-food restaurant establishments. The utility no longer offers rebates for steam traps, clothes washers, and dish washers.

Two thirds of the utility's programs are overseen by a third-party implementer. The implementer participates in program marketing activities which benefits the programs by increasing program participation. The implementer also oversees the trade ally relationships in the commercial sector while the utility oversees the trade ally relationships in the residential sector.

The utility also offers midstream retail programs, and it was suggested that TGS may benefit from a midstream program since doing so connects them with the contractor or retailer who in turn works directly with the customer on the purchase of energy efficient equipment.

ADM asked about the handling of paperwork in the rebate application process, and the utility stated it now has a mobile app that customers can use for scanning in applications to be sent electronically. Customers can also send in photos taken with their phones using photo geo-location to verify equipment installation.

In terms of budget, the utility spends approximately 50% on incentive payments and program labor costs. The remaining 50% is spent on program marketing and administration costs. Marketing activities for the programs have included television and radio advertisement.

### 1.1.3 Black Hills Energy Research Findings

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The manager of energy efficiency at Black Hills Energy (BHE) was interviewed as part of the utility benchmark study. The manager oversees the energy efficiency programs in Arkansas.

BHE provided ADM the breakdown of their program implementation budget. Their budget is broken down as follows:

- 49% for incentives;
- 43% on marketing delivery;
- 4% on their EM&V evaluator;
- 2% on administration; and
- 2% on planning and design.

Recently, BHE's smart thermostat program launch was successful. To market the program, an email blast was sent out to residential customers. The promotion started with a limited number of thermostat brands (Next and Ecobee). Since then, BHE has decreased the equipment rebate amount but now allows any thermostat that is EnergyStar rated to be eligible for the program.

BHE expressed concerns with the uptake of food service equipment since the market tends to sell used or refurbished equipment; BHE has reservations about that and does not offer rebates for that type of equipment. The utility also expressed challenges getting larger commercial customers participating in the programs since natural gas measure offerings can be very limited for that customer type.

Other issues that have arisen are related to tankless water heater rebates. Not all homes are ready to have a tankless water heater installed; there may not be enough gas pressure or a large enough gas line to meet the natural gas supply requirements of the tankless water heater.

Last year, BHE increased funding for the weatherization program since there was an increase in through-put usage by the utility. Increasing the implementation budget of the weatherization program led to increased customer satisfaction.

BHE has a third-party implementer for their programs. The implementer reviews new technologies, IECC codes, program goals, cost effectiveness, and attends industry

conferences. This helps BHE determine what measures to approve for their portfolio and the funding levels for each program. Although BHE has not had any problems with their implementer, they stated that there could be drawbacks to having a third-party implementer. A benefit to having a third-party implementer is that they can build an educated contractor network. A drawback includes that the third-party implementer could be the party that the customers associate the program with. To prevent this from happening, BHE has held rebate check presentations specifying that BHE is the issuer of the rebate checks. They also require a line item on the invoices stating that the rebate is a BHE Rebate if the incentive amount goes to the contractor rather than the customer.

When discussing trade allies, BHE stated that they do not have requirements for trade allies in the equipment rebate program. Any licensed HVAC contractor/plumber can provide installation services to a customer to which BHE will then provide a rebate. For the commercial program, BHE has specific trade ally partners that serve the steam system rebates. Those trade allies are knowledgeable in that business. All weatherization program trade allies are required to have continuing training and education.

BHE's marketing method is through word-of-mouth. They also continue to implement contractor energy efficiency education.

The implementer oversees data tracking and management. BHE recommends a single data administrator since it makes data management and tracking more streamlined, and it removes that burden from the utility.

In terms of Quality Control and Assurance, 100% of commercial projects are subject to quality control measures. For equipment rebates, 5% of installations are quality controlled. Lastly, for weatherization, 10% of projects are quality controlled if a new trade ally did the work or if the trade ally had recently been suspended and reinstated. Overall, for weatherization, 5% of projects are subject to quality control procedures.

BHE had several recommendations they offered to TGS. The first recommendation was to avoid putting the majority of the implementation budget into the commercial programs as that program type requires a greater number of projects to achieve a high share of the savings. The second recommendation was to implement a behavioral program if the goal was to quickly achieve energy savings goals. Other advice was to partner with an electric utility for promoting dual-fuel measures and avoiding electric-to-gas fuel switching rebates. Partnering with the electric utility can bolster measure-level savings and reduce implementation costs since both utilities would be providing implementation funding and marketing. BHE also suggested to be flexible with program rebate amounts based on cost benefit analysis; this strategy has helped the utility achieve varying degrees of success.

#### 1.1.4 Unisource Energy Services Research Findings

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The senior program manager of the energy programs offered by UniSource Energy Services (UniSource) was interviewed for this benchmarking study.

UniSource offers both residential and commercial energy efficiency programs. On the residential side, their programs include a low-income weatherization program and a new

construction program. Due to certain limitations, these are the only 2 residential programs that are currently offered.

The residential programs do not have a third-party implementer. However, for the low-income weatherization program, UniSource leverages the efforts of community action partners, which act as trade allies/contractors for the program. These partners qualify the individual homeowners based on income level requirements. They review the eligibility criteria, perform an in-home audit, write the scope of work including what retrofits are needed, and finally provide the utility with the work performed and information to fund projects completed at the home.

The new construction program is a joint utility program. The requirements are that the customer must install a natural gas furnace (95% AFUE) and natural gas water heater (0.67 EF) as part of the new construction project.

In the commercial sector, UniSource's main incentives are for custom measures, and they also provide opportunities for the rebate of specific equipment replacements. The custom measures are more popular than equipment replacements. The types of custom projects that are most incentivized include boilers and hot water heaters in university campuses and similar space-types. The contractor or vendor working with the customer routes the customer into the program. Some challenges with commercial program participation include limited internal resources and the absences of an implementation contractor, both of which can hinder program participation.

UniSource recruits applicants to the residential new construction program through participating home builders. There is a participating agreement between the customer and the builder. The builder has a separate relationship with the HERs rater to get the home energy score to meet application requirements (otherwise known as HERs score). The builder has to pre-register before participating in the program but is later able to retroactively pre-register. When applying to the program, builders must apply on a per home basis. This is a common industry practice.

In terms of residential portfolio implementation costs, 95% of Unisource budgeted costs go to incentives and 5% go to program administration. For weatherization, 90% of the budget is spent on rebates and 10% is spent on administrative. For the commercial program, 80% of the budget is spent on rebates and 20% is spent on administrative costs.

UniSource uses internal company resources for all the programs' data management and tracking needs.

To increase savings by 50% in a span of 3 years, UniSource stated that a possible avenue would be to increase savings on the commercial side due to limitations in savings on residential weatherization and new construction. They have organized educational and outreach events to promote the programs, but there has not been any traction on these activities yet.

UniSource stated that partnerships with different utilities has helped them align program savings goals and funding across the state and region; connecting and collaborating with government agencies has also helped the success of their programs in terms of growth and participation.

### 1.1.5 Philadelphia Gas Works Research Findings

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As part of the benchmark study, an interview was conducted with the manager of the energy efficiency programs at Philadelphia Gas Works (PGW).

PGW offers prescriptive rebate programs to their residential and commercial customers. These rebates include residential equipment rebates for high efficiency furnaces and boilers and commercial rebates for boilers and water heaters and kitchen equipment. There is also a custom commercial retrofit program for commercial and multifamily properties. PGW also offers a new construction grant program for new construction properties built beyond code for commercial and multifamily properties. The new construction program for the next phase is aiming to include expanded prescriptive offerings rather than offering energy model review due to challenges faced with builders. In terms of future programs, PGW is looking to administer a low-income program for smart thermostats.

PGW also offers a robust low-income program. They identify low-income customers and pay for 100% of the work performed in the home. The customers who are high-energy users qualify. Furthermore, PGW has developed a Health and Safety Pilot Program for low-income customers which allows contractors to exclude health and safety costs from impacting cost effectiveness requirement.

A program that is no longer offered by PGW is the residential retrofit (weatherization) program. The residential retrofit program had 5 approved contractors that could perform the work and they offered reduced energy audit costs and reduced cost of the completed work. However, the utilities commission ordered that PGW no longer continue offering this program.

PGW uses a third-party implementer for the market rate portfolio, but the low-income portfolio is self-administered. The advantages of a third-party implementer include their expertise in engineering, management of the energy efficiency website, and marketing of the programs. There is a split of program implementation duties between PGW and the implementer. While the implementer focuses on the tasks just mentioned, PGW focuses on the program design aspect and high-level strategy of program implementation. PGW manages the pre-review process for custom projects and completes those reviews internally.

PGW does not have a formal trade ally program. They have done individual case studies but do not have a trade ally list or contractor list. Only the low-income program has pre-approved contractors.

PGW's third-party implementer does most of the project post-implementation quality control. They go on site to perform verifications on a percentage of installations that have been approved for a rebate. The implementer also maintains the database in terms of data tracking and management. The advantages to having the implementer administering these tasks is that PGW spends less time with application paperwork or processing and reviewing data entry into the program database.

PGW's advice to TGS is to work with the local electric utility to coordinate efforts, but to let the market that you serve be the determining factor to what extent you work with the

other utility to implement and promote energy efficiency. Also, PGW recommends that TGS keep the program processes as simple as possible for the customer.

### 1.1.6 TGS Research Findings

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TGS offers natural gas conservation (energy efficiency) programs for residential, commercial, and new construction projects. The residential offerings are for customers installing new appliances in existing homes. For customers on fixed or moderate incomes, there is the free equipment program which entails TGS providing free-of-charge energy efficient equipment and installation services. These services include free installation of new and replacement wall or central furnaces, natural gas water heaters, natural gas dryers and ranges, as well as free weatherization services. The residential new construction offerings are for builders or customers installing new appliances in newly constructed homes. Lastly, a free water kit is offered to qualifying residential customers. The commercial offerings are for commercial rate customers including master-metered multi-family units. The water kit includes a low flow showerhead, a low flow kitchen faucet aerator, and two low flow bathroom faucet aerators.

The residential rebate programs include:

- Natural Gas Heating Program
- Natural Gas Water Heating Program
- Natural Gas Dryer Program
- Home Improvement Program
- Free Equipment Program
- Water Kits Program

The commercial rebate programs include:

- Commercial Water Heating Program
- Commercial Food Service
- Natural Gas Dryer
- Commercial Direct Install Program

The residential new construction rebate programs include:

- Water Heating Program
- Heating Program
- Natural Gas Dryer Program

TGS offers rebates to customers living within the city limits of the following cities: Austin, Bee Cave, Cedar Park, Cuero, Dripping Springs, Gonzales, Kyle, Lakeway, Lockhart, Luling, Nixon, Rollingwood, Shiner, Sunset Valley, West Lake Hills, and Yoakum, Texas.

According to the 2019 Annual Report<sup>1</sup>, the majority of residential rebates (4,154 out of 6,139) were issued to the home improvement program. The majority of commercial rebates went towards door weatherstripping (22,659 out of 26,145). For new construction rebates, the majority of rebates went towards water heaters (1,204 out of 2,085). Eighty-three water heaters were also rebated in the free equipment program.

TGS's natural gas conservation programs are overseen by a manager of energy efficiency, a manager of community relations, and other supporting employees. The other supporting employees include a liaison between the city and the 15 other cities in the service area. It was noted that the customers are geographically separated in terms of income.

According to TGS staff, the sources for savings for the energy efficiency programs come from deemed savings calculations from Technical Reference Manuals (TRMs). The other savings calculations come from an engineering group that work in the commercial program; these savings are also TRM deemed but may have custom, weather-adjusted variables as part of the calculations.

TGS has cut conservation programs that were not performing well. All incentives for the natural gas programs are first come, first serve, and customers cannot reserve incentive amounts. In the last two to three years, TGS has reduced several of the rebate amounts. TGS staff has not seen a consistent pattern in participation where they can determine if this has had a positive or negative effect on program participation. However, contractors have expressed dissatisfaction with the reduced rebate amounts. In terms of future rebates offerings, TGS is considering offering incentives for gas ranges. Currently, TGS is launching a new pilot rebate program for food service equipment.

## **1.2 Key Findings and Recommendations from Utility Benchmarking Research**

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The key research findings from the utility staff interviews include:

- Partnerships with electric utilities can continue to be beneficial when marketing and implementing the programs. TGS currently partners with Austin Energy for dual-fuel saving measure installations. The natural gas utilities interviewed recommended that working with the electric utility in the same territory will provide customers with more rebate options and better services.
- Having a third-party implementer is common among natural gas utilities. The utilities discussed their relationship with their third-party implementer. The implementer helps the utilities with a range of activities including program implementation, data tracking, marketing, and engineering savings calculations.
- Flexibility in the rebate program and making the application process as simple for the customer are practices implemented by two of the gas utilities. Flexibility and

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<sup>1</sup> <https://www.texasgasservice.com/media/TGS/EnergyEfficiency/CentralTexas/ProgramAnnualReport/TGS-CTSA-AnnualReport.pdf>

simple processes have helped these utilities achieve success in terms of reaching savings and program participation goals.

Based on the key findings from both the utility staff interviews, ADM recommends the following:

- Continue to explore opportunities for collaboration with the electric utility to help market the programs, provide improved services, and provide rebate offerings.
- Continue to offer flexibility in the rebate application process and explore additional ways for customers to participate in the natural gas conservation programs.
- If pursuing a food service equipment pilot program, consider offering a midstream delivery channel as well as the traditional rebate application process.
- TGS should consider implementing a residential appliance midstream program. Conducting a midstream program can connect the utility with local retailers which may result in customers purchasing more energy efficient equipment as well as enhancing relationships with local retailers.
- TGS should consider building or enhancing existing trade ally networks to improve program marketing efforts. Trade allies, such as residential contractors, often interact with customers and can be beneficial by promoting program offerings. Two of the utilities discussed their relationship with trade allies which included education materials and incentives being given directly to customers by the trade ally.

## 2 Cost Effectiveness Review and Recommendations

The following sections describe the cost effectiveness review performed by ADM as well as research findings and recommendations

### 2.1 Cost Effectiveness Review

TGS contracts with a consultant (TGS outside expert) who is an expert in the field of energy efficiency program evaluation and cost effectiveness testing. The TGS outside expert performed the impact evaluation and cost effectiveness testing of the natural gas conservation programs. The TGS outside expert used the five most widely accepted tests used to perform cost effectiveness testing.

A variety of inputs are needed to perform cost effectiveness of energy efficiency programs, such as avoided energy production and capacity costs, program incentive and administrative costs, and final ex post gross savings generated by program activity.

Table 2-1 shows inputs used by TGS outside expert for cost effectiveness testing.

*Table 2-1 TGS Outside Expert Cost Effectiveness Model Inputs*

<i>Cost Effectiveness Model Input</i>	<i>Measurement Level</i>	<i>Source</i>
Reported energy savings	Measure type	EM&V findings
Effective useful life	Measure type	TRM or research-based
Incentive payments	Measure type	Program database
Administrative costs	Program/portfolio	Utility
Avoided costs	Statewide	Utility
Weighted average cost of capital (WACC)	Utility	Utility

ADM analyzed final, post-implementation cost effectiveness of each measure, program, and the overall portfolio for the 2018 program year. ADM calculated cost effectiveness using the five most widely accepted tests conducted in evaluation of energy efficiency programs across North America. These tests are summarized below:

- Utility Cost Test (PACT/UCT): Comparison of program administrator costs to resource supply costs.
- Total Resource Cost Test (TRC): Comparison of program administrator and customer costs to utility resource savings.
- Ratepayer Impact Measure Test (RIM): Impact of the program on all ratepayers, including non-participants.

- Societal Cost Test (SCT): Comparison of total societal costs to resource savings and non-monetized benefits.
- Participant Cost Test (PCT): Comparison of costs and benefits from the perspective of the customer implementing the measures.

Each test was performed in accordance with the methodologies described in the National Action Plan for Energy Efficiency (NAPEE) manual on cost effectiveness analysis and the California Public Utilities Commission cost effectiveness analysis Standard Practice Manual.

The inputs to the cost effectiveness analysis performed by ADM came from multiple sources:

- TGS provided information on avoided energy production and capacity costs, avoided costs from distribution system losses, and applicable discount rates.
- TGS provided incentive, administrative, and portfolio-level costs as allocated across the portfolio of programs.
- TGS provided final 2018 ex post therm savings determined by internal processes.
- ADM researched and provided measure incremental costs and equipment effective useful life (EUL) information.

Table 2-2 shows ADM inputs for the cost effectiveness testing.

*Table 2-2 ADM Cost Effectiveness Model Inputs*

<i>Model Input</i>	<i>Measurement Level</i>	<i>Source</i>
Reported energy savings	Measure type	Utility
Effective useful life	Measure type	TRM or research-based
Incentive payments	Measure type	Utility
Administrative costs	Program/portfolio	Utility
Avoided costs	Statewide	Utility
Weighted average cost of capital (WACC)	Utility	Utility

Cost effectiveness analysis results were compared with the findings by TGS outside expert; the results along with explanations about differences between the two analyses are detailed below.

Table 2-3 shows TGS outside expert’s cost effectiveness test results for each program. Programs that failed a given cost effectiveness test are lightly greyed for ease of identification. Sector-level and portfolio-level test results are also provided in the table below. Under some circumstances, it is acceptable to offer some measures or programs that are not cost effective if the overall portfolio cost effectiveness ratio remains greater

than one. For the table below, this can be observed under the TRC test results. The TRC test is the most widely used and accepted cost effectiveness test.

*Table 2-3 TGS Consultant Cost Benefit Test Results*

<i>TGS Program</i>	<i>PCT</i>	<i>TRC</i>	<i>SCT</i>	<i>PACT/ UCT</i>	<i>RIM</i>
Commercial Appliance	5.80	7.42	14.25	5.81	1.13
Commercial Direct Install	3.86	4.45	8.20	4.45	1.06
<i>Commercial Sector Total</i>	<i>4.13</i>	<i>1.99</i>	<i>3.70</i>	<i>1.96</i>	<i>0.81</i>
Residential Home Improvement	2.08	2.57	4.69	2.58	1.09
Residential Space Heating	0.99	0.55	0.90	0.75	0.54
Residential Water Heating	1.93	0.67	1.14	0.41	0.34
Residential Dryer	1.40	1.42	1.81	1.88	0.95
Residential Natural Gas Vehicle	0.00	0.00	0.00	0.00	0.00
Residential Low-Income	4.57	1.28	1.48	0.08	0.07
Residential New Construction	1.88	0.78	1.27	0.46	0.37
<i>Residential Sector Total</i>	<i>1.76</i>	<i>1.11</i>	<i>1.70</i>	<i>0.80</i>	<i>0.56</i>
<b>Portfolio Total</b>	<b>1.95</b>	<b>1.24</b>	<b>2.00</b>	<b>0.98</b>	<b>0.62</b>

Table 2-4 shows ADM's cost effectiveness test results for each program. Programs that failed a given cost effectiveness test are lightly greyed for ease of identification. Sector-level and portfolio-level test results are also provided in the table below. Again, under the TRC test, some programs may not be cost effective, but the overall portfolio is cost effective.

*Table 2-4 ADM Cost Benefit Test Results*

<i>TGS Program</i>	<i>PCT</i>	<i>TRC</i>	<i>SCT</i>	<i>PACT/ UCT</i>	<i>RIM</i>
Commercial Appliance	5.90	8.38	17.66	6.99	1.14
Commercial Direct Install	3.68	4.28	10.00	4.18	1.05
<i>Commercial Total</i>	<i>4.00</i>	<i>2.00</i>	<i>4.56</i>	<i>1.95</i>	<i>0.81</i>
Residential Home Improvement	2.02	2.40	4.38	2.23	1.05
Residential Space Heating	1.07	0.59	1.01	0.41	0.53
Residential Water Heating	2.78	1.21	2.28	0.28	0.41
Residential Dryer	2.52	2.57	4.33	1.39	0.92
Residential Natural Gas Vehicle	0.00	0.00	0.00	0.00	0.00
Residential Low-Income	14.69	1.46	2.28	0.07	0.07
Residential New Construction	2.68	1.23	2.30	0.54	0.43
<i>Residential Total</i>	<i>2.48</i>	<i>1.25</i>	<i>2.26</i>	<i>0.69</i>	<i>0.56</i>
<b>Total Portfolio</b>	<b>2.69</b>	<b>1.42</b>	<b>2.76</b>	<b>0.89</b>	<b>0.62</b>

Overall, both ADM and TGS outside expert results are fairly consistent with similar passing and failing results at the sector level (i.e., commercial and residential), and similar passing and failing results at the portfolio level. Divergences in program-level results were largely a factor of differences in assumptions about incremental equipment costs and EUL information.

For the remainder of the chapter, the discussion focuses on TRC and PACT/UCT results, since the TRC is the most widely used cost effectiveness test, and PACT/UCT is the primary cost effectiveness test used in Texas.

Table 2-5 shows the comparison between the TGS outside expert-calculated benefits and ADM-calculated benefits for the PACT/UCT and TRC tests. Differences in monetized benefits are largely a factor of EUL assumptions. Furthermore, for the PACT/UCT benefits, ADM factored in net-to-gross (NTG) ratios for realized therm savings, as the use of NTG ratios is a requirement for the PACT/UCT test in Texas.

*Table 2-5 Side-by-side Comparison of PACT and TRC Benefits*

<i>TGS Program</i>	<i>Outside Expert PACT/ UCT Benefits</i>	<i>ADM PACT/ UCT Benefits</i>	<i>Outside Expert TRC Benefits</i>	<i>ADM TRC Net Benefits</i>
Commercial Appliance	\$198,022	\$238,353	\$199,698	\$241,826
Commercial Direct Install	\$751,963	\$706,418	\$751,963	\$716,240
<i>Commercial Total</i>	<i>\$949,984</i>	<i>\$944,771</i>	<i>\$951,661</i>	<i>\$958,066</i>
Residential Home Improvement	\$1,029,011	\$888,472	\$1,029,011	\$935,227
Residential Space Heating	\$74,084	\$40,614	\$74,084	\$72,874
Residential Water Heating	\$141,436	\$98,096	\$141,436	\$182,516
Residential Dryer	\$467,101	\$345,172	\$1,313,733	\$525,318
Residential Natural Gas Vehicle	\$0	\$0	\$0	\$0
Residential Low-Income	\$20,986	\$20,289	\$101,067	\$28,687
Residential New Construction	\$328,448	\$388,917	\$380,419	\$407,455
<i>Residential Total</i>	<i>\$2,061,065</i>	<i>\$1,781,560</i>	<i>\$3,039,750</i>	<i>\$2,152,078</i>
<b>Total Portfolio</b>	<b>\$3,011,050</b>	<b>\$2,726,331</b>	<b>\$3,991,411</b>	<b>\$3,110,144</b>

Figure 2-1 shows a graphical representation comparing PACT/UCT benefits, and Figure 2-2 shows the same information for TRC benefits. As can be seen in the figures, TGS outside expert and ADM calculated benefits are closely aligned for all programs with the exception of natural gas dryers. TGS outside expert assumed a high avoided equipment cost benefit for dryers. Looking at the high monetized benefits associated with dryers, it would be reasonable to expect high TRC and PACT/UCT scores, however, TGS outside expert also assumed high incremental costs for dryers. ADM assumes lower values on both accounts, and the effect on overall testing is that ADM calculated higher TRC and PACT/UCT scores for dryers.

Figure 2-1 PACT/UCT Benefits Comparison

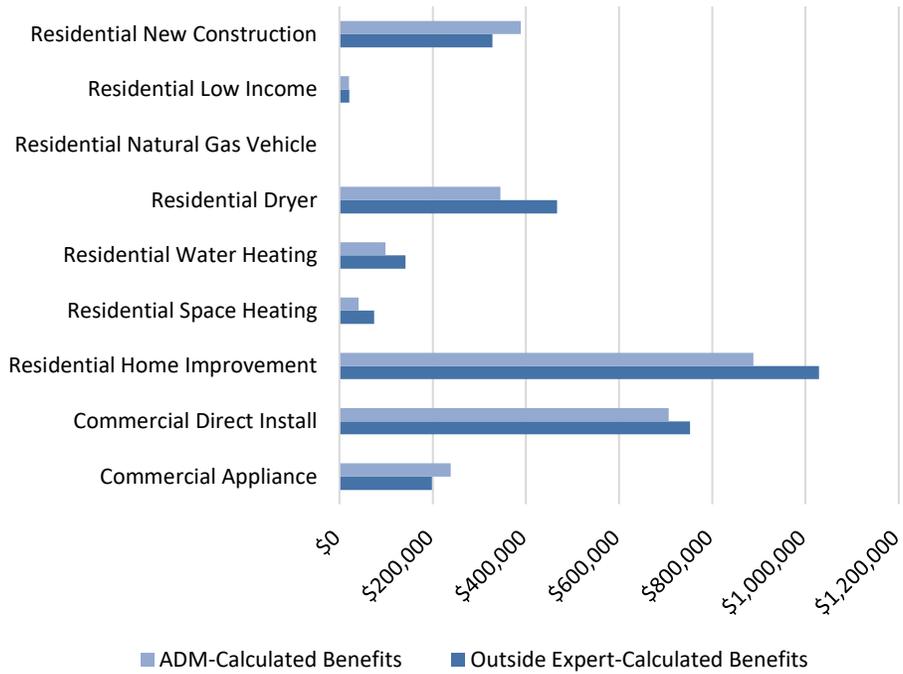


Figure 2-2 TRC Benefits Comparison

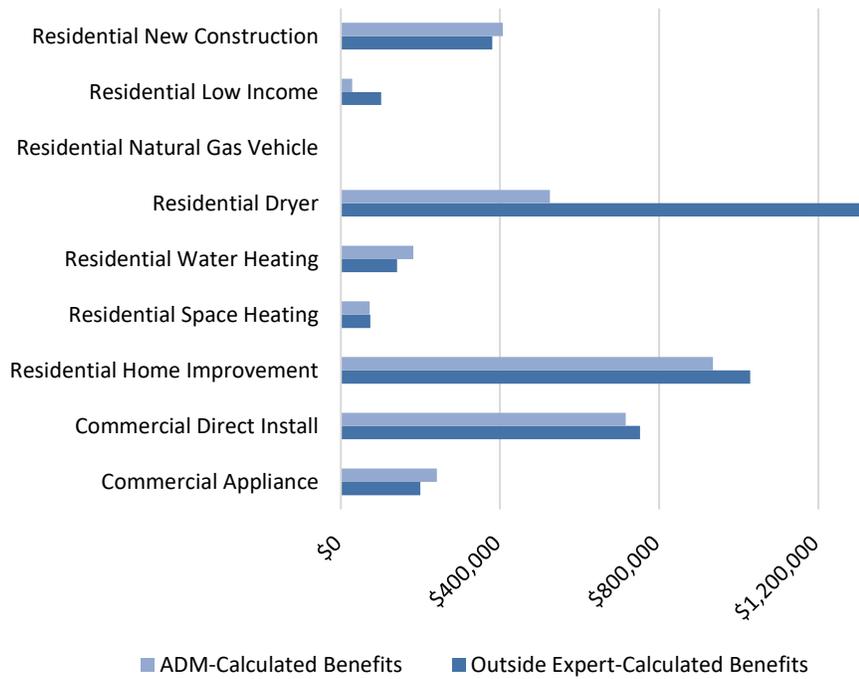


Table 2-6 shows TGS outside expert’s reported program costs. Program costs include incentives and program overhead costs and are provided for each commercial and residential program, as well as summarized at the sector-level and portfolio-level.

*Table 2-6 Program Costs Used by TGS Outside Expert*

<i>TGS Program</i>	<i>Incentives</i>	<i>Program Overhead Costs</i>	<i>Total Program Costs</i>
Commercial Appliance	\$34,111	\$0	\$34,111
Commercial Direct Install	\$168,867	\$0	\$168,867
Commercial Education/Administrative	\$0	\$282,056	\$282,056
<b>Commercial Total</b>	<b>\$202,978</b>	<b>\$282,056</b>	<b>\$485,034</b>
Residential Home Improvement	\$398,218	\$0	\$398,218
Residential Space Heating	\$98,395	\$0	\$98,395
Residential Water Heating	\$347,150	\$0	\$347,150
Residential Dryer	\$248,800	\$0	\$248,800
Residential Natural Gas Vehicle	\$2,000	\$0	\$2,000
Residential Low-Income	\$271,216	\$0	\$271,216
Residential New Construction	\$719,050	\$0	\$719,050
Residential Education/Administrative	\$0	\$495,454	\$495,454
<b>Residential Total</b>	<b>\$2,084,829</b>	<b>\$495,454</b>	<b>\$2,580,283</b>
<b>Total Portfolio</b>	<b>\$2,287,807</b>	<b>\$777,510</b>	<b>\$3,065,317</b>

Table 2-7 shows ADM reported program costs. The costs are broken down the same as the above table. The costs are identical across both tables and this is a result that is to be expected.

*Table 2-7 Program Costs Used by ADM*

<i>TGS Program</i>	<i>Incentives</i>	<i>Program Overhead Costs</i>	<i>Total Program Costs</i>
Commercial Appliance	\$34,111	\$0	\$34,111
Commercial Direct Install	\$168,867	\$0	\$168,867
Commercial Education/Administrative	\$0	\$282,056	\$282,056
<b>Commercial Total</b>	<b>\$202,978</b>	<b>\$282,056</b>	<b>\$485,034</b>
Residential Home Improvement	\$398,218	\$0	\$398,218
Residential Space Heating	\$98,395	\$0	\$98,395
Residential Water Heating	\$347,150	\$0	\$347,150
Residential Dryer	\$248,800	\$0	\$248,800
Residential Natural Gas Vehicle	\$2,000	\$0	\$2,000
Residential Low-Income	\$271,216	\$0	\$271,216

Residential New Construction	\$719,050	\$0	\$719,050
Residential Education/Administrative	\$0	\$495,454	\$495,454
<i>Residential Total</i>	<i>\$2,084,829</i>	<i>\$495,454</i>	<i>\$2,580,283</i>
<b>Total Portfolio</b>	<b>\$2,287,807</b>	<b>\$777,510</b>	<b>\$3,065,317</b>

Table 2-8 provides a Comparison of total program-level incremental costs. These figures were calculated using the unit incremental equipment cost and factoring by the quantity of measures rebated or installed through the implementation of the natural gas conservation programs. Generally, research performed by ADM on incremental cost resulted in lower values compared to those used by TGS outside consultant. Additional details on unit-incremental costs and sources used are provided later in the document.

*Table 2-8 Comparison of Program Incremental Costs*

<i>TGS Program</i>	<i>TGS Outside Consultant Incremental Costs</i>	<i>ADM Incremental Costs</i>
Commercial Appliance	\$26,914	\$54,770
Commercial Direct Install	\$168,867	\$168,867
<i>Commercial Total</i>	<i>\$195,781</i>	<i>\$223,637</i>
Residential Home Improvement	\$400,481	\$358,074
Residential Space Heating	\$135,536	\$79,032
Residential Water Heating	\$212,206	\$151,683
Residential Dryer	\$925,573	\$204,020
Residential Natural Gas Vehicle	\$0	\$0
Residential Low-Income	\$78,846	\$36,236
Residential New Construction	\$485,619	\$331,112
<i>Residential Total</i>	<i>\$2,238,261</i>	<i>\$1,160,157</i>
<b>Total Portfolio</b>	<b>\$2,434,042</b>	<b>\$1,383,794</b>

Table 2-9 provides a comparison of measure per-unit incremental costs as well as the source used by ADM to determine per-unit incremental cost.

*Table 2-9 Comparison of Measure Incremental Costs*

<i>Measure Name</i>	<i>TGS Outside Expert Per- unit Incremental Costs</i>	<i>ADM Per- unit Incremental Costs</i>	<i>ADM Incremental Cost Sources</i>
Commercial Dryer	\$916.41	\$700.00	Illinois TRM V8

<i>Measure Name</i>	<i>TGS Outside Expert Per-unit Incremental Costs</i>	<i>ADM Per-unit Incremental Costs</i>	<i>ADM Incremental Cost Sources</i>
Commercial Storage Water Heater	\$762.00	\$377.00	Mid-Atlantic TRM V9
Commercial Food Service Program - Fryers	\$1,120.00	\$1,200.00	Mid-Atlantic TRM V9
Commercial Tankless Water Heater	\$407.00	\$478.64	ADM Analysis
Weather Stripping Direct Install	\$8.00	\$8.00	Equal to Measure Incentive
HH Showerhead Direct Install	\$21.00	\$13.00	Equal to Measure Incentive
Fixed Showerhead Direct Install	\$13.00	\$13.00	Equal to Measure Incentive
Faucet Aerator Direct Install	\$13.00	\$13.00	Equal to Measure Incentive
Steam Trap Replacement Direct Install	\$400.00	\$400.00	Equal to Measure Incentive
Dryer Smart Direct Install	\$1,000.00	\$1,200.00	Equal to Measure Incentive
Pre-Rinse Spray Valve Direct Install	\$140.00	\$140.00	Equal to Measure Incentive
Attic Insulation Residential Rebate	\$157.47	\$157.47	Equal to Measure Incentive
Duct Efficiency Improvement Residential Rebate	\$371.62	\$371.62	Equal to Measure Incentive
Residential Wireless Thermostat	\$127.85	\$154.00	Mid-Atlantic TRM V9
Mail Out Kits	\$16.52	\$12.00	ONG Evaluation
High Efficiency Furnace Residential Rebate (>80%)	\$-	\$392.00	Mid-Atlantic TRM V9
High Efficiency Furnace Residential Rebate (>92%)	\$429.00	\$429.00	Mid-Atlantic TRM V9
Furnace Tune-up Residential Rebate	\$91.35	\$80.00	ADM Market Research
Tankless Water Heater Residential Rebate	\$407.00	\$290.37	ADM Analysis
Storage Water Heater Residential Rebate	\$159.00	\$159.00	Mid-Atlantic TRM V9
Natural Gas Dryer Program	\$916.41	\$202.00	ONG Evaluation
Natural Gas Vehicle Program	\$-	\$-	N/A
Low-Income Program - Water Heater	\$159.00	\$159.00	Mid-Atlantic TRM V9
Low-Income Program - Furnace	\$392.00	\$392.00	Mid-Atlantic TRM V9
Low-Income Program - Stove	\$850.14	\$-	ONG Evaluation
Low-Income Program - Dryer	\$916.41	\$202.00	ONG Evaluation
New Construction High Efficiency Furnace Residential Rebate (>92%)	\$429.00	\$429.00	Mid-Atlantic TRM V9
New Construction Natural Gas Dryer Program	\$916.41	\$202.00	ONG Evaluation
New Construction Tankless Water Heater Residential Rebate	\$407.00	\$290.37	ADM Analysis

Table 2-10 provides a Measure-level EUL comparison as well as the source used by ADM to determine measure EUL.

Table 2-10 Comparison of Measure Effective Useful Life

Measure Name	TGS Outside Expert Per-unit Incremental Costs	ADM EUL	ADM EUL Sources
Dryer Program	16	14	Illinois TRM V8
Commercial Storage Water Heater	15	15	Arkansas TRM V8.1
Commercial Food Service Program - Fryers	12	12	Arkansas TRM V8.1
Commercial Tankless Water Heater	13	20	Arkansas TRM V8.1
Weather Stripping Direct Install	11	11	Arkansas TRM V8.1
HH Showerhead Direct Install	10	10	Arkansas TRM V8.1
Fixed Showerhead Direct Install	10	10	Arkansas TRM V8.1
Faucet Aerator Direct Install	10	10	Arkansas TRM V8.1
Steam Trap Replacement Direct Install	5	5	Arkansas TRM V8.1
Dryer Smart Direct Install	14	14	Illinois TRM V8
Pre-Rinse Spray Valve Direct Install	5	5	Arkansas TRM V8.1
Attic Insulation Residential Rebate	25	20	Arkansas TRM V8.1
Duct Efficiency Improvement Residential Rebate	18	18	Arkansas TRM V8.1
Residential Wireless Thermostat	11	11	Arkansas TRM V8.1
Mail Out Kits	10	10	ONG Evaluation
High Efficiency Furnace Residential Rebate (>80%)	18	20	Arkansas TRM V8.1
High Efficiency Furnace Residential Rebate (>92%)	18	20	Arkansas TRM V8.1
Furnace Tune-up Residential Rebate	3	3	Paul Raab Analysis
Tankless Water Heater Residential Rebate	13	20	Arkansas TRM V8.1
Storage Water Heater Residential Rebate	13	13	Arkansas TRM V8.1
Natural Gas Dryer Program	16	16	Illinois TRM V8
Natural Gas Vehicle Program	N/A	N/A	N/A
Low-Income Program - Water Heater	13	13	Arkansas TRM V8.1
Low-Income Program - Furnace	18	20	Arkansas TRM V8.1
Low-Income Program - Stove	15	15	ONG Evaluation
Low-Income Program - Dryer	16	16	Illinois TRM V8
New Construction High Efficiency Furnace Residential Rebate (>92%)	18	20	Arkansas TRM V8.1
New Construction Natural Gas Dryer Program	16	16	Illinois TRM V8
New Construction Tankless Water Heater Residential Rebate	13	20	Arkansas TRM V8.1

**2.2 Review of Tankless Water Heater Incentives and Invoice Costs**

ADM performed a review of TGS invoice documentation for rebated residential and commercial natural gas tankless water heater installations. A similar review was performed of invoice documentation for the same equipment-type rebated through Arkansas Oklahoma Gas Company (AOGC) and Black Hills Energy Arkansas (BHE). A sample of invoice documentation was requested from TGS, AOGC, and BHE. Installation types included residential, residential new construction, and commercial.

For TGS, the parts and labor costs associated with residential tankless water heaters was varied. Typical installations cost between \$900 to \$2,500 dollars; less typical installations could be \$5,000 or greater. More expensive installations had a variety of factors that affected the cost, such as model type, installation location, and modifications needed for supplying natural gas to the appliance. For commercial installation, there was very little variance of labor and installation costs due to the facility type, which was likely a multifamily building (e.g., in-unit apartment installations). The cost at \$850 per unit appeared reasonable.

For AOGC most residential installations ranged from \$900 to \$2,500, with most being in the \$2,500 range. In the commercial sector, there was much greater variance which is to be expected. Commercial facility types included a hotel and a junior high school, and generally the installation costs were greater than \$10,000.

For BHE, most residential tankless water heater installation costs ranged from \$1,800 to \$2,500 which appeared reasonable based on the research performed for the other utilities. Finally, commercial tankless water heater installations included a multifamily building at a cost of \$1,035.

Additional research was performed on tankless water heater rebate amounts by comparing incentives across several utilities, including the aforementioned AOGC and BHE, as well as CenterPoint Arkansas and Oklahoma (CPA & CPO). Table 2-11 shows the results of the rebate amount comparison.

*Table 2-11 Utility Comparison of Tankless Water Heater Rebates*

<i>Equipment Type</i>	<i>TGS</i>	<i>AOGC</i>	<i>BHE</i>	<i>CPA &amp; CPO</i>
Residential Tankless Water Heater	\$650	\$500	\$300	\$900
Commercial Tankless Water Heater	\$600	\$500	\$300	\$500

Based on the comparison in rebates by each utility, there is substantial variability in rebated amounts. The tankless water heater rebates that TGS currently offers are reasonable based on this comparison.

### **2.3 Research Findings and Recommendations**

The key findings from the cost effectiveness review include:

- Overall, the results of the cost effectiveness results from the TGS outside expert and ADM were consistent and reasonably aligned.
- TGS outside expert appeared to use reasonable assumptions for incremental costs and equipment EUL information.

- A review of tankless water heater installation costs for TGS and other utilities reveals that customers have paid similar amounts for the installation of tankless water heaters.
- TGS incentive amounts for rebated tankless water heater installations seem reasonable based on a comparison with other natural gas utilities.

Based on the cost benefit review, ADM recommends the following:

- Consider lowering the incentive for residential replacement tankless water heaters; a reasonable rebate amount would be in the \$500 range.
- Based on the invoice documentation review, consider partnering with residential contractors who perform tankless water heater installations; this would help promote the program and further educate contractors and customers as well as increase participation, which could result in contractors passing savings to customers by way of lower installation costs.

## 3 Recommendations for EM&V Best Practices

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There are many benefits to engaging a third-party evaluator for the evaluation, measurement and verification (EM&V) of energy efficiency programs. In the sections below, ADM details some of those benefits and proven techniques which represent industry best practices.

### 3.1 Impact Evaluation Best Practices

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The first step in program evaluation is to prepare an EM&V plan which serves as the overall "blueprint" for executing work, while also ensuring the third-party evaluator's ability to control the progress of the evaluation work. Given budgetary and time constraints for performing evaluation work, special care is taken in preparing an EM&V plan to allocate resources and effort across programs and with respect to impact, process, and market effects evaluations. Various procedures and tools are used to allocate personnel and equipment resources and to prepare the evaluation schedule to complete the evaluation work in a timely, cost effective way. The steps followed in determining the allocation of resources are as follows:

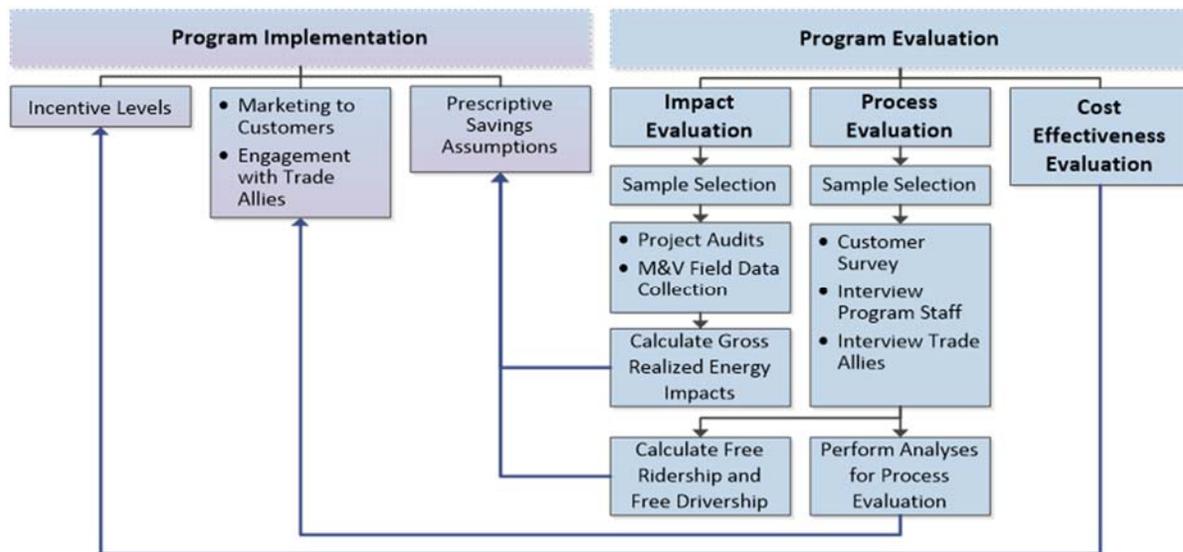
- Prepare projections of the number and types of participants for each program.
- Estimate the personnel and equipment needed to complete the individual activities in the evaluation of each program.
- Summarize activities and costs for the entire project.
- Use detailed reports to project when resources are needed for each program and each task. These reports include the identification of reporting and other requirements with fixed deadlines. Resources are then allocated to each task accordingly.
- The resource requirements are summed across the programs and compared to the availability of the resources.
- Existing resources are redistributed across the programs to maximize their availability. Resource requirements are again summed across the programs to identify shortfalls.
- Where possible the shortfalls are redistributed across the projects to avoid delays and determine the personnel and equipment requirements.
- If needed, shortfalls are addressed by adding staff or equipment to meet projected schedules.

This planning effort is completed so that the evaluation managers for the individual programs are fully aware of the schedule, the critical paths in the schedules, and the implications of requesting changes within the overall effort or altering the deadlines for reporting requirements. With this approach to scheduling, the third-party evaluator can respond to issues in advance by reassigning team members, slipping schedules for

activities that are not on the critical path, leasing equipment, adding personnel, and, if necessary, requesting adjustment to schedules.

Typically, evaluation work on program portfolio evaluations occurs in real time while the programs are being implemented. With real-time evaluation, the various EM&V activities that occur during a program year are used to administer the implementation of the program. Information from the EM&V activities is used to provide real-time feedback to make real-time adjustments in program implementation that helps ensure that program targets are met. **Error! Reference source not found.** is a schematic showing how these real-time EM&V activities relate to program planning and implementation.

Figure 3-1 Integration of EM&V Activities with Program Planning and Implementation



The various activities involved in the real-time EM&V efforts are typically as follows:

- Market assessment and technical feasibility;
- Review deemed savings, technical reference manual, and sampling plan;
- Review program implementation plans including cost effectiveness projections;
- Assess adequacy of the program tracking database;
- QA / QC of program applications / projects;
- Tracking and verification of measure installations;
- Measurement of savings impacts for measures / projects;
- Program evaluation;
- Ex Ante and Ex Post Savings impacts; and
- Program process evaluation, program theory and logic models, QA/QC.

The impact component of the EM&V plan could include the following elements:

- Evaluation objectives;
- Sampling plan;
- Data acquisition plan;
- Analysis plan;
- Schedule;
- Staffing plan; and
- Budgets.

In preparing the program-specific evaluation plans, the third-party evaluator would take into account differences among programs with respect to factors such as types of customers targeted, expected number of participants, types of measures being installed, expected natural gas savings associated with those measures, and variability of savings/reductions among participants.

A range of methodologies for impact evaluation of the programs can be used. These approaches would comply with CPP protocols for Deemed Savings, Comparison Group Analysis, and Project-Based M&V (PBMV). The application of these approaches is as follows:

- **Deemed Savings:** This includes any analysis based upon deemed savings documentation. This approach involves using stipulated savings for energy efficiency measures for which average savings values are well known and documented. Efforts on such programs would include verifying measure installations through on-site inspection or telephone surveys. This may involve using one savings value for all installations of a particular measure (for example, a residential water heater) or a site-specific analysis that uses partially deemed unit energy savings algorithms (such as assessing the hours of use as an input to calculating savings from deemed commercial lighting retrofits).
- **Comparison Group Analysis:** Billing data analysis may be applied when there is a large, relatively homogenous pool of participant customers installing similar energy efficiency measures. Billing analysis may be particularly effective when a program installs a number of measures in individual homes, which affect similar end uses and therefore have interactive effects. Such analysis typically involves regression modeling of participants and a non-participant control group, examining bills of these two groups before and after participation has occurred.
- **Project-Based M&V:** This refers to any program where savings must be calculated on a per-site basis using primary data collected on-site or facility bills for a unique, premise-level analysis. This might include commercial programs for which custom protocols would need to be applied (e.g., IPMVP).

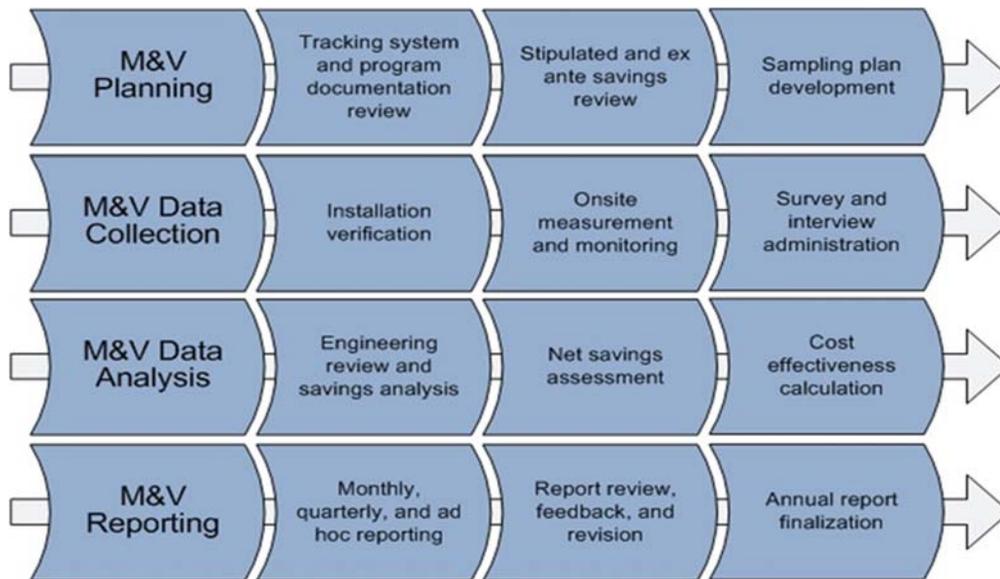
Several factors should be taken into account when choosing an approach for estimating program savings

- Consider the differences between residential and C&I energy efficiency projects in terms of participation levels, energy savings, and characteristics of participants.

- Consider the relative overall program magnitude of expected savings from measures because the analysis of billing data may not be of sufficient explanatory power to detect small magnitude savings for some measures.
- Consider the number and complexity of the measures and technologies being promoted through a project as a factor in determining the savings estimation approach.

The typical activities undertaken for an impact evaluation are shown in Figure 3-2.

*Figure 3-2 Flow Diagram for Impact Evaluation Activities*



The impact evaluation typically involves the following components:

- Reviewing program materials and tracking data systems to support client deliverables;
- Developing samples for field EM&V and impact analysis;
- Developing EM&V plans;
- Collecting on-site survey and EM&V data for sampled projects;
- Developing simple engineering algorithms, as appropriate, for non-weather-sensitive measures and programs with smaller impacts, drawing as appropriate on deemed savings values;
- Developing building energy simulation models for weather-sensitive measures within high impact programs (as appropriate);
- Performing billing analysis (as appropriate); and
- Presenting impact evaluation findings through appropriate reports.

Impact evaluation work should begin by reviewing data tracking systems for the programs to assess how best to extract the data that will be needed for the evaluation effort. An assessment is completed of whether the data are sufficient for use in assessing program impacts, regulatory reporting, and other requirements. We review reporting channels and procedures for ease of delivery of data and completeness.

Sampling plans should be prepared for selecting samples of customers or projects for measuring and analyzing savings; one sample should be developed for collection of data through telephone or email surveying that can be used for the process evaluations, and a second set for collecting data through site visits for gross impact analysis.

Customer satisfaction with the energy efficiency programs is also affected by EM&V. The third-party evaluator should take the following steps to ensure that the data acquisition process is smooth and that the customers have a full understanding of the EM&V process.

- Prior to M&V related contact, a list of sampled customers would be provided to the utility. Utility account representatives can have the option to discuss the M&V process with customers.
- Upon approval to customer contact, the evaluator would engage the customer and establish a convenient time and date for the on-site work.

Primary data needed to estimate impacts is typically obtained by making on-site visits to a sample of sites. Site visits are used to accomplish two major tasks. Evaluator personnel would verify that the energy efficiency measures for which incentives were given were installed, that they were installed correctly, and that they still function properly. Second, they would collect the data needed to analyze the energy savings for the installed measures.

As part of the data collection, power monitoring of specific measures may be conducted, as is applicable and where it is feasible. A third-party evaluator would have considerable experience in conducting field monitoring of natural gas efficiency measures, including field monitoring of furnaces, water heaters, low flow devices, and numerous industrial process technologies.

### **3.2 Process Evaluation Best Practices**

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A third-party evaluator can have extensive experience conducting research and providing consultation to support energy efficiency programs. Through this research, feedback can be developed from the perspective of customers, trade allies, program administrators and other stakeholder groups. Additionally, market research can be performed to support program decisions about measures to offer, markets to target, and implementation strategies. Ultimately, actionable findings and recommendations that can positively impact clients' programs can be provided.

A number of topics, listed below, can be performed to support program improvements:

- Marketing and Outreach: What marketing and outreach approaches are being implemented? Are these approaches effective at increasing awareness, interest,

and participation? Are they reaching all pertinent market segments, including previously underserved segments?

- Maximizing program energy savings: How well are the programs maximizing energy savings by getting as much done as possible in each project and by generating repeat participation and participation in multiple programs?
- Program data tracking and quality control: Is the program collecting complete information in a format that facilitates evaluation activities? Is collected data sufficient to allow for regular reporting and progress updates? Are data quality control procedures effective at preventing problems and identifying those not prevented?
- Program Reach: What types of customers are participating relative to their numbers in the eligible population? Why is there higher participation among some customer types than others? What are the barriers to participation and how can these be mitigated? Are there additional actions the program could take to increase participation, including among under-represented groups?
- Program processes: How well are program administrative processes working in terms of efficiency, consistency, and ease to program staff, participants, and relevant market actors?
- Market Conditions: What market factors external to the program may affect program success, and how so?
- Database Review: Properly used, a database review can provide a wealth of information to answer the key research questions described above, such as how well the program is performing across customer types and geographic locations compared to general population parameters from the customer database and external sources such as U.S. Census data, the Commercial Building Energy Consumption Survey (CBECS), and third-party databases. Project tracking data can be analyzed to answer these questions as well as to examine how effectively programs are generating the most possible savings from each customer and each project.
- Document Review: Program documentation can be reviewed, including any implementation manuals, incentive guidelines and applications, and marketing and outreach plans and activities. The purpose would be to confirm knowledge of, and identify any changes to, program processes and rules, to inform questions for program staff and other evaluation sources, and to guide database review.
- Survey Development and Administration: Third-party evaluators typically deploy numerous surveys of program participants and nonparticipants and have experience in developing and administering surveys delivered online, by telephone, postal mail, and surveys that use a combination of these delivery modes. Surveys with complex skip logic, question branching, and data validation elements can be developed. Steps can be taken to ensure that the administration of surveys does not trigger any customer relations issues and that any issues identified with question wording, ordering, etc. during pilot administration are fully captured and quickly addressed.

A key concern in the administration of a survey is to mitigate potential non-response bias. As such, mitigation of non-response bias is a significant point of focus in completing survey research and steps are taken during survey administration to improve responses. Responses can be improved through the following steps outlined below that are consistent with Dillman's Tailored Design Method as well as other recent research on improving response rates.

- The use of program and other utility information that contain contact names and telephone numbers, wherever possible. (The contact name may be the person who pays the bill rather than the person most knowledgeable about the survey topic, but this still makes it easier to find the correct person to respond to a survey.)
- Notification of the survey explaining the purpose and value to the respondent and providing a contact for verification (when necessary).
- Up to five contact attempts per contact, conducted on different days and at different times.
- Using advance letters where appropriate to increase response rates and provide an option for customers to complete surveys online at their convenience.
- Using multiple modes of contact including phone, email, and postal mail where practicable.
- Scheduling appointments for phone surveys at times convenient to the respondent.
- Providing anonymity to respondents, unless they request that certain information be passed on for later contact.
- The use of surveys that are carefully designed to ensure that: the questions reflect an understanding of the respondent's perspective, use language familiar to the respondent, address only items useful for the evaluation, and that average no more than 15 minutes.

In-depth interviews (IDIs) are semi-structured interviews that use open-ended questions and probes to elicit detailed responses for qualitative analysis. IDIs are used when collecting information from a very small and finite group or when detailed, insightful responses are otherwise prioritized over reliable quantitative estimates. For example, IDIs are used with program staff and with program trade allies. Interviews with program staff typically take around an hour, but otherwise, IDI should take no more than 20 minutes, unless a respondent has much to say or is of particular importance. IDIs are conducted by analysts who are both knowledgeable about the topic and experienced in completing IDIs.

The value of IDIs is the rich and detailed information that they can provide. They bring to light idiosyncratic insights into program delivery and operations that could be missed in a more highly structured survey instrument. Although not all respondents may make the same observation, the insight may nevertheless be generalizable to the program.

## 4 TGS Customer Survey Findings

The following chapter details the research findings from residential and non-residential TGS customer surveys performed by ADM. The findings from the residential non-participant survey are outlined in Section 4.1, while the findings from the non-residential non-participant survey are outlined Section 4.2.

### 4.1 Residential Non-Participant Survey

A total of 200 customers were surveyed about TGS's residential rebate programs. One hundred eighty of the survey respondents were deemed non-low-income customers. Twenty of the survey respondents were low-income customers. For low-income respondents, ADM asked about household size and income level to determine if a respondent was at or below the 200% Federal Poverty Level. In addition, all respondents interviewed had not participated in the rebate programs in the past five years and were considered non-participating customers. The following sections describe the responses for all customers who completed the survey.

#### 4.1.1 Residence Type and Equipment Installations

**It is common for non-participants to reside in a single-family home.** Eighty-three percent of respondents live in a single-family home, and 27% live in an apartment building with two or greater units. Residence type results are summarized in **Error! Reference source not found.** *Table 4-1.*

*Table 4-1 Residence Type*

<i>Response</i>	<i>Percent (n=198)</i>
Manufactured home	1%
Single-family house detached from any other house	72%
Single family house attached to one or more other houses, for example, duplex, row house, or townhome	11%
Apartment in a building with 2 to 3 units	1%
Apartment in a building with 4 or more units	16%
Note: Percentage does not add to 100% due to rounding	

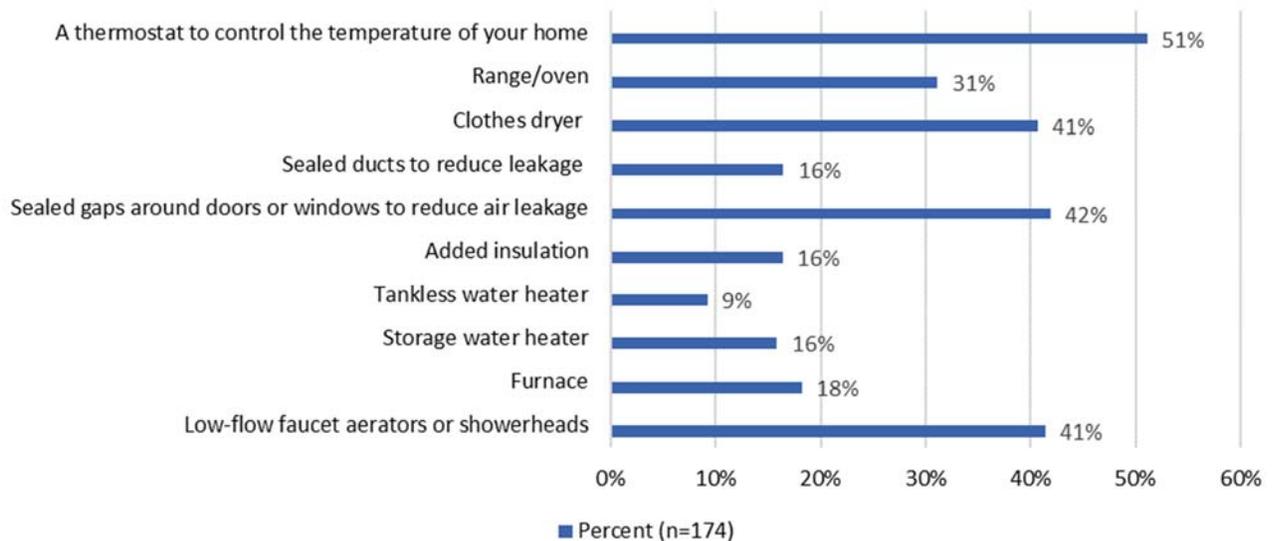
**Home ownership is common amongst the customers that responded to the survey.** Sixty-eight percent of respondents stated that they own their home, and 32% stated that they rent their property. Results are summarized in *Table 4-2.*

Table 4-2 Home Ownership

Response	Percent (n=199)
Own	68%
Rent	32%

**It was common for non-participants to have purchased, installed, or implemented various home improvements at their residence.** Common pieces of equipment installed include thermostats (51%), clothes dryer (41%), sealed gaps around doors or windows to reduce leakage (16%), and low flow devices (41%). Results are summarized for those who answered that they installed various improvements. (Figure 4-1).

Figure 4-1 Measures Installed



**Central forced air furnace was the most common heating type. Most homes' water heaters were fueled by natural gas.** Seventy-eight percent of those surveyed have a central forced air furnace as their main heating type for their home, and 93% of respondents have natural gas as the fuel for their main water heater. Other less common sources of space heating include a heat pump (11%) and a space heater (9%) See Table 4-3 and

Table 4-4.

*Table 4-3 Space Heating Type*

<i>Response</i>	<i>Percent (n = 167)</i>
Heat Pump	11%
Central forced air furnace	78%
Room or space heater	9%
Something else	2%

*Table 4-4 Water Heater Fuel Type*

<i>Response</i>	<i>Percent (n = 177)</i>
Natural Gas	93%
Electricity	7%

**The age of the heating system equipment was usually under 10 years old for households.** Seventy percent of respondents stated that their heating system was less than 10 years old. Sixteen percent of respondents stated that their heating system was between 10-14 years old, and 10% stated it was between 15-19 years old. Three percent stated that their heating system was 20 or more years old. Results are summarized in Table 4-5.

*Table 4-5 Heating System Age*

<i>Response</i>	<i>Percent (n =154)</i>
Less than 2 years old	20%
2 to 4 years old	21%
5 to 9 years old	29%
10 to 14 years old	16%
15 to 19 years old	10%
20 or more years old	3%
Note: Percentage does not add to 100% due to rounding	

**A programmable thermostat that lets user schedule different temperature settings for different types of days was the most common type of thermostat for respondents.** Forty percent of those surveyed stated that they have a programmable thermostat that lets you schedule different temperature settings for different times of the day. Twenty-eight percent of respondents stated that they have a smart thermostat, and 26% have a standard thermostat. Results are summarized in Table 4-6.

*Table 4-6 Thermostat Type*

<i>Response</i>	<i>Percent (n =197)</i>
A programmable thermostat that lets you schedule different temperature settings for different times of day.	40%
A smart thermostat that is connected to the internet.	28%
A standard thermostat that lets you set on/off temperatures. You cannot set on/off times.	26%
The heating system is not controlled by a thermostat.	5%

**Almost all of the respondents did not have a pool at their residence.** Over 90% of respondents reported that they did not have a pool at their residence. Results are summarized in the table below. (Table 4-7).

*Table 4-7 Has Pool at Residence*

<i>Response</i>	<i>Percent (n=120)</i>
Yes	9%
No	91%

#### 4.1.2 Program Awareness

**Non-participants were typically unaware of rebates for energy efficient equipment, home improvements, and other services offered by TGS.** Over 70% of respondents were unaware of the rebate programs offered. Results are summarized in *Table 4-8*.

*Table 4-8 Rebate Awareness*

<i>Response</i>	<i>Percent (n = 175)</i>
Yes	27%
No	73%

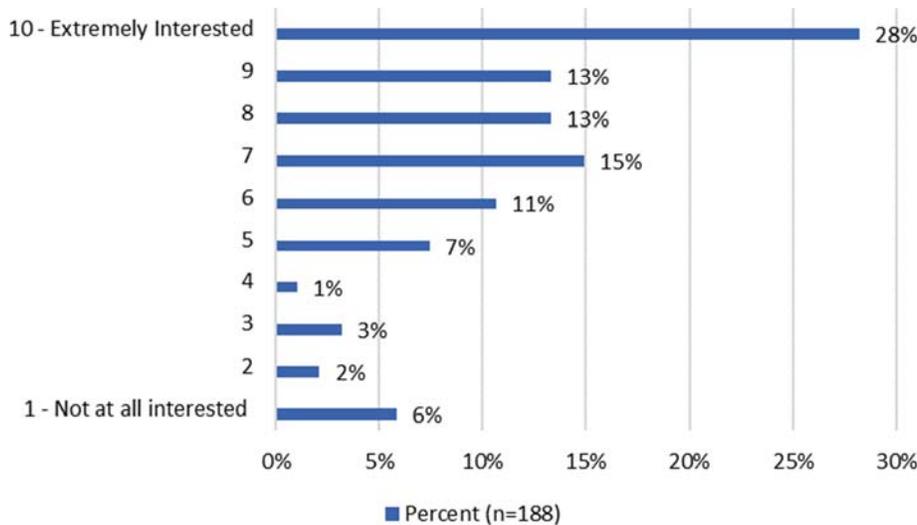
**Out of those who had learned of the rebates or services, the majority learned of them through email or mail sources.** Over 50% of respondents learned of the rebate programs through these methods. Other sources of learning included a TGS bill insert (9%) and the TGS website (11%). Results are summarized in *Table 4-9*.

*Table 4-9 Ways Learned of the Program*

<i>Response</i>	<i>Percent (n = 45)</i>
Information that came in the mail	33%
Email	36%
Newspaper or magazine article	2%
Word of mouth from friends, relatives or others	2%
Radio ad	2%
TGS bill insert	9%
TGS website	11%
TGS Program staff	2%
Other	2%

**Customers expressed some interest in increasing their home’s energy efficiency.** On a 10-point scale, customers were asked to rank their interest in energy efficiency. Forty-one percent of customers were “extremely” interested in increasing their home’s energy efficiency. Results are summarized in *Figure 4-2*.

*Figure 4-2 Interest in Home’s Energy Efficiency*



**The majority of customers were interested in getting additional information on energy savings tips and energy efficiency rebate programs.** Sixty-five percent of customers were “moderately interested” or “very interested” in getting these tips. A few customers (12%) were not at all interested in getting these tips. Results are summarized in *Table 4-10*.

*Table 4-10 Interest in Energy Efficiency*

<i>Response</i>	<i>Percent (n = 116)</i>
Very Interested	26%
Moderately interested	39%
Slightly interested	23%
Not at all interested	12%

4.1.3 Demographics

**The majority of households had 3 people or less living in the home and earned greater than \$50,000 per year.** Eighty-one percent of households had less than 3 people in 2019, and 75% of households made greater than \$50,000 before taxes in 2019. Results are summarized in Table 4-11 and

Table 4-12.

*Table 4-11 Number of People in Household*

<i>Response</i>	<i>Percent (n=108)</i>
1 person	21%
2 people	48%
3 people	12%
4 people	14%
5 people	4%
6 people	1%

*Table 4-12 Household Income*

<i>Response</i>	<i>Percent (n=145)</i>
\$10,000 to less than \$20,000	6%
\$20,000 to less than \$30,000	3%
\$30,000 to less than \$40,000	6%
\$40,000 to less than \$50,000	4%
\$50,000 to less than \$75,000	6%
\$75,000 to less than \$100,000	22%
\$100,000 to less than \$150,000	17%
\$150,000 to less than \$200,000	15%
\$200,000 or more	8%

**The majority of customers completed an associates degree or higher.** Thirty-nine percent of those surveyed stated that they have a graduate or professional degree, and

38% have four- year college degree. Twelve percent have an associates degree. Results are summarized in Table 4-13.

*Table 4-13 Education Level*

<i>Response</i>	<i>Percent (n=190)</i>
Did not graduate high school	2%
High school graduate	9%
Associates degree, vocation/technical school, or some college	12%
Four-year college degree	38%
Graduate or professional degree	39%

**The majority of homes were built after 1980.** Sixty-percent of customer’s homes were built after 1980. Results are summarized in

Table 4-14.

*Table 4-14 Year Home Built*

<i>Response</i>	<i>Percent (n=174)</i>
Before 1950	7%
1950 to 1959	6%
1960 to 1969	9%
1970 to 1979	18%
1980 to 1989	13%
1990 to 1999	8%
2000 to 2009	17%
2010 to 2019	22%

## **4.2 Low-Income Residential Non-Participant Survey Results**

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ADM looked at the twenty survey responses from low-income customers individually from the rest of the survey population. The low-income survey results are detailed in the following sections.

### 4.2.1 Residence Type and Equipment Installations

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**There is an even split between living in an apartment or a single-family for low-income customers.** Fifty-three percent of respondents live in a single family home and 47% of respondents live in an apartment building. Residence type results are summarized in **Error! Reference source not found.**Table 4-15.

*Table 4-15 Residence Type*

<i>Response</i>	<i>Percent (n=19)</i>
Single-family house detached from any other house	42%
Single family house attached to one or more other houses, for example, duplex, row house, or townhome	11%
Apartment in a building with 2 to 3 units	0%
Apartment in a building with 4 or more units	47%

**Renting is common amongst the customers that responded to the survey.** Seventy percent of respondents stated that they rent their home, and 30% stated that they rent their property. Results are summarized in

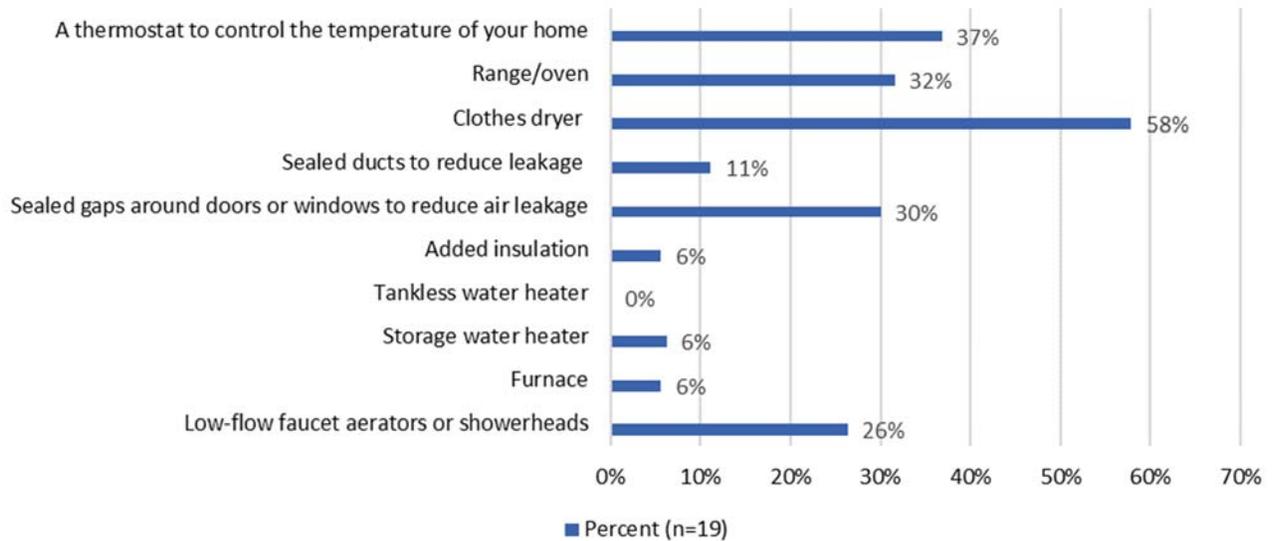
Table 4-16.

*Table 4-16 Home Ownership*

<i>Response</i>	<i>Percent (n=20)</i>
Own	30%
Rent	70%

**It was common for low-income non-participants to have purchased, installed, or implemented various home improvements at their residence.** Common pieces include clothes dryer (58%), thermostats (37%), and a range/oven (32%). Results are summarized for those who answered that they installed various improvements. (Figure 4-3).

Figure 4-3 Measures Installed



**A space heater was the most common heating method. Most homes' water heaters were fueled by natural gas.** Forty-seven percent of low-income customers stated that their main space heating type was a space heater, and 76% stated that their water heater fuel type was natural gas. See Table 4-17 and Table 4-18.

Table 4-17 Space Heating Type

Response	Percent (n = 15)
Heat Pump	13%
Central forced air furnace	33%
Room or space heater	47%
Something else	7%

Table 4-18 Water Heater Fuel Type

Response	Percent (n = 17)
Natural Gas	76%
Electricity	24%

**The age of the heating system equipment was usually under 9 years old for households.** Ninety-one percent of low-income respondents stated that their heating

systems were less than 9 years old. The other 9% of respondents had heating systems that were 15-19 years old. Results are summarized in Table 4-19.

*Table 4-19 Heating System Age*

<i>Response</i>	<i>Percent (n = 11)</i>
Less than 2 years old	45%
2 to 4 years old	18%
5 to 9 years old	27%
15 to 19 years old	9%

**A standard thermostat that lets you set on/off temperatures was the most common type of thermostat for respondents.** Thirty-five percent of respondents have a standard thermostat. Other common responses include having a programmable thermostat (20%) and also a heating system that is not controlled by a thermostat (20%). Results are summarized in Table 4-20.

*Table 4-20 Thermostat Type*

<i>Response</i>	<i>Percent (n =20)</i>
A programmable thermostat that lets you schedule different temperature settings for different times of day.	20%
A smart thermostat that is connected to the internet.	15%
A standard thermostat that lets you set on/off temperatures. You cannot set on/off times.	35%
The heating system is not controlled by a thermostat.	20%

**Almost all of the respondents did not have a pool at their residence.** Ninety percent of respondents reported that they did not have a pool at their residence. Results are summarized in the table below. (Table 4-21).

*Table 4-21 Has Pool at Residence*

<i>Response</i>	<i>Percent (n=20)</i>
Yes	10%
No	90%

4.2.2 Program Awareness

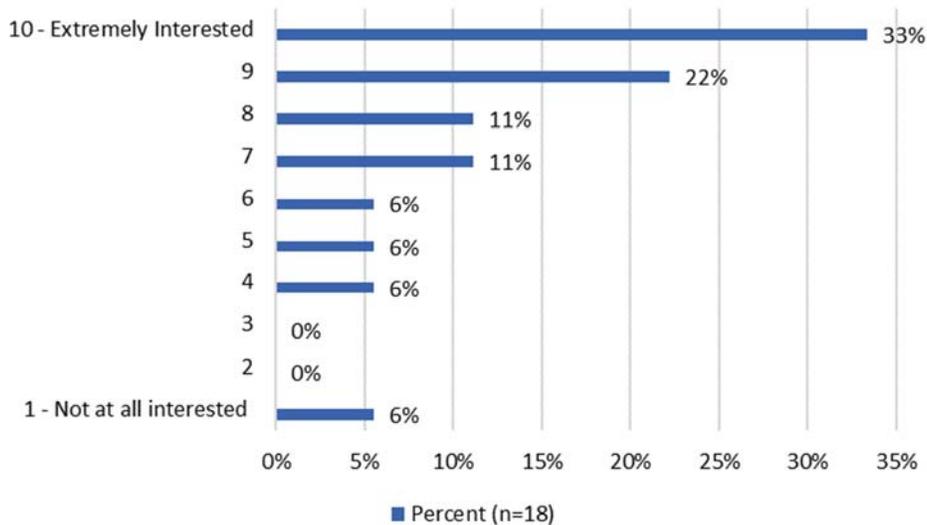
**Non-participants were typically unaware of rebates for energy efficient equipment, home improvements, and other services offered by TGS.** Eighty-nine percent of respondents were unaware of the rebate programs offered. Results are summarized in Table 4-22.

Table 4-22 Rebate Awareness

Response	Percent (n = 18)
Yes	11%
No	89%

**Customers expressed some interest in increasing their home’s energy efficiency.** On a 10-point scale, customers were asked to rank their interest in energy efficiency. Thirty-three percent of customers were “extremely” interested in increasing their home’s energy efficiency. Results are summarized in Figure 4-4.

Figure 4-4 Interest in Home’s Energy Efficiency



**The majority of customers were interested in getting additional information on energy savings tips and energy efficiency rebate programs.** Sixty-eight percent of customers were “moderately interested” or “very interested” in getting these tips. A few customers (16%) were not at all interested in getting these tips. Results are summarized in Table 4-23.

*Table 4-23 Interest in Energy Efficiency*

<i>Response</i>	<i>Percent (n = 19)</i>
Very Interested	42%
Moderately interested	26%
Slightly interested	16%
Not at all interested	16%

### 4.2.3 Demographics

This section details demographics in the entire sample including low-income and non - low-income customers.

**The majority of households earned income between \$10,000-\$40,000 last year. Most households had 2-5 people living there.** Seventy-five percent of households had less than 3 people in 2019, and 75% of households made greater than \$50,000 before taxes in 2019. Results are summarized in Table 4-24 and Table 4-25.

*Table 4-24 Number of People in Household*

<i>Response</i>	<i>Percent (n=20)</i>
1 person	5%
2 people	30%
3 people	20%
4 people	25%
5 people	10%
6 people	5%
8 or more people	5%

*Table 4-25 Household Income*

<i>Response</i>	<i>Percent (n=20)</i>
\$10,000 to less than \$20,000	35%
\$20,000 to less than \$30,000	15%
\$30,000 to less than \$40,000	25%
\$40,000 to less than \$50,000	15%
\$50,000 to less than \$75,000	5%

**The majority of customers were high school graduates.** Thirty-seven percent of those surveyed stated that they graduated high school and 32% have four- year college degree. Results are summarized in Table 4-26.

*Table 4-26 Education Level*

<i>Response</i>	<i>Percent (n=19)</i>
Did not graduate high school	11%
High school graduate	37%
Associates degree, vocation/technical school, or some college	16%
Four-year college degree	32%
Graduate or professional degree	5%

**The majority of homes were built after 1980.** Sixty-four percent of customer's homes were built after 1980. Results are summarized in Table 4-27.

*Table 4-27 Year Home Built*

<i>Response</i>	<i>Percent (n=14)</i>
Before 1950	14%
1950 to 1959	7%
1960 to 1969	0%
1970 to 1979	14%
1980 to 1989	14%
1990 to 1999	14%
2000 to 2009	29%
2010 to 2019	7%

### **4.3 Non-residential Non-Participant Survey**

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Out of 31 non-residential non-participant customers surveyed, 15 customers gave complete responses and responded to the survey. All respondents interviewed stated they have not participated in the commercial rebate programs in the past three years and were considered non-participating customers.

#### **4.3.1 Customer Background and Awareness**

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**Restaurant business was the most common answer for a company's primary business type.** Twenty percent of those who responded stated that their organization was a restaurant business. Thirteen percent stated their business was lodging, and the "other" 13% stated that their businesses were a "non-profit" or a "mixed use" facility. Other responses included grocery/convenience store (7%), healthcare (7%), and industrial/manufacturing (7%). Results are summarized in *Table 4-28*.

*Table 4-28 Business Type*

<i>Response</i>	<i>Percent (n = 15)</i>
Restaurant	20%
Grocery/convenience store	7%
Healthcare	7%
Industrial/manufacturing	7%
Lodging	13%
Other	13%

**Most respondents lease the space of their facility.** Sixty-seven percent of respondents stated that they lease the space, and 20% stated that they own the building and occupy part of it while leasing parts to others. Thirteen percent stated that they own and occupy the entire building. Results are summarized in Table 4-29.

*Table 4-29 Ownership*

<i>Response</i>	<i>Percent (n = 15)</i>
Own and occupy the entire building	13%
Own the building and occupy part of it while leasing part to others	20%
Lease the space	67%

**Respondents have not upgraded or replaced natural gas equipment in the last three years and do not expect to receive a rebate from TGS.** Twelve respondents stated that they do not expect to receive a rebate from TGS or do not plan to replace or upgraded natural gas equipment at their facility (*Table 4-30*).

*Table 4-30 Planning Equipment Upgrades and Expect to Obtain a Rebate*

<i>Response</i>	<i>Percent (n = 12)</i>
Yes	0%
No	100%

**The majority of respondents are decision makers when it comes to the energy using equipment for their facilities and were not aware of the energy efficient rebates.** Sixty percent of respondents stated that they make the decisions when it comes to purchasing energy using equipment for their facilities/sites, and 40% of respondents stated that they provide input to others who make those decisions. Sixty-two percent of respondents stated that they are unaware that TGS provides rebates for energy efficient

equipment purchases as well as free of charge direct installation equipment. Results are summarized in Table 4-31 and Table 4-32.

*Table 4-31 Decision Making Ability*

<i>Response</i>	<i>Percent (n=15)</i>
Make those decisions	60%
Provide input to others who make those decisions	40%

*Table 4-32 Awareness of Rebates*

<i>Response</i>	<i>Percent (n=13)</i>
Yes (Aware)	38%
Not (Unaware)	52%

**Those who did know about rebates were mostly aware of the incentives to replace their commercial water heater or clothes drying equipment and have mostly known about the rebates for more than 2 years.** Five respondents stated that they were aware of incentives to replace commercial water heater or clothes drying equipment. Three respondents were aware of the free-of-charge direct install equipment, and two respondents were aware of the incentives to replace commercial food service equipment. Results are summarized in Table 4-33.

*Table 4-33 Length of Time Aware of Rebates*

<i>Response</i>	<i>Percent (n=4)</i>
Less than one year	25%
More than two years	75%

**Those who did know about the rebates mostly learned about them through informational brochures and the TGS website.** Twenty-nine percent of respondents stated that they received the information from the TGS website, and 29% also stated that they received the information from a brochure. Other responses included from an email blast (14%), an event/trade show (14%), and from a TGS account representative (14%). Results summarized in Table 4-34.

*Table 4-34 Sources for Information*

<i>Response</i>	<i>Percent (n=7)</i>
From TGS Account Representative	14%
At an event/trade show	14%
Received an email blast or electronic newsletter	14%
Received an informational brochure	29%
From TGS website	29%

**Those who installed energy efficient equipment installed water heating equipment and clothes drying equipment.** Twenty percent of respondents stated that in 2019 or 2020 they purchased and installed energy efficient equipment. Out of those respondents, 50% installed water heating equipment and the other 50% installed clothes dryer equipment. Results are summarized in Table 4-35 and

Table 4-36.

*Table 4-35 Energy Efficient Equipment Installed*

<i>Response</i>	<i>Percent (n=2)</i>
Water heating equipment	50%
Clothes dryer equipment	50%

*Table 4-36 Purchased Equipment in 2019 or 2020*

<i>Response</i>	<i>Percent (n=10)</i>
Yes	20%
No	80%

**Less than fifty percent of respondents stated that it was likely that they would schedule a free walk-through assessment to identify and install energy efficient upgrades.** Twenty-eight percent of respondents stated that they were “likely” or “extremely likely” to schedule a free walk-through assessment to identify and install energy efficient upgrades. The reasons for not scheduling a free walk-through varied including 44% of respondents saying that all such decisions are not made by them. Thirty-three percent of respondents reported “other” reasons which included Covid-19, scheduling, and that the facility is already new. Results are summarized in Table 4-37 and Table 4-38.

*Table 4-37 Likelihood of Scheduling Walk Through*

<i>Response</i>	<i>Percent (n=14)</i>
1 – Not at all likely	21%
2	7%
3	43%
4	14%
5 – Very likely	14%

*Table 4-38 Reasons for not Scheduling Walk Through*

<i>Response</i>	<i>Percent (n=9)</i>
Energy savings from equipment upgrades are not worth the trouble	11%
Too much time or trouble	11%
Not applicable – all such decisions are made by a property or energy management firm	33%
Other	44%

#### **4.4 Key Findings and Recommendations from Customer Surveys**

The key findings from the residential and non-residential customer surveys are presented below.

- Generally, TGS customers are not aware of the rebates provided by TGS. For residential customers, over fifty percent of respondents were unaware of the rebate programs offered. For non-residential customers, fifty-two percent of respondents stated that they are unaware that TGS provides rebates for energy efficient equipment purchases as well as free of charge direct installation equipment.
- Out of those residential customers who had learned of the rebates or services, the majority learned of them through email or mail sources. Over 50% of respondents learned of the rebate programs through these methods.
- Out of the non-residential customers who knew about the rebates most learned about them through informational brochures and the TGS website. Twenty-nine percent of respondents stated that they received the information from the TGS website, and 29% also stated that they received the information from a brochure.
- The majority of residential customers were interested in getting additional information on energy savings tips and energy efficiency rebate programs. Close to 65% of customers were “moderately interested” or “very interested” in getting these tips.
- Generally, non-residential customers have not upgraded or replaced natural gas equipment in the last three years and do not expect to receive a rebate from TGS for future replacements. Twelve respondents stated that they do not expect to

receive a rebate from TGS or to have to replace or upgrade natural gas equipment at their organization.

Overall, TGS has had success in implementing the natural gas conservation programs. Based on the key research findings, ADM recommends the following suggestions so that program offerings and services can continue to be improved:

- TGS should increase their marketing of equipment rebates due to the lack of rebate awareness that customers reported. Since customers seemed to learn about the rebates from email, the website, and mailed brochures, these communication channels should be the focal point.
- Marketing should be aimed at residential customers due to their interest in energy efficiency programs and actions. Contacting these customers can best be done via utility bill inserts, the utility website, or email communications.
- Since respondents have been purchasing and installing natural gas equipment, TGS should consider implementing a midstream program. Conducting a midstream program can connect the utility with local retailers and enhancing that relationship, as well as resulting in customers purchasing more energy efficient equipment and raising customer awareness of TGS programs.
- Increase energy efficiency education and marketing efforts for non-residential customers who own the business premise. All non-residential customers who responded stated that they have not upgraded natural gas equipment in the last 3 years. This could be due to a lack of energy efficiency education, or lack of outreach efforts by the utility or program implementor.
- For non-residential customers, contact the primary energy decision maker for the premise about offering a free walk through rather than a tenant who leases the space. Typically, premise tenants cannot make energy efficiency decisions, so the premise owner should be contacted. It would be beneficial for TGS to investigate who the primary decision maker is at non-residential accounts, and attempt to build that relationship. Alternatively, business owner relationship-building could be handled by the commercial program implementor, CLEARResult.