OKLAHOMA GAS and ELECTRIC COMPANY

2014 Arkansas Energy Efficiency Program Portfolio Annual Report

Section 9: Annual Reporting Requirements, and Order No. 18 in Docket No. 06-004-R.
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1.0 Executive Summary

Executive Summary

Oklahoma Gas and Electric Company ("OG&E" or "Company") hereby submits its Energy Efficiency ("EE") program portfolio Annual Report for Program Year ("PY") 2014 to the Arkansas Public Service Commission ("APSC" or "Commission") pursuant to Order No. 18 in Docket 06-004-R. This report is required to be filed annually by April 1, per Section 9 of the APSC Rules for Conservation and Energy Efficiency Programs.

HISTORY:
OG&E began implementation of EE programs in Arkansas in December 2007 with its Quick Start program portfolio. The Quick Start program continued through December 31, 2009. That portfolio contained seven programs in total; five OG&E administered programs and two state administered programs. The OG&E administered programs included; the Livingwise® Student Energy Education program, the Residential Energy Audit program, the Commercial Lighting program, the Motor Replacement program, and the Compact Fluorescent Light ("CFL") program. The two state administered programs included were the Arkansas Weatherization Program ("AWP"), and the Energy Efficiency Arkansas ("EEA") program. The CFL program was not launched with the other Quick-Start programs and was ultimately discontinued. The Quick-Start portfolio allowed OG&E to build a program delivery framework for its customers in the Arkansas jurisdiction.

The initial Comprehensive Energy Efficiency Program ("CEEP") was approved on February 3, 2010 for an 18 month implementation period ending on June 30, 2011. The initial CEEP included the continuation of the two statewide programs, AWP and EEA, and three OG&E programs; Livingwise® Student Energy Education, Commercial Lighting, and Motor Replacement programs. The Residential Energy Audit program was renamed the Custom Energy Report ("CER") program and the new OG&E Weatherization program was introduced. The OG&E Weatherization program was established to offer weatherization for residential customers that would not otherwise qualify for the AWP.

The current Comprehensive Portfolio was approved on June 30, 2011 for the remainder of PY 2011. The PY's 2012 and 2013 were subsequently approved on December 30, 2011. The two statewide programs, AWP and EEA, were continued along with OG&E's Commercial Lighting program and the Livingwise® Student Energy Education program. The CER program was discontinued as an EE program, but is still available through OG&E's website. The OG&E Weatherization program was modified to a collaborative program with Arkansas Oklahoma Gas Corporation ("AOG") to take advantage of administrative efficiencies and cost sharing. The Motor Replacement Program was incorporated into the new Commercial and Industrial Standard Offer Program ("C&I SOP"). In addition, new programs were created for both residential and nonresidential customers. For residential customers, the HVAC tune-up and duct repair program, the Window Unit A/C program, and the Multi-Family program were created to provide a more diverse residential portfolio of programs. After the plan was approved, it was determined the Multi-Family program could not be implemented as designed and was discontinued. For nonresidential customers, in addition to the C&I SOP, the Commercial Tune-up program was created to inspect and tune commercial HVAC systems.

In January 2013, the APSC opened Docket 13-002-U to resolve issues related to the development and implementation of the second three year cycle of EE programs in Arkansas. In Order No. 2 of that same Docket, the APSC approved the request of the Parties Working Collaboratively ("PWC") extending the filing date for the second three year cycle of EE programs from June 1, 2013 to June 1, 2014. The Commission also directed that energy savings targets, budgets, and the incentive structure previously approved by the Commission in the TF dockets for use by the Utilities and EE program administrators for the existing PY 2013 shall also be used for PY 2014.The exception to this was if the Utilities sought Commission approval of proposed modifications to their EE portfolios.

OG&E reviewed its portfolio performance through 2013 and filed an application to modify its existing portfolio to enhance its ability to achieve Commission approved targets for 2014. OG&E's interim filing proposed to modify its portfolio by discontinuing three programs, adding one new program, increasing the budget for industrial programs, and aligning its rebate structure with Commission approved targets. The three programs that were discontinued were the Residential HVAC program, the Commercial and Industrial HVAC program, and the Window Unit AC program. The new program added was the Multi-Family Direct Install program. On March 17, 2014, the Commission approved OG&E's modified portfolio.

The following table summarizes historical annual incremental EE savings achieved by OG&E's previous efforts:

Program Year	Energy (kWh)	Demand (kW)
2008	2,434,738	666
2009	5,607,951	921
2010	4,143,096	1,317
2011	4,985,328	1,520
2012	7,595,741	1,840
2013	13,410,729	2,797

GOALS AND OBJECTIVES:

Order No. 15 in Docket 08-137-U established default energy savings goals as a percent of 2010 energy sales. The annual energy savings goals are shown in the following table.

Program Year	Percent of 2010 Sales	Energy Savings Goals
2011	0.25%	6,752,758
2012	0.50%	11,363,560
2013	0.75%	16,843,560
2014	0.75%	16,287,689

OG&E's energy savings goal for 2014 was 16,287,689 kWh or 0.75% of 2010 weather normalized sales as adjusted for self-direct exemptions. The 2014 EE portfolio actual results achieved for energy savings were 13,794,070 kWh.

MAJOR ACCOMPLISHMENTS:
OG&E reached its highest level of energy savings in 2014 since beginning its EE efforts in 2008 and for the first time in program history qualified for a performance incentive. OG&E's collaborative Weatherization program with AOG was again very successful and exceeded energy savings targets for 2014. The OG&E/AOG collaborative weatherization program delivered 105% of planned electric energy savings while spending 97% of the planned budget. Word of mouth marketing from customers continues to be the main source of new customers in the program for both OG&E and AOG. In a 2014 EVOLVE Research survey, 9 out of 10 participants in the OG&E/AOG Weatherization program indicated they would recommend the program to friends and relatives.

OG&E's Multi-Family Direct Install program was approved for implementation as part of its 2014 modified portfolio and performed well despite some early setbacks. The year ended before complete implementation was achieved. However, the program delivered 87% of planned savings while spending 78% of the budget.

PROGRESS ACHIEVED:
The 2014 Portfolio achieved savings continues the steady climb of year over year savings from 2011. OG&E's achieved annual incremental savings in gigawatt hours is represented in the table below. The achieved energy savings for 2014 is 85% of the Commission approved target. This continued increase in year over year savings reflects significant enhancements in many program areas and confirms OG&E's commitment to achieve energy savings.

Program Year	GWh sales
2011	4.99
2012	7.60
2013	13.41
2014	13.79

HIGH-LEVEL RECAP:
The 2014 portfolio produced 13,794,070 kWh or 84.69% of the energy savings goal. These on-going energy savings will accumulate over the life of the measures. The EE Program recoverable expenses of $4,547,081 for 2014 were 99% of the approved annual budget of $4,590,967. Customer incentives and rebates account for 78% of the total program expenses.

HIGHLIGHTS OF WELL PERFORMING PROGRAMS:
OG&E achieved 105% of the 2014 goal for its collaborative residential weatherization program. OG&E weatherized 1,372 homes in its service territory. This program performed very well in 2014 and accounted for 65% of OG&E's residential portfolio energy savings.

OG&E began implementation of the Multi-Family Direct Install program in 2014 and achieved 87% of its savings goal. The program directly installed EE measures in 1,884 multi-family units. This program accounted for 29% of OG&E's residential portfolio energy savings. This program also penetrates a hard to reach customer segment allowing for more customers to participate and be further educated in the energy management of their home.

OG&E's addition of a full-time employee working the commercial and industrial market contributed to the Commercial Lighting program growth in energy savngs of over 230% from 2012. The Commercial Lighting program achieved savings of 6,525,599 kWh in 2014 or 126% of its target.

WHAT'S WORKING, WHAT'S NOT:
The residential portfolio of EE programs is working well. With the addition of the Multi-Family Direct Install program, OG&E is reaching additional residential customers. The residential portfolio of OG&E administered programs achieved 99% of energy savings goals while spending 95% of the total residential budget. The current EM&V reports validate the impact and process success of OG&E's residential programs.

The Commercial Lighting program achieved 126% of its goal in 2014, and continues to pick up momentum from lighting customers. The new direct install component of the C&I programs has provided a major increase to savings for 2014. Even so, the C&I Standard Offer Program continues to struggle achieving only 45% of the 2014 goal.

PLANNED CHANGES:
On March 2, 2015, OG&E filed a request to increase the budgets for three programs to enhance its ability to achieve the increased energy savings target for 2015. OG&E's employed CLEAResult to assist in reviewing existing programs to determine potential for additional savings. Based on the independent contractor review, feedback from customers, and OG&E program managers, three programs offered the best potential to increase energy savings. OG&E reviewed CLEAResult's proposal to increase budgets in the residential Multi-Family Direct Install program and both commercial and industrial programs. The expected additional energy savings provided by increasing the budgets of the three programs is enough to meet the increased energy savings goal for 2015.

TRAINING ACHIEVEMENTS:
OG&E provided training to approximately 984 individuals in 2014. OG&E hosted seminars for weatherization contractors and crews to explain the benefits of the residential programs. OG&E also provided educational sessions with commercial and industrial customers on the benefits of energy efficiency.

EM&V ACTIVITIES:
Applied Energy Group ("AEG"), formerly EnerNOC Utility Solutions, was selected to perform the EM&V for all of the EE programs in the portfolio except the AWP and the OG&E/AOG Weatherization

program. ADM Associates, Inc. performs the EM&V for both the AWP and the OG&E/AOG Weatherization program. Using the same contractor for both weatherization programs ensures consistency in evaluation. For PY 2014 both EM&V contractors performed process and impact evaluations of the programs delivering measure by measure evaluated net savings. The three EM&V reports detail their findings and are in the appendix of this annual report.

LONG-TERM ENERGY SAVINGS:

The current program portfolio was developed to meet the energy efficiency targets established by the APSC in Order No.15 in Docket 08-137-U. The expected kW and kWh savings delivered by this portfolio, estimated kW and kWh savings from future portfolios and the cumulative kW and kWh savings from previous portfolios, are included in the Company's Load forecast. The Integrated Resource Plan incorporates this information in its planning report.

EE OVERVIEW:

The following three tables provide an overview of the EE portfolio results for PY 2014:

2014 Portfolio Summary

Net Energy Savings		Cost			Cost-Benefits	
Demand MW	Energy MWh	Actual Expenses	LCFC	Performance Incentives	TRC Net Benefits	TRC Ratio
3	13,794	$ 4,547,081	$ 1,893,174	$229,548	$ 7,374	2.50

EE Portfolio Cost by Program

Program Name	Target Sector	Program Type	2014 Budget ($)	2014 Actual ($)	% of Budget
Custom Energy Report (Discontinued)	Residential	Behavior/Education	-	-	-
Multi-Family (Discontinued)	Residential	Market Specific/Hard to Reach	-	-	-
Multi-Family Direct Install	Residential	Market Specific/Hard to Reach	268,893	233,411	87%
OG&E - AOG Weatherization	Residential	Whole Home	2,231,745	2,231,745	100%
Residential HVAC Tune-up & Duct Repair (Di	Residential	Measure/Technology Focus	-	-	-
Student Energy Education	Residential	Behavior/Education	88,694	88,694	100%
Window A/C (Discontinued)	Residential	Market Specific/Hard to Reach	-	-	-
C&I Standard Offer	Commercial & Industrial	Measure/Technology Focus	926,250	949,805	103%
Motors (Discontinued)	Commercial & Industrial	Measure/Technology Focus	-	-	-
Commercial HVAC Tune-up (Discontinued)	Small Business/C&I	Measure/Technology Focus	-	-	-
Commercial Lighting	Small Business/C&I	Measure/Technology Focus	900,128	958,830	107%
Arkansas Weatherization Program (AWP)	Residential	Whole Home	77,157	22,914	30%
Energy Efficiency Arkansas (EEA)	All Classes	Behavior/Education	21,600	18,319	85%
Regulatory	-	-	76,500	43,361	57%
		Total	**4,590,967**	**4,547,081**	**99%**

EE Portfolio Summary by Cost Type

EE Program Cost Summary Cost Type	2014 Total Cost % of Total	Budget ($)	Actual ($)	% of Total
Planning / Design	0%	17,963	14,185	0%
Marketing & Delivery	11%	505,015	344,225	8%
Incentives / Direct Install Costs	74%	3,391,072	3,578,660	79%
EM&V	6%	263,751	212,975	5%
Administration	7%	336,667	353,675	8%
Regulatory	2%	76,500	43,361	1%
	100%	**4,590,967**	**4,547,081**	100%

Company Statistics

Program Year	Revenue and Expenses					Energy				
		Budget		Actual			Plan		Evaluated	
	Total Revenue (a) ($000's)	Portfolio Budget (b) ($000's)	% of Revenue (%=b/a)	Portfolio Spending (c) ($000's)	% of Revenue (%=b/a)	Total Annual Energy Sales (d) (MWh)	Net Annual Savings (e) (MWh)	% of Energy Sales (%=b/a)	Net Annual Savings (f) (MWh)	% of Energy Sales (%=b/a)
2010	$ 176,717	$ 1,364	0.8%	$ 1,305	0.7%	2,837,921	2,667	0.1%	4,143	0.1%
2011	$ 180,406	$ 2,680	1.5%	$ 2,172	1.2%	2,802,634	6,991	0.2%	4,985	0.2%
2012	$ 167,615	$ 3,524	2.1%	$ 3,149	1.9%	2,743,246	14,145	0.5%	7,596	0.3%
2013	$ 179,047	$ 3,938	2.2%	$ 3,714	2.1%	2,710,927	20,848	0.8%	13,411	0.5%
2014	$ 181,431	$ 4,591	2.5%	$ 4,547	2.5%	2,693,601	14,560	0.5%	13,794	0.5%

2.0 Portfolio Programs

2.1 OG&E Weatherization Program

2.1.1 Program Description

Designed to target residential customers and allow them to participate in the program at no cost, this program provides customers the opportunity to actively manage their energy costs. The program targets residential single-family homes which were built before 1997, specifically those that are severely energy inefficient. Homes that meet these criteria begin with an energy audit utilizing blower door technology on the structure to capitalize on specific weatherization techniques. The program is designed to upgrade and improve the thermal envelope of the dwelling.

OG&E serves more than 54,000 residential customers in its Arkansas service territory and has estimated there are as many as 30,000 homes in need of weatherization improvements. OG&E views the Weatherization program as a key component in its EE portfolio, and uses three independent contractors: DK Construction, based in Van Buren (Crawford County), Total Home Efficiency and Williams Energy, both based in south Fort Smith (Sebastian County). Each contractor has certified Building Performance Institute ("BPI") and Residential Energy Services Network ("RESNET"), Home Energy Service Professionals ("HESP") auditors on staff. OG&E personnel also conducted field training throughout the course of the program which will continue throughout the remainder of the existing program as needed. Contractors are encouraged to attend and receive additional education on weatherization of homes, both online and in classrooms, for improvement in proper home weatherization techniques. Additional training is recommended for each of the contractors to obtain national certifications.

Energy saving equipment that is installed or improved in the homes include: replacement of glass and/or windows and doors requiring attention at the time of the project, ground cover for vapor barrier, CFLs, return air cavity sealing, CO detectors, smoke detectors, attic insulation, window unit AC tune-up, air infiltration, and water heater pipe wrap. Utilizing blower door technology, the contractors are able to locate and seal larger areas of air infiltration on the homes.

The partnership with Arkansas Oklahoma Gas Corporation ("AOG") has proved to be a successful collaboration for the joint weatherization program. The ability to work together with other utilities is an ongoing effort to combine resources as well as to reach out to more customers in our over-lapping service territories. OG&E and AOG continue to work together with contractors to ensure program success. OG&E and AOG, along with the efforts of Frontier Associates, continue to fine tune the software package to meet the criteria of the most current Technical Reference Manual ("TRM"). The improvements are to help ensure the software captures more accurate field data, as well as a split payment process for each of the utilities to pay the individual contractors assigned to the program.

2.1.2 Program Highlights

- Civic and community presentations highlighting the program were conducted throughout communities served by OG&E promoting the Weatherization program.
- OG&E achieved 105% of planned energy savings.
- OG&E weatherized 1,372 homes in 2014.
- The OG&E/AOG Weatherization Program was used as the model for the new Arkansas Unified Weatherization Program.

2.1.3 Program Budget, Savings and Number of Measures

OG&E - AOG Weatherization												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 2,296,960	$ 2,296,935	100%	2,994,261	3,638,503	122%	516	1,006	195%	1,620	1,631	101%
Program Year 2013	$ 2,302,446	$ 2,302,158	100%	2,994,261	3,655,091	122%	516	1,040	202%	1,620	1,623	100%
Program Year 2014	**$ 2,231,745**	**$ 2,231,745**	**100%**	**3,497,085**	**3,679,571**	**105%**	**990**	**1,086**	**110%**	**1,620**	**1,372**	**85%**

2.1.4 Description of Participants

- Participants of this program fall into two groups. The first group are more mature customers living in single-family homes built more than 15 years ago. Many of these participants are either retired or near retirement and own their own home. They maintain a low-key lifestyle and typically do not have young children living at home.
- The second group of participants are younger customers with young children living at home. This group of participants include single-family home renters and those that own their home.

2.1.5 Challenges and Opportunities

- Working in conjunction with the Community Clearinghouse, OG&E has been able to maintain a steady pace in obtaining and qualifying customers' homes in a timely manner for weatherization.
- As this program matures, long term lead generation will be necessary for future success.
- Data validation, consistent education messaging, and ease of enrollment issues may require new processes to resolve.
- Opportunities will exist for expanding the market of eligible homes when the new program begins in 2016.

2.1.6 Planned or Proposed Changes to Program and Budget

- In order to maintain a consistent and adequate volume of participant leads during the 2015 program year, the home construction year requirement (currently, prior to 1997) may be adjusted to align with the 10-year rolling construction year requirement in the *Recommended Weatherization Approach to Provide Consistent Weatherization Programs Across All Utilities in Arkansas*, which was approved by the Commission on December 9, 2014 in Order No. 22 of Docket No. 13-002-U. OG&E does not foresee any budget increases for the 2015 program year.

2.2 Student Energy Education Program (LivingWise®)

2.2.1 Program Description

The program provides 6th grade teachers and their students a curriculum on home EE. At the end of the curriculum a LivingWise® education kit provides the students the opportunity to participate with their families on energy awareness. The LivingWise® education kit contains 3 CFL bulbs, two faucet aerators, one low-flow showerhead, one LED night light, a thermometer, and a student handbook on EE for the home and community. The students take the LivingWise® kit home and install the EE measures with the assistance of their parents.

OG&E provides a list of schools each semester to Resource Action Programs ("RAP") for potential participation in the LivingWise® Program. RAP contacts the school, enrolls the teacher and quantifies the number of students. A list of enrolled schools and participation information is sent to OG&E each month. RAP mails the kits to the teachers enrolled in the program. Finally, RAP follows up with teachers on class participation during the curriculum and the students' interaction with parents including the installation of the energy savings measures. There was an overwhelming consensus from all participating teachers that it was an informative, easy to understand curriculum. The teachers expressed that with the uncertain environmental and energy situation, the teaching materials were both timely and important.

2.2.2 Program Highlights

- The LivingWise® Program provided EE and environmental awareness education for 1,872 students from January 2014 through December 31, 2014, targeting 9 school districts in Arkansas.
- Use OG&E customized box to improve the generic look for the LivingWise® Kits.
- OG&E utilized Community Coordinators along with key contact personnel for promotion of the program.
- A report is submitted to OG&E at the end of each semester detailing the activity, the results and the participation level and acceptance of the program.
- OG&E had a 100% return rate from teachers responding to the follow-up surveys.
- The kit contents were redesigned for 2014 to increase the savings potential.

2.2.3 Program Budget, Savings and Participants

Student Energy Education

	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 87,508	$ 82,273	94%	152,120	291,628	192%	15	36	237%	1,840	1,817	99%
Program Year 2013	$ 76,298	$ 73,907	97%	152,120	126,084	83%	15	15	99%	1,840	2,006	109%
Program Year 2014	**$ 88,694**	**$ 88,694**	**100%**	**288,792**	**311,942**	**108%**	**36**	**39**	**108%**	**1,840**	**1,872**	**102%**

2.2.4 Description of Participants

- This program focuses on 6th grade students in the public school system. The kit provides several easily installed EE products for the home allowing students and parents to have conversations about using energy efficiently. This program promotes EE education to the future home owners so they will understand the impacts of energy conservation.

2.2.5 Challenges and Opportunities

- OG&E's success with this program has been through key contacts in each of the school districts. Each of the participating schools within the OG&E service territory have embraced the concept and curriculum provided through RAP.
- The annual updating of the Arkansas Technical Reference Manual has historically presented challenges to the program's cost effectiveness.

2.2.6 Planned or Proposed Changes to Program and Budget

- This Comprehensive program ended on June 30, 2011 and a new EE program was approved on June 30, 2011 for the program years 2011-2013. The Arkansas Public Service Commission approved an extension of the program for 2014 and 2015. OG&E plans to continue its support for the Student Energy Education program through 2015.

2.3 Commercial Lighting Program

2.3.1 Program Description

The purpose of the Commercial Lighting program is to provide incentives to the OG&E Commercial and Industrial customers to install or replace lighting with more efficient equipment. The program targets commercial, public authority and industrial facilities of all sizes with a focus on the small to medium-sized facilities, where saturation rates and awareness levels of high efficiency lighting are expected to be lower than in larger commercial operations. To encourage commercial customers to participate, incentives are offered for the following upgrades; T-12 to T-8 or T-5 lamps and or LED fixtures, upgrading HID to high efficiency T-8, or T-5's, installation of sensors, LED exit lighting, incandescent lighting to CFL's or the upgrade of parking lot lighting. The program also encourages new construction to upgrade their lighting utilizing the 2006 IECC code for standards and guidelines. Incentives were based on kWh reduced on the structure.

The Commercial Lighting program was designed to reach existing customers including large school districts, commercial, and industrial complexes. OG&E personnel continued to recruit and educate commercial customers on the advantages of upgrading their lighting systems through educational seminars and booth displays at local vendor open houses and lunch and learn opportunities. OG&E personnel utilized many different avenues and strategies to encourage customers to upgrade the lighting in each facility. This includes working with lighting manufacture representatives, conducting walk through audits and detailed audits. The program is very well received with the incentives allowing for quicker payback on enhanced lighting levels in their facilities. More of the commercial customers took advantage of the rebate while educating themselves on the benefits of more efficient lighting and lighting controls.

2.3.2 Program Highlights

- Presentations were made at supply and distributor warehouses throughout 2014.
- Civic and community presentations promoting the lighting program were conducted throughout each town served by OG&E.
- CLEAResults Consulting continued to assist OG&E personnel throughout 2014 in capturing opportunities for lighting replacements with all classifications of commercial and industrial ("C&I") consumers.
- Audits were performed to ensure the program was implemented as designed and proper documentation was collected.

2.3.3 Program Budget, Savings and Participants

Commercial Lighting												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 323,331	$ 246,824	76%	5,238,456	2,725,963	52%	1,323	512	39%	125	66	53%
Program Year 2013	$ 514,899	$ 387,722	75%	9,010,145	6,325,111	70%	2,275	967	43%	215	186	87%
Program Year 2014	**$ 900,128**	**$ 958,830**	**107%**	**5,162,810**	**6,525,599**	**126%**	**970**	**1,117**	**115%**	**125**	**106**	**85%**

2.3.4 Description of Participants

- Participants in the program included all classifications of commercial and industrial customers.

2.3.5 Challenges and Opportunities

- Keeping the distributors and contractors updated on the latest program changes, codes and standards, and energy savings calculations.
- Economic conditions in the Fort Smith market place have started to rebound slowly, in addition, the unemployment rate is leveling off; however, many commercial lighting customers continue to delay lighting projects due to corporate budget limitations.
- Market acceptance of LEDs is beginning to grow as incremental costs begin to decrease.

2.3.6 Planned or Proposed Changes to Program and Budget

- OG&E plans to spend the approved budgeted amount for 2015, however, OG&E has filed a request for a modified budget for this program along with two other programs to help ensure it can meet the increased goal in 2015.
- OG&E will discontinue using its online calculator for lighting measures and will begin using a prescriptive list approach in 2015.

2.4 Energy Efficiency Arkansas Program

2.4.1 Program Description:

The Energy Efficiency Arkansas ("EEA") program provides information to all customers, of all classes, allowing them to make informed decisions about how they use energy and to look at alternatives to improve their consumption, thereby decreasing demand and energy usage.

OG&E has continued its support of the EEA Comprehensive plan through three components: 1) residential education and information outreach; 2) media promotion; 3) commercial and industrial education and outreach, provided by the Arkansas Energy Office ("AEO").

The AEO provided educational pamphlets, DVDs, and training materials to homeowners throughout the OG&E service territory. Multiple classes were held throughout the State of Arkansas on residential, commercial, and industrial energy efficient usage and design. Area industry plant engineers as well as CEOs, CFOs, and purchasing agents were updated on techniques of how to manage energy consumption in their plants. Courses on refrigeration and compressed-air were held in the Fort Smith area to update individual businesses on EE operations within the C&I segment.

2.4.2 Program Highlights:

- The AEO provides various methods of reaching all classifications of OG&E customers through radio, print, and seminars.
- The AEO offered training through Arkansas Manufacturing Solutions throughout the year in the OG&E service territory.
- Additional information is submitted by the AEO annual report.
- The comprehensive program began February 3, 2010 and ended on June 30, 2011. The EEA program began on July 1, 2011 and continues on through December 2015.

2.4.3 Program Budget, Savings and Participants

Energy Efficiency Arkansas (EEA)												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 25,977	$ 25,929	100%	0	0	-	0	0	-	0	0	-
Program Year 2013	$ 24,000	$ 18,659	78%	0	0	-	0	0	-	0	0	-
Program Year 2014	**$ 21,600**	**$ 18,319**	**86%**	**0**	**0**	-	**0**	**0**	-	**0**	**0**	-

2.4.4 Description of Participants

- Residential and C&I customers in Arkansas.

2.4.5 Challenges and Opportunities

- OG&E, along with the AEO, has continued to provide updated material to all classifications of consumers throughout the OG&E service territory. Cost effective measures should be implemented in a timely manner to lower utility costs. Education to the customer is essential in stressing the importance of EE in all applications.

2.4.6 Planned or Proposed Changes to Program and Budget

- OG&E agreed to participate with EEA in the new EE program that was approved on June 30, 2011 for the program years 2011-2013 extended through 2014 and is planned to continue through 2015. OG&E plans to continue its support for the EEA program.

2.5 Commercial and Industrial Standard Offer Program

2.5.1 Program Description

This is a comprehensive long term EE program targeted to Commercial and Industrial ("C&I") Power and Light rate customers. The program provides incentives for the energy savings produced through EE improvements. This program provides customized EE solutions to meet requirements unique to each facility. It has proven to be successful in helping to not only manage, but to assist in upgrading existing equipment to higher efficiency. This program has an on-going opportunity to help industrial customers achieve higher efficiency standards while providing incentives to help shorten payback periods. OG&E personnel, along with CLEAResults representatives call on individual industrial and commercial customers as well as local Engineering firms to inform them of updated and approved standards published in the latest Technical Reference Manual ("TRM").

2.5.2 Program Highlights

- The C&I Standard Offer program was promoted through various functions to Industrial customers throughout 2014.
- Contractors, public school districts, and customers embraced the program by upgrading their HVAC equipment to higher efficiency units.
- Lunch and learns were provided by CLEAResults, OG&E, Arkansas Oklahoma Gas, and the University of Arkansas Industrial Energy Clearinghouse.
- OG&E promoted the program through various civic presentations across OG&E's service territory.
- OG&E contracted with CLEAResults Consulting to assist OG&E personnel in the C&I programs with data logging and verification.

2.5.3 Program Budget, Savings and Participants

C&I Standard Offer												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 327,434	$ 161,145	49%	4,246,188	619,897	15%	1,141	154	13%	12	22	183%
Program Year 2013	$ 537,940	$ 523,591	97%	7,177,710	2,535,967	35%	1,962	570	29%	18	2,469	13717%
Program Year 2014	**$ 926,250**	**$ 949,805**	**103%**	**3,596,963**	**1,606,746**	**45%**	**938**	**431**	**46%**	**88**	**144**	**164%**

2.5.4 Description of Participants

- Participants in the program included each of the classifications for C&I customers.

2.5.5 Challenges and Opportunities

- Economic conditions in the Fort Smith market place have started to rebound slowly, in addition, the unemployment rate is leveling off; however, the EE improvements with many industrial customers continue to move at a slow pace due to corporate budget limitations on capital improvements.
- The most advanced energy efficient equipment available is cost prohibitive for most buyers, therefore distributors keep little or no inventory of the higher cost equipment.
- Many projects have lead times of up to 18 months or longer from start to finish, which presents a challenge in trying to manage program budgets.

2.5.6 Planned or Proposed Changes to Program and Budget

- This EE program will continue to be implemented through 2015. OG&E has filed a request for a modified budget for this program along with two other programs to help ensure it can meet the increased goal in 2015.
- OG&E will discontinue using its online calculator for lighting measures and will begin using a prescriptive list approach in 2015.

2.6 Arkansas Weatherization Program (AWP)

2.6.1 Program Description

The Arkansas Weatherization Program ("AWP") was designed to promote EE in homes throughout the OG&E service territory in Arkansas. This program is monitored by the Arkansas Community Action Agencies Association ("ACAAA"). The EE program is targeted to residential customers and allows the customer to participate in programs to assist in managing energy costs and to begin to utilize price response tariffs. This program focuses on customer owned homes that are severely energy inefficient. The program design is to upgrade and improve the thermal envelope of the dwelling and the energy use of appliances.

OG&E continued its participation with the AWP in conjunction with other utilities across the state. The Central Arkansas Development Council ("CADC") administers the disbursement of funding for the utility collaborative. OG&E serves over 54,000 residential customers in its Arkansas service territory and has estimated as many as 30,000 homes need weatherization improvements. OG&E estimates there are 10,000 severely energy inefficient homes in its service territory. Presentations describing the AWP are made to Civic and Senior Citizen Groups throughout the OG&E service territory to inform customers of the program. Agency contractor crews install key weatherization components in the homes to help upgrade the homes from energy inefficient to more efficient standards. Some of the components that were installed include: ceiling insulation, caulking, insulating foam, weather stripping, replacement of glass and or windows, doors, ground cover, compact fluorescent lighting, duct and plenum repair, return air cavity sealing, CO detectors, smoke detectors, HVAC tune-ups, and indoor coil cleaning.

OG&E provides funding for ACAAA to weatherize severely energy inefficient homes in its Arkansas service territory. Working with the Crawford-Sebastian Community Development Council, Inc., located in Fort Smith, the AWP program weatherized 3 severely energy inefficient residential homes in 2014. These homes also utilized DOE funds, as well as LIHEAP funding and additional grants, for improvements to the home. Area counties served by the agencies are Crawford, Sebastian, Franklin, Johnson, and Logan.

2.6.2 Program Highlights

- The Energy Efficiency Arkansas Weatherization Program was launched on July 1, 2011.
- AWP weatherized 3 homes in 2014 in OG&E's service territory at an average cost per home of $1,034.
- Civic and community presentations promoting the AWP program were conducted throughout each town served by OG&E.
- The AWP was administered through the CADC.
- The Crawford-Sebastian Community Development Council Inc. performed audits and jobs in the OG&E service territory.

2.6.3 Program Budget, Savings and Participants

Arkansas Weatherization Program (AWP)												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ 86,988	$ 66,767	77%	522,485	76,898	15%	69	12	17%	59	45	76%
Program Year 2013	$ 85,730	$ 38,714	45%	522,485	54,516	10%	69	31	46%	59	35	59%
Program Year 2014	**$ 77,157**	**$ 22,914**	**30%**	**100,821**	**3,141**	**3%**	**16**	**1**	**4%**	**59**	**3**	**5%**

2.6.4 Description of Participants

- This program looks for customers with severely energy inefficient homes and limited disposable income for EE measures. Customers may qualify for federal funds based on income.

2.6.5 Challenges & Opportunities

- The ability to process lead generation in a timely manner continues to be a challenge in the program.
- Fluctuations in the funding process.

2.6.6 Planned or Proposed Changes to Program & Budget

- This Comprehensive program ended on June 30, 2011 and a new EE program was approved on June 30, 2011 for the program years 2011-2013. The Arkansas Public Service Commission ("APSC") granted an extension of the AWP along with the utility's EE portfolios to continue in 2014 with 2013 budgets. The APSC granted another extension for 2015 as well. In December of 2014 the APSC approved the recommended Weatherization program which will replace the AWP beginning January 1, 2016. OG&E plans to continue its support for the AWP through 2015.

2.7 Multi-Family Direct Install Program

2.7.1 Program Description:

- The Multi-Family Direct Install ("MFDI") program is intended to target multi-family complex owners and/or managers who seek assistance in improving the efficiency of individual units in their complex. The program provides energy saving fixtures for residential customers living in multi-family housing at no cost to the customer. Replacement fixtures include, but are not limited to, CFL's, water heating pipe insulation, low-flow showerheads, faucet aerators, duct sealing, and advanced power strips.

2.7.2 Program Highlights:

- The MDFI program was approved for implementation by the Arkansas Public Service Commission in March of 2014. This program was part of an interim filing by OG&E to modify its EE portfolio to ensure it meets energy savings targets. The program reached 1,884 participants in the OG&E service territory.

2.7.3 Program Budget, Savings and Number of Measures:

Multi-Family Direct Install												
	Cost			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2012	$ -	$ -	-	0	0	-	0	0	-	0	0	-
Program Year 2013	$ -	$ -	-	0	0	-	0	0	-	0	0	-
Program Year 2014	**$ 268,893**	**$ 233,411**	**87%**	**1,914,153**	**1,667,071**	**87%**	**236**	**209**	**89%**	**2,050**	**1,884**	**92%**

2.7.4 Description of Participants

- The participants for the MFDI program are customers living in apartment complexes or other multi-family units and typically rent rather than own their housing. This arrangement requires OG&E to receive permission from the owner of the properties before EE measures are installed. Because of this arrangement, multi-family customers can be considered hard-to-reach when providing education and opportunities for managing energy use.

2.7.5 Challenges and Opportunities

- The planned energy savings estimates were calculated using a higher percentage of two-bathroom units than was realized during the program implementation. Additional measures were added to offset the lower per unit energy savings.
- OG&E continues to seek ways to reach this target market where the decision maker for enrolling in an EE program isn't the customer paying the electric bill.

2.7.6 Planned or Proposed Changes to Program and Budget

- OG&E has asked for a budget increase for the MFDI program to enhance its ability to meet the increased energy savings target for 2015.

3.0 Supplemental Requirements

3.1 Staffing

- OG&E has a total of 3 FTEs; 2 FTEs managing its EE programs, an EM&V Specialist supporting the evaluation of programs, and an Administrative Clerk make up the remaining FTE. The EM&V Specialist and the clerical support have additional responsibilities in OG&E's Oklahoma EE programs as well.

- New staffing in 2014 included one additional supervisor in OG&E's Arkansas service territory that is funded in base rates. The addition of a supervisor experienced with large C&I customers offered additional opportunities for OG&E's C&I programs.

3.2 Stakeholders Activities

- Training classes fall into three categories. First, training for trade allies who are working with OG&E on the implementation of the program. Their purpose is to educate the installers of the components and operations of the program. Second, training classes for C&I customers provide information on both OG&E programs and educate customers on the benefits of how EE products and processes can assist their energy management efforts. Third, classes are held to train OG&E members, installers, and customers on the technical issues to improve energy efficiencies for customers.

- Please see training activity included in the annual workbook tables.

3.3 Information provided to Customer to Promote EE

- Please see Section 5.0 Appendix B for samples of educational materials and information used in the program year.

4.0 Appendix A: EM&V Contractor Report

Attach as an appendix, any materials or documentation which is deemed useful in explaining or clarifying the results or performance of any program conducted during the program year. At minimum, the appendix should include any study or research relied upon in the delivery or EM&V of any program conducted during the program year. If any such items **include confidential information, the confidential information shall be redacted** in the public version of the document.

EM&V Contractor Report

OG&E has three different EM&V Reports associated with evaluated savings for PY 2014. ADM & Associates provided results for both the AWP Program and OG&E's Weatherization Program while AEG provided results for the remaining programs. Frontier Associates, LLC provided the cost benefit analysis and report for PY 2014. OG&E is providing these reports in the attached exhibits.

Attachments:

- Attachment A) contains Frontier's Cost Effective Analysis
- Attachment B) contains ADM's evaluation of the AWP Program.
- Attachment C) contains ADM's evaluation of OG&E/AOG's Weatherization Program.
- Attachment D) contains AEG's evaluation of the remaining programs.

Attachment A:
Frontier's Cost Effective Analysis

OG/E

Annual Report of Energy Efficiency Programs – Program Year 2014

March 2015

Evaluation Conducted by:
Frontier Associates

FRONTIER ASSOCIATES

Table of Contents

Introduction

Oklahoma Gas & Electric's Arkansas Energy Efficiency Plan for PY 2014 was approved by the Arkansas Public Service Commission (APSC) on March 17, 2014 in Docket Number 07-075-TF, Order No. 55. As required by the Conservation and Energy Efficiency Rules, OG&E is submitting its annual report addressing the performance of all approved energy efficiency programs. This report covers program savings and the amount spent per program and total amount spent. It also includes a cost-effectiveness analysis of each program and the portfolio of programs, including all costs and benefits from January 1, 2014 through December 31, 2014.

Report Organization

This report presents the following information, which is based on the Commission's Energy Efficiency Rule, but also includes the results of California Standard Practice Manual cost-benefit tests:

1. Brief description of each program;
2. The most current information available comparing projected savings to reported savings for each of the utility's programs;
3. The results of the standard cost/benefit tests for each program;
4. A statement of funds expended by the utility for program administration.

Program Descriptions

Student Energy Education (SEE):

The Student Energy Education program is an established residential energy efficiency program that uses a school delivery format, in which students are provided with take-home kits containing efficiency devices and are exposed to creative classroom and in-home education techniques which inspire families to adopt new resource usage habits. Students receive a kit of energy and water efficient devices, which are taken home and installed, and the learning experience is shared with family members. They work on subjects required by state learning standards to understand and appreciate the value of natural resources in everyday life. The program aims to shape new behaviors and encourage reduced energy use through a mix of new product installation and resource efficiency knowledge.

In OG&E'S Arkansas service territory, the program provides the teachers and their classes of 6th grade students a curriculum on home energy efficiency. At the end of the curriculum a SEE education kit, (which includes a CFL, air filter, aerator, low-flow shower head, night light and energy efficiency information), provides the students the opportunity to participate with their families on energy awareness. The students take the kit home and install the energy efficiency measures with the assistance of their parents.

SEE is a turnkey program managed by Resource Action Programs (RAP) of Modesto, California. In coordination with OG&E, Resource Action Programs performs the marketing and outreach to acquire participation and enrollment in the program. Once schools are enrolled into the program, Resource Action Programs will deliver educational materials directly to participant teachers.

Multi-Family Direct Install Program:

The Multi-Family Direct Install program is designed to reach residential customers living in multi-family housing. The program provides energy saving fixtures and installation at no cost to the customer. Replacement fixtures include, but are not limited to, Compact Fluorescent Lights (CFLs), water heating pipe insulation, low flow shower heads, faucet aerators, air infiltration, duct sealing and Advanced Power Strip (APS) measures.

Arkansas Weatherization Program (AWP):

This program is implemented by ACAA and targets severely energy inefficient homes. It provides energy efficiency improvements to participants, thereby decreasing demand and energy usage for those customers. The purpose of the AWP is to improve comfort and reduce energy costs by upgrading the thermal envelope and appliances in severely energy inefficient homes. The AWP program is designed to work in partnership with agencies that assist residents occupying severely energy inefficient homes. OG&E partners with the CAP Agencies in Fort Smith, Arkansas. The program helps individuals and families primarily by making their homes more secure from the weather, which helps to conserve energy and reduce energy bills for future years. In addition, homes that are warm in the winter and cool in the summer are more comfortable for individuals.

OG&E Weatherization Program:

This measure is targeted to acutely energy inefficient homes. It provides energy efficiency improvements to participants, thereby decreasing demand and energy usage for those customers. The purpose of OG&E's Weatherization Program is to improve comfort and reduce energy costs by upgrading the thermal envelope and appliances in targeted households.

This program is delivered in association with the Ft. Smith region gas distribution company, Arkansas Oklahoma Gas (AOG). AOG is contributing resources to be used alongside OG&E's on a per household basis to ensure the most effective application of energy efficiency possible.

Commercial Lighting Program:

The Commercial Lighting Program provides prescriptive rebates for customers that improve the efficiency of lighting systems in existing buildings. This measure is designed to educate, offer performance contracting services, and provide incentives on replacement of inefficient T-12 or T-8 lamps with higher efficiency T-8 or T-5 lamps to commercial and industrial customers. It also promotes replacing less efficient high intensity discharge (HID) lighting with high-bay and low-bay fluorescent lamps, replacing inefficient incandescent lighting with hardwired CFLs, and replacing incandescent exit lighting with LED exit lighting.

Additionally, this program provides incentives to OG&E construction commercial and industrial (C & I) customers who purchase and install energy efficient indoor and outdoor lighting, lighting controls, occupancy sensors, light emitting diode (LED), and exit lights. The measure offers incentives based on the kW and kWh reduction calculated from a lighting survey by a lighting contractor that takes into

account the type and quantity of lighting fixtures installed, the building type, and control technologies in place.

Commercial and Industrial Standard Offer Program (SOP):

The SOP offers financial incentives for the installation of a wide range of measures that reduce customer energy costs, reduce peak demand, and/or save energy in non-residential facilities such as public authority buildings, schools, hospitals, and other industrial customers in OG&E's Arkansas jurisdiction (entities that qualify for the Power and Light rate or the Large power and Light rate). In this program, large individual customers, energy service companies (ESCOs), and qualified contractors are eligible for incentive payments for energy efficiency projects that significantly reduce customer peak demand. The applying entity, whether the customer, ESCO, or other contractor, is a "Project Sponsor," and is the responsible party for complying with all program requirements.

The SOP allows for incentivizing of many measures not covered under other OG&E programs.

Program Projections and Results

The following tables present program specific information, including forecasted savings, reported savings, the number of participants, participant costs, the economic benefit realized in 2014, and the economic benefits to be expected over the life of the measures. Note that economic benefits are restricted to avoided electricity generation and capacity costs and avoided natural gas costs.

Note also the important distinction between the "Forecasted Net Savings" displayed in this section and the "Ex Ante" savings stated as "Evaluated Savings." The "Forecasted Net Savings" are the net savings included in OG&E's Direct Testimony and Exhibits of Billy Dean Pollock in Docket No. 07-075-TF. The "Ex Ante" savings reflect the savings calculated using actual participation data and the deemed savings used to develop the forecasted savings and in continuous tracking of program savings. Assumptions for energy and demand savings, measure lives, and Net-to-Gross Ratios are from the EMV savings analysis for PY 2014. Measure cost assumptions are sourced to any cost data captured by OG&E's databases and supplemented by measure cost research performed by Frontier Associates. Discount rates, fuel costs and other inputs are sourced to OG&E Arkansas Energy Efficiency Program Analysis and Plan for PY 2011-2013, filed in Docket Number 07-075-TF (William L. Brooks' testimony, Exhibit WLB-01). The line losses are sourced to an OG&E Line Loss Study conducted in 2012. The modeling of the Forecasted Net Savings and Project Net Savings are based on the following assumptions:

(a) Forecasted savings are based on the target participation levels for PY 2014 as approved by the APSC in Order No. 55 of Docket No. 07-075-TF on March 17, 2014.
(b) Program participants are those who participated in the program year 2014.
(c) The cost per kWh saved is calculated by dividing the total program costs by the lifetime energy saved. The cost per kW-year is calculated by dividing the total program costs by the product of the kW reduction and the approximate average effective useful life (EUL) of measures installed in the program.
(d) The net present value of the total economic benefits was calculated by taking the discounted value of the annual avoided cost times the annual savings over the useful life of each program measure.
(e) The Projected Net Savings for residential programs assume an energy rate based on Rate Arkansas Rate Tariff R-1. Commercial energy rates are assumed to be $.09/kWh for all seasons. Commercial load rates are accounted for in this assumption. The energy rates' escalation rates are derived from the avoided costs.

The Forecasted Net Savings and Evaluated Savings are presented in Table 1. The Evaluated Savings include electric line losses.[1]

Table 1 - Forecasted Net Savings vs. Evaluated Savings[2]

Program	Forecasted Net Savings (2014)			Evaluated Savings (2014)		
	Annual Energy Savings (kWh)	Peak Demand Reduction (kW)	Participants	Annual Energy Savings (kWh)	Peak Demand Reduction (kW)	Participants[3]
SEE Program	288,792	36	1,840	341,257	43	1,903
Multi-Family Direct Install	1,914,153	236	2,050	1,823,729	228	6,915
AWP	100,821	16	59	3,436	1	3
AOG-OG&E Weatherization Program	3,497,085	990	1,620	4,025,348	1,188	1,372
Commercial Lighting	5,162,810	970	125	7,138,824	1,222	254
Commercial and Industrial SOP	3,596,963	938	88	1,757,734	471	224
TOTAL	**14,560,624**	**3,186**	**5,782**	**15,090,328**	**3,154**	**10,671**

The results of the Total Resource Cost Test show $7,330,241 in present value net benefits for all of 2014, as illustrated in Table 2. Of these benefits, $4,595,913 can be attributed to commercial programs and $2,796,010 is associated with residential programs.

[1] Electric line losses used for this cost-effectiveness analysis are 8.59%. This percentage comes from OG&E's 2012 Line Loss study.

[2] http://www.apscservices.info/pdf/07/07-075-TF_223_1.pdf

[3] For the SEE, MF Direct Install, Commercial Lighting and C&I SOP, the participant numbers are sourced to the OG&E AR PY 2014 Final EM&V Report February 27, 2015 by AEG. For the SEE program, the number of "participants" are defined as the number of kits. For MF Direct Install, Commercial Lighting, and the Commercial SOP, the number of "participants" are defined as the number of projects. AWP participant numbers are sourced to the Evaluation of 2014 Arkansas Weatherization Program March 2015 by ADM. AWP number of "participants" are defined as the number of homes retrofitted. For the AOG-OG&E Weatherization Program, the number of "participants" are sourced the Evaluation of 2014 AOG-OG&E Weatherization Program February 2015 by ADM. AOG-OG&E Weatherization Program "participant numbers" are defined as the number of homes.

Table 2 – Energy Efficiency Program Total Resource Cost Test Net Benefits

Program Name	TRC Net Benefits ($000s)	Lifetime Energy Savings (kWh)
SEE Program	88.56	3,064,215
Multi-Family Direct Install	597.07	20,159,147
AWP	-19.73	40,227
OG&E Weatherization	2,130.11	53,513,902
Commercial Lighting	3,581.47	99,943,534
Commercial SOP	1,014.44	21,022,499
ALL RESIDENTIAL	2,796.01	76,777,491
ALL COMMERCIAL	4,595.91	120,966,032
TOTAL	7,330.24	197,743,523

Table 3 shows the cumulative results of OG&E's residential energy efficiency programs cost-effectiveness portfolio. The five cost tests deliver a snapshot of the general benefit of the residential energy efficiency programs. The TRC, being above 1, indicates that the residential programs produce an aggregate benefit.

Table 3 - ALL Residential Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	3.02	1.70	0.76	2.07	2.10
Net Benefits ($000s)	4,531.29	1,806.03	-1,406.01	2,796.01	2,884.69
Total Benefits ($000s)	6,775.52	4,382.79	4,382.79	5,416.47	5,505.15
Total Costs ($000s)	2,244.23	2,576.76	5,788.80	2,620.46	2,620.46

Tables 4 through Table 7 individually show the results of OG&E's residential energy efficiency programs cost-effective portfolio.

Table 4 - SEE Program Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	3.44	1.48	0.61	2.00	2.04
Net Benefits ($000s)	204.34	42.57	-83.64	88.56	92.57
Total Benefits ($000s)	288.02	131.26	131.26	177.26	181.26
Total Costs ($000s)	83.68	88.69	214.90	88.69	88.69

Table 5: Multi-Family Direct Install Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	4.82	3.46	0.75	3.15	3.24
Net Benefits ($000s)	1,099.40	574.33	-265.51	597.07	621.55
Total Benefits ($000s)	1,387.27	807.74	807.74	874.18	898.66
Total Costs ($000s)	287.87	233.41	1,073.25	277.11	277.11

Table 6 - AWP Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	1.18	0.09	0.09	0.14	0.14
Net Benefits ($000s)	3.03	-20.75	-22.50	-19.73	-19.68
Total Benefits ($000s)	20.14	2.17	2.17	3.18	3.23
Total Costs ($000s)	17.11	22.91	24.67	22.91	22.91

Table 7 - OG&E Weatherization Program Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	2.74	1.54	0.77	1.95	1.98
Net Benefits ($000s)	3,224.52	1,209.87	-1,034.34	2,130.11	2,190.25
Total Benefits ($000s)	5,080.11	3,441.62	3,441.62	4,361.86	4,421.99
Total Costs ($000s)	1,855.58	2,231.74	4,475.96	2,231.74	2,231.74

Table 8

Table 8 - All Commercial Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	4.22	3.24	0.92	3.07	3.13
Net Benefits ($000s)	5,631.16	4,282.09	-540.67	4,595.91	4,737.11
Total Benefits ($000s)	7,381.74	6,190.73	6,190.73	6,816.66	6,957.85
Total Costs ($000s)	1,750.58	1,908.64	6,731.40	2,220.75	2,220.75

Table 9 - Commercial Lighting Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	3.67	5.06	0.98	3.06	3.13
Net Benefits ($000s)	4,136.95	3,893.88	-92.35	3,581.47	3,698.99
Total Benefits ($000s)	5,686.61	4,852.71	4,852.71	5,316.05	5,433.57
Total Costs ($000s)	1,549.66	958.83	4,945.06	1,734.58	1,734.58

Table 10 - Commercial and Industrial Standard Offer Program Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	8.44	1.41	0.75	3.09	3.14
Net Benefits ($000s)	1,494.21	388.21	-448.46	1,014.44	1,038.11
Total Benefits ($000s)	1,695.13	1,338.02	1,338.02	1,500.61	1,524.28
Total Costs ($000s)	200.92	949.81	1,786.48	486.17	486.17

Table 11 shows the cumulative cost-effectiveness results for OG&E's energy efficiency portfolio for program year 2014.

Table 11 - Portfolio Cost/Benefit Tests

	PCT	UCT	RIM	TRC	SCT
Benefit/Cost Ratio	3.54	2.33	0.84	2.50	2.54
Net Benefits ($000s)	10,162.45	6,026.44	-2,008.37	7,330.24	7,560.11
Total Benefits ($000s)	14,157.26	10,573.52	10,573.52	12,233.14	12,463.01
Total Costs ($000s)	3,994.81	4,547.08	12,581.89	4,902.89	4,902.89

Program-Related Expenditures

All program-related expenditures are presented in Table 12 and are separated by administrative costs and inducements. The administrative costs include program planning and design, marketing and delivery, EM&V, and third party implementation costs.

Table 12 – Program Costs - 2014

Program Name	Administrative and Other Non-Inducement Costs ($)	Inducements ($)	Total Program Cost ($)
SEE Program	$5,016	$83,678	$88,694
Multi-Family Direct Install	$22,456	$210,955	$233,411
AWP	$5,809	$17,106	$22,914
OG&E Weatherization	$376,162	$1,855,583	$2,231,745
Commercial Lighting	$200,417	$758,413	$958,830
Commercial SOP	$291,902	$657,904	$949,805
Energy Efficiency Arkansas	$18,319	$0	$18,319
Regulatory Costs	$43,361	$0	$43,361
TOTAL	**$963,443**	**$3,583,638**	**$4,547,081**

Planned and actual program costs, including additional regulatory costs and costs associated with the Energy Efficiency Arkansas Program, are compared in Table 13.

Table 13 - Planned and Actual Program Costs - 2014

Program Name	Planned Program Cost ($)	Actual Program Cost ($)
SEE Program	$88,315	$88,694
Multi Family Direct Install	$298,770	$233,411
AWP	$85,730	$22,914
OG&E Weatherization	$2,281,220	$2,231,745
Commercial Lighting	$897,396	$958,830
Commercial SOP	$830,536	$949,805
Energy Efficiency Arkansas	$24,000	$18,319
Regulatory Costs	$85,000	$43,361
TOTAL	**$4,590,967**	**$4,547,081**

Attachment B:
ADM's Evaluation of the Arkansas Weatherization Program (AWP)

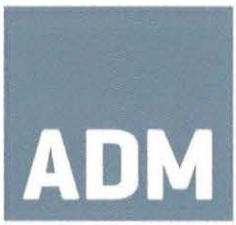
Evaluation of 2014 Arkansas Weatherization Program

Submitted to:

Arkansas Community Action Agencies Association
Arkansas Oklahoma Gas Corporation
CenterPoint Energy Arkansas
Oklahoma Gas and Electric
Southwestern Electric Power Company
Empire District Electric Company
Entergy Arkansas, Inc.
SourceGas Arkansas

March 2015

Prepared by:



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1. Executive Summary

The purpose of this report is to provide a summary of the methodology and results for the evaluation of the 2014 Arkansas Weatherization Program (AWP). This evaluation was conducted by ADM Associates (referred to in this report as the Evaluators). This report provides the results of both the impact evaluation and process evaluation activities, presenting verified savings results and discussing changes and updates in the program since the prior program year.

As there have been few significant modifications to overall program structure and delivery since the prior program year, the process findings are mainly focused on assessing program performance characteristics, any changes in program delivery, and the program's responsiveness to prior evaluation recommendations. A comprehensive process evaluation can be found in the 2012 Arkansas Weatherization Program Evaluation Report.

1.1 Summary of Arkansas Weatherization Program

Program design and structure in 2014 remained consistent with the 2013 program year. The following provides a review of program design characteristics and operational procedures, noting any specific updates for 2014.

In 2014, the Arkansas Weatherization Program (AWP) provided residential energy audits and energy efficiency measure installations to homes whose residents are customers of one or more of the following investor owned utilities (IOUs):

- American Electric Power – Southwestern Electric Power Company (AEP-SWEPCO);
- Entergy Arkansas, Inc. (EAI);
- Oklahoma Gas and Electric (OG&E);
- Arkansas Oklahoma Gas Corporation (AOG);
- CenterPoint Energy (CenterPoint);
- SourceGas Arkansas (SGA); and
- Empire District Electric Company (EDEC).[1]

The program is offered in conjunction with the Department of Energy (DOE) Weatherization Assistance Program (WAP), which provides federal assistance to fund the customer co-payment in the AWP for income-qualified households. In Arkansas, the

[1] EDEC is a sponsoring IOU of the Arkansas Weatherization Program and has achieved savings through the program in past years, but did not have any projects completed in its service territory during 2014.

WAP is administered by the Arkansas Energy Office (AEO).[2] If the customer meets the eligibility requirements of the WAP, the weatherization project can be funded by both the WAP and the AWP in order to fully cover the project cost and eliminate the cost to the customer.[3] Customers who are not eligible for the WAP are required to provide their own co-pay in order to participate in the AWP and receive the audit and associated measures.

In 2014, 91% of participating AWP customers were eligible to have their projects partially funded through the WAP. This is consistent with prior years, where fewer than 10% of participants provided their own co-payment to participate in the AWP.

Rather than an income requirement, eligibility for the AWP is based on a set of criteria regarding customer residence energy efficiency. In order to qualify, customer homes must meet specific criteria indicating that the residence is severely energy-inefficient. There were no modifications to these criteria for the 2014 program year.

Local community action agencies work with customers to enroll in the program and determine AWP and WAP eligibility. In 2014, qualifying AWP projects were completed by one of five such agencies:

- Central Arkansas Development Council (CADC);
- Crowley's Ridge Development Council (CRDC);
- Crawford-Sebastian Community Development Council, Inc. (C-SCDC);
- Pine Bluff Jefferson County Economic Opportunities Commission, Inc. (PBJCEOC); and
- Community Action Program for Central Arkansas (CAPCA).

After the customer is approved and the in-home audit is performed, optimal energy efficiency measures for AWP (and WAP, for eligible customers) are identified through the use of National Energy Audit Tool (NEAT) or Mobile Home Energy Audit (MHEA) software. The measures implemented in participating homes during 2014 include:

- Ceiling, floor and wall insulation;
- Air infiltration reduction;
- Window replacement and storm window installation;
- Heating and air conditioning replacement;

[2] The administration of the WAP transitioned to the AEO from the Department of Human Services (DHS) during 2013.

[3] Eligibility for the Weatherization Assistance Program (WAP) is based on income thresholds, which increase with the number of residents in the home. A description of the WAP, along with the associated income requirements, can be found here: http://www.benefits.gov/benefits/benefit-details/1843.

- Water heater insulation jackets and pipe wrap;
- Refrigerator replacement;
- CFL retrofits; and
- Smart thermostats.[4]

The local agencies conduct onsite audits and install the necessary measures using their internal crews or subcontractors. Audit and installation crews record all relevant measure input data and report it to the Central Arkansas Development Council (CADC), who aggregates the information from each agency. Batches of data are then sent to Frontier Associates, the program database provider that manages the EnerTrek software tool. EnerTrek incorporates the onsite data into TRM savings formulas (and NEAT/MHEA values for measures not included in the TRM) to calculate *ex ante* savings for each measure. The resulting savings are made accessible to program utilities and EM&V contractors, who use EnerTrek database exports to conduct measure implementation and savings verification activities.

Table 1-1 identifies core program stages and includes key activities performed throughout the program process. The activities and stages shown for 2014 are fairly consistent with those of 2013 and prior years, with modifications to include additional details and clarifications regarding program procedures.

Table 1-1 Key Activities and Program Stages, 2014 Program Year

Program Stage	*Key Activities*
Program Design Planning	• Utilities set budgets and savings goals for the program year. • Frontier Associates and the participating agencies make any necessary modifications to data collection procedures or program delivery based on TRM changes or other program design changes. • Agencies plan their program activity based on expected WAP funding levels and planned AWP funding.
Training and Implementation Planning	• Community action agencies, contractors, and other program operations staff attend program-relevant training sessions (primarily for new contractor staff) • ACAAA, CADC, and local agencies discuss implementation and program updates (primarily to comply with TRM changes).
Program Promotion	• Agencies market the program to local customers who may provide a private co-pay. • Agencies enroll customers from the WAP wait list. • Utilities answer customer inquiries about the AWP or refer customers to their respective agencies.
Program Participation	• Customers apply for the AWP and home eligibility is determined. • WAP eligibility is determined. • Participants receive in-home audits and measures are identified.

[4] A complete list of all eligible program measures can be found in ACAAA Docket no. 07-079-TF, Attachment A (AWP Modified Program Design and Description).

Program Stage	*Key Activities*
	• Contractors install measures that are either stipulated based on NEAT or MHEA software or are agreed upon with the customer (depending on whether or not WAP funds are used for the co-pay).
Data Processing and Monitoring	• Measure costs and participant tracking data are collected by each agency and reported to CADC. • CADC provides periodic cost and participation updates to the utilities. • Frontier Associates receives implementation data from CADC and calculates *ex ante* savings • Frontier Associates sends savings data in batches to the utilities. • Utilities, ACAAA, Frontier Associates, and agencies have periodic discussions regarding program participation levels and other topics.

1.2 Evaluation Objectives

The evaluation of the 2014 Arkansas Weatherization Program (AWP) consisted of a program savings impact analysis and a limited process evaluation. These evaluation objectives were primarily focused on savings analysis and verification, as well as program updates and tracking of prior evaluation findings. Specifically, the evaluation activities conducted for the 2014 program year include:

- Review of deemed savings calculations. The Evaluators used the Arkansas Technical Reference Manual, Version 4.0 (TRM) to verify savings calculations for each implemented measure type in order to ensure that *ex ante* measure savings were properly calculated according to TRM protocols.[5]

- Tracking database and documentation review. The Evaluators conducted a comparative assessment of the AWP tracking database in order to evaluate tracking data modifications and improvements since the 2013 program year. Additionally, the Evaluators reviewed program documentation such as promotional materials, and the results of customer satisfaction surveys conducted by the participating community action agencies.

- On-site field verification. The Evaluators scheduled and conducted site visits to participant homes in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to verify home characteristics such as heating and water heating fuel type.

- Program staff interviews. Interviews were conducted with utility staff and implementation staff (members of ACAAA and CADC). These interviews provided insight into any recent program changes for 2014, updates in specific program

[5] Although EnerTrek calculated savings for the AWP in 2014 using protocols in TRM 3.0, the Evaluators referenced TRM 4.0 for verification purposes as it was the most current version of the TRM at the time of evaluation.

processes, potential future improvements to program operation, and overall 2014 program performance.

1.3 Summary of Findings

1.3.1 Field Verification Results

The Evaluators conducted onsite verification visits to 38 participant homes, supplemented by 10 telephone verifications for a total of 48 homes in the verification sample. These site visits were conducted in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to verify home characteristics such as heating and water heating fuel type.

The field and telephone verification activity showed that the weatherization measures had for the most part been installed in the quantities reported within program tracking data. Specific notes regarding the onsite and telephone verification findings include:

- **Contact Information:** All residences were located at the addresses provided within the tracking data. However, many of the telephone numbers listed in the tracking data appeared to be disconnected or incorrect. In total, 26 out of the 121 telephone numbers (22%) dialed by the Evaluators were found to be disconnected or incorrect during the site visit scheduling process. Contractors should endeavor to obtain the best available contact information from each customer, although it is possible that some customers disconnected their telephones or changed their telephone number since receiving the audit and measure installation.

- **Air Infiltration:** The Evaluators conducted blower door testing in 38 participant homes for the 2014 program year. Of these 38 homes, the CFM_{50} value measured during the verification visit was within 10% of the reported value for 18 (47%) homes. The Evaluated CFM_{50} value was more than 10% greater than the Reported CFM50 value for 17 homes. Overall, the Evaluated CFM_{50} value was greater than the Reported CFM_{50} value for 25 of the 38 homes (66%).

- **Window Replacement:** The Evaluators were able to locate and verify all instances of reported window replacement with the exception of one home. For this home, the tracking data indicated that one window had been replaced, but during the verification visit the homeowner stated that the contractors had not replaced any windows. As contractors typically replace multiple windows in a home when conducting window replacement, it is likely that this reported instance was a data entry or database error. For the window replacements that were successfully verified, the Evaluators found the SHGC, U-Factor, and window area listed in the tracking data to be accurate.

- **CFLs:** All reported instances of 13W CFL installation were verified. For 18W CFLs, the Evaluators verified 375 of the 441 CFLs (85%) represented by sampled

participants. In most cases, the difference between reported and evaluated CFL counts was fairly minor and was likely due to customer removal of bulbs. However in one case, the tracking data reported that 76 CFLs had been installed in a single home, and the Evaluators were able to identify only 14 CFLs. The number of reported CFLs for this home exceeds the typical number of bulb sockets in a single-family residence, and is likely a data collection or EnerTrek error.[6] All verified CFLs matched the wattage and lumen range reported in the EnerTrek tracking data.

- **Attic Insulation:** All reported instances of attic insulation were verified. There were no significant differences between reported pre-installation R values and evaluated pre-installation R values. All homes met the TRM requirement of an R-38 post-installation value. There were no significant differences between reported square footage and evaluated square footage.
- **Water Heater Jacket and Pipe Wrap:** The Evaluators were able to verify all but one instance of reported water heater pipe wrap; one customer had removed their water heater pipe wrap. The reported instance of water heater jacket installation was successfully verified.
- **Gas Heat Replacement:** All reported instances of gas heat replacement were verified.
- **Smart Thermostat:** The reported instance of smart thermostat installation was verified.
- **Refrigerator Replacement:** All reported instances of refrigerator replacement were verified.
- **Direct Vent Heater:** All reported instances of direct vent heater installation were verified.

Overall, the results of the verification activity suggest that measures are for the most part installed in the quantities reported in program tracking data, with a few exceptions. These findings are fairly consistent with the results of the 2012 onsite verification activity, although there are some emerging issues (e.g. increased discrepancies in blower door testing results, and issues with customer contact information) that should be addressed moving forward.

1.3.2 Summary of Ex Post Net Savings

For measures implemented through the 2014 program, savings verification was performed according to methodologies described in TRM V4.0. The following table identifies the sections in the TRM that were used for verification of measure-level savings under the Arkansas Weatherization Program. The savings for smart thermostats and

[6] This home was not serviced by a participating electric utility, so the electric savings from these erroneously reported bulbs did not affect the *ex post* savings for any of the AWP electric IOUs.

storm windows were calculated through NEAT/MHEA, and these measures do not have an associated section in the TRM. As these measures accounted for a very small portion of program savings,[7] the *ex ante* savings values were applied as *ex post* savings for these two measures. The savings for all other measures were calculated and verified using protocols and equations specified in the following sections of TRM V4.0:

Table 1-2 TRM Sections by Measure Type

Measure	*TRM Version*	*Section in TRM*
Air Infiltration	4.0	2.2.9
Ceiling Insulation	4.0	2.2.2
Central AC Replacement	4.0	2.1.6
ENERGY STAR® Windows	4.0	2.2.7
Floor Insulation	4.0	2.2.4
Gas Furnace Replacement	4.0	2.1.3
Lighting Efficiency	4.0	2.5.1
ENERGY STAR® Refrigerator	4.0	2.4.3
Smart Thermostat	N/A	N/A
Storm Windows	N/A	N/A
Direct Vent Heaters	4.0	2.1.1
Wall Insulation	4.0	2.2.3
Water Heater Jackets	4.0	2.3.2
Water Heater Pipe Insulation	4.0	2.3.3
Window AC	4.0	2.1.10

Table 1-3 and Table 1-4 present *ex post* net savings for electric utilities and gas utilities, respectively. Table 1-5 presents the *ex post* net savings by measure, including measure-level realization rates (RR). The net-to-gross ratio for the AWP is 1, meaning that net savings are equal to gross savings.[8]

[7] Smart thermostats and storm windows accounted for less than .03% of 2014 program year savings.

[8] The Evaluators conducted a net-to-gross assessment of the program during the 2012 program year in order to determine the likelihood of significant free-ridership or savings spillover. Due to program design factors, target customer segment characteristics, and lack of participant spillover, the Evaluators determined the net-to-gross ratio for the AWP to be 1. This determination has been carried over and applied to the 2014 program year.

Table 1-3 Ex Post Net Savings by Electric Utility

Electric Utility	# of Homes	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)
AEP-SWEPCO	12	8.40	31,154.13	461,148.41
EAI	112	105.99	229,868.21	3,271,557.30
OG&E	3	0.63	3,140.96	36,642.36
Non-IOU	41	37.60	66,640.04	860,087.50
Total	168	152.63	330,803.34	4,629,435.56

Table 1-4 Ex Post Net Savings by Gas Utility

Gas Utility	# of Homes	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)
AOG	3	8.33	479.54	9,590.78
CenterPoint	113	742.24	28,948.28	416,134.08
SGA	11	56.80	2,452.89	34,668.20
Non-IOU	41	76.19	3,485.79	58,313.25
Total	168	883.56	35,366.50	518,706.31

Table 1-5 Ex Post Net Savings by Measure Type – Overall

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)
Air Infiltration	56.32	126,484.93	1,391,334.18	620.40	20,546.88	226,015.67
Ceiling Insulation	56.50	97,901.52	1,958,030.48	182.26	10,530.49	210,609.71
Central AC Replacement	3.64	8,850.00	168,150.00	-	-	-
Direct Vent Heater	-	-	-	9.04	588.49	11,769.78
Duct Sealing Installation	-	-	-	-	-	-
Floor Insulation	(0.07)	(441.83)	(8,836.56)	0.97	144.35	2,886.92
Gas Central Replacement	-	-	-	25.00	1,632.58	32,651.59
Refrigerator Replacement	0.22	1,536.52	26,120.82	-	-	-
Residential Lighting	10.77	66,213.86	506,768.48	-	(0.40)	(3.02)
Smart Thermostat	-	105.00	1,260.00	-	358.00	4,296.00
Storm Windows	0.02	29.70	594.00	3.83	100.50	2,010.00
Wall Insulation	0.81	1,145.75	22,915.00	6.08	332.30	6,645.94
Water Heater Insulation	0.01	68.00	884.00	0.04	22.02	286.26
Water Heater Pipe Insulation	0.32	1,096.19	12,058.08	0.71	98.36	1,278.74
Window AC	1.05	643.90	6,760.96	-	-	-
Window Replacement	23.05	27,169.81	543,396.12	35.23	1,012.94	20,258.74
Total	152.63	330,803.34	4,629,435.56	883.56	35,366.50	518,706.31

Table 1-6 presents annual therms and kWh realization rates by measure category. These realization rates are presented at the program level, and individual utility realization rates may vary from those presented in this table.

Table 1-6 Gas and Electric Realization Rates by Measure Type

Measure	*kWh Realization Rate*	*Therms Realization Rate*
Air Infiltration	127%	153%
Ceiling Insulation	106%	162%
Central AC Replacement	100%	-
Direct Vent Heater	-	95%
Duct Sealing Installation	0%	-
Floor Insulation	-72%	25%
Gas Central Replacement	-	100%
Refrigerator Replacement	49%	-
Residential Lighting	101%	28%
Smart Thermostat	100%	100%
Storm Windows	100%	100%
Wall Insulation	63%	76%
Water Heater Insulation	100%	100%
Water Heater Pipe Insulation	96%	94%
Window AC	100%	-
Window Replacement	102%	98%
Overall	110%	142%

1.3.3 Summary of Savings Verification Findings

Ex post savings were calculated through TRM verification of EnerTrek inputs and *ex ante* savings values. Any instances of discrepancies between *ex ante* and *ex post* savings were due to one of two issues:

- Difference in TRM: EnerTrek calculated measure savings in 2014 using TRM 3.0, and the Evaluators conducted savings verification using TRM 4.0. There were differences in input assumptions, measure parameters, and savings equations between the two TRM versions for some measures.

- Calculation Error: Any difference in interpretation of TRM protocols, mathematical errors, or data entry errors may cause *ex ante* savings to be higher or lower than *ex post* (verified) savings.

The realization rate for most measures was very close to 100%, and the Evaluators found that the majority of discrepancies between *ex ante* and *ex post* savings were due to differences between TRM V3.0 and TRM V4.0 rather than due to calculation errors.

The following list identifies measure categories where there were significant differences between *ex ante* and *ex post* savings, and specifies whether this was due to differences in TRM versions or due to calculation errors:

- Ceiling Insulation
  - Difference in TRM: High overall electric and gas realization rates were due to differences in TRM versions. TRM V4.0 is more granular than TRM V3.0 with regard to the pre-implementation R-value. One effect of this is higher savings for homes that did not have ceiling insulation initially.
- Floor Insulation
  - Difference in TRM: Low overall electric and gas realization rates were due to differences between TRM versions. TRM V3.0 specifies positive kWh savings for floor insulation, while TRM V4.0 implements an electric savings penalty for homes with gas heat and air conditioning. The simulation procedures used for this measure in TRM V4.0 identified negative electric savings, likely caused by the floor insulation acting as a barrier to ground cooling effects. This would cause the home temperature to be higher during cooling months, likely resulting in increased air conditioner usage.
- Wall Insulation
  - Difference in TRM: Low overall electric and gas realization rates were due to differences between TRM versions. TRM 4.0 specifies lower deemed savings per square foot.
- Residential Lighting
  - Difference in TRM/Calculation Error: Low overall electric and gas realization rates were due to differences between TRM versions and possible EnerTrek calculation issues. CFL annual kWh savings in EnerTrek may have been calculated as an increment of lifetime savings, which takes into account future baseline changes that should not affect first-year kWh savings.
- Air Infiltration
  - Difference in TRM/Calculation Error: High overall electric and gas realization rates are partially due to differences between TRM versions and likely due to calculation errors within *ex ante* savings. TRM V4.0 specifies minimum and maximum caps for CFM_{50} values and specifies different deemed savings values for each weather zone, but the Evaluators were unable to duplicate the EnerTrek *ex ante* savings values using TRM V3.0. The analysis resulted in a wide range of realization rates, both high and low, across the participant population.
- Refrigerator Replacement

- Calculation Error: A low electric realization rate was primarily due to two instances of substantial *ex ante* overestimation of savings, where one refrigerator was listed with *ex ante* savings of approximately 1,000 kWh, and another with *ex ante* savings of approximately 700 kWh.

Detailed savings verification findings can be found in Sections 2.8 and 2.9 of this report.

1.3.4 Responsiveness to Prior Year Recommendations

Table 1-7 summarizes the status of recommendations identified in the 2013 process evaluation and impact evaluation of the Arkansas Weatherization Program. While there have been advances in some areas such as improved communication among utilities and stakeholders, fewer errors in tracking exports, and increased compliance with TRM requirements, several of the issues have persisted through the 2014 program year.

Table 1-7 Status of Recommendations from 2013 Program Year

Issue	Consequences	Recommendation	Program Response	Status of Issue
There have been delays in database finalization due to uncertainties in data interpretation and requirements between CADC and Frontier.	Reduces accessibility to database for utilities Delays savings reporting and may cause inaccurate reports	Resolve issues early in 2014 program year, including data interpretation issues, so that multiple data and database revisions are not necessary.	There appear to have been fewer issues between Frontier and CADC in terms of gathering the required data fields. However, updates to the EnerTrek database, combined with continued delays in receiving data from some agencies resulted in several tracking data revisions and delays.	Partially addressed
Some data are not available due to being only in hardcopy form or decentralized from the CADC.	Potential lost data Potential delays in data transfer if additional data are needed	Agencies should maintain electronic records of all collected audit, implementation, and verification data.	Agencies continue to maintain hardcopy records of data that are not required for savings analysis. Some data are not available in electronic format.	Persists
Communication among utilities and agencies is limited.	Causes difficulties in utility-agency coordination	Recommendation 1: Hold introductory meetings between utilities and the remaining six agencies in order to develop familiarity and identify key contact persons, establish communication lines Recommendation 2: Develop an organizational chart displaying roles, responsibilities, and contact persons for each entity (utilities, agencies, ACAAA, etc.)	Communication among utilities and other stakeholders has improved substantially throughout the meetings and discussions surrounding development of the Unified Weatherization Program Utilities report that roles and responsibilities have for the most part been clarified and that a formal organizational chart is not likely necessary at this point.	Addressed
Some data required for TRM 2.0 and 3.0 do not appear to have been collected.	Creates difficulties in savings verification May result in inaccurate *ex ante* savings estimates if insufficient inputs are used	Ensure that the data collection forms and database are compliant with relevant TRM requirements to the extent possible based on budget constraints.	EnerTrek was updated to contain nearly all necessary fields for calculation of savings under TRM V3.0. Although some inputs were not collected for the first few months of the year, Frontier developed reliable and conservative assumptions in order to allow for savings analysis.	Addressed

Issue	*Consequences*	*Recommendation*	*Program Response*	*Status of Issue*
Utilities are not aware of project details until end of year.	Limits utility ability to plan for annual reporting Limits utility awareness of program performance	Include more details in the periodic reports that are sent to utilities, including measure counts/descriptions, customer names, etc.	The level of detail in monthly and quarterly reports to the utilities from CADC and other agencies has not increased. Measure counts and specific participant information have not been included.	Persists
EnerTrek contains erroneous assumptions for individual measure algorithms (air infiltration, attic insulation, window replacement).	Results in inaccurate *ex ante* savings (in this case savings were highly overestimated) Decreases program realization rates	Frontier should perform thorough quality assurance practices and verify that EnerTrek calculations comply with TRM algorithms.	Calculation errors appear to have decreased for 2014, although there were new errors for a few measures such as refrigerator replacement and air infiltration.	Partially addressed
TRM estimates for Therms savings substantially exceed regression analysis results.	TRM formulas may be inaccurately estimating Therms savings.	Conduct further research into TRM industry standards for weatherization, or perform a more in-depth billing analysis for a larger population, prior to implementing TRM changes for air infiltration or insulation.	No further impact research has been conducted for the AWP, and the billing analysis approach was not used for 2014. Difficulties in isolating the effects of individual measures within regression analysis create challenges for updating individual measure savings algorithms.	Persists

1.3.5 Summary of Conclusions and Recommendations

The Arkansas Weatherization Program was evaluated for overall effectiveness, performance, and design, and the Evaluators developed conclusions with consideration of the seven comprehensiveness factors developed by the Arkansas Public Service Commission. After reviewing the Arkansas Weatherization Program for 2014, the Evaluators provide the following conclusions:

Continued WAP Reliance Issues: As with prior years, utility, ACAAA, and CADC staff acknowledged the challenges that have emerged and persisted due to the AWP's relationship with the Weatherization Assistance Program (WAP).

Ideally, this arrangement would use utility funds to efficiently leverage federal funding and substantially increase the number of weatherization projects that the agencies are able to perform. However, the AWP's inherent link to the WAP has continued to result in performance issues due to federal funding reductions and statewide program reorganization. Additionally, the participating agencies were directed to prioritize LIHEAP funding over AWP funding when implementing weatherization projects, which is a key barrier to AWP program activity.

The transfer of the WAP to the AEO does not appear to have mitigated any of the AWP's operational or performance issues. It is possible that a more effective working relationship between the AEO and AWP staff will emerge in the future, but thus far the AWP has not been able to consistently leverage funds through the WAP.

Decreasing Program Activity: The number of participants and the resulting savings levels for the AWP have steadily decreased since the 2011 program year. This decline in program activity is likely due to several issues including variable agency engagement in weatherization services, inconsistent availability of WAP funding, and insufficient interest from private co-pay customers. Although program staff has made efforts to mitigate each of these issues in recent years, the major operational challenges affecting the program have not been sufficiently addressed. When asked about potential future participation, utility staff stated that they do not expect program performance to increase, and ACAAA and CADC staff explained that future program success depends heavily on WAP reliability and organization.

Upcoming Unified Weatherization Program: The new weatherization framework developed by the utilities and other stakeholders will establish statewide weatherization procedures and services, starting at the beginning of the upcoming program cycle.[9] Utility staff reported that they anticipate that this Unified Weatherization Program will be a more effective method of meeting the state's weatherization needs. Additionally, utility staff noted that the collaborative relationship among utilities has improved during the

[9] As 2015 will be another bridge year for the program, the next program cycle will begin, at the earliest, in January of 2016.

development of the new framework. This is not a direct result of the AWP, but does address the utility communication issue discussed in prior evaluation reports.

Improved Tracking Data Procedures: Frontier Associates has been fairly responsive to past evaluation recommendations and was able to provide utilities with batches of EnerTrek data throughout the program year. Additionally, Frontier Associates corrected the errors that the Evaluators identified in the 2013 evaluation report. Although the Evaluators identified several additional tracking data issues for the 2014 program year, the magnitude and frequency of these issues appears to have decreased. With regard to TRM compliance, Frontier Associates was able to accurately update the EnerTrek system as per TRM V3.0 protocols. There were some late revisions and corrections within EnerTrek after final data had been provided to the utilities, but these were fairly minor.

Continued Limitations of Program Activity Reports: Utility staff stated that the quarterly program activity reports that they receive from CADC have not yet included measure-level information such as measure costs and counts, or specific customer information. It was previously recommended that these details be included in the periodic reports, and CADC noted that it would be possible to do so, but the utilities continued to express their need for additional details throughout the program year. These details would be useful for planning purposes, and would allow the utilities to roughly estimate their expected savings during the year rather than waiting until the EnerTrek reports are distributed.

Continued TRM Update Issues: While the current version of the tracking database contains adequate calculations and inputs for TRM V3.0, the processes of uploading data to the database and updating database structure have continued to be time-consuming and costly. In addition to administrative costs, the time and budget required to retroactively update the database can create barriers to program performance.

In order to fully comply with any future TRM updates, EnerTrek will have to be flexible enough to receive updates without disrupting the data input process or delaying savings reporting. If the update process becomes too costly or time-consuming, it may be more efficient to only update the inputs for the highest-savings measures and use existing inputs for the remaining measures. This may affect program realization rates, but will not affect program net savings as the Evaluators would calculate savings as per the most current TRM.

Weatherization Messaging Issues: In order to assess current program promotion and informational resources, the Evaluators reviewed each utility and agency website for information regarding the AWP. All of the participating utilities currently have a section on their websites describing the program, or providing a link to the website of their local community action agency. However, after reviewing the specific program information provided, the Evaluators found that several utilities provide or link to documents that list more service providers than are currently eligible for weatherization services. Thus, it appears that these program materials are out-of-date.

Upon reviewing the websites of the six participating community action agencies, the Evaluators found that five out of the six agencies provide information about the WAP but do not discuss the AWP. These five agencies describe weatherization as an income-qualified service, but do not state that there is no income requirement for the AWP or that customers are allowed to provide their own co-payment under this program. This may discourage many prospective participants who are not eligible for enrollment in the WAP from considering the AWP, and may have a negative effect on the number of potential private co-pay customers that are aware of the program.

Based on these conclusions and other findings, the Evaluators provide the following recommendations:

Actively Work with AEO to Develop Program Coordination: As the AWP is closely tied to the operations and performance of the WAP, it is essential for the WAP to acknowledge the AWP as a viable leveraging opportunity. Additionally, maintaining consistency between the WAP and AWP where possible (e.g. with auditing software) will likely increase agency engagement in the AWP and will reduce data collection and reporting issues moving forward. The Evaluators recommend that CADC continue to discuss the existing program issues with AEO staff, and make efforts to create a mutually beneficial relationship.

Resolve Minor Tracking Data Issues: The Evaluators identified several minor issues within program tracking data for the 2014 year. This includes missing *ex ante* savings for some CFLs, missing ages of pre-existing units, and apparent calculation errors for air infiltration and refrigerator replacement savings. The Evaluators recommend resolving these issues in order to maximize potential program savings and maintain expected measure-level realization rates. These issues are further discussed in Sections 2.8 and 3.6 of this report.

Update Program Documentation on Utility and Agency Websites: The Evaluators found that several utilities provide or link to program documents that are out-of-date. The Evaluators recommend that the utilities provide links to updated program documents or include a note that informs customers of the currently active agencies.

Additionally, the Evaluators found that five out of the six agencies provide information about the WAP but do not discuss the AWP. These five agencies describe weatherization as an income-qualified service, but do not state that there is no income requirement for the AWP or that customers are allowed to provide their own co-payment under this program. The Evaluators recommend that each of the participating community action agencies update their websites to include information regarding the AWP, including information clarifying that the AWP does not have an income requirement.

Maintain Electronic Records: As mentioned in the prior report, it would be beneficial for each agency to collect and maintain accessible electronic records of any data that may be requested by Frontier. Alternatively, CADC would aggregate the data from each

agency and store it in a centrally accessible way. Situations where there are implementation, audit, or verification data that only exist in hardcopy format at the end of the program year should be avoided. This would ensure that all relevant data are stored in a single location, and would likely reduce the turnaround time for data requests.

Increase Level of Detail in Utility Updates: As with the prior program year, utility staff reported that the updates they receive from CADC regarding program performance are mainly limited to participant counts and overall costs. Utility staff are not aware which customers participated in the program or which measures were installed until the end of the program year. CADC should increase the level of detail within these reports and include participant names, addresses, measure counts, and other information if possible. This will allow the utilities to identify participants, to understand more about how the program is performing, and to potentially estimate preliminary savings.

Investigate Air Infiltration Reduction Procedures: As discussed in Section 2.6.1 of this report, the Evaluators identified discrepancies between reported air infiltration leakage rates and verified air infiltration leakage rates. In order to potentially address this issue or identify the cause of these discrepancies, the Evaluators provide the following recommendations:

- Include itemized air infiltration measures in tracking data: Thus far, the tracking data have not included information regarding what air sealing measures were installed (e.g. door sweeps, window sealing) in each home, or where they were installed (e.g. back door, bathroom window). Including this information in the program tracking data would allow the Evaluators to determine whether a discrepancy between reported and evaluated leakage could be due to measures becoming damaged, or customers removing measures.
- Include any air infiltration field notes for each home: Due to situational residence characteristics such as whether a fireplace flue is open or closed, or whether the homeowner did not allow the contractor to close a certain window, it is sometimes difficult to recreate the testing conditions that were present for the contractor measurement. Including information regarding any notable characteristics of the testing conditions that should be recreated during the verification process will minimize the potential for situational discrepancies.

Additionally, the Evaluators offer to have a discussion with CADC and the other agencies and their contractors regarding the methodology used during blower door testing in order to ensure that testing is conducted consistently among agencies, and between the agencies and the Evaluators.

Table 1-8 Recommendations from 2014 Program Year Evaluation

Issue	Consequences	Recommendation
Many AWP operational and performance issues are related to WAP operations and WAP requirements for community action agencies.	Restricts agency participation in AWP May create inconsistencies in data collection, leading to potential errors for the AWP	CADC should continue to make efforts to work with the AEO in developing a mutually beneficial working relationship, and maintain consistency between the two programs where feasible.
There were minor tracking data errors such as missing *ex ante* savings, calculation errors, and other missing fields in some cases.	Potentially lost savings Skewed measure-level realization rates	Resolve these tracking data issues for the 2015 program year.
Some utilities provide or link to program documents that are out-of-date. Most of the participating agencies do not discuss the AWP on their websites, and frame weatherization as an income-qualified service.	Customers may gain inaccurate information regarding service providers and other details. May reduce program interest from private co-pay customers.	The utilities should review their website materials and provide links to updated program documentation if possible. The agencies should provide information regarding the AWP on their websites, and explain that the program does not have an income level requirement.

Issue	Consequences	Recommendation
Some data are not available due to being only in hardcopy form or decentralized from the CADC.	Potential lost data Potential delays in data transfer if additional data are needed	Agencies should maintain electronic records of all collected audit, implementation, and verification data.
Periodic program activity updates to the utilities do not include measure level cost data or measure counts.	Limits utility ability to plan for annual reporting Limits utility awareness of program performance	Include more details in the periodic reports that are sent to utilities, including measure counts/descriptions, customer names, etc.
The reported air infiltration leakage rates appear skewed downward, based on the Evaluators' site visits.	Possible issues with measure implementation or data collection Possible discrepancies between implementation and verification that will lead to skewed realization rates.	1: Include itemized air infiltration measures in the tracking data so that the Evaluators are able to verify individual measure elements 2: Include any field notes related to the blower door test in the tracking data so that the Evaluators may more accurately recreate the testing conditions 3: Discuss air infiltration testing procedures with the Evaluators in order to ensure that the testing methodologies are consistent among agencies, their contractors, and the Evaluators.

1.4 Report Organization

The report is organized as follows:

- Chapter 2 presents the impact findings and discusses the methods used for, and the results obtained from, estimating gross and net savings for the program;
- Chapter 3 presents the results of the process evaluation tasks and additional program findings; and
- Chapter 4 presents key conclusions and recommendations from the evaluation of the program.

2. Impact Evaluation Findings

This chapter presents the results of the gross savings verification and savings calculation review for the Arkansas Weatherization Program (AWP) in the 2014 program year.

2.1 Glossary of Terms

As a first step to detailing the evaluation methodologies, the Evaluators provide a glossary of terms to follow:

- *Ex Ante Savings* – Energy savings as determined and reported by program implementers/sponsoring utilities prior to evaluation by EM&V contractor
- *Ex Post Gross Savings* – Energy savings as determined by the EM&V contractor through engineering analysis, statistical analysis, and/or onsite verification
    - *Gross Realization Rate* – Ratio of *Ex Post* Gross Savings / *Ex Ante* Savings
- *Ex Post Net Savings* – *Ex Post* Gross savings x Net-to-Gross Ratio
    - *Net-to-Gross Ratio (NTGR)* = (1 – Free-Ridership % + Spillover %), also defined as *Ex Post* Net Savings / *Ex Post* Gross Savings[10]
    - *Free-Ridership* – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program
    - *Spillover* – Savings generated by a program that are not incentivized. Examples of this include a customer that is introduced to energy efficiency through the program and due to this undertakes other projects for which they do not receive an incentive.
    - *Net Realization Rate* = Ratio of *Ex Post* Net Savings / *Ex Ante* Savings

2.2 Summary of Ex Ante Savings

The Arkansas Weatherization Program is designed to use both electric and gas utility funds to assist customers with the cost of the in-home audit and energy efficient measures. Table 2-1 presents the overall *ex ante* savings by measure. These values are based on the claimed savings values within the EnerTrek software tool. Exports of these data were provided to the Evaluators for analysis and verification purposes.

[10] The net-to-gross ratio for the AWP in 2014 is 1, thus 100% of gross savings are counted as net savings.

Table 2-1 Ex Ante Savings by Measure Type – Overall

Measure	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*
Air Infiltration	43.20	99,845.91	329.58	13,458.63
Ceiling Insulation	47.06	92,006.66	104.96	6,518.98
Central AC Replacement	3.64	8,850.00	-	-
Direct Vent Heater	-	-	9.52	619.96
Duct Sealing Installation	0.08	469.82	-	-
Floor Insulation	-	614.19	7.35	570.21
Gas Central Replacement	-	-	25.00	1,632.58
Refrigerator Replacement	0.44	3,131.38	-	-
Residential Lighting	10.49	65,291.45	-	(1.42)
Smart Thermostat	-	105.00	-	358.00
Storm Windows	0.02	29.70	3.83	100.50
Wall Insulation	0.41	1,827.62	7.49	439.59
Water Heater Insulation	0.01	68.00	0.04	22.02
Water Heater Pipe Insulation	0.33	1,140.97	0.75	105.01
Window AC	1.05	643.90	-	-
Window Replacement	18.65	26,644.48	45.29	1,038.86
Total	125.38	300,669.08	533.80	24,862.91

2.2.1 Ex Ante Savings for Electric Utilities

The electric utilities with participating homes in the AWP during 2014 were AEP-SWEPCO, EAI, and OG&E. Table 2-2 presents the savings results of the evaluation of the 2014 AWP for electric utilities.

Table 2-2 Ex Ante Savings by Electric Utility

Electric Utility	*# of Homes*	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*
AEP-SWEPCO	12	7.00	23,603.85
EAI	112	87.11	210,514.92
OG&E	3	.70	3,938.89
Non-IOU	41	30.57	62,611.42
Total	168	125.38	300,669.08

Table 2-3 through Table 2-5 summarize the *ex ante* savings by measure for each electric utility. The "Non-IOU" category refers to savings that were achieved as a result of program services, but were not attributable to the investor-owned utilities (IOUs) that fund the Arkansas Weatherization Program.

Table 2-3 Ex Ante Savings by Measure Type – AEP-SWEPCO

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)
Air Infiltration	1.52	6,959.83
Ceiling Insulation	2.68	7,874.88
Central AC Replacement	-	-
Direct Vent Heater	-	-
Duct Sealing Installation	-	-
Floor Insulation	-	267.96
Gas Central Replacement	-	-
Refrigerator Replacement	0.09	681.32
Residential Lighting	0.77	4,072.09
Smart Thermostat	-	-
Storm Windows	0.01	15.70
Wall Insulation	0.22	725.22
Water Heater Insulation	-	-
Water Heater Pipe Insulation	0.03	88.07
Window AC	0.21	114.20
Window Replacement	1.47	2,804.58
Total	7.00	23,603.85

Table 2-4 Ex Ante Savings by Measure Type - EAI

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)
Air Infiltration	28.83	74,550.21
Ceiling Insulation	35.26	68,905.16
Central AC Replacement	2.26	5,701.00
Direct Vent Heater	-	-
Duct Sealing Installation	0.08	469.82
Floor Insulation	-	159.98
Gas Central Replacement	-	-
Refrigerator Replacement	0.31	2,254.66
Residential Lighting	6.25	38,307.44
Smart Thermostat	-	79.00
Storm Windows	0.00	7.80
Wall Insulation	-	-
Water Heater Insulation	0.01	68.00
Water Heater Pipe Insulation	0.28	963.76
Window AC	0.84	529.70
Window Replacement	12.98	18,518.40
Total	87.11	210,514.92

Table 2-5 Ex Ante Savings by Measure Type – OG&E

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)
Air Infiltration	0.24	2,770.85
Ceiling Insulation	0.34	524.06
Central AC Replacement	-	-
Direct Vent Heater	-	-
Duct Sealing Installation	-	-
Floor Insulation	-	-
Gas Central Replacement	-	-
Refrigerator Replacement	-	-
Residential Lighting	0.12	643.98
Smart Thermostat	-	-
Storm Windows	-	-
Wall Insulation	-	-
Water Heater Insulation	-	-
Water Heater Pipe Insulation	-	-
Window AC	-	-
Window Replacement	-	-
Total	0.70	3,938.89

Table 2-6 presents the *ex ante* electric savings that were not associated with any IOU. These *ex ante* savings are attributable to municipal utilities, co-op utilities, or other energy providers. These savings are not attributed to any specific program sponsoring utility, and are provided for reference only.

Table 2-6 Ex Ante Savings by Measure Type – Non-IOU (Electric)

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)
Air Infiltration	12.61	15,565.02
Ceiling Insulation	8.79	14,702.56
Central AC Replacement	1.38	3,149.00
Direct Vent Heater	-	-
Duct Sealing Installation	-	-
Floor Insulation	-	186.24
Gas Central Replacement	-	-
Refrigerator Replacement	0.03	195.40
Residential Lighting	3.35	22,267.95
Smart Thermostat	-	26.00
Storm Windows	0.00	6.20
Wall Insulation	0.19	1,102.40
Water Heater Insulation	-	-
Water Heater Pipe Insulation	0.02	89.15
Window AC	-	-
Window Replacement	4.20	5,321.50
Total	30.57	62,611.42

2.2.2 Ex Ante Savings for Gas Utilities

The participating gas utilities are AOG, CenterPoint, and SGA. Table 2-7 presents the savings results of the evaluation of the 2014 AWP for gas utilities.

Table 2-7 Ex Ante Savings by Gas Utility

Gas Utility	*# of Homes*	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*
AOG	3	8.70	523.43
CenterPoint	113	441.54	20,137.27
SGA	11	43.13	2,323.60
Non-IOU	41	40.43	1,878.61
Total			

Table 2-8 through Table 2-10 summarize the *ex ante* savings by measure for each gas utility. The "Non-IOU" category refers to savings that were achieved as a result of program services, but were not attributable to the investor-owned utilities (IOUs) that fund the Arkansas Weatherization Program.

Table 2-8 Ex Ante Savings by Measure Type - AOG

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*
Air Infiltration	-	-
Ceiling Insulation	2.86	181.07
Central AC Replacement	-	-
Direct Vent Heater	-	-
Duct Sealing Installation	-	-
Floor Insulation	-	-
Gas Central Replacement	1.63	108.51
Refrigerator Replacement	-	-
Residential Lighting	-	(0.02)
Smart Thermostat	-	-
Storm Windows	-	-
Wall Insulation	3.19	209.75
Water Heater Insulation	-	-
Water Heater Pipe Insulation	-	-
Window AC	-	-
Window Replacement	1.02	24.13
Total	8.70	523.43

Table 2-9 Ex Ante Savings by Measure Type – CenterPoint

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)
Air Infiltration	288.54	11,752.58
Ceiling Insulation	87.14	5,389.53
Central AC Replacement	-	-
Direct Vent Heater	6.68	434.90
Duct Sealing Installation	-	-
Floor Insulation	-	-
Gas Central Replacement	16.02	1,033.81
Refrigerator Replacement	-	-
Residential Lighting	-	(1.19)
Smart Thermostat	-	305.00
Storm Windows	3.25	79.00
Wall Insulation	4.30	229.84
Water Heater Insulation	0.02	11.30
Water Heater Pipe Insulation	0.67	93.65
Window AC	-	-
Window Replacement	34.93	808.85
Total	441.54	20,137.27

Table 2-10 Ex Ante Savings by Measure Type – SourceGas

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)
Air Infiltration	25.29	1,072.90
Ceiling Insulation	4.80	344.58
Central AC Replacement	-	-
Direct Vent Heater	0.22	13.68
Duct Sealing Installation	-	-
Floor Insulation	5.71	443.49
Gas Central Replacement	5.22	348.16
Refrigerator Replacement	-	-
Residential Lighting	-	(0.11)
Smart Thermostat	-	41.00
Storm Windows	0.59	17.10
Wall Insulation	-	-
Water Heater Insulation	0.01	7.34
Water Heater Pipe Insulation	0.05	7.23
Window AC	-	-
Window Replacement	1.24	28.22
Total	43.13	2,323.60

Table 2-11 presents the *ex ante* gas savings that were not associated with any AWP IOU. As there are few non-IOU gas utility providers in the state of Arkansas, the "non-IOU" *ex ante* gas savings may represent propane customers or possibly tracking database errors that claim gas savings for homes that are not serviced by a gas utility. Therefore, Table 2-11 is a reflection of the non-IOU *ex ante* gas savings that are claimed within the tracking system, and these savings are not applicable to any specific service provider.

Table 2-11 Ex Ante Savings Values by Measure Type – Non-IOU (Gas)

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*
Air Infiltration	15.74	633.15
Ceiling Insulation	10.16	603.80
Central AC Replacement	-	-
Direct Vent Heater	2.62	171.37
Duct Sealing Installation	-	-
Floor Insulation	1.64	126.72
Gas Central Replacement	2.13	142.11
Refrigerator Replacement	-	-
Residential Lighting	-	(0.10)
Smart Thermostat	-	12.00
Storm Windows	-	4.40
Wall Insulation	-	-
Water Heater Insulation	0.01	3.38
Water Heater Pipe Insulation	0.03	4.13
Window AC	-	-
Window Replacement	8.11	177.66
Total	40.43	1,878.61

2.3 Gross Savings Calculation Methodology

For measures implemented through the 2014 program, savings verification was performed according to methodologies described in TRM V4.0. Table 2-12 identifies the sections in the TRM that were used for verification of measure-level savings under the AWP.

In 2014, there were two measure types implemented under the AWP that are not addressed within the set of TRM savings algorithms; smart thermostats and storm windows. The *ex ante* savings for these measures resulted from NEAT/MHEA stipulated calculations. As these measures accounted for a minor portion of total program savings, the Evaluators deferred to the NEAT/MHEA results during savings verification.

Table 2-12 TRM Sections by Measure Type

Measure	*TRM Version*	*Section in TRM*
Air Infiltration	4.0	2.2.9
Ceiling Insulation	4.0	2.2.2
Central AC Replacement	4.0	2.1.6
ENERGY STAR® Windows	4.0	2.2.7
Floor Insulation	4.0	2.2.4
Gas Furnace Replacement	4.0	2.1.3
Lighting Efficiency	4.0	2.5.1
ENERGY STAR® Refrigerator	4.0	2.4.3
Smart Thermostat	N/A	N/A
Storm Windows	N/A	N/A
Direct Vent Heaters	4.0	2.1.1
Wall Insulation	4.0	2.2.3
Water Heater Jackets	4.0	2.3.2
Water Heater Pipe Insulation	4.0	2.3.3
Window AC	4.0	2.1.10

Air infiltration reduction and ceiling insulation accounted for the majority of both gas and electric savings for the AWP in 2014. Residential lighting (CFL installation) also accounted for a substantial portion of electric savings. The calculation methodologies for these three measures are detailed in the following sections.

The deemed savings algorithms in TRM 4.0 for air infiltration reduction were developed through simulation modeling in BEopt, a residential building simulation modeling platform that uses the DOE EnergyPlus simulation engine. Multiple equipment configurations were simulated in each of the four Arkansas weather zones in developing savings values denominated in deemed savings per CFM50 of air leakage rate reduction. The following table summarizes the deemed savings values for Weather Zone 7.

Table 2-13 Deemed Savings Values for Air Infiltration Reduction, Zone 7

Equipment Type	*kWh Savings / CFM50 (ESF)*	*kW Savings / CFM50 (DSF)*	*Therm Savings / CFM50 (GSF)*	*Peak Therms / CFM50 (GPSF)*
Electric AC with Gas Heat	0.190	0.00016	0.0707	0.002181
Gas Heat Only (no AC)	0.053	n/a	0.0747	0.002181
Elec. AC with Resistance heat	1.812	0.00016	N/A	N/A
Heat Pump	0.818	0.00016	N/A	N/A

The following example considers a residence in Weather Zone 7 with electric AC and gas heat. If the residence had a leakage rate of 16,100 CFM_{50} before air infiltration reduction and a leakage rate of 7,220 CFM_{50} after, then the residence would have an annual gross savings of 1,687 kWh.

$$Air\ Infiltration\ Savings = 0.190 \frac{kWh\ Savings}{CFM_{50}} \cdot \left(16{,}100\ CFM_{50\ pre} - 7{,}220\ CFM_{50\ post}\right)$$

$$Air\ Infiltration\ Savings = 1{,}687\ kWh$$

TRM 4.0 also specifies Minimum Final Ventilation Rates (MVR) and Maximum Pre-installation Infiltration Rates in order to ensure that air infiltration work is performed in accordance with health and safety guidelines and that infiltration reduction is not attempted on homes with prohibitively severe leakage levels.

The MVR specifies the minimum post-installation air infiltration value that can be applied to the deemed savings calculation. If a home's final CFM50 value is below the MVR, the deemed savings calculation for air infiltration reduction on the home is calculated using the MVR rather than the actual post-installation leakage value.

The MVR for a given home is calculated as follows:

$$Min\ CFM50 = [0.01 \times A_{floor} + 7.5 \times (BR + 1)] \times N$$

Where:

Min CFM50 = Minimum final ventilation rate (CFM50)

AFloor = Floor area (ft^2)

BR= Number of bedrooms (must be at least 1)

N = N factor (deemed value based on type of wind shielding and number of stories in home)

With regard to Maximum Pre-installation Infiltration Rate, TRM 4.0 specifies that in order to avoid incentivizing homes with severe building envelope issues that cannot be remedied with typical air infiltration procedures, the baseline pre-installation infiltration rate should be based on a maximum air change rate of 3.0. With this baseline in effect, the maximum allowable pre-installation CFM50 value is calculated as follows:

$$CFM_{50,pre}/ft^2 = \frac{ACH_{Nat,pre} \times h \times N}{60}$$

Where:

CFM50,pre /ft^2 = Per square foot pre-installation infiltration rate (CFM50/ft^2)

ACHNat,pre = Maximum pre-installation air change rate (ACHNat) = 3.0

60 = Constant to convert from minutes to hours

h = Ceiling height (ft) = 8.5 (default)

N = N factor (deemed value based on type of wind shielding and number of stories in home)

If a home's pre-installation infiltration rate exceeds the rate calculated above, the Maximum Pre-installation Infiltration Rate is used for deemed savings calculations.

Additionally, TRM 4.0 specifies a maximum CFM50 per-square-foot value. For deemed savings calculations, pre-installation leakage rates cannot exceed these values.

2.3.1 Ceiling Insulation Savings Calculations

The deemed savings algorithms in TRM 4.0 for ceiling insulation were developed through simulation modeling in BEopt, a residential building simulation modeling platform that uses the DOE EnergyPlus simulation engine. Multiple equipment configurations were simulated in each of the four Arkansas weather zones in developing savings values denominated in deemed savings per square footage of ceiling area. Table 2-14 summarizes the deemed savings values for Weather Zone 8.

Table 2-14 Deemed Savings Values for Ceiling Insulation, Zone 8

Ceiling Insulation Base R-value	*AC/Gas Heat kWh*	*Gas Heat (no AC) kWh*	*Gas Heat (no AC) Therms*	*AC/Electric Resistance kWh*	*Heat Pump kWh*	*AC Peak Savings (kW)*	*Peak Gas Savings[11] (therms)*
	(/ sq. ft.)	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*
0 to 1	1.8642	0.2203	0.3060	8.734	4.572	0.001393	0.00539
2 to 4	1.0497	0.1215	0.1687	4.846	2.495	0.000765	0.00284
5 to 8	0.6330	0.0728	0.1011	2.909	1.495	0.000461	0.00165
9 to 14	0.3909	0.0446	0.0618	1.784	0.917	0.000293	0.00099
15 to 22	0.1847	0.0216	0.0299	0.858	0.439	0.000131	0.00048

The following example considers a residence in Weather Zone 8 with a heat pump, and a pre-retrofit R-value of ceiling insulation in the range of 9 to 14. If the residence has a ceiling area of 1,200 sq. ft., then the residence would have an annual gross savings of 1,100 kWh.

$$Ceiling\ Insulation\ Savings = 0.917 \frac{kWh}{ft^2} \cdot (1{,}200\ ft^2) = 1{,}100\ kWh$$

[11] Data in table are for Blytheville peak. Other Zone 8 peaks can be calculated by multiplying Blytheville peak by the appropriate factor, m. For Jonesboro, m=0.890 (0-1), m = 0.901 (2 to 4), 0.906 (5 to 8), 0.907 (9 to 14), 0.918 (15 to 22). For Fort Smith, m=0.859 (0-1), m = 0.872 (2 to 4), 0.878 (5 to 8), 0.879 (9 to 14), 0.891 (15 to 22).

TRM 4.0 specifies an efficiency standard of R-38, meaning that in order to qualify for deemed savings the combined R-value of existing and added insulation should be at least R-38.

2.3.2 Compact Fluorescent Lamps (CFLs) Savings Calculations

The deemed savings for compact fluorescent lamps can be calculated by using the following equation.

$$kWh_{savings} = ((Watts_{base} - Watts_{post})/1{,}000)\ x\ Hours\ x\ ISR\ x\ IEF_E$$

The inputs, which assume the following prerequisite knowledge, can be found in Section 2.5.1 of TRM V4.0:

- The quantity and wattages of both pre and post fixtures;
- Whether or not the retrofits were time of sale or direct install (this defines the in-service rate); and
- The heating type of the residence.

For example, if in March 2014 (5) 13W CFLs were directly installed to replace (5) 60W incandescent lamps in a residence with gas heating, the residence would have an annual gross savings of 198 kWh.

$$kWh_{savings} = ((5 \cdot 60 - 5 \cdot 13)/1{,}000 \cdot 792.6 \cdot 0.97 \cdot 1.10 = 198\ kWh$$

TRM 4.0 includes specifications for heating penalties from CFLs in natural gas heated homes, calculated as follows:

$$Therms_{penalty} = \left((W_{base} - W_{post})/1000\right)\ x\ ISR\ x\ IEF_G$$

Where:

IEFg = Interactive Effects Factor to account for gas heating penalties (specified in TRM 4.0 as -0.0063)

TRM 4.0 also accounts for future changes in lighting baselines as per EISA 2007 guidelines. Specifically, TRM 4.0 specifies that the 1st Tier EISA 2007 baseline for CFLs in the 750-1,049 lumen range comes into effect in January 2014, and that the 2nd Tier EISA 2007 baseline for these CFLs comes into effect in January 2020. These baseline changes affect lifetime savings calculations for CFLs.

As per Protocol E2 of TRM 4.0, the enforcement date for a code or standard update is the end of the current program year if the effective date of the code or standard update is before July 1. Thus, the Evaluators calculated 2014 first-year savings using the Pre-EISA 2007 baseline for CFLs in the 750-1,049 lumen range. Deemed savings for these CFLs will be calculated using the 1st Tier EISA baseline beginning in the 2015 program year.

2.4 Net Savings Determination

As with prior program years, the Evaluators applied a net-to-gross ratio of 1 for savings achieved through the program in 2014. The context for and explanation of this determination, which appeared in the 2013 AWP evaluation report, is provided below.

The Evaluators conducted a net-to-gross assessment of the program in 2012 in order to determine the likelihood of significant free-ridership or savings spillover. Feedback obtained from customers, community action agencies, and utility staff indicates that the likelihood for program free-ridership is very low. As a high percentage of AWP participants qualified for and participated in the income-qualified statewide Weatherization Assistance Program (WAP), they are unlikely to be candidates for free-ridership in the AWP.

The promotional structure of the AWP targets customer groups who would be very unlikely to pursue these weatherization projects in the absence of the program, and who would likely not seek out an energy audit at their own cost. Additionally, participants who were visited by the Evaluators' field staff were asked a series of questions related to program savings spillover, and none of these customers identified any potential spillover savings.

Due to these factors, the Evaluators determined the net-to-gross ratio for the Arkansas Weatherization Program to be 1, or 100% of gross savings, for the 2012 program year. This determination has been carried over and applied to the 2014 program year, and 2014 AWP gross savings are equal to net savings.

This determination may be modified, with an additional net-to-gross assessment required, if the portion of participants who provide their own private co-pay (non-WAP) increases significantly. There was no increase in private co-pay activity for the 2014 program year.

2.5 On-site Verification Procedure

In addition to TRM verification, the Evaluators conducted on-site field verification of a sample of participant homes. This process involved reviewing tracking information and inspecting the completeness and accuracy of the implemented measures. This section provides a summary of the methodology used by the Evaluators to conduct the verification activity.

2.5.1 Verification Sampling Methodology

The Evaluators conducted a random sample of participants for the ex-post verification process. The sample size for verification surveys was calculated to meet 90% confidence and 10% precision (90/10) for the overall 2014 program population at the time of the on-site verification activity. The main purpose of the verification activity was to determine whether measures were properly installed in the quantities reported in program tracking data. Thus, the coefficient of variation (CV) used for sampling was not based on

participant savings but was assumed to be .5, which is a commonly assumed CV value for residential program evaluations. The resulting sample size is estimated as:

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

Where,

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

CV = Coefficient of Variation

RP = Required Precision, 10% in this evaluation

With 10% required precision (RP), this calls for a sample of 68 for programs with a sufficiently large population. However, for programs with lower levels of participation, a finite population correction is used to maintain cost-effective verification while meeting precision goals. For the AWP, the Evaluators applied a finite population correction factor as follows:

$$n = \frac{n_0}{1 + {}^{n_0}/_N}$$

Where

n_0 = Sample Required for Large Population

N = Size of Population

n = Corrected Sample

During 2014, 159 residences received measures through the AWP.[12] After applying the population correction factor, the program calls for a sample size of 48 participants.

In total, the Evaluators scheduled appointments with 50 participants. Due to cancellations and customer absences, Evaluator field staff members were able to conduct on-site visits for 38 program participants. This was supplemented by telephone verification with an additional 10 participants for a total of 48 verifications.

In order to design a sample of homes that was representative of the participant population, the Evaluators attempted to conduct on-site appointments and telephone verifications in a manner that matched the distribution of participants across the participating utilities.

Table 2-15 presents the target sample size for each utility provider, along with the number of verifications conducted. Customers receiving utility service from more than one IOU (e.g. receiving gas service from CenterPoint and electric service from EAI) were counted

[12] In addition to these homes, nine homes received an initial audit but did not receive any weatherization or other energy efficiency measures through the AWP. As these homes did not receive utility funding or achieve energy savings during 2014, they are not included in the 2014 sampling parameters.

towards the sample target for both IOUs. In cases where a customer cancelled a verification appointment and the Evaluators were not able to schedule an on-site appointment with another home receiving service from the same utility provider, the Evaluators attempted to meet the sample target through telephone verification. The Evaluators attempted to contact customers four times before categorizing that customer as non-responsive. Due to a higher than expected rate of disconnected or incorrect telephone numbers, the Evaluators exhausted the participant population for SGA and AEP-SWEPCO and were not able to meet the sample target for these groups.

Table 2-15 Verifications by Utility Provider

Utility Provider	*Target Sample*	*Achieved Sample*
EAI	32	34
OG&E	1	2
AEP-SWEPCO	3	1
AOG	1	1
SGA	3	0
CenterPoint	32	35
(Electric - Other)	12	12
(Gas - Other or None)	12	13

2.5.2 Verification Procedure

The primary goal of field verification was to ensure that the reported measures were installed and operating correctly in participant homes. Participants were given Walmart gift cards for their time; these were in the amount of $20. During the on-site visits, the Evaluators' field technicians accomplished the following:

- Verified the implementation status of the measures; verified that the measures were installed, that they were installed correctly, and were functioning properly. Photographs were taken of most of the installed measures.
- Data collected at each site focused on obtaining more specific information regarding the characteristics of the home where the measures were implemented.

A field visit form was completed for each visited site in order to document measure quantities, home characteristics, and any needed additional commentary regarding the visit. Specifically, the field form included the following fields:

- Home Characteristics: The field engineer documented the type of home (i.e. single story vs. multi-story), number of bedrooms, number of bathrooms, total conditioned area, and heating type.
- Measure Quantity Verification: The engineer documented reported vs. actual quantities of each measure type (e.g. CFLs, water heater measures) and any applicable notes regarding burnt out bulbs or non-operational equipment.

- Insulation Assessment: The form includes fields for insulation square footage, the R-value or inches of insulation, and the type of insulation (e.g. blown cell).
- Infiltration Assessment: For homes receiving air infiltration measures, the field engineer conducted a blower door test and recorded ex-post leakage for comparison with reported leakage values.
- Supplemental Notes: The field engineer recorded any notable comments provided by the customer regarding the work that was performed, and identified any verification issues that had occurred during the visit (e.g. if the attic was not accessible).

Overall, the results of the verification activity suggest that measures are for the most part installed in the quantities reported in program tracking data, with a few exceptions. Further information detailing the overall results of the field verification visits can be found in the following section.

2.6 Onsite Verification Results

As described in Section 2.5 of this report, the Evaluators conducted onsite verification visits to 38 participant homes, supplemented by 10 telephone verifications for a total of 48 verifications. These site visits and telephone calls were conducted in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to collect information regarding residence characteristics such as square footage and heating type.

The field and telephone verification activity showed that the weatherization measures had for the most part been installed in the quantities reported within program tracking data. This section summarizes the verification findings by measure category.

2.6.1 Contact Information

All residences were located at the addresses provided within the tracking data. However, many of the telephone numbers listed in the tracking data appeared to be disconnected or incorrect. In total, 26 out of the 121 telephone numbers (22%) dialed by the Evaluators were found to be disconnected or incorrect during the site visit scheduling process. It is possible that some customers disconnected their telephones or changed their telephone number since providing the number to the weatherization contractor, although in the future it would be useful to obtain a secondary telephone numbers from customers when possible.

2.6.1 Air Infiltration

The Evaluators conducted blower door testing in 38 participant homes for the 2014 program year. Of these 38 homes, the CFM_{50} value measured during the verification visit was within 10% of the reported value for 18 (47%) homes. The following figure displays

the percentage difference between the CFM_{50} value reported in EnerTrek and the CFM_{50} value obtained during the Evaluators' site visit. As shown in the figure, the Evaluated CFM_{50} value was more than 10% greater than the Reported CFM50 value for 17 homes. Overall, the Evaluated CFM_{50} value was greater than the Reported CFM_{50} value for 25 of the 38 homes (66%).

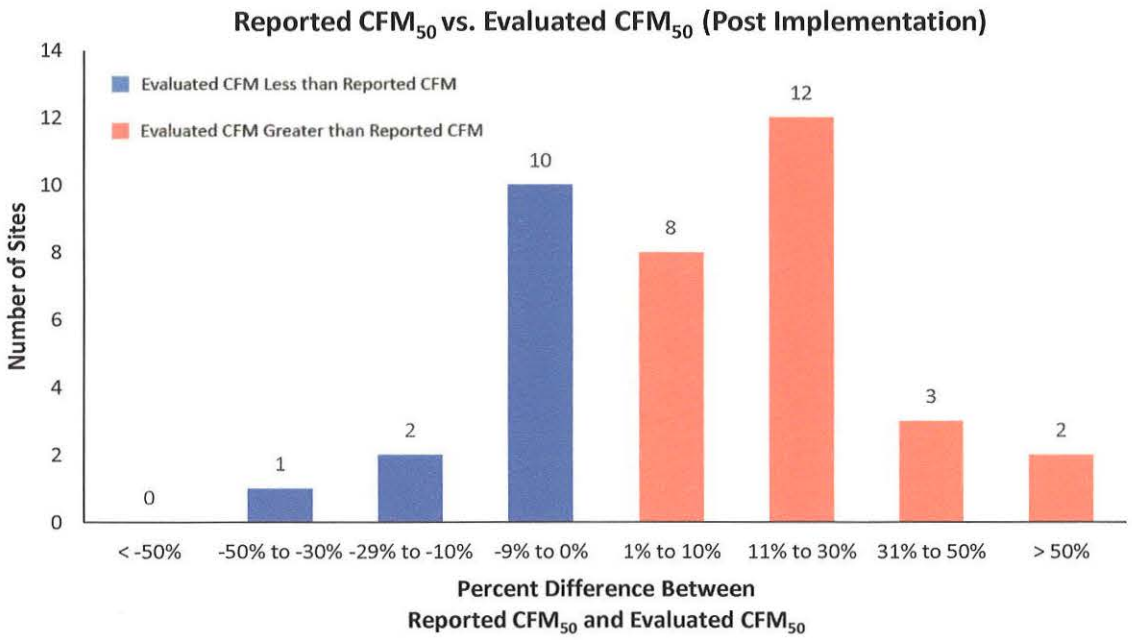

Figure 2-1 Reported CFM_{50} vs. Evaluated CFM_{50}, Post-implementation

A comparison between the blower door testing results from the 2012 program year and the 2014 program year shows that the discrepancies between Evaluated and Reported CFM_{50} values are greater in 2014 than in 2012, both in frequency and magnitude. In 2012, the Evaluated CFM_{50} value was more than 10% greater than the Reported CFM_{50} value for only 13% of sampled homes, compared to 45% of sampled homes in 2014.[13]

There are several factors that may cause the Evaluated CFM_{50} value to be greater than the Reported CFM_{50} value, including customer actions following the weatherization work (such as removing door sweeps), methodological differences between contractor blower door testing and Evaluator blower door testing, and environmental or weather effects. Without additional information regarding air sealing and leakage testing procedures conducted by contractors for each home, it is not possible to determine the reason for these measurement discrepancies. In order to more accurately assess this issue in future years, the Evaluators make the following recommendations:

[13] In 2012, the Evaluators conducted blower door testing in 45 participant homes.

- Include itemized air infiltration measures in tracking data: Thus far, the tracking data for air infiltration measures have included the pre-implementation CFM value and post-implementation CFM value, but have not included information regarding what air sealing measures were installed (e.g. door sweeps, window sealing) in each home, or where they were installed (e.g. back door, bathroom window). Including this information in the program tracking data would allow the Evaluators to determine whether a discrepancy between reported and evaluated leakage could be due to measures becoming damaged, or customers removing measures. Additionally, itemized air sealing measures would allow for a greater level of detail in verification visits.
- Include any air infiltration field notes for each home: Due to situational residence characteristics such as whether a fireplace flue is open or closed, or whether the homeowner did not allow the contractor to close a certain window, it is sometimes difficult to recreate the testing conditions that were present for the contractor measurement. Including information regarding any notable characteristics of the testing conditions that should be recreated during the verification process will minimize the potential for situational discrepancies.

Additionally, the Evaluators offer to have a discussion with CADC and the other agencies and their contractors regarding the methodology used during blower door testing in order to ensure that testing is conducted consistently among agencies, and between the agencies and the Evaluators. Although it is very difficult to consistently reproduce blower door test leakage values on separate occasions, increasing the level of tracking data detail and minimizing methodological differences will help to distinguish data entry and implementation errors from situational and procedural differences.

2.6.1 Window Replacement

All reported instances of storm window installation were verified.

For other window replacement reported, the Evaluators were able to locate and verify all instances of reported window replacement with the exception of one home. For this home, the tracking data indicated that one window had been replaced, but during the verification visit the homeowner stated that the contractors had not replaced any windows. As contractors typically replace multiple windows in a home when conducting window replacement, it is likely that this reported instance was a data entry or database error.
For the window replacements that were successfully verified, the Evaluators found the SHGC, U-Factor, and window area listed in the tracking data to be accurate.

2.6.1 CFLs

All reported instances of 13W CFL installation were verified. For 18W CFLs, the Evaluators verified 375 of the 441 CFLs (85%) represented by sampled participants. In most cases, the difference between reported and evaluated CFL counts was fairly minor and was likely due to customer removal of bulbs. However in one case, the tracking data

reported that 76 CFLs had been installed in a single home, and the Evaluators were able to identify only 14 CFLs. The number of reported CFLs for this home exceeds the typical number of bulb sockets in a single-family residence, and is likely a data collection or EnerTrek error.[14] All verified CFLs matched the wattage and lumen range reported in the EnerTrek tracking data.

2.6.1 Attic Insulation

All reported instances of attic insulation were verified. There were no significant differences between reported pre-installation R values and evaluated pre-installation R values. All homes met the TRM requirement of an R-38 post-installation value. There were no significant differences between reported square footage and evaluated square footage.

2.6.2 Water Heater Jacket and Pipe Wrap

The Evaluators were able to verify all but one instance of reported water heater pipe wrap; one customer had removed their water heater pipe wrap. The reported instance of water heater jacket installation was successfully verified.

2.6.3 Gas Heat Replacement

All reported instances of gas heat replacement were verified.

2.6.4 Smart Thermostat

The reported instance of smart thermostat installation was verified.

2.6.5 Refrigerator Replacement

All reported instances of refrigerator replacement were verified.

2.6.6 Direct Vent Heater

All reported instances of direct vent heater installation were verified.

Overall, the results of the verification activity suggest that measures are for the most part installed in the quantities reported in program tracking data, with a few exceptions. These findings are fairly consistent with the results of the 2012 onsite verification activity, although there are some emerging issues (e.g. increased discrepancies in blower door testing results, and issues with customer contact information) that should be addressed moving forward.

2.7 Review of EnerTrek Input Assumptions

Although the EnerTrek system calculated savings for the AWP using protocols in TRM V3.0, some of the measure inputs required by the TRM were not collected by program contractors during the first few months of 2014. In order to calculate savings, Frontier Associates developed input assumptions for individual measure types. The Evaluators

[14] This home was not serviced by a participating electric utility, so the electric savings from these erroneously reported bulbs did not affect the *ex post* savings for any of the AWP electric IOUs.

reviewed these assumptions and attempted to validate or supplement specific assumptions during the verification activity. The assumptions applied to individual measure calculations for some homes in 2014 include:

- ENERGY STAR® Refrigerator Replacement: Assume replace on burnout
- Gas Central Replacement: Assume replace on burnout
- Direct Vent Heaters: Assume replace on burnout, assume fan type
- Residential Lighting: Assume CFLs located in conditioned area; map lumen range based on wattage
- Window Replacement: Assume qualifying U-Factor and SHGC values

During the verification activity, the Evaluators attempted to gather information regarding the replacement type (e.g. replace on burnout vs. early retirement) of direct vent heaters, refrigerators, and gas heating replacements. The Evaluators found that the majority of these units had not been functional at the time of replacement (replace on burnout). Additionally, none of the four residents who reported that their unit had been operational at the time of replacement were able to recall the age of their pre-existing unit, which is a required parameter for calculating early retirement savings in TRM V4.0.

Data collected by the Evaluators during the verification activity indicated that the assumptions for CFLs and window replacements were reasonable and consistent with actual measure characteristics.

Overall, following a review of program tracking data and field verification findings, the Evaluators determined that all of the listed assumptions were reasonable for measures implemented during 2014.

2.8 Ex Post Net Savings by Measure

Ex post savings were calculated through TRM verification of EnerTrek inputs and *ex ante* savings values. Any instances of discrepancies between *ex ante* and *ex post* savings were due to one of two issues:

- Difference in TRM: EnerTrek calculated measure savings in 2014 using TRM 3.0, and the Evaluators conducted savings verification using TRM 4.0. There were differences in input assumptions, measure parameters, and savings equations between the two TRM versions for some measures.

- Calculation Error: Any misinterpretation of TRM protocols, mathematical errors, or data entry errors may cause *ex ante* savings to be higher or lower than *ex post* (verified) savings.

Table 2-16 presents electric and gas realization rates by measure category. These realization rates are presented at the program level, and individual utility realization rates

may vary from those presented in this table. Individual utility realization rates are presented in Section 2.10 and Section 2.11.

Table 2-16 Gas and Electric Realization Rates by Measure Type

Measure	*kWh Realization Rate*	*kW Realization Rate*	*Therms Realization Rate*	*Peak Therms Realization Rate*
Air Infiltration	127%	130%	153%	188%
Ceiling Insulation	106%	120%	162%	174%
Central AC Replacement	100%	100%	-	-
Direct Vent Heater	-	-	95%	95%
Duct Sealing Installation	0%	0%	-	-
Floor Insulation	-72%	-	25%	13%
Gas Central Replacement	-	-	100%	100%
Refrigerator Replacement	49%	51%	-	-
Residential Lighting	101%	103%	28%	-
Smart Thermostat	100%	-	100%	-
Storm Windows	100%	100%	100%	100%
Wall Insulation	63%	200%	76%	81%
Water Heater Insulation	100%	100%	100%	100%
Water Heater Pipe Insulation	96%	97%	94%	94%
Window AC	100%	100%	-	-
Window Replacement	102%	124%	98%	78%
Overall	110%	122%	142%	166%

The realization rate for most measures was very close to 100%, and the Evaluators found that the majority of discrepancies between *ex ante* and *ex post* savings were due to differences between TRM V3.0 and TRM V4.0 rather than due to calculation errors.

The following list identifies measure categories where there were significant differences between *ex ante* and *ex post* savings, and specifies whether this was due to differences in TRM versions or due to calculation errors:

- Ceiling Insulation
    - Difference in TRM: High overall electric and gas realization rates were due to differences in TRM versions. TRM V4.0 is more granular than TRM V3.0 with regard to the pre-implementation R-value. One effect of this is higher savings for homes that did not have ceiling insulation initially.
- Floor Insulation
    - Difference in TRM: Low overall electric and gas realization rates were due to differences between TRM versions. TRM V3.0 specifies positive kWh

savings for floor insulation, while TRM V4.0 implements an electric savings penalty for homes with gas heat and air conditioning. The simulation procedures used for this measure in TRM V4.0 identified negative electric savings, likely caused by the floor insulation acting as a barrier to ground cooling effects. This would cause the home temperature to be higher during cooling months, likely resulting in increased air conditioner usage.

- Wall Insulation
  - Difference in TRM: Low overall electric and gas realization rates were due to differences between TRM versions. TRM 4.0 specifies lower deemed savings per square foot.
- Residential Lighting
  - Difference in TRM/Calculation Error: Low overall electric and gas realization rates were due to differences between TRM versions and possible EnerTrek calculation issues. CFL annual kWh savings in EnerTrek may have been calculated as an increment of lifetime savings, which takes into account future baseline changes that should not affect first-year kWh savings.
- Air Infiltration
  - Difference in TRM/Calculation Error: High overall electric and gas realization rates are partially due to differences between TRM versions and likely due to calculation errors within *ex ante* savings. TRM V4.0 specifies minimum and maximum caps for CFM_{50} values and specifies different deemed savings values for each weather zone, but the Evaluators were unable to duplicate the EnerTrek *ex ante* savings values using TRM V3.0. The analysis resulted in a wide range of realization rates, both high and low, across the participant population.
- Refrigerator Replacement
  - Calculation Error: A low electric realization rate was primarily due to two instances of substantial *ex ante* overestimation of savings, where one refrigerator was listed with *ex ante* savings of approximately 1,000 kWh, and another with *ex ante* savings of approximately 700 kWh.

Overall, there were fewer instances of calculation errors and incomplete data than were identified in prior program years. Past issues such as calculating savings using an incorrect heating and cooling type appear to have been for the most part resolved, and EnerTrek negated savings for measures that did not qualify for savings as per TRM V3.0 standards. The remaining and emerging issues are fairly minor, with the exception of air infiltration savings.

2.9 Overall Ex Post Net Savings

Table 2-17 presents the savings results of the evaluation of the 2014 Arkansas Weatherization Program, by measure. Total savings summarizes the savings calculations performed as per TRM V4.0 protocols for the AWP. As previously noted, the net-to-gross ratio for the 2014 program year is 1.

Table 2-17 Ex Post Net Savings by Measure Type – Overall

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)
Air Infiltration	56.32	126,484.93	1,391,334.18	620.40	20,546.88	226,015.67
Ceiling Insulation	56.50	97,901.52	1,958,030.48	182.26	10,530.49	210,609.71
Central AC Replacement	3.64	8,850.00	168,150.00	-	-	-
Direct Vent Heater	-	-	-	9.04	588.49	11,769.78
Duct Sealing Installation	-	-	-	-	-	-
Floor Insulation	(0.07)	(441.83)	(8,836.56)	0.97	144.35	2,886.92
Gas Central Replacement	-	-	-	25.00	1,632.58	32,651.59
Refrigerator Replacement	0.22	1,536.52	26,120.82	-	-	-
Residential Lighting	10.77	66,213.86	506,768.48	-	(0.40)	(3.02)
Smart Thermostat	-	105.00	1,260.00	-	358.00	4,296.00
Storm Windows	0.02	29.70	594.00	3.83	100.50	2,010.00
Wall Insulation	0.81	1,145.75	22,915.00	6.08	332.30	6,645.94
Water Heater Insulation	0.01	68.00	884.00	0.04	22.02	286.26
Water Heater Pipe Insulation	0.32	1,096.19	12,058.08	0.71	98.36	1,278.74
Window AC	1.05	643.90	6,760.96	-	-	-
Window Replacement	23.05	27,169.81	543,396.12	35.23	1,012.94	20,258.74
Total	152.63	330,803.34	4,629,435.56	883.56	35,366.50	518,706.31

2.10 Ex Post Net Savings for Electric Utilities

The participating IOUs with homes achieving savings through the 2014 program were AEP-SWEPCO, EAI, and OG&E. Table 2-18 presents the *ex post* net savings results of the evaluation of the 2014 AWP for electric utilities.

Table 2-18 Ex Post Net Savings by Electric Utility

Electric Utility	# of Homes	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)
AEP-SWEPCO	12	8.40	31,154.13	461,148.41
EAI	112	105.99	229,868.21	3,271,557.30
OG&E	3	0.63	3,140.96	36,642.36
Non-IOU	41	37.60	66,640.04	860,087.50
Total	168	152.63	330,803.34	4,629,435.56

Table 2-19 through Table 2-21 summarize the *ex post* net savings and net realization rates by measure for each electric utility.

Table 2-19 Ex Post Net Savings by Measure Type – AEP – SWEPCO

Measure	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*	*Lifetime Savings (kWh)*	*kWh Realization Rate*	*kW Realization Rate*
Air Infiltration	2.21	11,747.98	129,227.77	169%	146%
Ceiling Insulation	3.14	11,587.14	231,742.72	147%	117%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	-	-	-	-	-
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	(0.04)	(169.30)	(3,386.04)	-63%	-
Gas Central Replacement	-	-	-	-	-
Refrigerator Replacement	0.01	95.55	1,624.37	14%	15%
Residential Lighting	0.73	4,472.41	35,378.81	110%	94%
Smart Thermostat	-	-	-	-	-
Storm Windows	0.01	15.70	314.00	100%	100%
Wall Insulation	0.33	405.27	8,105.40	56%	155%
Water Heater Insulation	-	-	-	-	-
Water Heater Pipe Insulation	0.02	84.59	930.46	96%	97%
Window AC	0.21	114.20	1,199.12	100%	1100%
Window Replacement	1.78	2,800.59	56,011.80	100%	121%
Total	8.40	31,154.13	461,148.41	132%	120%

Table 2-20 Ex Post Net Savings by Measure Type – EAI

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	kWh Realization Rate	kW Realization Rate
Air Infiltration	37.15	91,001.42	1,001,015.64	122%	129%
Ceiling Insulation	42.77	71,702.58	1,434,051.57	104%	121%
Central AC Replacement	2.26	5,701.00	108,319.00	100%	100%
Direct Vent Heater	-	-	-	-	-
Duct Sealing Installation	-	-	-	0%	0%
Floor Insulation	(0.02)	(125.93)	(2,518.56)	-79%	-
Gas Central Replacement	-	-	-	-	-
Refrigerator Replacement	0.18	1,249.13	21,235.15	55%	58%
Residential Lighting	6.48	39,860.61	314,339.71	104%	104%
Smart Thermostat	-	79.00	948.00	100%	-
Storm Windows	0.00	7.80	156.00	100%	100%
Wall Insulation	-	-	-	-	-
Water Heater Insulation	0.01	68.00	884.00	100%	100%
Water Heater Pipe Insulation	0.27	925.89	10,184.83	96%	97%
Window AC	0.84	529.70	5,561.84	100%	100%
Window Replacement	16.04	18,869.01	377,380.11	102%	124%
Total	105.99	229,868.21	3,271,557.30	109%	122%

Table 2-21 Ex Post Net Savings by Measure Type – OG&E

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	kWh Realization Rate	kW Realization Rate
Air Infiltration	0.18	1,981.50	21,796.47	72%	74%
Ceiling Insulation	0.34	454.23	9,084.52	87%	101%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	-	-	-	-	-
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	-	-	-	-	-
Gas Central Replacement	-	-	-	-	-
Refrigerator Replacement	-	-	-	-	-
Residential Lighting	0.11	705.24	5,761.37	110%	92%
Smart Thermostat	-	-	-	-	-
Storm Windows	-	-	-	-	-
Wall Insulation	-	-	-	-	-
Water Heater Insulation	-	-	-	-	-
Water Heater Pipe Insulation	-	-	-	-	-
Window AC	-	-	-	-	-
Window Replacement	-	-	-	-	-
Total	0.63	3,140.96	36,642.36	80%	90%

Table 2-22 presents the electric savings that were not associated with any AWP IOU. These savings are attributable to municipal utilities, co-op utilities, or other energy providers. Thus, the savings are not attributed to any specific program sponsoring utility, and are provided for reference only.

Table 2-22 Ex Post Net Savings by Measure Type – Non-IOU (Electric)

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	kWh Realization Rate	kW Realization Rate
Air Infiltration	16.78	21,754.03	239,294.30	140%	133%
Ceiling Insulation	10.26	14,157.58	283,151.67	96%	117%
Central AC Replacement	1.38	3,149.00	59,831.00	100%	100%
Direct Vent Heater	-	-	-	-	-
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	(0.02)	(146.60)	(2,931.96)	-79%	-
Gas Central Replacement	-	-	-	-	-
Refrigerator Replacement	0.03	191.84	3,261.30	98%	103%
Residential Lighting	3.44	21,175.59	151,288.59	95%	103%
Smart Thermostat	-	26.00	312.00	100%	-
Storm Windows	0.00	6.20	124.00	100%	100%
Wall Insulation	0.48	740.48	14,809.60	67%	253%
Water Heater Insulation	-	-	-	-	-
Water Heater Pipe Insulation	0.02	85.71	942.79	96%	97%
Window AC	-	-	-	-	-
Window Replacement	5.23	5,500.21	110,004.21	103%	125%
Total	37.60	66,640.04	860,087.50	106%	123%

2.11 Ex Post Net Savings for Gas Utilities

The participating gas utilities are AOG, CenterPoint, and SourceGas. Table 2-23 presents the savings results of the evaluation of the 2014 AWP for gas utilities and for non-IOU sources. Table 2-24 through Table 2-26 summarize the *ex post* net savings and net realization rate by measure for each gas utility.

Table 2-23 Ex Post Net Savings by Gas Utility

Gas Utility	# of Homes	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)
AOG	3	8.33	479.54	9,590.78
CenterPoint	113	742.24	28,948.28	416,134.08
SGA	11	56.80	2,452.89	34,668.20
Non-IOU	41	76.19	3,485.79	58,313.25
Total	168	883.56	35,366.50	518,706.31

Table 2-24 Ex Post Net Savings by Measure Type – AOG

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*	*Lifetime Savings (Therms)*	*Therms Realization Rate*	*Peak Therms Realization Rate*
Air Infiltration	-	-	-	-	-
Ceiling Insulation	3.30	201.12	4,022.47	111%	115%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	-	-	-	-	-
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	-	-	-	-	-
Gas Central Replacement	1.63	108.51	2,170.16	100%	100%
Refrigerator Replacement	-	-	-	-	-
Residential Lighting	-	(0.01)	(0.05)	28%	-
Smart Thermostat	-	-	-	-	-
Storm Windows	-	-	-	-	-
Wall Insulation	2.62	147.18	2,943.54	70%	82%
Water Heater Insulation	-	-	-	-	-
Water Heater Pipe Insulation	-	-	-	-	-
Window AC	-	-	-	-	-
Window Replacement	0.79	22.73	454.66	94%	78%
Total	8.33	479.54	9,590.78	92%	122%

Table 2-25 Ex Post Net Savings by Measure Type – CenterPoint

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)	Therms Realization Rate	Peak Therms Realization Rate
Air Infiltration	540.33	17,744.73	195,192.02	151%	187%
Ceiling Insulation	145.10	8,302.14	166,042.85	154%	167%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	6.61	430.17	8,603.34	99%	99%
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	-	-	-	-	-
Gas Central Replacement	16.02	1,033.81	20,676.16	100%	100%
Refrigerator Replacement	-	-	-	-	-
Residential Lighting	-	(0.33)	(2.54)	28%	-
Smart Thermostat	-	305.00	3,660.00	100%	-
Storm Windows	3.25	79.00	1,580.00	100%	100%
Wall Insulation	3.46	185.12	3,702.40	81%	81%
Water Heater Insulation	0.02	11.30	146.90	100%	100%
Water Heater Pipe Insulation	0.63	87.70	1,140.12	94%	94%
Window AC	-	-	-	-	-
Window Replacement	26.81	769.64	15,392.81	95%	77%
Total	742.24	28,948.28	416,134.08	144%	122%

Table 2-26 Ex Post Net Savings by Measure Type – SourceGas

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)	Therms Realization Rate	Peak Therms Realization Rate
Air Infiltration	44.23	1,551.45	17,065.98	145%	175%
Ceiling Insulation	4.92	333.11	6,662.28	97%	103%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	0.21	13.08	261.59	96%	96%
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	0.72	110.29	2,205.80	25%	13%
Gas Central Replacement	5.22	348.16	6,963.16	100%	100%
Refrigerator Replacement	-	-	-	-	-
Residential Lighting	-	(0.03)	(0.19)	27%	-
Smart Thermostat	-	41.00	492.00	100%	-
Storm Windows	0.59	17.10	342.00	100%	100%
Wall Insulation	-	-	-	-	-
Water Heater Insulation	0.01	7.34	95.42	100%	100%
Water Heater Pipe Insulation	0.05	6.79	88.29	94%	95%
Window AC	-	-	-	-	-
Window Replacement	0.84	24.59	491.88	87%	68%
Total	56.80	2,452.89	34,668.20	106%	127%

Table 2-27 presents the *ex post* net gas savings that were not associated with any AWP IOU. As there are few non-IOU gas utility providers in the state of Arkansas, the "non-IOU" *ex ante* gas savings may represent propane customers or possibly tracking database errors that claim gas savings for homes that are not serviced by a gas utility.

Table 2-27 Ex Post Net Savings by Measure Type – Non-IOU (Gas)

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)	Therms Realization Rate	Peak Therms Realization Rate
Air Infiltration	35.83	1,250.70	13,757.67	198%	228%
Ceiling Insulation	28.94	1,694.11	33,882.11	281%	285%
Central AC Replacement	-	-	-	-	-
Direct Vent Heater	2.22	145.24	2,904.84	85%	85%
Duct Sealing Installation	-	-	-	-	-
Floor Insulation	0.25	34.06	681.12	27%	15%
Gas Central Replacement	2.13	142.11	2,842.11	100%	100%
Refrigerator Replacement	-	-	-	-	-
Residential Lighting	-	(0.03)	(0.24)	33%	-
Smart Thermostat	-	12.00	144.00	100%	-
Storm Windows	-	4.40	88.00	100%	-
Wall Insulation	-	-	-	-	-
Water Heater Insulation	0.01	3.38	43.94	100%	100%
Water Heater Pipe Insulation	0.03	3.87	50.33	94%	95%
Window AC	-	-	-	-	-
Window Replacement	6.79	195.97	3,919.38	110%	84%
Total	76.19	3,485.79	58,313.25	186%	118%

3. Process Evaluation Findings

This chapter presents the key findings from the limited process evaluation that the Evaluators conducted in 2014. This includes a status assessment of recommendations from prior program evaluations and a summary of updates to program operation and delivery. Additionally, the chapter presents findings from in-depth interviews with program staff, provides a review of customer surveys conducted by the participating community action agencies, and addresses the checklist factors for portfolio comprehensiveness.

3.1 Process Evaluation Considerations

The Evaluators conducted a formal process evaluation of the AWP in 2012. This process evaluation resulted in several recommendations and identified program strengths and weaknesses, as well as existing opportunities. TRM V4.0 Protocol C addresses the criteria used to determine the timing and conditions needed for a process evaluation, and the following tables summarize the AWP in the context of these requirements.

Table 3-1 Determining Process Evaluation Timing

Component	*Determination*
New and Innovative Components	No. The overall program design has not been modified since 2012.
No Previous Process Evaluation	No. A formal process evaluation was conducted in 2012.
New Vendor or Contractor	No. The program continued to be funded by the Arkansas IOUs, administered by ACAAA, and implemented by the Arkansas community action agencies and their contractors.

Table 3-2 Determining Process Evaluation Conditions

Component	*Determination*
Are program impacts lower or slower than expected?	Yes. Program activity has decreased since 2012 and 2013, and the program has not met its savings goals for any of the IOUs.
Are the educational or informational goals not meeting program goals?	No. Program awareness is sufficient and participants have reported substantial increases in energy efficiency and home maintenance awareness.
Are the participation rates lower or slower than expected?	Yes. Program activity has decreased since 2012 and 2013, and the program has not met its savings goals for any of the IOUs.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	Yes. The community action agencies have struggled to expend utility funds towards weatherization projects, and there have been substantial delays in data reporting and processing.
Is the program's cost-effectiveness less than expected?	No. The program's cost-effectiveness has been maintained at expected levels.
Do participants report problems with the programs or low rates of satisfaction?	No. Participants in 2012 and 2013 reported very high levels of satisfaction with their participation and with the quality of work performed.
Is the program producing the intended market effects?	Possibly. Overall weatherization activity, including development of additional weatherization programs, has increased since the initiation of the AWP, although attribution to the AWP has not been formally established.

While the timing components indicate that a full process evaluation is not currently necessary, the Evaluators determined that the 2014 evaluation of the AWP calls for a limited process evaluation focusing on specific program areas. These areas are identical to those addressed in the 2013 evaluation and include:

- Program operations and managerial structure;
- Program savings performance; and
- Program participation levels.

In order to address these areas, the Evaluators conducted the following research tasks:

- Tracking database and documentation review;
- Interviews with ACAAA and CADC staff; and
- Utility staff interviews.

Additionally, the Evaluators gained insight into savings performance through the impact evaluation. Results from the TRM verification provided insight into *ex ante* vs. *ex post* savings discrepancies and overall measure savings estimates.

Table 3-3 below summarizes the survey and interview data collection for these process evaluation activities, including data collection type, number of respondents, and additional details.

Table 3-3 Interview and Survey Data Collection Summary

Target	*Component*	*Activity*	*N*	*Details*
Utility Staff	AOG Program Manager and Staff	Interview	3	The program manager and operational staff are responsible for managing reimbursements to local agencies, planning for overall program activity and savings expectations, and communicating with agency and ACAAA staff as necessary throughout the program year.
	OG&E Program Manager and Staff	Interview	3	
	SourceGas Program Manager	Interview	1	
	SWEPCO Program Manager	Interview	1	
	CenterPoint Program Manager	Interview	1	
	EAI Program Manager	Interview	1	
ACAAA Staff	ACAAA Staff	Interview	2	The Energy Policy Coordinator and other ACAAA staff are responsible for coordinating efforts among the local agencies and providing information to the utility program managers.
	CADC Executive Director	Interview	1	CADC serves as the lead community action agency and coordinates program implementation, quality assurance, and data reporting processes.

3.2 Response to Program Recommendations

Table 3-4 summarizes the status of issues and recommendations identified in the 2013 process evaluation and impact evaluation of the Arkansas Weatherization Program. While there have been advances in some areas such as improved communication among utilities and stakeholders, fewer errors in tracking exports, and increased compliance with TRM requirements, several of the issues have persisted through the 2014 program year.

Table 3-4 Status of Recommendations from 2013 Program Year

Issue	Consequences	Recommendation	Program Response	Status of Issue
There have been delays in database finalization due to uncertainties in data interpretation and requirements between CADC and Frontier.	Reduces accessibility to database for utilities Delays savings reporting and may cause inaccurate reports	Resolve issues early in 2014 program year, including data interpretation issues, so that multiple data and database revisions are not necessary.	There appear to have been fewer issues between Frontier and CADC in terms of gathering the required data fields. However, updates to the EnerTrek database, combined with continued delays in receiving data from some agencies resulted in several tracking data revisions and delays.	Partially addressed
Some data are not available due to being only in hardcopy form or decentralized from the CADC.	Potential lost data Potential delays in data transfer if additional data are needed	Agencies should maintain electronic records of all collected audit, implementation, and verification data.	Agencies continue to maintain hardcopy records of data that are not required for savings analysis. Some data are not available in electronic format.	Persists
Communication among utilities and agencies is limited.	Causes difficulties in utility-agency coordination	Recommendation 1: Hold introductory meetings between utilities and the remaining six agencies in order to develop familiarity and identify key contact persons, establish communication lines Recommendation 2: Develop an organizational chart displaying roles, responsibilities, and contact persons for each entity (utilities, agencies, ACAAA, etc.)	Communication among utilities and other stakeholders has improved substantially throughout the meetings and discussions surrounding development of the Unified Weatherization Program Utilities report that roles and responsibilities have for the most part been clarified and that a formal organizational chart is not likely necessary at this point.	Addressed
Some data required for TRM 2.0 and 3.0 do not appear to have been collected.	Creates difficulties in savings verification May result in inaccurate *ex ante* savings estimates if insufficient inputs are used	Ensure that the data collection forms and database are compliant with relevant TRM requirements to the extent possible based on budget constraints.	EnerTrek was updated to contain nearly all necessary fields for calculation of savings under TRM V3.0. Although some inputs were not collected for the first few months of the year, Frontier developed reliable and conservative assumptions in order to allow for savings analysis.	Addressed

Issue	*Consequences*	*Recommendation*	*Program Response*	*Status of Issue*
Utilities are not aware of project details until end of year.	Limits utility ability to plan for annual reporting Limits utility awareness of program performance	Include more details in the periodic reports that are sent to utilities, including measure counts/descriptions, customer names, etc.	The level of detail in monthly and quarterly reports to the utilities from CADC and other agencies has not increased. Measure counts and specific participant information have not been included.	Persists
EnerTrek contains erroneous assumptions for individual measure algorithms (air infiltration, attic insulation, window replacement).	Results in inaccurate *ex ante* savings (in this case savings were highly overestimated) Decreases program realization rates	Frontier should perform thorough quality assurance practices and verify that EnerTrek calculations comply with TRM algorithms.	Calculation errors appear to have decreased for 2014, although there were new errors for a few measures such as refrigerator replacement and air infiltration.	Partially addressed
TRM estimates for Therms savings substantially exceed regression analysis results.	TRM formulas may be inaccurately estimating Therms savings.	Conduct further research into TRM industry standards for weatherization, or perform a more in-depth billing analysis for a larger population, prior to implementing TRM changes for air infiltration or insulation.	No further impact research has been conducted for the AWP, and the billing analysis approach was not used for 2014. Difficulties in isolating the effects of individual measures within regression analysis create challenges for updating individual measure savings algorithms.	Persists

3.3 Program Structure Overview

The overall design, structure, and objectives of the Arkansas Weatherization Program have remained fairly constant throughout 2011-2014. This section provides a summary of current program design characteristics and processes, noting any differences between 2014 and prior program years.

In 2014, the Arkansas Weatherization Program (AWP) provided residential energy audits and energy efficiency measure installations to homes whose residents are customers of one or more of the following investor owned utilities (IOUs):

- American Electric Power – Southwestern Electric Power Company (AEP-SWEPCO);
- Entergy Arkansas, Inc. (EAI);
- Oklahoma Gas and Electric (OG&E);
- Arkansas Oklahoma Gas Corporation (AOG);
- CenterPoint Energy (CenterPoint);
- SourceGas Arkansas (SGA); and
- Empire District Electric Company (EDEC).[15]

The program is offered in conjunction with the Department of Energy (DOE) Weatherization Assistance Program (WAP), which provides federal assistance to fund the customer co-payment in the AWP for income-qualified households. In Arkansas, the WAP is administered by the Arkansas Energy Office (AEO).[16] If the customer meets the eligibility requirements of the WAP, the weatherization project can be funded by both the WAP and the AWP in order to fully cover the project cost and eliminate the cost to the customer.[17] Customers who are not eligible for the WAP are required to provide their own co-pay in order to participate in the AWP and receive the audit and associated measures.

[15] EDEC is a sponsoring IOU of the Arkansas Weatherization Program and has achieved savings through the program in past years, but did not have any projects completed in its service territory during 2014.

[16] The administration of the WAP transitioned to the AEO from the Department of Human Services (DHS) during 2013.

[17] Eligibility for the Weatherization Assistance Program (WAP) is based on income thresholds, which increase with the number of residents in the home. A description of the WAP, along with the associated income requirements, can be found here: http://www.benefits.gov/benefits/benefit-details/1843.

In 2014, 91% of participating AWP customers were eligible to have their projects partially funded through the WAP. This is consistent with prior years, where fewer than 10% of participants provided their own co-payment to participate in the AWP.

Rather than an income requirement, eligibility for the AWP is based on a set of criteria regarding customer residence energy efficiency. In order to qualify, customer homes must meet specific criteria indicating that the residence is severely energy-inefficient. There were no modifications to these criteria for the 2014 program year.

Local community action agencies work with customers to enroll in the program and determine AWP and WAP eligibility. In 2014, qualifying AWP projects were completed by one of five such agencies:

- Central Arkansas Development Council (CADC);
- Crowley's Ridge Development Council (CRDC);
- Crawford-Sebastian Community Development Council, Inc. (C-SCDC);
- Pine Bluff Jefferson County Economic Opportunities Commission, Inc. (PBJCEOC); and
- Community Action Program for Central Arkansas (CAPCA).

In order to qualify for the AWP, customer homes must meet specific criteria indicating that the residence is severely energy-inefficient. Participants must be a residential customer of at least one utility that is involved in the AWP. The program is available only to residences built prior to 1997. Additionally, participant homes must meet three of the following seven criteria:[18]

- Ceiling insulation less than or equal to R-30;
- Wall insulation equal to R-0;
- Floor insulation equal to R-0;
- Single pane windows with no storm windows attached;
- Non-working heating system or heating system with less than 70% AUE;
- Non- working cooling system or cooling system with SEER of 8 or less; and
- Air infiltration problems identified through a) visual inspection of duct-work, walls, floors, ceilings, doors, and windows; or b) pre-blower door test.

[18] Eligibility requirements are taken from AWP program design filed March 15, 2011 with the Commission. These can be found at: http://www.apscservices.info/pdf/07/07-079-tf_62_1.pdf. The Commission Order approving the design was order # 20 located at: http://www.apscservices.info/pdf/07/07-079-tf_76_1.pdf issued on June 30, 2011.

After the customer is approved and the in-home audit is performed, optimal energy efficiency measures for AWP (and WAP, for eligible customers) are identified through the use of National Energy Audit Tool (NEAT) or Mobile Home Energy Audit (MHEA) software. The measures implemented in participating homes during 2014 include:

- Ceiling, floor and wall insulation;
- Air infiltration reduction;
- Window replacement and storm window installation;
- Heating and air conditioning replacement;
- Water heater insulation jackets and pipe wrap;
- Refrigerator replacement;
- CFL retrofits; and
- Smart thermostats.[19]

The local agencies conduct onsite audits and install the necessary measures using their internal crews or subcontractors. Audit and installation crews record all relevant measure input data and report it to the Central Arkansas Development Council (CADC), who aggregates the information from each agency. Batches of data are then sent to Frontier Associates, the program database provider that manages the EnerTrek software tool. EnerTrek incorporates the onsite data into TRM savings formulas (and NEAT/MHEA values for measures not included in the TRM) to calculate *ex ante* savings for each measure. The resulting savings are made accessible to program utilities and EM&V contractors, who use EnerTrek database exports to conduct measure implementation and savings verification activities.

Table 3-5 identifies core program stages and includes key activities performed throughout the program process. The activities and stages shown for 2014 are fairly consistent with those of 2013 and prior years, with modifications to include additional details and clarifications regarding program procedures.

[19] A complete list of all eligible program measures can be found in ACAAA Docket no. 07-079-TF, Attachment A (AWP Modified Program Design and Description).

Table 3-5 Key Activities and Program Stages, 2014 Program Year

Program Stage	*Key Activities*
Program Design Planning	• Utilities set budgets and savings goals for the program year. • Frontier Associates and the participating agencies make any necessary modifications to data collection procedures or program delivery based on TRM changes or other program design changes. • Agencies plan their program activity based on expected WAP funding levels and planned AWP funding.
Training and Implementation Planning	• Community action agencies, contractors, and other program operations staff attend program-relevant training sessions (primarily for new contractor staff) • ACAAA, CADC, and local agencies discuss implementation and program updates (primarily to comply with TRM changes).
Program Promotion	• Agencies market the program to local customers who may provide a private co-pay. • Agencies enroll customers from the WAP wait list. • Utilities answer customer inquiries about the AWP or refer customers to their respective agencies.
Program Participation	• Customers apply for the AWP and home eligibility is determined. • WAP eligibility is determined. • Participants receive in-home audits and measures are identified. • Contractors install measures that are either stipulated based on NEAT or MHEA software or are agreed upon with the customer (depending on whether or not WAP funds are used for the co-pay).
Data Processing and Monitoring	• Measure costs and participant tracking data are collected by each agency and reported to CADC. • CADC provides periodic cost and participation updates to the utilities. • Frontier Associates receives implementation data from CADC and calculates *ex ante* savings • Frontier Associates sends savings data in batches to the utilities. • Utilities, ACAAA, Frontier Associates, and agencies have periodic discussions regarding program participation levels and other topics.

3.4 Arkansas Weatherization Program 2014 Participation

In 2014, the Arkansas Weatherization Program conducted energy audits in 168 homes, and installed energy efficiency measures in 159 homes. This is a substantial reduction in participation from each of the prior program years (291 homes serviced in 2013, 641 in 2012, and 810 in 2011).

Table 3-6 displays total participation disaggregated by the community action agency associated with the participant. As with prior years, CADC was the most active agency within the program, completing 76% of projects (CADC completed 41% of AWP projects during the 2013 program year). Although Black River Area Development Corporation (BRAD) was eligible to complete projects under the AWP during 2014, this agency did not report any program activity.

Table 3-6 Total Participation by Community Action Agency

Agency Name	*Percentage of Participating Homes*[20]
Central Arkansas Development Council (CADC)	75%
Crowley's Ridge Development Council (CRDC)	12%
Crawford-Sebastian Community Development (C-SCDC)	6%
Community Action Program for Central Arkansas, Inc. (CAPCA)	4%
Pine Bluff-Jefferson County Economic Opportunities Commission (PBJCEOC)	4%
N	159

The AWP is offered in all investor-owned utility service territories and is funded by participating gas utilities and electric utilities throughout Arkansas. Depending on the location of customers and the fuel sources used in their homes, services for each customer are funded by one gas utility, one electric utility, or both a gas and an electric utility. Table 3-7 cross-tabulates participation by the gas and/or electric utility associated with the participant. "N/A" represents projects performed in homes with only one utility source or with a utility service provider that is not part of the AWP. This table does not include the audit-only homes that did not receive measures through the program.[21]

Table 3-7 Participation by Associated Utility, 2014

Electric Utility	Gas Utility			
	Arkansas Oklahoma Gas	*CenterPoint*	*Source Gas*	*N/A*
EAI	-	69	1	35
OG&E	2	-	-	1
AEP-SWEPCO	1	4	2	4
N/A	-	33	7	-

Figure 3-1 displays a comparison between 2014 and 2013 in terms of participation rates by month. The number of weatherization projects per month in 2014 was lower than 2013 for all months other than April and June. In contrast to 2013, the majority of projects in 2014 were completed during the first half of the program year. This is likely due to the fact that program activity was delayed in 2013 due to organizational changes related to the restructuring of the Weatherization Assistance Program and the eligible weatherization

[20] Not included in the percentages are eight homes for CADC, and one home for C-SCDC that only received an audit without receiving any measures through the program.

[21] The nine audit only homes were distributed across utility providers as follows: SGA/AEP-SWEPCO: 1 home; CenterPoint/None: 1 home; EAI/None: 1 home; CenterPoint/EAI: 6 homes.

service provider agencies. 2014 did not experience this delay, but program participation slowed substantially towards the end of the program year.

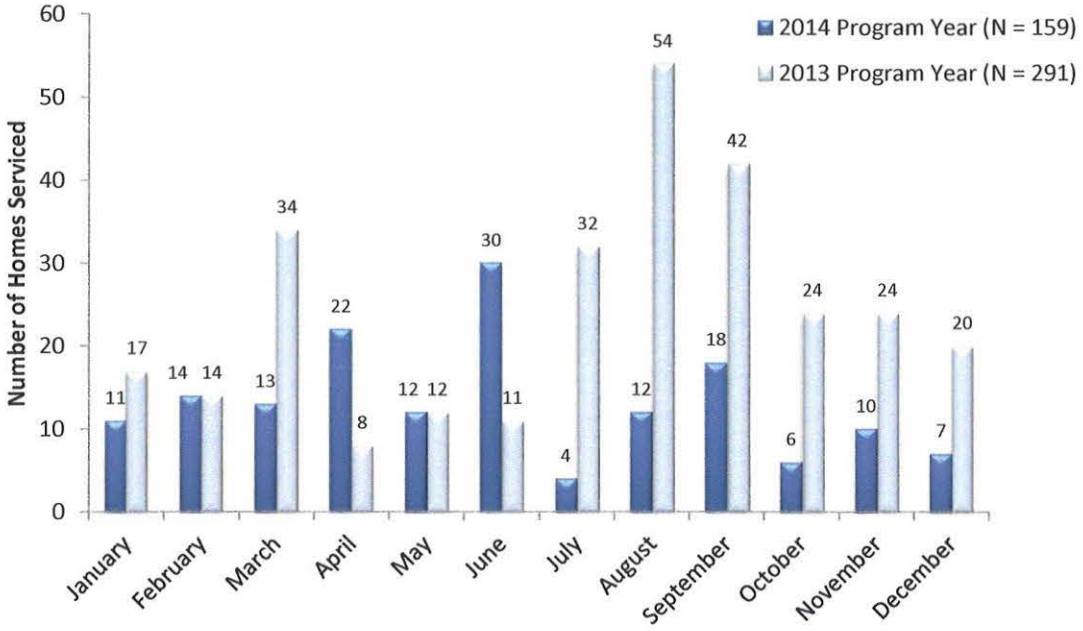

Figure 3-1 Participation Rates by Month, 2014 vs. 2013

The average square footage of participating residences was 1,358 while the median square footage was 1,222. The average number of bedrooms was 2.8, and the average age of participant homes was 47 years. These values are nearly identical to those found for the 2013 and 2012 program years.

3.5 Program Staff Interviews

As part of the evaluation of the 2014 Arkansas Weatherization Program, the Evaluators conducted in-depth interviews with utility staff members involved in managing and operating the program, as well as ACAAA representatives and CADC staff. These interviews primarily served to assess the status of previous evaluation conclusions and recommendations, as well as to identify notable changes in program operation, delivery, and performance. As program performance continued to decrease in 2014, the interviews also addressed possible explanations for persisting program challenges.

This section presents key findings and issues identified through these interviews.

3.5.1 Program Efficiency and Performance

Continued Prioritization of WAP Funding: As with prior years, utility, ACAAA, and CADC staff acknowledged the challenges that have emerged and persisted due to the AWP's relationship with the Weatherization Assistance Program (WAP). The Arkansas

Energy Office (AEO), which administers the WAP, has directed the agencies to follow a specific set of rules in order to comply with WAP procedures. According to CADC and ACAAA, the participating agencies have been directed to prioritize LIHEAP funding over AWP funding when implementing weatherization projects; remaining LIHEAP funds were set to expire on September 30th, 2014. This works as a barrier to participation for the AWP, and was not resolved during 2014.

Persisting Reliance on WAP and AEO Operations: Additionally, program staff noted that the information and guidance from the AEO continually changed throughout the program year with regard to upcoming and existing funding levels and program requirements. As the participating agencies tend to complete weatherization work only when program activity is allowed under the WAP, the AWP is directly affected by any WAP funding delays or work stoppage. Overall, program staff explained that the agencies' ability to complete projects through the WAP has been very unpredictable, which has decreased their overall weatherization activity and constrained AWP participation potential.

Program staff noted that if the WAP had been operating efficiently and the AEO had made efforts to work with the AWP, the program would likely be much closer to its goals. As recruiting private co-pay customers into the AWP has not been very successful thus far, program staff explained that effective coordination between the WAP and AWP is essential for AWP success.

Continued Program Decline: When asked about program performance in 2014 as compared with prior years, utility staff noted that participation rates have steadily decreased during recent years and that very few significant program improvements had been made. Several utility staff members reported that their expectations for AWP performance are very low, and that inherent flaws in the program's design have created strong performance barriers. Utility staff stated that while they are not optimistic about the AWP's future performance, they anticipate that the upcoming Unified Weatherization Program that was developed by the utilities and other stakeholders will be a more effective method of meeting the state's weatherization needs.

Continued Private Co-Payment Issues: When asked about the presence of AWP participants who are not eligible for WAP-funding, the general statement among interviewees was that the AWP has continued to encounter barriers to participation for these customers. As with prior years, staff identified barriers including AWP eligibility requirements, the reliance on WAP funding and participation levels, and the continued customer perspective that the AWP is associated with an income requirement. Overall, utility staff members reiterated their perspectives from prior program years: that they would like to achieve increased participation from private co-payment customers, but that these existing barriers are well-established and difficult to reduce.

3.5.2 Data Quality and Availability

Continued Data Accuracy Issues: With regard to data accuracy, utilities noted that Frontier had made several revisions to individual EnerTrek batches, and that they did not rely on the *ex ante* savings numbers because of likely adjustments within EnerTrek or corrections implemented by the Evaluators. The majority of utility staff reported that there had been no noticeable improvements in data accuracy, and that many of the data issues from prior years appear to have persisted through 2014.

Need for Increased Detail in Agency Reports: Utility staff reported that they have continued to receive periodic program activity updates from CADC. Every quarter, CADC sends a report detailing the number of homes serviced, the amount of program dollars expended to date, and the remaining budget for each utility. Although these reports contain overall cost information, they do not include the measure counts or costs by measure. Utility staff noted that having the measure implementation activity throughout the program year would be helpful for planning purposes.

When asked whether this could be done, CADC noted that it would be possible to provide the utilities with measure-level information (although individual measure savings would not be present until Frontier had processed the data through the EnerTrek system). The Evaluators recommend that the agencies provide measure-level information in the periodic reports to the utilities moving forward.

Continued Hardcopy Documentation: When asked about whether the agencies have begun to record all data electronically, CADC reported that the agencies create electronic reports of the requested data but maintain hardcopy records of all remaining data. In past years where additional measure details were needed late in the program year, this procedure has led to delays in data reporting. However, this was not an issue during the 2014 program year and the agencies were ultimately able to provide all necessary inputs.

Increased Frequency of EnerTrek Reporting: When asked about the quality and frequency of program activity updates from Frontier Associates, several utility staff members noted that Frontier was able to provide full program activity details in batches during 2014. These batches included measure counts, customer information, and *ex ante* savings estimates. Although utility staff noted that they would have preferred more timely or more frequent batches, several staff members acknowledged that the data reporting frequency had improved.

3.5.1 Weatherization Assistance Program Design

Continued WAP Waiting List Issues: During 2013, interview respondents reported that the Arkansas Energy Office may allow for some flexibility within the WAP waiting list for projects that are able to leverage additional funding sources. Program staff explained that customers who are on the WAP waiting list but who also qualify for AWP funds may be

moved to a higher priority on the list. However, program staff noted that the AEO had not made any allowances regarding WAP waiting-list customers who are eligible for the AWP. CADC stated that if the AEO recognizes the benefits of AWP leveraging of WAP funds, both programs would benefit as a result. It is currently unclear whether any such arrangements will be made moving forward, although CADC has made efforts to discuss these issues with AEO staff.

Upcoming WAP Software Tool Update: In terms of changes within the WAP that may have affected the AWP, program staff noted that AEO decided to discontinue the use of the NEAT/MHEA audit tool for the WAP and instead switch to a new software tool. The AWP was initially designed to comply with WAP protocols, and it was estimated that using the same audit tool would be beneficial to agencies that claim both WAP and AWP projects. With the upcoming audit tool change for the WAP, the participating community action agencies have expressed concern about having to use two audit tools.

Program staff noted that if the agencies are required to use different audit tools for the WAP than for the AWP, they may decide to only complete projects through the WAP. This would result in very few, if any, AWP project completions. It is unclear whether this will be an issue during the 2015 program year, as the agencies have not yet been required to adopt the new audit tool and are still allowed to use NEAT/MHEA for WAP projects.

Internal AEO Changes: Program staff explained that there will be several staffing changes in the AEO for 2015, and that this may have an effect on the administration and delivery of the WAP. It is unclear how changes within AEO will ultimately affect the AWP, although increased efficiency and consistency with the WAP would likely benefit the AWP over time. While program staff were not certain about how the WAP will operate in 2015, CADC anticipates that the working relationship between the WAP and AWP may improve moving forward.

Localized Service Provider Interruption: In terms of weatherization service providers, ACAAA and CADC staff explained that the AWP continued to use the same six agencies that were authorized to provide weatherization during the 2013 program year. However, the WAP caused a reconfiguration in the agency service territory and added a seventh, non-agency, service provider in order to provide weatherization in the Pulaski and Lonoke areas. This service provider was ultimately not approved to operate as a weatherization provider due to delays in the state WAP plan, but ACAAA reported that during July through December clients were not receiving service in the affected areas.

At the time of the interview, program staff did not know which agency or organization would be authorized to provide service in the Pulaski and Lonoke areas moving forward. This reconfiguration decreased AWP participation for those counties, and program staff noted that they hope to rectify the lack of participation in these areas in the future if they are allowed to do so.

3.5.2 Communication and Collaborative Efforts

Improved Utility Collaboration through Upcoming Framework Development: Utility staff explained that although coordination of all parties involved in the AWP has been very difficult, the collaboration involved in developing the upcoming Unified Weatherization Program has improved the communication and overall working relationship among the utilities. Several utilities also reported that they are planning to coordinate with other utilities in developing cross-fuel weatherization services under the new framework, and that they expect the new structure to operate more efficiently and effectively.

CADC and EnerTrek Coordination: CADC noted that the cost of updating their audit and implementation data sheets is substantial, and that any updates implemented in the EnerTrek system require the agencies to update these sheets in order to remain compliant with data collection needs. CADC noted that although there were multiple data collection and formatting changes needed during 2014 that potentially caused delays in data reporting, the working relationship with Frontier has been fairly positive.

Transition from ACAAA to CADC Administration: ACAAA explained that moving forward into the 2015 program year, CADC will become the administrator of the AWP and ACAAA will slowly transition away from the program. In anticipation of this change, ACAAA has been training CADC in program operation and annual reporting procedures. Both ACAAA and CADC reported that this process had gone smoothly thus far, and that the two organizations have been able to communicate effectively about the transition.

3.6 Tracking Database Review

As with prior years, Frontier Associates develops and maintains EnerTrek, the software tool that is used to store participant data and to calculate measure level savings based on collected inputs and TRM formulas. EnerTrek includes a full list of all participants, the measures that were installed in their homes, and the kWh and Therms savings associated with each measure.

During the 2014 program year, the Evaluators received periodic tracking data updates as well as final tracking exports.

The EnerTrek system was updated to include necessary inputs as per TRM V3.0 for the 2014 program year. Other than these updates, the structure and content of program tracking data remained consistent with prior years. The Evaluators previously reviewed program tracking data in 2013 in order to assess its compliance with Protocol A of TRM V4.0, which specifies that tracking data should be checked for:

- Participating Customer Information;
- Measure Specific Information;
- Vendor Specific Information;

- Program Tracking Information;
- Program Costs; and
- Marketing & Outreach Activities.

The Evaluators conducted a review of each of the above factors within the 2014 program tracking data with the exception of marketing and outreach activities as these are outside the scope of EnerTrek reporting.

Each of these factors was assessed individually based on the guidelines stated in TRM V4.0. Overall, the Evaluators conclude the following regarding tracking data completeness:

- The tracking data contained names and addresses for all participants, and contained contact information for all but one participant. All participants were listed with a Job ID number. Additional participant information present in the tracking data included gas and electric utility provider designations and utility account numbers.
- All participant records included the name of the agency that implemented the weatherization services, and all records included the date of measure installation with the exception of the nine homes that only received an audit through the program.
- The tracking data included project level costs for each home. The exports received by the Evaluators did not include measure-level costs.
- Premise characteristics such as home heating type, cooling type, construction date, baseline measurements, and attic square footage were present for all participants where necessary.
- The tracking data included sufficient information for the majority of measures as per the requirements of TRM V3.0.

3.6.1 Tracking Data Recommendations

While the content of 2014 tracking data appeared to be for the most part complete, there were a few issues with some measures and fields that should be addressed for future program years. The Evaluators provide the following recommendations for consideration:

- Approximately 10% of homes had a listed gas utility of "None", but were listed as having gas heating. These homes may receive propane service, but for purposes of comprehensive data collection the Evaluators recommend that contractors distinguish between customers who have no gas in their homes from customers who have propane or receive gas from another source.
- Four homes were listed as having CFLs and other measures installed, but did not have associated *ex ante* savings for some measures. It is unclear why *ex ante*

savings were not calculated for these homes but this issue should be investigated for the 2015 program year.

- The tracking data did not include the age of pre-existing equipment for many of the refrigerator replacements, direct vent heaters, and furnace replacements that were implemented. This information should be collected in the future for all homes where the measure is categorized as an early retirement replacement.
- As recommended in prior years, the Evaluators advise participating agencies to record all collected data, including data that are not initially requested for savings calculation, in an electronic format. This may include the presence of window air conditioner units, in-progress construction work, or whether the home configuration required any atypical methods to be performed during the contractor blower door test. These data may be useful during the verification process and storing data electronically will likely reduce reporting delays if additional inputs are requested by Frontier, the utilities, or the Evaluators.

3.7 Review of Agency Participant Surveys

Although the Evaluators did not conduct a survey of AWP participants during 2014, ACAAA provided the Evaluators with the results of participant surveys that were conducted by community action agency service providers. This section summarizes the results of these surveys in order to provide an update regarding customer satisfaction.

As part of their internal record keeping and program evaluation, ACAAA and the local community action agencies administer surveys to customers who have participated in the AWP. The purpose of these surveys is to gather information regarding customer satisfaction, and general feedback from customers regarding their experience with the agencies and program as a whole.

During 2014, the participating agencies submitted a total of 132 AWP satisfaction surveys to ACAAA.

The satisfaction survey asked customers to rate their satisfaction with individual program elements, on a scale of *very satisfied* to *very dissatisfied*. Key findings for each program element included in the survey are as follows:

- **Information Supplied in the Energy Audit:** None of the respondents reported being dissatisfied with the information supplied, and 92% indicated that they were very satisfied with this element.
- **Material Used for Weatherization Work:** None of the respondents reported being dissatisfied with the material used, and 92% indicated that they were very satisfied with this element.
- **Workmanship of the Delivered Services:** None of the respondents reported being dissatisfied with the workmanship of the delivered services, and 92% indicated that they were very satisfied with this element.

- **Speed of Delivered Services:** One respondent indicated that they were *dissatisfied* with the speed of delivered services. The remaining 131 respondents stated that they were either *satisfied* or *very satisfied* with this program element.
- **Weatherization Program as a Whole:** One respondent indicated that they were *dissatisfied* with the AWP as a whole. The remaining 131 respondents stated that they were either *satisfied* or *very satisfied* with the overall program.

These results suggest that participating customers are highly satisfied with the AWP, and that there are no program delivery issues that are negatively affecting the customer experience. This is consistent with the Evaluators' participant survey from 2012, where nearly all respondents indicated that they highly valued the program and that their experience had been positive.

3.8 Comprehensiveness Factors

The Arkansas Public Service Commission has in place a set of criteria in order to determine whether a DSM portfolio qualifies as "Comprehensive". This section provides updates to the review of the Arkansas Weatherization Program that was conducted by the Evaluators in prior years in relation to each factor.

As the AWP is one component of the larger utility energy efficiency program portfolios, a broader perspective is necessary in order to determine how well it is serving its intended role in those groups of programs. Utility annual reports and portfolio evaluations may present the AWP within the context of these broader energy efficiency portfolios. This section focuses on the comprehensiveness factors as they relate to the AWP on the program-level.

Additionally, as there were few changes to program design and operation during the 2014 program year, this review uses the prior comprehensiveness findings as a baseline and provides updates where appropriate.

- ***Factor 1:*** *Whether the programs and/or portfolio provide, either directly or through identification and coordination, the education,* ***training****, marketing, or outreach needed to address market barriers to the adoption of cost-effective energy efficiency measures;*
    - **Assessment of Education**

      The AWP has continued to implement educational efforts towards its prospective participants and other customers. This includes:

        - Providing educational materials (energy audit, brochures, demonstrations)
        - Providing outreach through multiple channels (news releases, in-person, direct mail, informational flyers, website)

- Providing education targeted to specific market barriers (emphasizing increased comfort and safety levels as a benefit of energy efficiency)

As with prior years, improvement is needed for the following component:

- Providing coordinated education from multiple entities. Each agency and some utilities provide this, but based on interviews with agency and utility staff, the coordination could be improved. For example, seeking best practices from agency to agency may lead to a unified and effective educational approach.

- **Assessment of Training**

The active community action agencies have continued to participate in multiple training courses throughout the year. This includes training related to program updates and data requirements, as well as training that leads to residential audit and installation certifications.[22] These courses maintain contractor skill levels and ensure that agency services comply with up-to-date audit and installation requirements.

- **Marketing and Outreach**

The marketing methods that have been used during 2013 meet the following criteria:

- Performed through several channels (in-person, websites, direct mail, word-of-mouth)

Improvement is needed for the following components:

- Promoted by trade allies (agencies and their contractors). Program marketing activity has generally been negatively correlated with the increase in WAP waiting list participants. Agencies could be more active in promoting the program to non-WAP participants, although these efforts appear to have increased during the 2013 program year. [23]
- Address specific barriers. As five of the six participating community action agencies do not mention the AWP in the weatherization sections of their websites, customers who do not meet the WAP income requirement or are willing to provide their own co-payment may not be aware that the AWP option exists. The framing of weatherization as exclusively an income-qualified service is a barrier to the AWP that should be addressed moving forward.

[22] Further training information may be found in the Arkansas Weatherization Program annual report.
[23] Based on program tracking data, a higher percentage (~10%) of participants were non-WAP customers as compared to prior years where less than 5% of participants were non-WAP customers.

- ***Factor 2:*** *Budgetary, Management, and Program Delivery Resources*

  Although utility budget allocations to the AWP are sufficient to fund the targeted number of homes, the AWP has continually experienced challenges in meeting program goals due to organizational and program delivery issues.

  While there are no budgetary issues on the part of the sponsoring utilities, funding issues within the WAP have constrained the AWP's participation potential and effectively reduced program resources.

  As mentioned in prior evaluations, adequate budgetary and staffing levels may not be achieved unless the agencies have access to reliable and sufficient funding through the WAP.

- ***Factor 3:*** *Addressing Major End-Uses*

  The measure list available to the AWP did not change in 2014. The AWP offers a wide range of measures, which are chosen based on cost-effectiveness testing through NEAT and MHEA. The list of eligible program measures covers all major end-uses for targeted customer homes, including:

  - HVAC systems;
  - Equipment tune-ups;
  - Hot water measures;
  - Appliances (refrigerators);
  - Safety measures (smoke detectors);
  - Lighting; and
  - Building envelope measures.[24]

  The "whole house" approach to participant home improvements is conducive to providing a comprehensive set of measures in each home. The eligible measure list may be modified if additional energy efficiency measures become relevant to the residential sector.

- ***Factor 4:*** *Comprehensively Addressing Customer Needs*

  The AWP is designed to comprehensively address the major needs of its participants by providing the following benefits:

  - Technical assistance through in-home audits;
  - Energy and monthly bill savings through measure installation; and
  - Increased comfort and/or safety for participants.

[24] A complete list of eligible AWP measures can be found in program filing and planning documentation such as Attachment A, (AWP Modified Program Design and Description), of ACAAA Docket no. 07-079-TF.

Although the AWP is able to provide these benefits to customers who participate in the program, there remain a large number of utility customers who are in need of such services but whose participation has been delayed due to the program's operational issues.

Participants who provide their own private co-pay for the audit and energy efficiency measures may choose to receive a less comprehensive set of services as they are allowed to select individual measures. These participants are encouraged to install the full set of recommended items, but comprehensiveness within measure installation is not required by the program in these cases.

- ***Factor 5:*** *Targeting Market Sectors & Leveraging Opportunities*

  The AWP focuses on a specific market of utility residential customers whose homes are severely energy inefficient. The AWP also involves utility partnerships and is intended to provide cross-fuel coordination rather than focusing only on gas or electric savings in isolation. This program is intended to amplify the benefits of the statewide Weatherization Assistance Program (WAP) in order to provide additional services to customers who have substantial weatherization needs. Thus, in theory, the program leverages WAP resources and is delivered through the same channels as the WAP.

- ***Factor 6:*** *Cost-Effectiveness of Energy Efficiency*

  There have been no significant improvements to program cost-effectiveness for 2014. Although the program is designed to cost-effectively generate net savings and meet the stated annual program goals, it has been unable to meet the annual goals thus far. Cost-effectiveness has varied widely among utilities in prior years. The AWP has successfully met industry standards for net-to-gross levels, as the Evaluators have determined that it calls for a net-to-gross ratio of 1. However, in terms of cost-effectiveness and savings goals, the AWP has not performed sufficiently.

- ***Factor 7:*** *Adequacy of EM&V Procedures*

  The AWP was reviewed for EM&V procedures in the following areas:

  - QA/QC and EM&V procedures conducted by utility staff;
  - QA/QC and EM&V procedures conducted by installation contractor staff; and
  - QA/QC and EM&V procedures conducted by the Evaluators.

  The onsite QA/QC procedures currently conducted by utility staff and agency staff are adequate. These procedures monitor implementation quality, ensure the accuracy of *ex ante* records, and are able to resolve onsite issues soon after they occur. During onsite field verification visits during 2012, the Evaluators found that the reported installation data was fairly accurate and matched actual observed

conditions for the majority of measures. The issues that were identified during these site visits are detailed in Section 2.6.

Although the issues regarding data consistency, calculation accuracy, and data cleaning have continued into the 2014 year, the current version of the tracking database within EnerTrek contains nearly all necessary information to comply with TRM V3.0 requirements.[25] Frontier Associates, has made efforts to update the system as needed, and although this has resulted in delays and access issues, the finalized tracking data for 2014 were adequate for calculating program savings. There continue to be some improvements that could be made to the tracking system, as identified within this report. Improvements to reports provided by CADC are needed in order to provide utilities with additional program activity information for planning purposes.

The Arkansas Weatherization Program meets several of the comprehensiveness requirements, but issues related to Factors 1, 2, 6, and 7 have persisted through the 2014 program year. In order to address these issues, changes will likely be necessary both within the program's operational structure and within the external market, before these criteria can be fully met. Some of these changes are likely outside the scope of AWP operations and management, as they are caused by the program's connection to the WAP. As previously noted, utility annual reports and other portfolio-level assessments may provide a more comprehensive view of how the AWP fits into the larger context of the sponsoring utilities' energy efficiency program portfolios.

[25] See Section 2.8 of this report for detailed information regarding the program tracking data review.

4. Conclusions and Recommendations

After reviewing the Arkansas Weatherization Program for 2014, the Evaluators highlight the following conclusions:

Continued WAP Reliance Issues: As with prior years, utility, ACAAA, and CADC staff acknowledged the challenges that have emerged and persisted due to the AWP's relationship with the Weatherization Assistance Program (WAP).

Ideally, this arrangement would use utility funds to efficiently leverage federal funding and substantially increase the number of weatherization projects that the agencies are able to perform. However, the AWP's inherent link to the WAP has continued to result in performance issues due to federal funding reductions and statewide program reorganization. Additionally, the participating agencies were directed to prioritize LIHEAP funding over AWP funding when implementing weatherization projects, which is a key barrier to AWP program activity.

The transfer of the WAP to the AEO does not appear to have mitigated any of the AWP's operational or performance issues. It is possible that a more effective working relationship between the AEO and AWP staff will emerge in the future, but thus far the AWP has not been able to consistently leverage funds through the WAP.

Decreasing Program Activity: The number of participants and the resulting savings levels for the AWP have steadily decreased since the 2011 program year. This decline in program activity is likely due to several issues including variable agency engagement in weatherization services, inconsistent availability of WAP funding, and insufficient interest from private co-pay customers. Although program staff has made efforts to mitigate each of these issues in recent years, the major operational challenges affecting the program have not been sufficiently addressed. When asked about potential future participation, utility staff stated that they do not expect program performance to increase, and ACAAA and CADC staff explained that future program success depends heavily on WAP reliability and organization.

Upcoming Unified Weatherization Program: The new weatherization framework developed by the utilities and other stakeholders will establish statewide weatherization procedures and services, starting at the beginning of the upcoming program cycle.[26] Utility staff reported that they anticipate that this Unified Weatherization Program will be a more effective method of meeting the state's weatherization needs. Additionally, utility staff noted that the collaborative relationship among utilities has improved during the development of the new framework. This is not a direct result of the AWP, but does address the utility communication issue discussed in prior evaluation reports.

[26] As 2015 will be another bridge year for the program, the next program cycle will begin, at the earliest, in January of 2016.

Improved Tracking Data Procedures: Frontier Associates has been fairly responsive to past evaluation recommendations and was able to provide utilities with batches of EnerTrek data throughout the program year. Additionally, Frontier Associates corrected the errors that the Evaluators identified in the 2013 evaluation report. Although the Evaluators identified several additional tracking data issues for the 2014 program year, the magnitude and frequency of these issues appears to have decreased. With regard to TRM compliance, Frontier Associates was able to accurately update the EnerTrek system as per TRM V3.0 protocols. There were some late revisions and corrections within EnerTrek after final data had been provided to the utilities, but these were fairly minor.

Continued Limitations of Program Activity Reports: Utility staff stated that the quarterly program activity reports that they receive from CADC have not yet included measure-level information such as measure costs and counts, or specific customer information. It was previously recommended that these details be included in the periodic reports, and CADC noted that it would be possible to do so, but the utilities continued to express their need for additional details throughout the program year. These details would be useful for planning purposes, and would allow the utilities to roughly estimate their expected savings during the year rather than waiting until the EnerTrek reports are distributed.

Continued TRM Update Issues: While the current version of the tracking database contains adequate calculations and inputs for TRM V3.0, the processes of uploading data to the database and updating database structure have continued to be time-consuming and costly. In addition to administrative costs, the time and budget required to retroactively update the database can create barriers to program performance.

In order to fully comply with any future TRM updates, EnerTrek will have to be flexible enough to receive updates without disrupting the data input process or delaying savings reporting. If the update process becomes too costly or time-consuming, it may be more efficient to only update the inputs for the highest-savings measures and use existing inputs for the remaining measures. This may affect program realization rates, but will not affect program net savings as the Evaluators would calculate savings as per the most current TRM.

Weatherization Messaging Issues: In order to assess current program promotion and informational resources, the Evaluators reviewed each utility and agency website for information regarding the AWP. All of the participating utilities currently have a section on their websites describing the program, or providing a link to the website of their local community action agency. However, after reviewing the specific program information provided, the Evaluators found that several utilities provide or link to documents that list more service providers than are currently eligible for weatherization services. Thus, it appears that these program materials are out-of-date.

Upon reviewing the websites of the six participating community action agencies, the Evaluators found that five out of the six agencies provide information about the WAP but

do not discuss the AWP. These five agencies describe weatherization as an income-qualified service, but do not state that there is no income requirement for the AWP or that customers are allowed to provide their own co-payment under this program. This may discourage many prospective participants who are not eligible for enrollment in the WAP from considering the AWP, and may have a negative effect on the number of potential private co-pay customers that are aware of the program.

Based on these conclusions and other findings, the Evaluators provide the following recommendations:

Actively Work with AEO to Develop Program Coordination: As the AWP is closely tied to the operations and performance of the WAP, it is essential for the WAP to acknowledge the AWP as a viable leveraging opportunity. Additionally, maintaining consistency between the WAP and AWP where possible (e.g. with auditing software) will likely increase agency engagement in the AWP and will reduce data collection and reporting issues moving forward. The Evaluators recommend that CADC continue to discuss the existing program issues with AEO staff, and make efforts to create a mutually beneficial relationship.

Resolve Minor Tracking Data Issues: The Evaluators identified several minor issues within program tracking data for the 2014 year. This includes missing *ex ante* savings for some CFLs, missing ages of pre-existing units, and apparent calculation errors for air infiltration and refrigerator replacement savings. The Evaluators recommend resolving these issues in order to maximize potential program savings and maintain expected measure-level realization rates. These issues are further discussed in Sections 2.8 and 3.6 of this report.

Update Program Documentation on Utility and Agency Websites: The Evaluators found that several utilities provide or link to program documents that are out-of-date. The Evaluators recommend that the utilities provide links to updated program documents or include a note that informs customers of the currently active agencies.

Additionally, the Evaluators found that five out of the six agencies provide information about the WAP but do not discuss the AWP. These five agencies describe weatherization as an income-qualified service, but do not state that there is no income requirement for the AWP or that customers are allowed to provide their own co-payment under this program. The Evaluators recommend that each of the participating community action agencies update their websites to include information regarding the AWP, including information clarifying that the AWP does not have an income requirement.

Maintain Electronic Records: As mentioned in the prior report, it would be beneficial for each agency to collect and maintain accessible electronic records of any data that may be requested by Frontier. Alternatively, CADC would aggregate the data from each agency and store it in a centrally accessible way. Situations where there are implementation, audit, or verification data that only exist in hardcopy format at the end of

the program year should be avoided. This would ensure that all relevant data are stored in a single location, and would likely reduce the turnaround time for data requests.

Increase Level of Detail in Utility Updates: As with the prior program year, utility staff reported that the updates they receive from CADC regarding program performance are mainly limited to participant counts and overall costs. Utility staff are not aware which customers participated in the program or which measures were installed until the end of the program year. CADC should increase the level of detail within these reports and include participant names, addresses, measure counts, and other information if possible. This will allow the utilities to identify participants, to understand more about how the program is performing, and to potentially estimate preliminary savings.

Investigate Air Infiltration Reduction Procedures: As discussed in Section 2.6.1 of this report, the Evaluators identified discrepancies between reported air infiltration leakage rates and verified air infiltration leakage rates. In order to potentially address this issue or identify the cause of these discrepancies, the Evaluators provide the following recommendations:

- Include itemized air infiltration measures in tracking data: Thus far, the tracking data have not included information regarding what air sealing measures were installed (e.g. door sweeps, window sealing) in each home, or where they were installed (e.g. back door, bathroom window). Including this information in the program tracking data would allow the Evaluators to determine whether a discrepancy between reported and evaluated leakage could be due to measures becoming damaged, or customers removing measures.
- Include any air infiltration field notes for each home: Due to situational residence characteristics such as whether a fireplace flue is open or closed, or whether the homeowner did not allow the contractor to close a certain window, it is sometimes difficult to recreate the testing conditions that were present for the contractor measurement. Including information regarding any notable characteristics of the testing conditions that should be recreated during the verification process will minimize the potential for situational discrepancies.

Additionally, the Evaluators offer to have a discussion with CADC and the other agencies and their contractors regarding the methodology used during blower door testing in order to ensure that testing is conducted consistently among agencies, and between the agencies and the Evaluators.

Table 4-1 Recommendations from 2014 Program Year Evaluation

Issue	Consequences	Recommendation
Many AWP operational and performance issues are related to WAP operations and WAP requirements for community action agencies.	Restricts agency participation in AWP May create inconsistencies in data collection, leading to potential errors for the AWP	CADC should continue to make efforts to work with the AEO in developing a mutually beneficial working relationship, and maintain consistency between the two programs where feasible.
There were minor tracking data errors such as missing *ex ante* savings, calculation errors, and other missing fields in some cases.	Potentially lost savings Skewed measure-level realization rates	Resolve these tracking data issues for the 2015 program year.
Some utilities provide or link to program documents that are out-of-date. Most of the participating agencies do not discuss the AWP on their websites, and frame weatherization as an income-qualified service.	Customers may gain inaccurate information regarding service providers and other details. May reduce program interest from private co-pay customers.	The utilities should review their website materials and provide links to updated program documentation if possible. The agencies should provide information regarding the AWP on their websites, and explain that the program does not have an income level requirement.

Issue	Consequences	Recommendation
Some data are not available due to being only in hardcopy form or decentralized from the CADC.	Potential lost data Potential delays in data transfer if additional data are needed	Agencies should maintain electronic records of all collected audit, implementation, and verification data.
Periodic program activity updates to the utilities do not include measure level cost data or measure counts.	Limits utility ability to plan for annual reporting Limits utility awareness of program performance	Include more details in the periodic reports that are sent to utilities, including measure counts/descriptions, customer names, etc.
The reported air infiltration leakage rates appear skewed downward, based on the Evaluators' site visits.	Possible issues with measure implementation or data collection Possible discrepancies between implementation and verification that will lead to skewed realization rates.	1: Include itemized air infiltration measures in the tracking data so that the Evaluators are able to verify individual measure elements 2: Include any field notes related to the blower door test in the tracking data so that the Evaluators may more accurately recreate the testing conditions 3: Discuss air infiltration testing procedures with the Evaluators in order to ensure that the testing methodologies are consistent among agencies, their contractors, and the Evaluators.

Attachment C:
ADM's Evaluation of the OG&E/AOG Weatherization Program

Evaluation of 2014 AOG/OG&E Weatherization Program

Submitted to:
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We would also like to thank Independent Evaluation Monitor staff for their active involvement in providing thorough answers and clarification to the evaluation team in response to higher-level questions that arose throughout the EM&V effort.

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1. Executive Summary

The purpose of this report is to provide the methodology and results of the evaluation effort for the 2014 AOG/OG&E Weatherization Program. This evaluation was conducted by ADM Associates (referred to in this report as the Evaluators). This report provides the results of both the impact evaluation and process evaluation activities, presenting verified savings results and tracking program performance and changes in program delivery since the prior program year.

While this report provides a review of previous program findings and recommendations and additional conclusions and recommendations based on the limited process evaluation conducted for the 2014 and 2013 program years, a full process evaluation of the program can be found in the 2012 AOG/OG&E Weatherization Program Evaluation Report.

1.1 Overview of AOG/OG&E Weatherization Program

The general structure of the program has for the most part remained unchanged since the 2013 program year. The following provides a review of program design characteristics and operational procedures.

In 2014, the AOG/OG&E Weatherization Program provided residential energy audits and energy efficiency installations to customers within the service territory of Arkansas Oklahoma Gas Corporation (AOG) and Oklahoma Gas and Electric (OG&E). Participating homes were evaluated in order to determine potential energy efficiency measures that would improve overall building efficiency and reduce residential energy usage. The program provided funds for the installation of various measures, including insulation, lighting, air infiltration, water heater jackets and pipe wrap, and air conditioner replacement.[1]

The AOG/OG&E Weatherization Program is designed to provide utility funds to customers in order to assist customers with the costs of the in-home audit and installation of energy efficiency improvements. Eligible customers receive funds from both AOG and OG&E in this co-funded program. As with the prior program year, total utility funding is a maximum of $3,000 per participant home.

Eligible OG&E customers include homeowners or leaseholders of a single family home, duplex condos, townhouses or mobile home constructed prior to 1997. Participants must

[1] Only one air conditioner replacement was conducted during the 2014 program year.

meet three of the following eligibility criteria, which are identical to the criteria used for the 2012 and 2013 program years.[2]

- Attic insulation less than or equal to R-22;
- Wall insulation equal to or less than R-4;
- Floor insulation equal to R-0;
- Single pane windows with no storm windows attached;
- Heating system less than or equal to 78% AFUE;
- Cooling system with SEER of 10 or less; and
- Air infiltration problems identified through either a pre-blower door test[3] or visual inspection procedures.

The following table reviews core program stages and includes key activities performed throughout the program process. The activities and stages shown for 2014 are fairly consistent with those of prior years, with minor modifications to represent additional details of the program delivery process.

[2] Eligibility requirements are taken from AOG informational materials. Obtained from: https://www.aogc.com/energyefficiency.aspx#aogwp

[3] Measured air infiltration is measured at 50 Pascal (Pa) and must be greater than 2,200 CFM for households of five or fewer occupants, or greater than 2,700 CFM for households of more than five occupants.

Table 1-1 Key Activities and Program Stages, 2014 Program Year

Program Stage	*Key Activities*
Program Design Planning	• AOG and OG&E set budgets and savings goals for the program year. • AOG and OG&E make any necessary modifications to program design or delivery based on TRM changes, annual budgets and goals, or other factors.
Program Training and Promotion	• Contractors and other program operations staff attend program-relevant training sessions as needed (primarily for new contractor staff) • Contractors promote the program through the use of service trucks, uniforms, and in-person promotion. • Program is also promoted on utility websites, and enrollment is facilitated by the Community Services Clearinghouse in Fort Smith.
Program Participation	• Customers apply for the program. • Participants receive in-home audits and potential measures are identified. • One of the three participating contractor firms installs measures, with total utility funds not to exceed $3,000.
Data Processing and Monitoring	• Measures and associated savings are calculated and recorded by Frontier Associates. • AOG and OG&E monitor program progress and cooperate to make program improvements and maintain customer satisfaction. • Program is evaluated through the use of measurement and verification activities.

1.2 Evaluation Objectives

The evaluation of the 2014 AOG/OG&E Weatherization Program consisted of a program savings impact analysis and a limited process evaluation. The primary objectives of this evaluation were to verify reported program savings through TRM verification, and to track program performance characteristics and operational changes since the prior program year. The evaluation activities conducted for the 2014 program year include:

- Review of deemed savings calculations. The Evaluators used the Arkansas Technical Reference Manual, Version 4.0 (TRM) to verify savings calculations for each implemented measure type in order to ensure that *ex ante* measure savings were properly calculated according to TRM protocols.[4]

[4] Although some *ex ante* savings calculations were based on methodologies provided in TRM 3.0, the Evaluators referenced TRM 4.0 for verification purposes as it was the most current version of the TRM at the time of evaluation.

- Tracking database and documentation review. The Evaluators conducted a tracking database review according to the guidelines defined in Protocol A of the TRM.

- On-site field verification. The Evaluators scheduled and conducted site visits to participant homes in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to verify home characteristics such as heating and water heating fuel type.

- Program staff interviews. Interviews were conducted with utility staff who are responsible for designing and managing the program. These interviews primarily served to assess the status of previous evaluation conclusions and recommendations, as well as to identify notable changes in program operation, delivery, and performance.

- Program contractor interviews. Telephone interviews were conducted with each of the three participating contractor firms responsible for conducting audits and implementation of measures through the program. These interviews were designed to gauge contractor engagement and satisfaction with the program, and to identify any changes or challenges associated with modifications to the TRM.

- Participant surveying. Telephone surveys were conducted with a sample of program participants in order to collect data regarding customer satisfaction, participant characteristics, and to identify any issues with program operation or delivery from the customer perspective.

1.3 Summary of Findings

1.3.1 Onsite Verification Results

The Evaluators conducted onsite verification visits to 62 participant homes, supplemented by eight telephone verifications. These site visits were conducted in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to verify home characteristics such as heating and water heating fuel type. The onsite field verification showed that the weatherization measures had for the most part been installed in the quantities reported within program tracking data. Specific notes illustrating the accuracy of program tracking data include:

- **Contact information:** All residences were located at the addresses provided within the tracking data. Although the majority of telephone numbers were found to be accurate during the appointment scheduling and field visit activities, the Evaluators identified a few telephone numbers during the appointment scheduling process that were disconnected or did not belong to a program participant. This was the case for less than 10% of attempted calls, and may be due to customers

changing their telephone numbers or temporarily disconnecting their telephone lines.

- **Air infiltration:** For homes receiving blower door testing for air infiltration, the reported CFM leakage value and measured leakage value closely matched in approximately 90% of cases. There was only one instance where measured leakage was more than 50% greater than reported leakage. Measured leakage was between 20% and 50% greater than reported leakage in approximately 13% of cases.
- **Ceiling insulation:** All reported instances of ceiling insulation were verified. Any identified discrepancies between reported insulation levels and measured insulation levels were very minor and infrequent. Additionally, there were no instances where the reported insulation square footage differed significantly from the observed insulation square footage.

There were a few instances of missing measures or discrepancies between the tracking data and field visit data, including:

- Out of 62 onsite verification visits, there were four cases where the reported heating type did not match the actual heating type found in the home. Additionally, there were three cases where the reported water heating type did not match the actual water heating type (e.g. electric vs. gas) found in the home.
- The measured in-service-rate for CFL bulbs was approximately 93%, as opposed to the 97% direct install in-service-rate specified in TRM 4.0.[5] The Evaluators were unable to locate any CFLs at two of the visited homes, despite the program tracking data reporting CFL installation for both of these homes.
- There were two instances of missing water heater jackets, and one instance of missing water heater pipe wrap. All other water heater measures were verified as being installed correctly.

The two homes with zero CFLs and the three homes with missing water heater measures likely represent data reporting errors, as none of these customers indicated that they had removed the items in question. However, for the water heater items, it is also possible that another resident in the home removed these measures without the knowledge of the site contact. Overall, given the number of program participants, the discrepancies were infrequent and minor and do not appear to indicate any systematic issues with program delivery.

1.3.2 Ex Post Gross and Net Savings Results

For measures implemented through the 2014 program, savings verification was performed according to methodologies described in TRM V4.0. The following table

[5] Out of a total of 1,520 CFLs reported for homes receiving site visits, the Evaluators were able to identify 1,416 CFLs.

identifies the sections in the TRM that were used for verification of measure-level savings under the AOG/OG&E Weatherization Program:

Table 1-2 TRM Sections by Measure Type

Measure Type	TRM Section(s)
Air Infiltration	2.2.9
Ceiling Insulation	2.2.2
CFLs	2.5.1
Window AC	2.1.10
Water Heater Measures	2.3.2, 2.3.3

A net-to-gross analysis for the program was performed during the 2012 evaluation year, resulting in free-ridership and spillover savings estimates. The resulting net-to-gross ratios for gas and electric savings were very close to 1. These estimates were applied to gross savings in the 2012 and 2013 evaluation years. In the 2013 evaluation report, the Evaluators noted that as the gas and electric net-to-gross ratios were very close to 1, and program design and operation have remained constant across program years, it is unnecessary to conduct another net-to-gross analysis unless there are significant program changes that may affect free-ridership or spillover rates.

Additionally, the Evaluators determined that applying a net-to-gross ratio of 1 to the program would be reasonable for the 2014 program year, as free-ridership and spillover rates appear to be minimal and nearly offset one another. Thus, the Evaluators applied a net-to-gross ratio of 1 for the 2014 program year, and gross savings are equal to net savings.

Table 1-3 presents net program savings for AOG and OG&E, including the number of participating homes contributing to the savings totals.[6]

Table 1-3 Ex Post Net Savings, AOG and OG&E

Utility	# of homes	Peak Demand Savings (kW)	Annual Savings (kWh)	Lifetime Savings (kWh)	Peak Demand Savings (Therms)	Annual Savings (Therms)	Lifetime Savings (Therms)
AOG	1,029	-	-	-	4,366.79	204,222.60	3,270,236.90
OGE	1,372	1,086.01	3,679,570.67	49,347,830.77	-	-	-

Table 1-4 presents the net impact by measure for AOG and OG&E. As with Table 1-3, this table includes all electric savings for participating homes serviced by OG&E, and all gas savings for participating homes serviced by AOG where AOG paid a portion of the

[6] During the 2014 program year, OG&E paid the full project cost for 143 participating homes that were serviced by AOG. These 143 homes and their Therms savings are not included in the AOG savings total.

project cost. The table does not include gas savings for the 143 AOG-serviced homes were OG&E paid the full project cost.

Table 1-4 Ex Post Net Savings by Measure Type, AOG and OG&E

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*	*Lifetime Savings (Therms)*	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*	*Lifetime Savings (kWh)*
CFL	-	(4.84)	(27.26)	177.24	1,179,547.53	6,328,593.83
Attic Insulation	1,865.25	113,749.86	2,274,997.29	700.13	1,706,526.79	34,130,535.74
Window AC	-	-	-	0.30	165.07	1,733.20
Air Infiltration	2,480.27	87,445.62	961,901.77	186.58	713,169.34	7,844,862.70
Water Heater Jacket & Pipe	21.28	3,031.96	33,365.10	21.76	80,161.95	1,042,105.31
Total	4,366.79	204,222.60	3,270,236.90	1,086.01	3,679,570.67	49,347,830.77

Ex post savings were based on TRM 4.0 verification of EnerTrek inputs and savings values. Thus, instances of discrepancies between *ex ante* and *ex post* savings were due to EnerTrek using a different TRM or EnerTrek using a different interpretation of TRM 4.0 methodologies. The *ex post* savings calculated by the Evaluators matched the *ex ante* savings reported in EnerTrek for all measures other than CFLs. The reasons for discrepancies between *ex ante* and *ex post* CFL savings are as follows:

- For CFLs installed in 2014 prior to June, EnerTrek CFL savings were based on calculations from TRM 3.0 rather than TRM 4.0. As the Evaluators exclusively referenced TRM 4.0 for savings verification, the *ex post* gross savings for CFLs installed prior to June of 2014 vary from those calculated within EnerTrek.
- EnerTrek calculated annual (first-year) kWh savings for CFLs by first calculating lifetime savings and then dividing by the estimated useful life (EUL). Thus, the annual kWh values calculated by EnerTrek incorporate future CFL baseline changes that will occur as per EISA 2007 guidelines. As the Evaluators calculated annual kWh savings as first-year savings rather than as an increment of lifetime savings, *ex post* CFL savings are on average greater than *ex ante* CFL savings.

A detailed description of the savings verification findings can be found in Section 2.6 of this report.

1.3.1 Conclusions and Recommendations

The AOG-OG&E Weatherization Program was evaluated for overall effectiveness, performance, and design, and the Evaluators developed conclusions with consideration of the seven comprehensiveness checklist factors developed by the Arkansas Public

Service Commission. The key conclusions from the 2014 evaluation of the AOG/OG&E Weatherization Program are as follows:

Very High Participant Satisfaction: The results of the 2014 participant survey suggest that nearly all participants are very satisfied with each element of their program experience. This is consistent with the results obtained during 2012, and with commentary obtained from participants during on-site verification visits in 2013. Although some respondents had issues with the scheduling of their appointment or the level of information provided by the program, instances of dissatisfaction were minimal. There were fewer instances of dissatisfaction in 2014 than 2012.

Increased Contractor Training and Coordination: All three implementation contractors noted that they have pursued additional certifications for their staff members, and that they have participated in training with the utilities for new staff members. Additionally, contractors noted that they do not allow new staff members to conduct site visits without being accompanied by experienced staff members. Additionally, contractors reported that the utilities have been able to provide them with grouped jobs based on weatherization area, and that the contractors have successfully coordinated or traded jobs when necessary in order to increase operational efficiency. These factors reflect a contractor network that is extremely familiar with program requirements and processes, and suggest that contractors will be well suited to meeting any increased program activity or data collection needs that may arise in the future.

Consistent Participant Characteristics: As shown in Section 3.7.5 of this report, there do not appear to have been any significant changes in the demographics or residential characteristics of participating customers since the 2012 program year. The average square footage (Table 3-20), residence age (Table 3-19), and number of bedrooms, bathrooms, showers, and residents per home (Table 3-21) are consistent with the data provided by customers during the 2012 participant survey. Additionally, the distribution of electric and gas heating systems and water heaters among participants (Figure 3-2 and Figure 3-3) has remained fairly constant. There does not appear to have been a shift in participant education levels (Table 3-22), and although participants reported a slightly higher level of income (Figure 3-4) on average than was found during the 2012 program year, the difference is fairly minor and does not indicate a significant change in the participant group at this time.

Benefit of Cross-fuel Participants: AOG fully expended its program budget by late August of 2014, meaning that no additional AOG-only homes will receive service through the program until 2015. This issue is likely to persist in future years, but by focusing on homes that receive utility service from both AOG and OG&E, AOG would be able to fund a greater number of homes and possibly retain some funding for later in the program year.

Overall, this does not necessarily reflect a program performance issue as the program was able to provide services to nearly as many homes as were weatherized in previous

years, and the utilities were able to coordinate their resources in order to prevent delays or interruptions in program delivery.

Minimal Weatherization Framework Transition Effects: The AOG-OG&E Weatherization Program is currently well suited to transitioning into the new statewide weatherization framework that has been developed by the Arkansas IOUs and other stakeholders. As many aspects of this framework referenced the design and operation of the AOG-OG&E program as a successful model, complying with the guidelines of the new framework will likely require few changes to this program. Likely modifications include incorporating additional educational elements into the program and removing the maximum square footage requirement for participating homes, which should be straightforward to implement.

Fairly Adequate Data Collection Procedures: As with the 2013 and 2012 program years, the measure implementation data reported by the installation contractors were found to be fairly accurate and few discrepancies were identified. There were some issues with customer telephone numbers, although the majority of contact information was found to be accurate and usable. The water heating type was not collected for some homes that did not receive water heating measures, although this data may be useful for tracking purposes and potential spillover calculations in future years. However, the discrepancies were infrequent and minor, and do not appear to indicate any systematic issues with program delivery.

Fairly Adequate Database Quality: The Evaluators found the *ex ante* savings values within the EnerTrek database to be accurate for nearly all measures. Additionally, Frontier Associates was very consistent in responding to data requests and correcting errors when necessary. Additionally, there have been improvements within the EnerTrek system to resolve prior data issues and update the database based on TRM requirements. However, the Evaluators identified new minor errors that should be addressed in order to ensure accurate data reporting.

In terms of savings calculations, the EnerTrek database calculated annual savings as an increment of lifetime savings, which incorporated future baseline changes that are not relevant to first-year savings. This issue is further described in Section 2.6 of this report, and resulted in a high realization rate for CFLs. Additional areas to address include tracking data issues described in Section 3.10 of this report.

The AOG/OG&E Weatherization Program was very successful in 2014. The Evaluators identified few specific, systematic or persistent issues with program operation and design. Consideration of the following recommendations may benefit program performance and efficiency in future years:

Include Itemized Air Infiltration Measures: This recommendation was provided in the 2013 evaluation report. The initial home audit data collection form and the post-implementation measure verification form both include fields for detailed measure

information and additional field notes. However, some of this information is not present in the tracking data exports. For example, the air infiltration section on the verification form includes fields to record which specific improvements were made (e.g. window caulking, door sweeps, weather stripping). The actual EnerTrek tracking exports include blower door readings for air infiltration, but do not itemize the air infiltration improvements. Maintaining complete electronic records of all collected data, including any qualitative comments on specific jobs, is beneficial from a program evaluation standpoint especially when onsite verification is conducted. Additionally, uploading all relevant data into a single accessible database will ensure that potentially useful information is not lost or discarded.

Improve Consistency of Contractor Data Collection: Although the data collected by program contractors were found to be very accurate and complete in most cases, there were some minor issues that should be addressed for future years. This includes collecting the water heater type for each home, and collecting a full telephone number for each customer and a secondary telephone number if possible.

Resolve Tracking Data Errors: Although the tracking data were found to be very accurate in most cases, the Evaluators identified several minor issues that should be resolved. This includes savings calculation issues described in Section of this report, and other tracking data issues described in Section 3.10 of this report.

Consider Development of Educational Materials: As the upcoming weatherization framework will likely require AOG and OG&E to incorporate additional educational components into their current structure, it may be useful to anticipate these needs and begin developing educational documentation or tools for future participants. As some participant survey respondents noted that they would have liked to receive additional suggestions for energy efficiency improvements from the installation contractors, there is already a demand for this type of information in the AOG and OG&E customer base. Providing customers with additional suggestions regarding energy efficient improvements, or directing them towards additional sources of information about residential maintenance, would likely benefit the participant base and generate beneficial market effects.

Ensure that Planned Tracking Improvements are Implemented (Ongoing): The Evaluators referenced TRM 4.0 for savings verification during the 2014 program year, although some EnerTrek savings calculations were performed using TRM 3.0. Additionally, TRM 5.0 is currently in development, and this upcoming version may require minor modifications in data collection needs for this program. Frontier Associates was able to incorporate numerous assumptions into the database during the first half of the program year, but revising the system early in the year so that the proper data can be collected is a more accurate approach.

Table 1-5 presents the above items, outlining the relevant issue, potential consequences, and associated recommendations.

Table 1-5 Recommendations from 2014 Program Year Evaluation

Issue	Consequences	Recommendation
Tracking data do not include specific measure details for some items (i.e. whether door sweeps, window sealing, etc. were installed, whether lighting was installed indoors or outdoors)	Difficult to completely inspect measure installation Limits level of detail possible for measure tracking	Include an itemized list of all air infiltration reduction measures installed in each home.
Water heater type and telephone number were not consistently recorded in some cases	Increases difficulty of participant surveying and field verification May have minor limitations on any spillover savings calculations performed for water-saving measures	Consistently record water heater type for all homes, and record full telephone number including area code, and a secondary telephone number if possible.
There were minor tracking data errors such as missing savings for CFLs, incorrect wattage, and a first-year annual savings calculation that incorporated lifetime baseline changes	May cause discrepancies between *ex ante* savings and *ex post* gross savings	Check tracking data for missing inputs and increase database quality control procedures if necessary. Calculate annual savings as first-year savings moving forward.
Program educational materials are fairly limited	Upcoming weatherization framework will likely require additional educational component Some participants may feel that they did not receive enough information regarding home maintenance and EE	Consider developing additional educational materials that installation contractors can provide to customers, or provide additional educational materials on the utility website and direct participants to the page.
EnerTrek calculated some savings with TRM 3.0, such as CFLs in the first half of the program year	May cause discrepancies between *ex ante* savings and *ex post* gross savings	Update EnerTrek with any necessary TRM modifications as early in the program year as possible. Inform contractors of additional data collection needs as soon as they are in place.

1.4 Report Organization

The report is organized as follows:

- Chapter 2 presents the impact findings and discusses the methods used for, and the results obtained from, estimating gross and net savings for the program;
- Chapter 3 presents the results of the process evaluation tasks and additional program findings;
- Chapter 4 presents key conclusions and recommendations from the evaluation of the program; and
- Appendix A presents the survey instrument administered to a sample of 2014 program participants.

2. Impact Evaluation Findings

This section presents the results of the gross savings verification and savings calculation review for the AOG/OG&E Weatherization Program in the 2014 program year.

2.1 Glossary of Terms

As a first step to detailing the evaluation methodologies, the Evaluators provide a glossary of terms to follow:

- *Ex Ante Savings* – Energy savings as determined and reported by program implementers/sponsoring utilities prior to evaluation by EM&V contractor
- *Ex Post Gross Savings* – Energy savings as determined by the EM&V contractor through engineering analysis, statistical analysis, and/or onsite verification
    - *Gross Realization Rate* – Ratio of *Ex Post* Gross Savings / *Ex Ante* Savings
- *Ex Post Net Savings* – *Ex Post* Gross savings x Net-to-Gross Ratio
    - *Net-to-Gross Ratio (NTGR)* = (1 – Free-Ridership % + Spillover %), also defined as *Ex Post* Net Savings / *Ex Post* Gross Savings
    - *Free-Ridership* – Percentage of participants who would have implemented the same energy efficiency measures in a similar timeframe absent the program
    - *Spillover* – Savings generated by a program that are not incentivized. Examples of this include a customer that is introduced to energy efficiency through the program and due to this undertakes other projects for which they do not receive an incentive.
    - *Net Realization Rate* = Ratio of *Ex Post* Net Savings / *Ex Ante* Savings

2.2 Summary of Ex Ante Savings

The AOG/OG&E Weatherization Program generated savings through the implementation of several energy efficient measure types, such as ceiling insulation, CFLs, air infiltration reduction, and water heater insulation. Table 2-1 and Table 2-2 present the overall *ex ante* savings for AOG and OG&E by measure, respectively. These values were obtained from the EnerTrek program tracking database exports that were provided to the Evaluators by Frontier Associates.

These tables include all *ex ante* gas savings for participating homes serviced by AOG where AOG paid at least a portion of the project cost, and all *ex ante* electric savings for participating homes serviced by OG&E where OG&E paid at least a portion of the project cost.

Table 2-1 Ex Ante Savings by Measure Type, AOG

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)
CFLs	-	(12.14)
Air Infiltration	2,482.07	87,567.74
Ceiling Insulation	1,867.59	113,913.79
Window AC	-	-
Water Heater Measures	21.28	3,031.96
Total	4,370.93	204,501.36

Table 2-2 Ex Ante Savings by Measure Type, OG&E

Measure	Peak Demand Savings (kW)	Annual Savings (kWh)
CFLs	150.17	908,196.32
Air Infiltration	186.57	713,983.72
Ceiling Insulation	700.03	1,707,662.28
Window AC	0.30	165.07
Water Heater Measures	21.76	80,161.95
Total	1,058.83	3,410,169.34

The following table presents the remaining *ex ante* gas and electric savings that were not included in the two tables above. This consists of gas and electric savings attributable to municipal utilities, co-op utilities, or other investor owned utilities, which are not sponsors of this program, as well as gas savings from the 143 homes serviced by AOG where OG&E paid the full project cost.

Table 2-3 Ex Ante Savings by Measure Type – Non-Program and AOG Homes Paid by OG&E

Measure	Peak Demand Savings (Therms)	Annual Savings (Therms)	Peak Demand Savings (kW)	Annual Savings (kWh)
CFLs	-	(2.02)	-	-
Air Infiltration	578.27	20,392	43.49	62,405
Ceiling Insulation	454.56	27,719	151.97	211,192
Window AC	-	-	-	-
Water Heater Measures	3.85	554.51	0.85	3,032
Total	1,036.69	48,663.36	196.31	276,628.55

2.3 Ex Post Gross Savings Calculation Methodology

For measures implemented through the 2014 program, savings verification was performed according to methodologies described in TRM V4.0. Table 2-4 identifies the sections in the TRM that were used for verification of measure-level savings under the AOG/OG&E Weatherization Program.

Table 2-4 TRM Sections by Measure Type

Measure Type	*TRM Section(s)*
Air Infiltration	2.2.9
Ceiling Insulation	2.2.2
CFLs	2.5.1
Window AC	2.1.10
Water Heater Measures	2.3.2, 2.3.3

Three measures were responsible for nearly all of the *ex post* gross savings for the AOG/OG&E Weatherization Program: air infiltration reduction, ceiling insulation, and the replacement of incandescent lamps with compact fluorescent lamps (CFLs). The calculation methodologies for these measures are detailed in the following sections. In these examples, energy units are expressed in kWh.

2.3.1 Air Infiltration Reduction Savings Calculations

The deemed savings algorithms in TRM 4.0 for air infiltration reduction were developed through simulation modeling in BEopt, a residential building simulation modeling platform that uses the DOE EnergyPlus simulation engine. Multiple equipment configurations were simulated in each of the four Arkansas weather zones in developing savings values denominated in deemed savings per CFM50 of air leakage rate reduction. The following table summarizes the deemed savings values for Weather Zone 7.

Table 2-5 Deemed Savings Values for Air Infiltration Reduction, Zone 7

Equipment Type	*kWh Savings / CFM50 (ESF)*	*kW Savings / CFM50 (DSF)*	*Therm Savings / CFM50 (GSF)*	*Peak Therms / CFM50 (GPSF)*
Electric AC with Gas Heat	0.190	0.00016	0.0707	0.002181
Gas Heat Only (no AC)	0.053	n/a	0.0747	0.002181
Elec. AC with Resistance heat	1.812	0.00016	N/A	N/A
Heat Pump	0.818	0.00016	N/A	N/A

The following example considers a residence in Weather Zone 7 with electric AC and gas heat. If the residence had a leakage rate of 16,100 CFM_{50} before air infiltration reduction

and a leakage rate of 7,220 CFM_{50} after, then the residence would have an annual gross savings of 1,687 kWh.

$$Air\ Infiltration\ Savings = 0.190 \frac{kWh\ Savings}{CFM_{50}} \cdot \left(16{,}100\ CFM_{50\ pre} - 7{,}220\ CFM_{50\ post}\right)$$

$$Air\ Infiltration\ Savings = 1{,}687\ kWh$$

TRM 4.0 also specifies Minimum Final Ventilation Rates (MVR) and Maximum Pre-installation Infiltration Rates in order to ensure that air infiltration work is performed in accordance with health and safety guidelines and that infiltration reduction is not attempted on homes with prohibitively severe leakage levels.

The MVR specifies the minimum post-installation air infiltration value that can be applied to the deemed savings calculation. If a home's final CFM50 value is below the MVR, the deemed savings calculation for air infiltration reduction on the home is calculated using the MVR rather than the actual post-installation leakage value.

The MVR for a given home is calculated as follows:

$$Min\ CFM50 = [0.01 \times A_{floor} + 7.5 \times (BR + 1)] \times N$$

Where:

Min CFM50 = Minimum final ventilation rate (CFM50)

AFloor = Floor area (ft^2)

BR= Number of bedrooms (must be at least 1)

N = N factor (deemed value based on type of wind shielding and number of stories in home)

With regard to Maximum Pre-installation Infiltration Rate, TRM 4.0 specifies that in order to avoid incentivizing homes with severe building envelope issues that cannot be remedied with typical air infiltration procedures, the baseline pre-installation infiltration rate should be based on a maximum air change rate of 3.0. With this baseline in effect, the maximum allowable pre-installation CFM50 value is calculated as follows:

$$CFM_{50,pre}/ft^2 = \frac{ACH_{Nat,pre} \times h \times N}{60}$$

Where:

CFM50,pre /ft^2 = Per square foot pre-installation infiltration rate (CFM50/ft^2)

ACHNat,pre = Maximum pre-installation air change rate (ACHNat) = 3.0

60 = Constant to convert from minutes to hours

h = Ceiling height (ft) = 8.5 (default)

N = N factor (deemed value based on type of wind shielding and number of stories in home)

If a home's pre-installation infiltration rate exceeds the rate calculated above, the Maximum Pre-installation Infiltration Rate is used for deemed savings calculations.

Additionally, TRM 4.0 specifies a maximum CFM50 per-square-foot value. For deemed savings calculations, pre-installation leakage rates cannot exceed these values.

2.3.2 Ceiling Insulation Savings Calculations

The deemed savings algorithms in TRM 4.0 for ceiling insulation were developed through simulation modeling in BEopt, a residential building simulation modeling platform that uses the DOE EnergyPlus simulation engine. Multiple equipment configurations were simulated in each of the four Arkansas weather zones in developing savings values denominated in deemed savings per square footage of ceiling area. Table 2-6 summarizes the deemed savings values for Weather Zone 8.

Table 2-6 Deemed Savings Values for Ceiling Insulation, Zone 8

Ceiling Insulation Base R-value	*AC/Gas Heat kWh*	*Gas Heat (no AC) kWh*	*Gas Heat (no AC) Therms*	*AC/Electric Resistance kWh*	*Heat Pump kWh*	*AC Peak Savings (kW)*	*Peak Gas Savings[7] (therms)*
	(/ sq. ft.)	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*	*(/ sq. ft.)*
0 to 1	1.8642	0.2203	0.3060	8.734	4.572	0.001393	0.00539
2 to 4	1.0497	0.1215	0.1687	4.846	2.495	0.000765	0.00284
5 to 8	0.6330	0.0728	0.1011	2.909	1.495	0.000461	0.00165
9 to 14	0.3909	0.0446	0.0618	1.784	0.917	0.000293	0.00099
15 to 22	0.1847	0.0216	0.0299	0.858	0.439	0.000131	0.00048

The following example considers a residence in Weather Zone 8 with a heat pump, and a pre-retrofit R-value of ceiling insulation in the range of 9 to 14. If the residence has a ceiling area of 1,200 sq. ft., then the residence would have an annual gross savings of 1,100 kWh.

$$Ceiling\ Insulation\ Savings = 0.917 \frac{kWh}{ft^2} \cdot (1{,}200\ ft^2) = 1{,}100\ kWh$$

TRM 4.0 specifies an efficiency standard of R-38, meaning that in order to qualify for deemed savings the combined R-value of existing and added insulation should be at least R-38.

[7] Data in table are for Blytheville peak. Other Zone 8 peaks can be calculated by multiplying Blytheville peak by the appropriate factor, m. For Jonesboro, m=0.890 (0-1), m = 0.901 (2 to 4), 0.906 (5 to 8), 0.907 (9 to 14), 0.918 (15 to 22). For Fort Smith, m=0.859 (0-1), m = 0.872 (2 to 4), 0.878 (5 to 8), 0.879 (9 to 14), 0.891 (15 to 22).

2.3.3 Compact Fluorescent Lamps (CFLs) Savings Calculations

The deemed savings for compact fluorescent lamps can be calculated by using the following equation.

$$kWh_{savings} = ((Watts_{base} - Watts_{post})/1{,}000)\ x\ Hours\ x\ ISR\ x\ IEF_E$$

The inputs, which assume the following prerequisite knowledge, can be found in Section 2.5.1 of TRM V4.0:

- The quantity and wattages of both pre and post fixtures;
- Whether or not the retrofits were time of sale or direct install (this defines the in-service rate); and
- The heating type of the residence.

For example, if in March 2014 (5) 13W CFLs were directly installed to replace (5) 60W incandescent lamps in a residence with gas heating, the residence would have an annual gross savings of 198 kWh.

$$kWh_{savings} = ((5 \cdot 60 - 5 \cdot 13)/1{,}000 \cdot 792.6 \cdot 0.97 \cdot 1.10 = 198\ kWh$$

TRM 4.0 includes specifications for heating penalties from CFLs in natural gas heated homes, calculated as follows:

$$Therms_{penalty} = \left((W_{base} - W_{post})/1000\right)\ x\ ISR\ x\ IEF_G$$

Where:

IEFg = Interactive Effects Factor to account for gas heating penalties (specified in TRM 4.0 as -0.0063)

TRM 4.0 also accounts for future changes in lighting baselines as per EISA 2007 guidelines. Specifically, TRM 4.0 specifies that the 1st Tier EISA 2007 baselines come into effect in January 2014, and that the 2nd Tier EISA 2007 baselines come into effect in January 2020. These baseline changes affect lifetime savings calculations for CFLs.

As per Protocol E2 of TRM 4.0, the enforcement date for a code or standard update is the end of the current program year if the effective date of the code or standard update is before July 1. Thus, the Evaluators calculated 2014 first-year savings using the Pre-EISA 2007 baseline. Deemed savings for CFLs will be calculated using the 1st Tier EISA baseline beginning in the 2015 program year.

2.4 On-site Verification Procedure

In addition to TRM verification, the Evaluators conducted on-site field verification of a sample of participant homes. This process involved reviewing tracking information and inspecting the completeness and accuracy of the implemented measures. The methodologies for sampling and conducting field visits during the 2014 program

evaluation year are identical to those employed for the 2013 and 2012 evaluations. A summary review of these methods is provided below.

2.4.1 Verification Sampling Methodology

The Evaluators conducted a random sample of participants for the ex-post verification process. The sample size for verification surveys is calculated to meet 90% confidence and 10% precision (90/10).

The main purpose of the verification activity was to determine whether measures were properly installed in the quantities reported in program tracking data. Thus, the coefficient of variation (CV) used for sampling was not based on participant savings but was assumed to be .5, which is a commonly assumed CV value for residential program evaluations. The resulting sample size is estimated at:

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

Where,

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

CV = Coefficient of Variation

RP = Required Precision, 10% in this evaluation

With 10% required precision (RP), this calls for a sample of 68 for programs with a sufficiently large population. In total, the Evaluators scheduled appointments with 72 participants. Due to cancellations and customer absences, Evaluator field staff members were able to conduct on-site visits for 62 program participants. This was supplemented by telephone verification with an additional 8 participants in order to exceed the 68 participant target.

In order to design a sample of homes that was representative of the participant population, the Evaluators attempted to conduct on-site appointments and telephone verifications with homes with different combinations of utility service providers and program installation contractors. This involved conducting site visits and telephone verifications with the following three types of residences:

- Residences serviced by both AOG and OG&E;
- Residences serviced only by OG&E (or by OG&E and a non-participating gas provider); and
- Residences serviced by AOG and a non-participating electric utility.

The following table presents the number of homes receiving verification from the Evaluators for each of the above utility service categories:

Table 2-7 Verifications by Utility Provider Combination

Utility Provider	*Number of Verifications*
Both AOG and OG&E	46
AOG only (with other electric)	9
OG&E only (all-electric)	15
Total	70

Additionally, the Evaluators conducted telephone and on-site verification with homes representing each of the three contractors who conducted audits and measure installation through the AOG-OG&E Weatherization Program during 2014. The following table presents the number of homes receiving verification by which contractor conducted the audit and measure installation:

Table 2-8 Verifications by Installation Contractor

Contractor Name	*Number of Verifications*
Williams Energy Efficiency	29
D K Construction	23
Total Home Efficiency	18
Total	70

2.4.2 Verification Procedure

The primary goal of field verification was to ensure that the reported measures were installed and operating correctly in participant homes. Participants were given VISA or Walmart gift cards for their time; these were in the amount of $20. During the on-site visits, the Evaluators' field technicians accomplished the following:

- Verified the implementation status of the measures; verified that the measures were indeed installed, that they were installed correctly, and were functioning properly. Photographs were taken of most of the installed measures.
- Data collected at each site focused on obtaining more specific information regarding the characteristics of the home where the measures were implemented.

A field visit form was completed for each visited site in order to document measure quantities, home characteristics, and any needed additional commentary regarding the visit. Specifically, the field form included the following fields:

- Home Characteristics: The field engineer documented the type of home (i.e. single story vs. multi-story), number of bedrooms, number of bathrooms, total conditioned area, and heating type.

- Measure Quantity Verification: The engineer documented reported vs. actual quantities of each measure type (i.e. CFLs, water heater measures) and any applicable notes regarding burnt out bulbs or non-operational equipment.
- Insulation Assessment: The field form asks for insulation square footage, the R-value or inches of insulation, and the type of insulation (i.e. blown cell).
- Infiltration Assessment: For homes receiving air infiltration measures, the field engineer conducted a blower door test and recorded ex-post leakage for comparison with reported leakage values.

For the most part, field staff found the reported tracking information to be accurate, and confirmed that nearly all reported measures had been installed completely and correctly. There were few discrepancies between the reported data and actual verified sites. Further information detailing the overall results of the field verification visits can be found in Chapter 3.

2.5 2014 Net Savings Determination

A net-to-gross analysis for the program was performed during the 2012 evaluation year, resulting in free-ridership and spillover savings estimates. The resulting net-to-gross ratios for gas and electric savings were very close to 1. These estimates were applied to *ex post* gross savings in the 2012 and 2013 evaluation years. In the 2013 evaluation report, the Evaluators noted that as the gas and electric net-to-gross ratios were very close to 1, and program design and operation have remained constant across program years, it is unnecessary to conduct another net-to-gross analysis unless there are significant program changes that may affect free-ridership or spillover rates.

Additionally, the Evaluators determined that applying a net-to-gross ratio of 1 to the program would be reasonable for the 2014 program year, as free-ridership and spillover rates appear to be minimal and nearly offset one another. Thus, the Evaluators applied a net-to-gross ratio of 1 for the 2014 program year, and *ex post* gross savings are equal to *ex post* net savings.

2.6 Ex Post Net Savings Results

After reviewing the tracking data and inputs for savings calculations, the Evaluators provided *ex post* net savings according to protocols from the TRM. Savings from the following measures were verified and matched the calculations provided by Frontier Associates through the EnerTrek software tool:

- Air Infiltration
    - Accounts for 21% of *ex ante* kWh savings, and 43% of *ex ante* Therms savings.
- Ceiling Insulation

  - Accounts for 52% of *ex ante* kWh savings and 56% of *ex ante* Therms savings.
- Water Heater Jacket and Water Heater Pipe Wrap
  - Accounts for 2% of *ex ante* kWh savings and 1% of *ex ante* Therms savings.
- Window Air Conditioning
  - Accounts for a very small portion of *ex ante* kWh savings (less than .005%; only one unit was installed).

The savings calculated in this evaluation differed from EnerTrek calculations for CFLs. The reasons for discrepancies between *ex ante* and *ex post* CFL savings are as follows:

- For CFLs installed in 2014 prior to June, EnerTrek CFL savings were based on calculations from TRM 3.0 rather than TRM 4.0. As the Evaluators exclusively referenced TRM 4.0 for savings verification, the *ex post* savings for CFLs installed prior to June of 2014 vary from those calculated within EnerTrek.
- EnerTrek calculated annual (first-year) kWh savings for CFLs by first calculating lifetime savings and then dividing by the estimated useful life (EUL). Thus, the annual kWh values calculated by EnerTrek incorporate future CFL baseline changes that will occur as per EISA 2007 guidelines. As the Evaluators calculated annual kWh savings as first-year savings rather than as an increment of lifetime savings, *ex post* CFL savings are on average greater than *ex ante* CFL savings.

The following table presents the savings results of the evaluation of the 2013 AOG/OG&E Weatherization Program, by measure type. Table 2-9 includes net realized savings by measure for AOG and OG&E. This consists of all gas savings for participating homes serviced by AOG where AOG paid at least a portion of the project cost, and all electric savings for participating homes serviced by OG&E where OG&E paid at least a portion of the project cost.

Table 2-9 Ex Post Net Savings by Measure Type, AOG and OG&E

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*	*Lifetime Savings (Therms)*	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*	*Lifetime Savings (kWh)*
CFL	-	(4.84)	(27.26)	177.24	1,179,547.53	6,328,593.83
Attic Insulation	1,865.25	113,749.86	2,274,997.29	700.13	1,706,526.79	34,130,535.74
Window AC	-	-	-	0.30	165.07	1,733.20
Air Infiltration	2,480.27	87,445.62	961,901.77	186.58	713,169.34	7,844,862.70
Water Heater Jacket & Pipe	21.28	3,031.96	33,365.10	21.76	80,161.95	1,042,105.31
Total	4,366.79	204,222.60	3,270,236.90	1,086.01	3,679,570.67	49,347,830.77

In the AOG/OG&E Weatherization Program, the participating utilities are AOG and OG&E. Typically, the amount that either utility pays for a participating home depends on whether the utility is serviced by AOG, by OG&E, or by both utilities. Weatherization of a home receiving both gas service from AOG and electric service from OG&E would typically be paid for by both AOG and OG&E. However, in the 2014 program year, AOG expended its full program budget by mid-year and OG&E began to pay the full project cost for homes receiving utility service from both AOG and OG&E. This was done for 143 AOG-serviced homes.

For savings allocation purposes, the Evaluators allocate gas savings to AOG for homes where AOG paid at least a portion of the project cost, and electric savings to OG&E for homes where OG&E paid at least a portion of the project cost. Thus, the gas savings from the 143 AOG-serviced homes where OG&E paid the full project cost are not directly attributed to AOG, and are included in the savings totals attributable to non-program utilities such as municipal utilities, co-op utilities, or other investor owned utilities which are not sponsors of this program.

Table 2-10 presents the remaining *ex post* gas and electric savings that were not included in the table above. This consists of gas and electric savings attributable to municipal utilities, co-op utilities, or other investor owned utilities which are not sponsors of this program, as well as gas savings from the 143 homes serviced by AOG where OG&E paid the full project cost.

Table 2-10 Ex Post Net Savings by Measure Type, Non-Program and AOG Homes Paid by OG&E

Measure	*Peak Demand Savings (Therms)*	*Annual Savings (Therms)*	*Lifetime Savings (Therms)*	*Peak Demand Savings (kW)*	*Annual Savings (kWh)*	*Lifetime Savings (kWh)*
CFL	-	(1.56)	(8.29)	-	-	-
Attic Insulation	454.62	27,708.63	554,172.45	151.93	211,156.83	4,223,136.74
Window Air Conditioning	-	-	-	-	-	-
Air Infiltration	578.27	20,392.37	224,316.11	43.67	62,422.42	686,646.70
Water Heater Jacket & Pipe	3.85	554.514	6,114.31	0.85	3,032.05	39,416.64
Total	1,036.75	48,653.95	784,594.58	196.45	276,611.30	4,949,200.08

Table 2-11 presents overall kWh and Therms net realization rates by measure. These net realization rates are representative of all program savings, including all gas and electric savings presented in both Table 2-9 and Table 2-10.

Table 2-11 Overall Net Realization Rates by Measure

Measure	*kWh Net Realization Rate*	*Therms Net Realization Rate*
CFL	130%	45%
Attic Insulation	100%	100%
Window Air Conditioning	100%	-
Air Infiltration	100%	100%
Water Heater Jacket & Pipe	100%	100%

3. Process Evaluation Findings

This chapter presents the key findings from the limited process evaluation that the Evaluators conducted in 2014, including tracking recommendations from prior program evaluations and summarizing updates to program operation and delivery. Additionally, the chapter presents findings from in-depth interviews with program staff and addresses the checklist factors for portfolio comprehensiveness.

3.1 Process Evaluation Considerations

The Evaluators conducted a formal process evaluation of the AOG/OG&E Weatherization Program in 2012 and determined that the program was operating effectively and had been successful in meeting its goals. TRM V4.0 Protocol C addresses the criteria used to determine the timing and conditions needed for a process evaluation, and the following tables summarize the program in the context of these requirements.

Table 3-1 Determining Process Evaluation Timing

Component	*Determination*
New and Innovative Components	No. The program design has not been modified in the past year.
No Previous Process Evaluation	No. A formal process evaluation was conducted in 2012.
New Vendor or Contractor	No. The program continues to use three installation contractors and is otherwise operated by AOG and OG&E jointly.

Table 3-2 Determining Process Evaluation Conditions

Component	*Determination*
Are program impacts lower or slower than expected?	No. The program has consistently met its savings goals.
Are the educational or informational goals not meeting program goals?	No. Program awareness within the customer market has increased, and educational efforts have been successful.
Are the participation rates lower or slower than expected?	No. The program has consistently met its participation goals.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. The prior process evaluation found these structures to be operating efficiently with adequate resources.
Is the program's cost-effectiveness less than expected?	No. The program's cost-effectiveness has been maintained at expected levels.
Do participants report problems with the programs or low rates of satisfaction?	No. Participants have consistently reported high levels of satisfaction with their program experience.
Is the program producing the intended market effects?	Yes. Non-program contractors are being informed of opportunities within the non-participant market. Surveyed participants also appear more aware of energy efficiency in general.

Based on these findings, the Evaluators determined that the 2014 evaluation of the AOG/OG&E Weatherization Program calls for a limited process evaluation. However, the Evaluators determined that it would also be appropriate to conduct a participant telephone survey and interviews with program contractors, as these activities were not conducted for the 2013 program year. Thus, the 2014 limited process evaluation consisted of the following research tasks:

- Tracking database and documentation review;
- On-site field verification;
- Participant surveying to assess current satisfaction levels and energy efficiency engagement; and
- Program utility staff and participating contractor interviews.

Table 3-3 below summarizes the survey and interview data collection for the 2014 program evaluation, including data collection type, number of respondents, and additional details.

Table 3-3 Interview and Survey Data Collection Summary

Target	*Component*	*Activity*	*N*	*Details*
Program Staff	AOG Program Staff	Interview	2	The program manager and operational staff are responsible for coordinating program data, managing program resources, directing installation contractors, and communicating with AOG or OG&E staff as needed during the program process. The audit and installation contractors are responsible for conducting the initial energy assessment of participant homes and completing the installation of recommended measures.
	OG&E Program Staff	Interview	2	
	Participating Contractors	Interview	3	
Program Participants	Telephone Survey	Survey	300	This consisted of a satisfaction questionnaire and a series of questions related to program and energy efficiency awareness and engagement.

3.2 Response to Program Recommendations

Table 3-4 summarizes the status of issues and recommendations identified in the 2013 process evaluation and impact evaluation of the AOG/OG&E Weatherization Program.

Table 3-4 Status of 2013 Evaluation Recommendations

Issue	*Consequences*	*Recommendation*	*Program Response*	*Status of Issue*
Tracking data do not include specific measure details for some items	Difficult to completely inspect measure installation Limits detail possible for measure tracking	Include an itemized list of all air infiltration reduction measures installed in each home.	Air infiltration measure details have not been added to the tracking data exports.	Persists
Limited onsite feedback from participants regarding program awareness and marketing effectiveness	Possible missed opportunities for collecting useful marketing and outreach	Add one or two short questions to the contractor field forms asking how the customer learned of the program and/or what program information they have seen (website, flyers, etc.)	The utilities are aware of how customers learn of the program and do not require additional information from customers at this time.	Reviewed & Not Adopted
Savings value found in the aggregated savings column of the tracking data did not match the sum of the savings. Additionally, some savings calculations did not match TRM protocols.	May cause discrepancies between *ex ante* savings and *ex post* gross savings	Ensure that the summary columns containing savings or other aggregated data match the sum of the individual fields being referenced. Also check to ensure that database calculations match TRM formulas.	Frontier and AOG-OG&E have worked to resolve errors in the tracking database. The errors discovered in the 2013 evaluation have been resolved.	Resolved
Duct sealing measurement requirements conflict with air infiltration measurement requirements in the TRM (must be measured at different pressures)	Discourages implementation and claiming savings of duct sealing with air infiltration Difficult to verify duct sealing savings	Investigate adding duct sealing to common program measures Avoid implementation of duct sealing with air infiltration measures unless measurement procedures can comply with TRM requirements or TRM is updated to facilitate efficient measurement	No modification to measure implementation or adjustment of savings calculations, but no savings claimed for duct sealing	Partially resolved
Some customers are interested in participating but are ineligible due to home age or size	A portion of the customer base may not have access to alternative energy efficiency options	Actively refer ineligible customers to alternative AOG and OG&E energy efficiency programs.	AOG and OG&E refer customers to other opportunities when possible. Home age and size requirements will be modified under new framework	Resolved

3.3 Program Structure Overview

The overall structure and delivery of the AOG/OG&E Weatherization Program has remained fairly constant throughout 2011-2014. This section provides a summary of current program design features and procedures, noting any differences between 2014 and prior years.

Program procedures and participation stages have remained unchanged since the 2013 program year. A program logic model that outlines program processes and phases can be found in the 2013 program year evaluation report.

As with prior years, the 2014 AOG/OG&E Weatherization Program provided residential energy audits and energy efficiency installations to customers within the service territory of Arkansas Oklahoma Gas Corporation (AOG) and Oklahoma Gas and Electric (OG&E). Participating homes were evaluated in order to determine cost-effective energy efficiency measures that would improve overall building efficiency and reduce residential energy usage. The program provided funds for the installation of various measures, including insulation, lighting, air infiltration, and water heater jacket and pipe wrap.

The AOG/OG&E Weatherization Program is designed to provide utility funds to customers in order to fully offset the costs of energy efficiency audits and resulting energy efficiency measures and installations. Weatherization of participating homes is funded by AOG and/or OG&E, depending on the home's utility service provider, in this co-funded program. As with prior years, the utilities jointly cover up to $3,000 of services in participant homes.

The eligibility requirements for the 2014 program year remained unchanged. Eligible OG&E customers include homeowners or leaseholders of a single family home, duplex condos, townhouses or mobile home constructed prior to 1997. Participants must meet three of the following eligibility criteria:[8]

- Attic insulation less than or equal to R-22;
- Wall insulation equal to or less than R-4;
- Floor insulation equal to R-0;
- Single pane windows with no storm windows attached;
- Heating system less than or equal to 78% AFUE;
- Cooling system with SEER of 10 or less; and

[8] Eligibility requirements are taken from AOG informational materials. Obtained from: https://www.aogc.com/energyefficiency.aspx#aogwp

- Air infiltration problems identified through either a pre-blower door test or visual inspection procedures. [9]

These criteria are designed to target severely energy inefficient residences; this helps to ensure that each participating home has the potential to generate a substantial amount of energy savings through the program.

The enrollment procedures for 2014 were consistent with prior years. Customers who are interested in participating in the program contact program staff members to sign up for the in-home audit. Additionally, prospective participants may learn about the program and apply for enrollment through a local community clearinghouse. This clearinghouse informs customers of eligibility requirements, provides informational marketing materials such as flyers, and assists customers with the program enrollment process.

As with the 2012 year, the program currently uses three installation contractors who perform the weatherization and measure implementation services. During the preliminary in-home audit, contractors determine customer eligibility and identify potential energy efficiency measures for the residence. After the measures are installed, utility staff members perform post-inspections in order to verify that all measures have been properly implemented.

3.4 AOG/OG&E Weatherization Program 2014 Participation

In 2014, the AOG/OG&E Weatherization Program serviced a total of 1,649 homes. This is a slight decrease from the 2013 year but is a more homes than were weatherized in 2012 or 2011. Participants received in-home energy audits and one or more of the following measure types:

- 13-17 Watt CFLs;
- Ceiling/attic insulation;
- Window air conditioner;
- Water heater pipe wrap;
- Water heater jacket; and
- Air infiltration reduction improvements.

The audits and measure installation in each home were performed by one of three program contractors. These contractors also conducted post-implementation visits to homes, and utility staff performed quality assurance visits on a sample of residences.

The AOG/OG&E Weatherization Program is offered in the service territories of both utilities, which are estimated to have an overlap of approximately 30,000 customers. Depending on the location of customers and the fuel sources used in their homes,

[9] Measured air infiltration is measured at 50 Pascal (Pa) and must be greater than 2,200 CFM for households of five or fewer occupants, or greater than 2,700 CFM for households of more than five occupants.

services for each customer are funded by AOG, OG&E, or both AOG and OG&E. Table 3-5 cross-tabulates the number of participating homes by utility. As participants were only required to be customers of one of the two participating utilities, some residences in the program were serviced by utilities other than AOG and OG&E. These utilities included municipal utilities, co-ops, or non-participating investor owned utilities.

Table 3-5 Participation by Associated Utility

Electric Utility	Gas Utility	
	AOG	*Other/None*
OG&E	895	477
Other	277	-
OG&E Total	**AOG Total**	**Total Homes**
1,372	**1,172**	**1,649**

Figure 3-1 displays the month of weatherization for homes serviced during the 2014 program year, based on the weatherization date listed in program tracking data. January was the most active month, followed by July. Program activity declined substantially after August of 2014, which is likely primarily due to OG&E being the only funding source for projects after August.

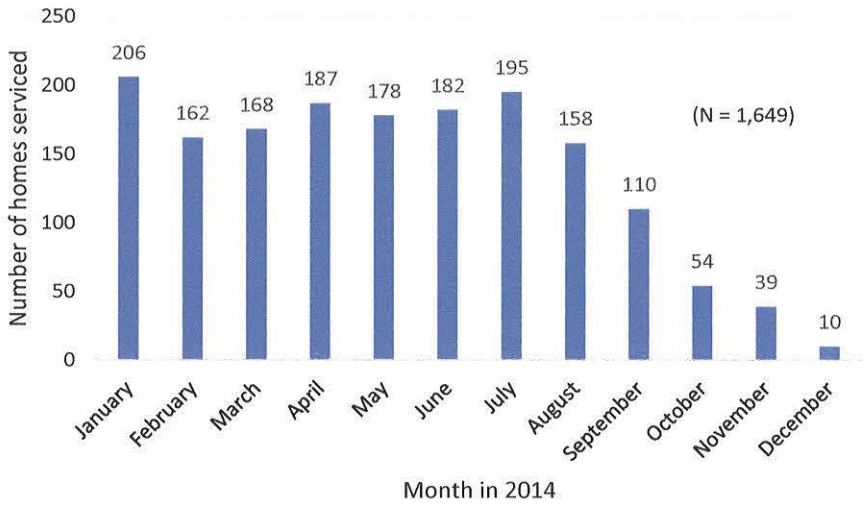

Figure 3-1 Homes Serviced by Month, 2014

Table 3-6 displays the number of 2014 measure installations by measure type for each utility, arranged by the most commonly installed measures.[10] Ceiling insulation was the most common measure type, followed by CFLs and air infiltration.

Table 3-6 Total Implementations by Measure

Measure Type	*Number of attributable installations generating savings*	
	AOG	*OGE*
Ceiling Insulation	914	1,265
Air Infiltration	883	1,224
CFL	696	1,342
Water Heater Jacket/Pipe	536	279
Window AC	-	1
Total	3,029	4,111

There were some variations in measure distribution and measure types implemented in 2014 compared to prior years. The notable differences between 2014 and 2013 measure counts include:

- There was a substantial decrease in the number of water heater jacket and pipe wrap measures installed in OG&E serviced homes (in 2013 there were 1,200 such installations).

[10] The values represent the number of homes receiving the measure, rather than the total number of measures installed at all homes. Thus, the values for CFLs do not present the total number of bulbs installed, but the total number of participants receiving at least one of that measure type.

- All of the CFLs installed during 2014 were in the 13-17w range, while a few homes in 2013 received 26-32w CFLs.
- Only one window air conditioning unit was installed. Although this is a measure that qualifies for savings under the program, and is included in the program's eligible measure list, the installation of window air conditioners is very infrequent in this program.
- There were no refrigerator replacements in 2014. As noted in the prior evaluation report, OG&E determined that refrigerator replacement did not meet the designated savings to investment ratio (SIR) target of 1, and thus this measure was only installed during the first few months of the program year.

Overall, the number of measure installations attributable to AOG decreased from 3,211 in 2013 to 3,029 in 2014. The number of measure installations attributable to OG&E decreased from 5,841 in 2013 to 4,111 in 2014. For AOG, this is primarily due to the 143 participant homes receiving gas service from AOG whose project cost was fully paid by OG&E, as those measure counts were not attributed to AOG. For OG&E, this is likely due to the substantial decrease in installation of water heater measures, as the majority of participant homes serviced by OG&E did not have electric water heaters.

3.5 Utility Staff Member Interviews

As part of the 2014 program evaluation, interviews were conducted with utility staff members responsible for managing and designing the AOG/OG&E Weatherization Program. These interviews primarily served to assess the status of previous evaluation conclusions and recommendations, as well as to identify notable changes in program operation, delivery, and performance.

The primary purpose of the 2014 evaluation interviews is to explore any changes in the program and any new developments over the past year. This evaluation seeks to follow-up on key issues and draw comparisons between program years where appropriate.

These findings are based on utility staff in-depth interviews, as well as program documentation and periodic communications with program staff.

3.5.1 Data Collection and Reporting

Successful Coordination and Error Checking: Utility staff members noted that there were very few issues with data accuracy, program applicant eligibility, or quality of measure installation in 2014. The utilities check participation and enrollment data against their internal databases in order to ensure that the participant is one of their customers and that there are no discrepancies between the data sources. Program staff noted that they are continually improving these internal data verification methods, and that coordination between the two utilities has become very efficient.

No Issues with Data Collection Requirements: Program staff reported that Frontier updated the EnerTrek database to comply with TRM requirements, and that this required some additional data to be collected on-site. Program staff noted that this process had been fairly straightforward and that there we no significant issues with modifying data collection or working with Frontier during 2014.

3.5.1 Program Marketing

Limited Marketing Activities in 2014: Utility staff noted that although extensive program marketing has not been necessary, there were a few periods in 2014 where participation levels decreased. During these periods, the utilities increased program marketing through radio advertisements. Other than these radio advertisements, the program continues to be marketed primarily by the contractors themselves and by word-of-mouth from customers.

3.5.1 Program Implementation

Full OG&E Funding of AOG-OG&E Homes: AOG provided funding for AOG-serviced homes weatherized in the first half of the program year, but had fully expended its program budget by late August. In order to prevent any disruptions in program operation and to continue generating savings, OG&E fully funded all projects that were completed after August of 2014. This resulted in OG&E fully funding the weatherization of 143 homes where AOG was the gas provider. OG&E did not fund weatherization for any homes where OG&E was not the electric provider; any AOG-only homes remaining from 2014 were placed on a reserve list so that they could be weatherized and funded by AOG in the 2015 program year.

AOG Budget Management: As mentioned above, AOG fully expended its program budget by late August of 2014. AOG staff noted that although the utility had been able to fund more projects in prior years by shifting other budget resources towards the AOG-OG&E Weatherization Program, AOG was not able to do this in 2014. Moving forward, AOG staff noted that this would likely be the case for 2015 as well, and that the number of AOG homes weatherized would likely be limited by budget constraints rather than enrollment levels. AOG staff explained that by focusing on homes that receive utility service from both AOG and OG&E, AOG would be able to fund a greater number of homes and retain some funding for later in the program year.

No Change in Installation Contractors: Program staff reported that there have been no changes to the existing group of contractors who implement measures under the AOG/OG&E Weatherization Program. AOG and OG&E continued to use the same three contractor firms for audits and measure installation during 2014 as were used in prior years. The utilities continued to provide training for new contractor staff who joined these firms for the 2014 program year. This training was focused on ensuring that each member of contractor staff was familiar with weatherization procedures, data collection requirements, and overall program processes.

No Significant Contractor Quality Issues: In terms of contractor effectiveness, utility staff reported that there had been very few issues with the quality of work performed by contractor staff, and that the contractors had been able to collect all necessary data to inform savings calculations. As with prior years, interviewed staff stated that the existing three contractor organizations have had sufficient resources to meet program demands, and that there are no current plans to add or remove contractors from the program.

3.5.1 Future Program Design

Upcoming Weatherization Framework Effects: When asked about the new weatherization framework that is currently being developed for the state of Arkansas by the IOUs and other stakeholders, program staff explained that the effects on the AOG-OG&E Weatherization Program will likely be minimal. One modification under the new framework is that the weatherization program will likely not have a maximum square footage requirement for participant homes, meaning that AOG and OG&E will be able to expand program services to customers with larger homes. Additionally, the program will likely incorporate additional educational elements in order to inform the customer base about energy efficiency and home safety and comfort. Overall, AOG and OG&E staff reported that the Arkansas IOUs and other stakeholders have had a positive and effective working relationship during the discussions and design of the upcoming statewide weatherization framework.

Eligibility Requirements: Program staff noted that they are still planning to expand the program's home age requirement from 1997 to 2000, but that this would not be done until the beginning of a new program cycle. Other than this change, program staff did not identify any necessary modifications to program eligibility requirements.

3.6 Audit and Installation Contractor Interviews

The Evaluators conducted telephone interviews with management staff of the three contracting firms responsible for conducting the audit and implementation phases of the program in participant homes. The Evaluators previously conducted interviews with each of these three contractors for the 2012 program year, primarily to gather information regarding contractor procedures and familiarity with program processes.

The interviews conducted for the 2014 program year focused on gaining insight into contractor engagement and satisfaction with the program, to gauge contractor perspectives on any changes that may take place under the upcoming statewide weatherization framework, and to identify any recommendations that contractors may have for program improvement.

This section summarizes the results of the contractor interviews, with findings categorized into key program areas.

3.6.1 Customer Awareness and Engagement

Sufficient Program Awareness and Marketing: When asked about the level of program awareness within the customer market, one contractor explained that many customers are now aware of AOG and OG&E's weatherization services and are interested in participating. Additionally, one of the contractors stated that many customers ask them if the program will continue in future years, as they are interested in referring friends or family members. Contractors noted that they have continued to hand out informational cards and set up yard signs in participants' homes, but that extensive marketing for the program has not been necessary.

Increasing Customer Familiarity with Energy Efficiency: When asked about any trends in the participating customer group, one contractor stated that the most recent participants appear to have a better understanding of energy efficient practices and equipment than previous participants. It is unclear whether this is due to a shift in the type of customers who are participating in the program, or a general market trend within the AOG and OG&E customer base. However, contractor staff noted that participant homes seem better maintained, and that current participants seem more proactive about managing their energy use.

3.6.2 Audit and Implementation Crews

Active Contractor Training and Certification: All three of the contractors reported that their staff members received training during the 2014 program year, both with the utilities and with external organizations. One contractor noted that they have worked in conjunction with Residential Energy Services Network (RESNET) to provide in-house training to their staff members. Another contractor also reported that their lead auditor was recently certified by RESNET, and that they are planning to provide further training to all of their staff members in 2015. Additionally, this contractor stated that they will likely add another auditor to their crew in 2015, who will either be Building Performance Institute (BPI) or RESNET certified.

The third contractor noted that both they and their primary inspector are BPI certified. When asked about the addition of new staff to the audit and installation crews, contractors reported that they always pair experienced staff members with new staff members in order to provide on-the-job training and to ensure that the work is performed properly.

Improved Contractor Coordination and Operational Efficiency: Contractors reported that they continue to meet with the utilities periodically in order to discuss any program changes, participation updates, or other issues. When asked about coordination among the contractors, one respondent reported that the contractors are able to trade jobs with each other in order to more efficiently reach a specific geographic area. It is more efficient for a single contractor to service all of the homes in a given neighborhood, rather than having a contractor crew drive to that neighborhood for a single home. According to

contractors, AOG and OG&E are aware of this and have become more consistent in sending geographically grouped homes to each contractor.

3.6.1 Program Structure and Procedures

Air Infiltration Data Collection: With regard to data collection, one contractor noted that they record all measures that are installed as part of the air infiltration reduction process, such as door sweeps and window caulking. This contractor noted that these items are listed on the invoice that is sent to the utility. During the 2012 and 2013 program year evaluation, the Evaluators recommended that the specific air infiltration measures be included in program tracking data in order to assist the Evaluators' verification and quality assurance procedures, and to track program procedures in greater detail.

Although these measure details have not been included in the EnerTrek data exports, it appears that contractors are consistently collecting this information and that it would be available if needed. Overall, contractors noted that their data collection, audit, and installation procedures had for the most part remained unchanged in 2014, and that any changes had been easily adopted by their staff.

Program Measure Mix: In terms of the measures offered through the program, one contractor explained that a larger budget per home would allow for expansion into new measures such as HVAC retrofits and tune-ups. Another of the contractors explained that the list of measures offered through the program is sufficient, and that customers do not typically ask about receiving additional measures. The only exception to this was that some customers ask about receiving new windows, which is a popular request in residential weatherization programs.

3.6.2 Overall Satisfaction and Expectations

Contractor Satisfaction: When asked about their perception of overall program structure, contractors mainly reported that they were satisfied with the program and that it had been a valuable tool for their business. However, one contractor noted that their operational and equipment costs have been increasing over time, meaning that the amount of work performed per home may decrease unless program budgets per home are increased. Additionally, one contractor explained that they would like to weatherize a larger share of participant homes; this contractor noted that they have enough resources and operational capacity to service at least double the number of homes that they weatherized in 2014.

Future Program Expectations: None of the contractors identified any specific expectations for the upcoming statewide weatherization framework. All three contractors reported that they plan to continue providing weatherization through the AOG and OG&E Weatherization Program, and that they would be able to accommodate necessary changes in data collection, audit, and measure installation procedures.

3.7 Participant Survey Findings

The following section presents key findings from surveys conducted with customers who participated in the 2014 AOG and OG&E Weatherization Program. The participant survey for 2014 was primarily designed to gauge current participant satisfaction levels and to identify any trends in customer characteristics or perspectives from prior program years. Specifically, the 2014 survey results can be compared with the results of the participant survey that was conducted for the 2012 program year.

For 2014, data collected via participant surveying is used in evaluating:

- Sources of customer awareness of the program;
- Customer knowledge of energy efficiency;
- Customer satisfaction with the program; and
- Customer demographics and residence characteristics.

The Evaluators conducted three rounds of surveying for the 2014 program year, obtaining 100 survey responses in each round. Thus, a total of 300 participants responded to the survey.

This section summarizes the 2014 participant survey results and provides comparisons to the 2012 participant survey findings where appropriate. A copy of the 2014 participant survey instrument can be found in Appendix A.

3.7.1 Participant Motivations and Awareness

Participant respondents were first asked about how they learned of the AOG-OG&E Weatherization Program; the distribution of responses is shown in Table 3-7. As with the 2012 participant survey, the majority of participants stated that they learned about the program through their friends, relatives, or other personal acquaintances. This is consistent with the program's marketing strategy, which has primarily relied on word-of-mouth and other forms of indirect promotion. Additionally, eight percent of respondents specifically mentioned that they had seen a program sign in a neighbor's yard.

Table 3-7 How Participants Learned of the Program

	Response	*Percentage of Respondents* (N = 300)*
How did you learn of the Weatherization Program sponsored by AOG and OG&E?	Word of mouth from friends, relatives, or others	66%
	Yard sign	8%
	OG&E bill message	7%
	Newspaper or magazine article/ad	7%
	Other	7%
	Information that came in the mail	5%
	Contractor	4%
	AOG or OG&E website	4%
	AOG bill message	3%
	TV ad	2%
	Retailer / in store	1%
	Don't know	1%
	Radio ad	1%

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

Participants were then asked why they decided to participate in the AOG-OG&E Weatherization Program. Table 3-8 displays the distribution of responses, and respondents were able to provide more than one response.

As with the 2012 participant survey, respondents most commonly indicated that they participated in the program in order to reduce their gas or electric utility bills, and the majority of respondents selected at least one of these options.

When asked which of these factors was the most important in their decision to participate in the program, respondents most commonly reaffirmed that they wanted to reduce their monthly utility bills. Additionally, approximately 20% of respondents noted that the age of their home or their appliances had prompted them to sign up for the program.

Table 3-8 Motivations for Participating in the Program

	Response	*Percentage of Respondents* (N = 300)*
Why did you decide to sign up for the program?	To reduce my monthly electric bill	48%
	To reduce my monthly gas bill	36%
	To save energy	29%
	Other	24%
	AOG and OG&E paid for the improvements	21%
	Recommendation from a friend, relative, neighbor	16%
	It is the right thing to do	16%
	Help save the environment	10%
	Contractor recommendation	5%
	OG&E recommendation or information	4%
	AOG recommendation or information	3%

**Since respondents were able to select more than one response, the sum of the percentages in the table above can exceed 100%.*

In order to gauge any differences between 2014 and 2012 program participants with regard to energy efficiency knowledge and engagement, respondents were asked a series of questions related to their involvement with energy efficiency practices.

As shown in Table 3-9, two-thirds of respondents reported that they were at least somewhat familiar with the benefits of energy efficiency improvements prior to their participation in the program. Only 18% of respondents indicated that they were very unfamiliar with these benefits. This is consistent with the results obtained during the 2012 participant survey effort.

Table 3-9 Prior Customer Awareness of Energy Efficiency Measures

	Response	*Percentage of Respondents (N = 300)*
Prior to the audit, how familiar were you with the benefits of installing various energy efficiency improvements similar to those offered by the AOG and OG&E Weatherization Program?	Very familiar	22%
	Somewhat familiar	44%
	Somewhat unfamiliar	13%
	Very unfamiliar	18%
	Don't know	3%

When specifically asked about their prior familiarity with energy saving activities such as washing with cold water, reducing light fixture use, and adjusting heating settings, only seven percent of respondents indicated that they were somewhat unfamiliar or very unfamiliar with these practices. As Table 3-10 shows, the majority of respondents were confident in their energy efficiency knowledge, although it should be noted that this question may be influenced by a social desirability bias, where respondents select a response that they believe is the most socially acceptable. [11] These results are also consistent with those obtained during the 2012 evaluation.

Table 3-10 Prior Customer Awareness of Energy Saving Behaviors

	Response	*Percentage of Respondents (N = 300)*
Prior to the audit, how familiar were you with various household energy saving activities such as washing with cold water, reducing your use of light fixtures, and adjusting heating system settings?	Very familiar	49%
	Somewhat familiar	43%
	Somewhat unfamiliar	3%
	Very unfamiliar	4%
	Don't know	1%

3.7.2 Participant Energy Efficiency Involvement

In addition to asking about participants' familiarity with energy efficiency, the survey included several questions related to actual energy saving behaviors and purchases that may have taken place prior to the weatherization work being performed. As shown in Table 3-11, two-thirds of respondents indicated that they had previously performed energy saving activities in their home.

When asked to elaborate on these activities, respondents most commonly stated that they use cold water for washing, that they turn off lights when they are not in use, and that they closely monitor their thermostat settings. A few respondents stated that they try to use appliances during off-peak hours. Specific commentary regarding participants' past energy saving behaviors includes:

> *"We used cold water to wash clothes and don't use the dishwasher unless it's full. And we use ceiling fans in almost every room, and we turn off the lights."*

> *"[We are] washing early in the morning and we started using laundry soap that lets you wash in cold water."*

[11] Robinson, J. P., Shaver, P. R., & Wrightsman, L. S. (1991). Measurement and control of response bias. *Measures of social psychological attitudes, 1,* 17-59.

"I limited the temperature on the thermostat. I kept it lower in the winter and higher in the summer."

"[We] just keep the doors shut, keeping the curtains down to keep the heat out."

Table 3-11 Prior Customer Involvement with Energy Saving Behaviors

	Response	*Percentage of Respondents (N = 300)*
Prior to the audit, did you perform any common household energy saving activities? If so, which activities?	Yes	66%
	No	33%
	Don't know	1%

Following this, respondents were asked whether they had purchased and installed any energy efficient measures or equipment prior to participating in the AOG-OG&E Weatherization Program.

Table 3-12 shows that the majority of respondents reported purchasing and using energy efficient measures and/or equipment prior to participating in the program. When asked what they had previously purchased and installed, a high majority of respondents explained that they had purchased CFLs or LEDs. A minority of these respondents stated that they had made larger purchases such as appliances, including refrigerators, washers and dryers, dishwashers, and microwaves. Only a few respondents stated that they had previously made building shell improvements such as replacing windows, adding caulking, or adding insulation.

These results are fairly similar to those obtained during the 2012 program year, with a slight decrease in reported prior experience with energy efficient measures and equipment.[12]

Table 3-12 Prior Customer Involvement with Energy Efficiency Measures

	Response	*Percentage of Respondents (N = 300)*
Before you participated in the AOG and OG&E Weatherization Program, had you purchased and used any energy efficient measures or equipment in your home?	Yes	57%
	No	43%
	Don't know	-

[12] In 2012, 64% of respondents reported purchasing energy efficient equipment or other measures prior to participating in the program.

3.7.3 Post-participation Energy Efficiency Perspectives

In order to gauge participants' perceived benefits from enrolling in the program, respondents were asked whether the program increased their familiarity with energy efficiency. As shown in Table 3-13, 78% of respondents reported that they are now at least somewhat more knowledgeable about energy efficient options for their home than they were before participating in the program. Only eight percent of respondents indicated that the program did not increase their knowledge of energy efficiency.

As with the 2012 program year, these results suggest that participants have gained useful information from program materials, on-site auditors and installation crews, and the overall experience of receiving home improvements through the program.

Table 3-13 Post-participation Familiarity with EE Measures and Behaviors

	Response	*Percentage of Respondents (N = 300)*
As a result of your experience with the AOG and OG&E Weatherization Program, how much more knowledgeable would you say you are about energy efficiency and energy efficient options for your home?	Much more knowledgeable than before participating	37%
	Somewhat more knowledgeable than before participating	41%
	Slightly more knowledgeable than before participating	14%
	No more knowledgeable than before participating	8%

When asked whether they would purchase energy efficient items on their own without an incentive as a result of participating in the program, 90% of respondents indicated that they would do this. Additionally, of the 129 respondents who reported that they had not purchased energy efficient measures prior to participating in the program, 83% stated that they would be likely to do so as a result of participating in the program.

When asked whether they currently take actions to save energy in their homes, such as washing with cold water or managing their lighting loads, 83% of respondents reported that they do conduct such practices. This is an increase from the 66% of respondents who indicated that they performed these activities prior to participating, suggesting that the program is increasing participants' likelihood to consider additional efforts in managing their residential energy usage.

The results for both of these questions are very similar to those obtained during the 2012 evaluation.

Table 3-14 Reported Likelihood to Independently Purchase EE Measures

	Response	*Percentage of Respondents (N = 300)*
As a result of your experience with the AOG and OG&E Weatherization Program, would you buy energy efficient measures in the future, even if financial incentives were not offered?	Yes	90%
	No	10%
	Don't know	-

Table 3-15 Post-participation Energy Efficiency Behaviors

	Response	*Percentage of Respondents (N = 300)*
As a result of your experience with the program, do you now take additional action to save energy in your home, such as wash with cold water, reduce your use of light fixtures, and adjust heating system settings?	Yes	83%
	No	16%
	Don't know	1%

Participants were asked whether they had removed or replaced any of the energy efficiency measures that were implemented through the AOG-OG&E Weatherization Program, with only seven percent of respondents indicated that they had done this. Respondents who provided information regarding what they had removed primarily stated that they had replaced light bulbs. Additionally, one respondent reported that they had removed their water heater blanket, and another respondents stated that they had moved their attic insulation in order to access a portion of their attic.

Table 3-16 Post-participation Measure Replacement

	Response	*Percentage of Respondents (N = 300)*
Since the work was performed, have you removed or replaced any of the equipment or energy efficiency improvements implemented in your home through the program?	Yes	7%
	No	92%
	Don't know	1%

Respondents were then asked whether they had added or repaired any major appliances in their home since the weatherization work was completed. Information regarding customer activity following program participation may provide insight into potential take back and/or snapback effects that can occur. Take back and snapback effects have the potential to skew observed energy savings, such as during billing data analysis.

Only eight percent of respondents reported that they had made major repairs or added a new appliance to their home since the weatherization work was conducted. When asked

to specify what appliances they had purchased, the majority of these respondents explained that they had purchased a new refrigerator, a microwave, a dishwasher, or a washer and dryer.

Respondents who reported repairing an appliance provided a variety of responses, such as repairing windows, replacing plumping, and having their dishwasher or water heater repaired.

The survey then asked participants whether they had had independently implemented energy efficiency improvements in the past year without receiving an incentive for doing so, and the results are displayed in Table 3-17.

Fifteen percent of respondents stated that they had purchased an energy efficient item in the past year without an incentive. These results are very similar to those obtained for the 2012 program year, although a higher percentage of 2012 participants reported purchasing energy efficient measures on their own.[13]

Any non-incentivized measure whose purchase was influenced by the AOG-OG&E Weatherization Program is a potential candidate for contributing to overall program net savings, although spillover savings cannot be attributed to the program without establishing the level of influence that the program had on the purchasing decision. While a formal net-to-gross analysis was not conducted for the 2014 program year, the consistency in survey results suggests that free-ridership and spillover levels have likely remained constant, and minimal, since the initial net-to-gross estimate was developed.

Table 3-17 Potential Spillover Implementation of Energy Efficiency Measures

	Response	*Percentage of Respondents (N = 300)*
In the past year, have you installed any energy efficient equipment in your home, besides those installed through the Weatherization Program, that you have not received an incentive for?	Yes	15%
	No	85%
	Don't know	1%

3.7.4 Participant Satisfaction

Survey respondents were asked about their levels of satisfaction with selected elements of their experience with the 2014 AOG-OG&E Weatherization Program. Results were provided on a scale of *1* to *5*, with *1* representing "very dissatisfied" and *5* representing

[13] In the 2012 program year, 23% of participants reported that they had independently purchased energy efficient equipment without an incentive.

"very satisfied". As displayed in Table 3-18, respondents generally reported high satisfaction levels with the majority of program elements.

Respondents provided the highest satisfaction ratings for the service provided by AOG and OG&E staff, which may also represent their satisfaction with audit and installation crew staff. Similarly, respondents reported very high levels of satisfaction with the quality of installation work conducted and information provided by the contractors. None of the respondents reported being at all dissatisfied with their overall program experience.

Program elements receiving relatively lower satisfaction scores include the wait time to receive program services and the information provided regarding how to reduce the customer's utility bills. Respondents who reported being *somewhat dissatisfied* or *very dissatisfied* with these program elements were asked to provide further information, and examples of their comments include:

- Wait time to receive program services:
    - *"It took a long time, [I] had to apply two times and it took six months to a year for them to come."*
    - *"I think my husband had to call two or three different times, and there was a waiting period."*
    - *"It took about eight months to be scheduled, maybe [I] called at the wrong time of the year."*
    - It should be noted that as the AOG-OG&E Weatherization Program is most active during the beginning and middle of the program year, customers who apply to the program towards the end of the year will not receive services until the beginning of the next program year. The majority of respondents who expressed dissatisfaction with the wait-time to receive services had their homes weatherized in the first three months of 2014, suggesting that they may have applied towards the end of 2013. Alternatively, some of these respondents may have also applied to the Arkansas Weatherization Program, which is also partially funded by AOG and OG&E, and they may be commenting on the waiting period for that program.
- Information provided on how to reduce utility bills:
    - *"I never was provided information."*
    - *"They don't really tell you anything about it. If they send [information] by postal mail, [we have] more of a chance of throwing it away."*
    - *"Well, I just don't know if I ever heard of information on that from them… they need to advertise the program more."*

Although some respondents expressed dissatisfaction with one or more program elements, the overall satisfaction ratings were very positive. Additionally, several

respondents who provided a rating of *somewhat dissatisfied* or *very dissatisfied* later clarified that they were not actually dissatisfied.

Compared to the satisfaction ratings obtained for these program elements in 2012, these results reflect a slightly higher level of satisfaction with all program elements.[14]

Table 3-18 Participant Satisfaction with Selected Program Elements

Element of Program Experience	*Satisfaction Rating (N = 300)*					
	Very satisfied	*Somewhat satisfied*	*Neutral*	*Somewhat dissatisfied*	*Very dissatisfied*	*Don't know*
The service provided by AOG and OG&E staff	81%	13%	2%	1%	1%	3%
The quality of installation work by the contractor	79%	15%	3%	1%	1%	1%
Information provided by the contractor	79%	11%	6%	1%	1%	2%
The performance of the equipment installed	78%	10%	5%	1%	1%	6%
Overall program experience	77%	20%	3%	-	-	-
The effort required for the application process	75%	16%	5%	1%	-	3%
The wait-time to receive the services	69%	17%	7%	4%	-	3%
Usefulness of the energy audit	68%	19%	5%	1%	-	6%
Improvement in home comfort	60%	20%	15%	1%	-	5%
Information provided by AOG and OG&E on how to reduce your utility bills	58%	14%	10%	2%	1%	14%
The savings on your monthly utility bills	39%	20%	19%	1%	-	20%

Following the satisfaction instrument, respondents were given the option to provide open-ended commentary regarding their experiences in the program, their perceptions of AOG or OG&E, or about any other topics related to energy efficiency. The majority of respondents used this opportunity to provide positive commentary about the program; this included expressing the benefits they have gained from participating, and providing praise of program contractors and staff. Specific commentary of this nature includes:

[14] In the 2012 survey effort, there were approximately 40% more instances of *somewhat dissatisfied* and *very dissatisfied* responses.

"I would say it's a fantastic program, efficiency-wise, and I hope that they can continue providing this program… it definitely saves energy and saves you money on your bill."

"I think they are a big help to anybody especially people on a fixed income."

"Whoever they contracted to do the service [was] very polite, efficient, they cleaned up after themselves, and I didn't have to do anything."

"I was very pleased to receive all the weather stripping and caulking and additional insulation."

"Thank you very much… if you need a spokesperson, call me!"

"I feel more comfortable, and the cooling seems to be working better."

Some respondents also provided suggestions for improving the program, or noted items that they would like to see added to the program. Examples of this type of commentary included:

"[I wish] they would check the A/C unit more. It's not working efficiently, and it doesn't cool the house."

"[They] need to do more with the windows and doors."

"Education is a very smart thing to do, just keep that up."

"They should make people more aware of this program by promoting it in a lot of different places."

"I would like to have my thermostat replaced."

"They need to bring back the program where they help to replace the AC unit."

As with the 2012 participant survey, the results from the satisfaction instrument and open-ended portions suggest that nearly all participants are very satisfied with each element of their program experience. Although some respondents had issues with the scheduling of their appointment or the level of information provided by the program, instances of

dissatisfaction were minimal. Overall, it appears that the AOG-OG&E Weatherization Program has continued to provide customers with valuable services and support.

3.7.5 Participant Demographics

This section presents the results of a series of survey questions related to participants' demographics and residence characteristics. Residence characteristics include the age, square footage, heating type, and water heating type of participating homes. Additionally, respondents were asked about the number of bedrooms, bathrooms, showers, and total residents in their homes. There were no significant differences between these results and those obtained for these questions during the 2012 participant survey effort.

Table 3-19 Reported Age of Participant Homes

	Response	*Percentage of Respondents (N = 300)*
When was your home built?	Before 1970's	46%
	1970's	24%
	1980's	15%
	1990-1994	6%
	1995-1999	6%
	2000-2005	-
	2006 or newer	1%
	Don't Know	1%
	Refused	-

Table 3-20 Reported Square Footage of Participant Homes

	Response (in square feet)	*Percentage of Respondents (N = 292)*
What is the approximate square footage of your home?	Less than 1,000	5%
	1,001-1,500	34%
	1,501-2,000	30%
	2,001-2,500	15%
	Greater than 2,500	10%
	Don't know	5%

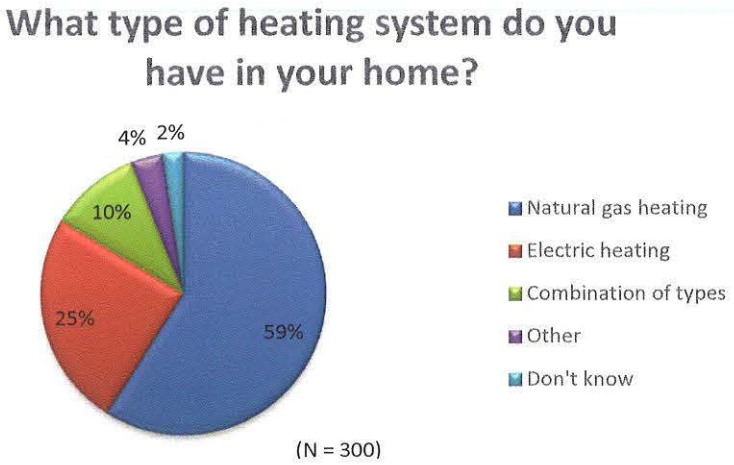

Figure 3-2 Reported Participant Residence Heating Type

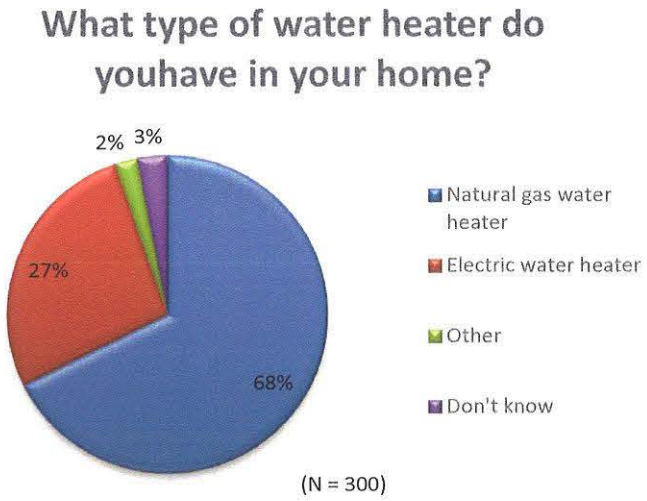

Figure 3-3 Reported Participant Residence Water Heating Type

Table 3-21 Other Reported Participant Residence Characteristics

Residence characteristic type	*Average number reported*	*Median number reported*	*N*
Bedrooms	3.0	3	295
Bathrooms	1.8	2	295
Showers	1.6	2	294
Total residents	2.5	2	295

Figure 3-4 and Table 3-22 display overall participant income and education levels. Demographic and residence metrics may be compared over time in order to identify any patterns or changes in the participant population across program years.

Reported income levels were fairly similar to those found in the 2012 participant survey, with a slight shift towards higher income levels.[15]

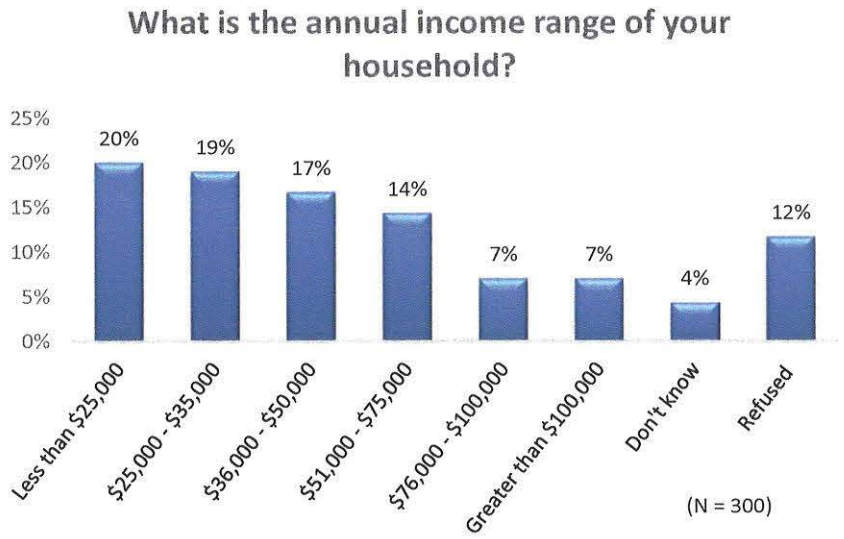

Figure 3-4 Reported Participant Income Ranges

Table 3-22 Reported Participant Education Levels

	Response	*Percentage of Respondents (N = 300)*
What is the highest level of education that you have completed?	Did not graduate high school	5%
	High school graduate	33%
	Associates degree, vocational/technical school, or some college	34%
	Four-year college degree	17%
	Graduate or professional degree	8%
	Don't know	-
	Refused	2%

[15] In the 2012 participant survey, 61% of respondents reported having an income of less than or equal to $50,000.

3.8 Onsite Verification Results

As described in Section 2.4 of this report, the Evaluators conducted onsite verification visits to 62 participant homes, supplemented by eight telephone verifications. These site visits were conducted in order to verify complete and proper measure installation, to conduct post-implementation measurements, and to collect data regarding participant residence characteristics.

This section summarizes the key findings from these field visits, highlighting results from the measure verification tasks and supplemental questionnaire.

3.8.1 Measure Verification Findings

The onsite field verification showed that the weatherization measures had for the most part been installed in the quantities reported within program tracking data. Specific notes illustrating the accuracy of program tracking data include:

- **Contact information:** All residences were located at the addresses provided within the tracking data. Although the majority of telephone numbers were found to be accurate during the appointment scheduling and field visit activities, the Evaluators identified a few telephone numbers during the appointment scheduling process that were disconnected or did not belong to a program participant. This was the case for approximately 30% of attempted calls, and may be due to customers changing their telephone numbers or temporarily disconnecting their telephone lines.
- **Air infiltration:** For homes receiving blower door testing for air infiltration, the reported CFM leakage value and measured leakage value closely matched in approximately 90% of cases. There was only one instance where measured leakage was more than 50% greater than reported leakage. Measured leakage was between 20% and 50% greater than reported leakage in approximately 13% of cases.
- **Ceiling insulation:** All reported instances of ceiling insulation were verified. Any identified discrepancies between reported insulation levels and measured insulation levels were very minor and infrequent. Additionally, there were no instances where the reported insulation square footage differed significantly from the observed insulation square footage.

There were a few instances of missing measures or discrepancies between the tracking data and field visit data, including:

- Out of 62 onsite verification visits, there were four cases where the reported heating type did not match the actual heating type found in the home. Additionally, there were three cases where the reported water heating type did not match the actual water heating type (e.g. electric vs. gas) found in the home.

- The measured in-service-rate for CFL bulbs was approximately 93%, as opposed to the 97% direct install in-service-rate specified in TRM 4.0.[16] The Evaluators were unable to locate any CFLs at two of the visited homes, despite the program tracking data reporting CFL installation for both of these homes.
- There were two instances of missing water heater jackets, and one instance of missing water heater pipe wrap. All other water heater measures were verified as being installed correctly.
- Two customers reported that the contractor did not conduct a blower door test, despite the tracking data indicating pre- and post-implementation CFM values for both homes. However, this may be due to customers not being familiar with blower door tests, or not being home when the work was performed.

3.8.1 Field Visit Summary

As with the 2013 and 2012 program years, the measure implementation data reported by the installation contractors were found to be fairly accurate and few discrepancies were identified. There were some issues with customer telephone numbers, although the majority of contact information was found to be accurate and usable.

The two homes with zero CFLs and the three homes with missing water heater measures likely represent data reporting errors, as none of these customers indicated that they had removed the items in question. However, for the water heater items, it is also possible that another resident in the home removed these measures without the knowledge of the site contact. Overall, given the number of program participants, the discrepancies were infrequent and minor and do not appear to indicate any systematic issues with program delivery.

3.9 Program Quality Assurance Update

During the 2012 evaluation the Evaluators assessed the program's quality assurance and quality control procedures in order to document the QA/QC structure and to identify any opportunities for improvement. Overall, the existing verification methods were found to be sufficient, and there were no changes to quality assurance and control for the 2014 program year.

The Evaluators previously conducted a document review of the field form used during the utility inspection procedures. This form was found to be sufficiently detailed and well suited to the program's QA/QC needs.

As with the 2013 evaluation, utility staff confirmed that no new significant issues were found during verification visits in 2014. The program contractors are now very familiar with program requirements and with the consistent set of implemented measures. Staff members also reported that very few issues had been brought up by participating

[16] Out of a total of 1,520 CFLs reported for homes receiving site visits, the Evaluators were able to identify 1,416 CFLs.

customers during visits or at other points during their participation. These findings confirm that the QA/QC procedures for the AOG/OG&E Weatherization Program have continued to adequately verify measure installation and to sufficiently monitor the quality of work being performed.

3.10 Tracking Database Review

The EnerTrek database system managed by Frontier Associates includes a full list of all AOG-OG&E Weatherization Program participants, the measures that were installed in their homes, and the kWh and Therms savings associated with each measure.

During the 2014 program year, the Evaluators received periodic tracking data updates as well as final tracking exports.

The EnerTrek system was updated to include necessary inputs as per TRM 3.0 and TRM 4.0. Other than these updates, there were no major updates to the structure or content of program tracking data. The Evaluators previously reviewed program tracking data in 2013 in order to assess its compliance with Protocol A of the TRM, which specifies that tracking data should be checked for:

- Participating Customer Information;
- Measure Specific Information;
- Vendor Specific Information;
- Program Tracking Information;
- Program Costs; and
- Marketing & Outreach Activities.

The Evaluators conducted a review of each of the above factors within the 2014 program tracking data with the exception of marketing and outreach activities as these are outside the scope of EnerTrek reporting.

3.10.1 Customer, Premise, Cost, and Vendor Information

Each of these factors was assessed individually based on the guidelines stated in TRM V4.0. Overall, the Evaluators conclude the following regarding tracking data completeness:

- Participating customer information was complete for nearly all participants. This included Job IDs, telephone numbers, addresses, full names, and utility account numbers for AOG and OG&E. The only exception to this was that 13 participants had incomplete telephone numbers, or telephone numbers that did not include an area code.
- All participant records included the name of the installation contractor who performed the implementation as well as the invoice date and weatherization date.

This is an improvement over the prior program year, where a few respondents did not have these fields listed.

- Tracking data included the measure and project costs for each home.
- As with the prior program year, premise characteristics such as home heating type, cooling type, and ceiling square footage were present for all participants where appropriate and needed. However, 416 participants were listed as having a water heating type of "N/A".

3.10.2 Measure Specific Information

The content of tracking data was found to include sufficient information for the majority of measures. However, Frontier Associates did not update the EnerTrek database to comply with TRM updates until June of 2014, so the installation contractors did not collect the necessary inputs for some measures until midyear. In order to calculate savings as per updated TRM guidelines, Frontier Associates developed assumptions for some inputs based on prior program activity, survey data, and conservative estimates. The measures whose inputs were not fully incorporated into EnerTrek until midyear include:

- Water Heater Measures (Water Heater Jacket & Water Heater Pipe Insulation)
  - For water heater pipe wrap, Frontier incorporated assumptions for electric water heater type, the R-value of pipe insulation, the pipe length, and the pipe diameter.
  - For water heater jacket, TRM V4.0 presents savings values as a function of jacket thickness, type of water heating, and tank size. The tracking data did not present jacket thickness or tank size.
- Air Infiltration
  - Frontier incorporated assumptions for wind shielding type and ceiling height. Additionally, as the maximum infiltration rate is based on the number of bedrooms in the home, Frontier incorporated an assumption for number of bedrooms based on home square footage (this assumption was corroborated by past participant survey data).
- Lighting
  - Frontier incorporated assumptions for replacement bulb lumens, the installation location (indoors vs. outdoors), and the wattage of the replacement bulb.
- Attic Insulation
  - Frontier incorporated an assumption for post-installation R-value.
- Window Air Conditioner

- Frontier incorporated an assumption that specified units as louvered, and non-reverse cycle.

The Evaluators identified two minor issues associated with data for CFLs. These issues are as follows:

- Some CFLs were listed in the tracking data as having a post-wattage of 1 Watt. This was assumed to be an error, and these four records were changed to have a post-wattage of 14 Watts.
- There were six homes in the AOG-OG&E tracking data file that reported the installation of CFL bulbs, but did not report *ex ante* savings for those bulbs. It is unclear why savings were not reported for these bulbs.

The tracking database was for the most part well organized. The recommended changes to the tracking data include providing a complete set of calculation inputs and fully capturing customer residence characteristics and contact information.

3.10.3 Tracking Data Recommendations

Although program tracking data were found to be fairly complete and accurate in 2013, the tracking data review for the 2013 program year resulted in several recommendations regarding tracking data accuracy and comprehensiveness. The Evaluators reviewed the 2014 tracking data to assess whether these recommendations had been met, and whether there had been any other changes to tracking data completeness or accuracy.

- The Evaluators previously recommended that additional field notes be added into the tracking database, such as the presence of window air conditioner units, in-progress construction work, or whether the home configuration required any atypical methods to be performed during the contractor blower door test. These notes have not been added to the tracking data as of 2014.
- The Evaluators previously recommended that the tracking data include the specific measures installed as part of the air infiltration reduction process (e.g. door sweeps, window sealing). This information has not been added to the tracking data as of 2014.
- The Evaluators previously recommended that the tracking data include any information collected by installation contractors related to program marketing and customer awareness during their home visits. This information has not been added to the tracking data as of 2014.
- The Evaluators previously recommended that the EnerTrek software be updated to include inputs in order to comply with TRM 3.0 calculation requirements. These inputs were added by the end of 2014.
- The Evaluators previously recommended that the summary columns containing savings or other aggregated data be updated to match the sum of the individual

fields being referenced. This issue appears to have been resolved during the 2014 program year.

The following tracking data recommendations are based on new issues that were not discussed in the prior evaluation:

- The water heater type was listed as "N/A" for 419 homes. Although none of these homes had received water heater jackets or pipe wrap, 300 other homes that had not received these measures did have a listed water heater type. It appears that there is some inconsistency among installation contractors regarding whether to collect water heater type data for homes that do not receive water heater measures. The Evaluators recommend that water heater type be collected for all homes, as this information may be useful in the event of savings spillover calculations for water-saving measures.
- The customer's telephone number should be accurately recorded for each home. Additionally, as the Evaluators identified a substantial number of disconnected or incorrect telephone numbers during the field visit scheduling and surveying process, the Evaluators recommend collecting a secondary telephone number from customers when possible.

3.11 Comprehensiveness Checklist Factors

The Arkansas Public Service Commission has in place a set of criteria in order to determine whether a DSM portfolio qualifies as "Comprehensive". These criteria are:

- ***Factor 1:*** *Whether the programs and/or portfolio provide, either directly or through identification and coordination, the education,* ***training****, marketing, or outreach needed to address market barriers to the adoption of cost-effective energy efficiency measures;*
- ***Factor 2:*** *Whether the programs and/or portfolio, have adequate* ***budgetary****, management, and program delivery resources to plan, design, implement, oversee and evaluate energy efficiency programs;*
- ***Factor 3:*** *Whether the programs and/or portfolio, reasonably address all major* ***end-uses*** *of electricity or natural gas, or electricity and natural gas, as appropriate;*
- ***Factor 4:*** *Whether the programs and/or portfolio, to the maximum extent reasonable, comprehensively address the needs of customers at one time, in order to avoid* ***cream-skimming*** *and lost opportunities*
- ***Factor 5:*** *Whether such programs take advantage of opportunities to address the comprehensive needs of* ***targeted customer sectors*** *(for example, schools, large retail stores, agricultural users, or restaurants) or to leverage non-utility program resources (for example, state or federal tax incentive, rebate, or lending programs)*

- ***Factor 6:*** *Whether the programs and/or portfolio enables the delivery of all achievable,* ***cost-effective*** *energy efficiency within a reasonable period of time and maximizes net benefits to customers and to the utility system;*
- ***Factor 7:*** *Whether the programs and/or portfolio, have evaluation, measurement, and verification "EM&V") procedures* ***adequate*** *to support program management and improvement, calculation of energy, demand and revenue impacts, and resource planning decisions.*

This section provides updates to the review of the AOG/OG&E Weatherization Program that was conducted by the Evaluators in prior years in relation to each factor. It should be noted that this does not provide a portfolio-wide perspective for AOG and OG&E. As noted in the prior evaluation, these criteria are intended to evaluate a portfolio of programs as a whole and assessment of the comprehensiveness checklist factors is best suited to portfolio-level evaluations and reports.

As such, a review of how the AOG/OG&E Weatherization Program fits into the overall utility profile can be found in the Evaluation of 2014 DSM Portfolio Report for AOG. The portfolio report includes the AOG/OG&E Weatherization Program in its tests for portfolio comprehensiveness, assessing the comprehensiveness checklist factors in a cross-program context.

Additionally, as there were few changes to program design and operation during the 2014 program year, this review uses the prior comprehensiveness findings as a baseline and provides updates where appropriate.

- ***Factor 1:*** *Education, Training, Marketing, and Outreach*
    - **Assessment of Education**

      The AOG/OG&E Weatherization Program sufficiently implements educational efforts towards its prospective participants and other customers. This includes:

        - Providing educational materials (flyers, brochures)
        - Providing outreach through multiple channels (in-person, utility websites, community events)
        - Providing education targeted to specific market barriers (focusing on connection between comfort and energy efficiency, demonstrating potential savings from program measures)
        - Providing coordinated education from multiple entities (staff members from both utilities and each of the three program contractors)

      The program has the potential to provide further educational materials to customers during the on-site audit, installation, or verification visits. Providing customers with additional suggestions regarding energy efficient

improvements, or directing them towards additional sources of information about residential maintenance, would likely benefit the participant base and generate beneficial market effects.

- **Assessment of Training**

  As mentioned in utility staff interviews and the utilities' annual energy efficiency reports, the program has continued to provide updated and relevant training to its contractors. Additionally, the contractors have increased their levels of internal training and have pursued BPI and RESNET certifications for their staff members.

- **Marketing and Outreach**

  Program marketing has proven to be conservative in cost and scope but sufficient to recruit a high level of participation. The marketing methods of the program meet the following criteria:[17]

  - Address specific barriers (informing customers that the program is available at no additional cost, demonstrating potential savings and increase in comfort level)
  - Promoted by trade allies (program and non-program contractors inform prospective participants of program services and opportunities)
  - Performed through several channels (in-person, websites, word-of-mouth, radio)

  There are opportunities to expand program marketing to additional channels if participation rates decrease in the future. This could include sending occasional bill inserts or promoting the program through additional non-participating contractors.

- ***Factor 2:*** *Budgetary, Management, and Program Delivery Resources*

  The AOG/OG&E Weatherization Program currently has adequate utility and contractor staffing resources. As can be seen within the utilities' annual reports, program budgets are sufficient to support the savings goals, and the overall program infrastructure is able to meet program demands.[18]

  Although AOG fully expended its budget by August of the 2014 program year, this does not necessarily reflect a budgetary issue, as the program was able to provide services to nearly as many homes as were weatherized in previous years, and the

[17] Appendix A contains specific examples of AOG and OG&E marketing and outreach materials.

[18] Appendix B provides reference tables from AOG and OG&E 2012 annual reports, summarizing annual program budgets and goals.

utilities are able to coordinate their resources in order to prevent delays or interruptions in program delivery.

- ***Factor 3:*** *Addressing Major End-Uses*

  The AOG/OG&E Weatherization Program offers a wide range of measures, which are chosen based on cost-effectiveness testing. The large list of eligible program measures covers all major end-uses for targeted customer homes, including:

  - HVAC systems;
  - Hot water measures;
  - Appliances (refrigerators);
  - Lighting; and
  - Building envelope measures.[19]

  Currently, the program does not implement all of the measures from the eligible measure list (such as refrigerators), and customers have expressed interest in receiving additional services such as HVAC tune-ups. However, the program selects measures based on cost-effectiveness and has selected a group of measures that are well suited to a cross-fuel program.

- ***Factor 4:*** *Comprehensively Addressing Customer Needs*

  The program comprehensively addresses the major needs of its targeted customer market by providing several benefits to participants. The program provides services to customers who likely would not otherwise make major efficiency improvements to their homes, and may not have the opportunity to participate in other utility-sponsored energy efficiency programs. Specifically, the program provides the following benefits:

  - Technical assistance through in-home audits;
  - Energy and monthly bill savings through measure installation; and
  - Increased comfort and/or safety for participants.

- ***Factor 5:*** *Targeting Market Sectors & Leveraging Opportunities*

  Consistent with prior years, the AOG/OG&E Weatherization Program focuses on a specific market of utility residential customers whose homes are sufficiently energy inefficient. This is an important program in the residential sector of portfolio offerings. The AOG/OG&E Weatherization Program is also an example of utility leveraging of available partnerships: AOG and OG&E have successfully engaged in cross-fuel coordination in order to provide combined benefits to customers of one or both utilities.

[19] A complete list of eligible measures for the AOG-OG&E Weatherization Program can be found in utility documentation such as filing documents and annual reports (for example: http://www.apscservices.info/pdf/07/07-075-tf_75_1.pdf)

- ***Factor 6:*** *Cost-Effectiveness of Energy Efficiency*

  The program is designed to cost-effectively generate net savings and meet the stated annual program goals. It has been successful in these efforts thus far, meeting specific criteria such as:

  - Meeting net savings goals (overall program net-to-gross ratio is 1, program has met goals through 2014);
  - Meeting industry norms for net-to-gross (expected net-to-gross of approximately 1); and
  - Meeting cost-effectiveness goals (the program is designed to meet cost-effectiveness on the measure level and as a whole, and has been successful in doing so).[20]

- ***Factor 7:*** *Adequacy of EM&V Procedures*

  The AOG/OG&E Weatherization Program was reviewed for EM&V procedures in the following areas:

  - QA/QC and EM&V procedures conducted by utility staff;
  - QA/QC and EM&V procedures conducted by installation contractor staff; and
  - QA/QC and EM&V procedures conducted by the Evaluators.

  As stated previously, the quality assurance and verification procedures currently conducted by utility staff and installation contractors are adequate for monitoring implementation quality and ensuring the accuracy of *ex ante* installation records.

  The Evaluators' field data were fairly consistent with reported tracking data values, indicating that overall measure implementation is recorded accurately and consistently.[21] There were some issues with missing or incorrect data, but the Evaluators have provided recommendations regarding these issues. [22] Program staff has historically been very responsive in resolving data issues, and have been very responsive to data collection needs.

These results indicate that the AOG/OG&E Weatherization Program continues to contribute to utility portfolio comprehensiveness as a residential services offering. As mentioned above, a full review of the utilities' portfolio comprehensiveness checklist factors can be found in the utilities' portfolio-wide evaluation reports.

[20] Further information regarding program cost-effectiveness can be found in utility-specific cost-benefit spreadsheets on the Arkansas Public Service Commission (APSC) website: http://www.apscservices.info/eeAnnualReports.aspx

[21] See Section 3.8 of this report for detailed information regarding program implementation verification.

[22] See Section 3.10 of this report for detailed information regarding the program tracking data review.

4. Conclusions and Recommendations

After reviewing the AOG/OG&E Weatherization Program for 2014, the Evaluators provide the following conclusions:

Very High Participant Satisfaction: The results of the 2014 participant survey suggest that nearly all participants are very satisfied with each element of their program experience. This is consistent with the results obtained during 2012, and with commentary obtained from participants during on-site verification visits in 2013. Although some respondents had issues with the scheduling of their appointment or the level of information provided by the program, instances of dissatisfaction were minimal. There were fewer instances of dissatisfaction in 2014 than 2012.

Increased Contractor Training and Coordination: All three implementation contractors noted that they have pursued additional certifications for their staff members, and that they have participated in training with the utilities for new staff members. Additionally, contractors noted that they do not allow new staff members to conduct site visits without being accompanied by experienced staff members. Additionally, contractors reported that the utilities have been able to provide them with grouped jobs based on weatherization area, and that the contractors have successfully coordinated or traded jobs when necessary in order to increase operational efficiency. These factors reflect a contractor network that is extremely familiar with program requirements and processes, and suggest that contractors will be well suited to meeting any increased program activity or data collection needs that may arise in the future.

Consistent Participant Characteristics: As shown in Section 3.7.5 of this report, there do not appear to have been any significant changes in the demographics or residential characteristics of participating customers since the 2012 program year. The average square footage (Table 3-20), residence age (Table 3-19), and number of bedrooms, bathrooms, showers, and residents per home (Table 3-21) are consistent with the data provided by customers during the 2012 participant survey. Additionally, the distribution of electric and gas heating systems and water heaters among participants (Figure 3-2 and Figure 3-3) has remained fairly constant. There does not appear to have been a shift in participant education levels (Table 3-22), and although participants reported a slightly higher level of income (Figure 3-4) on average than was found during the 2012 program year, the difference is fairly minor and does not indicate a significant change in the participant group at this time.

Benefit of Cross-fuel Participants: AOG fully expended its program budget by late August of 2014, meaning that no additional AOG-only homes will receive service through the program until 2015. This issue is likely to persist in future years, but by focusing on homes that receive utility service from both AOG and OG&E, AOG would be able to fund a greater number of homes and possibly retain some funding for later in the program year.

Overall, this does not necessarily reflect a program performance issue as the program was able to provide services to nearly as many homes as were weatherized in previous years, and the utilities were able to coordinate their resources in order to prevent delays or interruptions in program delivery.

Minimal Weatherization Framework Transition Effects: The AOG-OG&E Weatherization Program is currently well suited to transitioning into the new statewide weatherization framework that has been developed by the Arkansas IOUs and other stakeholders. As many aspects of this framework referenced the design and operation of the AOG-OG&E program as a successful model, complying with the guidelines of the new framework will likely require few changes to this program. Likely modifications include incorporating additional educational elements into the program and removing the maximum square footage requirement for participating homes, which should be straightforward to implement.

Fairly Adequate Data Collection Procedures: As with the 2013 and 2012 program years, the measure implementation data reported by the installation contractors were found to be fairly accurate and few discrepancies were identified. There were some issues with customer telephone numbers, although the majority of contact information was found to be accurate and usable. The water heating type was not collected for some homes that did not receive water heating measures, although this data may be useful for tracking purposes and potential spillover calculations in future years. However, the discrepancies were infrequent and minor, and do not appear to indicate any systematic issues with program delivery.

Fairly Adequate Database Quality: The Evaluators found the *ex ante* savings values within the EnerTrek database to be accurate for nearly all measures. Additionally, Frontier Associates was very consistent in responding to data requests and correcting errors when necessary. Additionally, there have been improvements within the EnerTrek system to resolve prior data issues and update the database based on TRM requirements. However, the Evaluators identified new minor errors that should be addressed in order to ensure accurate data reporting.

In terms of savings calculations, the EnerTrek database calculated annual savings as an increment of lifetime savings, which incorporated future baseline changes that are not relevant to first-year savings. This issue is further described in Section 2.6 of this report, and resulted in a high realization rate for CFLs. Additional areas to address include tracking data issues described in Section 3.10 of this report.

The AOG/OG&E Weatherization Program was very successful in 2014. The Evaluators identified few specific, systematic or persistent issues with program operation and design. Consideration of the following recommendations may benefit program performance and efficiency in future years:

Include Itemized Air Infiltration Measures: This recommendation was provided in the 2013 evaluation report. The initial home audit data collection form and the post-implementation measure verification form both include fields for detailed measure information and additional field notes. However, some of this information is not present in the tracking data exports. For example, the air infiltration section on the verification form includes fields to record which specific improvements were made (e.g. window caulking, door sweeps, weather stripping). The actual EnerTrek tracking exports include blower door readings for air infiltration, but do not itemize the air infiltration improvements. Maintaining complete electronic records of all collected data, including any qualitative comments on specific jobs, is beneficial from a program evaluation standpoint especially when onsite verification is conducted. Additionally, uploading all relevant data into a single accessible database will ensure that potentially useful information is not lost or discarded.

Improve Consistency of Contractor Data Collection: Although the data collected by program contractors were found to be very accurate and complete in most cases, there were some minor issues that should be addressed for future years. This includes collecting the water heater type for each home, and collecting a full telephone number for each customer and a secondary telephone number if possible.

Resolve Tracking Data Errors: Although the tracking data were found to be very accurate in most cases, the Evaluators identified several minor issues that should be resolved. This includes savings calculation issues described in Section of this report, and other tracking data issues described in Section 3.10 of this report.

Consider Development of Educational Materials: As the upcoming weatherization framework will likely require AOG and OG&E to incorporate additional educational components into their current structure, it may be useful to anticipate these needs and begin developing educational documentation or tools for future participants. As some participant survey respondents noted that they would have liked to receive additional suggestions for energy efficiency improvements from the installation contractors, there is already a demand for this type of information in the AOG and OG&E customer base. Providing customers with additional suggestions regarding energy efficient improvements, or directing them towards additional sources of information about residential maintenance, would likely benefit the participant base and generate beneficial market effects.

Ensure that Planned Tracking Improvements are Implemented (Ongoing): The Evaluators referenced TRM 4.0 for savings verification during the 2014 program year, although some EnerTrek savings calculations were performed using TRM 3.0. Additionally, TRM 5.0 is currently in development, and this upcoming version may require minor modifications in data collection needs for this program. Frontier Associates was able to incorporate numerous assumptions into the database during the first half of the program year, but revising the system early in the year so that the proper data can be collected is a more accurate approach.

Table 4-1 presents the above items, outlining the relevant issue, potential consequences, and associated recommendations.

Table 4-1 Recommendations from 2014 Program Year Evaluation

Issue	Consequences	Recommendation
Tracking data do not include specific measure details for some items (i.e. whether door sweeps, window sealing, etc. were installed, whether lighting was installed indoors or outdoors)	Difficult to completely inspect measure installation Limits level of detail possible for measure tracking	Include an itemized list of all air infiltration reduction measures installed in each home.
Water heater type and telephone number were not consistently recorded in some cases	Increases difficulty of participant surveying and field verification May have minor limitations on any spillover savings calculations performed for water-saving measures	Consistently record water heater type for all homes, and record full telephone number including area code, and a secondary telephone number if possible.
There were minor tracking data errors such as missing savings for CFLs, incorrect wattage, and a first-year annual savings calculation that incorporated lifetime baseline changes	May cause discrepancies between *ex ante* savings and *ex post* gross savings	Check tracking data for missing inputs and increase database quality control procedures if necessary. Calculate annual savings as first-year savings moving forward.
Program educational materials are fairly limited	Upcoming weatherization framework will likely require additional educational component Some participants may feel that they did not receive enough information regarding home maintenance and EE	Consider developing additional educational materials that installation contractors can provide to customers, or provide additional educational materials on the utility website and direct participants to the page.
EnerTrek calculated some savings with TRM 3.0, such as CFLs in the first half of the program year	May cause discrepancies between *ex ante* savings and *ex post* gross savings	Update EnerTrek with any necessary TRM modifications as early in the program year as possible. Inform contractors of additional data collection needs as soon as they are in place.

Appendix A: Participant Survey Instrument

AOG/OG&E Weatherization Program

Participant Telephone Survey

ID No. _____

Customer Name: _____

Date of interview: _____

Date data entered _____

.....

Hello. May I please speak with [CONTACT NAME]: _____)?

Hello. My name is ____ and I'm calling from [Surveying Company Name] on behalf of Oklahoma Gas & Electric and Arkansas Oklahoma Gas [if necessary, refer to "AOG and OG&E", the customer's utility companies] about the weatherization program your household participated in this year. Are you the person who is most familiar with your household's participation in this program?
(IF NOT RIGHT PERSON) May I please speak to the person who would know the most about your household's participation in this program?
REPEAT INTRODUCTION AND CONTINUE
(IF RIGHT PERSON) We are conducting a study to evaluate AOG and OG&E's Weatherization Program. AOG and OG&E will use the results of this evaluation to determine the effectiveness of the program and to make improvements. We would like to include your opinions about the program in our evaluation.

Q-1 Our records indicate that you participated in AOG and OG&E's Weatherization Program this year by completing an energy audit and receiving several energy efficient measures installed in your home. Do you recall participating in this program?

- ❑ Yes [SKIP TO Q-4]
- ❑ No [THANK RESPONDENT AND TERMINATE INTERVIEW]
- ❑ Don't know [ASK TO SPEAK WITH SOMEONE IN THE HOME WHO MAY KNOW]

Q-2 Is there anyone else in your household who may be familiar with your household's participation in the program?

- ❑ Yes [SKIP TO Q-3]
- ❑ No [THANK RESPONDENT AND TERMINATE INTERVIEW]
- ❑ Don't know [THANK RESPONDENT AND TERMINATE INTERVIEW]

Q-3 May I speak with that person?

- ❑ Yes [RETURN TO Q-1 AND BEGIN QUESTIONS WITH NEW RESPONDENT]
- ❑ No [THANK RESPONDENT AND TERMINATE INTERVIEW]
- ❑ Don't know [THANK RESPONDENT AND TERMINATE INTERVIEW]

RESPONDENT BACKGROUND

At this time, I'd like to let you know that your responses to this survey will be kept completely confidential. I'll begin with a few questions about your decision to participate in the program.

Q-4 How did you learn of the Weatherization Program sponsored by AOG and OG&E? [SELECT ALL THAT APPLY]

- ❑ Information that came in the mail
- ❑ Newspaper or magazine article/ad
- ❑ Contractor
- ❑ Word of mouth from friends, relatives, or others
- ❑ TV ad
- ❑ Radio ad
- ❑ AOG bill message
- ❑ OG&E bill message
- ❑ AOG website
- ❑ OG&E website
- ❑ Retailer / in store
- ❑ Other (*Specify*) _____
- ❑ Don't know [DO NOT READ]

Q-5 Why did you decide to sign up for the program? [SELECT ALL THAT APPLY]

- ❑ To reduce my monthly gas bill
- ❑ To reduce my monthly electric bill
- ❑ AOG and OG&E paid for some or all of the improvements
- ❑ Contractor recommendation
- ❑ AOG recommendation or information
- ❑ OG&E recommendation or information
- ❑ Recommendation from a friend, relative, neighbor
- ❑ It is the right thing to do
- ❑ Help save the environment
- ❑ Save energy
- ❑ Other (*Specify*) _____

Q-5A Of the things you mentioned, which was the most important?

- ❑ To reduce my monthly gas bill
- ❑ To reduce my monthly electric bill

- ❑ AOG and OG&E paid for some or all of the improvements
- ❑ Contractor recommendation
- ❑ AOG recommendation or information
- ❑ OG&E recommendation or information
- ❑ Recommendation from a friend, relative, neighbor
- ❑ It is the right thing to do
- ❑ Help save the environment
- ❑ Save energy
- ❑ Other (*Specify*) _____

MEASURE INSTALLATION

Next, I have some questions about the work that was performed in your home through the Weatherization Program.

Q-6 Since the work was performed, have you removed or replaced any of the equipment or energy efficiency improvements implemented in your home through the program?

- ❑ Yes *(Please specify which items have been removed or replaced):*

  _____

  _____
- ❑ No
- ❑ Don't know

Q-7 How likely is it that you would have hired a professional contractor to perform a home audit like the Weatherization Program offers IF YOU HAD NOT participated in the Weatherization Program sponsored by AOG and OG&E?

- ❑ Definitely would have [ASK Q-7A]
- ❑ Probably would have [ASK Q-7A]
- ❑ Probably would not have [SKIP TO Q-8]
- ❑ Definitely would not have [SKIP TO Q-8]
- ❑ Don't know [SKIP TO Q-8]

Q-7A Before you participated in the AOG and OG&E Weatherization Program, did you already have plans to have a similar audit performed on your own?

- ❑ Yes
- ❑ No
- ❑ Don't know

Q-8 For the work that was performed in your home following the audit, did you have existing plans to have this work performed prior to your participation in the Weatherization Program?

- ❑ Yes
- ❑ No
- ❑ Don't know

Q-9 For the work that was performed in your home following the audit, would you still have made any of these improvements in your home if you had not participated in the AOG and OG&E Weatherization Program?

- ❑ Yes [ASK Q-9A]
- ❑ No [SKIP TO Q10]

Q-9A. Which of the following improvements would you have made even if you had not participated in the audit and installation provided by the AOG and OG&E Weatherization Program? [SELECT ALL THAT APPLY]

- ❑ Adding attic insulation
- ❑ Weather sealing windows and doors
- ❑ Modifying thermostat settings
- ❑ Upgrading lighting efficiency
- ❑ Adding low flow equipment to faucets and showers
- ❑ Exchanging refrigerator for an Energy Star® model
- ❑ Making thermal improvements to water heater
- ❑ Other (Specify):_____

_____

Q-9B Did the program cause you to have the energy efficient work performed earlier than you otherwise would have without the program?''

- ❑ Yes [ASK Q-9C]
- ❑ No, program did not affect timing of purchase and installation [SKIP TO Q-10]

Q-9C How much sooner?

- ❑ A year sooner
- ❑ Two years sooner
- ❑ Three years sooner
- ❑ Four to five years sooner
- ❑ I would never have done this work on my own

Q-10 When you were replacing low-cost items such as light bulbs in your home before you participated in this program, how likely were you to replace it with energy efficient equipment?

- ❑ Very likely
- ❑ Somewhat likely
- ❑ Somewhat unlikely
- ❑ Not at all likely
- ❑ Don't know

Q-11 When you were replacing larger items such as appliances in your home before you participated in this program, how likely were you to replace it with energy efficient equipment?

- ❑ Very likely

- ❑ Somewhat likely
- ❑ Somewhat unlikely
- ❑ Not at all likely
- ❑ Don't know

Q-12 Would you have been financially able to have an audit performed and install these energy efficient measures without the Weatherization Program provided by AOG and OG&E?

- ❑ Yes
- ❑ No
- ❑ Don't know

OVERALL ENERGY EFFICIENCY DECISION MAKING

Q- 14 Before you participated in the AOG and OG&E Weatherization Program, had you purchased any energy efficient items or equipment on your own? If so, which ones?

- ❑ Yes *(Please explain):*

  _____

  _____ [GO TO Q-15]
- ❑ No

Q-15 In the past year, have you installed any energy efficient equipment in your home that you have not received an incentive for?

- ❑ Yes [ASK Q-15A]
- ❑ No [SKIP TO Q-16]

Q-15A For each of the following items please tell me if you purchased on your own and how many you purchased. If you have purchased something that is not included in the table, please describe the additional items in as much detail as you can. *(In the following table, please indicate the quantity of each item type purchased, or specify another item type and quantity)*

Measure Type	***Quantity Purchased***
CFLs	
Water Heater Pipe Insulation	
Water Heater Jacket/Blanket/Insulation	
LED Light Bulbs	
Low Flow Bathroom Aerators	
Low Flow Kitchen Aerator	
Low Flow Showerhead	

LED Nightlights	
Other:	

Q-15B What primarily motivated you to purchase these energy efficient items?

1. The energy savings I would achieve
2. Guidance from the AOG/OG&E Weatherization Program
3. The quality of the energy efficient item(s)
4. The fact that the item(s) were on sale
5. Other (please explain): _____
6. Don't know

Q-15C How important was your experience with the AOG/OG&E Weatherization Program in your decision to purchase and install these additional items?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
5. Don't know

Q-15D How important was your past participation in any programs offered by AOG or OG&E in your decision to purchase and install these additional items?

1. Very important
2. Somewhat important
3. Only slightly important
4. Not at all important
5. Don't know

Q-15E Which, if any, of these energy efficiency improvements were recommended during the Weatherization Program energy audit? [VERBATIM]:

_____

_____

Q- 16 Prior to the audit, how familiar were you with the benefits of installing various energy efficiency improvements similar to those offered by the AOG and OG&E Weatherization Program?

- ❑ Very familiar
- ❑ Somewhat familiar
- ❑ Somewhat unfamiliar
- ❑ Very unfamiliar
- ❑ Don't know

Q-16A Prior to the audit, how familiar were you with various household energy saving activities such as washing with cold water, reducing your use of light fixtures, and adjusting heating system settings?

- ❑ Very familiar
- ❑ Somewhat familiar
- ❑ Somewhat unfamiliar
- ❑ Very unfamiliar
- ❑ Don't know

Q-16B Prior to the audit, did you perform any common household energy saving activities? If so, which activities?

- ❑ Yes *(please explain):* _____
  _____
- ❑ No
- ❑ Don't know

Q-17 As a result of your experience with the AOG and OG&E Weatherization Program, would you buy energy efficient measures in the future, even if financial incentives were not offered?

- ❑ Yes
- ❑ No

Q-18 As a result of your experience with the AOG and OG&E Weatherization Program, how much more knowledgeable would you say you are about energy efficiency and energy efficient options for your home?

- ❑ Much more knowledgeable than before participating
- ❑ Somewhat more knowledgeable than before participating
- ❑ Slightly more knowledgeable than before participating
- ❑ No more knowledgeable than before participating

Q-18A As a result of your experience with the program, do you now take additional action to save energy in your home, such as wash with cold water, reduce your use of light fixtures, and adjust heating system settings?

- ❑ Yes *(please explain):* _____
  _____
- ❑ No
- ❑ Don't know

PROGRAM SATISFACTION

Now I'd like to ask you about your satisfaction with several aspects of this program.

Q-19 On a scale of 1 to 5, where "5" is very satisfied and "1" is very dissatisfied, and a "3" is neutral, how would you rate your satisfaction with the following?

Element of Program Experience	*Very Satisfied*	*Somewhat Satisfied*	*Neither Satisfied or Dissatisfied*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Don't Know*
Information provided by the contractor	❑	❑	❑	❑	❑	❑

Element of Program Experience	*Very Satisfied*	*Somewhat Satisfied*	*Neither Satisfied or Dissatisfied*	*Somewhat Dissatisfied*	*Very Dissatisfied*	*Don't Know*
The quality of installation work by the contractor	❑	❑	❑	❑	❑	❑
The performance of the equipment installed	❑	❑	❑	❑	❑	❑
The savings on your monthly utility bills	❑	❑	❑	❑	❑	❑
The effort required for the application process	❑	❑	❑	❑	❑	❑
The wait-time to receive the services	❑	❑	❑	❑	❑	❑
The service provided by AOG and OG&E staff	❑	❑	❑	❑	❑	❑
Information provided by AOG and OG&E on how to reduce your gas bill	❑	❑	❑	❑	❑	❑
Improvement in home comfort	❑	❑	❑	❑	❑	❑
Usefulness of the energy audit	❑	❑	❑	❑	❑	❑
Overall program experience	❑	❑	❑	❑	❑	❑

Q-20 (If any item in Q-19 rated 2 or 1) Why were you dissatisfied with [Program Element]? [VERBATIM]:

_____

_____

_____

Q-21 Are there any changes or improvements you would like to see for the AOG and OG&E Weatherization Program? [VERBATIM]:

_____

_____

_____

DEMOGRAPHICS

Finally, I have a few questions about your household. As a reminder, your responses will remain confidential.

Q-22 When was your home built? [IF RESPONDENT DOES NOT GIVE VERBATIM ANSWER, READ OFF YEAR RANGES UNTIL RESPONDENT INDICATES ONE]

- ❑ Verbatim____
- ❑ Before 1970's
- ❑ 1970's
- ❑ 1980's
- ❑ 1990-1994

- ❑ 1995-1999
- ❑ 2000-2005
- ❑ 2006 or newer
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-23 What is the approximate square footage of your home? [IF RESPONDENT DOES NOT GIVE VERBATIM ANSWER, READ OFF SIZE RANGES UNTIL RESPONDENT INDICATES ONE]

- ❑ Verbatim____
- ❑ Less than 1,000
- ❑ 1,001-1,500
- ❑ 1,501-2,000
- ❑ 2,001-2,500
- ❑ Greater than 2,500
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-24 How many bedrooms are there in your home?

- ❑ Quantity:____
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-25 What type of heating system do you have in your home?

- ❑ Natural gas heating
- ❑ Electric heating
- ❑ Combination of types *(Specify):*_____
- ❑ Other *(Specify):* _____
- ❑ Don't know [DON'T READ]

Q-26 What type of water heater do you have in your home?

- ❑ Natural gas water heater
- ❑ Electric water heater
- ❑ Other *(Specify):* _____
- ❑ Don't know [DON'T READ]

Q-27 How many bathrooms are there in your home?

- ❑ Quantity:____
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-28 How many showers are there in your home?

- ❑ Quantity:____
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-29 Including yourself, how many people currently live in your home year-round?

- ❑ Quantity:____
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-30 I'm going to read off a list of income ranges, please indicate which range your total household income falls. Is the total annual income of your household:

- ❑ Less than $25,000
- ❑ $25,000 - $35,000
- ❑ $36,000 - $50,000
- ❑ $51,000 – $75,000
- ❑ $76,000 - $100,000
- ❑ Greater than $100,000
- ❑ Don't know [DON'T READ]
- ❑ Refused

Q-31 What's the highest level of education you've completed? [DON'T READ]

- ❑ Did not graduate high school
- ❑ High school graduate
- ❑ Associates degree, vocational/technical school, or some college
- ❑ Four-year college degree
- ❑ Graduate or professional degree
- ❑ Don't know
- ❑ Refused

Q-32 What temperature do you normally set your thermostat to during the summer?:

_____

_____

Q-33 What temperature do you normally set your thermostat to during the winter?:

_____

_____

Q-34 Have you changed your thermostat settings since receiving the weatherization work on your home?

- ❑ Yes [ASK Q-34a]
- ❑ No [SKIP TO Q-35]
- ❑ Don't know [SKIP TO Q-35]

Q-34a How have you changed your thermostat settings? [If answer is vague, state "Can you tell me by about how many degrees you have changed your thermostat?"]:

_____

_____

Q-35 Have you added or repaired any major appliances to your home since the work was completed?

- ❑ Yes, have added a new appliance to my home [ASK Q-36]
- ❑ Yes, have repaired a major appliance within my home [SKIP TO Q-37]
- ❑ Yes, I have done both [ASK Q-36 AND Q-37]
- ❑ No [SKIP TO Q-38]
- ❑ Don't know [SKIP TO Q-38]
- ❑ Refused [SKIP TO Q-38]

Q-36 What appliance(s) have you added to your home since the work was completed?

_____

_____

Q-36a When did you purchase the appliance(s)?

Month: _____

Year: _____

Q-37 What appliance(s) have you repaired in your home since the work was completed?

_____

_____

Q-37a When did you repair the appliance(s)?

Month: _____

Year: _____

Q-38 Do you have any other comments that you would like to relay to AOG or OG&E about energy efficiency in residences or about their programs? [VERBATIM]

_____

_____

_____

This completes the survey. Your input is greatly appreciated and will be used to help improve AOG and OG&E's energy efficiency programs in the future. Thank you very much for your time!

Attachment D:
AEG's Evaluation of OG&E's Energy Efficiency Programs

Oklahoma Gas & Electric (OG&E) Arkansas Energy Efficiency Portfolio (EE) Evaluation Report PY 2014

Final Report

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EXECUTIVE SUMMARY

As per regulatory requirements, in 2014 OG&E Arkansas implemented the approved modified EE Portfolio of programs as a bridge year to the approved EE plan for 2011-2013[1]. Applied Energy Group ("AEG") evaluated four programs implemented by OG&E in Arkansas: Multi-Family Direct Install, Student Energy Education (SEE) LivingWise®, Commercial Lighting, and Commercial and Industrial Standard Offer, This report covers evaluated savings for program year 2014 (PY 2014), and lifetime savings by measure and program, provides findings and recommendations for improvements to the programs, addresses OG&E's response to PY 2013 recommendations as well as the Comprehensive Factors.

Approach

AEG's evaluation of the PY2014 programs included checking compliance with the Technical Reference Manual (TRM 3.0 or TRM 4.0 as applicable), engineering reviews of program results, and applying net-to-gross values to AEG-adjusted savings. Process evaluation activities included in-depth interviews with program staff and implementers, comparing database tracking to recommendations from Protocol A (Program Tracking and Database Development), and participant surveys of participants in the Commercial Lighting and C&I Standard Offer programs.

2014 Program Goals Compared to Reported

The number of projects completed in PY 2014 were close to planned; overall claimed savings achieved were 85% for demand and 98% for energy. Table ES-1 below compares planned and reported participation, claimed demand reduction (kW), and claimed energy savings (kWh) for these programs.

Table ES-1 2014 Program Participation and Net Savings (Planned[2] vs. Claimed Savings)

	Participation		Demand (kW)		Annual Energy (kWh)	
Program	**Planned**	**Claimed**	**Planned**	**Claimed**	**Planned**	**Claimed**
Multi-Family (Units)	2,050	1,884	236	241	1,914,153	1,879,351
SEE LivingWise® (Kits)[3]	1,840	1,872	36	27	288,792	209,514
Commercial Lighting (Projects)	125	106	970	1,108	5,162,810	6,702,086
C&I Standard Offer (Projects)	88	144	938	478	3,596,963	1,906,781
Totals	**4,103**	**4,006**	**2,180**	**1,854**	**10,962,718**	**10,697,732**

[1] Order NO. 55, Docket 07-075-TF
[2] Source: In the matter of the request for approval of its quick start energy efficiency programs and the tariff related to the program by Oklahoma Gas And Electric Company, Docket no. 07-075-TF, Direct Testimony and Exhibits of Billy Dean Pollock on behalf of Oklahoma Gas and Electric Company, February 14, 2014.
[3] Net demand (kW) savings per kit = 0.0145. Net energy (kWh) savings per kit = 111.92.

Evaluation Results

Table ES-2 shows the reported gross (claimed) savings[4] and evaluated gross (AEG adjusted) and net savings. Reported gross demand reductions were 1,854 kW, evaluated demand reductions were 1,848 kW for a realization rate of 99.7%, and net evaluated demand reduced was 1,796 kW. OG&E claimed energy savings of 10,697,732 kWh, evaluated energy savings were 10,407,715 for a realization rate of 97.3%, and net evaluated savings were 10,111,358 kWh.

Table ES-2 OG&E Arkansas PY 2014 Results by Program

Program	Demand (kW)			Energy (kWh)		
	OG&E Claimed	AEG Adjusted	AEG Net	OG&E Claimed	AEG Adjusted	AEG Net
Multi-Family Direct Install	241	239	209	1,879,351	1,878,891	1,667,071
SEE LivingWise®	27	39	39	209,514	301,240	311,942
Commercial Lighting	1,108	1,128	1,117	6,702,086	6,591,514	6,525,599
C&I Standard Offer	478	442	431	1,906,781	1,636,070	1,606,746
Totals	**1,854**	**1,848**	**1,796**	**10,697,732**	**10,407,715**	**10,111,358**
Realization Rates		**99.7%**			**97.3%**	

[4] Claimed and AEG-adjusted savings are net not gross.

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Introduction

Background for OG&E Arkansas EE Programs

In January 2006, the Arkansas Public Service Commission (APSC) began the rulemaking for developing and implementing energy efficiency programs for Arkansas's four electric utilities. By May of 2007, these rules were finalized, adopting protocols and procedures for testing the cost-effectiveness of energy efficiency (EE) programs and conducting evaluation, measurement, and verification (EM&V) of claimed savings. In October 2007, OG&E introduced a Quick Start Program in the Arkansas jurisdiction. Two of the Quick Start measures, Weatherization and Education, are collaborative efforts by all Arkansas utilities.

In June 2011, the APSC approved OG&E's portfolio of energy efficiency programs for that program year (2011-2013 Energy Efficiency and Load Management Plan). In Sept 2011, OG&E filed a revised proposal to achieve the energy savings goals required by the Order for the 2012 and 2013 program years, Oklahoma Gas & Electric's 2011-2013 Arkansas Energy Efficiency Program Analysis and Plan prepared by Frontier Associates, Sept 2011 ("the Plan").

OG&E Electric Services offers retail electric service in Oklahoma and Arkansas, servicing approximately 65,000 customers in Arkansas. OG&E's Arkansas service area encompasses the City of Fort Smith and several nearby municipalities. In 2010, OG&E's Arkansas retail customer classes used 2,700,703 MWh which is 10.8% of all OG&E energy.

Applied Energy Group (AEG) evaluated the results for PY 2014 for two Commercial and Industrial (C&I) programs (Commercial Lighting, Standard Offer) and two Residential Programs (Multi-Family, Student Energy Education LivingWise® programs).

Residential Program Descriptions

Multi-Family Program Direct Install Program

In February 2014, OG&E proposed to the Arkansas Commission that they include a new program focusing on the underserved market of residential customers in multi-family dwellings[5]. OG&E identified over 13,000 multi-family units in its service area which represent approximately 24% of OG&E's residential customers. The previous portfolio did not specifically address multi-family customer needs regarding energy efficiency. OG&E engaged a third-party implementer (CLEAResult) to actively promote the program and reach out to property management companies, property owners, and tenants.

The Multi-Family Direct Install program was to provide energy saving fixtures and installation at no cost to the customer. Replacement fixtures included Compact Fluorescent Lights ("CFL's"), water heating pipe insulation, low flow shower heads, and faucet aerators. The program got started late in 2014 and CLEAResult found that there were fewer 2-bath units participating than expected which would decrease the expected energy and demand savings. The implementer suggested to OG&E that they

[5] Source: In the matter of the request for approval of its quick start energy efficiency programs and the tariff related to the program by Oklahoma Gas And Electric Company, Docket no. 07-075-TF, Direct Testimony and Exhibits of Billy Dean Pollock on behalf of Oklahoma Gas and Electric Company, February 14, 2014.

would include advanced power strips and perform duct sealing and air sealing on electrically heated homes to help ensure the program met its PY 2014 savings goals.

The incentive structure includes 1) incentive payments to the contractor that covers the entire cost of the measures and installation and 2) an incentive for the participating property management groups and owners. The number of bathrooms in each unit determines the number of measures installed and the contractor incentive amount. Table 1-1 shows the costs for the program measures.

Table 1-1 Customer Inducement Per Apartment Unit[6]

Direct Install Measure	Contractor Incentive Per Measure	Customer Incentive Per Unit
Faucet Aerator	$ 5.00	$ 15.00 per unit
Shower Head	$ 15.00	
CFLs	$ 5.00	
Water Heater Pipe Wrap (max. 4 ft.)	$5.00/ft.	
APS[7]	$ 20.00	
Air Sealing[6]	$87.50	
Duct Sealing[6]	$87.50	

This multi-family option is designed to complement OG&E's existing programs servicing multi-family properties. Through this program, CLEAResult screens and enrolls contractors to perform work, recruit customers (property owners/management groups) to participate, coordinate multi-family project installations, process project completion forms for payment and perform inspections of work completed. Incentive payments are paid to contractors and customers for the installation of the direct install measures. Measures may be purchased through CLEAResult's preferred vendor or directly by participating contractors as long as the measures meet program requirements. CLEAResult coordinated the development of kits that may be ordered by contractors and shipped directly to their facilities.

CLEAResult's approach to marketing OG&E's Multi-family Direct Install Program is to empower OG&E staff and contractors to actively promote the program directly to customers. Conducting direct outreach to property management groups and property owners will be a critical component of program implementation. A CLEAResult Account Lead will recruit, educate and maintain contact with qualifying property management groups and property owners.

All work is performed by independent contractors. This not only promotes local businesses, but also allows contractors to develop relationships with property management groups and facilitate additional energy efficiency projects. Through other regional Multi-family Direct Install programs, CLEAResult have developed relationships with local contractors that perform these services. Through direct outreach, CLEAResult will leverage these relationships and continue to recruit new contractors for

[6] Source(s): In the matter of the request for approval of its quick start energy efficiency programs and the tariff related to the program by Oklahoma Gas And Electric Company, Docket no. 07-075-TF, Direct Testimony and Exhibits of Billy Dean Pollock on behalf of Oklahoma Gas and Electric Company, February 14, 2014. CLEAResult, OG&E Multi-Family Direct Install 2014 - Statement of Work, January 15, 2014.

[7] Measures piloted in preparation for 2015. Duct sealing and air sealing were incentivized as a package at $175/unit.

participation. All contractors will be required to complete a participation agreement that outlines the terms and conditions of participation. All contractors will be required to maintain liability and worker's compensation insurance and maintain high customer satisfaction ratings with OG&E's customers. Contractors will be provided with marketing materials and forms for project completion, including: Customer Flyer; Customer Enrollment Form/Agreement; Contractor Direct Install Participation Agreement; Contractor Direct Install Form; and Tenant Fact Sheet/Flyer.

The Measurement and Verification (M&V) process for the measures with deemed savings includes pre- and post-installation inspections on a sample of projects with pictures and information to verify installed measures and kWh and kW savings per project. CLEAResult performs pre-inspections during the initial qualification of the property to verify the units are eligible for replacement and documents the existing wattages and flow rates of eligible measures. Also, during the installation process CLEAResult inspectors coordinate with the installing contractor, arrive on site at random times, and sample a percentage of each type of unit.

Student Energy Education (SEE) LivingWise® Program

The Student Energy Education LivingWise® program (SEE) is a turnkey program, with all activities managed directly by the provider, Resource Action Programs (RAP). Nothing in the structure or delivery of the program in PY 2014 changed from the previous year; only the specific items in the kit. So, our findings about the program and its compliance with Arkansas guidelines are the same. For completeness, we largely repeat them here from the PY 2013 evaluation report.

The purpose of the SEE program is to shape household behaviors about resource use and encourage reduced energy use through a combination of information about resource efficiency and access to efficient products.

The program has been in operation since 2008. Under the program, 6th grade students in participating schools are each provided with a take-home kit containing energy and water efficiency devices and are exposed to information about energy efficiency, both in the classroom and through materials in the kit.

SEE is operated as a turn-key program. Under contract to OG&E, RAP implements its LivingWise® program by enrolling schools and furnishing the materials and training to teachers who then conduct the in-classroom lessons and provide the students with take-home kits (shown in Figure 1-1) that contain several energy and water savings devices, along with additional information about how to install the devices and save resources. The PY 2014 LivingWise® kits include: a low-flow showerhead, 3 CFLs (compared with 1 in previous years), a kitchen faucet aerator, a bathroom faucet aerator (new this year), an LED nightlight, other items designed to help families check for inefficiencies in their homes, and a curriculum for teachers. Both the kits and the RAP website contain explicit instructions on how to install each of the items.

Figure 1-1 PY 2014 SEE LivingWise® Kit

A participant is defined as a student. Under the program, each participant is issued a kit with the above noted items. The savings the program expects to realize and that OG&E is claiming, derive from the installation of three item types (six individual items) in the kit: the low-flow showerhead, the 3 CFLs, and the kitchen and bathroom faucet aerators. OG&E claims no savings for the other items in the kit.

The SEE LivingWise® program is operated by the contracted implementer, RAP, as a turnkey program, under the brand name LivingWise®. To meet the program objectives and savings goals, OG&E provides RAP with a list of potential schools eligible to participate. Each year, RAP researches the number of eligible students/schools in the area. Teachers may enroll in any of several ways—via telephone, email, or website. RAP also mails letters to and calls the schools each year. Teachers can also contact RAP or OG&E to request inclusion of their classes in the program. RAP confirmed that they have no trouble enrolling teachers into the program to meet the goal for number of kits distributed. The number of kits available is limited by the program budget. To optimize savings, RAP prioritizes teacher invitations based, in part, on their demonstrated past performance, as evidenced by returns in the student surveys. Once the quota is reached each year, RAP stops recruitment. RAP confirmed that once recruited, no teacher is turned away.

RAP has created a set of instructional materials and measures for students to install at home. They also provide an educational curriculum for the teachers to use. In a quick review of the student materials, we found that the installation instructions seem complete and easy to follow. The kits come with specialized tools to install and measure the low-flow showerheads; the faucet aerators and CFLs require common or no tools to install.

The RAP manager told us that the company keeps in contact with the enrolled teachers. Teachers have a phone number to contact RAP. As part of enrollment, RAP asks teachers to have students complete surveys about their understanding of energy and their installation of the measures at home. The student survey responses provide key program year-specific information, most importantly about which and how many of the measures are installed. As inducement,

teachers return surveys from at least 80% of their students are offered a gift card for purchase of educational materials or supplies for their classrooms.

At the outset of PY 2014, RAP calculated an average per-kit savings based on TRM 3.0 (which was the latest available at the time) and some assumptions about installation and net-to-gross rates. RAP sends electronic reports to OG&E throughout the year on the number of kits delivered to classrooms and the associated savings. OG&E uploads the information into its Saratoga tracking system. RAP provides OG&E with a complete report after the program year is complete that shows the number of kits delivered, as well as their own estimates of savings associated with each of the measures.

OG&E maintains a tracking system that shows the number of participants in the program each year and recorded savings. With the exception of the expected electric savings, all the data are provided by RAP and transferred into the Saratoga tracking system by OG&E. According to the OG&E program manager, RAP sends monthly electronic reports that show of the number of students enrolled and the number of kits shipped to schools.

Commercial & Industrial (C&I) Program Descriptions

This section describes the two C&I programs that were evaluated.

Commercial Lighting

The Commercial Lighting program provides incentives to Arkansas commercial and industrial (C&I) customers who purchase and install energy efficient indoor and outdoor lighting, lighting controls, light emitting diode (LED) exit lights in both retrofit and new construction applications. Incentive levels for the lighting measures are based on $0.12 per kWh of energy saved.

The incentives are based on the kWh savings calculated from a lighting survey that takes into account the type and quantity of lighting fixtures replaced, the new fixtures installed, the building type, and any control technologies in place.

C&I Standard Offer

The Commercial & Industrial Standard Offer Program (SOP) offers financial incentives of $0.12/kWh for the installation of a wide range of measures that reduce customer energy costs, reduce peak demand, and/or save energy in non-residential facilities such as public authority buildings, schools, hospitals, and other industrial customers. Large individual customers, energy service companies (ESCOs), and qualified contractors are all eligible to participate in the SOP. The SOP provides incentives for many energy efficiency measures that are not covered under other OG&E programs.

In addition, OG&E used some of the funds for this program to engage CLEAResult to install pre-rinse spray valves, CFLs, and faucet aerators at no cost to the customer as a direct install under this program. Unit costs for the measures installed through CLEAResult were as follows:

Pre-rinse spray valves	$140/unit
CFLs	$4/unit
Faucet aerators	$13/unit

Structure of the Report

This report is structured as shown below:

Section 1, Introduction

Section 2, Evaluation Methods

Section 3, Residential Program Findings

Section 5, Commercial & Industrial Program Findings

Section 6, Lifetime Savings

Section 7, Recommendations

Section 8, Response to PY2013 Recommendations

Section 9, Comprehensive Factors

Appendices

Evaluation Methods

Process Evaluation Methods

Process evaluations focus on determining the overall effectiveness of program delivery, identifying opportunities for program improvements and assessing key program metrics, including participation rates, market barriers, and overall program operations.

For the SEE LivingWise® program, we reviewed the design of the program, the measures, and the way it is deployed. This is a turnkey program, meaning that all aspects of the implementation are handled by the implementation contractor. We obtained detailed explanation about the design of the program and how it was deployed in PY 2014 from discussions with the OG&E program staff and the implementer. We also received and examined one of the kits. We examined the student take-home kits and had multiple discussions with the OG&E program staff and the implementer.

The process evaluation for all other programs included:

- Interviews with program managers and implementation contractors.
- Survey of commercial and industrial program participants (Commercial Lighting, C&I Standard Offer).
- Review of adherence to Independent Evaluation Monitor (IEM) protocol A
- Response to PY 2013 recommendations
- Recommendations for improvements to the program(s)

Impact Evaluation Methods

Table 2-1 summarizes the evaluation activities AEG carried out during the impact analysis for the C&I and Multi-Family programs. The subsections below discuss each activity in greater detail.

Table 2-1 Summary of Impact Evaluation Activities

Evaluation Activity	Student Energy Education	Multi-Family Direct Install	Commercial Lighting	C&I Standard Offer	C&I Direct Install
Algorithm Review	√	√	√	√	√
Tracking System Review	√	√	√	√	√
Replication of Savings Calculations	√	√	√ (for sample)	√	√
Documentation Spot Check		√	√	√	√
Complete Documentation Review			√ (for sample)	√ (for sample)	
Estimation of Gross Impacts	√	√	√	√	√
Estimation of Net Impacts	√	√	√	√	√

Impact Evaluation Tasks

Tracking System Review

AEG reviewed tracking systems and summary reports maintained by OG&E and each program implementer to verify consistency between the tracking systems and to assess how well the tracked fields comply with Protocol A requirements. For the impact evaluation, we paid particular attention to whether or not the implementers' tracking systems contained all the variables required to determine energy and demand savings. Our review also included a basic verification to ensure that the sum of the project-level savings from implementer reports equaled the total reported savings in OG&E's reports.

Replication of Savings Calculations

AEG used information in the tracking systems to replicate energy and demand savings calculations for as many projects as possible to verify that the project-level reported savings were calculated correctly. The steps were as follows:

- Requested and received spreadsheets with detailed tracking data from implementers
- Developed automated calculations and lookup tables to replicate savings estimates based on current deemed savings algorithms in TRM 3.0 and 4.0
- Compared the replicated estimates with reported savings and identified discrepancies
- Requested additional clarification from implementers for projects with discrepancies
- Finalized adjusted savings estimates for PY 2014 and for subsequent years across the lifetime of each project
- Developed project-level (and program-level) realization rates for PY 2014 based on the adjusted estimates

We were able to replicate savings and come up with realization rates for all PY 2014 projects for the following programs and program components:

- Multi-Family Direct Install
- C&I Standard Offer (HVAC Measures tracked with Direct Options' system)
- C&I Direct Install

Since the tracking reports for Commercial Lighting and a subset of 17 additional C&I Standard Offer projects (mostly motor projects) did not contain all the parameters required to calculate savings, AEG reviewed individual project files to evaluate impacts.

Algorithm Review

AEG verified that the Arkansas Technical Reference Manual (TRM) algorithms were applied to PY 2014 savings estimates. TRM Version 4.0 is the version currently in effect. However, due to its late adoption date (Aug. 29, 2014), the savings for some of OG&E's PY 2014 projects were determined with measure calculators based on TRM Version 3.0 algorithms. AEG reviewed all databases and calculators to check for compliance with either TRM 3.0 or 4.0 and identified instances where the TRM values were not applied properly. We present the algorithms used for each measure later in this section.

Documentation Spot Check

AEG spot-checked examples of project documentation for each program. Documentation included measure calculators, photographs, specification sheets, onsite data collection forms, rebate documents, invoices, etc. This review was to verify the type of data collected for the programs and to check for compliance with Protocol A.

Complete Documentation Review

For projects with reported savings that could not be verified through the replication step described above, AEG did a complete documentation review to assess reported savings and to come up with adjusted savings estimates for PY 2014 and for subsequent years across the lifetime of each project. The complete documentation review was carried out for all 17 C&I Standards Offer projects not tracked in the Direct Options system as well as for a sample of Commercial Lighting projects.

Sample Design for Commercial Lighting

AEG designed a stratified random sample to select projects for the Commercial Lighting documentation review. While a simple random sample selects sample points at random from the entire population, a stratified random sample selects sample points at random from the population within mutually exclusive groups called strata. In this analysis, we used the reported kWh savings as the stratification variable. As long as the stratification variable is correlated with the variable of interest, in this case actual savings, then using a stratified design increases the precision of the estimates holding sample size constant, or decreases sample size holding precision constant.

Our first step was to specify the sample frame, which consisted of the 254 projects in PY 2014. The next step was to determine the stratification variable and number of strata. We used the magnitude of kWh savings for stratification and originally planned for 3 strata: 1) low savings; 2) medium savings; and 3) high savings (which was a census stratum comprising the three projects with highest kWh savings). We next applied Delanius-Hodges method to determine the stratum boundaries. Then, we allocated the sample projects to the strata using a Neyman Allocation, which assigns sampling points to each stratum based on a combination of the weights and standard deviation for each stratum. Finally, we randomly selected sample points for Strata 1 and 2 (Stratum 3 was a census stratum).

Originally we intended to have a sample of 18 projects based on budgetary constraints. However, when we began reviewing the project documentation, it became apparent that it required minimal additional effort to review all projects associated with the given Rebate ID. Therefore, we assigned the additional projects outside of the original sample of 18 to a fourth stratum that was also designated a census stratum, since those projects were not randomly selected, and only represented themselves. Table 2-2 shows the resulting sample design.

Table 2-2 Commercial Lighting Documentation Review Sample Design Matrix

Stratum	Reported Savings (kWh)	# in Population	# in Sample
1. Low savings	≤ 36,000	185	7
2. Medium savings	> 36,000 and ≤ 300,000	22	8
3. High savings (census)	> 300,000	3	3
4. Additional Projects (census)	NA	44	44
Total		**254**	**62**

Estimate Gross Impacts

For all but the Commercial Lighting program, AEG summed the project-level adjusted savings to estimate the program-level gross impacts for PY 2014 and for subsequent years across the lifetimes of the measures.

For Commercial Lighting, AEG expanded the adjusted savings results from the sample to estimate the savings for the population of projects using a combined ratio estimate according to the steps below. We used this same estimation approach for the energy and demand savings.

1. Calculated the average PY 2014 reported savings and average PY 2014 through 2029 adjusted savings by stratum based on the sample results
2. Calculated a weighted average reported savings for 2014 and a weighted average adjusted savings for PY 2014 through 2029 using weights that reflect the proportion of projects in each stratum in the population
3. Calculated the ratio of the sample adjusted weighted average for each year (PY 2014 through 2029) to the sample reported weighted average
4. Applied these ratios to the program's total PY 2014 reported population savings to estimate the evaluated gross savings for PY 2014 through 2029

We analyzed the savings from the SEE LivingWise® program using the following approach:

1. Applied TRM 4.0 algorithms/assumptions to data to calculate per-unit measure savings
2. Calculated and applied in-service rates and any other installation data from participant surveys
3. Calculated gross annual energy and demand savings by measure and for the program as a whole
4. Obtained well-supported estimates of net-to-gross ratios for each measure and applied them to the gross measure savings to calculate total net program savings
5. Calculated lifetime energy savings for each measure using the expected useful life (EUL) values in TRM 4.0 and baseline wattages for CFLs using a combination of replaced lamp wattage for first year and EISA-compliant values for future year savings
6. Calculated the lifetime demand reduction as a weighted average annual kW demand reduction value calculated by dividing the sum of annual kW reductions by the estimated useful life of the measure.

The SEE LivingWise® tables, figures, and related text have all been updated to reflect results for the PY 2014 program. The key differences between this report and PY 2013 are:

- The PY 2014 kit includes more items: 3 13-w CFLs instead of 1, a more efficient low-flow showerhead (1.5 gpm instead of 2.0 gpm), and addition of a bathroom faucet aerator.
- The savings for PY 2014 have been calculated using TRM 4.0. The changes from TRM 3.0 have no appreciable impact on the per-unit savings. However, the improvement in showerhead efficiency yields a calculated per-unit savings that is appreciably higher than past. The TRM changes to CFLs results in a slightly lower per-lamp savings.
- The savings have been calculated based on PY 2014 participant data. They incorporate measure installation rates and water and space heating fuel shares from the survey responses of this year's participants.
- We obtained NTG ratios calculated from a similar program that OG&E's SEE contractor implemented in Indiana. Since these NTGs were based on primary data collection, we used these instead of rates assumed in previous years.

Estimate Net Impacts

In fall 2013, AEG conducted a literature review of net-to-gross (NTG) approaches for other similar programs implemented in Arkansas. Since then, new studies have been released, updating the NTG factors used for those other programs. We have applied those new ratios to OG&E's programs.

Residential Programs

There was not a comparable program to OG&E's Multi-Family program in Arkansas. As a result, we used evaluations of comparable programs in Illinois[8] and in Maine[9] to determine the NTG ratio for the direct install measures used in OG&E's program (the NTG ratio was 0.90 for both programs). This approach is consistent with the TRM protocols (Figure 5: Decision Tree for Application of Programmatic NTG).[10]

As in past years, and in agreement with the IEM, AEG did not conduct an independent assessment of NTG ratios to calculate net savings for SEE LivingWise®. Unlike past years, however, this year we gained access to net impact estimates from another, completely comparable, student education program in Indiana. The programs in Indiana were implemented by the same contractor, and supplied student take-home kits and teaching curricula exactly the same as the OG&E program[11].

Commercial & Industrial Programs

Although AEG conducted primary research with some program participants, with such limited participation (16 respondents for C&I Standard Offer, 18 for C&I Direct Install and 60 respondents for the Commercial Lighting program) we did not feel comfortable applying results from small samples. We therefore applied the updated 2014 NTG ratios used by other programs in Arkansas[12] (0.96 for SOP custom, 1.0 for Direct Install, 0.99 for Commercial Lighting). The survey data does provide qualitative support for these NTG factors:

- No C&I Direct Install participants said they were very likely to have installed the measures on their own. For the majority of participants this was their first experience with the measures.
- Most Standard Offer and Commercial Lighting participants heard about the program before they selected and purchased their equipment. The majority were influenced by trade allies and OG&E has done extensive outreach with the trade ally community. There is also evidence that OG&E staff, past program participation, and the rebate directly influenced the purchases.
- Twenty-six percent of participants purchased additional high efficiency measures and did not receive a rebate (spillover).

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[8] "Com Ed Programs NTG Approach for Programs" values were applied for EPY8. (http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/ComEd_EPY8_NTG_Summary_2015-01-13.pdf) Note that the Com Ed MF Direct Install program did not include air infiltration, duct sealing, and power strips so the entire program NTG of 0.9 was used for these measures.

[9] Source: Opinion Dynamics, Efficiency Maine, Multifamily Efficiency Program Evaluation, Final, March 17, 2014.

[10] Source: Arkansas TRM 4.0 Volume 1 Protocols, August 29, 2014.

[11] Source: Correspondence with Mike Gross, the OG&E Arkansas RAP contact.

[12] Comparable Arkansas programs included SWEPCO Commercial Energy Efficiency and Small Business Direct Install programs and Entergy Arkansas C&I Custom and C&I Prescriptive Programs.

Residential Measure Algorithms

Savings for PY 2014 measures in the SEE LivingWise® and Multi-Family Direct Install (MFDI) programs were calculated in accordance with the Arkansas TRM, Version 4.0.

Faucet Aerators.

Energy savings and peak demand reductions were calculated using the following algorithm:

$$\Delta kWh \text{ or } Therms = \rho * C_p * \Delta V * (T_{mixed} - T_{supply})/(RE * Conversion\ Factor) \quad (1)$$

$$\Delta kW = \Delta kWh * DSF \quad (2)$$

Where:

ρ = Water density, 8.33 lbs/gal (TRM default)

C_p = Specific heat of water, 1 BTU/lb·°F (TRM default)

ΔV = Gallons of water saved per faucet, calculated with default TRM values:

381.5 gal/year for a faucet rated at 1.5 GPM

635.9 gal/year for a faucet rated at 1.0 GPM[13]

T_{mixed} = Mixed water temperature at faucet (TRM default of 102.2°F for Ft. Smith)

T_{supply} = Average water main temperature (TRM default of 66.1°F for Ft. Smith)

RE = Recovery efficiency of water heater, excluding standby losses (TRM default):

0.98 for electric resistance water heaters

2.2 for heat pump water heaters

0.79 for gas water heaters

Conversion Factor = 3,412 BTU/kWh or 100,000 BTU/Therm for electric or gas

DSF = Demand savings factor, ratio of kW peak demand to kWh annual energy use:

0.000104 kW/kWh (TRM default)

Embedded energy savings for water use reduction were also calculated based on an earlier study done by the evaluation team[14] to reflect electricity savings due to avoided water supply and wastewater treatment. The water savings from each project (in gallons) were multiplied by the total energy and demand intensity values (after conversion to gallons from mega-gallons) that are seen in Table 2-3. Fort Smith values were used for the faucet aerator and low-flow showerhead measures in the SEE LivingWise® program. The weighted averages for the territory were used for the faucet aerator and low-flow showerhead measures in the MFDI program to accommodate the program's incorporation of prior guidance from the evaluation team. Since the Commercial Direct Installation program covers more than one OG&E climate zone, the weighted territory averages were also used for the pre-rinse spray valve, faucet aerator, and low-flow showerhead measures in this program. The embedded energy savings and embedded demand reduction were then added to the direct energy savings and demand reductions calculated through TRM algorithms to result in final savings values.

The embedded energy savings were then added to the savings from Equations 1 and 2.

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[13] The rounded TRM default values are 381 gal/year and 636 gal/year for 1.5 and 1.0 GPM faucets; AEG calculated the non-rounded value using the TRM water consumption formulas for baseline (2.2 GPM) and installed faucets.

[14] Parmenter, K., Ehrhard, R., Cook, G. and Williamson, C. *Embedded Energy Savings from Water Saving Measures: Electricity Savings Due to Avoided Water Supply and Wastewater Treatment*, Jan. 2014.

Table 2-3 Energy and Demand Intensities for Water in OG&E Territory

Location	Energy Intensity (kWh/MG)			Demand Intensity (kW/MG)		
	Drinking Water	Wastewater	Total	Drinking Water	Wastewater	Total
Oklahoma City, OK	2,996	1,806	**4,802**	0.34	0.21	**0.55**
Ardmore, OK	1,470	3,287	**4,757**	0.17	0.38	**0.54**
Muskogee, OK	1,389	2,274	**3,663**	0.16	0.26	**0.42**
Fort Smith, AR	480	1,917	**2,397**	0.05	0.22	**0.27**
Weighted Average	2,401	1,914	**4,316**	0.27	0.22	**0.49**

Low-Flow Showerheads

Energy savings and peak demand reductions were calculated using the following algorithm:

$$\Delta kWh \text{ or } Therms = \rho * C_p * \Delta V * (T_{mixed} - T_{supply})/(RE * Conversion\ Factor) \quad (3)$$

$$\Delta kW = \Delta kWh * DSF \quad (4)$$

Where:

ρ = Water density, 8.33 lbs/gal (TRM default)

C_p = Specific heat of water, 1 BTU/lb·°F (TRM default)

ΔV = Gallons of water saved per showerhead, calculated with default TRM values:

1,456.41 gal/year for a showerhead rated at 2.0 GPM

3,245.56 gal/year for a showerhead rated at 1.5 GPM[15]

T_{mixed} = Mixed water temperature at shower (TRM default of 103.9°F for Ft. Smith)

T_{supply} = Average water main temperature (TRM default of 66.1°F for Ft. Smith)

RE = Recovery efficiency of water heater, excluding standby losses (TRM default):

0.98 for electric resistance water heaters

2.2 for heat pump water heaters

0.79 for gas water heaters

Conversion Factor = 3,412 BTU/kWh or 100,000 BTU/Therm for electric or gas

DSF = Demand savings factor, ratio of kW peak demand to kWh annual energy use:

0.000104 kW/kWh (TRM default)

Embedded energy savings for water use reduction were also calculated with the same factors as for faucet aerators. Fort Smith values were used for the SEE LivingWise® program and the weighted territory averages were used for the MFDI program.

Compact Fluorescent Lights

Energy savings and peak demand reductions were calculated using the following algorithm:

$$\Delta kWh = \left(\frac{W_{base} - W_{post}}{1000}\right) * AOH * ISR * IEF_E \quad (5)$$

[15] The rounded TRM default values are 1,457 gal/year and 3,246 gal/year for 2.0 and 1.5 GPM showerheads; AEG calculated the non-rounded value using the TRM water consumption formulas for baseline (2.5 GPM) and installed showerheads.

$$\Delta kW = \left(\frac{W_{base} - W_{post}}{1000}\right) * ISR * IEF_D * CF \quad (6)$$

Where:

W_{base} = Baseline wattage for the existing lamp

W_{post} = Wattage of installed CFL

AOH = Annual operating hours, 792.6 hours/year (TRM default)

ISR = In-service rate, 97% for direct install programs (TRM default)[16]

IEF_E = Energy interactive effects factor (TRM default):

1.10 kWh/kWh for gas heat with AC HVAC system

0.83 kWh/kWh for electric resistance heat with AC HVAC system

0.96 kWh/kWh for heat pump HVAC system

IEF_D = Interactive effects factor for cooling demand reduction (TRM default):

1.25 kW/kW for all HVAC systems

CF = Coincidence factor, 10% for indoor lamps (TRM default)

Air Infiltration Reduction

Energy savings and peak demand reductions were calculated using the following algorithm:

$$\Delta kWh = \Delta CFM_{50} * ESF \quad (7)$$

$$\Delta kW = \Delta CFM_{50} * DSF \quad (8)$$

Where:

ΔCFM_{50} = reduction in infiltration in ft^3/min at 50 pascals, as measured by the difference between pre- and post-installation blower door air leakage tests

ESF = Energy Savings Factor (TRM default for Zone 8 – Ft. Smith):

2.079 kWh/CFM_{50} for AC with electric resistance heat HVAC system

0.942 kWh/CFM_{50} for heat pump HVAC system

DSF = Demand Savings Factor (TRM default for Zone 8 – Ft. Smith):

0.00014 kW/CFM_{50} for AC and heat pump HVAC system

Duct Sealing

Energy savings and peak demand reductions for duct sealing measures in homes with electric resistance heating were calculated per apartment using the following algorithms:

$$\Delta kWh_{Cooling} = (DL_{pre} - DL_{post}) * EFLH_C * (h_{out}\rho_{out} - h_{in}\rho_{in}) * 60/1,000 * SEER \quad (9)$$

$$\Delta kWh_{Heating} = (DL_{pre} - DL_{post}) * 60 * HDD * 24 * 0.018/3,412 \quad (10)$$

$$\Delta kW = \frac{\Delta kWh_{Cooling}}{EFLH_c} * CF \quad (11)$$

Where:

DL_{pre} = Pre-improvement duct leakage at 25 Pascals, in ft^3/min (CFM_{25})

[16] This value was stated to be the lifetime ISR for direct install CFLs from RLW Analytics, 2009. The TRM default is not used for the LivingWise® program.

This value is capped at 35 percent of total fan flow, as per the TRM[17]

DL_{post} = Post-improvement duct leakage at 25 Pascals, in ft^3/min (CFM_{25})

$EFLH_c$ = Equivalent full load cooling hours (TRM default of 1493 hours/yr for Ft. Smith)

h_{out} = Outdoor design specific enthalpy (39 Btu/lb TRM default for Ft. Smith)

h_{in} = Indoor design specific enthalpy (29 Btu/lb TRM default for Ft. Smith)

ρ_{out} = Outdoor air density at 95°F (TRM default of 0.0740 lb/ft^3)

ρ_{in} = Conditioned air density at 75°F (TRM default of 0.0756 lb/ft^3)

SEER = Seasonal Energy Efficiency Ratio of existing system (recorded)

HDD = Heating degree days (TRM default of 3,437 HDD for Ft. Smith)[18]

0.018 = Volumetric heat capacity of air (Btu/ft^3-°F)

CF = Coincidence factor of 0.87 (TRM default)

60 = Factor to convert from minutes to hours

1,000 = Factor to convert from W to kW

24 = Factor to convert from days to hours.

Advanced Power Strips

Energy savings and peak demand reductions per installed advanced power strip were calculated using TRM 4.0 average savings values of 241.7 kWh/unit and 0.03 kW/unit for the home entertainment system application.

Commercial & Industrial Measure Algorithms

The following depicts the algorithms and approaches used to determine gross savings for C&I measures in PY 2014. Since the program began installations before TRM 4.0 came into effect, all C&I measures except low-flow showerheads were evaluated with TRM 3.0 algorithms.

Lighting Replacements

Energy savings and peak demand reductions were calculated per measure using the following algorithms:

$$\Delta kWh = \left(\frac{N_{base}W_{base} - N_{post}W_{post}}{1000}\right) * AOH * ISR * IEF_E \quad (12)$$

$$\Delta kW = \left(\frac{N_{base}W_{base} - N_{post}W_{post}}{1000}\right) * CF * ISR * IEF_D \quad (13)$$

Where:

N_{base} = Number of fixtures in the baseline case

N_{post} = Number of fixtures installed

W_{base} = Wattage of baseline fixtures

W_{post} = Wattage of installed fixtures

AOH = Annual operating hours, reported or from Table 293 of TRM 3.0

ISR = In-service rate of installed fixtures:

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[17] Total fan flow = cooling capacity (tons) * 400

[18] A base temperature of 65°F is used for HDD in this evaluation.

0.878 for commercial direct install CFLs[19]

1.0 for all other lighting replacements

CF = Coincidence factor, based on building type from Table 293 of TRM 3.0

IEF_E = Energy interactive effects factor (TRM default)

IEF_D = Interactive effects factor for cooling demand reduction (TRM default)

Both IEF_E and IEF_D are stipulated in Table 294 of TRM 3.0

Lighting in New Construction

Energy savings and peak demand reductions for efficient commercial lighting in new construction projects were calculated using the following TRM 3.0 algorithms:

$$\Delta kWh = \left(\left(\mathbf{SF} * \frac{\mathbf{LPD}}{1000}\right) - \sum\left(\mathbf{N}_{post} * \frac{\mathbf{W}_{post}}{1000}\right)\right) * \boldsymbol{AOH} * \boldsymbol{IEF_E} \quad (14)$$

$$\Delta kW = \left(\left(\mathbf{SF} * \frac{\mathbf{LPD}}{1000}\right) - \sum\left(\mathbf{N}_{post} * \frac{\mathbf{W}_{post}}{1000}\right)\right) * \boldsymbol{CF} * \boldsymbol{IEF_D} \quad (15)$$

Where:

SF = Total affected square footage of the new construction facility

LPD = Maximum power density by building type (TRM 3.0 default, Table F1)

Lighting Controls

Energy savings and peak demand reductions for lighting control measures were calculated using the following TRM 3.0 algorithms, adjusted for the format of data recorded in the program:

$$\Delta kWh = \left(N_{Sensors} * \frac{\mathbf{Fixt}}{\mathbf{Sensor}} * \frac{\mathbf{W}_{fixt}}{1000}\right) * (\mathbf{1} - \mathbf{PAF}) * \boldsymbol{AOH} * \boldsymbol{IEF_E} \quad (16)$$

$$\Delta kW = \left(N_{Sensors} * \frac{\mathbf{Fixt}}{\mathbf{Sensor}} * \frac{\mathbf{W}_{fixt}}{1000}\right) * (\mathbf{1} - \mathbf{PAF}) * \boldsymbol{CF} * \boldsymbol{IEF_D} \quad (17)$$

Where:

$N_{Sensors}$ = Number of installed sensors

Fixt/Sensor = Fixtures controlled by each sensor

W_{fixt} = Watts per controlled fixture

PAF = Power adjustment factor (TRM 3.0 default, Table 288):

0.70 for occupancy sensor controls

Pre-Rinse Spray Valves

Energy savings and peak demand reductions per pre-rinse spray valve installation were calculated using the following TRM 3.0 algorithms:

$$\Delta\mathbf{kWh} = \boldsymbol{\rho} * \mathbf{C_p} * \mathbf{U} * (\mathbf{F}_B - \mathbf{F}_P) * \left(\mathbf{T_H} - \mathbf{T_{supply}}\right) * \frac{1}{E_t} * \frac{Days}{Yr} / (\mathbf{3,412\ Btu/kWh}) \quad (18)$$

$$\Delta\mathbf{kW} = \boldsymbol{\rho} * \mathbf{C_p} * \mathbf{U} * (\mathbf{F}_B - \mathbf{F}_P) * \left(\mathbf{T_H} - \mathbf{T_{supply}}\right) * \frac{1}{E_t} * \boldsymbol{P} / (\mathbf{3,412\ Btu/kWh}) \quad (19)$$

Where:

ρ = Water density, 8.33 lbs/gal (TRM default)

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[19] In-Service Rate for Direct Install delivery of CFLs in the non-residential sector from: Pacific Gas & Electric Company, "Compact Fluorescent, Downstream & Direct Install." Work Paper PGE3PLTG173, Revision 0. Aug 30, 2012.

C_p = Specific heat of water, 1 BTU/lb·°F (TRM default)

U = Water usage duration based on application (min/day/unit):

TRM 3.0 defaults found in Table 364

F_B = Baseline flow rate, in gal/min:

TRM default average is 2.25 GPM

F_P = Post-installation flow rate, in gal/min:

TRM default average is 1.28 GPM

T_H = Average mixed hot water temperature:

TRM default of 120°F

T_{supply} = Average supply water temperature:

TRM default of 66.1°F for Zone 8/Ft. Smith

E_t = Thermal efficiency of water heater:

TRM default of 0.98 for electric

Days/yr = Annual facility operating days for application:

TRM 3.0 defaults are found in Tables 364/365

P = Peak factor (hourly peak demand as fraction of daily hot water consumption):

TRM 3.0 defaults found in Table 364

Embedded energy savings and demand reductions were also calculated for pre-rinse spray valves based on the annual gallons of water saved per measure and regional average energy and demand intensities from Table 2-3.

Faucet Aerators

Energy savings and peak demand reductions per faucet aerator installation were calculated using the following TRM 3.0 algorithms:

$$\Delta\mathbf{kWh} = \boldsymbol{\rho} * \mathbf{C_p} * \mathbf{U} * (\mathbf{F_B} - \mathbf{F_P}) * (\mathbf{T_H} - \mathbf{T_{supply}}) * \frac{\mathbf{1}}{E_t} * \frac{Days}{Yr} / (\mathbf{3,412\ Btu/kWh}) \quad (20)$$

$$\Delta\mathbf{kW} = \boldsymbol{\rho} * \mathbf{C_p} * \mathbf{U} * (\mathbf{F_B} - \mathbf{F_P}) * (\mathbf{T_H} - \mathbf{T_{supply}}) * \frac{\mathbf{1}}{E_t} * \boldsymbol{P} / (\mathbf{3,412\ Btu/kWh}) \quad (21)$$

Where:

F_B = Baseline flow rate, in gal/min:

TRM default average is 2.2 GPM)

F_P = Post-installation flow rate, in gal/min

Default values for other variables are found in TRM 3.0, Table 264[20]

Embedded energy savings and demand reductions were also calculated for C&I faucet aerators based on the annual gallons of water saved per measure and regional average energy and demand intensities from Table 2-3.

[20] While most values are quite similar between pre-rinse spray valves and faucet aerators, building segment types are different.

Low-Flow Showerheads

Energy savings and peak demand reductions per C&I low-flow showerhead installation were calculated using the following TRM 4.0 algorithms (this measure was not present in TRM 3.0):

$$\Delta kWh = \rho * C_p * \Delta V * (T_H - T_{supply}) * \frac{1}{E_t} * \frac{Days}{Yr} / (3,412\ Btu/kWh) \quad (22)$$

$$\Delta kW = \rho * C_p * \Delta V * (T_H - T_{supply}) * \frac{1}{E_t} * P / (3,412\ Btu/kWh) \quad (23)$$

Where:

ΔV = Gallons of water saved per day, per showerhead:

These were calculated with equation 187 in TRM 4.0[21]

Default values for other variables are found in TRM 3.0, Table 297

Embedded energy savings and demand reductions were also calculated for C&I low-flow showerheads based on the annual gallons of water saved per measure and regional average energy and demand intensities from Table 2-3.

Vending Misers

Energy savings and peak demand reductions per vending miser, or vending machine occupancy control, were calculated using TRM 3.0 savings values of 1,612 kWh/unit and 0.03 kW/unit.

Motors

Energy savings and peak demand reductions for premium efficiency motor replacements were calculated with the following TRM 3.0 algorithms:

$$\Delta kW = HP_{rated} * 0.746\ kW/hp * LF * \left(\frac{1}{\eta_{base}} - \frac{1}{\eta_{installed}}\right) * CF \quad (24)$$

$$\Delta kWh = \Delta kW * Hrs \quad (25)$$

Where:

HP_{rated} = Nameplate horsepower rating of the motor

LF = Estimated load factor for the motor:

TRM 3.0 provides deemed values in Table 276

η_{base} = Baseline or existing energy efficiency rating of the motor:

TRM 3.0 default values in Table 273 for Replace-on-Burnout measures

TRM 3.0 default values in Table 274 for Early Retirement measures

(In case of rewound motors, the efficiency may be reduced by a percentage found in Table 275)

$\eta_{installed}$ = Nameplate energy efficiency rating of the newly installed motor

CF = Coincident factor (0.74)

Hrs = Estimated annual operating hours:

TRM 3.0 provides deemed values in Table 276

Chillers

Energy savings and peak demand reductions for chiller replacements were calculated with the following TRM 3.0 algorithms:

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[21] This equation was used in lieu of Table 296 in TRM 4.0 because the table was found to have erroneous values.

$$\Delta kW = Capacity * (\eta_{base} - \eta_{installed}) * CF \quad (26)$$

$$\Delta kWh = Capacity * EFLH_C * (\eta_{base} - \eta_{installed}) \quad (27)$$

Where:

Capacity = Rated equipment cooling capacity of the new chiller unit (tons)

η_{base} = Baseline or existing energy efficiency rating of the chiller (kW/ton):

TRM 3.0 default values in Table 201 for Replace-on-Burnout measures

TRM 3.0 default values in Tables 202, 203, 204, and 205 for Early Retirement measures

$\eta_{installed}$ = Nameplate energy efficiency rating of the new chiller (kW/ton)

CF = Coincident factor from Table 367

$EFLH_c$ = Equivalent full-load hours for cooling from Table 369

HVAC

Energy savings and peak demand reductions for unitary and split system AC equipment replacements were calculated with the following TRM 3.0 algorithms:

$$\Delta kWh = Capacity * \frac{1\,kW}{1000\,W} * \left(\frac{1}{\eta_{base}} - \frac{1}{\eta_{installed}}\right) * EFLH_C \quad (28)$$

$$\Delta kW = Capacity * \frac{1\,kW}{1000\,W} * \left(\frac{1}{\eta_{base}} - \frac{1}{\eta_{installed}}\right) * CF \quad (29)$$

Where:

Capacity = Rated equipment cooling capacity of the new unit, in Btu/hr

η_{base} = Baseline or existing energy efficiency rating of the equipment:

TRM 3.0 default values in Table 197 for Replace-on-Burnout measures

TRM 3.0 default values in Table 198 for Early Retirement measures

$\eta_{installed}$ = Nameplate energy efficiency rating of the installed equipment

$EFLH_c$ = Equivalent full load cooling hours (TRM 3.0 default in Table 364)

CF = Coincidence factor (TRM 3.0 default in Table 366)

Residential Program Findings

This section describes the evaluation of the two residential programs.

Multi-Family Direct Install Evaluation

Process Evaluation

This section provides the findings from the process evaluation of each of the two programs.

In-Depth Interviews

In fall 2014 AEG conducted in-depth interviews with the program manager and the implementation contractor for the Multi-Family program (see Appendix A for the program manager interview guide and Appendix B for the contractor interview guide). The following are some of the key points from the interviews with the program manager and the implementation contractor.

Marketing and Outreach

- OG&E works with a third party implementer for the programs' outreach activities. The implementer has established contacts with the multi-family segment and does most of the program's outreach through face to face meetings.
- Landlords and property managers are the main target market for the program. They sign a contract with OG&E allowing access to the tenants units.

Quality Assurance/Quality Control (QA/QC)

- The third party implementer maintains the program tracking database. One staff member goes along with the contractor during the installation. They record the measures installed and the location of the installed faucet aerators.
- CFL location is not tracked, but priority is given to high traffic areas during installation. A maximum of 10 CFLs are installed in each unit.
- The OG&E program manager has a personal goal of verifying 10% of installations.

Program Satisfaction and Effectiveness

- Initial feedback from participants is very positive. They appreciate that the measures are installed during the OG&E visit.
- According to the program manager most participants say they would not install these measures on their own if the program did not exist.
- Many participants also value the water savings from the program measures.

Impact Evaluation

Documentation for 2014 from OG&E shows that the implementer completed 6,915 projects with 23,342 measures. Using TRM 4.0 algorithms and data provided by OG&E and the implementer in the form of a tracking database, AEG estimated total program savings for each of the measures. Table 3-1 summarizes the PY 2014 evaluated impacts.

Table 3-1 Multi-Family Direct Install Program: Gross Savings Summary

Measure	Entry Count	Measure Count	Evaluated First-Year kWh Savings	kWh Realization Rate	Evaluated First-Year kW Savings	kW Realization Rate
CFLs	1,960	17,320	544,631	100.1%	98.70	101.5%
Aerators	3,132	3,839	190,122	100.3%	19.86	96.1%
Showerhead	1,641	2,001	582,676	100.2%	60.84	96.2%
Air Infiltration	90	90	82,170	100.0%	5.53	100.0%
Duct Sealing	90	90	478,809	99.4%	54.03	100.0%
Advanced Power Strip	2	2	483	100.0%	0.06	100.0%
Total	**6,915**	**23,342**	**1,878,891**	**100.0%**	**239.02**	**99.3%**

Compact Fluorescent Lights

AEG calculated the energy savings and peak demand reductions for the 17,320 CFLs installed in 2014 using the TRM 4.0 algorithms; inputs from the program tracking database included the apartment space heating type (electric resistance or heat pump) as well as baseline and installed wattages. A residential direct install in-service rate (ISR) of 97% was used in order to be consistent with the AR TRM. There were two Complex ID values (COM-000004 and COM-000005) that had blank entries for the "Heating Type" field but they were adjusted to heat pump and electric resistance heating, respectively, based on implementer feedback.

While the CFL savings calculated by AEG accounted for 100% and 101% of the total claimed energy savings and demand reductions, respectively, there were still discrepancies for some of the projects. Two of the projects (PRJ-025176 and PRJ-025199) had a formula error which resulted in no calculated savings and incentives; the implementer verified that both of these projects received 8 CFLs. Fourteen (14) other projects (18 installed lamps) had calculated energy savings and demand reductions that were significantly different from the claimed values, with discrepancies ranging from 33% to 267%. Additionally, there were 86 projects (658 installations) where calculated demand reductions were 156% of the claimed reductions. AEG spot checked the calculations for these projects using the parameters from the database and the measure calculator supplied the implementer; AEG's calculated reductions were consistent with the measure calculator, so it is unclear why there is a discrepancy with claimed demand reductions.

The final evaluated first-year savings for CFLs were found to be 544,631 kWh/yr and a peak demand reduction of 98.70 kW. These first-year savings were based off the claimed 60 watt existing baseline since this is a direct install program. For the remaining eight years of the CFL's nine-year estimated useful life (EUL), a different baseline should be used due to the requirements of the Energy Independence and Security Act (EISA) of 2007 that lowers the code baseline to 43 W.[22] Thus, the measure will save 347,637 kWh/yr and reduce peak demand by 63.0 kW each year over the remainder of the CFL's useful life (i.e., PY 2015 through PY 2022). The first-year and total lifetime energy savings as well as the first-year and weighted lifetime demand reductions are depicted in Table 3-2, where the lifetime demand reduction is a weighted average annual kW demand reduction value calculated by dividing the sum of annual kW reductions by the estimated useful life of the measure.

[22] EISA code requirements are stipulated in the Arkansas TRM 4.0.

Table 3-2 *Multi-Family CFLs: Gross Savings Summary*

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
Claimed Annual Savings	544,301	97.3
First-Year Evaluated Savings	544,631	98.7
Evaluated Savings for Remaining Years in Lifetime	2,781,094	63.0
Evaluated Lifetime Savings	**3,325,725**	**67.0**

Faucet Aerators

AEG calculated the energy savings and peak demand reduction for the 3,839 installed aerators using the TRM 4.0 algorithm and with the assumption that all water heaters in the program were electric resistance water heaters. The implementer confirmed this assumption to be accurate, since program staff verified the presence of electric water heaters at the site.

Calculated energy savings for 1,987 installed aerators were 100% consistent with claimed values after the addition of embedded energy savings. Savings for another 1,667 installed units had a realization rate of 100.2%, stemming from the fact that AEG calculated annual gallons of water based on TRM water usage values instead of using the final rounded water savings values stipulated in the TRM. However, there were also 185 installed units that had a realization rate of 104.8%. AEG determined that this discrepancy was due to embedded energy savings not being included in the claimed savings.

Unlike energy savings, calculated demand reductions for faucet aerators were not as consistent with the claimed values. Upon review of the measure calculator provided by the implementer, AEG found that the demand reductions (kWh savings multiplied by a factor of 0.000104 kW/kWh) for 3,654 installations were calculated using energy savings that already included the embedded energy savings. The other 185 installations did not take embedded demand reductions into account. This double-counting was removed, resulting in an overall demand reduction realization rate of 96%. A savings summary for the faucet aerator measure (which has a 10-year EUL per TRM 4.0) can be seen in Table 3-3.

Table 3-3 *Multi-Family Faucet Aerators: Gross Savings Summary*

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
Claimed Annual Savings	189,516	20.66
First-Year Evaluated Savings	190,122	19.86
Evaluated Lifetime Savings	**1,901,224**	**19.86**

Low-Flow Showerheads

The savings for 2,001 installed showerheads were calculated with TRM 4.0 algorithms and the assumption that all water heaters in the program were electric resistance water heaters. Energy savings for 1,888 installations were 100% consistent with claimed values after the addition of embedded energy savings. However, there were 113 showerhead installations that did not include the embedded energy savings, which increased the realization rate to 104.5% for these measures. One entry for showerheads (Project # PRJ-14080) was found to not have been installed, though savings for this measure were claimed. Furthermore, AEG found that 187 entries (323 installed units) had installed 2 GPM showerheads instead of the recorded 1.5 GPM based on feedback from the implementer.

Demand inconsistencies, though small, were also prevalent due to issues with double-counting the embedded energy intensity as described for aerators. Furthermore, there was an issue found in the embedded demand reduction calculations for the showerheads: Cell Z16 of the "Processing

Form" in the provided measure calculator referenced Cell A15 of the "Rebate Data TRM 4" sheet (volume of water saved), but this reference was not locked for the other demand calculations in Column Z and resulted in incorrect cell references. The overall demand reduction realization rate for low-flow showerheads was determined to be 96%. A savings summary for the low-flow showerhead measure (which has a 10-year EUL per TRM 4.0) can be seen in Table 3-4.

Table 3-4 Multi-Family Low-Flow Showerheads: Gross Savings Summary

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
Claimed Annual Savings	581,415	63.2
First-Year Evaluated Savings	582,676	60.8
Evaluated Lifetime Savings	**5,826,755**	**60.8**

Air Infiltration Reduction

AEG calculated the energy savings and peak demand reductions for the 90 infiltration reduction projects using the TRM 4.0 algorithms; inputs from the program tracking database included pre- and post-installation CFM50 measurements as well as the heating type (electric resistance or heat pump) for the apartment. The savings calculated by AEG were 100% consistent with the claimed savings. A savings summary for the air infiltration measure (which has an 11-year EUL per TRM 4.0) can be seen in Table 3-5.

Table 3-5 Multi-Family Infiltration Reduction: Gross Savings Summary

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
Claimed Annual Savings	82,170	5.53
First-Year Evaluated Savings	82,170	5.53
Evaluated Lifetime Savings	**903,874**	**5.53**

Duct Sealing

The energy savings and peak demand reductions were calculated for the 90 duct sealing projects using TRM 4.0 algorithms; inputs from the program tracking database included pre- and post-installation CFM25 measurements as well as the heating type (electric resistance or heat pump) for the apartment.

A cap on the pre-installation leakage rate was applied as a maximum 35% of total fan flow, per TRM 4.0. One of the reasons for this restriction is that the TRM algorithm may only be applicable within a certain range of duct leakage reductions. Outside of the range, the algorithm could fail and incorrectly estimate the savings. For instance, using the algorithm without a maximum leakage rate resulted in one apartment having approximately 28,700 kWh in savings, which could just about equal the electricity consumption of the whole 975 sq. ft. apartment.[23] Furthermore, the Arkansas TRM cites that data from installations in Texas "shows that more than 70 percent of all pre-retrofit leakage rates fall below 38 percent."

Once a threshold was applied on the pre-installation leakage rate, the final evaluated savings for duct sealing were found to be 478,809 kWh/yr with a peak demand reduction of 54.03 kW. This corresponds to energy and demand savings realization rates of 99.4% and 100%, respectively. It is unclear where the 0.6% discrepancy stems from, but it is most likely due to a rounding inconsistency. The projects with 100% energy savings realization did not record the unit square

[23] These savings are approximately equal to the total annual electricity consumption of a 2 ton SEER 10 CAC system (equipment recorded in the database) with a 40 kBtu/h electric resistance heater.

footage or the number of bedrooms, while the projects with 99% energy savings realization did record these values. These parameters are not used in the algorithm, but seem to be the only difference based on the values recorded in the program tracking database. A savings summary for the duct sealing measure (which has an 18-year EUL per TRM 4.0) can be seen in Table 3-6.

Table 3-6 ***Multi-Family Duct Sealing: Gross Savings Summary***

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
Claimed Annual Savings	481,466	54.03
First-Year Evaluated Savings	478,809	54.03
Evaluated Lifetime Savings	**8,618,558**	**54.03**

Advanced Power Strip

There were only two advanced power strip (APS) units installed in the PY 2014 program. OG&E confirmed that program staff installed both power strips for interested customers on home entertainment systems. Per the TRM 4.0, this resulted in energy savings of 241.7 kWh and a demand reduction of 0.03 kW per installed unit. Evaluated savings were consistent with claimed values. A savings summary for advanced power strip installation (which has a 10-year EUL per TRM 4.0) can be seen in Table 3-7.

Table 3-7 ***Multi-Family Power Strips: Gross Savings Summary***

Type of Savings	Energy Savings (kWh)	Annual Demand Reduction (kW)
First-Year Evaluated Savings	483	0.06
Evaluated Lifetime Savings	**4,834**	**0.06**

Net Impacts

There was no program in Arkansas comparable to OG&E's Multi-Family Direct Installation program. As a result, we used comparable programs in Illinois and Maine (see Section 2) to determine the NTG ratio for the direct install measures used in OG&E's program, as follows:

- CFLs: NTG ratio = 0.81
- Aerators: NTG ratio = 0.94
- Showerhead: NTG ratio = 0.93

Since the Illinois program did not include air infiltration, duct sealing, and power strips, the average program NTG of 0.9 was used for these measures. This value was the same for the Efficiency Maine Multi-Family Program.

Table 3-8 includes the PY 2014 impact results for the Multi-Family Direct Install program. AEG applied the NTG ratios to the gross savings resulting in first-year net impacts of 1,667,071 kWh per year and 209 kW.

Table 3-8 Multi-Family Direct Install Program: PY 2014 Impact Results

Savings	Measure	Gross Impacts for PY 2014			NTG	Net Impact
		Reported	Evaluated	Realization Rate		
Energy Savings (kWh/yr)	CFLs	544,301	544,631	100.1%	0.81	441,151
	Aerators	189,516	190,122	100.3%	0.94	178,715
	Showerhead	581,415	582,676	100.2%	0.93	541,888
	Air Infiltration	82,170	82,170	100.0%	0.90	73,953
	Duct Sealing	481,466	478,809	99.4%	0.90	430,928
	Advanced Power Strip	483	483	100.0%	0.90	435
	Total	**1,879,351**	**1,878,891**	**100.0%**		**1,667,071**
Demand Reduction (kW)	CFLs	97.28	98.70	101.5%	0.81	79.95
	Aerators	20.66	19.86	96.1%	0.94	18.66
	Showerhead	63.23	60.84	96.2%	0.93	56.58
	Air Infiltration	5.53	5.53	100.0%	0.90	4.98
	Duct Sealing	54.03	54.03	100.0%	0.90	48.63
	Advanced Power Strip	0.06	0.06	100.0%	0.90	0.05
	Total	**240.80**	**239.02**	**99.3%**		**208.86**

SEE LivingWise® Program

Process and Impact Evaluation

We obtained and reviewed a PY 2014 kit. All of the measures in the kits have efficiency levels at or above the minimum required by the TRM.

OG&E's participation goal for SEE LivingWise® PY 2014 was 1,840 participants. As Table 3-9 shows, RAP delivered a total of 1,903 kits. Of these, 1,872 were for distribution to students in 22 Arkansas schools. In PY 2014, 1,067 of the 1,872 students who were provided kits returned completed surveys, a response rate of 57%, just about the same response rate as in PY 2013.

Table 3-9 Distribution of Kits in PY 2014

Number of Kits Distributed	Spring 2014	Fall 2014	Total
RAP Delivered to Classrooms	290	1,613	1,903
For Teachers	8	23	31
For Students	282	1,590	1,872

AEG was able to replicate the example results in the TRM for each of the measures, ensuring that we could properly apply them. We then used the algorithms to estimate the savings in OG&E's Arkansas service territory, using default input values for OG&E's service territory in Arkansas (Ft. Smith) and program-specific data from participants. The TRM 4.0 algorithms and resulting estimates in Table 3-10 represent savings per measure installed. That is, they do not adjust for the installation rate of each measure or the relative share of participants' homes with electric versus natural gas water heating.

Table 3-10 TRM-Calculated Savings by Measure, Per Unit Installed

Measure	Annual kWh	Annual kW	Annual Therms
Kitchen Faucet Aerator	34.31	0.0036	1.45
Bathroom Faucet Aerator	57.19	0.0059	2.42
Low-Flow Showerhead	305.63	0.0318	12.94
13-watt CFL #1[24]	35.11	0.0059	--
13-watt CFL #2	35.31	0.0059	--
13-watt CFL #3	35.92	0.0061	--

We show how the algorithms were applied in the results for each measure in the following subsection. To estimate the overall program savings and savings realized per participant, we followed guidelines from the IEM regarding the use of as much reliable program-specific data as possible to inform the impact estimates. We used the following data from the participant surveys to estimate the per-participant and total program savings by measure reported below:

- Wattage of the lamps replaced by each of the CFLs in the kit (in the per-unit savings above)
- Installation rate of each measure (for aerators, showerhead, and CFLs)
- Share of electric versus natural gas water heating (for aerators and showerhead)
- Share of electric versus natural gas space heating (for CFL interactive effects, included in the per-unit savings above)

Program Year 2014 Results

Using data provided by OG&E and RAP, the TRM-based per-unit measure energy savings estimates, and information from the participant surveys, we estimated total first-year program savings for each of the measures in the PY 2014 program. These are summarized in Table 3-11. While OG&E does not provide natural gas to customers in Arkansas and has no goals for natural gas savings, 36% of the participants said they have gas water heat and realized significant natural gas savings from installation of the aerator and showerhead measures. In Btu equivalents, the annual natural gas kBtu savings are 77% of total annual electric kBtu savings for showerheads and aerators. We include those savings here as well.

Table 3-11 Natural Gas and Electric First-Year Btu Savings Comparison (Aerators & Showerheads)

Measure	Gas kBtu/yr	Electric kBtu/yr
Aerator	105,928	137,169
Showerhead	391,102	505,386
Total	497,030	642,554

[24] Savings for CFLs #1, 2, and 3 are slightly different due to different weighting of the baseline wattages from the survey responses.

The measures vary considerably in their contribution to the total savings. Low-flow showerheads alone account for almost half of the annual savings. By comparison, in PY 2013, showerheads and CFL contributed almost equally to the total kWh savings. Several factors account for this, including changes in TRM allowances and installation rates; but more than anything the driving factor was the higher efficiency of the showerhead included in the PY 2014 kit.

Combining the savings from all measures for all participants, the average first-year savings per participant are 161 kWh, 0.02 kW, and almost 3 annual therms. The total first-year program savings of 301,240 kWh and 39 kW for PY 2014 (see Table 3-12) are twice as much as the PY 2013 savings. Table 3-12 depicts the realized program energy savings (first-year and lifetime) and demand reductions (first-year and weighted average over lifetime) by measure, total, and per participant.

Table 3-12 SEE LivingWise® Gross Program Savings Summary

Measure	First-Year kWh Savings	Lifetime kWh Savings	First-Year Peak kW Reduction	Weighted Annual Peak kW Reduction	First-Year Therms Savings	Lifetime Therms Savings
Aerators	40,202	402,018	4.20	4.20	1,059	10,593
Showerhead	148,120	1,481,201	15.46	15.46	3,911	39,110
CFLs	112,918	690,331	19.03	12.93	--	--
Total	**301,240**	**2,573,549**	**38.69**	--	**4,970**	**49,703**
Per Participant	**160.9**	**1374.8**	**0.021**	--	**2.7**	**26.6**

In addition to the end-user savings, the values in the table above include water supply and wastewater treatment savings accrued to local water agencies due to reduced water usage from faucet aerators and low-flow showerheads. Each gallon of water saved reduces the drinking water or wastewater utility's energy requirements for functions such as collecting, treating, storing, and transporting water/wastewater. We refer to these as embedded savings and apply them based on a report prepared for OG&E by AEG in 2014.[25]

The study involved interviewing local water and wastewater agencies to determine typical energy intensity values for representative cities in Oklahoma and Arkansas and a literature review of energy intensity values as a function of water and wastewater plant characteristics to validate interview findings. Based on the research, the project team determined energy and average demand savings per unit of avoided water as a function of location across the electric utility's service territory. The research revealed that water treatment in the part of Arkansas that OG&E serves has lower energy intensity than other parts of the service territory. We used the lower Fort Smith, Arkansas per-gallon kWh and kW intensities rather than the regional averages, resulting in a more conservative estimate of the embedded savings. Using the same TRM water reduction values as for the end-user savings, we calculated the following embedded energy savings, which are reflected in the savings in Table 3-12.

[25] Parmenter, K., Ehrhard, R., Cook, G. and Williamson, C. *Embedded Energy Savings from Water Saving Measures: Electricity Savings Due to Avoided Water Supply and Wastewater Treatment*, Jan. 2014.

Embedded Energy Savings
Annual water savings per unit installed • Kitchen faucet aerator = 381.5 gal/yr • Bathroom faucet aerator = 639 gal/yr • Showerhead = 3,245.6 gal/yr **Water & wastewater energy and demand savings** • 2.4 Watt-hr/gal • 0.0003 Watt/gal
Total embedded energy and demand savings Units installed x gallons saved x savings/gal • Faucet aerators = 1,869 kWh, .21 kW • Showerheads = 6,590 kWh, .74 kW

Faucet Aerators

The per-unit installed savings for faucet aerators were calculated using the TRM 4.0 algorithms described in Equations 1 and 2 of the residential impact evaluation approach of this report.

Table 3-13 Faucet Aerator Realized Savings

Type of Aerator	Realized Gross Savings	Per Unit Installed	Per Participant	Participant Total
Kitchen Aerator	First-Year kWh	34.31	8.75	16,373
	Lifetime kWh	343.14	87.46	163,730
	Annual Peak kW Reduction	0.0036	0.0009	1.71
	Annual Therms	1.45	0.23	431
	Lifetime Therms	14.52	2.30	4,314
Bathroom Aerator	First-Year kWh	57.19	12.73	23,829
	Lifetime kWh	571.9	127.3	238,288
	Annual Peak kW Reduction	0.0059	0.0013	2.49
	Annual Therms	2.42	0.34	628
	Lifetime Therms	24.21	3.35	6,279
Aerators Total	First-Year kWh	--	21.48	40,202
	Lifetime kWh	--	214.75	402,018
	Annual Peak kW Reduction	--	0.0022	4.20
	Annual Therms	--	0.57	1,059
	Lifetime Therms	--	5.66	10,593

We calculated the per-participant and total measure savings using the TRM 4.0 algorithm and the following information:

- Each kit contained one kitchen faucet aerator and one bathroom faucet aerator.
- Kitchen faucet aerators were rated at 1.5 GPM and were calculated to save 381.5 gallons of water per year per aerator.
- Bathroom faucet aerators were rated at 1.0 GPM and saved 635.9 gal/year per aerator.
- The per-participant and total measure savings utilize the per-unit installed savings shown in Table 3-13 plus program-specific information from the PY 2014 participants. This includes:

- Kitchen aerator installation or in-service rate (ISR) = 44%
- Bathroom aerator installation or in-service rate (ISR) = 39%
- Water heat fuel shares = 55% electric and 36% natural gas[26]
  - All electric water heaters were assumed to be electric resistance[27]

- The per-participant and total measure savings also include drinking water and wastewater treatment savings accrued from the reduced water use, as identified in the report on embedded savings.[28]
  - Energy intensity of treatment = 2,397 kWh and 0.27 kW per million gal. water
  - Embedded savings total from aerators = 1869 kWh/yr and 0.21 peak kW
  - Treatment is electric and applies to all water used by installed units, regardless of water heat fuel

Low-Flow Showerheads

The per-unit installed savings for low-flow showerheads were calculated using TRM 4.0 algorithms described in Equations 3 and 4 of the residential impact evaluation approach section of this report.

Table 3-14 Low-Flow Showerhead Realized Gross Savings

Realized Gross Savings	Per Unit Installed	Per Participant	Participant Total
First-Year kWh	305.63	79.12	148,120
Lifetime kWh	3,056.27	791.24	1,481,201
Annual Peak kW Reduction	0.0318	0.0083	15.46
Annual Therms	12.94	2.09	3,911
Lifetime Therms	129.36	20.89	39,110

We calculated the per-participant and total measure savings using the TRM 4.0 algorithm and the following information:

- Each kit provided one low-flow showerhead rated at 1.5 GPM.
- Each low-flow showerhead was calculated to save 3,245.6 gallons of water per year.
- The per-participant and total measure savings utilize the per-unit installed savings shown in Table 3-14 plus program-specific information from the PY 2014 participants. This includes:
  - Low-flow showerhead installation or in-service rate (ISR) = 45%
  - Water heat fuel shares = 55% electric and 36% natural gas[29]

[26] The remaining 9.6% of water heaters were found to be fueled with propane. Water heating savings for propane tanks are not included in the TRM and were not included in the PY 2014 analysis.
[27] No information was available for market saturation of heat pump water heaters in OG&E territory, and OG&E staff stated that saturation would be extremely low, if any.
[28] Ibid.
[29] The remaining 9.6% of water heaters were found to be fueled with propane. Water heating savings for propane tanks are not included in the TRM and were not included in the PY 2014 analysis.

- All electric water heaters were assumed to be electric resistance[30]

- The per-participant and total measure savings also include drinking water and wastewater treatment savings accrued from the reduced water use, as identified in report on embedded savings.[31]
  - Energy intensity of treatment = 2,397 kWh and 0.27 kW per million gal. water
  - Embedded savings total from showerheads = 6,590 kWh/yr and 0.74 peak kW
  - Treatment is electric and applies to all water used by installed units, regardless of water heat fuel

Compact Fluorescent Lamps

The per-unit installed savings for CFLs were calculated using TRM 4.0 algorithms described in Equations 5 and 6 of the residential impact evaluation approach section of this report.

Table 3-15 CFL Realized Savings

CFL	Realized Gross Savings	Per Unit Installed	Per Participant	Participant Total
CFL #1	First-Year kWh	35.11	23.04	43,125
	Lifetime kWh	214.52	140.74	263,463
	First-Year Peak kW Reduction	0.0059	0.0039	7.27
	Weighted Annual Peak kW Reduction	0.0040	0.0026	4.93
CFL #2	First-Year kWh	35.31	19.45	36,416
	Lifetime kWh	215.77	118.89	222,560
	First-Year Peak kW Reduction	0.0059	0.0033	6.14
	Weighted Annual Peak kW Reduction	0.0040	0.0022	4.17
CFL #3	First-Year kWh	35.92	17.83	33,376
	Lifetime kWh	219.90	109.14	204,308
	First-Year Peak kW Reduction	0.0061	0.0030	5.62
	Weighted Annual Peak kW Reduction	0.0041	0.0020	3.83
CFL Total	First-Year kWh	--	60.32	112,918
	Lifetime kWh	--	368.77	690,331
	First-Year Peak kW Reduction	--	0.0102	19.03
	Weighted Annual Peak kW Reduction	--	0.0069	12.93

- Each kit provided three 13-watt CFLs.
- The per-participant and total measure savings utilize the per-unit installed savings shown in Table 3-15 plus program-specific information from the PY 2014 participants. This includes the participant-reported CFL installation or in-service rate (ISR):
  - ISR for CFL #1 = 66%
  - ISR for CFL #2 = 55%
  - ISR for CFL #3 = 50%
- Fully complies with TRM 4.0, including:

[30] No information was available for market saturation of heat pump water heaters in OG&E territory, and OG&E staff stated that saturation would be extremely low, if any.
[31] Ibid.

- Calculation of different impacts in homes with electric heat and gas heat (weighted average is reported in table above)
  - Share of homes with electric and gas heat reported by participants: 64% electric space heat and 36% gas and other space heat types
  - Assessment of the baseline, based on participant survey response about wattage of lamp replaced; the first-year baseline is the existing replaced lamp wattage, while the baseline for the rest of the CFL lifetime is compliant with the Energy Independence and Security Act (EISA) of 2007
    - Baselines for CFL #1: Existing = 60.3 W EISA = 43.2 W
    - Baselines for CFL #2: Existing = 60.6 W EISA = 43.4 W
    - Baselines for CFL #3: Existing = 61.4 W EISA = 44.0 W
  - TRM annual operating hours (AOH) = 792.6
- Non-electric heating penalties were not evaluated for CFLs due to the various non-electric fuels present in the population and the fact that OG&E does not claim any non-electric fuel savings.

Net Impact

As in past years, and in agreement with the IEM, we did not conduct an independent assessment of net-to-gross (NTG) ratios to calculate net savings for SEE. Unlike past years, however, this year we gained access to net impact estimates from another, completely comparable, student education program in Indiana. The programs in Indiana supplied student take-home kits and teaching curriculum exactly the same as the OG&E program and the program was implemented by the same contractor.

The evaluation of the Indiana programs[32] reports NTGs by measure, based on analysis that included collection of primary data and considerable analysis. The values incorporate estimates of both free ridership and spillover, as shown in Table 3-16. The free ridership values for showerheads and aerators confirm widespread agreement that few residential customers install them in the absence of a program that provides them. The 22% spillover rate supports the hypothesis that providing education and no-cost kits to students encourages households to take additional energy efficiency actions on their own.

Table 3-16: Energizing Indiana Education Program Free-ridership, Spillover, and NTG Summary

Measure	Free-ridership Percent	Spillover Estimate	NTG Ratio
CFLs (13 W)	27.63%	21.5%	93.87%
Low-Flow Showerhead	13.84%	21.5%	107.66%
Faucet Aerators	7.89%	21.5%	113.61%

Since the NTG values differ by measure type, we applied them to the first year SEE measure totals and calculated the net savings for the program as the sum of the net measure savings. Table 3-17 shows the effects of applying these NTG ratios to the Realized Gross Savings estimates for each measure and the total program. The overall program NTG ratio is 1.04.

[32] "2012 Energizing Indiana: EM&V Report," prepared by The Indiana Statewide Core Program Evaluation Team, June 20, 2013.

Table 3-17: Student Education Energy Net Program Savings by Measure

Measure	NTG Ratio	First-Year kWh Savings	Lifetime kWh Savings	First-Year kW Reduction	Weighted Average Annual kW Reduction
Faucet Aerators	1.14	45,830	458,301	4.78	4.78
Low-Flow Showerhead	1.08	159,970	1,599,697	16.70	16.70
13-watt CFLs	0.94	106,143	648,911	17.89	12.15
Total	**1.04**	**311,942**	**2,706,908**	**39.37**	--

The final estimated impacts from the PY 2014 Student Energy Education LivingWise® program are shown in Table 3-18. As in the past, participation was limited by the allocated budget, though RAP indicated it did allow them to reach a large majority of the 6th grade classes. The program achieved and slightly surpassed the goals OG&E set for participation as well as both annual kWh and kW savings.

The net first-year kWh savings and kW reductions realized by the program exceed OG&E's tracked (reported) savings by almost 50%. This is largely due to the following factors:

- The tracked savings utilize per-kit estimates developed early in the program year before the new TRM was issued. The CFL hours of use were increased in TRM 4.0.
- The tracked savings assumed continued use of NTGs from PY 2013 which were considerably lower than the new ones used in this evaluation, which are based on analysis using primary data.

Table 3-18: PY 2014 Student Education Energy Program Goals and Savings

Metric	Goal	Claimed (Net) #[33]	Realized (Net)	Realization Rate
Participants	1,840	1,872	1,872	100%
First-Year Energy kWh **Demand kW**	288,792 36	209,514 27.14	311,942 39.37	149% 145%

[33] Source: The reported values are from OG&E's Saratoga tracking system.

Residential Programs Adherence to Protocol A

The tracking systems for each of the databases conform reasonably well to the tracking system protocol developed for use in Arkansas. Table 3-19 shows a summary of how well the residential program tracking systems meets the components of the protocol.

Table 3-19 Adherence to Protocol A: Residential Programs

Multi-Family Program
Participating Customer Information – includes all information required including customer contact information, customer identifier (account number), location of building, and date completed
Measure Specific Information – includes type and quantity of measures installed. Could capture type of lighting replaced with CFL and location in the home.
Measure Codes – n/a; description fields could be used for a measure description such as aerator, CFL, etc.
Vendor Specific Information – not included. Could capture which contractor performed service.
Marketing and Outreach Activities – Extensive one-on-one outreach made by implementation contractor with building owners/property managers.
Student Energy Education
Participating Customer Information – not provided for individual participants; only for teachers. Customer milestone tracked is the date kits are shipped.
Measure Specific Information – not applicable as all kits the same and info provided by implementer on spec sheets. Estimated savings are included as well as equipment useful life. Kits are provided by OG&E at no cost to participants. Reported measure type of equipment replaced is tracked by participant surveys from implementer.
Measure Codes – individual measures not identified; all kits provided to participants are supposed to be the same.
Vendor Specific Information – n/a—measures self-installed
Program Tracking Information – date of the initial program contact provided. Rebate information n/a; provided @ no cost to participants
Marketing and Outreach Activities – RAP conducts a well-established pattern of outreach activities. It is not known whether OG&E keeps records of how many outreach letters the staff sends each year or to whom. RAP handles all other marketing.

Commercial & Industrial Program Findings

Commercial Lighting Impact Evaluation

Commercial lighting projects are entered into a Commercial Rebate web-based tool (www.ogelighting.com) that is supported by Direct Options. OG&E and the implementer provided AEG with a tracking database summarizing the PY 2014 Commercial Lighting projects. AEG used the provided dataset to design and select a representative sample for the impact analysis. For each sampled project, we reviewed the claimed savings, gathered and reviewed detailed project documentation, and use TRM 3.0 algorithms to develop adjusted energy and demand impacts. We then extrapolated the results to the population using a combined ratio estimate. Table 4-1 summarizes the gross energy and demand impacts for the program.

Table 4-1 Commercial Lighting: Gross Savings Summary

Project Count	Evaluated First-Year kWh Savings	Evaluated Lifetime kWh Savings	Evaluated First-Year kW Reduction	Evaluated Weighted Average kW Reduction
254	6,591,514	95,264,484	1,128.30	917

Sample Documentation Review and Findings

AEG reviewed a sample of 18 projects and 44 accompanying census projects (27 Rebate IDs) out of 254 total projects for this Commercial Lighting evaluation. We accessed the worksheets for the Rebate IDs on Direct Options' Commercial Rebate website and recorded the stated baseline and installed fixture types, fixture counts, fixture wattages, annual hours of use, building segment, and space type for each reviewed project. AEG then used the documentation, when provided, to verify the recorded values for these parameters, replicate the original claimed savings, and develop a set of evaluated savings values. If the worksheet parameters had been recorded in the tracking database, savings could have been replicated for the whole population and the sample review would have only served to fine-tune the savings.

AEG generally found that project documentation for the installed measures did not contain enough detailed information on the new and replaced lighting equipment. As such, AEG was unable to verify many of the inputs used to calculate savings (e.g. new and replaced equipment types, fixture wattages, and fixture counts). Issues found during the review are noted below.

- Even when itemized invoices were included, they were often incomplete and did not account for all the installed fixtures and/or lamps.
- Though many baseline and installed fixture wattages could not be verified without further documentation, they were checked against the TRM Standard Wattage Table (SWT, Appendix E of TRM 3.0) to judge the reasonableness of the recorded wattages.
- Only four rebates (multiple projects) out of the 25 rebate IDs reviewed had enough incontrovertible evidence to adjust the baseline and/or installed fixture wattages based on provided specifications or the SWT. Overall, wattages for 7/62 reviewed database entries were changed.
- AEG found that the space types for five Rebate IDs were incorrectly categorized.

  - Three of these rebates were in conditioned spaces with normal temperature ranges (>41°F), but a minimum refrigerated temperature (33-41°F) space type was claimed. Adjusting the space type for these projects reduced the evaluated energy savings and demand reductions due to interactive effects.
  - The other two rebate sites were calculated as an unconditioned space type but were found to be in a normal temperature conditioned space type. Adjusting the space type for these projects increased the evaluated energy savings and demand reductions due to interactive effects.

- One project (Rebate ID 2500231) was found to not have installed any of the claimed 136 occupancy sensors. This discrepancy was discovered when the fixture and sensor counts for the whole account (#13255) were reviewed and the implementer clarified that only the 152 sensors in Rebate ID 2500239 (different rebate, same contract account) were installed.

Table 4-2 depicts average claimed and evaluated energy savings and average claimed and evaluated demand reduction for the sampled projects, by stratum, for PY 2014. The table also shows the number of sample points in each stratum, the stratum weights, and the overall combined ratios used to extrapolate sampled results to the population for PY 2014 (first year).

Table 4-2 C&I Lighting Documentation Review Results for PY 2014: Sampled Projects

Stratum	# of Sample Points	Stratum Weights	Average kWh Savings for Sample, 2014		Average kW Savings for Sample, 2014	
			Claimed	Evaluated	Claimed	Evaluated
1. Low Savings	7	0.728	3,571	3,614	1.39	1.45
2. Medium Savings	8	0.087	81,428	80,878	14.43	14.63
3. High Savings (Census)	3	0.012	606,302	580,217	86.78	85.48
4. Additional Projects (Census)	44	0.173	26,186	26,022	4.25	4.40
Combined Ratio			**0.984**		**1.018**	

To evaluate lifetime savings, AEG used the EULs from TRM 3.0 Table 291 and assigned them to each project in the sample based on the installed lamp type.[34] For measures that replaced incandescent lamps 100 W or less, first-year savings were based on the claimed baseline and savings for all following years of the measure life were based on the EISA 2007 baseline from Table 289 in TRM 3.0. AEG also devised a consistent approach to estimate lifetime savings for delamping measures. The PY 2014 savings were based on the stated baseline wattage, and the most likely substitute fixture (what the fixture would have been replaced with if it was not delamped) was determined.[35] The savings from the substitute fixture's wattage were then applied for the remaining years of the substitute fixture's lifetime. AEG then extrapolated the sampled results to the population of projects for each subsequent year in the lifetime of the measures (2015 through 2029) using a combined ratio estimate for each year.

[34] The 8.5 year lifetime for "T5 or Premium T8 Replacement of T12 w/ Magnetic Ballast" was only assigned to projects with a 'FixtureName' field entry of "T12 to T8_T5".

[35] T8 equivalents for existing T12 fixtures were found in the AR TRM's Standard Wattage Table. A delamped 456 W HID was assumed to be replaced by a 215 W LED equivalent based on the schotopic/photopic multiplier method from Howard Lighting Products, "HID to LED Wattage Cross Reference Table." http://www.howard-lighting.com/Documents/ProductLiterature/HIDToLEDCrossReference.pdf

Achieved Precision of the Sample

AEG designed the sample for the Commercial Lighting documentation review to achieve the best precision possible given the original sample size of 18. Once we completed the documentation review and expanded the sample to the population, we calculated the achieved precision of the estimates. Table 4-3 reports the achieved precision at the 90% confidence level. The 90% confidence level relative precision for the total program was 0.78% for energy savings and 1.72% for demand savings. The uncertainty in the estimates is only due to Strata 1 and 2. There was no sampling error for Strata 3 and 4 since they were both census strata.

Table 4-3 Achieved Precision of the Savings Estimates

Metric	Evaluated Gross Savings Relative Precision
Energy Savings	0.78%
Demand Savings	1.72%

Net Impacts

Table 4-4 Table 4-4 summarizes the PY 2014 gross and net impact results for the Commercial Lighting program. AEG applied the NTG ratio of 0.99 to the gross savings resulting in net impacts of 6,525,599 kWh per year and 1,117 kW.

Table 4-4 PY 2014 Impact Results for Commercial Lighting

Metric	Gross Impacts			NTG	Net Impact
	Claimed	Evaluated	Realization Rate		
Annual Energy (kWh)	6,702,086	6,591,514	0.984	0.99	6,525,599
Demand Savings (kW)	1,108.41	1,128.30	1.018	0.99	1,117.02

C&I Standard Offer Program Impact Evaluation

AEG applied TRM 3.0 algorithms to estimate the savings for the C&I Standard Offer Program, using default input values for OG&E's service territory in Arkansas and program-specific data for participants. Table 4-5 depicts the results for gross energy savings and demand reductions for the program during PY 2014 (first year) and for the lifetime of the measures.

Table 4-5 C&I Standard Offer Program: Gross Savings Results

Program	Measure	EUL	Evaluated First-Year kWh Savings	Evaluated Lifetime kWh Savings	Evaluated First-Year kW Reduction	Evaluated Weighted Average kW Reduction
Direct Install	CFLs	3	386,591	880,114	60.79	46.13
	Pre-Rinse Spray Valves	5	13,066	65,332	1.43	1.43
	Faucet Aerators	10	306,464	3,064,641	86.91	86.91
	Low-Flow Showerheads	10	77,560	775,600	15.32	15.32
	Vending Misers	5	119,288	596,440	2.22	2.22
Custom	Motors	15	237,951	2,181,494	31.43	19.61
	Chillers	25	312,317	2,299,922	136.71	40.27
	HVAC *	15	182,832	728,432	107.03	28.94
SOP Total			**1,636,070**	**10,591,975**	**442**	**241**

* The HVAC figures in this table include 3 custom projects that were not administered by Direct Options, Inc.

Direct Install Measures

There were five measures installed and evaluated in PY 2014 through the C&I Direct Install program. Using data provided by OG&E and the implementer in the form of a tracking database and TRM-based constants, AEG estimated total program savings for each of the measures in the PY 2014 program. These are summarized in Table 4-6.

Table 4-6 C&I Direct Install Measures: Gross Savings Summary

Measure	Project Count	Measure Count	First-Year kWh Savings	kWh Realization Rate	First-Year kW Reduction	kW Realization Rate
CFL	63	3,084	386,591	88%	60.79	88%
Pre Rinse Spray Valve	1	1	13,066	103%	1.43	103%
Faucet Aerator	77	293	306,464	104%	86.91	102%
Low-Flow Showerhead	9	40	77,560	103%	15.32	138%
Vending Miser	74	74	119,288	100%	2.22	121%
Total	**224**	**3,492**	**902,970**	**96%**	**165.87**	**99%**

Compact Fluorescent Lights

AEG calculated the energy savings and peak demand reductions for the 3,084 CFLs installed in PY 2014 using TRM 3.0 algorithms; inputs from the tracking database included baseline and installed wattages, quantity installed per project, and an indication of whether the project site had electric cooling.

Since there was no building segment or specific HVAC system type identified in the program tracking database, AEG developed per-unit savings for each building segment and HVAC system in the TRM 3.0. These calculated savings were then used to match the claimed savings per unit installed and back-calculate the assumed building segment and HVAC system type per measure entry. An in-service rate (ISR) of 87.8%[36] was then applied to result in final evaluated first-year energy savings and demand reductions of 386,591 kWh/yr and 60.8 kW.

Commercial CFLs were assumed to have a three-year measure life based on a 10,000 hour manufacturer rated life for 13 W CFLs and a weighted average 3,263 annual operating hours across the program.[37] The first-year savings were based off the claimed 60 W existing baseline since this is a direct install program. For the remaining two years of the CFL's EUL, a baseline of 43 W from EISA 2007 requirements was used. For the remainder of the CFL's useful life (i.e. PY 2015 through PY 2016), the measure will save 246,671 kWh/yr and reduce peak demand by 38.8 kW each year.

Pre-Rinse Spray Valves

There was only one spray valve measure installed in the PY 2014 program; this installation was evaluated based on the TRM 3.0 algorithm. Though the TRM specifies average baseline and installed flow rates of 2.25 GPM and 1.28 GPM, AEG confirmed with program staff that the actual flow rates were measured by the installer following Option A IPMVP M&V analysis guidelines. The measured flow rates were found to be 3.83 GPM and 1.37 GPM for the baseline and installed conditions, respectively. The resulting calculated savings based on the measured reduction in flow rate were consistent with claimed values, but the building segment had to be back-calculated with a per-unit savings matrix. The faucet aerator measure saved 94,280 gallons of water per year. Adding regional average embedded energy and demand intensities to the analysis reduced peak demand by an additional 0.05 kW and saved an additional 407 kWh per year in energy. The resultant evaluated energy savings and demand reductions were 103% of the claimed values.

Faucet Aerators

The 293 faucet aerators installed in the PY 2014 program were evaluated with the appropriate TRM 3.0 algorithms; inputs from the database included the flow rate of the installed equipment and quantity installed. Since the building segment type was not specified in the tracking database, AEG developed per-unit TRM savings based on installed flow rate, building segment, and weather zone. These were then used to back-calculate the applicable building segment for each project. As shown in Table 4-7 below, faucet aerators reduced water use by 3,048,602 gallons per year. Adding regional average embedded energy and demand intensities to the analysis reduced peak demand by an additional 1.5 kW and saved an additional 13,158 kWh per year in energy. The resultant energy savings and demand reductions accounted for 104% and 102% of the original claimed savings, respectively.

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[36] In-Service Rate for Direct Install delivery of CFLs in the non-residential sector from: Pacific Gas & Electric Company, "Compact Fluorescent, Downstream & Direct Install." Work Paper PGE3PLTG173, Revision 0. Aug 30, 2012.

[37] This approach is consistent with TRM 3.0, and the annual operating hours were weighted based on actual program building segments and installations. However, the TRM does not specify an EUL for screw-in CFLs; only integrated-ballast CFLs are specified. The 10,000 hour lamp life is consistent with the hours assumed for the 13 W CFLs installed in the MFDI program.

Table 4-7 Commercial Faucet Aerators: Embedded Energy Savings

Building Segment	Water Use	# of Measures Installed	Water Saved (gal/yr)	Embedded Energy Savings (kWh/yr)	Embedded Demand Reduction (kW)
Hospital	3	26	47,852	207	0.02
Commercial	30	157	1,911,750	8,251	0.94
School	30	110	1,089,000	4,700	0.53
Total		**293**	**3,048,602**	**13,158**	**1.49**

Low-Flow Showerheads

Though TRM 3.0 does not include a showerhead algorithm, the 40 low-flow showerhead installations in PY 2014 were evaluated with appropriate TRM 4.0 algorithms. Since only the quantity of installed showerheads was recorded in the tracking database, AEG developed per-unit TRM savings based on the installed flow rate (2, 1.75, or 1.5 GPM) and building segment. We were then able to back-calculate the rated flow rate for the installed equipment as well as the assumed building segment for the project site based on per-unit kWh savings. Though the calculated per-unit energy savings for 1.5 GPM showerheads were approximately 99% of the claimed savings, the claimed kW reductions were more consistent with demand reductions for 1.75 GPM showerheads. After confirming with the implementer that 1.5 GPM showerheads were installed in all the projects and applying regional average embedded energy and demand intensities, the realization rates for the evaluated energy savings and demand reductions were found to be 103% and 138%, respectively.

As shown in Table 4-8 below, low-flow showerheads reduced water use by 559,628 gallons per year, reducing demand by an additional 0.27 kW and saving an additional 2,415 kWh per year in energy.

Table 4-8 Commercial Low-Flow Showerheads: Embedded Energy Savings

Building Segment	Water Use (min/day/unit)	# of Measures Installed	Water Saved (gal/yr)	Embedded Energy Savings (kWh/yr)	Embedded Demand Reduction (kW)
Hospital	6.9	4	7,318	32	0.00
Lodging	9.8	23	59,097	255	0.03
Commercial	7.6	1	1,366	6	0.00
24-H Fitness	155.5	12	491,848	2,123	0.24
Total		**40**	**559,628**	**2,415**	**0.27**

Vending Misers

Savings for the 74 vending misers, or vending machine occupancy controls, installed in PY 2014 were based on values in TRM 3.0. AEG confirmed with the implementer that all the controls were installed on refrigerated vending machines. We also found that one of the accounts did not claim demand reductions for the 13 vending misers installed at the site. The resulting energy savings and demand reductions accounted for 100% and 121% of the originally claimed values.

Standard Offer Program HVAC Measures

There were 112 commercial air conditioner replacement measures input into the Direct Options, Inc. online system and tracking database. Three additional air conditioner replacement projects were handled directly by OG&E's C&I Standard Offer program manager and, therefore, were not included in the Direct Options tracking database. This section discusses the 112 replacements administered by Direct Options, Inc. The other 3 projects are discussed below. AEG combined both sets of HVAC projects when developing measure summary tables.

AEG evaluated the impacts for the HVAC measures using TRM 3.0 guidelines. The efficiencies of the installed equipment were obtained from the tracking database, some of which were confirmed with spot checks of project documentation and OEM specifications. The efficiencies of the existing equipment were assigned based on the recorded age or confirmed with documentation. Measures were evaluated both on a Replace-on-Burnout (ROB) and Early Retirement (ER) basis depending on the recorded age of existing equipment. The savings during any particular year of the measure's 15-year lifetime are then:

$$\Delta kWh = (\Delta kWh_{ER} * RUL) + \left(\Delta kWh_{ROB} * (EUL - RUL)\right) \quad (30)$$

Where:

RUL = Remaining useful life during the year in question (TRM default)

EUL = Estimated useful life during the year in question (TRM default)

The baseline efficiencies for ROB were based on ASHRAE 90.1-2007 levels specified in Table 197 of the TRM 3.0; all recorded Seasonal Energy Efficiency Ratio (SEER) values were converted to Energy Efficiency Ratio (EER) for calculations.[38] The baseline efficiencies for ER were based on historical ASHRAE levels from 1990 through 2007, arranged by capacity tier in Table 198 of the TRM. If there was an existing equipment efficiency level documented in the tracking database, AEG attempted to verify this level with project documentation. If the existing equipment was 24 years of age or older, it was assumed to have an RUL of zero because the TRM did not specify RULs for that equipment. Furthermore, there was no documentation providing evidence that older equipment would be operational for another year. Thus, measures that replaced equipment greater or equal to 24 years of age were evaluated on an ROB basis.

The manufacture date (used to determine historical efficiency level) and RUL (used to determine ROB or ER savings) from the TRM based on equipment age can be seen in Table 4-9; a 23 year old system was taken to be manufactured in 1991. The measure calculator provided by the implementer agreed with this equipment dating method, but assigned an RUL of 1.1 for equipment that is 23 years of age. Furthermore, there was no option in the calculator to select manufacture dates prior to 1991; all equipment 23 years of age or older was assumed to have an (incorrect) RUL of 1.1 by the calculator.

[38] The TRM 4.0 update correctly changed this algorithm to use full-load efficiencies (EER) for demand reduction calculations and part-load efficiencies (SEER and IEER) for energy savings calculations.
Conversion of SEER to EER used by TRM: EER = $-0.02*SEER^2+1.12$ x SEER.

Table 4-9 Age, Manufacture Date, and RUL of Equipment in PY2014

Age (years)	Manuf. Date	RUL (years)	Age (years)	Manuf. Date	RUL (years)
≥ 24	1990	0	14	2000	3.3
23	1991	1	13	2001	3.8
22	1992	1.1	12	2002	4.4
21	1993	1.3	11	2003	5
20	1994	1.5	10	2004	5.7
19	1995	1.7	9	2005	6.5
18	1996	1.9	8	2006	7.3
17	1997	2.2	7	2007	8.2
16	1998	2.5	6	2008	9.1
15	1999	2.8	5	2009	10

Once the correct baseline efficiencies were assigned for the correct capacity tiers based on the capacity of the installed equipment, savings were calculated for each year of the 15-year measure life (i.e. 2014 through 2028). Table 4-10 Table 4-10 depicts the differences in the claimed savings, first-year savings of the ER and ROB baselines from the TRM, and the final evaluated first-year savings for energy and demand for the projects administered by Direct Options, Inc.

Table 4-10 Comparison of HVAC Savings Analyses[39]

Type of Analysis	Energy Savings (kWh/yr)	kWh Realization Rate	Demand Reduction (kW)	kW Realization Rate
Claimed	245,458	--	139	--
Early Retirement (TRM approach)	220,631	90%	124	89%
Replace-on-Burnout (TRM approach)	20,318	8%	12	9%
First-Year Evaluated Savings	**169,695**	**69%**	**98**	**71%**

Analysis of Discrepancies

There were many discrepancies between the claimed values and the final evaluation that resulted in a realization rate of 69% and 71% for the energy and demand savings, respectively, for the HVAC measures. Out of the 112 measures in the program, evaluated first year energy savings and demand reductions matched the claimed values for 61 projects. The remaining 51 projects had a number of issues:

[39] This table ONLY includes the Standard Offer Program HVAC projects administered by Direct Options, Inc.

- Twenty-two (22) projects replaced equipment that was 24 years old or more. These were evaluated on an ROB basis.
- Seventeen (17) projects replaced equipment that was 24 years old with equipment that met the ASHRAE 90.1-2007 standard ROB baseline efficiency requirements. Since the baseline and installed efficiencies were equal, the evaluated savings were zero.
- Three (3) projects replaced equipment that was 24 years old with equipment that was less efficient than the standard baseline. The negative savings were set to zero and not included in the final sum.
- Two (2) projects replaced equipment that was 24 years old or older with equipment that was more efficient than the standard baseline. The resulting evaluated savings were positive but still 20% and 17% of the claimed savings.
- Seventeen (17) projects at the same elementary school claimed weighted lifetime savings in the program database. The evaluated first-year savings were 183%, on average, of the original claimed savings.
- One (1) project with a 20-ton replacement was classified into the wrong capacity tier. The model number and efficiency were then adjusted based on OEM specifications and manufacturer feedback.[40]
- The remaining eleven (11) projects had various issues. Nine (9) of these projects had claimed an existing equipment efficiency, but did not provide sufficient documentation to support it. Documentation was retrieved where possible, and the following is a synopsis of the documentation review:
    - **Rebate ID #2600008:** No model number or nameplate efficiency data was provided for the two existing York AC units in order to substantiate the claimed baseline efficiencies. A baseline SEER of 7 Btu/Wh was claimed for the 5-ton unit and an EER of 7 Btu/Wh was claimed for the 15-ton unit. The applicable TRM 3.0 early retirement baseline for the 1992 vintage is an EER of 9.0 Btu/Wh for the first unit and an EER of 8.3 Btu/Wh for the second unit; these were used in the calculations.
    - **Rebate ID #2600009:** This project included one York 8.5-ton packaged AC and one York 7.5-ton packaged AC that were replaced with new Trane 7.5-ton units. Both existing units were claimed to have an EER of 7 Btu/Wh, but AEG verified that the rated EER for these units was between 8.5 and 9 Btu/Wh via OEM specifications. The applicable TRM 3.0 early retirement baseline for units manufactured in 1999 is an EER of 8.9 Btu/Wh and was used for this project.
    - **Rebate ID #2600010:** No model number or nameplate efficiency data was provided for the existing AC unit in order to substantiate the claimed baseline EER of 8 Btu/Wh. The applicable TRM 3.0 early retirement baseline for units manufactured in 1995 is an EER of 8.5 Btu/Wh and was used for this project.
    - **Rebate ID #2600011:** The existing packaged AC unit for this project (Carrier 48GS) was verified to have a SEER of 10 Btu/Wh instead of the reported SEER of 6 Btu/Wh with OEM specifications. No documentation was provided to substantiate the claimed existing equipment efficiency.

[40] For this project, the installed 20 ton model should have been in the "AC Air Cooled, >= 240,000 and < 760,000 BTU/h (20 to 63.3 tons)" capacity tier instead of the " >= 135,000 and < 240,000 BTU/h (11.25 to 20 tons)" capacity tier. The documentation was checked for this project, and no evidence of it or any nameplate data was found in the documentation attachments. Because the recorded model number (NF240xx) did not exist in York catalogs, the closest model (ZF240xx) was found from York documentation as the likely correct model. The tracking database also recorded an efficiency of SEER 13 for this retrofit, though this is not a typical rating seen for 20-ton units. Manufacturer specification sheets and the AHRI database confirmed the efficiency of a ZF240 unit as 10 EER, which was consistent with the ASHRAE baseline. The manufacturer was also contacted for verification of the serial number.

- **Rebate ID #2600013:** The provided nameplate documentation for the existing unit could not be used to substantiate the claimed baseline SEER of 7 Btu/Wh. The applicable TRM 3.0 early retirement baseline for the 1992 vintage 5 ton packaged AC unit is an EER of 9.0 Btu/Wh.
- **Rebate ID #2600042:** The provided model number for the existing unit could not be used to substantiate the claimed baseline SEER of 9 Btu/Wh. The applicable TRM 3.0 early retirement baseline for the 1992 vintage 3 ton split AC unit is an EER of 9.2 Btu/Wh.
- **Rebate ID #2600043:** AEG was not able to confirm the claimed efficiency for this 1991 vintage York unit. The early replacement efficiency for the equipment is an EER of 9.0 Btu/Wh per TRM 3.0, though the project submittal claimed a SEER of 9.0 Btu/Wh.
- Nine (9) projects claimed an existing baseline efficiency that was identical to the applicable standard based on the equipment vintage; claimed and evaluated savings for these projects matched.
- The remaining two projects had a realization rate of 45%, but it was unclear where the discrepancy stemmed from since first-year savings were evaluated on an ER basis.

Standard Offer Program Custom Measures

AEG evaluated three custom measures in this program based on TRM 3.0 guidelines. The three custom measures are: 1) premium-efficiency motor upgrades, 2) unitary/split HVAC equipment upgrades, and 3) chiller upgrades. The following table shows the number of projects and measures evaluated.

Table 4-11 SOP Custom Projects and Measure Counts

Measure	# of Projects	# of Measures
Premium-efficiency motor upgrades	9	161 motors
Unitary/split HVAC upgrades	3	5 HVAC units
Chiller upgrades	1	1 chiller

For each participant, AEG reviewed the tracked savings and project documentation provided by OG&E. The project documentation includes savings calculations, project invoices, and evidence of OG&E's incentive payments to the participants. Regarding the savings calculations, AEG reviewed the methodologies for consistency with the TRM 3.0 guidelines. AEG also reviewed all of the inputs into the savings calculations, and wherever possible, verified the inputs using the provided project documentation.

All of the custom measures installed under the Standard Offer Program were claimed to be under the Early Retirement category. Per the TRM 3.0 guidelines, AEG evaluated the lifetime savings on a Replace-on-Burnout (ROB) and Early Retirement (ER) basis depending on the recorded age of existing equipment. The savings during any particular year of the measure's lifetime are then:

$$\Delta kWh = (\Delta kWh_{ER} * RUL) + (\Delta kWh_{ROB} * (EUL - RUL)) \quad (31)$$

Where:

RUL = Remaining useful life during the year in question (TRM default)

EUL = Estimated useful life during the year in question (TRM default)

Per guidance received from the IEM, the first-year savings of the measure are used to compare to OG&E's claimed savings and to determine realization rates. Table 4-12 shows a summary of the evaluated savings for the SOP custom measures.

Table 4-12 SOP Custom Measures Gross Savings Summary

Measure	Claimed kWh Savings	Claimed kW Savings	Evaluated First-Year kWh Savings	kWh Realization Rate	Evaluated First-Year kW Reduction	kW Realization Rate
Premium Efficiency Motors	260,993	29.81	237,951	91%	31.43	105%
Chiller	454,803	136.71	312,317	69%	136.71	100%
HVAC	4,754	3.32	13,137	276%	8.75	264%
Total	**720,550**	**169.84**	**563,405**	**78%**	**176.89**	**104%**

Analysis of Discrepancies

AEG generally found that the project documentation for the installed measures did not contain detailed information on the new and replaced equipment specifications. As such, AEG was unable to verify many of the inputs used to calculate savings (e.g. annual hours of operation, new and replaced equipment efficiencies, and age of replaced equipment). For the motor upgrade measure, AEG found that the tracked savings represent the first-year savings for a portion of the installations and the weighted-average of the ROB and ER savings for the remaining installations.[41] Other issues that AEG found during the review that are specific to each participant are noted below.

- **Installations #817391, #139076, and #118222:** The annual hours of operation used to calculate energy savings of the new motors was 8,760 hours. This is significantly higher than the TRM's default hours of operation for the given type of facility and motor horsepower, and it is unlikely the motors operated 24 hours per day, each day of the year. AEG recalculated savings using the hours of operation specified by the TRM.
- **Installation #22176:** The two newly installed HVAC units are actually ground-source heat pumps. However, OG&E only claimed the cooling savings and not heating savings, possibly because the replaced units were AC units that only provided cooling. According to the manufacturer's specifications and photographs of the nameplates of the new units provided in the project documentation, the full-load cooling efficiency is 18.8 EER. Since OG&E used 16.2 EER in the calculator, AEG recalculated the savings using 18.8 EER.
- **Installation #118083:** The savings calculation for the chiller replacement measure does not follow the methodology prescribed in the TRM (IPLV was used instead of kW/ton to calculate the savings). AEG recalculated the savings according to the TRM. However, since the age of the replaced chiller is not available in the project documentation, AEG assumed that it is 36 years old in order to calculate the Early Retirement and lifetime savings.

[41] The weighted-average savings were calculated by using the measure's remaining useful life (RUL) and effective useful life (EUL) as the weights.

Standard Offer Program Net Impacts

Table 4-13 shows the PY 2014 impact results for the direct installation and custom measures under the umbrella of the C&I Standard Offer Program. AEG determined net savings by applying the NTG ratios of 1.0 for direct installation projects and 0.96 for custom projects as described in Section 3. Evaluated first-year savings for custom and direct installation measures were 1,636,070 kWh per year for energy and 442 kW for demand. Realization rates for energy and demand were 85.8% and 92.5%, respectively. The first-year net impacts were 1,606,746 kWh per year and 431 kW.

Table 4-13 2014 Impact Results for SOP

Program	Measure	Metric	Gross Impacts for PY 2014			NTG	Net Impact
			Claimed	Evaluated	Realization Rate		
Direct Install	CFLs	Energy Savings (kWh/yr)	440,309	386,591	87.8%	1	386,591
		Demand Reduction (kW)	69.24	60.79	87.8%	1	60.79
	Pre-Rinse Spray Valves	Energy Savings (kWh/yr)	12,659	13,066	103.2%	1	13,066
		Demand Reduction (kW)	1.39	1.43	103.3%	1	1.43
	Faucet Aerators	Energy Savings (kWh/yr)	293,306	306,464	104.5%	1	306,464
		Demand Reduction (kW)	85.29	86.91	101.9%	1	86.91
	Low-Flow Showerheads	Energy Savings (kWh/yr)	75,210	77,560	103.1%	1	77,560
		Demand Reduction (kW)	11.13	15.32	137.6%	1	15.32
	Vending Misers	Energy Savings (kWh/yr)	119,288	119,288	100.0%	1	119,288
		Demand Reduction (kW)	1.83	2.22	121.3%	1	2.22
Custom	Motors	Energy Savings (kWh/yr)	260,993	237,951	91.2%	0.96	228,433
		Demand Reduction (kW)	29.81	31.43	105.4%	0.96	30.17
	Chillers	Energy Savings (kWh/yr)	454,803	312,317	68.7%	0.96	299,825
		Demand Reduction (kW)	136.71	136.71	100.0%	0.96	131.24
	HVAC	Energy Savings (kWh/yr)	250,212	182,832	73.1%	0.96	175,519
		Demand Reduction (kW)	142.35	107.03	75.2%	0.96	102.75
Totals		**Energy Savings (kWh/yr)**	**1,906,781**	**1,636,070**	**85.8%**		**1,606,746**
		Demand Reduction (kW)	**478**	**442**	**92.5%**		**431**

Process Evaluation for C&I Programs

In-Depth Interviews

In fall 2014 AEG conducted in-depth interviews with the program manager and the implementation contractor for the Direct Install portion of SOP (see Appendix A and Appendix B for the interview guides).

The following are some of the key points from the interviews with the program manager and the implementation contractor.

Marketing and Outreach

- OG&E has done just about every type of marketing for the program over the last 2 years including: radio, TV, newspapers, flyers, bill stuffers, presentations at trade and civic organizations, in-person meetings, telephone calls, and the internet.

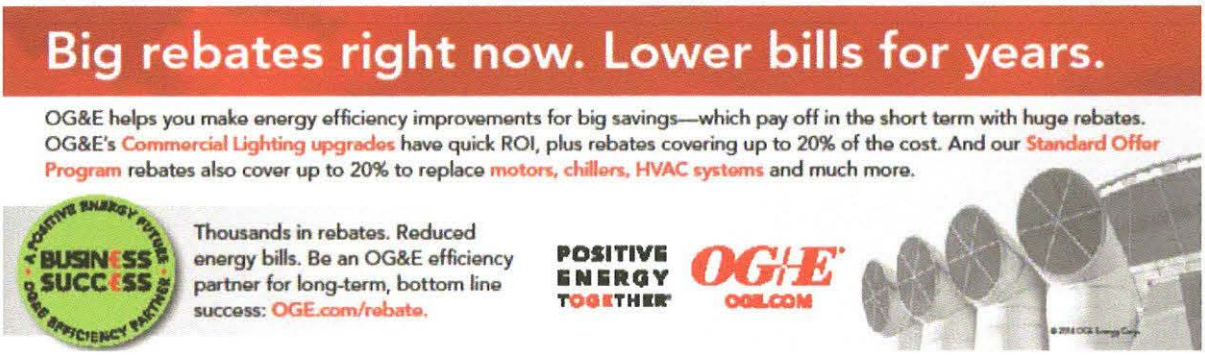


Figure 4-1 Example Print Ad for OG&E Commercial Programs

- The program manager feels the one on one calls/visits are the most successful marketing methods.
- Although OG&E works with a third party implementer, CLEAResult, for the Direct Install portion of the SOP, OG&E is mainly responsible for the marketing and outreach.

Market Barriers

- C&I funding is tenuous. It is difficult to get upgrades included in the customers' capital budgets, and when they are included the company may later decide not to fund the project.
- Having individual program spending caps limits flexibility. If a program (e.g., lighting) is very popular it may exceed its funding when other programs are struggling to meet goals. Having an umbrella program budget for the entire C&I sector with Lighting, SOP and Direct Install as separate components where any combination of projects could use the budget and contribute towards goals would eliminate this barrier.
- Changes to the TRM have decreased the savings achievable by HVAC upgrades. The incentive is now less than 10% of the total cost. As a result, rebates for this measure are not attractive to customers.
- Manufacturers and distributors add to the HVAC desirability problem by not stocking high efficiency units. Since the rebate typically is around $100 and high efficiency units are $1,100 to $1,600 more than standard efficiency, the rebate is not persuasive in encouraging manufacturers and distributors to stock high efficiency units.

Trade Allies

- The program manager does extensive outreach with many trade allies, including manufacturers, distributors, contractors and engineering firms. He attends meetings to explain the programs and has one on one visits as well.
- Feedback from trade allies shows that some feel the program may be too difficult or time consuming; they don't want to deal with paperwork. The online application is being promoted to mitigate this problem. The online application has been favorably received by trade allies.

Customer Satisfaction

- Customers are very satisfied with the program overall. The program manager and the implementation contractor have received positive feedback from customers. Some customers have called to thank the program manager for the rebate check, particularly customers who completed large projects.
- The lighting program and the SOP have recently changed to providing incentives for kWh savings rather than kW savings. Customers have responded really well to this and this change has increased participation, particularly for the lighting program.

Participant Survey

Contact information for a total of 464 unique C&I customers who participated in the Commercial Lighting, SOP or SOP Direct Install programs in 2014 was provided by OG&E. A survey was completed with 94 of these participants in December of 2014 (see Appendix C for the survey instrument). The call disposition of the survey is outlined in Table 4-14 below.

Table 4-14 Participant Survey Call Disposition

Call Disposition	Count	Percent
Sample received from OG&E	464	100%
Terminated – Said they did not participate in program	31	7%
Eligible sample	433	100%
Completed survey	94	22%
Direct Install	*18*	*19% of completes*
SOP	*16*	*17% of completes*
Lighting	*60*	*64% of completes*
Refused	60	14%
Unable to reach	190	44%
Participant not available	68	16%
Phone number issue	21	5%

The survey addressed how participants became aware of the program, verified that the equipment was still installed and in working order, participant satisfaction and program effectiveness.

Program Awareness

OG&E's marketing is having a direct effect on program participation, both in terms of mass marketing, direct customer contact and trade ally outreach activities. OG&E and trade allies are the main ways that participants heard about the program Figure 4-2). Trade ally outreach and direct customer contact seem to have the highest payoff in terms of raising awareness of the programs.

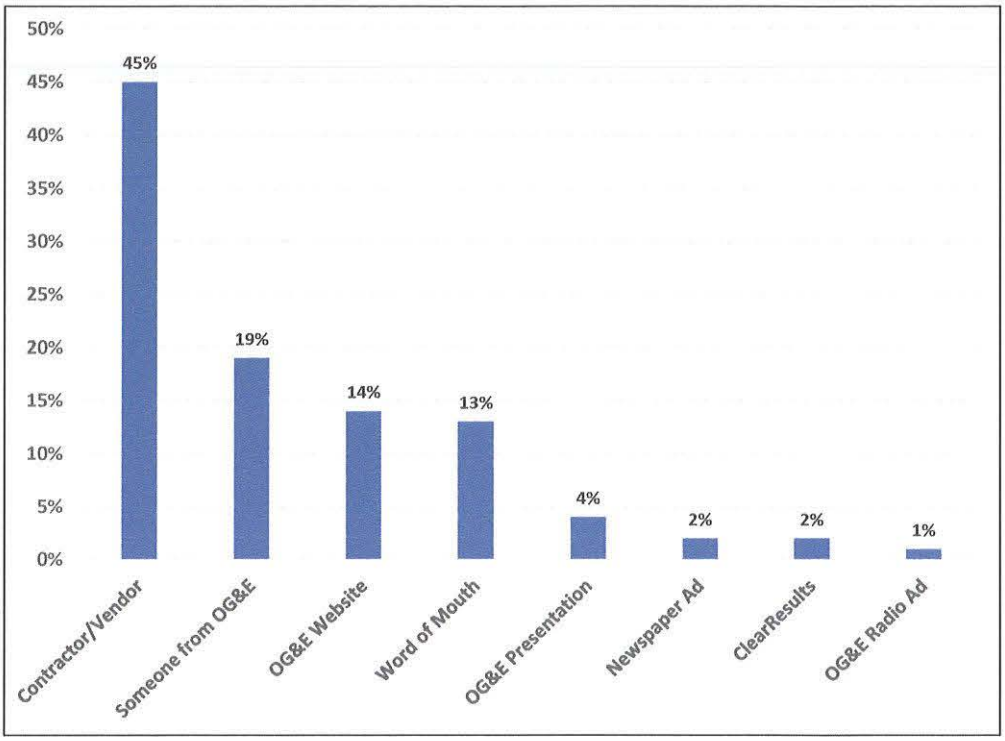


Figure 4-2 How Participants Became Aware of OG&E Program

Equipment Verification

During the survey, participants were asked to verify that the measures were installed in their homes and if they had subsequently removed any of the measures. All Commercial Lighting and SOP participants reported that the measures were currently installed. Three SOP Direct Install participants said they had removed CFLs – two said the CFLs stopped working and one said that the contractor installed CFLs in wall sconces and several wall sconces broke as a result. They also said the wall sconce dimmer switches did not work with the CFLs.

Participant Satisfaction

Satisfaction with various attributes of the program is high, with almost all attributes achieving a mean rating of 8 or higher on a 10-point satisfaction scale. The enrollment process and the ease of working with OG&E received very high mean satisfaction ratings for all programs.

Table 4-15 Mean Satisfaction Ratings by Program

Attribute	SOP Direct Install	SOP	Commercial Lighting
The equipment supported by the program	8.53	9.00	9.55
The enrollment process	9.36	9.13	9.11
Energy savings from equipment installed	7.21	8.20	8.91
Ease of working with OG&E	8.88	9.38	9.42
The program overall	8.12	8.69	9.32

Figure 4-3 shows the top box satisfaction scores (giving a rating of 8 or higher) for each attribute by program. Satisfaction with the energy savings achieved from the equipment installed is much lower for Direct Install participants.

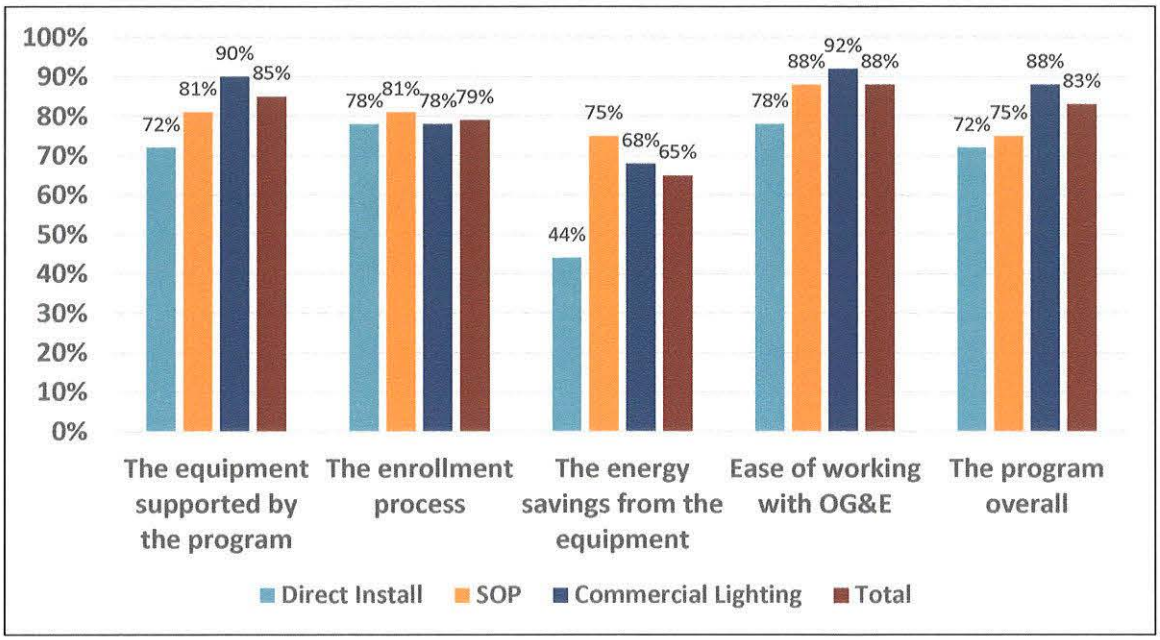


Figure 4-3 Top Box Satisfaction Ratings

Program Effectiveness

Most participants said they participated in the program either to save money or to save energy (Figure 4-4). Fifteen percent said they participated specifically to receive the rebate, although saving money and improving payback are also directly related to the program incentive.

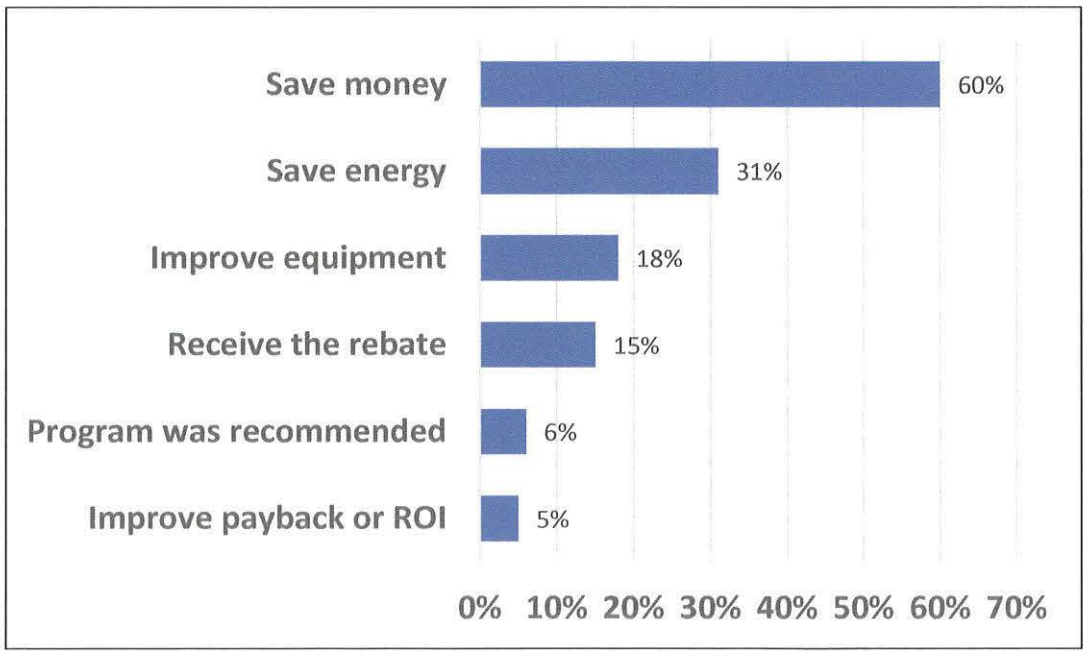


Figure 4-4 Reasons for Participation

Twelve percent of all participants said there was a corporate policy in place related to energy efficiency that they needed to consider when making purchasing decisions. Of those almost half said the policy was to purchase high efficiency equipment if it met specific payback or ROI criteria, a little over a quarter said it was to purchase standard equipment that met code, less than a quarter said it was to repair existing equipment as a first option, and one respondent said it was to purchase high efficiency regardless of cost.

Direct Install Decision Making

For most Direct Install participants (54%), this was their first experience with CFLs, faucet aerators and/or low flow spray valves. Forty-six percent said they had installed at least one of the measures in the past, with most having installed CFLs. Of those that had previous experience with the measures, most said they were not very or not at all likely to have installed the measures without the program (62%). Thirty-eight percent of those with previous experience said they were somewhat likely to have installed the measures on their own. No participants with previous experience said they were very likely to have installed the measures without the program.

SOP Purchasing Decision

Sixty-nine percent of participants learned about the SOP program before they had selected and purchased high efficiency equipment. Trade Allies (contractors/retailers) influenced the most participants to purchase high efficiency equipment; this may be due to OG&E trade ally outreach (Figure 4-5). OG&E directly influenced 19% of participants to purchase high efficiency equipment.

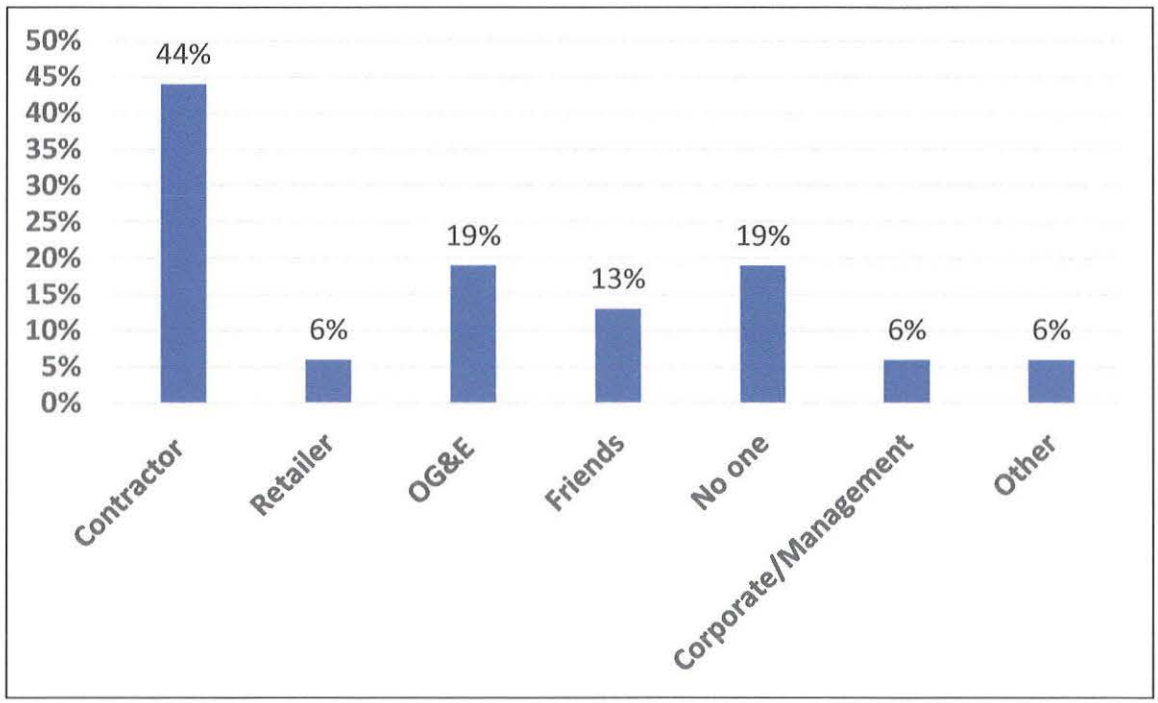


Figure 4-5 Who Influenced SOP Participants to Purchase High Efficiency Equipment

SOP participants were also asked to rate how influence the amount of the rebate and their past experience with OG&E programs had on their decision to purchase high efficiency equipment. Sixty-three percent of SOP participants said the amount of the rebate had a great deal of influence (giving a rating of 4 or 5 on a 5-point scale), while 66% said their past experience with programs had a great deal of influence. Figure 4-6 shows the OG&E influence.

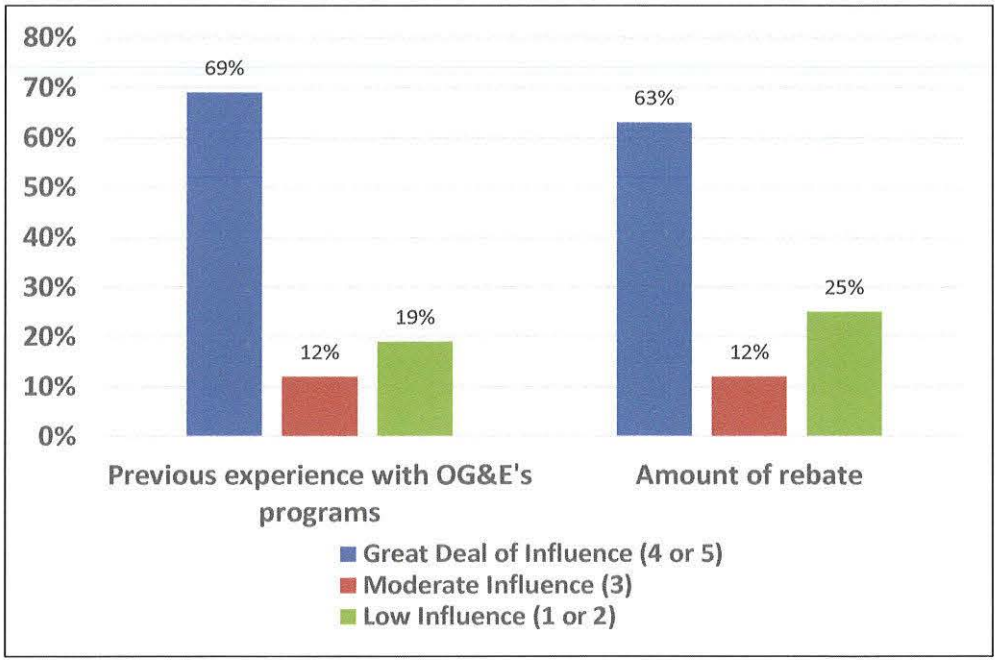


Figure 4-6 OG&E Influence on SOP Participant Purchasing Decision

Almost a third of SOP participants said that their equipment had to be specially ordered, it was not readily available for installation.

Commercial Lighting Purchasing Decision

More than half of respondents (55%) said they heard about the Commercial Lighting program before they had selected and decided to purchase high efficiency lighting. Similar to SOP Trade Allies (contractors/retailers) influenced the most participants to purchase high efficiency lighting and again may be due to OG&E trade ally outreach (Figure 4-7). OG&E also directly influenced 7% of participants to purchase high efficiency lighting.

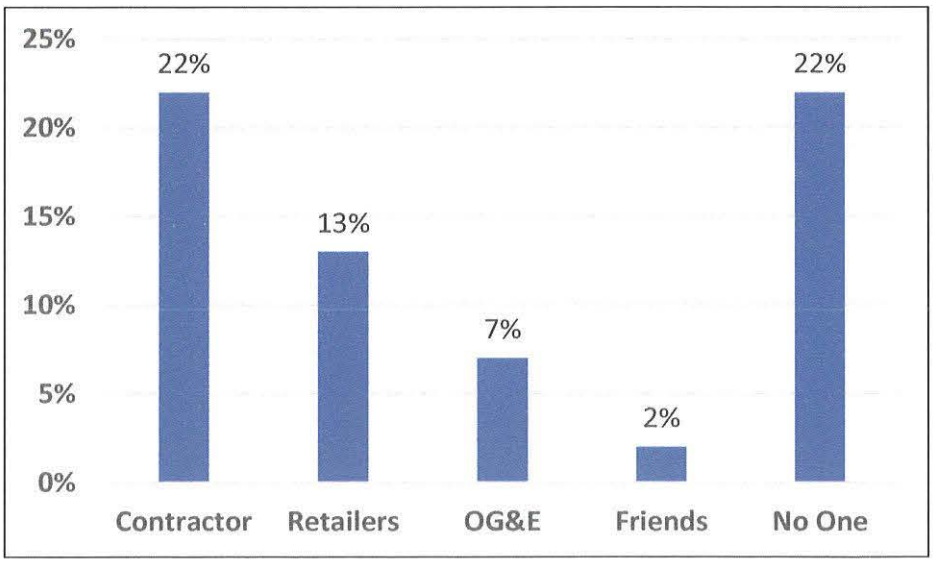


Figure 4-7 Who Influenced Commercial Lighting Participant to Purchase High Efficiency Lighting

Commercial lighting participants were also asked to rate how much influence the amount of the rebate and their past experience with OG&E programs had on their decision to purchase high efficiency lighting. Sixty-three percent of Commercial Lighting participants said the amount of the rebate had a great deal of influence (giving a rating of 4 or 5 on a 5-point scale), while 33% said their past experience with programs had a great deal of influence.

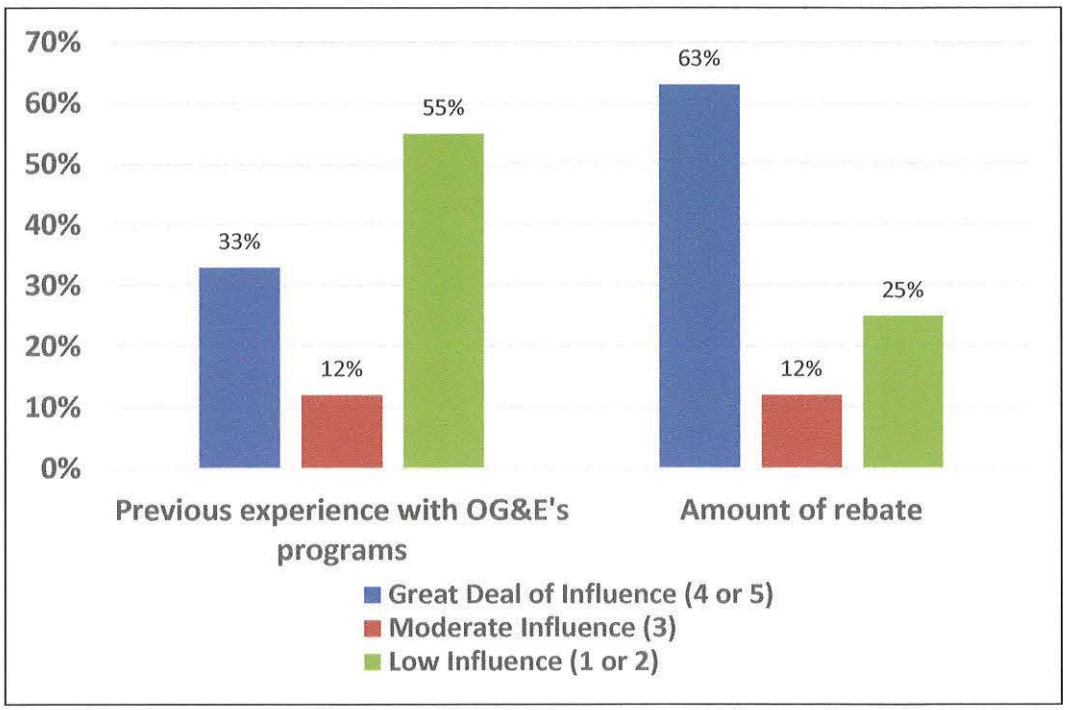


Figure 4-8 OG&E's Influence on Commercial Lighting Participant Purchasing Decision

Spillover

There is evidence of program spillover. Almost half of participants surveyed (46%) said they purchased additional high efficiency lighting or equipment as a result of their participation in the program, although some did receive a rebate from OG&E for their purchase. Twenty-six percent of all participants purchased additional equipment and did not receive an OG&E rebate.

C&I Programs Adherence to Protocol A

The tracking systems for each of the databases conform reasonably well to the tracking system protocol developed for use in Arkansas. Table 4-16 shows a summary of how well the commercial program tracking systems meets the components of the protocol.

Table 4-16 Adherence to Protocol A – Commercial & Industrial Programs

Commercial Lighting
Participating Customer Information – contains all information required including customer identifier (account number), and customer contact information. Also includes milestone dates in terms of application, installation, approval, rebate sent.
Measure Specific Information – collects type of equipment (and measure name), quantity, existing and new wattage, hours of operation, and estimated savings. Would like to see more detail in the tracking file about the specific lamps installed and replaced. Categorical measure names can be too general. OG&E is capturing this data but it is not included in the program tracking spreadsheets. Collecting data on space heating type and fuel would help to more accurately determine interactive effects in impact analysis.
Measure Codes – includes fixture identification number for installed equipment.
Vendor Specific Information - contractor information included on application such as contact name and phone number; could collect type of contractor (equipment or installation) on online application. Sometimes the implementation contractor is included in this field instead of an actual contractor who sold or installed the equipment.
Program Tracking Information - tracks dates of program contacts (application, approval, rebate sent, etc.), amount of incentive, and application status.
Marketing and Outreach Activities - OG&E has done extensive marketing over the years with specific effort paid to one-on-one outreach by the project manager. Includes extensive outreach to trade allies.
Standard Offer
Participating Customer Information – includes all information required including customer contact information, customer identifier (account number), location of building site, date completed and date rebate paid.
Measure Specific Information – includes new equipment type, description size, quantity, and efficiency level; includes estimated savings, hours of operation, and some information on replaced equipment. OG&E and implementation contractor provide two separate tracking files. Implementation contractor information is more complete. Data is captured for all projects but not everything is included on OG&E's tracking spreadsheet.
Measure Codes – n/a; description fields could be used for a measure description such as motors, chiller, HVAC, etc
Vendor Specific Information – - contractor information included on online portal such as contact name and phone number; could collect type of contractor.
Program Tracking Information – tracks dates of program contacts (application, approval, rebate sent, etc.), amount of incentive, and application status.
Marketing and Outreach Activities – One on one contacts and civic presentations to engineering groups are the most successful. Includes extensive outreach to trade allies. Ability to participate very dependent on the economy.
Standard Offer Direct Install
Participating Customer Information – – includes all information required including customer contact information, customer identifier (account number), address, and date completed
Measure Specific Information – – includes type and quantity of measures installed.
Measure Codes – includes unique code for each measure installed
Vendor Specific Information – - not included. Program implemented by third party
Marketing and Outreach Activities – One on one contacts are the most successful

Lifetime Savings

This section shows the lifetime savings by measure and by program. Full details are shown in Appendix D.

Lifetime Savings by Measure

As shown in Table 5-1 and Figure 5-1 C&I lighting measures provided 75% of lifetime energy (kWh) savings. This measure also results in a total of 907.7 weighted average annual demand (kW) reduction. Combined with duct sealing, these two measures provided 80% of lifetime energy savings.

Table 5-1 Lifetime Energy (kWh) Savings and Demand (kW) Reduced By Measure

Measure	Lifetime Energy (kWh) Savings	Lifetime Demand (kW) Reduced
Advanced Power Strips	4,351	0.1
Aerators	5,310,092	110.4
Air Infiltration	813,487	5.0
C&I Lighting	94,311,839	907.7
CFLs	4,222,863	112.5
Chillers	2,207,925	38.7
Duct Sealing	7,756,703	48.6
HVAC	699,295	27.8
Motors	2,094,234	18.8
Pre-Rinse Spray Valves	65,332	1.4
Showerheads	7,794,179	88.6
Vending Misers	596,440	2.2
Total	**125,876,740**	**1,361.8**

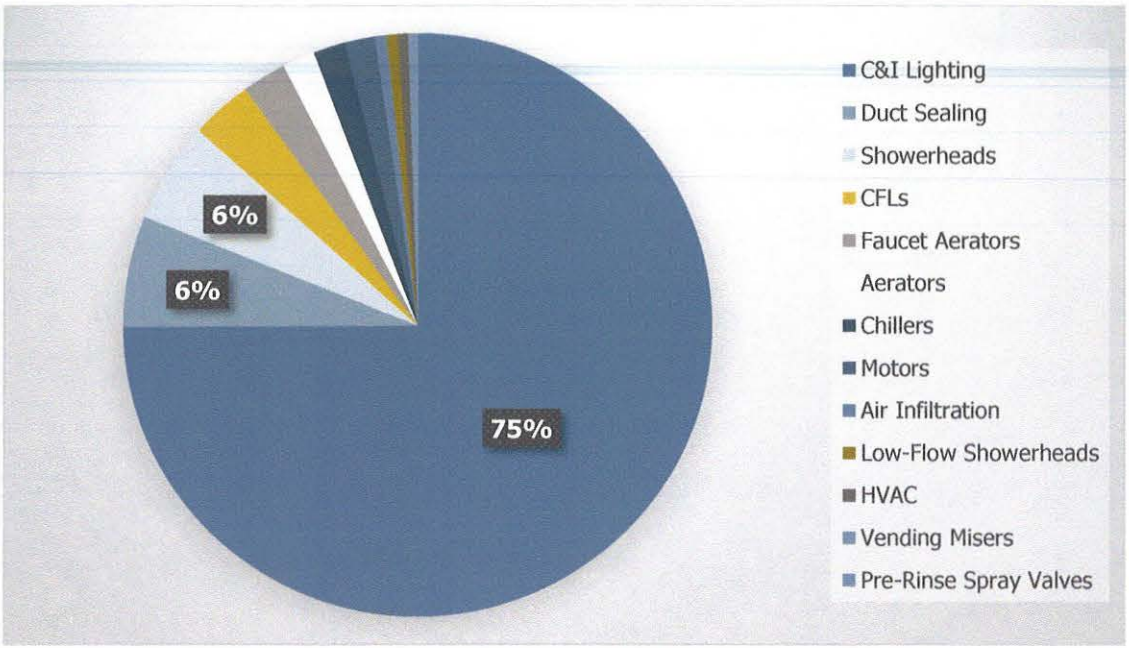


Figure 5-1 Lifetime Energy (kWh) Savings by Measure

Lifetime Savings by Program

As shown in Table 5-2 and Figure 5-2 the Commercial Lighting program provided most of the lifetime energy (kWh) savings and weighted average annual demand (kW) reduced. The Multi-Family Direct Install program provided another 15% of energy savings for a total of 80% for the two programs.

Table 5-2 Lifetime Energy (kWh) Savings and Demand (kW) Reduced by program

Program	Weighted Average Demand (kW) Reduction	Lifetime Energy (kWh) Savings
Commercial Lighting	907.72	94,311,839
MF Direct Install	183.15	18,474,410
C&I Standard Offer	237.29	10,383,581
LivingWise®	33.63	2,706,908
Total	**1,361.80**	**125,876,738**

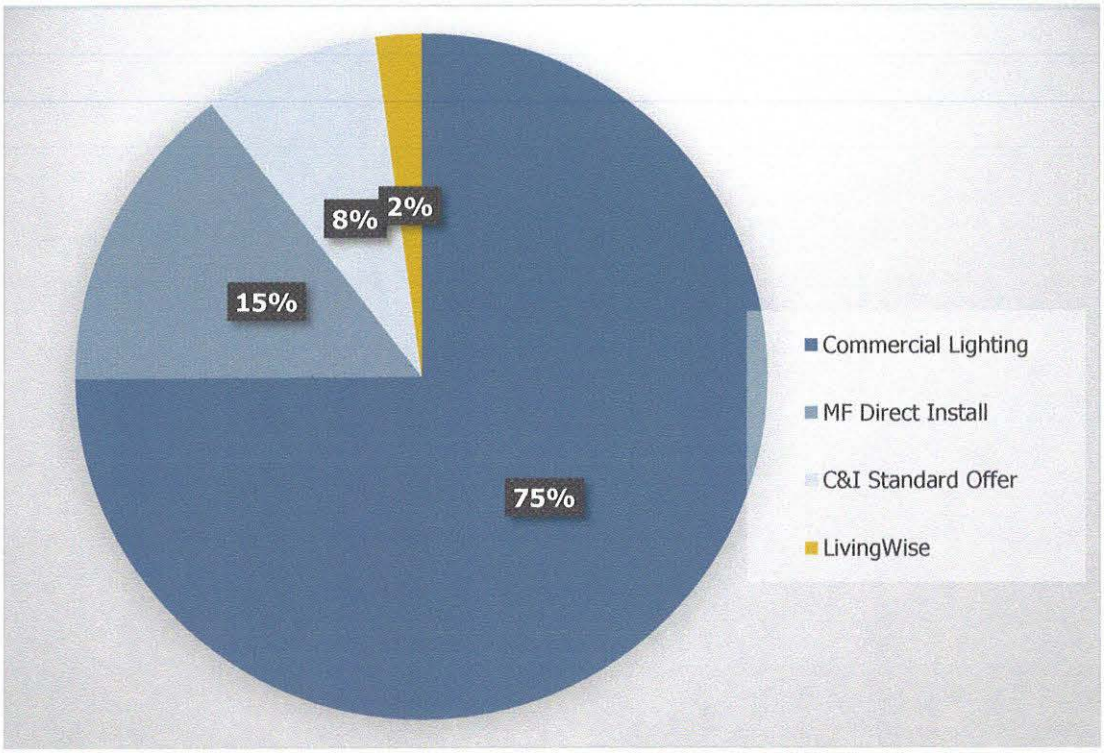


Figure 5-2 Lifetime Energy (kWh) Savings by Program

Recommendations

This section describes the recommendations for improving the programs.

Multi-Family Program

- **Recommendation 1:** Ensure the consistent application of embedded energy and peak demand savings for measures with water savings.

  Rationale: This will provide more accurate claimed savings.

- **Recommendation 2:** Ensure that low-flow showerheads have flow rates of 1.5 gpm rather than 2.0 gpm or use the correct values in calculating claimed savings.

  Rationale: This will provide more accurate claimed savings.

SEE LivingWise® Program

- **Recommendation 1:** The TRM now makes a distinction between heat pumps and other electric heating systems for the calculation of savings from measures that reduce water use and for CFL interactive effects. OG&E does not currently have any information on the saturation of heat pumps or heat pump water heaters but needs to collect it. This could be done in one of the following ways: by having RAP add heat pumps to the to the water and space heating technology options listed on the student surveys, from which the heating technology shares are currently calculated, along with explicit instruction on how to identify a heat pump, or alternately by OG&E conducting a market study to assess the prevalence of heat pumps and heat pump water heaters in the area.

  Rationale: To comply with TRM calculations in the future, OG&E needs to develop information on these electric technology heating shares.

- **Recommendation 2:** Update the values in the tracking system to reflect the newer TRM that becomes available before the end of the program year. While OG&E's implementer, RAP, utilizes the TRM to calculate savings used in the Saratoga tracking system, the values are based on the TRM version available at the beginning of the program year rather than the TRM version in place at the end of the program year and upon which the claimed savings should be based.

  - **Rationale:** OG&E could better align its end of year reported savings with the realized savings and improve the realization rate for the program.

Commercial Lighting Program

- **Recommendation 1:** Consistently collect information on existing and new equipment for Commercial Lighting projects and supporting documentation for projects claimed as early replacement.

  Rationale: Commercial Lighting provides 75% of lifetime energy savings and 67% of demand reduced over 16 years. With better information on new equipment the evaluator could determine lifetime savings by measure; with improved information on baseline

technology savings estimates will be more accurate; with information on the rationale and support for assuming early replacement the estimates of savings will be more robust and defensible.

- **Recommendation 2:** Modify the system to ensure transfer of all the values recorded in the online rebate worksheet to the tracking database, specifically: building segment, space type, and annual operating hours; and baseline and installed fixture types, counts, and wattages

  Rationale: If worksheet parameters are recorded in the tracking database, savings can be replicated for the whole population and the sample review used only to fine-tune the savings.

- **Recommendation 3:** Modify the system to match baseline fixture types to the Arkansas TRM Standard Wattage Table (Appendix E of the TRM). Consistently use fixture wattages that include the ballast (instead of just lamp wattages). Another approach would be to expand the fixture type fields in the worksheet to be more precise: e.g. a 400 HID to High Bay 6L-8L T8 or 4L-6L T5 should specify the number (4, 6 or 8) and type of lamp (T5 or T8) installed. If a T12 fixture is replaced, there should be more clarity on the lamp count, length, and ballast type of the baseline fixture.

  Rationale: Matching to the standard wattage table in TRM helps in baseline specification and verification since it is too difficult to procure cut sheets and information on baseline fixtures. Implementing this recommendation will improve confidence in the savings estimates.

- **Recommendation 4:** Record specifications and model numbers of installed fixtures in the database and include the information in the attached project documentation.

  Rationale: This would allow the evaluator to verify installed system parameters which would improve the robustness of the savings estimates.

- **Recommendation 5:** Ensure that participants provide itemized invoices for the whole project. The program manager could check a sample of 10% of projects against invoices and include a note about this on the program application.

  Rationale: With this information, the evaluator will be able to verify the counts and types of the installed fixtures without needing to request more information from the program manager. This will save evaluator time and costs and program manager time.

- **Recommendation 6:** Create a procedure to check the space type for any project with a space type categorized as Minimum or Low Temperature.

  Rationale: The evaluator found numerous instances of mistaken space types in the reviewed sample/census projects. Having retrofits in refrigerated spaces when the retrofit only takes place in a conditioned space overestimates savings due to greater interactive effects. Including this procedure will correct these errors in the claimed savings and increase the realization rates.

- **Recommendation 7:** Modify the database to check annual operating hours against the hours deemed in the TRM. If the hours do not match, OG&E should require participants to substantiate annual operating hours.

  Rationale: This would improve the effectiveness of the verification of claimed hours and improve the accuracy of savings estimates.

C&I Standard Offer Program

Direct Install Measures (implemented by CLEAResult)

- **Recommendation 1:** Document the building segment and HVAC system type in the program tracking database for each CFL measure entry. Document the building segment for all other measures in the program tracking database. Document the installed flow rate of the low-flow showerheads in the program tracking database.

  Rationale: Though most of the information listed above is kept in other program documentation files managed by the program implementer, being able to readily output this information into one central tracking spreadsheet for evaluators to review would help evaluators conduct the impact analysis much more efficiently.

- **Recommendation 2:** Use regional average embedded energy and demand intensities to take indirect energy and peak demand impacts for measures with water savings into account.

  Rationale: OG&E applies these savings to other program measures with water savings and it would be consistent to include them for these measures as well. This will increase savings and improve the realization rates.

HVAC Measures (tracked by Direct Options)

- **Recommendation 3:** Require the participants to submit documentation (e.g. manufacturer's technical specification sheets, photographs of nameplate, itemized invoices with equipment details, etc.) to substantiate the new and, as far as possible, replaced equipment efficiencies and age of the replaced equipment.

  Rationale: Implementing this recommendation will allow the evaluator to develop better, verifiable, savings estimates by verifying operating parameters and making sure the savings are calculated correctly.

- **Recommendation 4:** Provide evidence for program influence and equipment decommissioning when early retirement is claimed. The TRM does not provide guidance for equipment older than 23 years and, based on the lifetime curve, this equipment should not be functional. If early retirement is claimed for such equipment, the project documentation should include information on the existing operating conditions and maintenance schedule that shows the equipment would still be operating for another year if it was not replaced.

  Rationale: This will assist the evaluator in developing the correct calculation approach and producing verifiable and defensible savings.

- **Recommendation 5:** Update the measure calculator to accommodate units older than 23 years and ensure that equipment age matches with the Remaining Unit Life value.

  Rationale: Updating the measure calculator used for the HVAC (Direct Options) measure will ensure that the estimate of Remaining Useful Life (RUL) is consistent with the TRM.

Motor, Chiller, and Other HVAC Measures (handled by Program Manager)

- **Recommendation 6**: Require the participants to submit documentation (e.g. manufacturer's technical specification sheets, photographs of nameplate, itemized invoices with equipment details, etc.) to substantiate the new and replaced equipment efficiencies and age of the replaced equipment.

  Rationale: Implementing this recommendation will allow the evaluator to develop better, verifiable, savings estimates by verifying operating parameters and making sure the savings are calculated correctly.

- **Recommendation 7**: Provide evidence for program influence and equipment decommissioning when early retirement is claimed rather than assuming the equipment was replaced on burnout.

  Rationale: This would make sure that the applied baseline is accurate. In addition, evidence of equipment decommissioning helps make sure the equipment was actually replaced and removed rather than a newer (more efficient) load was added to the grid.

- **Recommendation 8:** Modify program procedures to follow up when hours of use for motors are claimed as 8,760 by either requiring documentation to substantiate the motor annual operation hours, or using the hours specified in the TRM corresponding to the given facility type.

  Rationale: Hours of operation is an important factor that determines energy savings for the reviewed custom measures. For the premium-efficiency motor measure in particular, an annual hours of operation value of 8,760 hours was claimed by several participants. Even in facilities that are 24/7 operations, it is rare that process motors in these facilities operate each and every hour of the year. Ensuring these hours of operations are correctly entered in the database will reduce time and costs for the evaluation and improve the realization rates for this measure.

Response to PY 2013 Recommendations

Create and implement QA/QC procedures

Recommendation. OG&E should develop a set of procedure/quality control steps in order to report consistent and accurate savings results. For example, OG&E can create a check list and have a supervisor initial and verify that check list tasks were completed before documents are provided to the evaluation team.

> **OG&E Response.** OG&E has implemented a process to have the PMs reconcile the monthly reporting into the Saratoga data base with their individual records. Data is then reconciled annually by the OG&E sales support group for accuracy of reporting. In addition to that, projects approved on the Direct Options website must be completed and approved through a checklist process by the PMs.

Improve Documentation

Recommendation. A data dictionary should be developed for all database maintained by OG&E, CLEAResult, and Direct Options.

> **OG&E Response.** OG&E has provided a data dictionary for 2014. OG&E will require a data dictionary from third party vendors in 2015.

Recommendation. In addition, for each program, OG&E should consolidate all backup documentation and explanations for each parameters tracked, as well as the calculations and methods including the relevant TRM sections for each program measure.

> **OG&E Response.** OG&E is working to consolidate all calculations and deemed savings used into one document. This is a large task as OG&E moves from in-house implementation to third party implementation of programs.

Reporting

Recommendation. Savings summary sheets provided for the evaluation should include all parameters used to calculate savings to the second decimal (or third if parameter used was taken to the third decimal).

> **OG&E Response.** OG&E has required all third party vendors to provide kW to 6 decimal places and kWh to 4 decimal places to reduce round off error and maintain accuracy to 2 decimal places in totals.

Recommendation. Create monthly reports with details by measure for each program to provide feedback to program managers and allow corrections and changes to be made during the program year rather than during the evaluation.

> **OG&E Response.** OG&E has implemented this in their monthly report procedures. A detail sheet is supplied to each PM each month showing each customer from the beginning of the year.

Residential HVAC Tune-Up Program

Recommendations. Replace distribution system efficiency (DSE) TRM default value with field-verified value in claimed savings calculations and urge APSC to adopt in next TRM version. Address contractors' disinterest in installing measures by either providing better or different

support to increase their interest or move to using direct installation to achieve savings. Investigate—perhaps as part of the statewide potential study—whether Arkansas customers need adjustments to refrigerant charges; there may not be much opportunities for savings from this measure as the program manager noted that many of the customers did not need a change of refrigerant charge.

OG&E Response. The program was discontinued Jan 1 2014.

Window AC Program

Recommendations. The program seems to be working as planned. May want to consider expanding the program to cover other efficiency products if they are cost-effective. Use climate zone appropriate deemed savings. The claimed savings used the TRM but some projects were assigned values from the incorrect zone. While the effect is small, the correction is easy and will increase confidence in OG&E's savings claims.

OG&E Response. The program was discontinued Jan 1 2014.

Student Energy Education

Recommendation: Check in with teachers during the participation period to ensure kit distribution and encourage installation of measures in kits. We believe that the implementer should provide this level of monitoring as part of the turn-key service.

> **OG&E Response:** Resource Action Programs (RAP) conducts several follow ups following the shipment of the materials. It begins with a notification to the teacher that their materials have left the facility and will be arriving within a week. In the communication RAP reiterates that the program is free of charge thanks to OG&E and asks them to notify their office staff of the materials pending arrival to ensure delivery is not refused as a result of an unknowing administrative person. RAP follows up again approximately one week post-delivery to inquire if they've opened and reviewed the materials. RAPs goal is twofold. First to confirm all materials were received and secondly to answer any questions they may have. RAP also inquires if they are still on schedule for their originally suggested implementation period. RAP calls again the week of identified implementation, again to offer assistance. During the follow-up, RAP reiterates the education materials support the Arkansas testing standards (e.g. Common Core), a key hot button for all teachers. RAP identifies the value of each kit's products. And, if they are not repeats, RAP points out the pages in their Teachers Guide that contain the option 5-day Teaching Unit Plan followed by the included step-by-step suggestions for starting the program . Both often reduce or eliminate time concerns teachers may have since they recognize the upfront work has been done for them. RAP also continues to follow up after they've indicated they've implemented with the specific goal of returning the student surveys. The effective hook used at this point is reminding them of the $100 mini grant (VISA card) RAP FedEx them when they return 80% of their surveys.

Recommendation: Eliminate sending duplicate kits to teachers who repeatedly enroll in the program. This would reduce program costs by about 2%. These free-up funds could be used to increase participation by additional students.

> **OG&E Response:** The makeup of the kits was changed for PY 2014 and each teacher certainly needs the current kit. In addition, OG&E believes that every teacher should have an up-to-date and fresh kit to use for demonstration purposes in the classroom. The teacher kit is used for classroom instruction and should be "new" in appearance. Also, the teacher's kit can be used as replacement parts for students that lose or break elements in their own kit.

Commercial Lighting Program

Recommendation. The tracking tool used for the Commercial Lighting program seems comprehensive and well maintained. It would be a good idea to have Direct Options create data dictionary and set up procedures to extract usable data and provide to program managers.

> **OG&E Response.** OG&E has had Direct Options provide reports for EM&V as needed through 2014. A data dictionary was provided to the EM&V contractor for 2014.

Recommendation. Ensure all new equipment for custom applications, i.e. rebated on the basis of kW savings, is captured, perhaps with a drop down menu that requires a response.

> **OG&E Response.** In 2014 OG&E moved the online tracking system to a new platform. As part of this migration, OG&E has engaged Direct Options to include drop down menus for all the existing equipment and the new equipment.

Recommendation. Create monthly program reports with measure details, participant information, as well as demand and energy savings, and enhance the ability to create ad hoc reports as needed. This will provide valuable feedback to program managers.

> **OG&E Response.** OG&E has provided program managers with monthly participant and savings values and has reports available from third party vendors to allow close monitoring of all activity.

Standard Offer and Commercial Tune-Up Programs

Recommendation. For PY 2014, add or reallocate funds to enable independent estimation of direct install measures over custom measures if they again comprise the majority of savings OG&E claims for the program.

> **OG&E Response.** OG&E has engaged CLEAResult to provide custom services to customers as well as provide online TRM compliant Chiller and HVAC calculators.

Recommendation. Focus outreach and recruitment on customers with larger energy savings opportunities. While the number of projects processed under the program was far higher than expected in PY 2013, in order to reach the kW and kWh goals, recruitment needs to focus on achieving larger and/or more comprehensive projects. One suggestion is to introduce tiered incentives which would provide higher per-kW for projects above a threshold level.

> **OG&E Response.** OG&E has engaged CLEAResult to design a new portfolio of programs, it is unknown at this time if they plan to present tiered incentives in their plan.

Recommendation. Claim kW savings for vending misers in addition to kWh savings, as indicated in the TRM.

> **OG&E Response.** OG&E has implemented this recommendation.

Recommendation. As part of the upcoming market potential study assess the focus and appeal of the custom projects components of these programs. This program is underperforming in terms of both peak kW reductions and annual kWh savings. The program either needs to include more measures that interest customers or a different outreach approach to reach the target market. Very few of the participants in the Commercial Tune-Up Program installed the high-impact measures promoted or expected by the program.

> **OG&E Response.** The Commercial Tune-Up program has been discontinued. OG&E will use the findings from the Arkansas Market Potential Study currently in progress to review/revise measures and/or target segments in future programs. OG&E has also engaged CR to design the next portfolio of programs, we believe their expertise will greatly boost this programs performance.

Comprehensive Factors

This section describes AEG's assessment of how effectively OG&E Arkansas programs (Multi-Family Direct Install, Student Energy Education LivingWise®, Commercial Lighting, and Standard Offer) have addressed the following comprehensive factors:

Factor 1: Whether the programs and/or portfolio provide, either directly or through identification and coordination, the education, training, marketing, or outreach needed to address market barriers to the adoption of cost-effective energy efficiency measures;

- OG&E's original portfolio contained some programs that met this need well and some that did not. OG&E's revised portfolio (March 2014) dropped programs that struggled to address market barriers and increased the customer incentive in other programs to address barriers in the Commercial and Industrial class. The addition of the Multi-Family Direct Install program directly addresses the "hard to reach customer" barrier for residential customers.

Factor 2: Whether the programs and/or portfolio, have adequate budgetary, management, and program delivery resources to plan, design, implement, oversee and evaluate energy efficiency programs;

- In the PY 2013 discussion of this factor, AEG (then EnerNOC) suggested two areas where OG&E could add more resources are quality assurance and program evaluation. OG&E implemented both of these suggestions for 2014. OG&E's new portfolio increased budgets to address specifically this factor, including allocating funds for program design and third-party implementation for the multi-family program and commercial and industrial programs.

Factor 3: Whether the programs and/or portfolio, reasonably address all major end-uses of electricity or natural gas, or electricity and natural gas, as appropriate;

- OG&E's new portfolio consists of programs designed to be cost effective and still reasonably address all major end-uses of electricity. The C&I SOP program was designed with enough flexibility to address changing commercial needs as the market may dictate. The programs reasonably address all the major end uses for the residential, commercial and industrial sectors as shown in the following table.

OG&E Program	Residential End Uses	Commercial End Uses	Industrial End Uses
Multi-Family Direct Install	Water Heating, Lighting, HVAC		
SEE LivingWise®	Water Heating, Lighting		
Commercial Lighting		Lighting	Lighting
Standard Offer		HVAC, Cooking, Refrigeration, Water Heating, Motors, Air Compressors, Process, Lighting	Refrigeration, Motors, Air Compressors, Pumps, Process

- In the new planning cycle (2016-2018), OG&E will include any new cost-effective measures identified by the statewide potential study. This will likely improve compliance with this factor.

Factor 4: Whether the programs and/or portfolio, to the maximum extent reasonable, comprehensively address the needs of customers at one time, in order to avoid cream-skimming and lost opportunities;

- OG&E's new portfolio addresses the need to address customer needs by providing several options for measures to the Multi-Family participant (e.g. water heating measures and HVAC duct sealing measures). Both the Commercial Lighting and Standard Offer programs are specifically designed to ensure that participant needs are addressed one customer at a time. A specific example of avoiding cream-skimming for residential customers is the new Multi-Family Direct Install program which addresses a "hard to reach" underserved customer segment.

Factor 5: Whether such programs take advantage of opportunities to address the comprehensive needs of targeted customer sectors (for example, schools, large retail stores, agricultural users, or restaurants) or to leverage non-utility program resources (for example, state or federal tax incentive, rebate, or lending programs);

- Both the Standard Offer and Commercial Lighting programs target a variety of sectors. The direct installation of measures in C&I facilities by CLEAResult also focuses on specific sectors such schools, retails stores and restaurants to implement measures such as vending misers and faucet aerators. CleaRESULT also implements programs specifically for schools and small businesses. OG&E's new portfolio of program was designed with enough flexibility to address the needs of the different sectors of customers. Aligning the customer incentive (rebates) with energy savings and will make the Commercial and Industrial programs available to even more customer sectors.

Factor 6: Whether the programs and/or portfolio enables the delivery of all achievable, cost-effective energy efficiency within a reasonable period of time and maximizes net benefits to customers and to the utility system;

- AEG is not responsible for cost-effectiveness analysis.

Factor 7: Whether the programs and/or portfolio, have evaluation, measurement, and verification "EM&V") procedures adequate to support program management and improvement, calculation of energy, demand and revenue impacts, and resource planning decisions.

- The EM&V procedures are continuing to work quite well with the addition of another fully dedicated OG&E EM&V contact. The new portfolio includes both resources and procedures for EM&V that adequately support management of the programs. The remaining programs from the originally filed portfolio have been improved based on recommendation(s) from evaluators. OG&E worked with its evaluator to ensure procedures are in place for the new Multi-Family Direct Install program. During the program year, OG&E solicits advice and guidance from its evaluator to ensure compliance with the TRM and that ex-ante savings are estimated using industry-standard approaches.

Program Manager Interview Guide

Background

Name:
Title:

Please give me a brief description of the program.

Please describe your job responsibilities.

What do you hope to learn from the evaluation?

Program Goals

What are your program goals for 2014?

Are you on target to reach you goals? Why or why not? What are some of the issues that will keep the program from meeting its potential?

Are your goals expected to change in 2015 – how?

Program Marketing

What outreach/recruitment activities do you use to inform customers about the program?

Who is your target market? How do you identify prospective customers for the program?

What marketing channels do you use?

What channels have been most effective?

What marketing messages do you use? What messages seem to resonate the best with customers?

Enrollment Process and Program Implementation

Once the customer is informed about the program what is the enrollment process?

Have you heard any feedback either positive or negative from customers about the enrollment process?

Have you made any changes to the program in the last year? If so, why?

How do you coordinate the efforts of this program with other programs OG&E offers?

Customer Response

What has been the customer response to the program? Have you met your participation goals?

What are the main reasons customers participate?

What is your opinion of free ridership for this program?

Are there certain types of customers that tend to participate more than others? Are you reaching your target market?

Are there certain groups or types of customers that you would like to participate but currently do not?

Are customers satisfied with the program overall? With the measures installed? Are they satisfied with the incentive amount? With the savings achieved?

Trade allies

Do you work with any trade allies on the program? What is their role?

How do you inform/educate trade allies about the program and the measures? Do you provide training/workshops?

What is the response from the trade allies? Are most of them aware of the program? Do you receive any feedback, positive or negative, from the trade allies?

Measures

What measures does the program promote?

If there are several measures, which are the most popular? Why are they installed more than other measures?

Do the incentive levels seem appropriate? If not, why not? What, if any, changes in the incentive levels do you think may be needed?

Other than the increased cost, what are the barriers to installing energy efficiency measures?

How does the program attempt to overcome those barriers?

Is there any evidence that the market for any measures has been transformed?

Program Tracking Database

Does the tracking database collect all the information you need? Is there information/data that you wish were available but are not? Is there information in the database that you don't use?

What quality control and assurance procedures are in place?

How are the inputs for each technology or project determined for baseline, effective useful life, persistence of savings, cost, or savings factors? What documentation is available?

What type of documentation is required to support the purchase and installation of the measure?

What reports or other outputs do you get from the database?

Are these reports easy to access? Are you able to customize the reports?

Lessons Learned/Future plans

Are there any changes planned for the program in the next couple of years?

Are there changes you would like to implement but cannot? What are the obstacles to implementing those changes?

How do you see the program evolving in the next 3- 5 years?

Implementation Contractor Interview Guide

Responsibilities

What are your responsibilities for OG&E's Arkansas programs?

How would you describe your working relationship with OG&E? Does OG&E provide you with all the information you need? Is OG&E available to answer your questions? Is there anything that could be improved?

What metrics do you use to measure your progress/success?

Customer Response

Have you heard any feedback from customers about the services you provide or OG&E?

Are customers satisfied with the program overall? With the measures installed? Are they satisfied with the incentive amount? With the savings achieved?

What are the main reasons customers participate?

What is your opinion of free ridership and spillover in the program? Do you think there is naturally occurring energy efficiency in the market? How much of an influence do you think the program has on improving energy efficiency in the market?

Measures

Are there certain measures that are more popular this program year? Do you promote any specific measures?

Do the incentive levels seem appropriate? If not, why not? What, if any, changes in the incentive levels do you think may be needed?

Other than the increased cost, what are the barriers to installing energy efficiency measures?

How does the program attempt to overcome those barriers?

Is there any evidence that the market for any measures has been transformed?

Program Tracking Database

Do you have a program operations manual, or any other program planning/implementation materials? Can you please provide copies?

Do you collect any data on the work that you do? What is collected? How is it stored?

Lessons Learned/Future plans

Are there any changes planned for your roll in the program in 2015 or beyond?

Are there changes you would like to make but cannot? What are the obstacles to implementing those changes?

OG&E Arkansas C&I Participant Survey Instrument

Introduction

Hello, my name is _____, and I'm calling on behalf of Oklahoma Gas & Electric (OG&E) regarding your company's participation in their Energy Efficiency Programs. May I please speak with [Participant Name]?

[WHEN CORRECT PERSON IS ON THE PHONE]

I am calling to learn about your experience with OG&E's commercial energy efficiency programs. Your company participated in one of OG&E's programs. Are you the correct person to talk with about your experience with OG&E's program?

[VERIFY CORRECT PERSON IS ON PHONE; IF NOT AVAILABLE COLLECT CONTACT INFORMATION]

I'm not selling anything; I'd just like to ask your opinion about this program. We are talking to program participants to learn more about your satisfaction as a program participant, what works well in the program, and what might be improved.

Variables from Sample

Progtype = Program Participated:

Direct Install
Standard Offer Program
Commercial Lighting

LowFlow = Number of low flow pre-rinse spray valves installed in Direct Install program

CFLs = Number of CFLs installed in Direct Install Program

Aerators = Number of Faucet Aerators installed in Direct Install Program

Vending = Number of Vending Misers installed in Direct Install Program

Shower = Number of Showerheads installed in the Direct Install Program

Screening

1. Our records show that you participated in the [PROGTYPE] program in the past year. Is that correct?

Yes
No

[IF NO; THANK AND TERMINATE]

Program Experience

First I would like to ask you some questions about your participation in OG&E's program.

2. How did you learn about OG&E's [PROGTYPE] program?

OG&E Bill Insert
OG&E Radio Ad
CLEAResult staff/contact
Newspaper Ad/Flyer
Phone call from OG&E
OG&E Website
Presentation given by OG&E
Told by contractor
Other (specify :_)

3. On a scale of 1 to 10 with 1 meaning "Not at all Satisfied" and 10 meaning "Very Satisfied" please rate how satisfied you are with the following:

[RECORD 1 to 10 SATISFACTION RATING FOR EACH]

3_1 The equipment supported by the program
3_2 The enrollment process
3_3 The energy savings from the efficient equipment
3_4 The program overall
3_5 Ease of working with OG&E

4. Companies participate in energy efficiency programs for different reasons. Why did your organization decide to participate in this program? *(DO NOT READ LIST; CHECK ALL THAT APPLY]*

0 = Not Mentioned
1 = Mentioned

4_1 The payback or return on investment
4_2 The rebate
4_3 The program was recommended to our company
4_4 Wanted to save energy
4_5 Wanted to save money
4_6 Other (Specify_)

Direct Install Participants

[ASK IF PROGTYPE = DIRECT INSTALL; ELSE SKIP TO NEXT SECTION]

Now I would like to ask you about the measures that were installed by CLEAResult in your building.

5. Our records indicate you had the following measures installed by the program, is that correct? *[VERIFY QUANTITY OF EACH MEASURE RECEIVED; FILL IN VERIFIED QUANTITY FOR EACH MEASURE; IF RESPONDENT IS UNSURE, CAN'T REMEMBER OR DOES NOT KNOW, PLEASE USE CODE 998. DO NOT INCLUDE GUESSES; IF THEY ARE NOT SURE CODE THE ANSWER 998]*

Measure	Quantity	Verified Quantity Installed
Low flow spray valves	[QTY FROM SAMPLE]	_____
CFLs	[QTY FROM SAMPLE]	_____
Faucet Aerators	[QTY FROM SAMPLE]	_____
Vending Miser	[QTY FROM SAMPLE]	_____
Showerhead	[QTY FROM SAMPLE]	_____

6. Have you removed any of the measures that were installed through the program?

Yes
No
Don't know

7. *[IF Q6 = YES]* What did you remove?

Measure	Quantity Removed
Low flow spray valves	_____
CFLs	_____
Faucet Aerators	_____
Vending Misers	_____
Showerheads	_____

[CHECK THAT QUANTITY REMOVED IS NOT GREATER THAN VERIFIED QUANTITY INSTALLED]

8. Why did you remove those measures?

RECORD VERBATIM RESPONSE

9. Have you installed CFL's, low flow spray valves or faucet aerators in the past?

Yes
No

10. *[IF Q9 = YES]* What have you installed?

CFLs
Low Flow Spray Valves
Faucet Aerators

11. How likely would you have been to install the measures on your own if they had not been offered through the program? Would you say that you would have been . . .

Very likely to install the measures
Somewhat likely to install the measures
Not very likely to install the measures
Not at all likely to install the measures

[SKIP TO PROGRAM EFFECTIVENESS]

Commercial Lighting

[ASK IF PROGTYPE = COMMERCIAL LIGHTING; ELSE SKIP TO NEXT SECTION]

Now I want to ask you some questions about why your company's decision to install high efficiency lighting at your facility.

12. Who if anyone recommended that you install high efficiency lighting in your facility?

Contractor
Retailer
Auditor or Energy Specialist
OG&E Account Representative/Program Manager/Staff
Friends/Family/Colleagues
No One
Other (specify_)

13. Did you learn about the rebate program before or after you selected and decided to purchase the high efficiency lighting?

Before selected lighting
After selected lighting
Don't know

14. I'm going to ask you to rate the importance of factors that might have influenced your decision to install high efficiency lighting. On a scale of 1 to 5 with 1 meaning "No Influence at All" and 5 meaning "A Great Deal of Influence" please rate how each of the following influenced your decision to install high efficiency lighting.

[RECORD 1 to 5 RESPONSE FOR EACH REASON]

14_1 *[IF Q12 NE NO ONE]* Recommendation of *[FILL Q12]*
14_2 Age or condition of existing lighting
14_3 Amount of rebate
14_4 Previous experience with OG&E's programs

15. Have you removed any of the lighting you installed through the program?

Yes
No

16. *[IF Q15 = YES]* What lighting did you remove?

RECORD VERBATIM RESPONSE [PROBE FOR QUANTITY AND TYPE OF LIGHTING]

17. Why did you remove the lighting?

RECORD VERBATIM RESPONSE

Commercial SOP

[ASK IF PROGTYPE = STANDARD OFFER PROGRAM; ELSE SKIP TO NEXT SECTION]

Now I want to ask you some questions about why you decided to purchase and install high efficiency equipment at your facility.

18. Who if anyone recommended that you install high efficiency equipment in your facility?

Contractor
Retailer
Auditor or Energy Specialist
OG&E Account Representative/Program Manager/Staff
Friends/Family/Colleagues
No One
Other (specify_)

19. Did you learn about the rebate program before or after you selected and decided to purchase the high efficiency equipment?

Before selected equipment
After selected equipment
Don't know

20. I'm going to ask you to rate the importance of factors that might have influenced your decision to install high efficiency equipment. On a scale of 1 to 5 with 1 meaning "No Influence at All" and 5 meaning "A Great Deal of Influence" please rate how each of the following influenced your decision to install high efficiency equipment.

[RECORD 1 to 5 RESPONSE FOR EACH REASON]

19_1 *[IF Q18 NE NO ONE]* Recommendation of *[FILL Q18]*
19_2 Age or condition of existing equipment
19_3 Amount of rebate
19_4 Previous experience with OG&E's programs

21. Was the high efficiency equipment you purchased and installed readily available, or did it have to be specially ordered?

Equipment was readily available
Equipment had to be specially ordered
Don't know

22. Have you removed any of the equipment that you installed through the program and received a rebate for?

Yes
No

23. *[IF Q22 = YES]* What equipment did you remove?

RECORD VERBATIM RESPONSE [PROBE FOR QUANTITY AND TYPE OF EQUIPMENT]

24. Why did you remove the equipment?

RECORD VERBATIM RESPONSE

Program Effectiveness

25. Does your company have any corporate policies related to energy efficiency that you need to consider when purchasing new equipment or making improvements to this facility?

Yes
No
Don't know*]*

26. *[IF Q25 = YES]* Which of the following best describes your corporate purchasing policy? *(READ LIST; CHECK ONE RESPONSE)*

Purchase energy efficient measures regardless of cost
Purchase energy efficient measures if it meets payback or return on investment criteria
Purchase standard efficiency measures that meet code
Repair existing equipment as first choice
Something else (Specify_)

27. As a result of your experience with the program did you install additional high efficiency equipment (that is, equipment that is more efficient than the minimum efficiency level allowed under code?

Yes
No

28. [IF Q27 = YES] What type of equipment did you install?

Lighting
HVAC (heating, cooling, ventilation, geothermal)
Motors
Chillers
Water Heating
Refrigeration
Kitchen appliances (cooking, dishwashing, etc.)
Something else (specify_)

29. Did you receive a rebate from OG&E for the additional high efficiency equipment you installed?

Yes
No

30. Do you have any suggestions for changes that could improve the program?

RECORD VERBATIM RESPONSE

That's all the questions that I have for you today. Thank you for your time. Have a great day.

APPENDIX | D

Lifetimes Savings by Program, Measure, and Year

Lifetime Gross Energy (kWh) Savings

Program	Measure	EUL (TRM)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Through 2038*	Total
LivingWise	CFLs	9	112,918	72,177	72,177	72,177	72,177	72,177	72,177	72,177	72,177	--	--	--	--	--	--	--	--	--	--	690,331
	Aerators	10	40,202	40,202	40,202	40,202	40,202	40,202	40,202	40,202	40,202	40,202	--	--	--	--	--	--	--	--	--	402,018
	Showerheads	10	148,120	148,120	148,120	148,120	148,120	148,120	148,120	148,120	148,120	148,120	--	--	--	--	--	--	--	--	--	1,481,201
	Total	Varies	**301,240**	**260,498**	**260,498**	**260,498**	**260,498**	**260,498**	**260,498**	**260,498**	**260,498**	**188,322**	--	--	--	--	--	--	--	--	--	2,573,549
MF Direct Install	CFLs	9	544,631	347,637	347,637	347,637	347,637	347,637	347,637	347,637	347,637	--	--	--	--	--	--	--	--	--	--	3,325,725
	Aerators	10	190,122	190,122	190,122	190,122	190,122	190,122	190,122	190,122	190,122	190,122	--	--	--	--	--	--	--	--	--	1,901,224
	Showerheads	10	582,676	582,676	582,676	582,676	582,676	582,676	582,676	582,676	582,676	582,676	--	--	--	--	--	--	--	--	--	5,826,755
	Air Infiltration	11	82,170	82,170	82,170	82,170	82,170	82,170	82,170	82,170	82,170	82,170	82,170	--	--	--	--	--	--	--	--	903,874
	Duct Sealing	18	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	478,809	--	8,618,558
	Advanced Power Strips	10	483	483	483	483	483	483	483	483	483	483	--	--	--	--	--	--	--	--	--	4,834
	Total	Varies	**1,878,891**	**1,681,897**	**1,681,897**	**1,681,897**	**1,681,897**	**1,681,897**	**1,681,897**	**1,681,897**	**1,681,897**	**1,334,261**	**560,979**	**478,809**	**478,809**	**478,809**	**478,809**	**478,809**	**478,809**	**478,809**	--	20,580,971
Commercial Direct Install	CFLs	3	386,591	246,761	246,761	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	880,114
	Pre-Rinse Spray Valves	5	13,066	13,066	13,066	13,066	13,066	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65,332
	Faucet Aerators	10	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	--	--	--	--	--	--	--	--	--	3,064,641
	Low-Flow Showerheads	10	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	--	--	--	--	--	--	--	--	--	775,600
	Vending Misers	5	119,288	119,288	119,288	119,288	119,288	--	--	--	--	--	--	--	--	--	--	--	--	--	--	596,440
	Total	Varies	**902,970**	**763,140**	**763,140**	**516,379**	**516,379**	**384,024**	**384,024**	**384,024**	**384,024**	**384,024**	--	--	--	--	--	--	--	--	--	5,382,128
C&I Standard Offer	Motors	15	237,951	237,951	237,951	237,951	237,951	227,172	193,543	123,601	92,055	83,472	54,379	54,379	54,379	54,379	54,379	--	--	--	--	2,181,494
	Chillers	25	312,317	312,317	312,317	184,224	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	56,131	392,915	2,299,922
	HVAC	15	182,832	149,727	66,933	34,937	32,994	29,589	26,327	25,637	25,637	25,637	25,637	25,637	25,637	25,637	25,637	--	--	--	--	728,432
	Total	Varies	**733,100**	**699,995**	**617,202**	**457,112**	**327,075**	**312,892**	**276,000**	**205,368**	**173,822**	**165,240**	**136,147**	**136,147**	**136,147**	**136,147**	**136,147**	**56,131**	**56,131**	**56,131**	**392,915**	5,209,847
Commercial Lighting	C&I Lighting	Varies	**6,591,514**	**6,334,956**	**6,250,848**	**6,250,848**	**6,250,848**	**6,250,848**	**6,250,848**	**6,250,848**	**6,139,125**	**6,115,561**	**6,115,561**	**6,115,561**	**6,115,561**	**6,115,561**	**6,115,561**	**2,000,430**				95,264,484
Total	All Programs	Varies	**10,407,716**	**9,740,487**	**9,573,586**	**9,166,735**	**9,036,698**	**8,890,160**	**8,853,269**	**8,782,636**	**8,639,366**	**8,187,407**	**6,812,687**	**6,730,517**	**6,730,517**	**6,730,517**	**6,730,517**	**2,535,369**	**534,940**	**534,940**		128,618,064

Lifetime Net Energy (kWh) Savings

Program	Measure	EUL (TRM)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Through 2038	Total
LivingWise	CFLs	9	106,143	67,846	67,846	67,846	67,846	67,846	67,846	67,846	67,846	--	--	--	--	--	--	--	--	--	--	648,911
	Aerators	10	45,830	45,830	45,830	45,830	45,830	45,830	45,830	45,830	45,830	45,830	--	--	--	--	--	--	--	--	--	458,301
	Showerheads	10	159,970	159,970	159,970	159,970	159,970	159,970	159,970	159,970	159,970	159,970	--	--	--	--	--	--	--	--	--	1,599,697
	Total		**311,942**	**273,646**	**273,646**	**273,646**	**273,646**	**273,646**	**273,646**	**273,646**	**273,646**	**205,800**	--	--	--	--	--	--	--	--	--	2,706,908
MF Direct Install	CFLs	9	441,151	281,586	281,586	281,586	281,586	281,586	281,586	281,586	281,586	--	--	--	--	--	--	--	--	--	--	2,693,837
	Aerators	10	178,715	178,715	178,715	178,715	178,715	178,715	178,715	178,715	178,715	178,715	--	--	--	--	--	--	--	--	--	1,787,151
	Showerheads	10	541,888	541,888	541,888	541,888	541,888	541,888	541,888	541,888	541,888	541,888	--	--	--	--	--	--	--	--	--	5,418,882
	Air Infiltration	11	73,953	73,953	73,953	73,953	73,953	73,953	73,953	73,953	73,953	73,953	73,953	--	--	--	--	--	--	--	--	813,487
	Duct Sealing	18	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	430,928	--	7,756,703
	Advanced Power Strips	10	435	435	435	435	435	435	435	435	435	435	--	--	--	--	--	--	--	--	--	4,351
	Total		**1,667,071**	**1,507,505**	**1,507,505**	**1,507,505**	**1,507,505**	**1,507,505**	**1,507,505**	**1,507,505**	**1,507,505**	**1,225,920**	**504,881**	**430,928**	**430,928**	**430,928**	**430,928**	**430,928**	**430,928**	**430,928**	**0**	18,474,410
Commercial Direct Install	CFLs	3	386,591	246,761	246,761	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	880,114
	Pre-Rinse Spray Valves	5	13,066	13,066	13,066	13,066	13,066	--	--	--	--	--	--	--	--	--	--	--	--	--	--	65,332
	Faucet Aerators	10	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	306,464	--	--	--	--	--	--	--	--	--	3,064,641
	Low-Flow Showerheads	10	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	77,560	--	--	--	--	--	--	--	--	--	775,600
	Vending Misers	5	119,288	119,288	119,288	119,288	119,288	--	--	--	--	--	--	--	--	--	--	--	--	--	--	596,440
	Total		**902,970**	**763,140**	**763,140**	**516,379**	**516,379**	**384,024**	**384,024**	**384,024**	**384,024**	**384,024**	--	--	--	--	--	--	--	--	--	5,382,128
C&I Standard Offer	Motors	15	228,433	228,433	228,433	228,433	228,433	218,085	185,801	118,657	88,372	80,133	52,204	52,204	52,204	52,204	52,204	--	--	--	--	2,094,234
	Chillers	25	299,825	299,825	299,825	176,855	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	53,886	377,199	2,207,925
	HVAC	15	175,519	143,738	64,256	33,540	31,674	28,406	25,274	24,611	24,611	24,611	24,611	24,611	24,611	24,611	24,611	--	--	--	--	699,295
	Total		**703,776**	**671,995**	**592,514**	**438,828**	**313,992**	**300,376**	**264,960**	**197,153**	**166,869**	**158,630**	**130,701**	**130,701**	**130,701**	**130,701**	**130,701**	**53,886**	**53,886**	**53,886**	**377,199**	5,001,453
Commercial Lighting	C&I Lighting		**6,525,599**	**6,271,607**	**6,188,340**	**6,188,340**	**6,188,340**	**6,188,340**	**6,188,340**	**6,188,340**	**6,077,733**	**6,054,406**	**6,054,406**	**6,054,406**	**6,054,406**	**6,054,406**	**6,054,406**	**1,980,425**	**0**	**0**	**0**	94,311,839
Total	All Programs		**10,111,359**	**9,487,893**	**9,325,145**	**8,924,697**	**8,799,862**	**8,653,891**	**8,618,476**	**8,550,669**	**8,409,778**	**8,028,779**	**6,689,988**	**6,616,034**	**6,616,034**	**6,616,034**	**6,616,034**	**2,465,239**	**484,813**	**484,813**	**377,199**	125,499,540

Lifetime Gross Weighted Average Demand (kW) Reduced

Program	Measure	EUL (TRM)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Through 2038	Weighted Average kW Reduction
LivingWise	CFLs	9	19.03	12.16	12.16	12.16	12.16	12.16	12.16	12.16	12.16	--	--	--	--	--	--	--	--	--	--	12.93
	Aerators	10	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	4.20	--	--	--	--	--	--	--	--	--	4.20
	Showerheads	10	15.46	15.46	15.46	15.46	15.46	15.46	15.46	15.46	15.46	15.46	--	--	--	--	--	--	--	--	--	15.46
	Total	Varies	**38.69**	**31.82**	**31.82**	**31.82**	**31.82**	**31.82**	**31.82**	**31.82**	**31.82**	**19.66**	--	--	--	--	--	--	--	--	--	
MF Direct Install	CFLs	9	98.70	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	--	--	--	--	--	--	--	--	--	--	66.97
	Aerators	10	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86	19.86	--	--	--	--	--	--	--	--	--	19.86
	Showerheads	10	60.84	60.84	60.84	60.84	60.84	60.84	60.84	60.84	60.84	60.84	--	--	--	--	--	--	--	--	--	60.84
	Air Infiltration	11	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	--	--	--	--	--	--	--	--	5.53
	Duct Sealing	18	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	54.03	--	54.03
	Advanced Power Strips	10	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	--	--	--	--	--	--	--	--	--	0.06
	Total	Varies	**239.02**	**203.32**	**203.32**	**203.32**	**203.32**	**203.32**	**203.32**	**203.32**	**203.32**	**140.32**	**59.56**	**54.03**	**54.03**	**54.03**	**54.03**	**54.03**	**54.03**	**54.03**	--	
Commercial Direct Install	CFLs	3	60.79	38.80	38.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46.13
	Pre-rinse Spray Valves	5	1.43	1.43	1.43	1.43	1.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.43
	Faucet Aerators	10	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	--	--	--	--	--	--	--	--	--	86.91
	Low-Flow Showerheads	10	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	--	--	--	--	--	--	--	--	--	15.32
	Vending Misers	5	2.22	2.22	2.22	2.22	2.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.22
	Total	Varies	**166.68**	**144.69**	**144.69**	**105.89**	**105.89**	**102.24**	**102.24**	**102.24**	**102.24**	**102.24**	--	--	--	--	--	--	--	--	--	
C&I Standard Offer	Motors	15	31.43	31.43	31.43	31.43	31.43	30.20	26.36	17.60	13.26	11.88	7.54	7.54	7.54	7.54	7.54	--	--	--	--	19.61
	Chillers	25	136.71	136.71	136.71	80.64	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	24.57	40.27
	HVAC	15	107.03	88.33	41.14	22.10	20.92	18.84	16.77	16.26	16.26	16.26	16.26	16.26	16.26	16.26	16.26	--	--	--	--	28.94
	Total	Varies	**275.16**	**256.47**	**209.28**	**134.17**	**76.91**	**73.61**	**67.70**	**58.43**	**54.09**	**52.71**	**48.37**	**48.37**	**48.37**	**48.37**	**48.37**	**24.57**	**24.57**	**24.57**	**24.57**	
Commercial Lighting	**C&I Lighting**	Varies	**1,128.30**	**1,027.71**	**951.83**	**951.83**	**951.83**	**951.83**	**951.83**	**951.83**	**928.44**	**922.49**	**922.49**	**922.49**	**922.49**	**922.49**	**922.49**	**339.89**				916.89
Total	**All Programs**	Varies	**1,847.86**	**1,664.02**	**1,540.94**	**1,427.03**	**1,369.77**	**1,362.82**	**1,356.90**	**1,347.64**	**1,319.91**	**1,237.41**	**1,030.42**	**1,024.89**	**1,024.89**	**1,024.89**	**1,024.89**	**418.49**	**78.60**	**78.60**	**24.57**	

Lifetime Net Weighted Average Demand (kW) Reduced

Program	Measure	EUL (TRM)	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Through 2038	Weighted Average kW Reduction
LivingWise	CFLs	9	17.89	11.43	11.43	11.43	11.43	11.43	11.43	11.43	11.43	--	--	--	--	--	--	--	--	--	--	12.15
	Aerators	10	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.78	--	--	--	--	--	--	--	--	--	4.78
	Showerheads	10	16.70	16.70	16.70	16.70	16.70	16.70	16.70	16.70	16.70	16.70	--	--	--	--	--	--	--	--	--	16.70
	Total		**39.37**	**32.92**	**32.92**	**32.92**	**32.92**	**32.92**	**32.92**	**32.92**	**32.92**	**21.48**	--	--	--	--	--	--	--	--	--	
MF Direct Install	CFLs	9	79.95	51.03	51.03	51.03	51.03	51.03	51.03	51.03	51.03	--	--	--	--	--	--	--	--	--	--	54.24
	Aerators	10	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	18.66	--	--	--	--	--	--	--	--	--	18.66
	Showerheads	10	56.58	56.58	56.58	56.58	56.58	56.58	56.58	56.58	56.58	56.58	--	--	--	--	--	--	--	--	--	56.58
	Air Infiltration	11	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	4.98	--	--	--	--	--	--	--	--	4.98
	Duct Sealing	18	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	48.63	--	48.63
	Advanced Power Strips	10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	--	--	--	--	--	--	--	--	--	0.05
	Total		**208.86**	**179.94**	**179.94**	**179.94**	**179.94**	**179.94**	**179.94**	**179.94**	**179.94**	**128.91**	**53.61**	**48.63**	**48.63**	**48.63**	**48.63**	**48.63**	**48.63**	**48.63**	--	
Commercial Direct Install	CFLs	3	60.79	38.80	38.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	46.13
	Pre-rinse Spray Valves	5	1.43	1.43	1.43	1.43	1.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.43
	Faucet Aerators	10	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	86.91	--	--	--	--	--	--	--	--	--	86.91
	Low-Flow Showerheads	10	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	15.32	--	--	--	--	--	--	--	--	--	15.32
	Vending Misers	5	2.22	2.22	2.22	2.22	2.22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.22
	Total		**166.68**	**144.69**	**144.69**	**105.89**	**105.89**	**102.24**	**102.24**	**102.24**	**102.24**	**102.24**	--	--	--	--	--	--	--	--	--	
C&I Standard Offer	Motors	15	30.17	30.17	30.17	30.17	30.17	28.99	25.30	16.90	12.73	11.40	7.24	7.24	7.24	7.24	7.24	--	--	--	--	18.82
	Chillers	25	131.24	131.24	131.24	77.41	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	23.59	38.66
	HVAC	15	102.75	84.80	39.49	21.21	20.08	18.09	16.10	15.61	15.61	15.61	15.61	15.61	15.61	15.61	15.61	--	--	--	--	27.79
	Total		**264.16**	**246.21**	**200.91**	**128.80**	**73.84**	**70.66**	**64.99**	**56.09**	**51.92**	**50.60**	**46.44**	**46.44**	**46.44**	**46.44**	**46.44**	**23.59**	**23.59**	**23.59**	**23.59**	
Commercial Lighting	**C&I Lighting**		**1,117.02**	**1,017.44**	**942.31**	**942.31**	**942.31**	**942.31**	**942.31**	**942.31**	**919.16**	**913.26**	**913.26**	**913.26**	**913.26**	**913.26**	**913.26**	**336.49**	--	--	--	907.72
Total	**All Programs**		**1,796.08**	**1,621.20**	**1,500.76**	**1,389.85**	**1,334.89**	**1,328.07**	**1,322.39**	**1,313.49**	**1,286.17**	**1,216.49**	**1,013.31**	**1,008.33**	**1,008.33**	**1,008.33**	**1,008.33**	**408.71**	**72.21**	**72.21**	**23.59**	

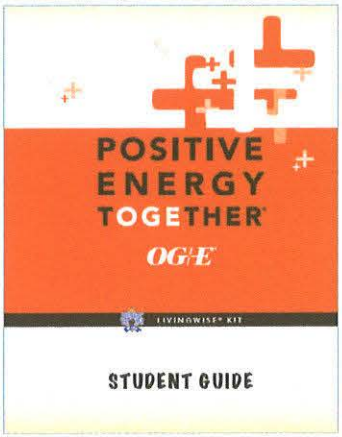
Applied Energy Group, Inc.
500 Ygnacio Valley Road, Suite 450
Walnut Creek, CA 94596

P: 510.982.3525
F: 925.284.3147

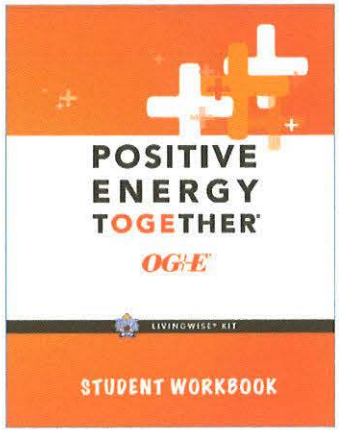
5.0 Appendix B: Marketing Materials

LivingWise® Kit

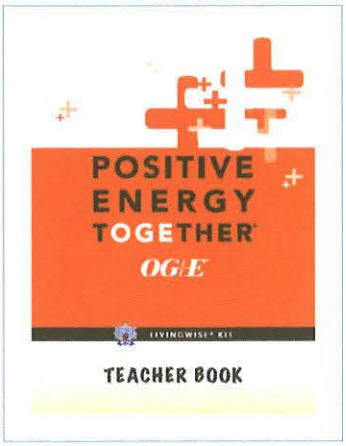
Living Wise Education Materials



Student Guide

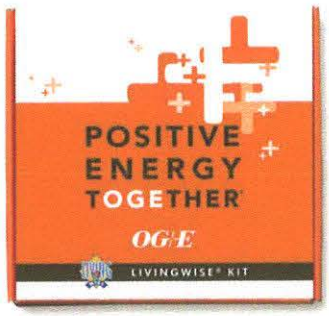


Student Workbook



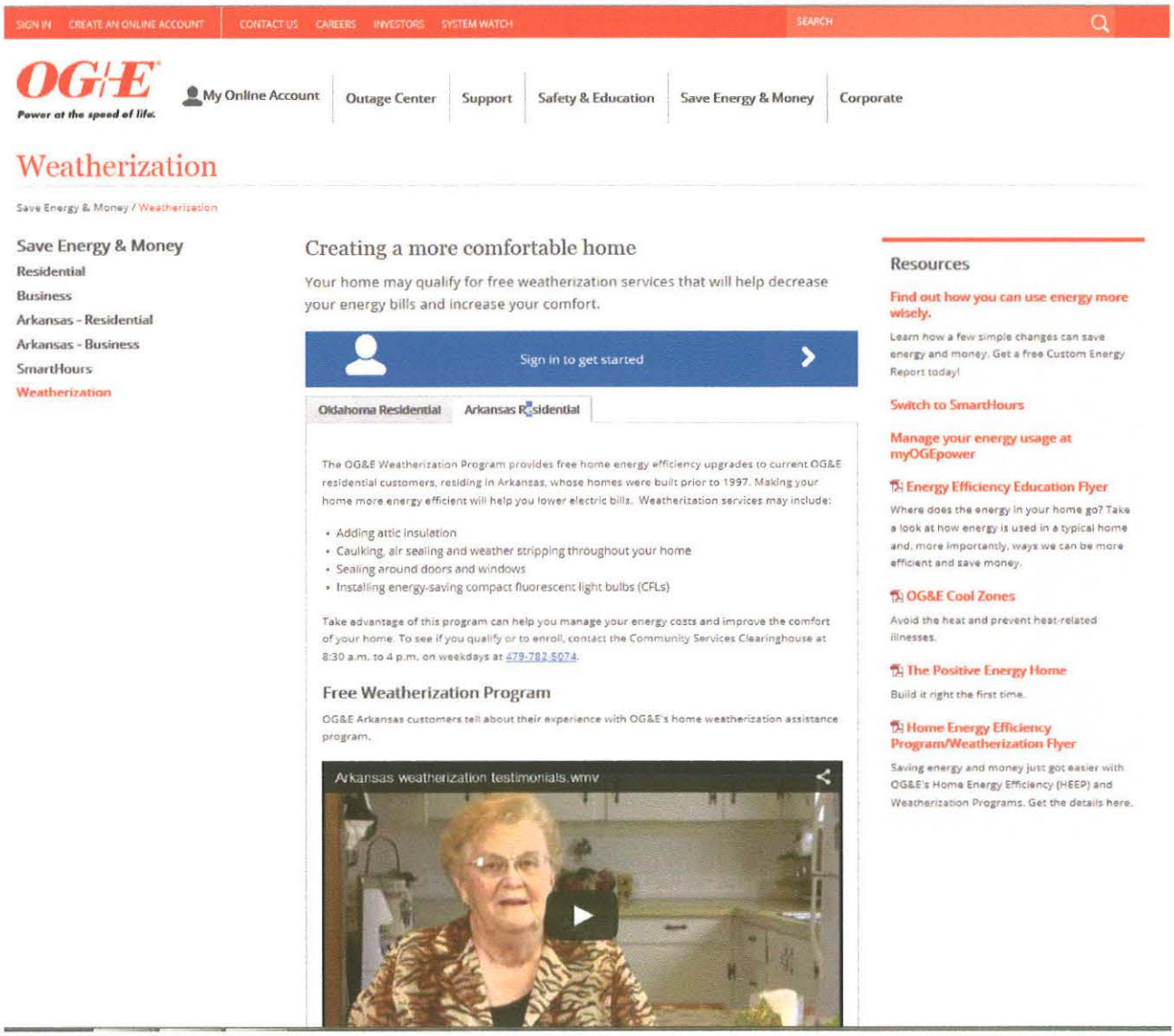
Teacher Book

Certificate of Achievement



Kit Box

Weatherization Program
Website Information



Weatherization Program

Energy Savings Tips

JANUARY

- ☐ After cooking in your oven, leave the door partly open; the left over heat can help warm your home.
- ☐ Ring in the New Year by lowering the temperature of your water heater. A 10-degree temperature reduction can save about 13% of your water heating costs this year.
- ☐ During the day, open curtains and blinds on your south facing windows to allow sunlight to naturally warm your home. Just be sure to close them at night to reduce the chill.
- ☐ Sealing air duct leaks in your attic can reduce heating costs by up to 20%, with reductions of 10% common!
- ☐ Don't let heat go up the chimney! Make sure your fire place damper is closed when you're not using it.

FEBRUARY

- ☐ Love is in the air for Valentine's Day. Because heat rises, reversing the direction of your ceiling fan blades will pull warm air down from the ceiling and spread the heat more evenly throughout your home.
- ☐ Turn off the oven or stovetop a minute or two before cooking time has elapsed. It will still retain enough heat to finish the cooking.
- ☐ When you are asleep or away from home, turn your thermostat back 10-degrees for eight hours. Do this consistently and you'll save around 10% a year on your heating bills.
- ☐ Insulate hot water pipes and ducts wherever they run through unheated areas in your home.

MARCH

- ☐ As often as possible, wash your clothes in cold water. Experts agree that modern laundry detergents wash just as well in cold as in hot water, but without the cost to heat the water.
- ☐ Daylight Savings Time is all about the "lights." Whenever possible, use one light bulb instead of multiple bulbs. A single 100-watt incandescent bulb produces the same amount of light as two 60-watt bulbs – but uses 20% less energy for some extra savings. And to save even more, use compact fluorescent light bulbs.
- ☐ A faucet that leaks one drip per second can waste 400 gallons of water in a year.
- ☐ Never write or mail a check again. Sign up for EZ Pay from OG&E which lets you pay your electric bill automatically from your checking or savings account. Sign up today!

Reminder to clean or change the filter in your heat & air system every two to three months

APRIL

- ☐ Spring is a great time to check your cooling system and proper sealing of all air ducts. And, it is the best way to improve the energy efficiency and overall performance of your system.
- ☐ Clean or change air filters every two to three months. The free-flow of air is the key to cooling, so don't make your system work harder and use more energy than it has to.
- ☐ In as little as one hour, exhaust fans in your kitchen or bathroom can deplete a house of its warm or cool air. Turn fans off as soon as they have finished their job.
- ☐ In honor of Earth Day, plant leafy trees on the south and west sides of your home to block heat from the sun in summer and let heat in during the winter. For continuous shade or to block heavy winds, use dense evergreen trees or shrubs.

MAY

- ☐ When using your dishwasher and washing machine, washing full loads saves time, detergent and energy. Your dishwasher uses the same amount of hot water for both small and full loads.
- ☐ Every time you open the oven door, the temperature drops 25 degrees or more and your oven has to work harder and use more energy to sustain temperature settings.
- ☐ When you're done wrapping the May pole, wrap your hot water tank, which can save on energy costs.
- ☐ Switch to compact fluorescent light bulbs, which can save 75% over conventional light bulbs and last up to four years!
- ☐ When cooking, use the smallest pan that will do for the job. It takes less time and energy to heat a smaller volume.

JUNE

- ☐ Replacing older shower heads with low flow units could save a family of four as much as 15-thousand gallons of water per year and can significantly reduce your water heating costs.
- ☐ If your oven has a self-cleaning cycle, start it while your oven is still warm from prior cooking.
- ☐ Clean the lint filter on your dryer after every load. Lint on the filter reduces air flow and makes your dryer use more energy.
- ☐ Father knows best! Celebrate dad's day by caulking windows and doors to prevent drafts from coming into your home and keep conditioned air from escaping out of your house.

Reminder to clean or change the filter in your heat & air system every two to three months

JULY

- ☐ Keep your thermostat at a constant, comfortable level (75-78 degrees) when you are home. Lowering the thermostat setting too far will not cool your home faster.
- ☐ Declare your independence of wasteful energy! A microwave oven cooks up to 75% faster and saves up to 70% of the energy used by a conventional oven.
- ☐ At the start of the cooling season, replace the air conditioner filter and check its condition monthly.
- ☐ To reduce heat and moisture, run appliances such as ovens, washing machines, dryers and dishwashers in the early morning or evening hours when it's generally cooler outside.
- ☐ Keep shades, blinds and curtains closed. About 40% of unwanted heat comes through windows. Simply drawing blinds and curtains, which act as a layer of insulation, can reduce heat gain.

AUGUST

- ☐ August is National Literacy Month. To show your energy literacy, don't preheat your oven except when required. If you must preheat, most ovens will preheat in 10 minutes or less.
- ☐ Use fans to circulate air. This will more evenly distribute cool air and can reduce the "on" time of your air conditioner. A ceiling fan uses only about as much electricity as a light bulb.
- ☐ Don't place lamps or televisions near your air conditioning thermostat. The heat from these appliances will cause the air conditioner to run longer.
- ☐ If your heating system has a pilot light, turn it off during the summer. A pilot light costs about $3 to $5 per month to keep lit.
- ☐ Sometimes a summer breeze can be enough to keep you cool. Open doors and windows on opposite sides of your house for cross ventilation.

SEPTEMBER

- ☐ Consider using a dehumidifier instead of turning on the air conditioning. You will be comfortable at much higher temperatures if you reduce the humidity in your home.
- ☐ This Labor Day, reduce your air conditioner's labor; place window units on the north or shady side of your residence to avoid overworking the unit in the hot daytime sun.
- ☐ Use an attic fan to get rid of the heat build-up in your attic. Heat from your attic eventually finds its way into your home.
- ☐ Keep both indoor and outdoor lighting fixtures and light bulbs clean. Dirty fixtures are not only unattractive, but can absorb as much as 50% of the light's illumination.
- ☐ Save energy by air drying your dishes instead of using your dishwasher's drying heater.

OCTOBER

- ☐ Make a new discovery this Columbus Day and cut your heating bill by 1% to 3% with a 1° F change in temperature. Many energy experts recommend setting your thermostat at 68° F or less and several degrees cooler overnight.
- ☐ A programmable thermostat lets you set your home temperature by time of day. Set it to lower the thermostat when no one is home and overnight. Save up to 20% on heating costs!
- ☐ Electric outlets can be insulated with a special insulation (available at a local building supply store) by removing the outlet covers and inserting the insulation. Additionally, special insulation plugs can be installed on outlets that are not being used.
- ☐ Use a lighter wash cycle for lightly soiled dishes. Some dishwashers already have an 'Energy Saver' setting for a lighter wash.

NOVEMBER

- ☐ Give "thanks" for your electronic conveniences, but to save energy, shut off computers and other electronic appliances when not in use. Many computer monitors have a sleep mode setting which, when activated, greatly reduces energy consumption.
- ☐ Use a dimmer switch or three-way incandescent bulbs to control the amount of light you need in a room. Dimming your lights' illumination by one-half cuts energy consumption almost in half.
- ☐ Have your heating and cooling system tuned and inspected by a service professional. Leaks from a poorly-maintained system accumulate over time, wasting energy and costing you more to operate.
- ☐ Set refrigerator temperatures between 37 and 40 degrees, and don't forget to clean the coils. Keep the refrigerator stocked; it takes more energy to cool an empty refrigerator.

DECEMBER

- ☐ When using your clothes dryer, dry loads consecutively to take advantage of the heat already built up in your dryer.
- ☐ Here's a warm way to greet the first day of winter: Try to minimize the number of times that outside doors are opened and closed at your home. Each time you open the door, it allows cold air to enter your home and makes your heater work harder to keep up.
- ☐ Use energy saving products such as small electric pans or toaster ovens to cook small meals instead of heating your large stove or oven.
- ☐ Lighting accounts for about 15 percent of a typical residential utility bill. So, turn off the lights when not in use.

Reminder to clean or change the filter in your heat & air system every two to three months

OG&E

Money Saving Tips for Your Home

12-Month To Do List

Season after season, keep this list handy and refer to it often for helpful ideas to raise your energy savings and lower your energy costs. And, for more money-saving tips and ideas, go to **oge.com**, today.

POSITIVE ENERGY TOGETHER

Weatherization Flyer

Saving energy and money just got easier...

POSITIVE ENERGY TOGETHER

The OG&E Weatherization Program

The OG&E Weatherization Program provides free home energy efficiency upgrades to customers who's home was built prior to 1997. This program is designed to help customers manage the costs of their utility bills and improve the comfort of their home. Some improvements could include:

- *Adding insulation to the attic*
- *Caulking, air sealing and weather stripping throughout your home*
- *Door and window replacements*
- *Installing energy-saving compact fluorescent light bulbs (CFLs)*

If you or someone you know could benefit form free home weatherization improvements, contact the Community Services Clearinghouse from 8:30 a.m. to 4 p.m. Monday through Friday at 479-782-5074. *Some qualifications apply, talk to an OG&E representative for more information.

Know your power at **myOGEpower**. That's where you can view your electricity use and costs, track your estimated bill and compare your use to others in the area — all to manage your electricity more efficiently and save money.
Go to myOGEpower.com to log in.

OG&E

OG&E offers FREE home weatherization to qualified customers

The OG&E Weatherization Program offers FREE energy efficiency upgrades to help customers manage the costs of their utility bills and improve the comfort of their home.

Some home improvements may include:

- Adding insulation to the attic
- Caulking, air sealing and weather stripping throughout your home
- Door and window replacements
- Installing energy saving compact fluorescent light bulbs.

(See reverse side for details)

OG&E

To qualify you must:

- Be an OG&E customer.
- Own or rent a home built before 1997.

If you or someone you know could benefit from FREE home weatherization improvements, contact the Community Services Clearinghouse at **479-782-5074** from 8:30 a.m. to 4 p.m.

The number of OG&E customer homes that can be weatherized with this FREE program is limited, so don't delay. Call today!

OG&E

OG&E

<Date>

<Ms. Jane Q. Sample>
<123 Main St.>
<Fort Smith, AR 54321-9876>

Dear <Jane Q. Sample>:

Increase Your Comfort While Reducing Your Energy Bills

Now that you're enrolled in the OG&E SmartHours Program, you could benefit from the free Weatherization Program. This program will help you increase the comfort of your home and reduce your heating and cooling bills. When paired with SmartHours, having a more energy efficient home will allow you to reduce your energy consumption and could save you even more during the hot summer months!

The services provided through this program have an estimated value over $3,000, but are FREE to current OG&E residential customers with homes built before 1997. The Weatherization Program is available to both homeowners and renters.

Thousands of customers have already taken advantage of this program and the services it offers. Completed by a trained crew sent by OG&E, these services consist of:

- Adding insulation to the attic
- Caulking, air sealing and weather stripping throughout your home
- Sealing around doors and windows
- Installing energy-saving compact fluorescent bulbs (CFLs)

This offer is for a limited time and will be completed at no charge to you. If you'd like to save even more all summer long or for more information, contact the Community Services Clearinghouse at 479-782-5074. CALL TODAY!

Sincerely,

Your Friends at OG&E

POSITIVE ENERGY TOGETHER

Multi-Family Direct Install Program

Website Information

SIGN IN | CREATE AN ONLINE ACCOUNT | CONTACT US | CAREERS | INVESTORS | SYSTEM WATCH | SEARCH

OG&E — Power at the speed of life.

My Online Account | Outage Center | Support | Safety & Education | Save Energy & Money | Corporate

Multi-Family Efficiency Program

Save Energy & Money / Arkansas - Business / Multi-Family Efficiency Program

Save Energy & Money
Residential
Business
Arkansas - Residential
Arkansas - Business
- myOGEpower
- Wind Power
- Standard Offer
- Commercial Lighting
- Multi-Family Efficiency Program

SmartHours
Weatherization

Rebates for Energy-Efficiency Upgrades

Add value to your complex by participating in the OG&E Multi-Family Efficiency Program today! You may receive a rebate from OG&E for upgrades to your complex.

The OG&E Multi-Family Efficiency Program offers great benefits to you and your tenants. Through this program, qualified contractors will install energy-saving products at no cost. The installation includes:

- Compact fluorescent light bulbs (CFLs)
- Energy-efficient low-flow shower heads
- Low-flow faucet aerators (kitchen and bath)
- Water heater pipe wrap

Once the contractor has completed the replacements they will submit a rebate form to OG&E for a check that will be mailed in 4 to 6 weeks. Improvements like these can reduce energy use by 15% in a typical 250-unit, individually metered, complex. This will help your tenants save on energy bills.

To get a better idea of how much can be saved over the course of a year, a 100-unit apartment complex with all upgrades installed may see a savings of:

- 80,680 kWh annually
- 290,000 gallons of water annually
- $1,500 incentive

Resources

See your company's energy usage at myOGEpower

Switch to SmartHours

OG&E's Energy Technology Center

Need a great facility to host your next meeting? Get details here.

SmartHours Price Plans for Arkansas Business Customers

Last year, over 80% of SmartHours Arkansas business customers saved, with an average of over $200. Sign up now, risk-free.

Commercial Lighting

Website Information

SIGN IN CREATE AN ONLINE ACCOUNT | CONTACT US CAREERS INVESTORS SYSTEM WATCH SEARCH

OG&E *Power at the speed of life.*

My Online Account | Outage Center | Support | Safety & Education | Save Energy & Money | Corporate

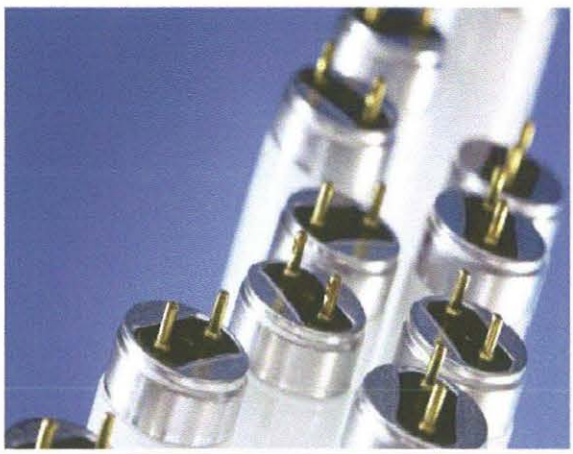
Commercial Lighting

Save Energy & Money / Arkansas - Business / Commercial Lighting

Save Energy & Money
- Residential
- Business
- Arkansas - Residential
- Arkansas - Business
  - myOGEpower
  - Wind Power
  - Standard Offer
  - Commercial Lighting
  - Multi-Family Efficiency Program
- SmartHours
- Weatherization

Arkansas Business Customers Can See Serious Savings

Receive a rebate from OG&E with the Commercial Lighting Program!



Resources

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Switch to SmartHours

OG&E's Energy Technology Center

Need a great facility to host your next meeting? Get details here.

SmartHours Price Plans for Arkansas Business Customers

Last year, over 80% of SmartHours Arkansas business customers saved,

Commercial Lighting upgrades usually have the quickest payback for customers and may help decrease monthly bills while improving business efficiency. To help reduce the costs associated with purchasing and installing lighting upgrades, the OG&E Commercial Lighting program offers a rebate to all eligible customers who are upgrading their lighting systems. This rebate will usually cover 10-20% of the cost of the improvements. Most lighting improvements include:

- Installing energy efficient indoor and outdoor lighting
- Installing lighting controls
- Installing light emitting diode (LED) exit lights in both retrofit and new construction

Rebates are based on kWh reductions from lighting upgrades. The OG&E Commercial Lighting program has paid almost 300 rebates since the program launch.

Funding for lighting rebates is limited and may be stopped at any time. So start improving the energy efficiency of your business today! Apply for a rebate now.

To take advantage of this program offer, please contact Robin Arnold at 479-649-2838 or by email at arnoldrk@oge.com.

Commercial Lighting rebates from OG&E

Two well-known Fort Smith businesses have upgraded their lighting, reduced their energy costs and benefitted from OG&E's rebate program.

Direct Options Website

Used for Commercial Lighting and Standard Offer

OG&E Power at the speed of life.

Commercial Energy Efficiency

Samples Register Log in

Log in

NOTICE TO OKLAHOMA CUSTOMERS

OG&E provides rebates for lighting retrofits and new construction projects based on kilowatt (kW) saved. Regulatory requirements have dictated OG&E make a change in the kW calculations which, in some cases, has resulted in reduced kW savings and thereby reduced rebates. OG&E intends to honor the rebates as originally calculated before the regulatory change.

In 2015 kW will be calculated in compliance with regulatory requirements which may reduce kW for some building types.

Email

Password

Remember me?

Log in

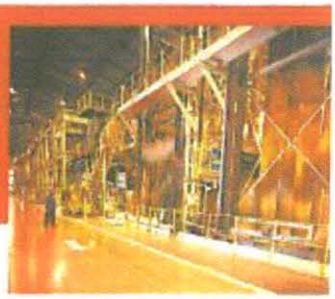
Register for an account

Forgot password?

You can see sample rebate worksheets without creating an account.

Direct Options © 2015 Direct Options Questions? Comments? Email us.

New, High Efficiency Lighting Upgrades
Deliver Lower Energy Bills & Cash Rebates from OG&E



OG&E's Commercial Lighting Program now offers a CASH REBATE to business customers who install new, high efficiency lighting for:

- Significantly reducing your energy costs;
- Enhancing the lighting/visibility at your business;
- Qualifying your business for a CASH REBATE worth hundreds – even thousands – of dollars!

A Commitment to Savings

These high efficiency lighting rebates are just one aspect of OG&E's commitment to reducing business energy consumption.

By lowering the demand for electricity, everyone saves. Here's how...

1. By making your business more energy efficient, you help OG&E avoid the building of expensive new power plants, which helps keep energy costs low.
2. Businesses installing new, high efficiency lighting will enjoy lower energy bills every month and every season for years to come!
3. When high efficiency lighting is installed, participating businesses will enjoy a significant, one-time cash rebate for upgrading.
4. Your business will enjoy the increased visibility, convenience and safety of new, state-of-the-art lighting for the years to come.

How to Get Your Rebates & Savings

Join the hundreds of OG&E business customers who have taken advantage of the Commercial Lighting Program cash rebate to help offset their energy efficiency upgrade costs AND increase their annual energy and money savings.

OG&E

POSITIVE ENERGY TOGETHER

Construction of NEW Facilities...

Your business can take advantage of the OG&E Commercial Lighting Program to help justify installing the high efficiency lighting option in your new facility. By choosing this option, you'll not only save on your monthly energy bill, but can use the OG&E rebate to help justify this selection.

The OG&E rebate for new construction energy efficient lighting is $160 per kW saved. The saved kW for new construction will be determined by comparing the as-designed kW to the allowable kW (as prescribed by the 2006 International Energy Conservation Code – IECC 2006).

This comparison can be performed by using the U.S. Department of Energy's (DOE) free software, called COMcheck. COMcheck can be accessed at www.energycodes.gov/comcheck. The lighting engineer you've hired for your new construction project may already be using COMcheck or similar software for your building.

In addition to the lighting rebate for new construction, your installed Sensors and Controls can be rebated at $160 per kW saved. This can be calculated using the Commercial Lighting Rebate Form.

Retro-Fitting of EXISTING Facilities...

1. Replace T12 lamps with T8 or T5 lamps (4-foot fixtures only)
   - Rebate of $4 per fixture for one - or two-lamp fixtures
   - Rebate of $8 per fixture for three - or four-lamp fixtures
   - Other fixtures rebated at $0.16 per watt of reduced consumption
2. Replace HID fixtures with fluorescent fixtures
   - Rebate of $52 per 400 watt HID fixture replaced
   - Rebate of $102 per 750-1000 watt HID fixture replaced
3. Replace inefficient incandescent lamps with hard-wired Compact Fluorescent Lamps (CFL)
   - Rebate of $8 per fluorescent fixture (26 watts or less)
   - Rebate of $11 per fluorescent fixture (more than 26 watts)
4. Replace inefficient incandescent Exit fixtures with more efficient LED fixtures
   - Rebate of $5 per LED fixture installed
5. Lighting, Sensors or Controls not specified
   - Rebate of $160 per kW of reduced peak demand

Saving Energy Means Saving Money

The Commercial Lighting Program can put cash in your pocket and energy and money savings in your future. For more information about how your business could benefit from the OG&E lighting rebates, contact

Robin Arnold
Senior Program Manager
479-649-2838 office
479-221-3641 cell
arnoldrk@oge.com
7200 Hwy 45
Fort Smith, Arkansas 72916

Visit oge.com today for more information about your rebate!

POSITIVE ENERGY TOGETHER

OG&E

C&I Standard Offer Program

Web Information

Standard Offer

An energy efficiency solution for your business

OG&E has a program that will repay 10-20% of your equipment upgrades.

OG&E is offering a rebate opportunity for all large commercial and industrial customers in Arkansas through the Standard Offer program.

The Commercial/Industrial Standard Offer program provides incentives for the installation of a wide range of measures that reduce customer energy costs, reduce peak demand, and/or save energy in non-residential facilities such as public authority buildings, schools, hospitals and other industrial customers. In this program, large individual customers, energy service companies (ESCOs), and qualified contractors are eligible for incentive payments of $0.12/kWh for energy efficiency projects that significantly reduce energy. The Standard Offer program was designed to offer a flexible program to help larger customers achieve energy and demand savings.

All commercial and industrial customers on the PL and LPL rates are eligible for this program. Last year the average rebate for customers participating in the Commercial and Industrial Standard Offer program was $17,720. Click here to apply for a rebate now.

For additional information, contact Robin Arnold at arnoldrk@oge.com or 479.649.2838.

Resources

See your company's energy usage at myOGEpower

Switch to SmartHours

OG&E's Energy Technology Center

Need a great facility to host your next meeting? Get details here.

SmartHours Price Plans for Arkansas Business Customers

Last year, over 80% of SmartHours Arkansas business customers saved, with an average of over $200. Sign up now, risk-free.

Standard Offer

OG&E Rebates Can GenerateNew Savings For Your Commercial or Industrial Facility

Upgrades to Any Electrical Equipment or System Can Earn Your Business Rebates Now and Monthly Savings from Now On!

How the Standard Offer Program Works

The Standard Offer Program is about helping industrial, institutional, commercial, schools, state agencies and retail enterprises become smarter and more frugal in their energy usage.

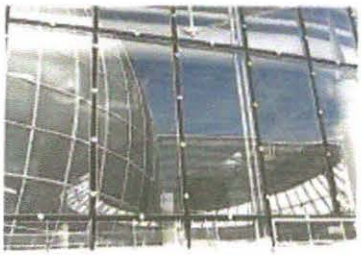
Naturally, there are some easy-to-follow guidelines for securing your OG&E rebates, including a description of the upgrade project, costs associated with the project, current and projected energy cost savings for the upgrade, as well as some other basics.

For a complete overview of the **Standard Offer Program** and its participation requirements, go to **www.oge.com** for complete details.

Saving Energy Means Saving Money
Nothing as good as these Standard Offer rebates can last forever. And once these rebates are gone, they're gone for good. That's why NOW is the time to take advantage of these money-saving electrical upgrade opportunities that can put cash in your pocket and energy and money savings in your future.

For more information about how your business could benefit from the OG&E rebates, contact:

Robin Arnold
Senior Program Manager
479-649-2838 office
479-221-3641 cell
arnoldrk@oge.com
7200 Hwy 45
Fort Smith, Arkansas 72916



OG&E

POSITIVE ENERGY TOGETHER

Re-Invest in Your Business and OG&E Will Invest in You.

Now, OG&E is making it easy to upgrade your business infrastructure and put money back in your pocket with the Standard Offer Program, the demand reduction opportunity offered all industrial, institutional, commercial, schools, state government facilities and retail businesses who upgrade to new, more energy efficient systems and processes.

From now through December 31, 2013, OG&E has hundreds of thousands of dollars in rebate money available to those entities who upgrade their infrastructure and can demonstrate verifiable electrical cost savings results back to OG&E.

The More You Save, the More You Can Make!

Naturally, larger consumers of electrical power represent the greatest energy savings potential. But big or small, every business holds the possibility of energy and money savings with your electrical upgrades.

Whether your business is...

- A manufacturer upgrading your chillers or air compression systems;
- An institutional facility switching to new, high-efficiency HVAC equipment;
- A commercial enterprise opting for a more efficient electrical-powered steam system;
- An industrial concern upgrading your various machines with new motors and drives with premium efficient electrical motors;
- A school upgrading your central heat and air system to a geothermal system.
- Other energy-saving facility upgrades in a variety of businesses and applications.

...OG&E can show you how to earn thousands of dollars in rebates NOW, plus enjoy thousands more in monthly energy savings over the life of your investment.

A Commitment to Savings

These rebates are just one aspect of OG&E's commitment to reducing business energy consumption. By lowering the demand for electricity, everyone saves. Here's how...

1. By making your business more energy efficient, you help OG&E avoid the building of expensive new power plants, which helps keep energy costs low.
2. Businesses installing new, high efficiency equipment upgrades will enjoy lower energy bills every month and every season for years to come!
3. When these new systems are installed, businesses providing verifiable, before-and-after energy savings documentation will enjoy significant, one-time cash rebates for their upgrades.
4. Your business will reap the increased productivity and safety of your new, state-of-the-art equipment upgrades for years to come.

POSITIVE ENERGY TOGETHER