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BEFORE THE

ARKANSAS PUBLIC SERVICE COMMISSION

IN THE MATTER OF THE APPLICATION	**)**	
OF ARKANSAS OKLAHOMA GAS	**)**	
CORPORATION FOR APPROVAL OF	**)**	**DOCKET NO. 07-077-TF**
QUICK START ENERGY EFFICIENCY	**)**	
PROGRAMS	**)**	

COMPREHENSIVE ENERGY EFFICIENCY PLAN

PROGRAM YEAR 2024

ANNUAL REPORT

April 30, 2025

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1.0 Executive Summary

This document is provided to the Arkansas Public Service Commission ("Commission") as the annual review of Arkansas Oklahoma Gas Corporation's ("AOG" or "Company") Comprehensive Energy Efficiency Plan ("CEE Plan" or "Plan") for the 2024 Program Year ("Program Year"), pursuant to Order No. 18 in Docket No. 06-004-R.

Historical Background

In the *Application of Arkansas Oklahoma Gas Corporation for Approval of its 2024-2026 Energy Efficiency Program Plans and Budgets* filed on August 1, 2023, in Docket No. 07-077-TF, and subsequently approved for the 2024 PY in Order No. 72 in Docket No. 13-002-U, AOG proposed the continuation of the following four programs previously approved by the Commission:

1. AOG Weatherization Program ("AOGWP");
2. Commercial/Industrial Solutions ("CIS") Program;
3. Equipment Rebate Program ("ERP"); and
4. Low-Income Pilot Program ("LIPP").

This CEE Plan was designed to achieve an annual energy savings target of 0.50% of 2022 retail sales in program years 2024 - 2026, per Order No. 68 in Docket No. 13-002-U. The Plan was deemed comprehensive, pursuant to Order No. 17 in Docket No. 08-144-U and approved by the Commission on June 17, 2019, in Order No. 88 in Docket No. 07-077-TF.

Major Accomplishments and Milestones

The 2024 Program Year represents AOG's best efforts to develop and implement a portfolio of comprehensive energy efficiency programs designed to meet or exceed the Commission's energy savings goals in Arkansas. AOG is proud to report that the 2024 Program Year results exceeded the energy savings target set by the Commission. Overall, AOG captured 151% of its Commission-ordered net energy savings target while expending 97% of the 2024 budget. Additionally, AOG's portfolio of programs achieved a Total Resource Cost (TRC) ratio of 1.96. AOG's historical portfolio TRC ratios are as follows:

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2.67	2.24	2.67	1.98	1.77	2.07	1.50	2.00	2.10	2.03	1.96

Goals and Objectives for the EE Portfolio

As presented in the CEE Plan, AOG had the following objectives for its portfolio of EE programs in 2024:

1. Reduce end-use natural gas consumption in a cost-effective manner to save money for consumers and conserve nonrenewable resources;
2. Protect the environment by encouraging installation of efficiency measures that help reduce carbon dioxide emissions and air pollutants;
3. Increase residential and commercial customer awareness of available energy efficiency opportunities by encouraging equipment upgrades and behavioral changes;

4. Generate greater customer awareness of the energy efficiency programs available through AOG to support their energy efficiency objectives;
5. Identify cost-effective natural gas saving measures for program participants;
6. Improve relationships with customers, trade allies, and stakeholders by providing value-added energy efficiency services, training and education, hardware, verification and support;
7. Support a more robust local and statewide economy by utilizing local labor and helping Arkansas residents reduce their monthly energy expenses.

In AOG's CEE Plan, energy savings goals were set for each program. These goals were developed to ensure that the successful implementation of each individual program would result in the total portfolio of AOG programs meeting the Commission-ordered savings target. AOG's Commission-ordered net energy savings target for 2024 was 324,002 therms.

Progress Achieved Versus Goals and Objectives

AOG captured net annual energy savings of 488,074 therms during the 2024 Program Year. This represents 151% of the net energy savings that AOG was tasked with obtaining by order of the Commission. In addition to exceeding the Commission's energy savings target, AOG's CEE Plan was successful in increasing energy efficiency awareness in all markets and developing positive relationships with customers, trade allies, and stakeholders.

Portfolio Savings, Participation Levels, and Prior Year Comparison

AOG's historical net energy savings (therms) has been impressive:

2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
591,591	535,479	534,421	536,202	500,829	492,071	459,387	458,151	491,429	528,592	488,074

Customer participation is critical to the success of AOG's EE programs. Participation levels were consistent with the net energy savings performance of each individual program in AOG's 2024 EE portfolio.

EE Portfolio Summary

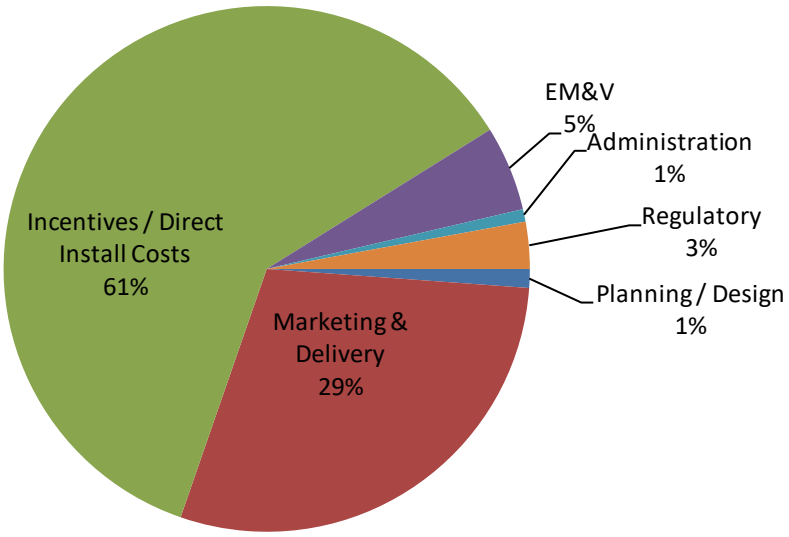
2024 Portfolio Summary										
Net Energy Savings		Costs			Cost-Effectiveness			Goal Achievement		
Demand Therms	Energy Therms	Actual Expenditures	LCFC	Performance Incentives	TRC Net Benefits (NPV)	TRC Ratio	PAC Ratio	Commission Established Target % of Baseline	Actual Savings Achieved % of Baseline	% of Target Achieved (%)
n/a	488,074	$ 2,414,196	$ 1,569,712	$ 199,145	$ 2,460,155	1.96	1.73	0.50%	0.75%	151%

EE Portfolio Summary by Program

EE Portfolio Expenditures by Program					
Program Name	Target Sector	Program Type	2024 Budget ($)	2024 Actual ($)	% of Budget
AOG Weatherization	Residential	Whole Home	1,158,971	1,107,130	96%
Low Income Pilot Program	Residential	Whole Home	256,435	251,076	98%
Equipment Rebate	Res/Small Business	Prescriptive/Standard Offer	525,735	517,978	99%
Commercial/Industrial	Small Business/C&I	Other	468,603	468,357	100%
Regulatory	-	-	79,568	69,655	88%
		Total	**2,489,312**	**2,414,196**	**97%**

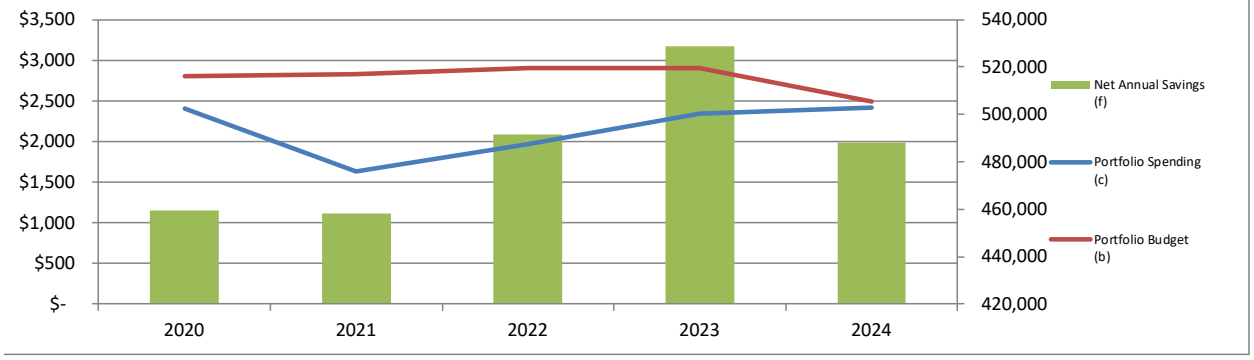
EE Portfolio Summary by Cost Type

EE Portfolio Expenditure Summary by Cost Type				
Cost Type	2024 Total Expenditures			
	% of Total	Budget ($)	Actual ($)	% of Total
Planning / Design	1%	18,455	27,902	1%
Marketing & Delivery	27%	673,122	703,848	29%
Incentives / Direct Install Costs	63%	1,560,871	1,468,031	61%
EM&V	6%	156,596	126,171	5%
Administration	0%	700	18,589	1%
Regulatory	3%	79,568	69,655	3%
	100%	**2,489,312**	**2,414,196**	100%



Company Statistics

Company Statistics											
Program Year	Revenue and Expenditures					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 (%=c/a)	Total Annual Energy Sales (d) (Therms)	Net Annual Savings (e) (Therms)	% of Energy Sales (%=e/d)	Net Annual Savings (f) (Therms)	% of Energy Sales (%=f/d)
2020	$ 43,990	$ 2,805	6.4%	$ 2,404	5.5%	70,319,580	454,245	0.65%	459,387	0.65%
2021	$ 47,089	$ 2,834	6.0%	$ 1,627	3.5%	73,302,890	457,858	0.62%	458,151	0.63%
2022	$ 61,124	$ 2,901	4.7%	$ 1,962	3.2%	78,030,660	461,620	0.59%	491,429	0.63%
2023	$ 62,526	$ 2,901	4.6%	$ 2,347	3.8%	71,174,694	461,620	0.65%	528,592	0.74%
2024	$ 58,831	$ 2,489	4.2%	$ 2,414	4.1%	71,727,590	433,091	0.60%	488,074	0.68%



2.0 Portfolio Programs

AOG's portfolio of programs is designed to comply with the definition of "comprehensive" and to achieve the energy savings targets directed by the Commission in Order No. 17 in Docket No. 08-144-U. These programs allow AOG to achieve energy savings by enabling consumers to change their behaviors, attitudes, awareness, and knowledge about energy savings and the utilization of energy efficient technologies.

2.1 AOG Weatherization Program

2.1.1 Program Description

The AOG Weatherization Program targets energy-inefficient homes for weatherization. The program improves comfort and reduces energy costs by upgrading the thermal envelope of qualified homes. By partnering with electric utilities including OG&E, this program exhibits cross-fuel cooperation that results in a comprehensive program offering to residential customers, with lower administrative costs.

2.1.2 Program Highlights

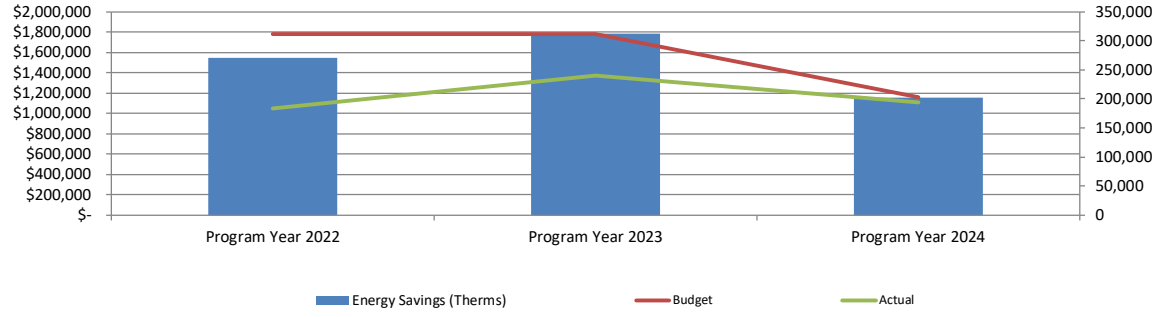
- This program began on July 1, 2011, and has continued through the 2024 Program Year.
- The program has grown to become the cornerstone of the residential portion of AOG's CEE Plan.

- On December 9, 2014, in Order No. 22 in Docket No. 13-002-U, the Commission approved the *Recommended Weatherization Approach to Provide Consistent Weatherization Programs across All Utilities in Arkansas*. This Core Program was modeled after the thriving AOG/OG&E Weatherization Program.
- The program is implemented by CLEAResult, a contractor for other utilities adhering to the state's Consistent Weatherization Approach (CWA) including Black Hills Energy, SWEPCO, OG&E, and Summit Utilities Arkansas. CLEAResult provides quality assurance inspections of weatherized homes by BPI-certified personnel and engages an experienced network of trade allies. These trade allies receive rigorous training adhering to best practices according to Factor 1 as designated by the Arkansas Public Service Commission.
- AOGWP is very successful. In 2024, the program weatherized 742 homes and captured net energy savings of 202,212 therms.
- The program is cost beneficial as evidenced by a Total Resource Cost Ratio of 2.05.
- The program is remarkably popular and requires a minimal marketing budget.
- AOG receives a considerable amount of positive feedback from participants of this program.

2.1.3 Program Budget, Savings, and Participants

AOG Weatherization

	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	**Budget**	**Actual**	**%**	**Plan**	**Evaluated**	**%**	**Plan**	**Evaluated**	**%**	**Plan**	**Actual**	**%**
Program Year 2022	$ 1,781,277	$ 1,047,088	59%	216,543	270,805	125%	n/a	n/a	-	857	746	87%
Program Year 2023	$ 1,778,492	$ 1,372,105	77%	216,543	311,684	144%	n/a	n/a	-	857	873	102%
Program Year 2024	**$ 1,158,971**	**$ 1,107,130**	**96%**	**193,808**	**202,212**	**104%**	**n/a**	**n/a**	**-**	**721**	**742**	**103%**



2.1.4 Description of Participants

Participants of the AOGWP include homeowners or leaseholders of a single-family home, duplex, triplex or 4-plex structures, or manufactured home constructed prior to 2014 or have monthly usage (as shown on the bill) of 10 cents per square foot or higher. The eligible dwelling must have been occupied for the previous 12 months and not received identical weatherization measures through a utility weatherization program in the past five years.

2.1.5 Challenges and Opportunities

AOG continues to steadily increase the energy-saving measures installed per project and is maintaining an effective level of incentive spending per home served. AOG will continue to ensure all customers are being served with the measures that best fit their needs.

2.2 Commercial/Industrial Solutions Program

2.2.1 Program Description

The primary goal of the Commercial/Industrial Solutions Program is to produce cost-effective natural gas energy savings by offering incentives for installation of energy efficiency measures in commercial and industrial facilities. The program is implemented by CLEAResult and consists of three major components, which provide multiple opportunities for customers to participate and capture energy savings:

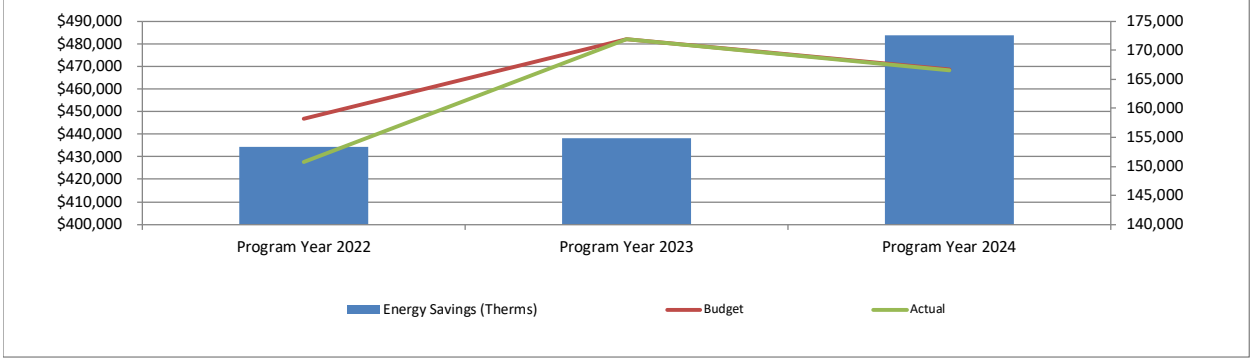
1. Direct Install – Primarily targets commercial customers. Energy efficiency measures include pre-rinse spray valves, faucet aerators, low-flow showerheads, and door sweeps. This program component provides convenient delivery of EE measures at no cost to the customer.
2. Prescriptive – Targets both commercial and smaller industrial customers. The program offers prescriptive rebates for a wide variety of high-efficiency commercial natural gas equipment. This includes, but is not limited to, ENERGY STAR® commercial kitchen equipment, commercial boilers, and boiler controls.
3. Custom – Targets both commercial and industrial customers. This program offers custom incentives for installation of energy efficiency measures in a variety of categories. This includes, but is not limited to, boiler upgrades, HVAC systems, steam system insulation, and steam trap replacements. The value of each custom incentive varies according to project scope and is calculated based on the verified energy savings of each measure installed. This allows AOG and CLEAResult to adapt the offering of the CIS Program to accommodate commercial and industrial customers of any size.

2.2.2 Program Highlights

- This program began on July 1, 2011, and has continued through the 2024 Program Year.
- The program targets AOG's larger customers, ensuring comprehensiveness of the CEE Plan.
- The program is managed by AOG and is implemented by CLEAResult.
- The program captured net energy savings of 172,533 therms in 2024.
- The program is cost beneficial as evidenced by a Total Resource Cost Ratio of 2.09.
- Satisfaction with the program operation is very high. The program builds goodwill with both trade allies and customers.

2.2.3 Program Budget, Savings, and Participants

Commercial/Industrial												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2022	$ 446,885	$ 427,527	96%	160,908	153,348	95%	n/a	n/a	-	1,276	1,012	79%
Program Year 2023	$ 481,885	$ 481,860	100%	160,908	154,809	96%	n/a	n/a	-	1,276	799	63%
Program Year 2024	**$ 468,603**	**$ 468,357**	**100%**	**166,725**	**172,533**	**103%**	**n/a**	**n/a**	**-**	**1,399**	**59**	**4%**



2.2.4 Description of Participants

The CIS Program is offered to all AOG commercial and industrial customers.

2.2.5 Challenges and Opportunities

Per AOG's third-party evaluation report, one interviewed trade ally noted that the application process was easy and straightforward. This trade ally also noted that they are interested in rebates for boiler tune-ups. AOG will investigate this as a prescriptive offering for the upcoming triennial planning cycle.

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2.3 Equipment Rebate Program

2.3.1 Program Description

The Equipment Rebate Program is designed to encourage the installation of high-efficiency natural gas heating and water heating equipment as well as smart thermostats. The program targets residential and commercial customers in both new and existing homes and businesses. AOG offers a financial incentive in the form of a cash rebate to customers who purchase and install qualifying equipment.

AOG relies heavily on trade allies to assist in promoting the ERP to participants. AOG recognizes that HVAC and plumbing contractors play a significant role in helping many customers select their heating and water heating equipment, both in new construction and equipment replacements. To acknowledge this important role, and further promote the use of high-efficiency natural gas heating equipment, AOG also offers an incentive to installers of qualifying equipment.

To encourage the installation of high-efficiency natural gas heating equipment, the following tiered rebates/incentives were offered:

Equipment	Efficiency	Customer Rebate	Trade Ally Incentive
Natural Gas Furnace	90-94.9% AFUE[1]	$400	$50
	95% or higher AFUE[1]	$800	$50
Natural Gas Water Heaters	0.90 UEF[2] or higher	$700	$50
Smart Thermostats	ENERGY STAR-certified	$100	-

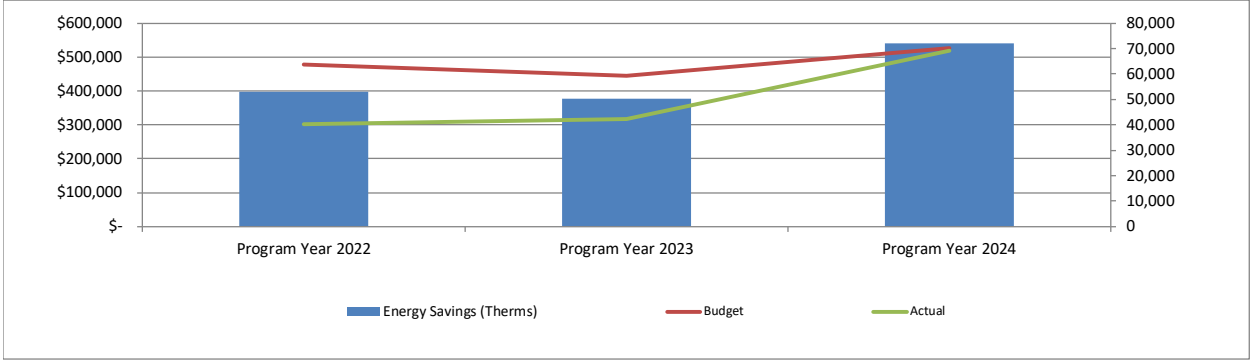
[1] Annual Fuel Utilization Efficiency, [2] Uniform Energy Factor

2.3.2 Program Highlights

- This program began in 2010 and has continued through the 2024 Program Year.
- This program was implemented by AOG, with the assistance of local trade allies.
- The ERP captured net energy savings of 71,957 therms in 2024.
- The program is cost beneficial as evidenced by a Total Resource Cost Ratio of 1.81.
- Customer satisfaction with the program is very high. This includes interactions with AOG employees, rebate processing times, savings realized from program participation, and ease of the application process. Overall, this has been a successful change due to the cost savings and the stability of customer satisfaction, and initial challenges with data aggregation and participation learning curves has been mitigated, resulting in increased participation and savings achievements.

2.3.3 Program Budget, Savings, and Participants

Equipment Rebate												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2022	$ 478,809	$ 302,694	63%	74,081	52,965	71%	n/a	n/a	-	1,038	565	54%
Program Year 2023	$ 443,809	$ 318,029	72%	74,081	50,336	68%	n/a	n/a	-	1,038	528	51%
Program Year 2024	**$ 525,735**	**$ 517,978**	**99%**	**31,928**	**71,957**	**225%**	**n/a**	**n/a**	**-**	**482**	**703**	**146%**



2.3.4 Description of Participants

The ERP is offered to all AOG residential and small commercial natural gas heating and water heating customers for both new construction and existing homes and businesses.

2.3.5 Challenges and Opportunities

Per AOG's third-party evaluation report, participation increases in commercial water heaters installed in various facility types may warrant initial requests for facility-specific energy saving assumptions from customers during the rebate submission process. AOG is investigating how to ensure the most accurate assumptions while minimizing what the customer may perceive as burdensome application requirements.

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2.4 Low-Income Pilot Program

2.4.1 Program Description

The Low-Income Pilot Program is a comprehensive long-term energy efficiency program targeting severely energy-inefficient homes for customers who meet the income eligibility requirements of the Low-Income Home Energy Assistance Program (LIHEAP) to improve comfort and reduce energy costs by upgrading the thermal envelope and installing water conservation measures in qualified homes at no cost to the participants.

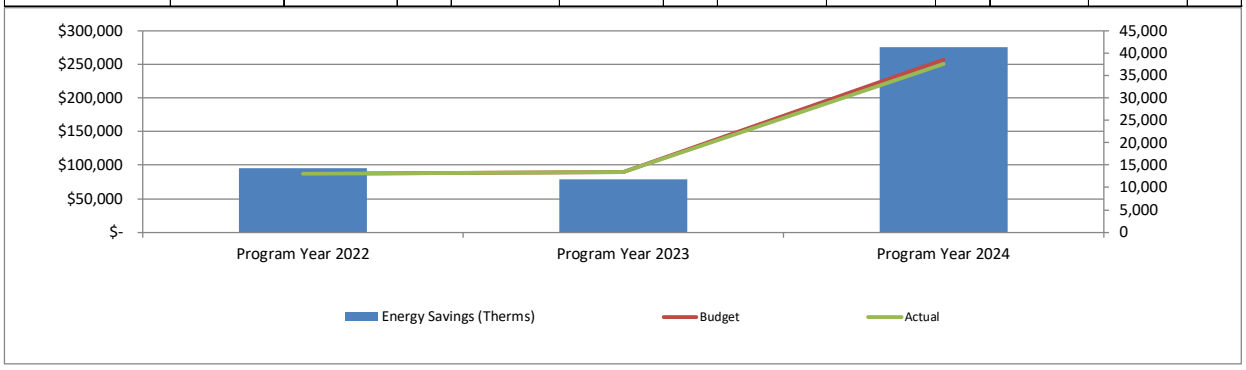
2.4.2 Program Highlights

- The program was developed to comply with Act 1102 of the 91st Arkansas General Assembly.
- This program began on January 1, 2020.
- The program is implemented by CLEAResult.
- LIPP is very successful. In 2024, the program completed 131 homes and captured net energy savings of 41,372 therms.
- The program is cost beneficial as evidenced by a Total Resource Cost Ratio of 2.09.
- The program is popular and requires a minimal marketing budget.
- As CLEAResult also implemented the AOGWP, many of the benefits realized in that program were also garnered within the LIPP.
- In 2024, health and safety spending per project increased to $463, the highest since program inception.

2.4.3 Program Budget, Savings, and Participants

Low Income Pilot Program

	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2022	$ 86,957	$ 86,957	100%	10,088	14,311	142%	n/a	n/a	-	35	35	100%
Program Year 2023	$ 89,742	$ 89,713	100%	10,088	11,763	117%	n/a	n/a	-	35	67	191%
Program Year 2024	**$ 256,435**	**$ 251,076**	**98%**	**40,630**	**41,372**	**102%**	**n/a**	**n/a**	**-**	**120**	**131**	**109%**



2.4.4 Description of Participants

Participants of the LIPP include homeowners or leaseholders of a single-family home, duplex, triplex or 4-plex structures or manufactured home. Eligible customers must meet the current income eligibility requirements of LIHEAP.

Annual Household Income Limits (before taxes)

Household Size*	Maximum Income Level (Per Year)
1	$21,870
2	$29,580
3	$37,290
4	$45,000
5	$52,710
6	$60,420
7	$68,130
8	$75,840

*For households with more than eight people, add $7,710 per additional person. Always check with the appropriate managing agency to ensure the most accurate guidelines.

2.4.5 Challenges and Opportunities

AOG will continue to examine methods of increasing benefits for customers through the LIPP, particularly in health and safety measures and spending.

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3.0 Supplemental Requirements

3.1 Staffing

The current CEE Program includes two employees with regulatory, implementation, financial, and energy efficiency expertise to plan, implement, and assist in the evaluation of the individual programs in the CEE Plan. These employees also supervise the contractors and consultants who work with AOG to deliver and evaluate the EE programs. Additionally, there are several other employees who are involved in AOG's EE efforts. These efforts include contributions to program development, marketing, engineering, regulatory compliance, education, training, delivery, and evaluation on an as-needed basis.

3.2 Stakeholder Activities

AOG personnel attended and provided numerous training and outreach events throughout the 2024 Program Year. AOG personnel attended several seminars covering energy efficiency topics and also conducted training sessions both internally and externally. Training was implemented to educate AOG personnel about the EE programs, and external training was provided to EE program participants, trade allies, and stakeholders to raise awareness and ensure that program procedures are followed.

AOG personnel attended several seminars covering energy efficiency-related topics. These trainings were provided by CLEAResult, ICF, Arkansas Advanced Energy Association. AOG also participated in trainings conducted by CLEAResult, the implementer for both AOGWP and LIPP, designed to instruct trade allies in program procedures and ensure quality performance.

Internal Training

Event No.	Start Date	Class	Class Description	Training Location	Sponsor	No. of Attendees (A)	Length of Session (B)	Training Session Man-Hours (A x B)	Any Certificates Awarded? (Y or N)	# of Certificates Awarded
1.	1/9/24	Arkansas Advanced Energy Association Quarterly Meeting	Discuss current landscape of energy advancement policies and goals in Arkansas	Little Rock	AAEA	1	3	3	N	0
2.	4/10/24	Arkansas Advanced Energy Association Quarterly Meeting	Discuss current landscape of energy advancement policies and goals in Arkansas	Little Rock	AAEA	1	4	4	N	0
4.	5/1/24	ENERGY STAR Version 5.0 Furnaces	Review the updated ENERGY STAR policies regarding furnaces	Virtual	ICF	2	2	4	N	0
5.	5/15/24	Energy Efficiency Solutions Working Group	Discuss current landscape of energy advancement policies and goals in Arkansas	Virtual	AAEA	1	1	1	N	0
6.	6/19/24	Arkansas Advanced Energy Association Meeting	Discuss current landscape of energy advancement policies and goals in Arkansas	Virtual	AAEA	1	1	1	N	0
8.	7/9/24	Arkansas Advanced Energy Association Quarterly Meeting	Discuss current landscape of energy advancement policies and goals in Arkansas	Little Rock	AAEA	1	3	3	N	0
9.	7/17/24	Energy Efficiency Solutions Working Group	Discuss current landscape of energy advancement policies and goals in Arkansas	Virtual	AAEA	1	1	1	N	0
10.	8/1/24	Now is The Golden Age of Efficient Natural Gas Equipment	Review commercial foodservice operations and their impact on gas utility revenues	Virtual	ESC	2	1	2	N	0
11.	9/30/24	CLEAResult Energy Forum	IRA Fundamentals, Gas Utility Hot Topics	San Diego, CA	CLEAResult	2	24	48	N	0
12.	10/8/24	Arkansas Advanced Energy Association Quarterly Meeting	Discuss current landscape of energy advancement policies and goals in Arkansas	Little Rock	AAEA	1	3	3	N	0
13.	10/17/24	EmPower Arkansas	Stakeholders meet to discuss regulatory changes in the energy space and workforce developments	Little Rock	AAEA	2	8	16	N	0
Totals:	Events:					15		86		0

External Training

Event No.	Start Date	Class	Class Description	Training Location	Sponsor	*No. of Attendees (A)	Length of Session (B)	Training Session Man-Hours (A x B)	Any Certificates Awarded? (Y or N)	# of Certificates Awarded
1.	2/8/24	Weatherization Contractor Lunch	WX Kick-off Meeting/ Meet contractors and go over 2024 program	Fort Smith	AOG & CLEAResult	2	4	8	N	0
2.	2/16/24	Fort Smith Builders Association Home Show	Represent AOG to local community	Fort Smith	Fort Smith Homebuilders	9	24	216	N	0
3.	3/9/24	HVAC Association Event	Represent AOG to local community on rebate program offerings	Fort Smith	HVAC Association, Robin Arnold	3	2	6	N	0
Totals:	Events:					14		230		0

*There were numerous attendees present at each conference, trade show, and outreach event. The values in the *No. of Attendees* column reflects the number of AOG personnel and/or AOG contractor personnel who provided education at these events.

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3.3 Information Provided to Consumers to Promote EE

AOG believes a successful marketing strategy is critical to the overall success of the CEE Plan, so AOG takes pride in delivering effective marketing to AOG customers and EE program participants. AOG's marketing efforts are driven through multiple channels, including both customer-direct outreach and marketing through contractors and other trade allies. AOG utilizes a mixture of print, web (including social media), radio, and word-of-mouth advertising.

AOG values the practice of continuous improvement, particularly with regard to the marketing of EE programs. AOG seeks a prudent balance of advertising efforts to maintain EE program participation and net energy savings results without stimulating program oversubscription. Maintaining this balance contributes to the success of the CEE Plan and ensures judicious use of ratepayers' money.

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4.0 Appendix A: Carbon Calculator Scenarios

The TRC results in the PY 2024 report include natural gas benefits and Non-Energy Benefits (NEBs) in alignment with prior program years:

- kWh
- kW
- Water
- Avoided replacement costs
- Deferred replacement costs

AOG has provided estimates of the cost of carbon under low, middle, and high-cost scenarios. They are summarized in the SARP workbook on the "Carbon Calculator" tab. The cost of carbon is not included in AOG's estimate of system benefits in any of the cost-effectiveness tests at this time.

Emissions Calculations

Gas	CO2 Equivalent
CO2	1

Conversions for listed units

Conversion factors	
therms per mmBTU	10
kilograms to metric tons	0.001
pounds to metric tons	0.00045

Emissions factors for natural gas

Fuel	kg CO2 per mmBtu
Natural Gas	53.06

Local emissions factors for electricity in Arkansas

Region	Non-Baseload Emission Factors CO2 lb / MWh	
SPSO (SPP South)	1,662.5	Choose the region using dropdown (in cell A18
Utility Specific (Enter value here==>)		

Calculated emissions per unit

CO2 tons / kWh	0.00075
CO2 tons / therm	0.00531

Scenario	CO2 Price per ton	₵ / kWh	₵ / therm	
Per dollar for calculations	per $	0.08	0.5	
Low case (Enter low case here ==>)	$0	0	0	Utility's lowest value
Middle case (Enter mid case here ==>)	$5	0.4	2.7	Utility's median value
High case (Enter high case here ==>)	$15	1.1	8	Utility's highest value

Rates	₵ / kWh	₵ / therm
Per unit energy charge (per kWh or therm rate)	6.99	81.80

Rate Impacts	% Change per kWh	% Change per therm
Low case	0.0%	0.0%
Middle case	5.7%	3.3%
High case	15.7%	9.8%

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5.0 Appendix B: EM&V Contractor Reports

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EVALUATION, MEASUREMENT AND VERIFICATION REPORT FOR THE 2024 ARKANSAS ENERGY EFFICIENCY PORTFOLIO

SUBMITTED TO: ARKANSAS OKLAHOMA GAS, A DIVISION OF SUMMIT UTILITIES

SUBMITTED ON: APRIL 25, 2025

SUBMITTED BY: ADM ASSOCIATES, INC.

SUBMITTED TO: ARKANSAS OKLAHOMA GAS, A DIVISION OF SUMMIT UTILITIES

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aog
ENERGY FOR LIFE

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Acknowledgements

We would like to thank the staff at Arkansas Oklahoma Gas (AOG) for their time and effort in contributing to the evaluation, measurement and verification (EM&V) of the Program Year 2024 (PY2024) portfolio. This evaluation was conducted with regular coordination with staff at AOG, who provided quick feedback and turnaround to the requests of the evaluation team as well as open and forthright insights into the operations of their programs.

Further, we would like to acknowledge our gratitude towards AOG customers, implementation contractor staff, and trade allies. As with the staff at AOG, their active participation allowed for the evaluation team to collect all needed data for this effort.

In final, we would like to thank staff at the Independent Evaluation Monitor (IEM) for their involvement in providing thorough answers and clarification to the evaluation team when higher-level questions arose over the course of the PY2024 EM&V effort.

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1 Executive Summary

In August 2023, the Arkansas Public Service Commission (APSC) approved the Arkansas Oklahoma Gas (AOG, a Division of Summit Utilities) three-year energy efficiency Plan (the Plan), covering program years 2024 – 2026, filed in compliance with Order No. 65 of Docket No. 13-002-U, which required investor-owned utilities in Arkansas to capture energy savings equivalent to 0.50% of their 2022 energy sales. As in previous APSC rulings, the Arkansas utilities retain flexibility to make up to 10% adjustments to program budgets and may adjust energy savings and as appropriate within the modified budgets. Thus, AOG's 2024 budgets and energy savings goals, reflecting allowable adjustments as described above, serve as the basis against which its portfolio of programs was evaluated in 2024.

AOG's Plan includes a portfolio of energy efficiency programs designed to facilitate energy savings in every customer class. AOG services approximately 45,000 customers in Arkansas. AOG's service area encompasses the City of Fort Smith and several nearby municipalities.

In accordance with APSC Rules for Conservation and Energy Efficiency Programs (C&EE Rules), AOG engaged ADM Associates, Inc. (ADM) to conduct an evaluation, measurement, and verification (EM&V) of its portfolio. The ADM staff, collectively referred to as the Evaluators, evaluated the AOG portfolio.

1.1 Summary of AOG Energy Efficiency Programs

In PY2024, the AOG EE portfolio comprised of the following programs:

- Equipment Rebate Program;
- Commercial & Industrial (C&I) Solutions Program;
- AOG Weatherization Program; and
- Low Income Program.

AOG designed its programs to achieve the following objectives:

- Net savings of 433,091 Therms in PY2024;
- Significant energy-saving opportunities for all customers and market segments;
- Broad ratepayer benefits; and
- Comprehensiveness in seven areas (comprehensiveness factors) defined by the APSC.[1]

The Evaluators evaluated the results for PY2024 for two residential programs, one C&I program, and one jointly implemented residential and C&I program. The Equipment Rebate Program

[1] As defined by the APSC in the C&EE Rules of Order No. 17 in Docket 08-144-U

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(ERP), the Commercial & Industrial Solutions Program (C&I Solutions) and the AOG Weatherization (AOGWP) Program[2] were all existing programs at the onset of PY2024.

Table 1-1: AOG PY2024 Energy Efficiency Portfolio Overview

Program	Channel	Sector
Equipment Rebate	Space Heating Equipment	All
	Water Heating Equipment	All
	Smart Thermostat	Residential
C&I Solutions	Custom	Commercial and Industrial
	Prescriptive	Commercial and Industrial
	Direct Install	Commercial and Industrial
AOG Weatherization	N/A	Residential
Low Income Program	N/A	Residential

Through its energy efficiency portfolio, AOG also seeks to provide customers with easy program entry points, flexible options for saving energy, and ongoing support for those who want to pursue deeper energy savings. Refer to Table 1-2 for a list of the AOG programs and targeted customer segments.

Table 1-2: AOG PY2024 Energy Efficiency Portfolio Sectors Serviced

Channel	Single Family	Multifamily	Small Business	Large C&I	Municipal	Agricultural
Equipment Rebate	✓	✓	✓	✓	✓	✓
C&I Solutions			✓	✓	✓	✓
AOG Weatherization	✓	✓				
Low Income Program	✓	✓				

1.2 Evaluation Goals

The goals of the PY2024 EM&V effort are as follows:

- **For prescriptive measures,** verify that savings are being calculated according to appropriate TRM guidelines. For most measures, this constitutes applying AR TRM V9.2[3] methodologies.

[2] The AOGWP is AOG's implementation of the Consistent Weatherization Approach (CWA)

[3] The AR TRM V9.2 can be found here: https://apps.apsc.arkansas.gov/pdf/10/10-100-R_239_4.pdf

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- **For custom measures,** this effort comprises the calculation of savings according to accepted protocols (such as IPMVP). This is to ensure that custom measures are cost-effective and providing reliable savings.
- **Conduct process evaluations of AOG programs.** Section 2.6 summarizes the Scope of the process evaluations.
- **Conduct net-to-gross assessments.** The Evaluators conducted NTG evaluation for the AOGWP and for Commercial Solutions custom projects in PY2024.

1.3 Impact Findings

Table 1-3 and 1-4 present the gross and net impact by program.

Table 1-3: Gross Impact Summary

Program	Annual Energy Savings (Therms)		Lifetime Energy Savings (Therms)		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	
Equipment Rebate	71,665	89,200	1,224,209	1,523,752	124.5%
C&I Solutions	179,714	178,275	2,173,152	2,155,750	99.2%
AOG Weatherization	206,952	206,909	3,526,799	3,480,718	100.0%
Low Income Program	41,386	41,372	698,140	689,785	100.0%
Total	**499,717**	**515,755**	**7,622,300**	**7,850,006**	**103.2%**
Sums may differ due to rounding.					

Table 1-4: Net Impact Summary

Program	Annual Energy Savings (Therms)		Lifetime Energy Savings (Therms)		NTGR	Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		
Equipment Rebate	55,055	71,957	940,474	1,252,994	80.7%	130.7%
C&I Solutions	173,444	172,533	2,097,338	2,091,574	96.8%	99.5%
AOG Weatherization	202,668	202,212	3,453,797	3,423,286	97.7%	99.8%
Low Income Program	41,386	41,372	698,140	689,785	100.0%	100.0%
Total	**472,554**	**488,074**	**7,189,750**	**7,457,639**	**94.6%**	**103.3%**
Sums may differ due to rounding.						

Figure 1-1 and

Figure *1-2* summarize the share of savings by measure category for residential and non-residential segments, respectively.

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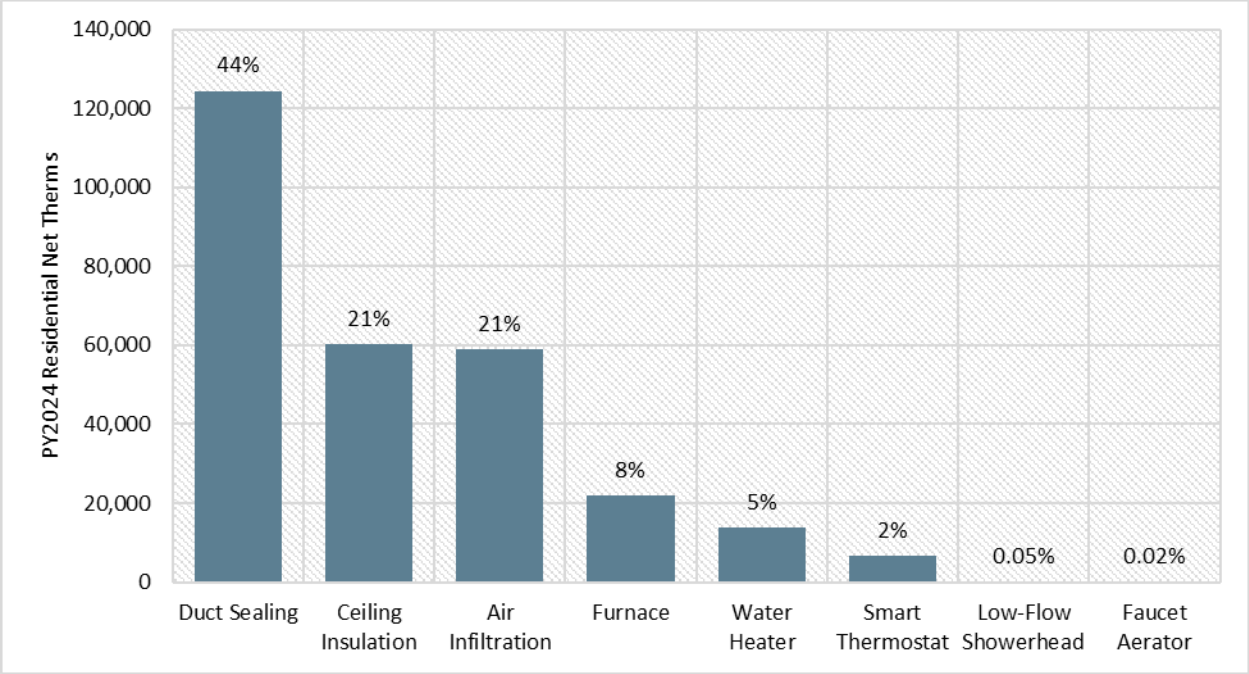

Figure 1-1: Savings Share by Measure – Residential

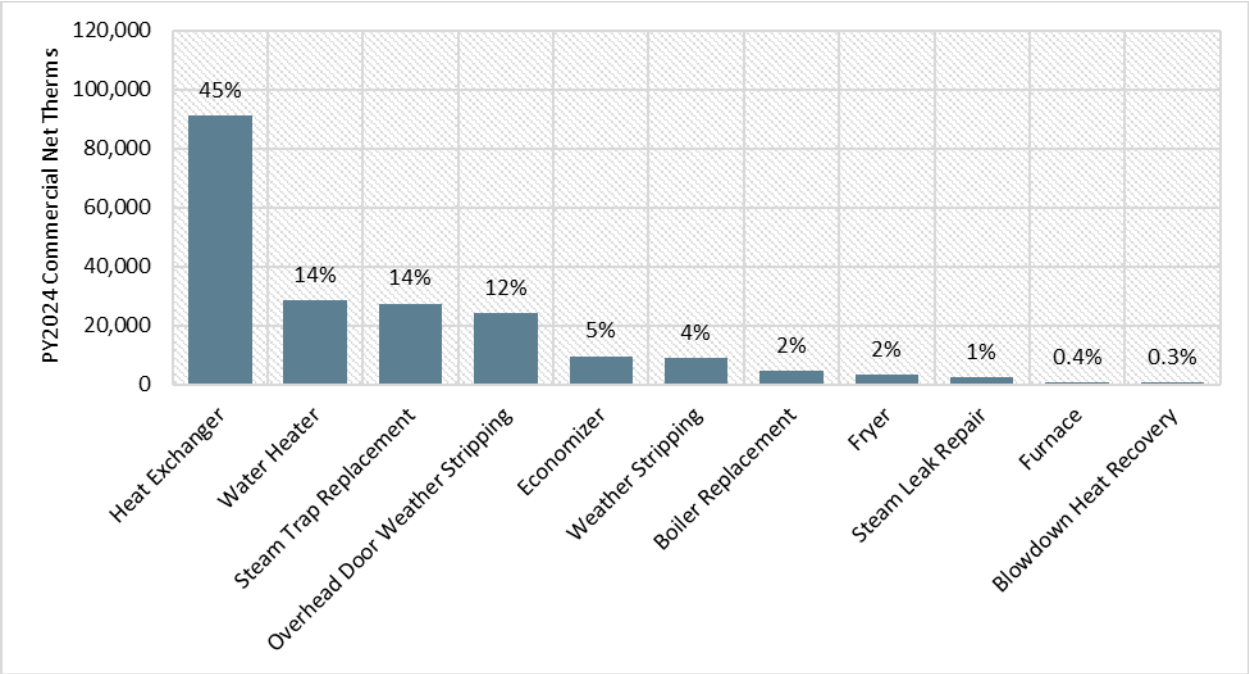

Figure 1-2: Savings Share by Measure – Commercial

From this, the Evaluators have identified the following High Impact Measures (HIMs):

Residential:

- Air infiltration;

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- Attic insulation;
- Duct sealing;
- High efficiency water heaters
- High efficiency furnaces; and
- Smart thermostats.

Non-residential:

- Waste heat recovery;
- Steam traps;
- Boiler replacement;
- Blowdown heat recovery;
- Weather stripping;
- High efficiency furnaces; and
- High efficiency water heaters.

Further, the Evaluators put the net savings into the context of AOG's PY2024 goals. Table 1-5 summarizes the performance against goals of programs evaluated in this report.

Table 1-5: AOG PY2024 EE Portfolio Performance Against Goals

Program	2024 Ex Post Net Therms	2024 Net Therms Goal	% of Goal Attained
Equipment Rebate	71,957	31,928	225.4%
C&I Solutions	172,533	166,725	103.5%
AOG Weatherization	202,212	193,808	104.3%
Low Income Program	41,372	40,630	101.8%
Total	**488,074**	**433,091**	**112.7%**
Sums may differ due to rounding.			

A summary of percent of budget spent and percent of net therm goal reached is provided in Figure 1-3. The Overall value also includes expenditures for regulatory and PWC proceedings.

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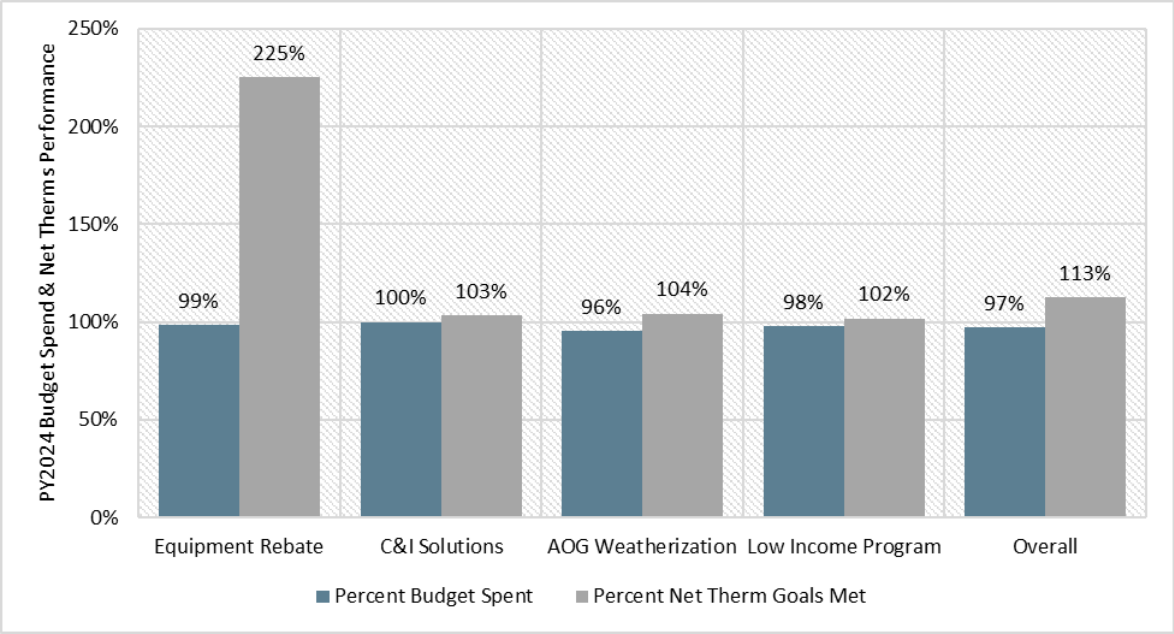

Figure 1-3: Summary of Budget Spend & Goals Attainment

The portfolio overall exceeded its net therm goals by 12.7%. The Equipment Rebate Program performed particularly well, achieving 225% of its net therm goal while expending 99% of its budget. The other programs performed well against their respective net therm goals and allocated budgets.

Non-energy benefits (NEBs) attained by the AOG portfolio in PY2024 are detailed in the tables to follow.

Table 1-6: AOG PY2024 Ex Post Electric Savings

Program	Measure	Net Annual kWh	Net Peak kW	Lifetime Net kWh
Equipment Rebate	Commercial Smart Thermostat	6,398	0.00	70,373
	Residential Smart Thermostat	79,186	0.00	871,043
AOG Weatherization	Air Infiltration	24,052	18.11	264,570
	Ceiling Insulation	75,588	53.07	1,511,755
	Duct Sealing	116,622	70.23	2,099,199
	LED Lamp	13,629	2.05	170,364
Low Income Program	Air Infiltration	9,634	7.25	105,977
	Ceiling Insulation	31,029	24.93	620,575
	Duct Sealing	42,467	25.80	764,411
	LED Lamp	4,716	0.71	58,946
C&I Solutions	OHD Weather Stripping	12,601	8.89	138,610
	Weather Stripping	3,874	2.73	42,615
Total		**419,795**	**213.77**	**6,718,436**
Sums may differ due to rounding.				

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Table 1-7: AOG PY2024 Ex Post Water Savings (Gallons)

Program	Measure	Net Annual Water	Net Lifetime Water
AOG Weatherization	Faucet Aerator	11,829	118,292
	Low-Flow Showerhead	26,629	266,295
Low Income Program	Faucet Aerator	4,627	46,274
	Low-Flow Showerhead	6,055	60,551
C&I Solutions	Blowdown Heat Recovery	97,143	1,457,145
	Steam Leak Repair	20,683	206,830
	Steam Trap Replacement	370,170	1,850,850
Total		**537,137**	**4,006,237**
Sums may differ due to rounding.			

Table 1-8: AOG PY2024 Deferred and Avoided Replacement Cost

Program	Measure	Net ARC/DRC per Unit	Total ARC/DRC
Equipment Rebate	Res Furnace Early Retirement	$854	$164,726
	Res Tankless WH	$303	$91,263
	C&I Tankless WH	$132	$3,163
AOG Weatherization	LED Lamp	$2	$1,204
Low Income Program	LED Lamp	$3	$416
Total		**$1,294**	**$260,771**
Sums may differ due to rounding.			

1.4 Process Findings

Following a review of present program offerings and interviews with utility and third-party implementation staff, the Evaluators found that:

- The programs are adequately staffed. AOG has allocated sufficient resources to successfully promote and implement their program offerings.
- Program staff at AOG and CLEAResult actively responded to PY2023 program recommendations, adopting most of the recommendations made by the Evaluators.
- Program staff have made marked improvement in implementation of health and safety measures within the Act 1102 LIP.

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1.4.1 Equipment Rebate

The program exceeded its net therm goal for PY2024.	The program met 225% of its PY2024 net savings goal, a significant increase from 68% in PY2023. The Evaluators noted an increase in rebated equipment compared to PY2023, resulting in a 35% increase in projects completed. The program achieved a TRC score of 1.81.
The program increased furnace rebates and the number of premises installing effacing furnaces increased.	In PY2024, 193 residential premises installed a high efficiency furnace, up from 161 in PY2023. The number of commercial premises installing furnaces remained about the same (4 premises) in PY2024. The results are consistent with the rebates increasing installations of furnaces.

1.4.2 C&I Solutions

The program exceeded its savings goal and was cost-effective.	The program met 103% of its net savings goal while spending 102% of its budget. The program had a 2.09 TRC and is considered to be cost-effective.
The interviewed trade ally provided positive feedback.	The interviewed trade ally noted that the application process was easy and straightforward.
Participants reported positive experiences with the program.	The survey findings, while limited by the small sample size, indicate generally positive experiences with contractors. The custom participant reported high satisfaction with both the process and outcomes, while the direct install participant provided neutral feedback on overall program satisfaction.

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1.4.3 AOG Weatherization

Comprehensiveness remained consistent.	Participants had an average of 2.59 measures installed in their projects. Incentives per home were slightly less at $1,002 per home, but within the historical range.

1.4.4 Low Income Program

Program Implementation Success	The program met 102% of its net savings goal while spending 98% of its program budget.
	Health and safety spending increased from $353 to $426 per home.
	The program installed 3.19 energy-saving measures at $1,405 per home, continuing the trend of increased expenditure per-home in alignment with Arkansas Comprehensiveness requirements.
Demand for the program continues to be strong.	Program staff are cautious in marketing the program as demand for services continues to be strong. The program completed its final PY2024 projects in August.
Program Tracking	As in PY2023, Program tracking included names and phone numbers for all participants but did not have email addresses.
	As in PY2023, program tracking data did not include Act 1102 eligibility fields, but this was stored separately by CLEAResult and made available to the Evaluators. The Act 1102 fields will be integrated into the 2025 program tracking data.

1.5 Response to PY2023 Recommendations

In the PY2023 evaluation, three program-level recommendations were provided to AOG. The Evaluators reviewed AOG's response to recommendations from the PY2023 EM&V report and categorized them as follows:

- **Completed.** Recommendation fully implemented.
- **Continuing.** Recommendation fully implemented. However, due to the nature of the recommendation, this will be an area monitored throughout the next program year.

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- **Rejected.** This applies to recommendations which are reviewed by AOG and rejected.
- **In progress.** Recommendation accepted and will be adopted before next program year.
- **Under consideration.** Recommendation still under review by program staff or implementers and no decision yet made.
- **Reviewed and rejected.** Recommendation considered and subsequently rejected or no longer applicable due to changes in program design or operations**.**

The disposition of PY2023 recommendations is summarized in Figure 1-4.

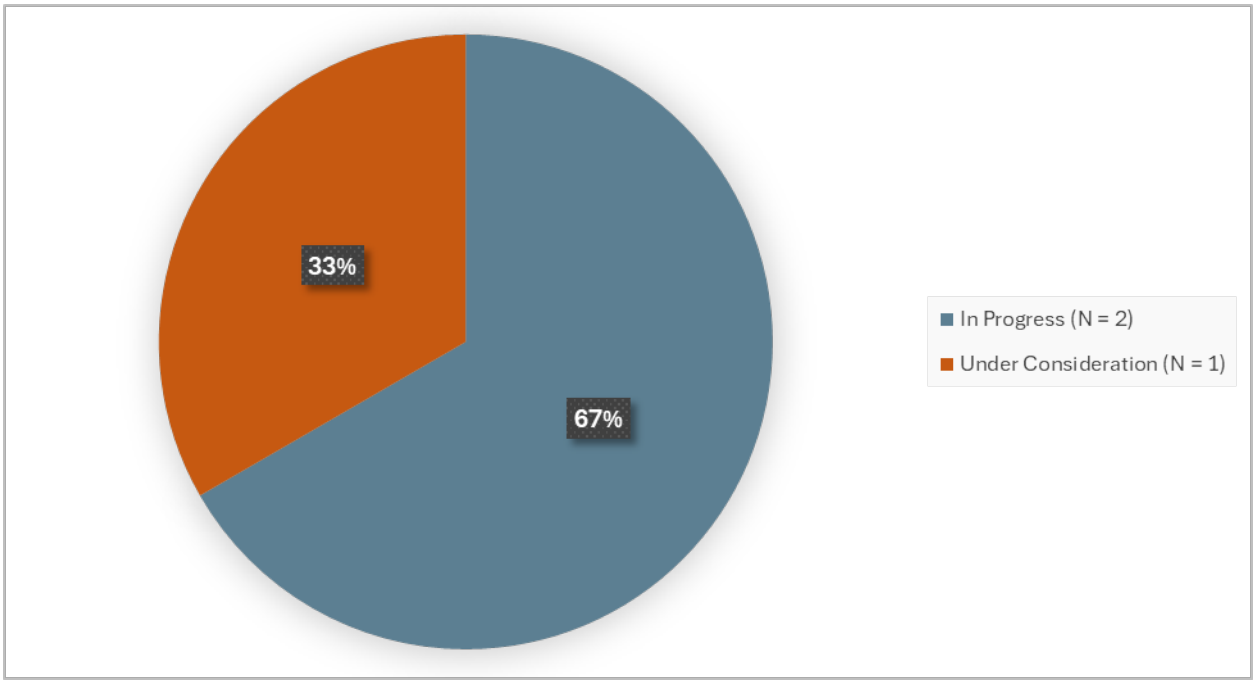

Figure 1-4: Status of PY2023 recommendations

1.6 Report Organization

This report is organized with one chapter providing the full impact and process summary of a specified program. The report is organized as follows:

- Chapter 2 presents general methodologies;
- Chapter 3 presents portfolio cross-cutting issues;
- Chapter 4 provides results for the Equipment Rebate Program;
- Chapter 5 provides results for the C&I Solutions Program;
- Chapter 6 provides results for the Weatherization Program;
- Chapter 7 provides results for the Low Income Program;
- Appendix A provides C&I Solutions custom site reports;

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- Appendix B provides Deferred Replacement Cost (DRC) calculations; and
- Appendix C provides sample TRM calculations.

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2 General Methodology

This section details general impact evaluation methodologies by program-type as well as data collection methods applied. This section will present full descriptions of:

- Gross savings estimation;
- Sampling methodologies;
- Free-ridership determination;
- Process evaluation methodologies; and
- Data collection procedures.

2.1 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators provide a glossary of terms to follow:[4]

- *Ex Ante* – Forecasted savings used for program and portfolio planning purposes (from the Latin for "beforehand")
- *Ex Post* – Savings estimates reported by an evaluator after the energy impact evaluation has been completed (from the Latin for "From something done afterward")
- *Deemed Savings* – An estimate of savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources and analytical methods that are widely accepted for the measure/purpose and (b) are applicable to the situation being evaluated. (e.g., assuming 17.36 therms savings for a low-flow showerhead)
- *Gross Savings* – The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated
- *Gross Realization Rate* – Ratio of Ex Post Savings / Ex Ante Savings (e.g. If the Evaluators verify 15 therms per showerhead, Gross Realization Rate = 15/17.36 = 86%)
- *Free-rider* – A participant who *would have* implemented the program measure or practice in the absence of the program. Free-riders can be total, partial, or deferred.
- *Spillover* – Reductions in consumption and/or demand caused by the presence of the energy efficiency program that exceed the program-related gross savings of the participants. There can be participant and/or non-participant spillover rates depending on the rate at which participants (and non-participants) adopt energy efficiency

[4] Arkansas TRM V9.2, Volume 1, Pg. 94-100 of pdf

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measures or take other types of efficiency actions on their own (i.e., without an incentive being offered).

- *Net Savings* – The total change in load that is attributable to an energy efficiency program. This change in load may include, implicitly or explicitly, the effects of free riders, spillover, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand. (e.g., if free-ridership for low-flow showerheads = 50%, net savings = 15 therms x 50% = 7.5 Therms)
- *Net-to-Gross-Ratio (NTGR)* = (1 – Free-ridership % + Spillover %), also defined as Net Savings / Gross Savings
- *Ex Ante Net Savings* = Ex Ante Gross Savings x Ex Ante Free-ridership Rate
- *Ex Post Net Savings* = Ex Post Gross Savings x Ex Post Free-ridership Rate
- *Net Realization Rate* = Ex Post Net Savings / Ex Ante Net Savings
- *Effective Useful Life (EUL)* – An estimate of the median number of years that the efficiency measures installed under a program are still in place and operable.
- *Gross Lifetime Therms* = Ex Post Gross Savings x EUL
- *Deferred Replacement Cost (DRC)* = The present value of the benefit of shifting the replacement cycle in perpetuity subsequent to an early replacement.
- *Avoided Replacement Cost (ARC)* = The present value of the benefit of avoided purchases due to efficient equipment having a longer rated life than baseline equipment (such as residential tankless water heaters having an EUL of 20 years compared to a baseline storage tank EUL of 11 years).
- *Non-Energy Benefits (NEBS)* = Claimable TRC benefits other than natural gas savings. This includes kWh, kW, deferred replacement cost, avoided replacement cost, and water savings.

2.2 Overview of Methodology

The proposed methodology for the evaluation of the PY2024 AOG EE Portfolio is intended to provide:

- Net impact results at the 90% confidence and +/-10% precision level; and
- Program feedback and recommendations via process evaluation.

In doing so, this evaluation will provide the verified net savings results, provide the recommendations for program improvement, and ensure cost-effective use of ratepayer funds.

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2.2.1 Sampling

Sampling is necessary to evaluate savings for the AOG EE portfolio insomuch as verification of a census of program participants is typically cost-prohibitive. As per evaluation requirements set forth by the IEM, samples are drawn in order to ensure 90% confidence at the +/- 10% precision level. Programs are evaluated on one of three bases:

- Census of all participants;
- Simple Random Sample; and
- Stratified Random Sample.

2.2.1.1 Census of Participants

A census of participant data was used for programs where such review is feasible. Programs that received analysis of a census of participants include the custom component of C&I Solutions.

2.2.1.2 In-Service Rates

The Evaluators conducted residential field data collection to assess the in-service rates for duct sealing, air infiltration, and ceiling insulation for the CWA program. The Evaluators also conducted field data collection to determine the in-service rates (ISRs) for various measures that were offered within the AOG Weatherization and the Low Income Weatherization programs.

In cases where there were limited insights from the field data collection findings, the Evaluators performed measure literature reviews to determine stipulated or reported in-service rates for similar measures (regardless of fuel type) found in Technical Reference Manuals or EM&V reports. The following tables show the various measure literature review results and the associated ISRs.

Table 2-1: Air Infiltration Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY2023 EM&V Report	AOG	Air Infiltration	TA Installed	108.1%
PY2023 EM&V Report	Summit AR	Air Infiltration	TA Installed	105.2%
PY2023 EM&V Report	SWEPCO AR	Air Infiltration	TA Installed	99.0%
PY2023 EM&V Report	BHE AR	Air Infiltration	TA Installed	104.3%
IL V11.0 TRM	NA	Air Infiltration	TA DI	100.0%
Average ISR				**103.3%**

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Table 2-2 Attic Insulation Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY2023 EM&V Report	AOG	Ceiling Insulation	TA Installed	100.0%
PY2023 EM&V Report	Summit AR	Ceiling Insulation	TA Installed	100.0%
PY2023 EM&V Report	SWEPCO AR	Ceiling Insulation	TA Installed	97.0%
PY2023 EM&V Report	BHE AR	Ceiling Insulation	TA Installed	100.0%
PY8 EM&V Report	SWEPCO LA	Ceiling Insulation	TA DI	100.0%
Average ISR				**99.4%**

Table 2-3 Duct Sealing Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY2023 EM&V Report	AOG	Duct Sealing	TA Installed	101.4%
PY2021 EM&V Report	OG&E AR	Duct Sealing	TA Installed	100.0%
PY2023 EM&V Report	SWEPCO AR	Duct Sealing	TA Installed	99.7%
PY11 EM&V Report	ENO	Duct Sealing	TA Installed	94.4%
Rhode Island TRM 2021	-	Duct Sealing	TA DI	100.0%
Average ISR				**99.9%**

Table 2-4 Faucet Aerator Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY21 EM&V Report	Entergy, AR	MF DHW	TA Installed Wx	100.0%
IL TRM V11.0	NA	Aerator	DI ISR	93.0%
New Orleans TRM 7.0	NA	Aerator	DI ISR	98.0%
IA TRM V7.0	NA	Aerator	DI ISR	95.0%
PY23 EM&V Report	OG&E AR	Aerator	TA installed Wx	100.0%
Average ISR				**97.2%**

Table 2-5 LED Lamp Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY9 (2023) EM&V Report	SWEPCO LA	LED Lamp	TA Installed	100.0%
2023 CPS Energy TRM	CPS Energy, TX	LED Lamp	Not Specific	97.0%
AR TRM V9.2	NA	LED Lamp	Not Specific	97.0%
PY2023 EM&V Report	OG&E AR	LED Lamp	DI in Wx	100.0%
Hawaii TRM PY2022	NA	LED Lamp	Not specific	97.0%
Average ISR				**98.2%**

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Table 2-6 Low-Flow Showerhead Literature Review Results

Source	Utility	Measure Name	Delivery Mechanism	In-Service Rate
PY21 EM&V Report	Entergy, AR	MF DHW	TA Installed Wx	100.0%
2022 Hawaii TRM	NA	Showerheads	DI ISR	93.0%
IL TRM V11.0	NA	Showerheads	DI ISR	96.0%
New Orleans TRM 7.0	Entergy New Orleans	Showerheads	DI ISR	98.0%
IA TRM V7.0	NA	Showerheads	DI ISR	98.0%
PY2023 EM&V Report	OG&E AR	Showerheads	TA installed Wx	100.0%
Average ISR				**97.5%**

2.2.1.3 Simple Random Sampling

For programs with relatively homogenous measures (largely in the residential portfolio), the Evaluators conducted a simple random sample of participants. The sample size for verification surveys is calculated to meet 90% confidence and 10% precision (90/10). The sample size to meet 90/10 requirements is calculated based on the coefficient of variation of savings for program participants. Coefficient of Variation (CV) is defined as:

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

Where *x* is the average therms savings per participant. Without data to use as a basis for a higher value, it is typical to apply a CV of .5 in 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. However, in some instances, programs did not have sufficient participation to make a sample of this size cost-effective. In instances of low participation, the Evaluators then applied a finite population correction factor, defined as:

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

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Where:

n_0 = Sample Required for Large Population

N = Size of Population

n = Corrected Sample

For example, if a program were to have only 100 participants, the finite population correction would result in a final required sample size of 41. The Evaluators applied finite population correction factors in instances of low participation in determining samples required for surveying or onsite verification.

2.2.1.4 Stratified Random Sampling

For the AOG C&I programs, Simple Random Sampling is not an effective sampling methodology as the CV values observed in business programs are typically very high because the distributions of savings are generally positively skewed. Often, a relatively small number of projects account for a high percentage of the estimated savings for the program.

To address this situation, the Evaluators use a sample design for selecting projects for the M&V sample that takes such skewness into account. With this approach, we select a number of sites with large savings for the sample with certainty (i.e., a census of sites that are above a specified savings threshold) and take a random sample of the remaining sites. To further improve the precision, non-certainty (i.e., randomly selected sample rather than a census) sites are selected for the sample through systematic random sampling. That is, a random sample of sites remaining after the certainty sites have been selected is selected by ordering them according to the magnitude of their savings and using systematic random sampling. Sampling systematically from a list that is ordered according to the magnitude of savings ensures that any sample selected will have some units with high savings, some with moderate savings, and some with low savings. Samples cannot include results that have concentrations of sites with atypically high savings or atypically low savings.

2.3 Free-ridership

In determining ex post net savings for the AOG EE portfolio, the Evaluators provide estimates of free-ridership for individual programs. Free-riders are program participants that would have implemented the same energy efficiency measures at nearly the same time absent the program. As per TRM V9.2 guidelines, free-riders are defined as:

> "…program participants who received an incentive but would have installed the same efficiency measure on their own had the program not been offered. This includes partial free-riders, defined as customers who, at some point, would have installed the measure anyway, but the program persuaded them to install it *sooner* or customers who would have installed the measure anyway,

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> but the program persuaded them to install more efficient equipment and/or more equipment. For the purposes of EM&V activities, participants who would have installed the equipment within one year will be considered full free-riders; whereas participants who would have installed the equipment later than one year will not be considered to be free-riders (thus no partial free-riders will be allowed)."[5]

Given this definition, participants are defined as free-riders through a binary scoring mechanism, in being either 0% or 100% free-riders.

2.3.1.1 Prescriptive Free-ridership

The general methodology for evaluating free-ridership among prescriptive program participants involved examination of four factors:

(1) Demonstrated financial ability to purchase high-efficiency equipment absent the rebate;

(2) Importance of the rebate in the decision-making process;

(3) Prior planning to purchase high-efficiency equipment; and

(4) Importance of the contractor in influencing the decision-making process.

In this methodology, Part (1) is essentially a gateway value, in that if a participant does not have the financial ability to purchase energy efficient equipment absent a rebate, the other components of free-ridership become moot. As such, if they could not have afforded the high-efficiency equipment absent the rebate, free-ridership is scored at 0%. If they did have the financial capability, the Evaluators then examine the other three components. The respondent is determined to be a free-rider based upon a preponderance of evidence of these three factors; that is, if the respondent's answers indicate free-ridership in two or more of these three components, they are considered free-riders. Specific questions and modifications to this general methodology are presented in the appropriate program chapters.

For residential programs, free-ridership is calculated as the average score determined for the sample of participants surveyed. For programs that are contractor-driven, the free-rider score of a survey respondent incorporates the relative importance of advice from their contractor, provided that the contractor is a program trade ally that received training from the appropriate program. This value is then applied to the program-level savings to discount savings attributable to free-ridership.

[5] Arkansas TRM V9.2, (Protocol F) Pg. 54 of pdf.

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2.3.1.2 Custom Free-ridership

For custom projects from the C&I Solutions Program, free-ridership is assessed on a case-study basis, through which the Evaluators conduct an in-depth interview that includes a battery of questions addressing:

- The timing of learning of the program relative to the timing of the planning of the retrofit;
- The impact the program incentive has on measure payback relative to the stated payback requirements by the respondent;
- Whether the respondent learned of the energy efficiency measure from a program-funded audit; and
- Whether any influence the program had in modifying the project affected savings by greater than 50%.

2.4 Impact Evaluation Activities by Program

The Evaluators used established, industry-standard approaches to estimate energy savings and demand reductions at the measure, program, and portfolio levels. ADM followed all applicable measure- and program-level guidelines and protocols from the AR TRM V9.2.

To evaluate program impacts, the Evaluators adjusted program-reported gross savings using the results of our research, relying primarily on engineering desk reviews, TRM deemed savings calculations, and onsite verification and metering for applicable programs. To calculate deemed savings, we verified the appropriateness of savings algorithms and values in program tracking data as compared to guidelines in the AR TRM V9.2. Where sampling was used (for surveys and site visits), we designed a sampling plan to achieve a minimum precision of ±10% of the gross realized savings estimate with 90% confidence at the program-level.

Impact evaluation activities by program are summarized in Table 2-7.

Table 2-7: PY2024 Impact Evaluation Activities by Program

Program	Equipment Rebate	C&I Solutions	AOG Weatherization	Low Income Program
Database & Document Review	✓	✓	✓	✓
Engineering Desk Review		✓		
TRM Deemed Savings Review	✓	✓	✓	✓
On-site Verification / Metering		✓	✓	
Simulation Modeling		✓		
Billing Analysis		✓		

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2.5 Net-to-Gross Approach by Program

From PY2020 – PY2023, the Evaluators conducted NTG research for most program offerings. Table 2-8 shows the NTG approach the Evaluators followed for each program based on our assessment of specific program needs and the availability of accurate, existing information. These data collection and analysis activities are in compliance with one of the five accepted approaches listed in the AR TRM V9.2, Protocol F.

Table 2-8: PY2024 NTG Approaches by Program

Program	Assigned Previous Participant Survey/ Interview Value	Literature Review
Equipment Rebate		
▪ Residential furnace retrofit	✓	
▪ Residential DHW retrofit	✓	
▪ Residential smart thermostats	✓	
▪ Housing authority furnace & DHW	✓	
▪ New construction – builders	✓	
▪ New construction – homeowner / custom	✓	
▪ Commercial furnace & DHW	✓	
C&I Solutions		
▪ Direct install	✓	
▪ Custom	✓	
▪ Prescriptive boilers	✓	
▪ Prescriptive food service	✓	
AOG Weatherization	✓	
Low Income Program		✓

2.6 Process Evaluation

The PY2024 process overviews began with interviews of program staff. These interviews, along with guidance from IEM protocols, inform the establishment of goals for the process evaluation, provide background history of programs, and introduce portfolio-level issues. From this, the Evaluators then develop a list of data collection activities. The data collection procedures for process evaluations included:

- *Participant Surveying*. The Evaluators surveyed statistically significant samples of participants in each program in order to provide feedback for the program and provide an assessment of participant satisfaction.
- *In-Depth Interviews*. The Evaluators conducted in-depth interviews with high-level program actors, including AOG program staff and third-party implementation staff.

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These interviews are semi-structured, in having general topics to be covered, without fully prescribed question and answer frameworks.

Table 2-9 summarizes the scope of the process evaluation research.

Table 2-9 Summary of Process Evaluation Scope

Program	Process Evaluation Scope
Equipment Rebate	Limited
Commercial & Industrial (C&I) Solutions Program	Full
AOG Weatherization Program	Limited
Low Income Program	Limited

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3 Portfolio-Level Summary

This chapter provides a summary of the portfolio-level findings and any cross-cutting evaluation activities that occurred over the course of the PY2023 EM&V effort. Specifically, this chapter includes:

- A summary of program and portfolio performance in PY2024;
- A summary of EM&V activities and expenditures in PY2024; and
- High-level findings that cut across programs.

3.1 Summary of EM&V Effort

With the beginning of a new triennial evaluation cycle, the C&I Solutions program received a full process evaluation while the other programs received a partial process evaluation. All programs have continuously met or exceeded savings goals. Table 3-1 summarizes the data collection efforts for the PY2024 EM&V effort. "Interviews" should be distinguished from "Surveys" in that "Interviews" reflect semi-structured, in-depth discussions with high-level program actors (such as utility staff and third-party implementation staff) whereas surveys are fully-structured and typically conducted with program participants.

Table 3-1: PY2024 Summary of Data Collection Efforts

Program	# Site Visits	# Surveys	# Staff Interviews	# Trade Ally Interviews
Equipment Rebate	0	0	2	0
C&I Solutions	0	2		1
AOG Weatherization	45	0		0
Low Income Program	17	0		0
Total	**62**	**2**	**2**	**1**

3.2 Comprehensiveness Checklist

The Arkansas Public Service Commission has in place a set of criteria in order to determine whether an EE 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;

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- **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 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.

The Evaluators reviewed the AOG programs and portfolio in order to assess whether it was in compliance with the APSC Comprehensiveness Goals. In assessing these metrics, the Evaluators score them on numerous subcomponents. The scoring methodology is as follows:

■: Meets all requirements and is in full compliance with this performance indicator

◒: Meets some requirements and is in partial compliance with this performance indicator

○: Is not in compliance with this performance indicator.

NA: Performance indicator is not applicable to this program.

3.2.1 Factor 1: Education, Training, Marketing, and Outreach

3.2.1.1 Assessment of Education

The Evaluators assessed the educational components of the AOG programs in order to identify whether the programs were providing potential participants with the needed information to guide their decision-making, and whether the channels used to reach the target markets are appropriate. The Evaluators found that:

- AOG's programs used a range of channels to provide educational materials to their programs' target markets. The educational materials included brochures, case studies, and presentations to trade & industry groups.
- AOG program staff conducts outreach and education through a wide range of potential program partners, including contractors, retailers, home builders, and local governments.

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The breadth of educational materials by program is summarized in Table 3-2.

Table 3-2: Assessment of Customer Education by Program

Program	***Provides Educational Materials***	***Outreach Through Multiple Channels***	***Education Targeted to Specific Market Barriers***	***Coordination of Education by Multiple Entities***
Equipment Rebate	■	■	■	■
C&I Solutions	■	■	■	■
AOG Weatherization	■	■	■	■
Low Income Program	■	■	■	■

3.2.1.2 Assessment of Training

The Evaluators reviewed each AOG program to assess:

1) Whether the program is trade ally-driven;
2) If not, is it a program that could or should be trade ally-driven;
3) The program provides training classes to support their program offerings; or
4) Whether the programs need trade ally certification.

Table 3-3: Assessment of Trade Ally Training by Program

Program	***Trade Ally Training Offered***	***Training Requirements Adhere to Best Practices***	***Trade Allies Participate in Training***
Equipment Rebate	■	■	■
C&I Solutions	■	■	■
AOG Weatherization	■	■	■
Low Income Program	■	■	■

AOG does not require trade ally registration to participate, except for in the AOG Weatherization Program and Low Income Program. Their approach has been to allow all licensed dealers or contractors to apply for the appropriate Equipment Rebate. The Evaluators have concluded that this has not to-date affected the quality assurance of the programs.

The Evaluators note that there was marked improvement in H&S measure implementation in PY2024, increasing from $18 per home in PY2021 to $423 per home for the Low Income Weatherization Program. To support health and safety spending, the program staff has providing additional training opportunities to contractors to help them understand when and where to implement the measures.

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3.2.1.3 Marketing & Outreach

The Evaluators reviewed the marketing and outreach strategies associated with each of the AOG programs. These strategies were reviewed to assess whether they adequately addressed the relevant participant barriers, the extent to which trade allies were actively marketing the program (where appropriate), and whether the materials were correctly targeted in marketing a comprehensive approach to energy efficiency.

A summary of the Evaluators' assessment of AOG's marketing and outreach is presented in Table 3-4.

Table 3-4: Assessment of Marketing & Outreach by Program

Program	*Marketing Addresses Specific Barriers*	*Trade Allies Promote Program*	*Marketing Support Provided to Trade Allies*	*Marketing Performed Through Diverse Channels*
Equipment Rebate	■	■	■	■
C&I Solutions	■	■	■	■
AOG Weatherization	■	■	■	■
Low Income Program	■	■	■	■

After reviewing the marketing and outreach materials, the Evaluators concluded that:

- AOG programs have marketing materials that address specific barriers associated with the targeted segments or technologies.
- Trade ally involvement in the C&I Solutions Program has increased significantly. The program allows for prescriptive rebates to be fully signed over to trade allies and their promotion of the program has increased.
- The AOG programs are marketed through a diverse range of channels, including mass-media advertising, online advertising, meetings and training sessions with professional organizations and trade groups, and partnered marketing with municipal governments.
- Marketing for AOG Weatherization and LIP is limited due to the demand for the program, but the programs are marketed both by program trade allies and through AOG bill inserts, web banners, and radio advertisements.

3.2.2 Factor 2: Budgetary, Management, and Program Delivery Resources

Several performance indicators were assessed in reviewing the adequacy of budgetary, management, and program delivery resources. This included:

- Self-reports from program management staff;

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- Cost per therm saved; and
- Review of trade ally resources dedicated to program promotion.

Table 3-5: Assessment of Budgetary, Management, and Delivery Resources

Program	***Budget is Sufficient to Support Program Goals***	***Cost-per-therm Aligns with Program Plan***	***Program Has Sufficient Staffing***	***Program Has Sufficient Trade Ally Support***
Equipment Rebate	■	■	■	■
C&I Solutions	■	■	■	■
AOG Weatherization	■	■	■	■
Low Income Program	■	■	■	■

From this review, the Evaluators concluded that the AOG portfolio overall has adequate budget and staff allocations. Aggregated across all programs, actual cost per net therm continues to be lower than planned. In PY2024, the AOG portfolio had an actual acquisition cost of $3.02. This is lower than the actual acquisition cost of $4.44 per net therm, found in PY2023. Overall, the PY2024 AOG portfolio is 16% lower than the portfolio plan value of $3.60.

At the individual program level, the Equipment Rebate Program significantly outperformed relative to its planned acquisition cost by 58%. Additionally, both the AOG Weatherization Program and the Low Income Weatherization Program outperformed their respective planned acquisition costs. In PY2024, the C&I Solutions Program was 0.5% higher than its planned acquisition cost, but this is significantly lower than the 12% above the program plan acquisition cost found in PY2023. Although the C&I Solutions Program actual cost is slightly higher than planned, it still remains as cost-effective, achieving a 2.09 TRC score.

Overall, the AOG portfolio is cost-effective in regard to acquisition cost per-net-therm, as demonstrated in

Figure 3-1.

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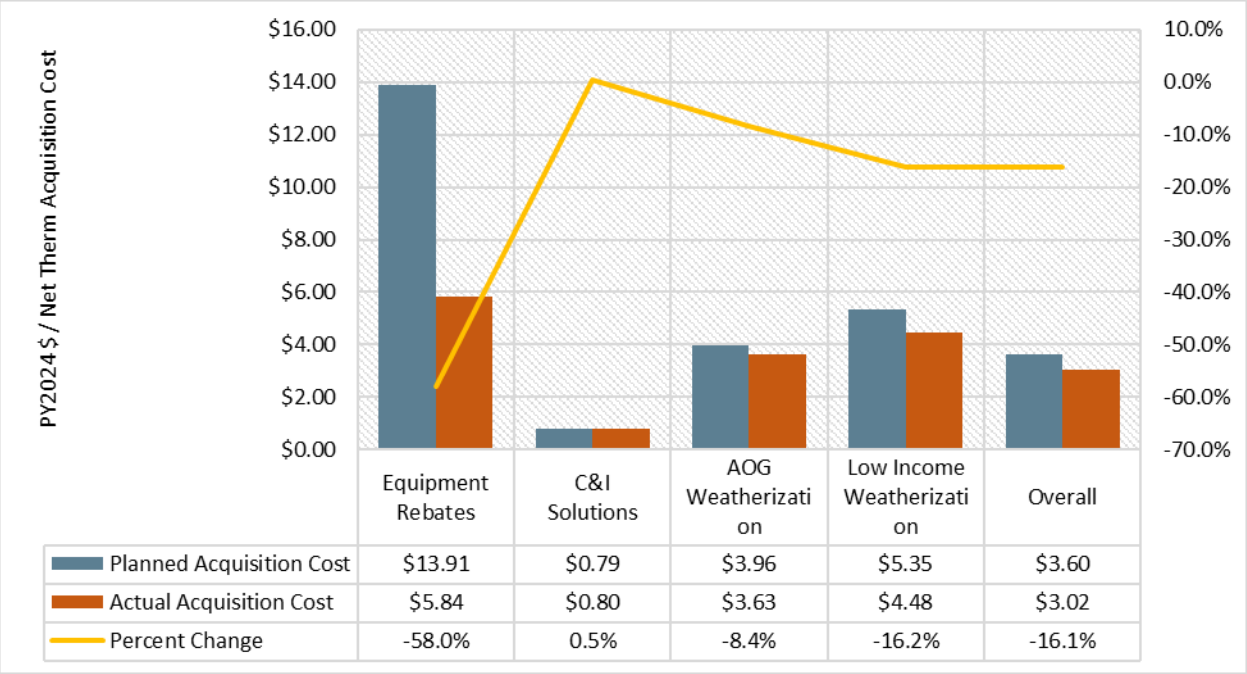

Figure 3-1: Comparison of Program Plan vs. Actual Acquisition Costs

3.2.3 Factor 3: Addressing Major End-Uses

The Evaluators identified the end-uses served by each of the AOG programs. Most AOG programs are designed around a specific technology or end-use. Table 3-6 summarizes the end-uses addressed by each program.

Table 3-6: End-Uses Addressed by Program

Program	*HVAC*	*Hot Water*	*Appliances*	*Food Service*	*Building Envelope*	*Industrial Process*	*Behavioral*
Equipment Rebate	■	■	NA	NA	NA	NA	NA
C&I Solutions	■	■	NA	■	■	■	NA
AOG Weatherization	■	■	NA	NA	NA	NA	NA
Low Income Program	■	■	NA	NA	NA	NA	NA

■ Measure targeted ◒ Measure offered ○ Measure not offered

Presently, the AOG portfolio covers most end-uses. The Evaluators found that sectors where the program offerings were not providing enough outreach and market transformation included:

- **Behavioral.** The AOG portfolio does not include any behavioral-based programs. However, this is likely not viable given the size of AOG's service territory. When examining the experiences of Black Hills Energy and Summit Utilities Arkansas, the Evaluators found that gas behavioral programs in Arkansas would require a recipient group of at least 25,000 households to reach cost-effectiveness. A behavioral program is under consideration in the overlapping OG&E service territory, and if this comes to

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fruition AOG could consider co-funding the initiative to obtain gas savings. Similarly, AOG is considering implementation of an SEM program to serve the C&I sector, but note that the variability in savings for this type of program makes it difficult to plan for given the size of the AOG portfolio.

- **Residential appliances.** The AR TRM V9.2 includes deemed savings for residential appliances, including dishwashers and clothes washers. These are not presently offered in any AOG programs. However, given the low unit energy savings of these measures, any offering for this end-use would need to be an upstream, multi-utility effort in order to be cost-effective.

Figure 3-2 summarizes the percent of projects that are single- versus multiple-measure installations by program. The Evaluators define "multiple measures" as follows:

- **Equipment Rebate:** Completing more than one of the following categories:
  - Furnace
  - Water Heater
  - Smart Thermostat
- **C&I Solutions:** Completing more than one of the following measures:
  - Custom
  - Prescriptive Boiler
  - Prescriptive Food Service
  - Direct Install Aerators
  - Direct Install Showerheads
  - Direct Install PRSVs
  - Direct Install Weather Stripping

  Or having completed more than one custom measure, either as part of one application or multiple applications. Measures listed as retro-commissioning were treated as multiple measure projects.
- **AOG Weatherization & LIP:** Completing more than one of the energy-saving improvements as part of weatherization, excluding the Assessment incentive:
  - Duct Sealing
  - Air Sealing
  - Attic Insulation
  - Faucet Aerators
  - Showerheads

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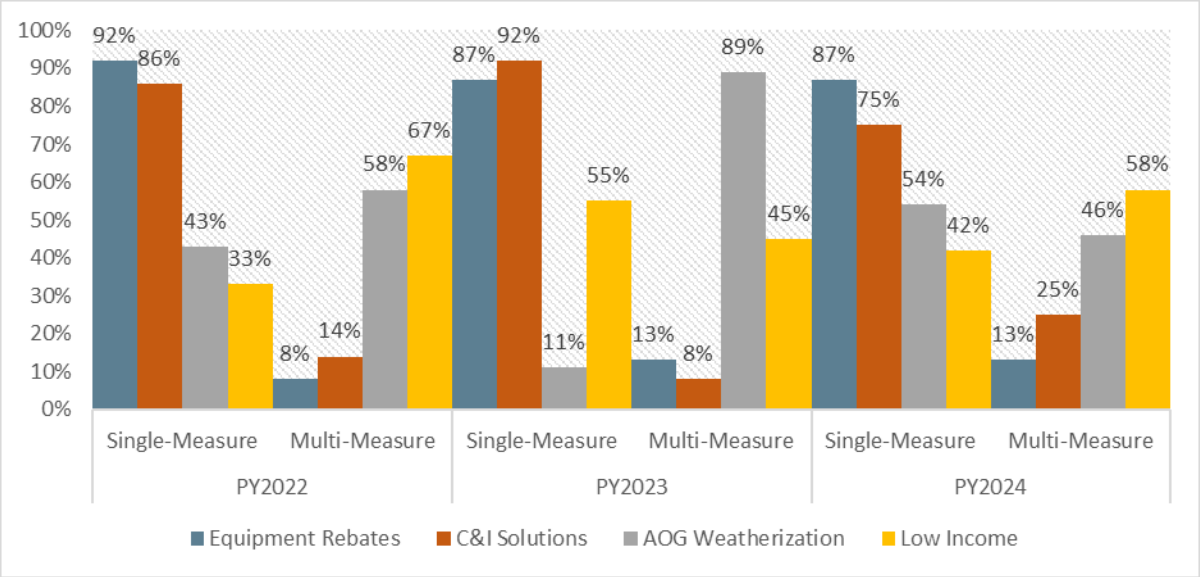

Figure 3-2: Installation of Multiple Measures

3.2.4 Factor 4: Comprehensively Addressing Customer Needs

To assess Factor 4, the Evaluators reviewed AOG programs to discern the extent of:

- Program-provided technical assistance;
- Incentives of comprehensive projects/measure suites; and
- Tiered incentives for higher efficiency levels.

The AOG portfolio has no specific requirements for installation of multiple measures. Customers are able to participate to an extent of their choice. This is a program best-practice in enabling customers to engage in energy efficiency in a manner in accordance with their budget constraints. However, there is no specific encouragement in place to incentivize comprehensive projects, as seen elsewhere in Arkansas[6].

Table 3-7 summarizes the comprehensiveness of offerings for each program.

Table 3-7: Assessment of Project Comprehensiveness by Program

Program	***Technical Assistance and/or Audits***	***Information Provided for Comprehensive Efficiency***	***Bundled Incentives for Multiple Measures***	***Tiered Incentives for Premium Efficiency***	***Trade Ally Incentives for Premium Efficiency***
Equipment Rebate	N/A	■	○	■	■
C&I Solutions	■	■	○	■	■

[6] For example, the Summit Arkansas Gas Equipment Rebate Program increases the incentive when a customer installs both a tankless water heater and 95 AFUE furnace.

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AOG Weatherization	■	■	NA	NA	NA
Low Income Program	■	■	NA	NA	NA

Findings from the assessment of this factor included:

- Most AOG prescriptive programs offer incentives to trade allies for installation of top-tier efficiency measures. This has included incentives for condensing furnaces, tankless water heaters, and cooking equipment.
- The AOG portfolio formerly offered tiered incentives for premium efficiency across all their rebate programs. In some cases, this tiering has been removed in lieu of only including premium efficiency. Examples include:
  - High-efficiency boiler incentives are $1,400/MMBtuh for units < 94% efficient and $2,000/MMBtuh for units with 94% efficiency or greater.
  - Gas Furnace incentives are $400 for units < 95% efficient and $800 for units with 95% efficiency or greater for residential units.
  - The AOG Weatherization Program provides a fixed budget for home retrofits at no cost to the participant.
- The AOG portfolio has programs that bundle on-site technical assistance with direct installation.
- The Equipment Rebate Program does not fund customer audits; there is technical assistance via the licensed HVAC and plumbing contractors that participate in the program, but in a prescriptive HVAC/DHW equipment rebate program, program-funded audits and technical assistance are not warranted.
- The range of technical assistance varies by program. The Equipment Rebate program offers technical assistance through trade allies. C&I Solutions provides on-site technical assistance that is directly funded by the program. Weatherization and Low Income provide energy assessments.
- Marketing materials typically make attempts at cross-promotion of programs.

3.2.5 Factor 5: Targeting Market Sectors & Leveraging Opportunities

The Evaluators reviewed whether the AOG portfolio offered a comprehensive range of energy efficiency opportunities to all major customer sectors. Table 3-8 summarizes the market sectors and what programs target or allow each sector.

Table 3-8: Assessment of Targeted Customer Sectors by Program

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Program	Residential	Multifamily	Manufactured Housing	Small Commercial	Large Commercial	Industrial	Agricultural	Public Sector
Equipment Rebate	■	◒	◒	■	◒	◒	◒	■
C&I Solutions	NA	NA	NA	■	■	■	■	■
AOG Weatherization	■	◒	◒	NA	NA	NA	NA	NA
LIP	■	■	◒	NA	NA	NA	NA	NA

■ Program targets this sector
◒ Sector is eligible for this program
NA Sector is ineligible for this program

Each sector has several programs for which they are eligible, and at least one program that targets them. Segment-specific findings include:

- Agriculture and Industrial sectors are not specifically targeted by the Equipment Rebate program as the equipment used by these facilities generally requires custom calculations.
- Public Sector facilities are targeted with a wide range of programs. This has included residential programs that reach out to public housing authorities.
- Multifamily and manufactured housing are eligible for AOG programs, but the opportunity to engage these segments has historically been limited as most of this housing stock within AOG's service territory has all-electric utility service.

In addition, the Evaluators reviewed the extent of collaboration and leveraging of available partnership opportunities by AOG.

Examples of cross-utility coordination included:

- The AOGWP is jointly implemented with Oklahoma Gas & Electric (OG&E) with both utilities using CLEAResult to provide third-party implementation support and is a very successful example of cross-fuel coordination. The costs are split when a home is an AOG and OG&E customer and paid in full by AOG if they are served by another electric utility (such as a municipal or a rural co-op).
- AOG uses a third-party implementer (CLEAResult) for their C&I Solutions Program. This implementer uses similar program design and incentive levels for Summit Utilities Arkansas (SUA) and Black Hills Energy of Arkansas (BHEA). This has allowed for reduced program costs for C&I Solutions, which is the largest program in each of the three gas utility portfolios.

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- AOG coordinates with OG&E and SWEPCO on joint custom projects that save both fuels.
- The Evaluators provide EM&V to AOG, SUA, and BHEA. This allows for sharing of fixed EM&V costs (such as development of data collection instruments) and more seamless comparison of program offerings and lessons learned across the natural gas energy efficiency portfolio. This has reduced the overall cost of EM&V across all three natural gas utilities.

Examples of coordination with non-utility partners included:

- AOG's programs are marketed through industry partners including professional organizations, trade groups, universities, and homeowners' associations.
- AOG's programs are prominently featured on the EEA website.

3.2.6 Factor 6: Cost-Effectiveness of Energy Efficiency

To assess this factor, the Evaluators reviewed whether:

- Programs met net savings goals;
- Whether the NTG ratios were in line with industry norms; and
- Whether programs passed cost-effectiveness (TRC) testing.

Table 3-9: Assessment of Cost-Effectiveness

Program	*NTGR*	*NTGR Within Industry Norms*	*Met Net Savings Goal*	*Program TRC*
Equipment Rebate	80.7%	Yes	Yes	1.81
C&I Solutions	96.8%	Yes	Yes	2.09
AOG Weatherization	97.7%	Yes	Yes	2.05
Low Income Program	100.0%	Yes	Yes	2.09

3.2.7 Factor 7: Adequacy of EM&V Procedures

The Evaluators conducted a review of EM&V procedures by program as implemented by several parties:

- QA/QC and EM&V procedures by AOG program staff;
- QA/QC and EM&V procedures by third-party implementation staff (where applicable); and
- QA/QC and EM&V procedures by the Evaluators.

The EM&V of the AOG programs incorporated industry best practices and was conducted in an iterative process that incorporated feedback from AOG and implementation contractors as well

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as the IEM. The Evaluators developed EM&V plans that corresponded to protocols set out in the AR TRM V9.2.

AOG provided the Evaluators with full documentation of their QA/QC post inspection results.

Finally, the Evaluators reviewed the quality of program tracking data in order to assess whether the data allowed for complete evaluation. Further, the Evaluators reviewed the extent to which individual savings calculations were performed using facility-specific inputs into the AR TRM V9.2 algorithms versus the use of simplifying assumptions[7]. The results of the review are summarized in Table 3-10.

Table 3-10: Assessment of Data & QA/QC Procedures by Program

Program	***Tracking Contains Necessary Fields***	***Savings Calculations Performed and Reported***	***Savings Calculations Based on Facility Data***	***QA/QC Inspections by Program Staff***
Equipment Rebate	■	■	■	■
AOG Weatherization	■	■	■	■
C&I Solutions	■	■	■	■
Low Income Program	■	■	■	■

3.3 Cost-Effectiveness Results

Table 3-11 summarizes the cost-effectiveness results by program.

Table 3-11: PY2024 Cost-Effectiveness Summary

Program	TRC	UCT	PCT	RIM	TRC Net Benefits
Equipment Rebate	1.81	1.32	2.36	0.45	$436,285
C&I Solutions	2.09	2.59	3.71	0.70	$670,182
AOGWP	2.05	1.71	3.51	0.47	$1,148,512
LIP	2.09	1.53	2.98	0.46	$274,832
EEA	0.00	0.00	0.00	0.00	$0
Regulatory	0.00	0.00	0.00	0.00	-$69,655
Total	**1.96**	1.73	3.17	0.51	**$2,460,156**

3.4 NEBs Summary

NEBs claimed by program are as follows:

- **Equipment Rebate:** avoided and deferred replacement costs, and kWh;
- **C&I Solutions:** kWh, kW, and water;

[7] Examples of this could include assuming average facility square footage for commercial water heating and using that as an input to the savings calculation, as opposed to collecting facility-specific square footage.

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- **AOGWP:** avoided replacement costs, kWh, kW, and water; and
- **LIP:** avoided replacement costs, kWh, kW, and water.

Table 3-12: Residential NEBs

Measure	Water	kWh / kW	ARC / DRC	AR TRM V9.2 Section
Furnace (Early Retirement only)			✓	2.1.3
Duct Sealing		✓		2.1.11
Smart Thermostat		✓		2.1.12
Attic insulation		✓		2.2.2
Air Infiltration		✓		2.2.9
Water Heater (Gas Tankless)			✓	2.3.1
Faucet Aerator	✓			2.3.4
Low-Flow Showerhead	✓			2.3.5
LED Lamp		✓	✓	2.5.1

Table 3-13: Non-residential NEBs

Measure	Water	kWh / kW	ARC / DRC	AR TRM V9.1 Section
Weather Stripping		✓		3.2.11
Water Heater (Gas Tankless)			✓	3.3.1
Steam Leak Repair	✓			3.1.15
Steam Trap Replacement	✓			3.1.15

Although slightly lower than PY2023, NEBs were a significant contributor to TRC benefits in PY2024, accounting for nearly 17% of total TRC benefits across the portfolio. Figure 3-3 summarizes TRC benefits by benefit source by program, and are shown in $1,000s.

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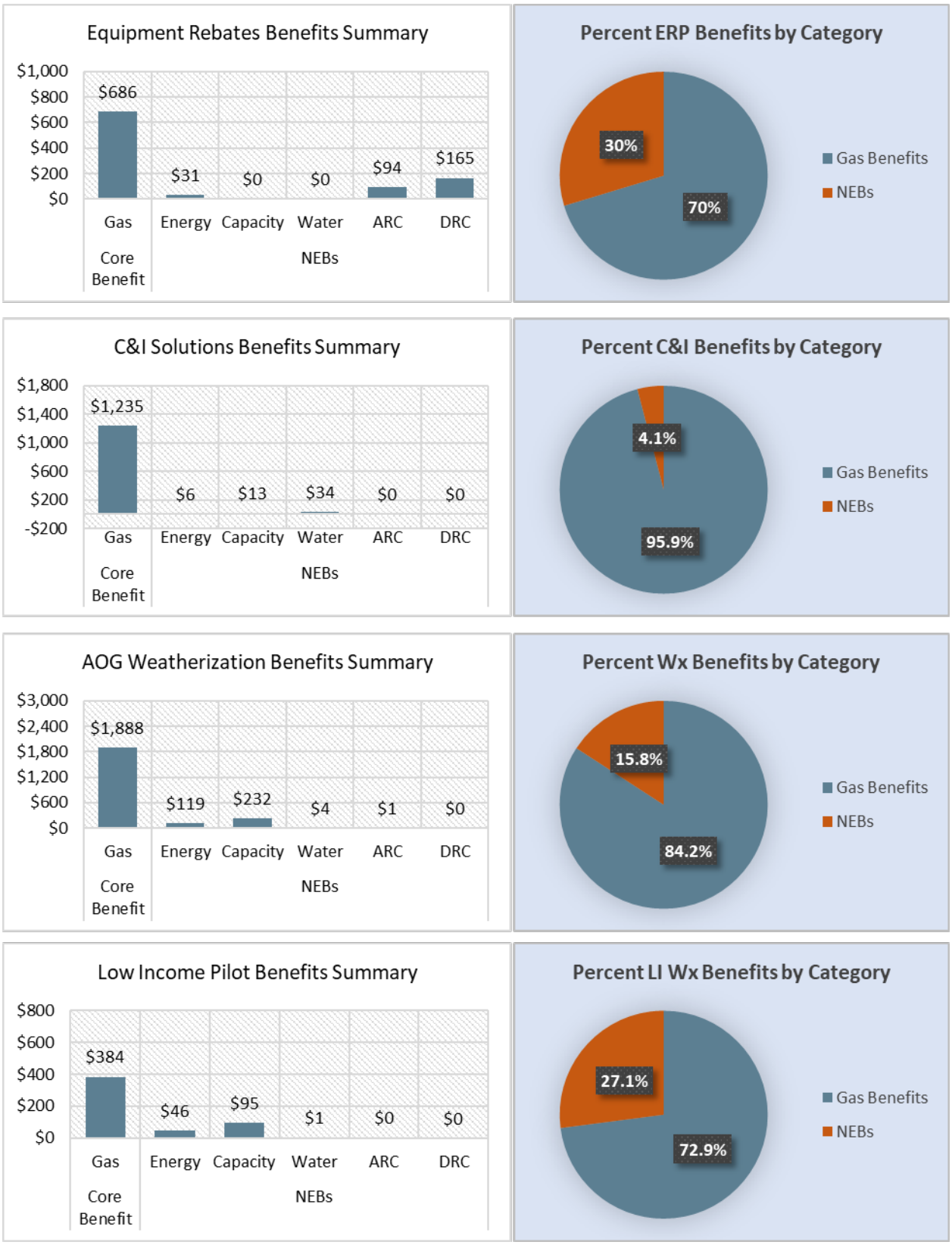

Figure 3-3: Benefit Summary by Program

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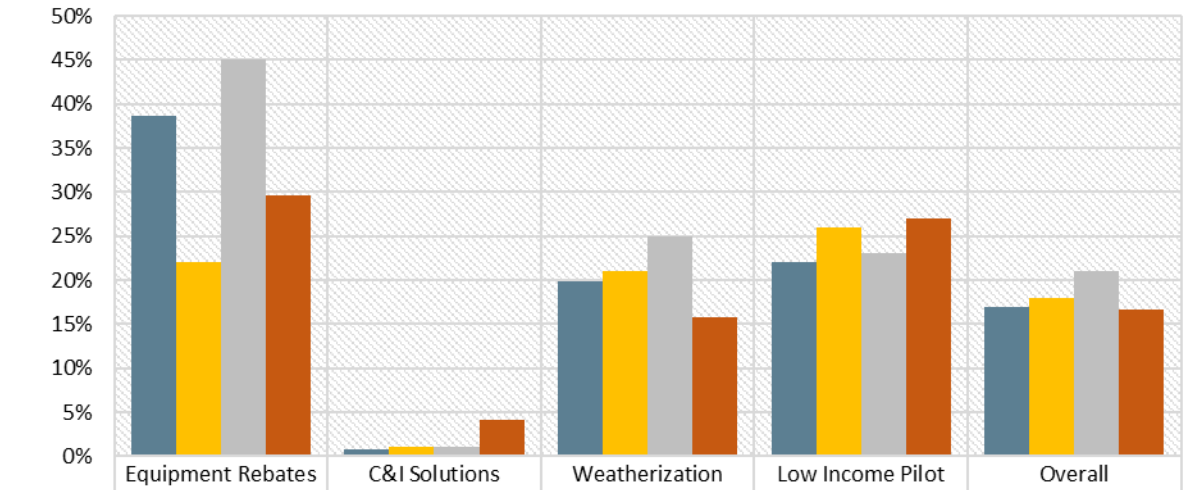

	Equipment Rebates	C&I Solutions	Weatherization	Low Income Pilot	Overall
PY2021	39%	1%	20%	22%	17%
PY2022	22%	1%	21%	26%	18%
PY2023	45%	1%	25%	23%	21%
PY2024	30%	4%	16%	27%	17%

Figure 3-4: Percent of Total TRC Benefits Derived from NEBs

The change in benefit share from NEBs from PY2023 to PY2024 is attributable to the following factors:

- **Equipment Rebate:** Slightly lower percent of savings from residential furnace early replacements resulted in a higher percent of TRC benefits coming from NEBs (deferred replacement cost).
- **C&I Solutions:** The extent to which this program generates NEBs is a function of the types of custom projects that occur in a given year; when there are a significant number of steam leak repair or condensate return projects, the program can show NEBs from water savings. There were 3 custom projects with water savings in PY2024, Additionally, there were electric NEBs from weather stripping (kWh, kW).
- **Weatherization:** NEBs from this program depend on AOG incentivizing homes served by Arkansas Valley Electric Co-op. When the participation mix has a larger share of non-IOU homes, the program claims a higher level of kWh savings.
- **Low Income Program:** The Low Income Program offers a similar measure package as the AOG Weatherization Program. As with that program, the percent of benefits from NEBs will be related to the extent of project co-funding with OG&E.

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4 Equipment Rebate

The Equipment Rebate program provides incentives to residential and non-residential customers for high-efficiency space heating and water heating equipment. This program is an aggregated program combining the former Heating Equipment Rebate and Water Heating & Conservation Programs. Eligible measures for this program include:

- $400 for gas furnaces with 90%-94.9% AFUE;
- $800 for gas furnaces with 95% or higher AFUE;
- $100 for eligible smart thermostats;
- $700 for tankless water heaters with an EF of 0.90 or greater;
- $50 Trade Ally Incentive for all program-qualified furnaces and water heaters.

4.1 Program Overview

The Heating Equipment Rebate and Water Heating & Conservation programs began in 2010. The combined Equipment Rebate Program is designed to incentivize the purchase of high-efficiency space heating and water heating equipment. Presently, the program incentivizes high-efficiency furnaces, hydronic heating systems, and high-efficiency water heaters.

The history of program performance and expenditures is presented in Table 4-1.

Table 4-1: Equipment Rebate Historical Performance against Goals

Program Year	# Participants			Budget			Net Therms		
	Actual	Goal	% Met	Spent	Allocated	% Spent	Ex Post	Goal	% Met
2010	1,250	1,445	87%	$96,259	$164,870	58%	26,411	44,020	60%
2011	1,663	1,680	99%	$143,325	$229,835	62%	45,098	44,904	100%
2012	2,380	1,632	146%	$284,486	$285,555	100%	69,843	41,838	167%
2013	1,740	1,536	113%	$336,073	$279,523	120%	74,493	25,446	293%
2014	1,563	1,536	102%	$384,142	$232,679	165%	45,182	25,446	178%
2015	390	216	181%	$348,455	$255,763	136%	42,181	12,096	349%
2016	492	216	228%	$421,884	$255,763	165%	102,817	12,096	850%
2017	594	829	72%	$385,881	$480,524	80%	52,038	92,438	56%
2018	842	829	102%	$462,805	$462,805	100%	55,983	92,438	61%
2019	796	829	96%	$391,456	$481,948	81%	49,446	92,438	53%
2020	824	969	85%	$407,599	$460,479	89%	59,606	66,482	90%
2021	679	1,004	68%	$316,439	$466,605	68%	43,551	70,304	62%
2022	565	1,038	54%	$302,694	$478,809	63%	52,966	74,081	71%
2023	528	1,038	51%	$318,028	$443,809	72%	50,336	74,081	68%
2024	711	482	148%	$518,228	$525,735	99%	71,957	31,928	225%

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4.2 Participation Summary

Figure 4-1 summarizes total rebates and net savings installed by month.

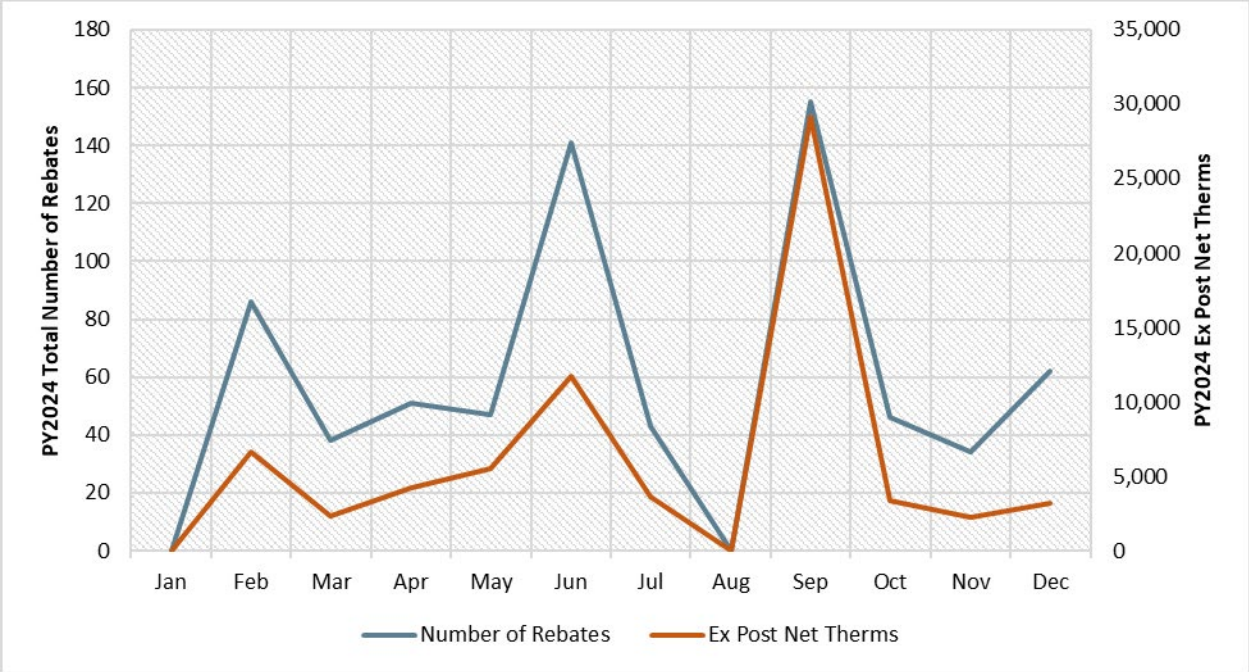

Figure 4-1: Participation & Savings by Month

4.2.1 Residential Participation - Furnaces

The residential component had a total of 193 residential rebates in 165 distinct premises. All units were 95% AFUE or higher. Seventy-nine percent of PY2024 participants were in retrofit applications, with 21% being new construction applications.

All new construction applications were paid to home builders.

4.2.2 Commercial Participation - Furnaces

The commercial component had a total of 4 rebates at three premises.

4.2.3 Residential Participation – Water Heaters

The residential component had a total of 301 residential rebates in 292 distinct premises. Thirty-eight percent of residential retrofit projects were submitted by two separate housing authority entities that installed the water heaters in municipally-owned homes where the gas bill is paid by the occupants.

4.2.4 Commercial Participation – Water Heaters

The commercial component had a total of 24 rebates at ten distinct premises. All 24 units were tankless. Figure 4-2 summarizes non-residential participation (in percent of total rebates) by

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facility type. Eight sit-down restaurants accounted for 75% of commercial water heater savings, while the remaining 16 projects (67% of total participation) accounted for 25% of net savings.

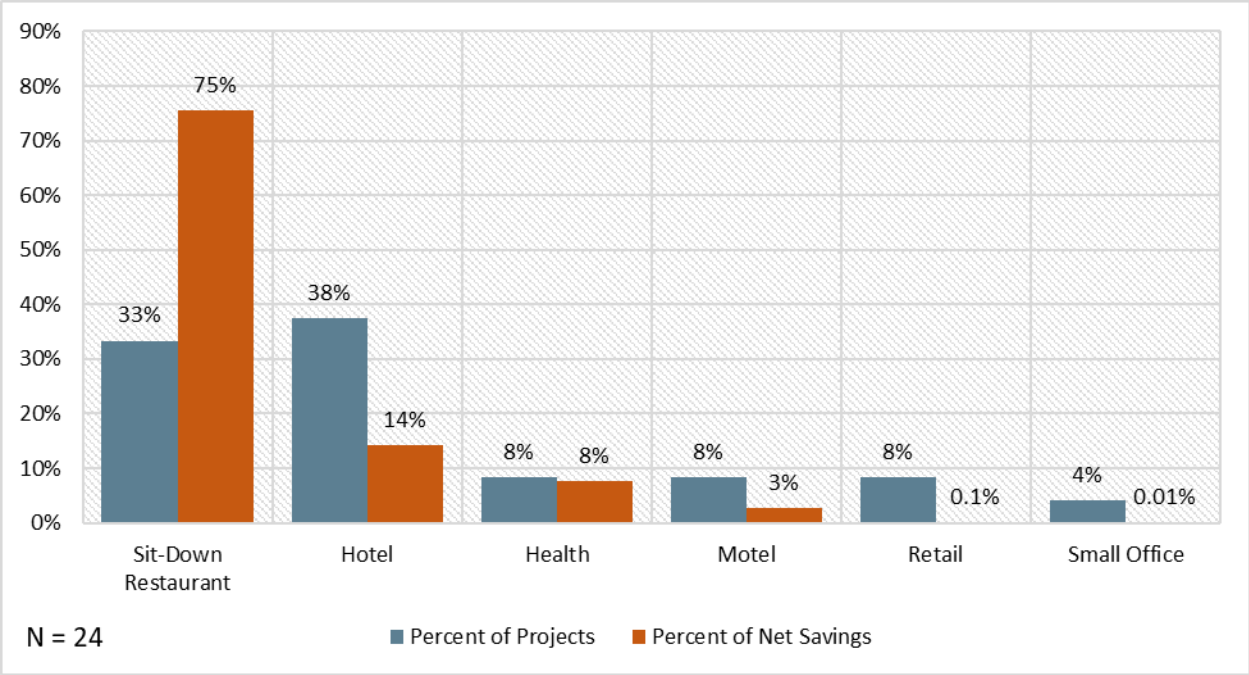

Figure 4-2: Water Heating Equipment Rebate C&I Participation by Facility Type

4.2.5 Smart Thermostats

The Equipment Rebate Program began rebating smart thermostats in PY2017. In PY2024, 165 rebates were issued for 150 distinct residential customers, with some customers receiving more than one thermostat. This is a slight (-3%) decrease compared to PY2023, where there were 170 rebates issued for 147 premises. The program provides a $100 rebate (capped at purchase price if lower than $100) for Energy-Star rated models.

Figure 4-3 summarizes participation by manufacturer. PY2024 saw a continuing trend towards lower cost Ecobee models and a decline in Nest participation.

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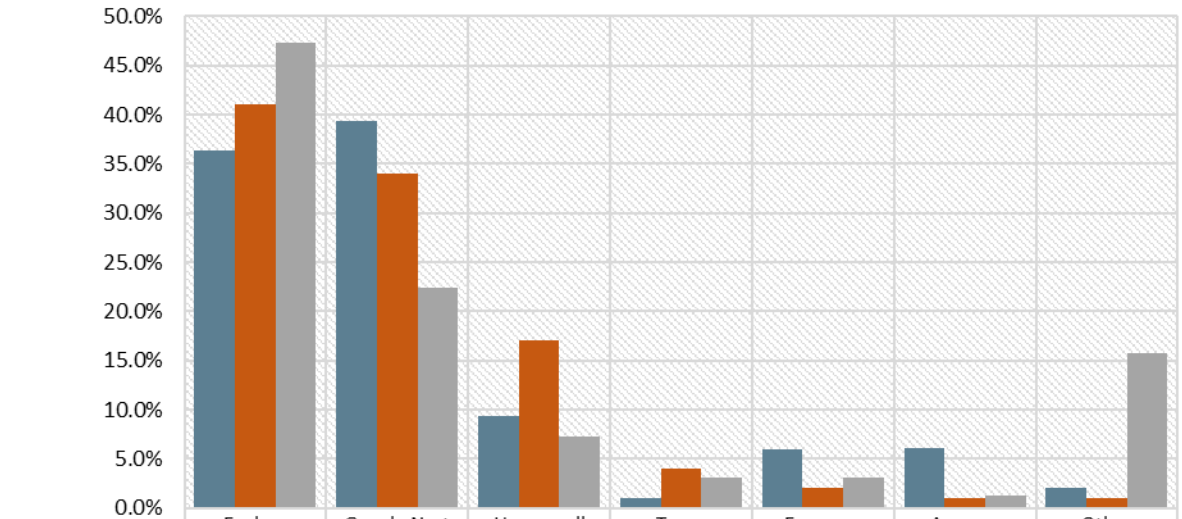

	Ecobee	Google Nest	Honeywell	Trane	Emerson	Amazon	Other
PY2022 (N = 190)	36.4%	39.3%	9.3%	1.0%	5.9%	6.1%	2.0%
PY2023 (N = 170)	41.0%	34.0%	17.0%	4.0%	2.0%	1.0%	1.0%
PY2024 (N = 155)	47.3%	22.4%	7.3%	3.0%	3.0%	1.2%	15.8%

Figure 4-3: Residential Smart Thermostat Participation by Brand – PY2022-PY2024

Nearly sixteen percent of thermostats were installed by participants that also installed a high efficiency furnace (a slight increase from PY2023, where 14% were paired with a high efficiency furnace).

Additionally, there were a total of sixteen smart thermostats that were installed in four distinct commercial premises in PY2024.

4.3 Equipment Rebate Process Evaluation

The Evaluators conducted a formal process evaluation of the Heating Equipment Rebate and Water Heating & Conservation Program in PY2020 and found that the program was successful in meeting participation, savings, and satisfaction goals. Table 4-2 and

Table 4-3 summarize the Evaluators' review of the Equipment Rebate Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 4-2: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and Innovative Components	No. The program is designed in a manner consistent with similar programs elsewhere and applies deemed savings values from the TRM.
No Previous Process Evaluation	No. The program received a comprehensive process evaluation in PY2020.
New Vendor or Contractor	No.

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Table 4-3: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. Program met 68% of savings goal in PY2023.
Are the educational or informational goals not meeting program goals?	No. The programs have had successful consumer and contractor outreach & education.
Are the participation rates lower or slower than expected?	No. Program met 68% of savings goal in PY2023.
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 that operational and management structure to be up to speed and efficient in administering the program.
Is the program's cost-effectiveness less than expected?	No. Program has met cost-effectiveness expectations.
Do participants report problems with the programs or low rates of satisfaction?	No. Participant surveys found exceedingly high satisfaction levels.

The program did not meet savings goal in PY2023. The Evaluators conducted a limited process evaluation in PY2024. A full process evaluation is planned for PY2025.

4.3.1 Data Collection Activities

Table 4-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, and sample sizes for data collection.

Table 4-4: AOG Equipment Rebate Data Collection Summary

Target	Component	Activity	n	Precision	Role
AOG Program Staff	Energy Efficiency Program Manager; Senior Energy Efficiency Consultant	Interview	2	NA	Overall administration of AOG EE programs. The Energy Efficiency Program Manager manages financial, contractual, and regulatory matters across the AOG portfolio. The Senior Energy Efficiency Consultant conducts day-to-day management and oversight of implementation and marketing efforts.
CLEAResult Staff	Program Manager	Interview	1	NA	Handles day-to-day operations for rebate processing, including application review, billing, and logistics

4.3.2 Process Results & Findings

This section will present the results and key findings from the data collection activities. These findings are based upon interviews with utility staff.

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4.3.2.1 Program Staff and CLEAResult Interview Summary

The equipment rebate program allows customers to lower their energy bills by purchasing more efficient equipment. While no new measures were added in 2024, incentive amounts were increased for furnaces. According to staff, this was the first increase since 2012, making the adjustments significant. The revised incentives now follow a tiered structure based on efficiency levels. Staff also reported a positive customer response, leading to increased program engagement.

4.4 Protocol A: Tracking Data Review

Table 123 summarizes the Protocol A tracking data review for the Equipment Rebate Program. Overall, the program tracking data contained the required information to perform an impact evaluation.

Table 4-5 Equipment Rebate Program Protocol A Summary

Category	Field	Status	Description of Issue(s)
Participating Customer Information	Unique customer identifier, such as account number	✓	
	Customer contact information – name, mailing address, telephone number	✓	
	Date/s of major customer milestones such as rebate application date, approval date, rebate processing date, etc.	✓	
Measure-Specific Information	Measure Group (Equipment Type)	✓	
	Equipment Fuel/Energy Source	-	Heating type is not explicitly provided, but it is assumed all equipment is gas fuel based.
	Equipment Quantity	✓	
	Efficiency Level	✓	
	Estimated Savings	✓	
	Estimated incremental measure cost	×	
	Equipment Useful Life	×	
	Measure Name – Text Description	✓	
	Measure Name – Numerical Code	N/A	
	Serial Number	✓	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	✓	
	Other inputs necessary for the use and compliance with the TRM	✓	
Vendor-Specific Information	Name and Contact Information for Contractor	✓	
	Contractor Type	N/A	
	Date of Installation	✓	
	Cost of the installed equipment	✓	
	Efficiency level of the installed equipment	✓	
Program Tracking Information	Date of the initial program contact/rebate information	✓	
	Date of rebate/incentive paid	✓	
	Incentive amount paid to-date	✓	

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	Incentive amounts remaining	✓	
	Application Status (i.e., number of applications approved, pending, or denied)	✓	
	Reason and reason code for application denial	✓	Only approved and paid-out rebates are provided in tracking data. However, the Evaluators acknowledge that this information is readily available upon request.
Program Costs	Overall program budgets	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	
Marketing and Outreach Activities	Advertising and marketing spending levels	-	Not itemized from total marketing costs in data provided to the Evaluators.
	Media schedules	N/A	
	Summary of number of community events/outreach activities	✓	
	Other media activities – estimated impressions via mailings, television/radio; print ads.	✓	

4.5 Equipment Rebate Impact Evaluation

The evaluation effort of the Equipment Rebate Program included the following:

- *Desk Review of Residential Calculations.* The Evaluators utilized AR TRM V9.2 values in assessing savings from residential furnaces.
- *Desk Review of Commercial Calculations*. The Evaluators applied AR TRM V9.2 deemed savings parameters in assessing savings of the commercial component.
- *Verification of equipment efficiencies through AHRI Database*. The Evaluators reviewed the rebated equipment in the program tracking data and gathered rated efficiencies to compare with efficiencies in the program tracking data.
- *Calculation of Avoided Replacement Costs.* The Evaluators used the calculation tool developed by the IEM to assess avoided replacement cost for residential and commercial water heaters.
- *Calculation of Early Retirement Deferred Replacement Costs.* The Evaluators used the calculation tool by IEM to assess deferred replacement costs for early retirement furnaces.

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- *Free-ridership Rates.* For PY2024, new free-ridership rates were developed and applied to residential furnaces, smart thermostats, and water heaters, whereas commercial furnaces and water heaters used the free-ridership rates developed in the PY2021 evaluation.

4.5.1 Summary of Non-Energy Benefits

Table 4-6 summarizes the non-energy benefits by measure that will be credited to the Equipment Rebate Program.

Table 4-6: Equipment Rebate Non-Energy Benefits

Measure	Electric Savings	Water Savings	Propane Savings	Deferred Replacement Cost	Avoided Replacement Cost
Residential Furnace Early Replacement				✓	
Residential Tankless WH					✓
Commercial Tankless WH					✓
Smart Thermostat	✓				

4.5.2 Residential Impact Evaluation

4.5.2.1 Residential Free-ridership

The Evaluators applied the net-to-gross ratios developed from PY2023 participant surveys for residential equipment rebates. The methodology used in that evaluation was based on a survey battery:

- Were you planning to complete the same [MEASURE] project in 2023 before learning about the program?
  - **IF PLANNING = "YES":** Would your budget for the planned project have accommodated the project's full cost if you had not completed the project through the program?
  - If the incentive was not available from the program, would you have completed the same project or would you have done something different?
  - **IF RESPONSE = "SOMETHING DIFFERENT":** Would it have been the same level of energy efficiency, higher energy efficiency, or lower energy efficiency?
- Would you have completed the same project or one that made your home even more energy efficient within one year if the program was not available?

A respondent is a free rider if they indicate all the following:

1. They had plans to complete the same measure in 2023;

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2. Had a budget that could accommodate the full project cost without the program;
3. Would have done the same project or a more efficient version of the project in the absence of the program; and
4. Would have completed the same or more efficient version of the project within a year.

Figure 4-4 summarizes the scoring mechanism for free-ridership for the Equipment Rebate and the Weatherization Programs.

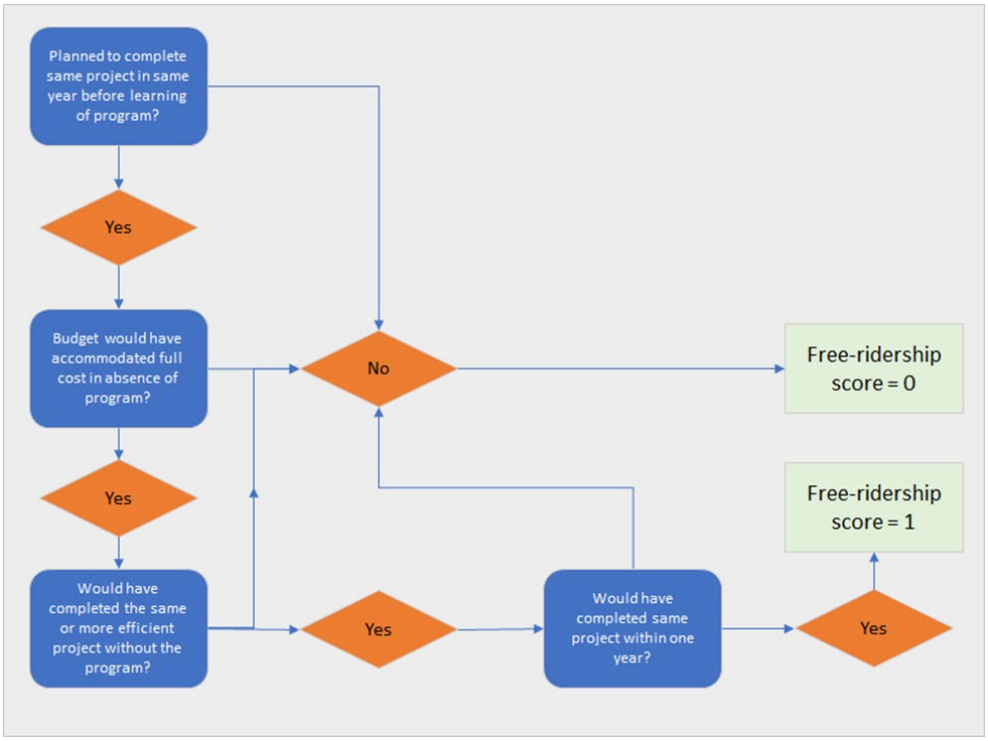

Figure 4-4: Residential Rebates FR Diagram

The resulting NTGRs were as follows:

- Residential Furnace Retrofit: 79.9%
- Residential Water Heating Retrofit: 73.2%
- Smart Thermostat: 61.2%

For new construction applications, we apply a similar scoring mechanism as-completed in the multi-utility survey effort for owner-built custom homes. For homes from production builders, we apply the PY2020 values developed as part of the new construction builder survey effort completed for CenterPoint Energy Arkansas. The values are:

- New Construction: Builder production homes: 91.0%

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4.5.2.2 Energy Savings Calculations - Heating

Savings for residential furnaces are calculated using protocols from AR TRM V9.2 Section 2.1.3. For sample calculations, see Appendix C.

4.5.2.3 Impact of Early Replacement

As per the AR TRM V9.2, and the procedures for calculating the impact of early replacement for residential furnaces, early retirement AFUE is calculated by a degradation factor of 80% AFUE unit. This is calculated as:[8]

$$AFUE_{base_early} = (Base\ AFUE) \times (1 - M)^{age}$$

$Base\ AFUE$ = efficiency of the existing equipment when new, 80% AFUE.
M [9] = maintenance factor, 0.01.
age = the age of the existing equipment, in years.

Following this, lifetime savings are determined based on the Remaining Useful Life (RUL) of the old equipment. The AR TRM V9.2 updated the RUL table, which has been reflected in Table 4-7.[10]

Table 4-7: Residential Furnace RUL

Unit Age	RUL	Unit Age	RUL
5	14.7	**19**	3.6
6	13.7	**20**	3.2
7	12.7	**21**	2.9
8	11.8	**22**	2.6
9	10.9	**23**	2.4
10	10.0	**24**	2.1
11	9.1	**25+**	0.0
12	8.3		
13	7.5		
14	6.8		
15	6.2		
16	5.5		
17	4.5		
18	4.0		

[8] Arkansas TRM V9.2 Volume 1, Pg. 44
[9] Maintenance factor of 0.01 is the average maintenance factor for gas furnaces taken from the October 2010 National Renewable Energy publication "Building America House Simulation Protocols", table 30.
[10] AR TRM V9.2, Volume 1, Pg. 45

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The Evaluators assessed whether a unit qualified for early retirement, and the Evaluators examined the following survey questions:

7. Was the replaced [BASELINE]….(READ LIST)?

1. Fully functional and not in need of repair?
2. Functional, but needed minor repairs?
3. Functional, but needed major repairs?
4. Not functional?

98. DON'T KNOW
99. REFUSED

8. How old was the [BASELINE] at the time you replaced it?

1. ___ # Years

98. DON'T KNOW
99. REFUSED

9. How long do you think your [BASELINE] would have lasted if you had not replaced it?

1. ___ # Years

98. DON'T KNOW

Figure 4-5 summarizes the scoring for early retirement based on these three questions.

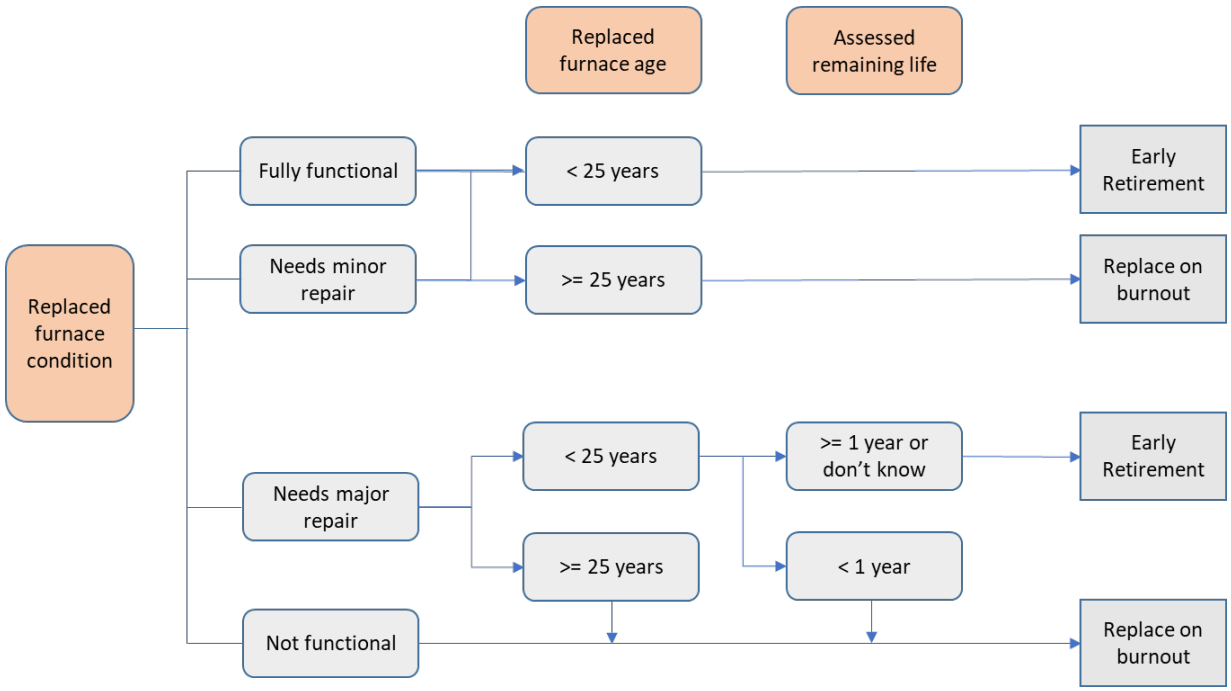

Figure 4-5: Residential Furnace Early Retirement Flowchart

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In total, the Evaluators found that 57.6% of AOG furnace retrofits were early retirement. Based on survey results from the PY2023 evaluation, the Evaluators applied an average age of 16.84 years for early retirement furnaces.

Based on the degradation equation from AR TRM V9.2, this leads to an Early Retirement AFUE of:

$$AFUE_{base_{early}} = (0.80) \times (1 - 0.01)^{16.84} = 0.6754$$

Further, based on the values in Table 4-7, the RUL of the early replacement units is five years. For years 6-20 of the unit EUL, the normal replacement baseline applies. The savings for each residential retrofit unit were calculated using both the normal and early replacement baselines, and final savings reflect a weighted average of these two values based on participant survey data findings. These values were then applied on a weighted basis to the residential retrofit units using weights of 57.63% early replacement and 42.37% normal replacement. The resulting weighted average baseline is:

$$AFUE_{base_{early-weighted}} = 57.63\% \times 0.6754 + 42.37\% \times 0.8 = 0.7282$$

4.5.2.4 Energy Savings Calculations – Water Heating

Savings from tankless water heaters were calculated using protocols from Arkansas TRM V9.2 Vol. 1 Section 2.3.1. For sample calculations see Appendix C.

4.5.2.5 Energy Savings Calculations – Smart Thermostats

Gross savings were calculated for smart thermostats using protocols from AR TRM V9.2 section 2.1.12. For example calculations, see Appendix C.

AOG tracked the baseline thermostat on their program application. The Evaluators applied the appropriate baseline for each line item. For new Construction applications, the Evaluators applied the “Default” weighted average baseline from the AR TRM V9.2.

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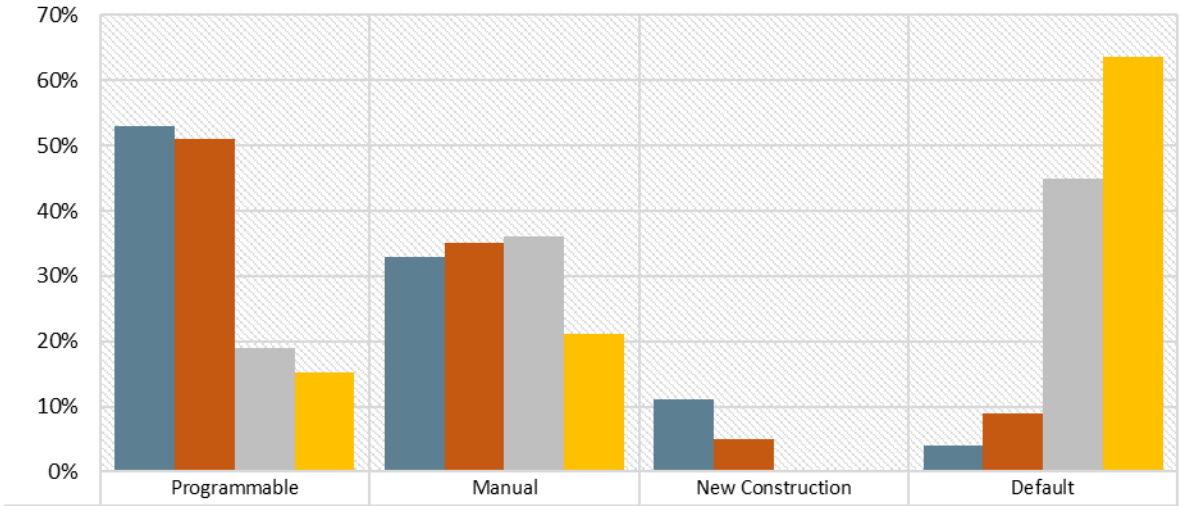

	Programmable	Manual	New Construction	Default
PY2021	53%	33%	11%	4%
PY2022	51%	35%	5%	9%
PY2023	19%	36%	0%	45%
PY2024	15%	21%	0%	64%

Figure 4-6: Baseline Thermostat for Smart Thermostat Rebates

Compared to prior program years, an increased number of units had no preexisting thermostat type listed (going from 45% in PY2023 to 64% in PY2024).

To evaluate attributable kWh savings for smart thermostats, the tracking data from the AOG program was compared to OG&E tracking data in order to identify premises that received rebates from both utilities. The Evaluators did not find any instances of joint-rebating and assigned all kWh from smart thermostats to AOG.

4.5.3 Commercial Impact Evaluation

4.5.3.1 Commercial Free-ridership

The Evaluators applied the PY2023 survey net-to-gross findings for prescriptive commercial furnaces and water heaters in the PY2024 evaluation. The PY2023 methodology is summarized in Figure 4-7.

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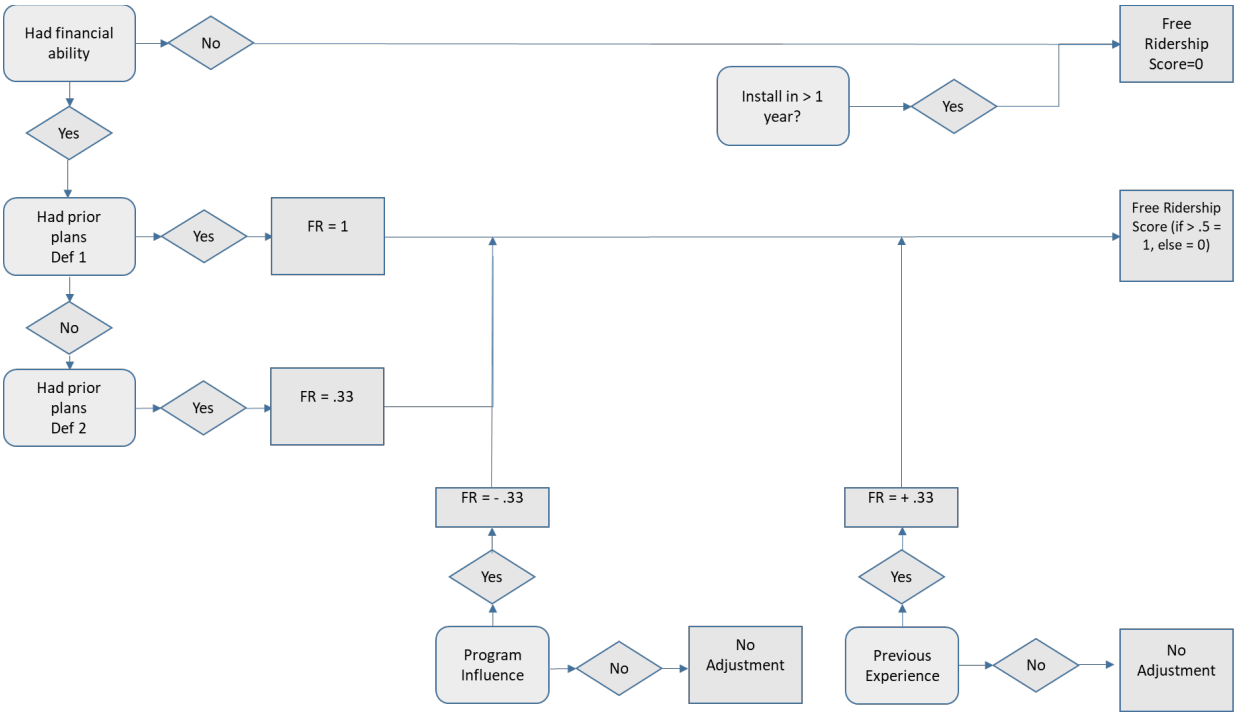

Figure 4-7: Nonresidential Free-ridership Scoring Flow Chart

Several criteria determine which portion of a participant's savings should be attributed to free-ridership. The first criterion comes from the response to:

> "Would you have been financially able to install the equipment or measures without the financial incentive from the Program?"

If a customer answered "No" a free-ridership score of 0 was assigned to the project. That is, if a customer required financial assistance from the program to undertake a project, that customer was not deemed a free-rider.

The second question pertains to project timing. Respondents are asked "Did you purchase and install the [MEASURE] earlier than you otherwise would have without the program?". If they indicate that they installed the measure more than one year earlier than they otherwise would have, they are not a free-rider.

For decision makers who indicated they could undertake energy efficiency projects without financial assistance from the program, three additional factors determined what percentage of savings is attributable to free-ridership. The three factors are:

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

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For each of these factors, rules were applied to develop binary variables indicating whether a participant showed free-ridership behavior. Responses to the decision-maker questionnaire helped to develop the rules for the free-ridership indicator variables

The first required step was to determine if a participant stated that his or her intention was to install an energy efficiency measure without the help of the program incentive. The survey respondents' answers to a combination of questions, then a set of rules determined whether a participant's behavior indicated likely free-ridership. Two binary variables were constructed to account for customer plans and intentions: one, based on a more restrictive set of criteria that may describe a high likelihood of free-ridership, and a second, based on a less restrictive set of criteria that may describe a relatively lower likelihood of free-ridership.

The first, more restrictive criteria indicating customer plans and intentions that likely signify free-ridership are as follows:

- The respondent answered "yes" to the following two questions: "Did you have plans to install the measure before participating in the program?" and "Would you have gone ahead with this planned installation of the measure even if you had not participated in the Program?"
- The respondent answered, "definitely would have installed" to the following question: "If the financial incentive from the Program had not been available, how likely is it that you would have installed [Equipment/Measure] anyway?"

The second, less restrictive criteria (Definition 2) indicating customer plans and intentions that likely signify free-ridership are as follows:

- The respondent answered "yes" to the following two questions: "Did you have plans to install the measure before participating in the program?" and "Would you have gone ahead with this planned installation of the measure even if you had not participated in the Program?"
- Either the respondent answered, "definitely would have installed" or "probably would have installed" to the following question: "How likely would you have been to have completed the [Equipment/Measure] project even if you had not participated in the program?"

The second required factor was determining if a customer reported that a recommendation from a program representative or experience with the program was influential in the decision to install a piece of equipment or measure. This criterion indicates that the program's influence may lower the likelihood of free-ridership when any of the following conditions are true:

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- The respondent answered "very important" to the following question: "How important was previous experience with the Program in making your decision to install [Equipment/Measure]?
- The respondent answered, "definitely not would have" or "probably not would have" to the following question: "If the Program representative had not recommended implementing the [Equipment/Measure], how likely is it that you would have implemented it anyway?"

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

- The respondent answered "yes" to the following question: "Thinking about all of the projects you completed in the last three years, did you implement any energy efficient equipment or projects similar to the [Equipment/Measure] that you implemented at your facility located at [LOCATION] as part of any of those projects?

4.5.3.2 Energy Savings Calculations – Commercial Furnaces

Savings for commercial furnaces are calculated using protocols from AR TRM V9.2 Section 3.1.9. For sample calculations, see Appendix C.

4.5.3.3 Energy Savings Calculations – Water Heating

Savings for commercial water heaters are calculated using protocols from AR TRM V9.2 Section 3.3.1. For example calculations, see Appendix C.

4.5.3.4 Commercial Desk Review Findings

The Evaluators conducted desk reviews for all commercial water heating projects. There were a few savings adjustments made for at least 5 of the projects that involved adjusting the facility type to better align with the AR TRM V9.2 and the actual facility type. Additionally, the Evaluators performed online research to determine either the applicable facility square footage or the number of units by facility type to calculate water usage per the AR TRM V9.2.

The Evaluators note that the acquisition cost from commercial water heating decreased slightly in PY2024 compared to prior program years, due to a mix of participation that included more high-use facility types (sit-down restaurants, motels, hotel, hospitality, medical, etc.).

- PY2019: $11.89/net therm

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- PY2020: $2.89
- PY2021: $7.86
- PY2022: $0.63
- PY2023: $0.94
- PY2024: $0.59

4.5.4 Ex Post Savings

Table 4-8 presents the gross savings results of the evaluation of the PY2024 Equipment Rebate Program. Total gross savings summarizes the savings calculations performed by TRM V9.2 Protocols.

Table 4-8: Equipment Rebate Ex Post Gross Therms Savings

Measure Category	Ex Ante Therms Savings	Ex Post Therms Savings	Gross Realization Rate	EUL	Lifetime Therms Savings
Residential Furnace	17,442	27,878	160%	14	401,042
Residential Water Heater	13,928	16,630	119%	20	332,608
Smart Thermostat	10,668	10,668	100%	11	117,347
Commercial Furnace	1,038	1,039	100%	20	20,780
Commercial Water Heater	27,732	32,128	116%	20	642,554
Commercial Smart Thermostat	856	856	100%	11	9,421
Total Gross Savings	**71,665**	**89,200**	**125%**	**17.1**	**1,523,752**
Sums may differ due to rounding.					

The resulting net savings are presented in Table 4-9.

Table 4-9: Equipment Rebate Net Savings Summary

Project Category	NTGR		Net Annual Savings		Net Realization Rate	Net Lifetime Therms Savings
	Ex Ante	Ex Post	Ex Ante	Ex Post		
Residential Furnaces	81%	78%	14,128	21,851	155%	314,330
Residential Tankless WH	95%	83%	13,232	13,722	104%	274,444
Smart Thermostat	68%	61%	7,254	6,528	90%	71,810
C&I Furnaces	83%	84%	862	867	101%	17,343
C&I Water Heaters	89%	89%	24,681	28,465	115%	569,303
Commercial Smart Thermostat	68%	61%	582	524	90%	5,765
Total	**81%**	**81%**	**60,739**	**71,957**	**118%**	**1,252,994**
Sums may differ due to rounding.						

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4.5.5 Non-Energy Benefits Summary

4.5.5.1 Residential Furnace Early Replacement

Early replacement of residential furnaces makes them eligible for the Deferred Replacement Cost Non-Energy Benefit, which assesses the economic value of the deferred replacement in perpetuity. This NEB was calculated using the IEM calculation tool[11]. The input assumptions were as follows:

- Full installed cost of efficient furnace: $2,548
- Full installed cost of baseline furnace: $2,011
- Nominal Discount Rate: 5.12%
- Inflation Rate: 1.90%
- Real Discount Rate: 3.16%

The resulting gross deferred replacement cost is $1,385.63 per unit. The calculator for this is provided in Appendix B of this report. For individual line items in the AOG program, this value was scaled by the appropriate NTG.

There were 152 residential furnaces eligible for DRCs in PY2024, and the resulting net DRC value is $164,726.

4.5.5.2 Residential Tankless Water Heaters.

Residential tankless water heaters have an EUL of 20 years. The baseline system has an EUL of 11 years. This makes the systems eligible for the Avoided Replacement Cost Non-Energy Benefit. This NEB was calculated using the IEM calculation tool[12]. The input assumptions were as follows:

- Full installed cost of tankless system: $1,219
- Full installed cost of baseline storage tank system: $614
- Nominal Discount Rate: 5.12%
- Inflation Rate: 1.90%
- Real Discount Rate: 3.16%

[11] Protocol L Avoided & Deferred Replacement Cost_08_31_16.xlsx

[12] Protocol L Avoided & Deferred Replacement Cost_08_31_16.xlsx

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The resulting gross avoided replacement cost is $367.46 per unit. The calculator for this is provided in Appendix B of this report. For individual line items in the AOG program, this value was scaled by the appropriate NTGR.

There were 301 residential tankless systems rebated in PY2024, and the resulting ARC value is $91,185.

4.5.5.3 Commercial Tankless Water Heaters.

Commercial tankless water heaters have an EUL of 20 years. The baseline system has an EUL of 15 years. This makes the systems eligible for the Avoided Replacement Cost Non-Energy Benefit. This NEB was calculated using the IEM calculation tool[13]. The input assumptions were as follows:

- Full installed cost of tankless system: $1,219
- Full installed cost of baseline storage tank system: $614
- Nominal Discount Rate: 5.12%
- Inflation Rate: 1.90%
- Real Discount Rate: 3.16%

The resulting gross avoided replacement cost is $148.74 per unit. The calculator for this is provided in Appendix B of this report. The Evaluators used the incremental costs associated with residential tankless systems as commercial costs are aligned with systems that are 200,000 BTU or greater in capacity (and therefore use the Combustion Efficiency baseline rather than the Energy Factor). All tankless systems rebated in commercial facilities in AOG's program were below 200,000 BTU and were units that are certified for residential applications. The values were then scaled by the commercial water heater NTG ratio (89%).

There were 24 commercial tankless systems rebated in PY2024, and the resulting ARC value is $3,163.

4.5.5.4 Smart Thermostats

AOG did not have a savings sharing agreement with any electric utilities for this component of their portfolio. To ensure that savings are claimable by AOG, the Evaluators cross-referenced AOG smart thermostat tracking data with OG&E and SWEPCO tracking data. The Evaluators found that no thermostats were rebated by SWEPCO or OG&E, and thus all electric savings

[13] Ibid.

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from them were credited as NEBs to AOG. The resulting kWh savings are in the table below. Avoided kWh and kW costs cite OG&E's filed avoided costs.

Table 4-10: Smart Thermostat kWh Savings Summary

Savings Type	Annual	Lifetime	Monetized Benefit
Gross	139,856	1,538,412	-
Net	85,583	941,416	$30,551

4.6 Progress on PY2023 Evaluation Recommendations

The table below summarizes the response by AOG and CLEAResult to the PY2023 recommendations.

Table 4-11 Status of Recommendations from PY2023 Evaluation

2023 Recommendation	Status	Comment
Scan CLEAResult tracking updates for new contractors to target for outreach and education. With many trade allies stating that they learned of the program from their clients, this would result in new business names periodically entering program tracking. New contractors identified in this manner could be targeted for a program training that enables them to better-market efficient equipment.	In Progress	NA

4.7 Conclusions

The program exceeded its net therm goal for PY2024.	The program met 225% of its PY2024 net savings goal, a significant increase from 68% in PY2023. The Evaluators noted an increase in rebated equipment compared to PY2023, resulting in a 35% increase in projects completed. The program achieved a TRC score of 1.81.
The program increased furnace rebates and the number of premises installing effacing furnaces increased.	In PY2024, 193 residential premises installed a high efficiency furnace, up from 161 in PY2023. The number of commercial premises installing furnaces remained about the same (4 premises) in PY2024. The results are consistent with the rebates increasing installations of furnaces.

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4.8 Recommendations

Program staff may consider requesting facility-specific assumptions from customers (if available) to calculate DHW load inputs for commercial water heaters.	The Evaluators performed online research to review commercial water heaters installed in various facility types in PY2024. There were a few projects that were categorized as 'Other' for facility type that the Evaluators adjusted to align with the AR TRM 9.2. Further, the Evaluators took time to apply the appropriate input assumptions to calculate water usage for each project.

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5 Commercial & Industrial (C&I) Solutions Program

The C&I Solutions program is directed at developing and incenting custom energy efficiency projects for which deemed values are not applicable or feasible. It is implemented by CLEAResult Consulting (CLEAResult) on behalf of AOG. CLEAResult handles program administration, marketing and outreach, direct install of water conservation and air infiltration measures, and technical review of custom projects. Program participants are provided:

(1) No-cost direct installation of low flow faucet aerators, showerheads, door air infiltration and pre-rinse spray valves (PRSVs), if they have gas comfort heating or water heating;

(2) Prescriptive incentives for boilers and food service equipment;

(3) $0.80 per therm for custom projects; and

(4) $0.90 per therm for small business custom projects.

5.1 C&I Solutions Program Overview

The C&I Solutions Program's historical performance is summarized in Table 5-1.

Table 5-1: C&I Solutions Program Historical Performance Against Goals

Program Year	# Participants			Budget			Net Therms		
	Actual	Goal	% Achieved	Spent	Allocated	% Spent	Ex Post	Goal	% Achieved
2011	78	127	61%	$82,115	$129,478	63%	31,528	29,766	106%
2012	68	162	42%	$132,970	$155,499	86%	80,347	39,890	201%
2013	123	2,009	6%	$271,858	$387,244	70%	267,250	175,049	153%
2014	157	2,009	8%	$369,939	$387,224	96%	341,703	218,811	156%
2015	165	149	111%	$335,369	$387,244	87%	256,546	175,049	147%
2016	186	149	125%	$372,156	$387,244	96%	232,038	175,049	133%
2017	53	146	36%	$424,060	$378,721	112%	193,139	194,361	99%
2018	36	146	25%	$398,136	$398,136	100%	194,054	194,361	100%
2019	26	146	18%	$419,003	$424,435	99%	220,683	194,361	114%
2020	34	82	41%	$395,147	$415,881	95%	162,774	161,132	101%
2021	13	83	16%	$399,356	$428,492	93%	174,241	160,923	108%
2022	12	83	14%	$427,527	$446,885	96%	153,347	160,908	95%
2023	34	83	41%	$481,860	$481,885	100%	154,809	160,908	96%
2024	56	166	38%	$476,457	$468,603	102%	172,533	166,725	103%

The C&I Solutions Program participants fall into one of three categories:

- Direct install;
- Prescriptive;
- Closed custom projects.

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5.2 Direct Install Participation Summary

In PY2024, there were direct install projects completed at 17 unique premises. The participation by facility type and the relative share of program therm savings are summarized in Figure 5-1.

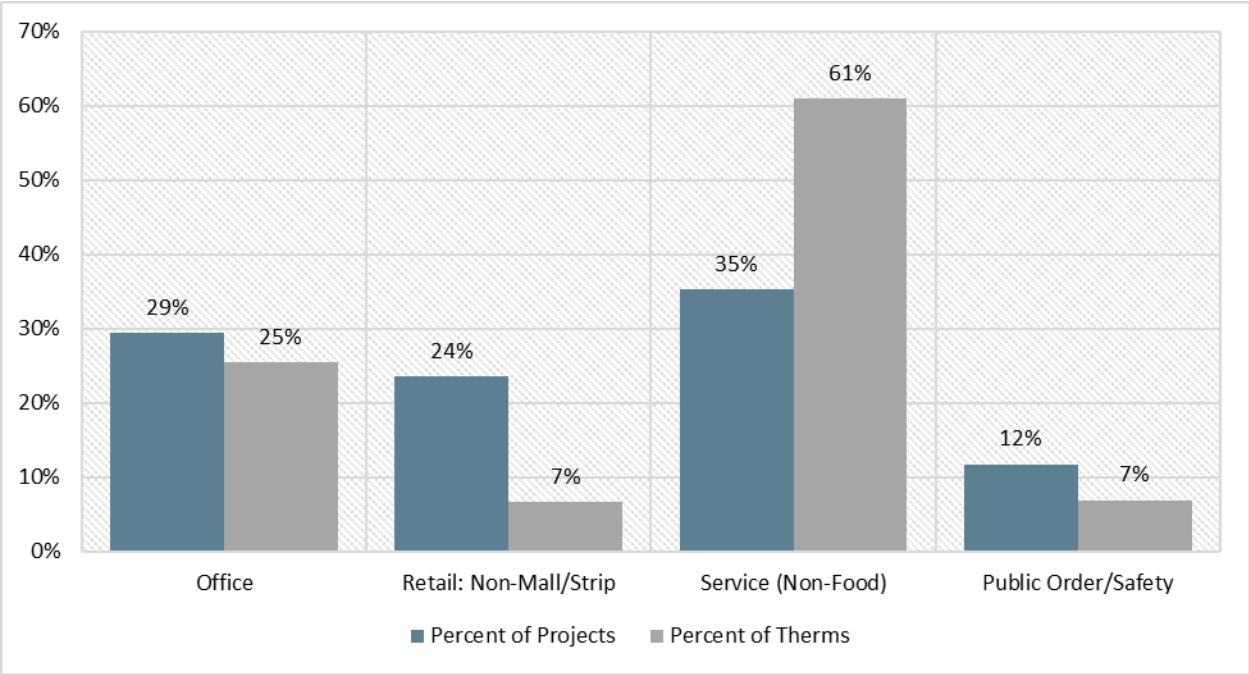

Figure 5-1: Direct Install Participation Summary

5.3 Closed Custom Project Participation Summary

Table 5-2 summarizes the closed projects from the PY2024 C&I Solutions custom component. Closed projects are projects that have been verified by the Evaluators and incentive issued by the implementer.

Table 5-2: Custom Project Participation Summary

Facility Type	Project ID	Measure
Food Processing	EA-0003252787	Steam Leak Repair
Medical	EA-0000682539	Heat Exchanger
		Steam Trap Replacement
		Boiler Replacement
		Economizer
		Blowdown Heat Recovery

5.4 Prescriptive Rebate Participant Summary

In PY2024, the program had two prescriptive food service projects installing fryers.

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The Evaluators performed online research to obtain the rated efficiencies for the two fryers and applied the appropriate baseline assumptions for each unit, per the methodology outlined in the AR TRM V9.2. Additionally, the Evaluators sourced equipment-specific idle and pre-heat BTUs from the Food Service Technology Center (FSTC) database.

5.5 C&I Solutions Process Evaluation

The Evaluators conducted a formal process evaluation of the C&I Solutions Program in PY2020 and a limited process evaluation in PY2022 and found that the program was successful in meeting participation, savings, and satisfaction goals. Table 5-3 and Table 5-4 summarize the Evaluators' review of the C&I Solutions Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 5-3: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and Innovative Components	No. The program was unchanged from PY2023
Previous Process Evaluation	No. The program received a comprehensive process evaluation in PY2020 and a limited process evaluation in PY2021 and PY2022.
New Vendor or Contractor	No. The program has been implemented by CLEAResult since 2011.

Table 5-4: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met savings goals (84% in PY2024).
Are the educational or informational goals not meeting program goals?	No. The program has an established trade ally network.
Are the participation rates lower or slower than expected?	No. The program met participant goals in program years PY2012-PY2022.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. The prior process evaluations found that operational and management structure to be up to speed and efficient in administering the program.
Is the program's cost-effectiveness less than expected?	No, the program's cost-effectiveness vastly exceeded expectations.
Do participants report problems with the programs or low rates of satisfaction?	No. Participant surveys found exceedingly high satisfaction levels.

Based on these findings, full process evaluation was conducted for PY2024 because the last process evaluation was completed in PY2020.

5.5.1 Data Collection Activities

Table 5-5 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, and timeframe of data collection.

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Table 5-5: AOG C&I Solutions Data Collection Summary

Target	Component	Activity	n	Precision	Role
AOG Program Staff	Energy Efficiency Program Manager; Senior Energy Efficiency Consultant	Interview	2	NA	Overall administration of AOG EE programs. The Energy Efficiency Program Manager manages financial, contractual, and regulatory matters across the AOG portfolio. The Senior Energy Efficiency Consultant conducts day-to-day management and oversight of implementation and marketing efforts.
CLEAResult Staff	Program Manager	Interview	1	NA	Handles day-to-day operations, including mass market outreach, application review, billing, and logistics
Participant Survey	Custom/Prescriptive Participant Survey	Survey	1	NA	Due to the small population size, a single response was obtained.
	Direct Install Participant Survey	Survey	1	NA	Due to the small population size, a single response was obtained.
Trade allies	Trade allies	Interview	1	NA	Interviews were conducted with one of the two trade allies who participate in the consistent weatherization approach program.

5.5.2 Process Results & Findings

This section will present the results and key findings from the data collection activities. These findings are based upon interviews with utility staff, implementation staff, surveys with participants, and interviews with trade allies.

5.5.2.1 Program Staff and CLEAResult Interview Summary

Evaluators interviewed two AOG staff members and one CLEAResult staff member about the commercial programs. AOG staff included the Program Director and the program manager responsible for tracking costs and processing invoices. The CLEAResult staff member was the program manager for AOG's commercial portfolio.

Staff explained that the C&I programs – direct install, prescriptive, and custom – continue to run smoothly: "this program is never really a concern for us." The account managers and engineers have worked on the programs for many years, and everyone knows program intricacies and are able to troubleshoot as problems arise.

The direct install program continues to provide weatherstripping, low flow water measures, and steam traps, with weatherstripping representing the lion's share of program savings; these measures are installed directly by CLEAResult staff. The prescriptive program includes food service equipment and boilers; this program is very small and experiences few customers due to the small territory served by AOG. As in years' past, the custom program continues to

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account for the majority of commercial savings. The custom program includes a no-cost audit and free-ridership screening for all applicants; once customers pass the free-ridership screening their incentive amount is earmarked in the budget based on estimated savings. Savings calculations vary based on business size.

C&I Solutions maintains a trade ally network that participants may reference when completing program projects. Participation in the network is not required—customers may work with their own contractors or in-house staff to install qualifying equipment. To join the network, trade allies must complete an application and submit a certificate of insurance. The trade ally network supports all Arkansas gas programs: AOG, Black Hills Energy, and Summit AR.

The commercial programs rely on organic leads via word of mouth, outreach, and repeat customers. Staff conduct minimal marketing.

The following material describes the program in greater detail and was developed as part of the PY2023 evaluation.

5.5.2.2 Program Theory & Design

The C&I Solutions Program was designed to provide outreach in hard-to-reach sectors of the C&I markets. The main bullets below list program activities and their expected outcomes. The secondary bullets indicate new program enhancements.

- **Direct installation of high-return saving measures.** The C&I Solutions program provides no-cost direct installation of door air infiltration, low flow faucet aerators, pre-rinse spray valves, steam traps, and showerheads. These measures have a high return of savings relative to their cost and as such can be provided free-of-charge and remain cost-effective. The provided savings are unlikely to occur absent the program; generally, if a respondent does not already have the equipment in place, the direct install activities induce an action that was not planned. It is also the intention that these activities will serve as an introductory teaser to energy efficiency for the recipients, and that they will then be further interested in participating in the custom component of the program.
- **Energy audits to medium and large customers.** These audits are conducted by CLEAResult staff, providing recommendations for energy efficiency improvements and an audit report. These audits are intended to generate the bulk of the program savings, yielding high-return custom projects.
- **Incentives for custom measures.** The C&I Solutions program provides $.80 per therm for verified savings from custom projects. These projects may be driven by a program-funded audit or be customer-directed. In some instances, customers attempting to participate in prescriptive programs are referred to the C&I Solutions program if their application is ineligible for deemed savings.

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- **Incentives for prescriptive measures in C&I Solutions.** This includes boiler and food service equipment at fixed incentive rates.
- **Enhanced outreach to small business customers with sizable gas loads.** Customers with usage below 200,000 therms annually qualify for $.90 per therm incentives.
- **Referral to AOG prescriptive programs.** Conversely, there are instances where the CLEAResult audit identifies energy savings opportunities that qualify for a prescriptive incentive for a furnace or water heater. In these instances, the customer is referred to the Equipment Rebate portal for processing, and the savings are not credited to the C&I Solutions program.

5.5.2.3 Program Administration

The C&I Solutions program is overseen by the manager of energy efficiency programs, and the senior energy efficiency consultant. The utility staff report to the Director of Energy Efficiency Chief Customer Officer. Given the size of AOG's territory and associated program budgets, the Evaluators determined this to be an efficient allocation of staff.

At CLEAResult's end, the program overall is led by the Program Manager, who oversees the implementation of the C&I Solutions Program for AOG. This manager handles high-level issues across the programs, including regulatory compliance and reporting, as well as some level of intervention on the larger projects. CLEAResult also oversees the C&I contractors. The Program Manager handles high level questions with the trade allies. Other in-house communications with trade allies involve meeting communications.

Direct install and audit activities are run by CLEAResult Field Staff. This staff performs direct installation and conducts the energy audits. After this, their responsibilities include development of the audit report and recommendations and following up with the customer to gauge interest in completing a project.

Marketing and outreach activities are run by CLEAResult in collaboration with AOG. The marketing channels that are used include collateral such as brochures as well as in-person activities. Other marketing channels include online channels such as updates to the website and email blasts.

Utility staff did not report any issues with data management and quality control/assurance.

5.5.2.4 Program Implementation and Delivery

In general, there were no major changes to the implementation of the program in 2023. Customers are free to use whomever they want for their projects, but AOG and CLEAResult will provide a list of trade allies upon request. Staff indicated that there are about 30 trade allies on the list, with five to seven active participants. The C&I Solutions program does not have an

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active marketing initiative as it is able to garner enough projects without it. Staff want to balance helping those in need, with not having to turn customers away due to a depleted budget.

Throughout the program year, CLEAResult would provide the Evaluators with updates regarding their pipeline of custom projects. The Evaluators were provided with monthly updates, listing the full scope of facility audits, ex ante savings with associated recommended measures, and what stage the project was in. These stages are:

- *Pipeline*. Projects listed as Pipeline are in the first phase of involvement in the C&I Solutions Program. These participants are customers that have received a facility audit and indicated systems of interest to CLEAResult.
- *Pre-Inspected*. Projects listed as Pre-Inspected are in the phase where CLEAResult has just completed a facility audit. During these audits, CLEAResult conducts a comprehensive review of the facility's systems and operation practices. On this basis, CLEAResult then formulates initial recommendations for energy efficiency improvements. These are discussed with facility staff during the audit, in order to address the viability of recommended measures. Measures that are stated to be viable by the customer are then noted and focused upon in the next steps of the audit process.
- *Pre-Installation Calculation*. At this phase, CLEAResult is compiling high-level data needed to provide an initial estimate of energy savings. This step of the process compiles the information collected in the site audit, which are then used in the development of an Audit Report.
- *Audit Report Complete*. In this phase, viable measures from the Pre-Inspection are compiled into a formal audit report, providing the participant with further detail as to the scope of the project, initial savings estimates, associated incentives, expected project cost, and the payback period of the measure. Additionally, should the measure provide operational benefits to the facility (such as improved comfort or product reliability), these are indicated as well in order to provide the customer with a full scope of the benefits of the project.
- *Project Application*. At this point, the customer has informed CLEAResult and AOG that they intend to install a program-recommended measure. When this occurs, CLEAResult then involves the Evaluators. CLEAResult provides the Evaluators with an M&V plan for the facility, detailing the project scope and proposed data collection and analysis. The Evaluator's engineering staff then reviews the M&V plan and makes recommendations for any changes needed. A project application is then signed, in which the reserved incentive amount is detailed and reflects the savings approved by the Evaluators.

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- *Post-Inspection*. This phase marks the completion of post-inspection for an installed measure. CLEAResult has at this point post-inspected a measure and revised savings accordingly if the installed project differs from the proposed project. At this point, 40% of the reserved incentive is paid if the project requires a lengthy M&V period. 100% of the reserved incentive is paid to the customer if the project only requires post-verification inspection or a short M&V period.
- *M&V*. M&V marks the phase when post-installation data are collected for an installed project in order to allow for calculation of a final savings estimate, from which the remaining incentive or 100% of the incentive amount owed to the customer is determined. There are some measures that do not need post-retrofit data; for such measures, the M&V phase is short and requires completion of calculations based upon inputs verified in the Post-Inspection. For facilities that require post-installation data, the data collection period can range from 30 days to 12 months.
- *Complete*. Facilities marked as Complete have received their full incentive. As stated previously, 60% of the reserved funds for the incentive are available to pay the remaining incentive amount or 100% of the reserved funds are available to pay the incentive amount owed to the customer. If the verified savings are below the Project Application savings, the customer's incentive is reduced accordingly, to keep incentive levels at $.80 or $.90/therm. If the verified savings are higher than the Project Application amount, CLEAResult and AOG then see if there are available incentive funds left for the program year. If the program has available funds, the customer receives a total incentive higher than the initial agreement. If the funds are not available, the customer's incentive is capped at the Project Application amount.

The process flow for the C&I Solutions Program is presented in Figure 5-2.

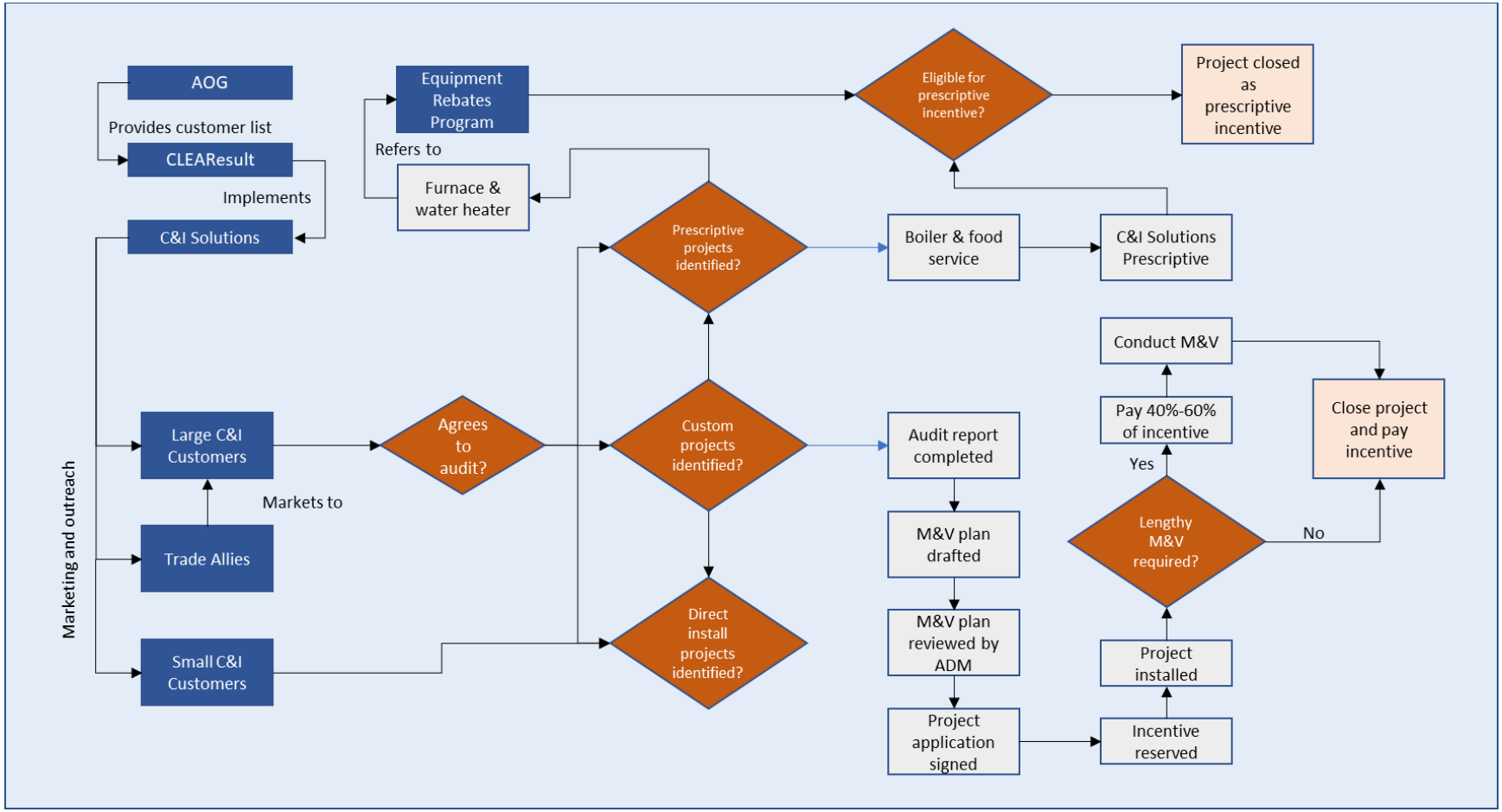

Figure 5-2: C&I Solutions Process Flow Chart

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5.5.2.5 Trade Ally Interview Findings

Evaluators attempted to interview contractors participating in the AOG commercial program. The tracking list included two trade allies, both of whom were contacted up to three times. However, only one responded, limiting the ability to draw broad conclusions about the program's overall effectiveness or contractor experiences. While the interview provides insight into one trade ally's experience, the findings should be interpreted with caution, as they do not reflect a diverse range of perspectives from different types of commercial trade allies.

The interviewee specializes in leak detection and steam trap services. They have participated in AOG's rebate program for approximately ten years, first learning about it through a gas rebate project for their personal property. The program's rebate structure, which offers savings evaluations by the utility's engineers, was noted as beneficial. The interviewee emphasized that their clients are exclusively industrial, and that high-efficiency equipment is generally an easy sell when positioned around cost savings, though some clients find the upfront investment challenging, even with partial rebates. Program marketing materials are available, but convincing customers that participation is free remains a hurdle. Notably, the interviewee suggested that the program could expand its support to smaller businesses by covering annual boiler tune-ups, which would yield significant gas savings—a practice adopted by another utility program. However, this measure is already offered by AOG, and the comment appears to reflect a misunderstanding of the program's current offerings. Overall, the interviewee expressed satisfaction with the program's seamless paperwork process but raised concerns about customer "opt-outs," which limit rebate eligibility for larger facilities.

5.5.2.6 Participant Survey Findings

Due to the small sample sizes, the ability to generalize survey findings is limited. However, the responses from the two participants are as follows:

- The custom participant reported that their contractor was professional and completed the work within a reasonable timeframe. They also found the application process to be smooth, easy to complete, and approved in a timely manner. Overall, this participant was highly satisfied with all rated aspects of the program and the program as a whole.
- The participant who received directly installed weatherization measures also provided positive ratings regarding their experience with the contractor. However, their responses were neutral when assessing overall satisfaction with the program.

5.6 Protocol A: Tracking Data Review

Table 5-6 summarizes the Protocol A tracking data review for the C&I Solitons Program. The program tracking database contained all required fields.

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Table 5-6: C&I Solutions Protocol A Summary

Category	Field	Status	Description of Issue(s)
Participating Customer Information	Unique customer identifier, such as account number	✓	This applied to the Custom, DI, and the Prescriptive components.
	Customer contact information – name, mailing address, telephone number	✓	
	Date/s of major customer milestones such as rebate application date, approval date, rebate processing date, etc.	✓	
Measure-Specific Information	Measure Group (Equipment Type)	✓	
	Equipment Fuel/Energy Source	✓	
	Equipment Quantity	✓	
	Efficiency Level	✓	
	Estimated Savings	✓	
	Estimated incremental measure cost	✓	
	Equipment Useful Life	✓	
	Measure Name – Text Description	✓	
	Measure Name – Numerical Code	N/A	
	Serial Number	N/A	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	×	
	Other inputs necessary for the use and compliance with the TRM	✓	
Vendor-Specific Information	Name and Contact Information for Contractor	✓	
	Contractor Type	✓	
	Date of Installation	✓	
	Cost of the installed equipment	✓	
	Efficiency level of the installed equipment	✓	
Program Tracking Information	Date of the initial program contact/rebate information	✓	
	Date of rebate/incentive paid	✓	
	Incentive amount paid to-date	✓	
	Incentive amounts remaining	✓	
	Application Status (i.e., number of applications approved, pending, or denied)	×	
	Reason and reason code for application denial	✓	
Program Costs	Overall program budgets	N/A	This is not applicable for the Custom nor the Prescriptive components of the C&I Solutions Program.
	Program expenditures to-date	N/A	
	Incentive Costs	N/A	
	Administrative Costs	N/A	
	Marketing/Outreach Costs	N/A	
	Evaluation Costs	N/A	

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Marketing and Outreach Activities	Advertising and marketing spending levels	N/A	Not itemized from total marketing costs in data provided to the Evaluators.
	Media schedules	N/A	
	Summary of number of community events/outreach activities	N/A	
	Other media activities – estimated impressions via mailings, television/radio; print ads.	N/A	

5.7 C&I Solutions Impact Evaluation

The impact evaluation of the C&I Solutions Program included the following:

- *Custom Project M&V.* The Evaluators conducted project-specific M&V on a census of custom projects completed through the C&I Solutions program. Each project included an M&V plan and project-specific report.
- *Free-ridership Estimation.* The PY2024 custom projects were all from installations with prior screening. Respondents were asked a series of questions related to their experience with the appropriate measures, and whether they had ever installed similar equipment at the participating premises or at other premises within their organization. Direct Install and Prescriptive channels had NTGRs based on PY2020 survey efforts.

5.7.1 Summary of Non-Energy Benefits

Table 5-7 summarizes the non-energy benefits by measure that are be credited to the C&I Solutions Program.

Table 5-7: C&I Solutions Non-Energy Benefits

Measure	Electric Savings	Water Savings	Propane Savings	ARC/DRC
Weather Stripping	✓			
Combination Oven		✓		
Custom	✓	✓	✓	✓

5.7.1.1 Electric Savings Calculation Procedure

Electric savings were claimed for commercial weather stripping. This direct install effort is not jointly administered with OG&E so all projects produce NEBs claimable by AOG. For these projects, AOG is credited with the cooling savings from weather stripping specified in AR TRM V9.2 Section 3.2.10.

5.7.2 C&I Solutions Direct Install Impact Evaluation

5.7.2.1 Deemed savings calculations

For sample AR TRM V9.2 calculations, see Appendix C.

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5.7.2.2 Direct Install Free-ridership

Direct Install participants were surveyed in PY2020 to estimate NTG, and this value was applied to PY2024. The methodology used in that evaluation is summarized here.

The methodology for DI Free-ridership was focused on the participants' past experiences with the appropriate equipment and whether they had organizational policies in place to install such equipment. Respondents were asked:

Q22. Before participating in the C&I Solutions Program, did you have plans to install [LIST MEASURE]?

Q23 Would you have gone ahead with this planned project even if you had not participated in the program?

Twenty percent of respondents stated that they were aware of the savings potential from such equipment.

Q27 If the [PROGRAM] program representative had not recommended installing the [PROJECT_DESCRIPTION], how likely is it that you would have installed it anyway?

1. Definitely would have installed
2. Probably would have installed
3. Probably would not have installed
4. Definitely would not have installed
5. Don't know

These are combined into the following factors:

A. **Prior Plans:** If the respondent indicated plans to install prior to participation, they receive a "1" for this metric.

B. **Installation counterfactual:** If the respondent states that they would have gone ahead with this project without the program, they receive a "1" for this factor.

C. **Program Influence:** If a respondent states that they "Definitely would have" or "probably would have" installed this equipment without the program, they receive a "1" for this factor.

To be found a free-rider, a respondent must receive a "1" score for all three factors. Based on PY2020 survey findings, the direct install channel had 87.5% NTGR.

5.7.2.3 Direct Install Spillover

No instances of spillover were identified among the C&I Solutions DI survey respondents.

5.7.3 C&I Solutions Prescriptive Projects Impact Evaluation

The C&I Solutions Program processed 5 prescriptive food service rebates in PY2024. The gross realization was 103%.

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Table 5-8: C&I Solutions Prescriptive Project Summary

Measure	Measure Count	Ex Ante Therms	Ex Post Therms	Lifetime Savings
Fryer	5	4,334	4,471	53,648
Total	**5**	**4,334**	**4,471**	**53,648**

The Evaluators found the following discrepancies in savings calculations:

- Food service: The savings calculations used AR TRM V9.2 input defaults for pre-heat BTU of efficient equipment, as ENERGY STAR does not include preheat BTU as a data field in their test results. The Evaluators sourced equipment-actual pre-heat BTUs from the Food Service Technology Center (FSTC) database.

5.7.4 Prescriptive Program Free-ridership

A NTG ratio of 77.2% for food service was assigned based on prior NTG research conducted for CenterPoint Energy's (now Summit Utilities Arkansas) Commercial Food Service and Commercial Boiler Conservation Improvement Programs.

5.7.5 C&I Solutions Custom Project Impact Evaluation

The Evaluators opted for a census of custom projects to capture the full variability associated with these projects; the measures are often unique with idiosyncratic issues, and as such extrapolation from the M&V of other projects would be inappropriate. Table 5-9 summarizes the custom projects completed and evaluated in PY2024. "Ex Ante Savings" is the value calculated by CLEAResult after M&V. "Ex Post Savings" is the savings calculation completed by the Evaluators.

Table 5-9: AOG C&I Solutions Custom Project Summary

Facility Type	Project ID	Measure	Ex Ante	Ex Post	M&V Protocol
Hospital	EA-0000682539	Heat Exchanger	91,218	91,218	Option A
		Steam Trap Replacement	27,449	27,449	Option A
		Boiler Replacement	4,716	4,716	Option A*
		Economizer	9,647	9,647	Option A*
		Blowdown Heat Recovery	653	653	Option A*
Food Processing	EA-0003252787	Steam Leak Repair	2,343	2,343	Option A
Restaurant	EA-0003218413	Fryer	3,731	3,804	Option A
Restaurant	EA-0003823330	Fryer	603	667	Option A
Total			**140,360**	**140,496**	
Sums may differ due to rounding.					
*Multi-year project claiming remainder of 2024 ex-post savings minus PY2023 ex-ante savings.					

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5.7.5.1 Custom Project Free-ridership

The Evaluators applied PY2023 research findings to estimate the net impacts of the custom projects. A net-gross ratio of 100%.

The PY2023 methodology used by the Evaluators in determining the free-ridership rates for custom projects examined the following factors:

- *Knowledge gained from program outreach*. If the project originated from program outreach (which may include program-sponsored training courses or facility audits), the respondent is asked if they had prior knowledge of the energy-saving opportunity recommended and eventually installed. If the respondent learned of the measure through the program audit or program–sponsored training, then they are considered to not have been free-riders, in that in the absence of the program, the likelihood of the facility receiving a similarly detailed audit are low. Questions used in evaluating this criterion include:

  FI-1 Prior to participating in the C&I Solutions Program, did your organization install any equipment similar to [MEASURE] at your facility without financial incentives or rebates?
  - ❑ Yes
  - ❑ No

  FI-1a Did you learn of this measure through your participation in the Commercial & Industrial Solutions Program?
  - ❑ Yes [IF YES, ASK FI-1b] Do you recall how you learned of the measure?
  - ❑ No

- *Prior plans for a similar measure*. This component is examined in instances where the respondent knew of the measure prior to receiving any technical assistance through the C&I Solutions Program. Respondents are asked a series of questions related to whether they had plans for installing this equipment prior to having learned of the available financial incentives from the C&I Solutions program. Questions used in this component include:

  FI-2 Did you have plans to install the [MEASURE] that was upgrades through C&I Solutions before participating in the program?
  - ❑ Yes
  - ❑ No

  If Yes: FI-2a Would you have gone ahead with this planned installation without the program rebates?
  - ❑ Yes
  - ❑ No

  FI-2b Would this installation have included the same equipment without the program rebates?
  - ❑ Yes
  - ❑ No

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- *Analysis of measure payback*. Respondents are asked to indicate what their required payback period is for energy efficiency improvements. This value is compared against the measure payback with and without the program incentive. If the financial incentive brings the project from over the threshold to under the threshold, then the project is considered to have been sufficiently influenced by the program incentive. This includes the following questions:

DM-5 Does your organization require a specific payback period in order to implement energy efficiency improvements?

- ❑ Yes [ASK DM-5A]
- ❑ No [SKIP TO DM-6]
- ❑ Don't know [DON'T READ]

DM-5a What **payback** *length of time* do you normally require in order to consider an energy investment cost effective?

____ Years

- ❑ Don't know

- *Modification of the project*. Respondents are asked a series of questions addressing whether they modified the project as a result of their program participation. This includes changes in equipment quantity and/or efficiency level (where appropriate for the measure) and a change in project timing. Questions used to analyze this component include:

FI-5 If the C&I Solutions through C&I Solutions Program were not available, would you have installed the…

- ❑ Same quantity of energy efficient equipment,
- ❑ A lower quantity, or
- ❑ No energy efficient equipment at all?

[IF FI-5 = "Lower Quantity"]: FI-5a: By percentage, how much lower?

FI-6 If the C&I Solutions program were not available, would you have installed …

- ❑ The same equipment with the same efficiency level,
- ❑ The same equipment with a lower energy efficiency level, but still above minimum code, or
- ❑ standard efficiency equipment?

[IF FI-6 = "Lower efficiency level, but still above minimum code"]: FI-6a: By percentage, how much lower?

FI-7 Did the C&I Solutions rebate allow you to install [EQUIPMENT/MESURE] sooner than you otherwise would have?

- ❑ Yes
- ❑ No

IF YES: FI-7a When would you otherwise have installed the equipment? (READ IF NEEDED)

- ❑ In less than 6 months later

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- In 6-12 months later
- In 1-2 years later
- In 3-5 years later
- More than 5 years later

The scoring mechanism for custom projects is presented in Figure 5-3.

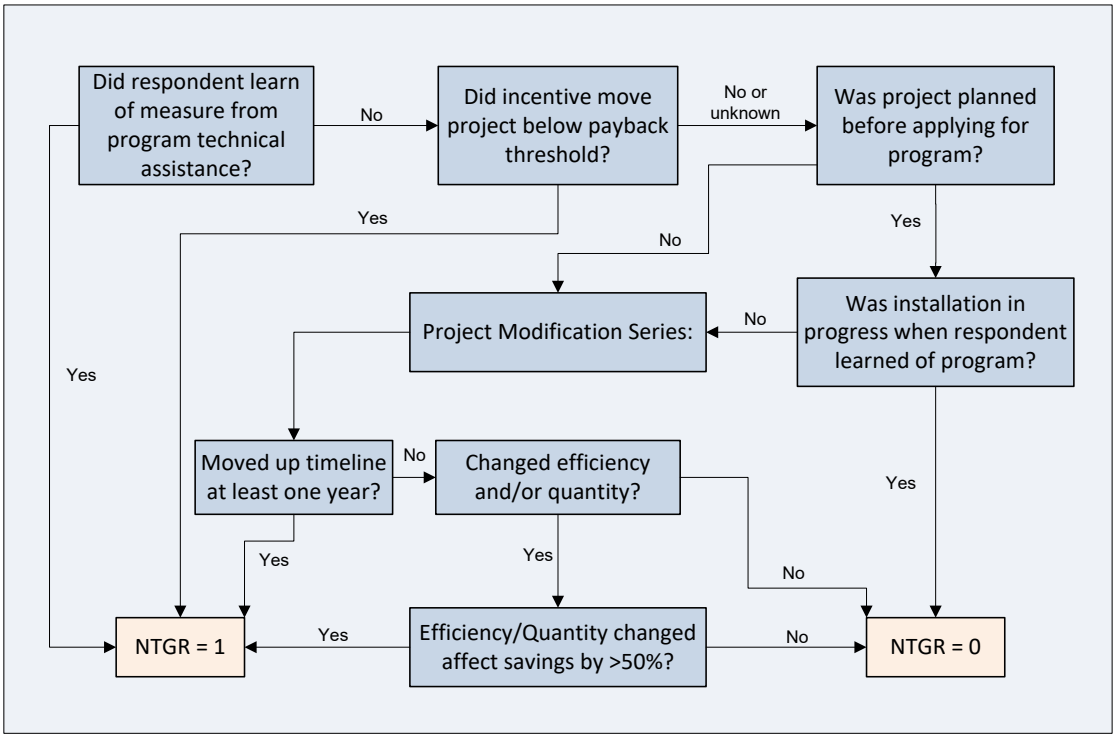

Figure 5-3: C&I Solutions Custom Project Free-ridership Diagram

5.7.6 Ex Post Savings

Table 5-10 and

Table 5-11 present the ex-post savings for the Commercial & Industrial Solutions program. EUL for the custom component is variable.

Table 5-10: Commercial & Industrial Solutions Gross Savings

Measure Category	Ex Ante Therms	Ex Post Therms	Gross Realization Rate	EUL	Ex Ante Lifetime Savings	Ex Post Lifetime Savings
Direct Install	39,354	37,778	96%	11	432,894	415,560
Custom	136,026	136,026	100%	13	1,686,542	1,686,542
Prescriptive	4,334	4,471	103%	12	52,007	53,648
Total Gross Savings	**179,714**	**178,257**	**99%**	**13**	**2,171,443**	**2,155,750**
Sums may differ due to rounding.						

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Table 5-11: Commercial & Industrial Solutions Ex Post Net Savings

Measure Category	Ex Post Savings	NTG	Ex Post Net Savings
Direct Install	37,778	87.5%	33,056
Custom	136,026	100.0%	136,026
Prescriptive	4,471	77.2%	3,451
Total	**178,275**	**96.5%**	**172,533**
Sums may differ due to rounding.			

Table 5-12: Commercial & Industrial Solutions Ex Post Net Water Savings

Measure Category	Net Annual Water	Net Lifetime Water	Monetized Benefit
Direct Install	0	0	$0
Custom	487,996	487,996	$4,543
Prescriptive	0	0	$0
Total	**487,996**	**487,996**	**$4,543**
Sums may differ due to rounding.			

5.8 Progress on PY2023 Evaluation Recommendations

The table below summarizes the response by AOG and CLEAResult to the PY2023 recommendations.

Table 5-13 Status of Recommendations from PY2023 Evaluation

2023 Recommendation	Status	Comment
Develop a Strategic Energy Management offering. This is offered in the BHE C&I Solutions program and is a viable custom measure.	Under Consideration	At this time, the C&I savings goal cannot support this variable measure. The measure is considered viable in the AOG territory and may be under future consideration.

5.9 Conclusions

The program exceeded its savings goals and was cost-effective.	The program met 103% of its net savings goal while spending 102% of its budget. The program had a 2.09 TRC and is considered to be cost-effective.
The interviewed trade ally provided positive feedback.	The interviewed trade ally noted that the application process was easy and straightforward.

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Participants reported positive experiences with the program.	The survey findings, while limited by the small sample size, indicate generally positive experiences with contractors. The custom participant reported high satisfaction with both the process and outcomes, while the direct install participant provided neutral feedback on overall program satisfaction.

5.10 Recommendations

The Evaluators do not have any recommendations for the C&I Solutions program at this time.

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6 AOG Weatherization Program

AOG launched the AOG Weatherization Program (AOGWP) in 2011. For its first five years of operation, the program was run as the AOG/OG&E Joint Weatherization Program. After the Arkansas utilities adopted the Consistent Weatherization Approach (CWA) under APSC guidance, the program had its offerings modified to comply with the CWA. The program is designed to train contractors to analyze energy use for single and multifamily homes and identify energy efficiency improvements which are then provided at no cost to the customer.

The program provides energy assessments, along with direct installation of low-cost measures and pre-qualification for building envelope improvements.

Direct install measures include:

- Faucet aerators;
- Low-flow showerheads; and
- LED lamps

Weatherization measures include:

- Air infiltration;
- Ceiling insulation; and
- Duct sealing.

The program offers direct installation of LED lamps in municipal/co-op-served homes that are otherwise eligible for weatherization measures. AOG opted to offer this to ensure a consistent offering for their customers. This benefit is possible due to the APSC guidance on NEBs allowing for the claiming of cross-fuel savings.

6.1 Program Overview

The AOGWP was formerly implemented directly by AOG with trade ally assistance. In PY2021, this transitioned to third-party implementation by CLEAResult. Table 6-1 summarizes the historical performance of the AOGWP since its reorganization to the CWA.

Table 6-1: AOG AOGWP Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	% Spent	Ex Post	Goal	% Achieved
2018	$1,564,105	$1,564,105	100%	250,792	158,145	159%
2019	$1,424,484	$1,600,745	89%	221,942	158,145	140%
2020	$1,280,586	$1,747,200	73%	230,147	216,543	106%
2021	$770,478	$1,754,746	44%	227,257	216,543	105%
2022	$1,047,088	$1,786,892	58%	270,805	216,543	125%
2023	$1,372,105	$1,778,492	77%	311,684	216,543	150%
2024	$1,072,507	$1,158,971	93%	202,212	193,808	104%

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6.2 Participation Summary

The AOGWP had 718 distinct participants in PY2024, saving 282 net therms per home. The program focuses on single family housing, as multifamily housing in AOG's service territory is largely all-electric.

The majority of net savings came from duct sealing (51%), ceiling insulation (25%), and air infiltration (24%). There was a net 136-therm penalty due to the direct installation of LEDs in homes served by Arkansas Valley Electric Cooperative (a co-op utility based in Van Buren, AR) and SWEPCO, with whom AOG does not have a fuel coordination agreement. The projects that included these therm penalties were completely paid for by AOG for all measures installed.

Figure 6-1 summarizes the per-project savings for weatherization measures from PY2021 to PY2024.

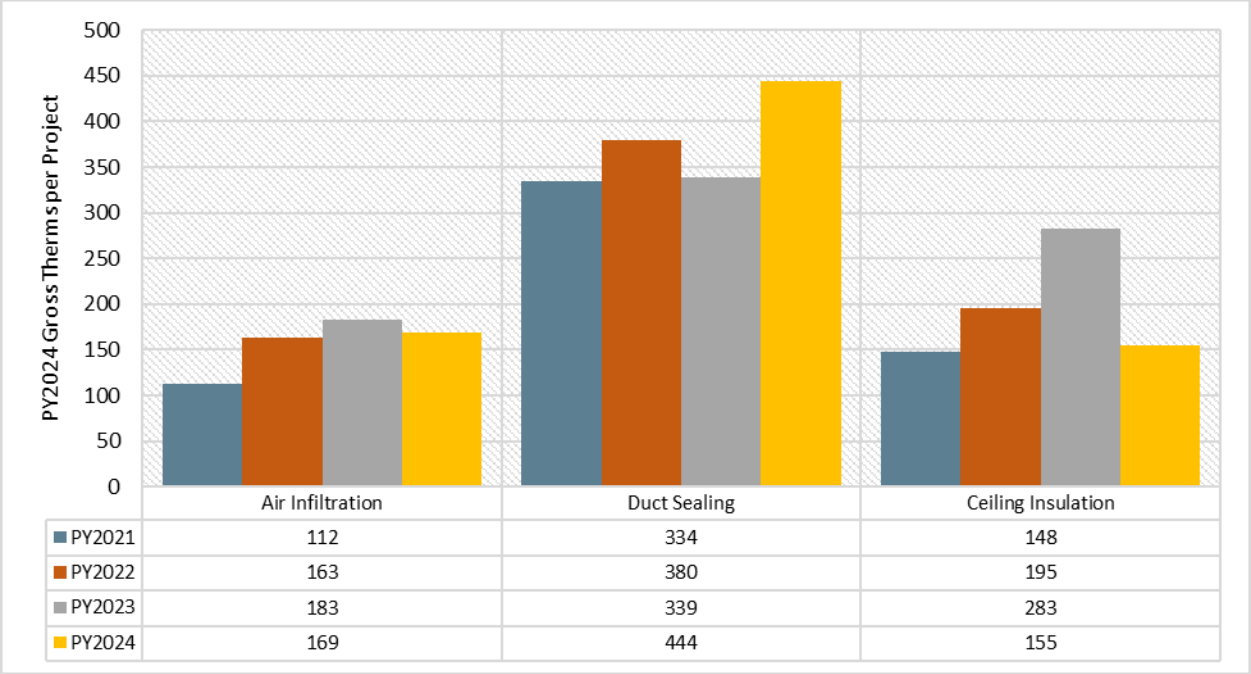

Figure 6-1: Savings Per-Project for Major Measures

In addition, incentives were provided for 555 assessments (73% of participants).

6.3 Contractor Participation

In PY2024, the AOGWP used six trade allies that were authorized under CLEAResult to administer the weatherization services.

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6.4 AOGWP Process Evaluation

AR TRM V9.2 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 6-2: Determining Process Evaluation Timing

Component	Determination
New and Innovative Components	No. The program has remained the same as previous years.
No Previous Process Evaluation	No. A formal process evaluation was conducted in 2020, and limited process evaluation was conducted in 2021 to address changes resulting from the change in program implementer.
New Vendor or Contractor	No. Program implementation is unchanged from PY2023.

Table 6-3: 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. The program is meeting comprehensiveness and informational goals.
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. PY2023 surveys found high satisfaction levels
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.

The evaluators conducted a limited process evaluation in PY2024.

6.4.1 Data Collection Activities

Table 6-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, and sample sizes for data collection.

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Table 6-4: AOGWP Data Collection Summary

Target	Component	Activity	n	Precision	Role
AOG Program Staff	Energy Efficiency Program Manager; Senior Energy Efficiency Consultant	Interview	2	N/A	The Energy Efficiency Program Manager manages financial, contractual, and regulatory matters across the AOG portfolio. The Senior Energy Efficiency Consultant conducts day-to-day management and oversight of implementation and marketing efforts by CLEAResult.
CLEAResult Program Staff	Senior Manager	Interview	1	N/A	The Senior Manager at CLEAResult manages the day-to-day implementation, marketing, rebate processing, and QA/QC for the program.

6.4.2 CWA Metrics Summary

The key CWA metrics are presented in Table 6-5 and Table 6-6.

The program installed 2.59 energy saving measures per home in PY2023, up from 2.41 in PY2023 and aligning with historical norms. Spending per-home decreased slightly from $1,070 to $1,002.

Table 6-5: CWA Required Process Evaluation Metrics

Metric	Value
Program name	AOG Weatherization Program
CWA implementation	The CWA is implemented using a third-party contractor (CLEAResult) with a network of pre-approved trade allies that market the program. The program coordinates with SWEPCO and Entergy
Total audits completed	554
Total submitted projects	730
Conversion rate*	132%
Measures installed per-project	2.59
Cost per participant	No customer co-pay. AOG paid $1,002/home
Percent of contractors promoting program	100%

* The conversion rate is defined as the ratio between the number of unique jobs completed during the Program Year divided by the number of audits completed during the Program Year (jobs/audits).

Table 6-6 Alignment with CWA Requirements

Requirement	Alignment with Requirement	Percent of Participants Receiving
Includes Applicable DI Measures	Yes	6.7%
Aerators	Yes	1.6%
Showerheads	Yes	1.0%

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Efficient lighting	Yes	5.1%
Prequalifies homes based on year of construction or energy costs	Yes, the customer must have had a bill in the last twelve months that exceeded ten cents per square foot or the home's age is 10 years or greater.	Not in tracking data
TRC is used to assess program cost-effectiveness	Yes	N/A
Measures screened using SIR or comparable metric	Program uses TRC	N/A
Includes Core No Cost Measures	Yes	100.0%
Audit (walk through)	Yes	75.9%
Ceiling insulation	Yes	45.8%
Duct sealing	Yes	43.8%
Air infiltration reduction	Yes	40.0%
Safety testing and/or measures	Yes	46.0%
Offers other utility measures	Yes	N/A
Contractors are certified BPI Building Analyst or RESNET HERS Rater	Yes, for duct sealing, air infiltration, and assessments. Insulation requires Arkansas Home Improvement Specialty License.	N/A

6.4.3 Process Evaluation Findings

CLEAResult continues to implement the standard and income qualified weatherization programs and AOG and CLEAResult have a strong working relationship.

Both weatherization programs continue to rely on a trade ally network, which currently consists of six members. Of these, four participated in the program last year, while two new trade allies were added. Utility staff emphasized the importance of maintaining a robust contractor network to ensure timely service, even when contractors are working in other service territories. CLEAResult manages the contractor network, with reimbursements based on implementation of the measures rather than service costs. However, CLEAResult staff noted that some contractors are facing staffing challenges, making it difficult to keep their crews fully staffed.

Program staff rely on trade ally driven marketing for the weatherization programs. Although AOG sends out bill inserts, utilizes web banners, and conducts radio advertisement, utility staff want to limit marketing to ensure demand does not exceed the budget. If and when the AOG program depletes all funds, dual-fuel homes will be sponsored by OG&E and gas only homes will be placed on a waitlist.

Staff explained that although health and safety measures are more of a focus of the income qualified program, customers in the standard pathway receive some health and safety

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measures if contractors identify areas of concern. Staff have increased the emphasis on health and safety measures in the income qualified program, offering additional training opportunities for contractors to understand when and where to include these measures.

6.5 Protocol A: Tracking Data Review

Table 6-7 summarizes the Protocol A tracking data review for the AOGWP. The CLEAResult DSMT tracking database contained all required fields.

Table 6-7: AOGWP Protocol A Summary

Category	Field	Status	Description of Issue(s)
Participating Customer Information	Unique customer identifier, such as account number	-	Account numbers are not included in the program data to limit the distribution of personally identifiable information.
	Customer contact information – name, mailing address, telephone number	✓	
	Date/s of major customer milestones such as rebate application date, approval date, rebate processing date, etc.	-	Only installation date is included in the program tracking data.
Measure-Specific Information	Measure Group (Equipment Type)	✓	
	Equipment Fuel/Energy Source	-	Heating type is not explicitly reported in tracking data
	Equipment Quantity	✓	
	Efficiency Level	✓	
	Estimated Savings	✓	
	Estimated incremental measure cost	×	
	Equipment Useful Life	✓	
	Measure Name – Text Description	✓	
	Measure Name – Numerical Code	N/A	
	Serial Number	N/A	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	✓	
	Other inputs necessary for the use and compliance with the TRM	✓	
Vendor-Specific Information	Name and Contact Information for Contractor	-	Contractor company name is present only, however, the Evaluators note that additional trade ally information is readily available upon request.
	Contractor Type	✓	
	Date of Installation	✓	
	Cost of the installed equipment	✓	
	Efficiency level of the installed equipment	N/A	
Program Tracking Information	Date of the initial program contact/rebate information	N/A	
	Date of rebate/incentive paid	✓	
	Incentive amount paid to-date	N/A	
	Incentive amounts remaining	✓	

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	Application Status (i.e., number of applications approved, pending, or denied)	✓	
	Reason and reason code for application denial	✓	
Program Costs	Overall program budgets	N/A	Not applicable to the AOGWP tracking data.
	Program expenditures to-date	N/A	
	Incentive Costs	N/A	
	Administrative Costs	N/A	
	Marketing/Outreach Costs	N/A	
	Evaluation Costs	N/A	
Marketing and Outreach Activities	Advertising and marketing spending levels	N/A	Not applicable to the AOGWP tracking data.
	Media schedules	N/A	
	Summary of number of community events/outreach activities	N/A	
	Other media activities – estimated impressions via mailings, television/radio; print ads.	N/A	

6.6 AOGWP Impact Evaluation

The evaluation effort of the AOGWP included the following:

- *Desk Review of Residential Calculations.* The Evaluators utilized AR TRM V9.2 values in assessing savings from measures included in the program.
- *Field Verification.* The Evaluators conducted field data collection at 45 homes.
- *Free-ridership Estimation.* Free-ridership rates were developed with participant surveys.

6.6.1 NEBS Summary

Table 6-8 summarizes the NEBs credited to the AOGWP. Propane savings are unchecked as measures that would provide it are only installed in homes with natural gas space heating. If a home has propane heating, its heating benefits are paid for by OG&E and credited to OG&E as a NEB.

Table 6-8: AOGWP Non-Energy Benefits

Measure	Electric Savings	Water Savings	Propane Savings	Avoided Replacement Cost
Air Infiltration	✓			
Ceiling Insulation	✓			
Duct Sealing	✓			
Faucet Aerator		✓		
LED Lamp	✓			✓
Low-Flow Showerhead		✓		

Water savings from low flow devices are calculated using TRM V9.2 protocols. Electric savings are calculated in a similar manner and credited to AOG when the participant is served by a municipal or rural co-op utility.

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6.6.2 Tracking Review

The impact evaluation began with a review of program tracking data. The tracking data included had a single row for each measure for each customer, with multiple columns detailing savings by measure. Table 6-9 summarizes ex ante savings by measure for the AOGWP.

Table 6-9: AOGWP Ex Ante Summary

Measure	Ex Ante Therms
Air Infiltration	47,869
Attic Insulation	51,901
Duct Sealing	107,015
Faucet Aerator	50
Low Flow Showerhead	117
LEDs	-
Total	**206,952**
Sums may differ due to rounding.	

The tracking data provided measured values for duct pressurization testing and blower door tests, allowing for the recreation of ex ante calculations based on leakage reduction. Attic insulation included an indicator for baseline R-value. Program specifications are to bring the home's insulation level up to R-38. The maximum allowable baseline insulation is R-22.

6.6.3 Field Verification Procedures

The Evaluators conducted field verification at 45 homes in the AOGWP and 17 Low Income homes. Measures included in this sample were as follows:

- Air Infiltration: 33 total homes
- Attic Insulation: 38 total homes, 39 projects;
- Duct Sealing: 34 total homes, 36 HVAC systems;
- LED Lamp: 8 total homes, 79 total bulbs;
- Faucet Aerator: 4 total homes, 10 total aerators; and
- Low-Flow Showerhead: 2 total homes, 3 total showerheads.

The Evaluators performed duct blaster and blower door tests in all homes that completed duct sealing and air infiltration projects, respectively.

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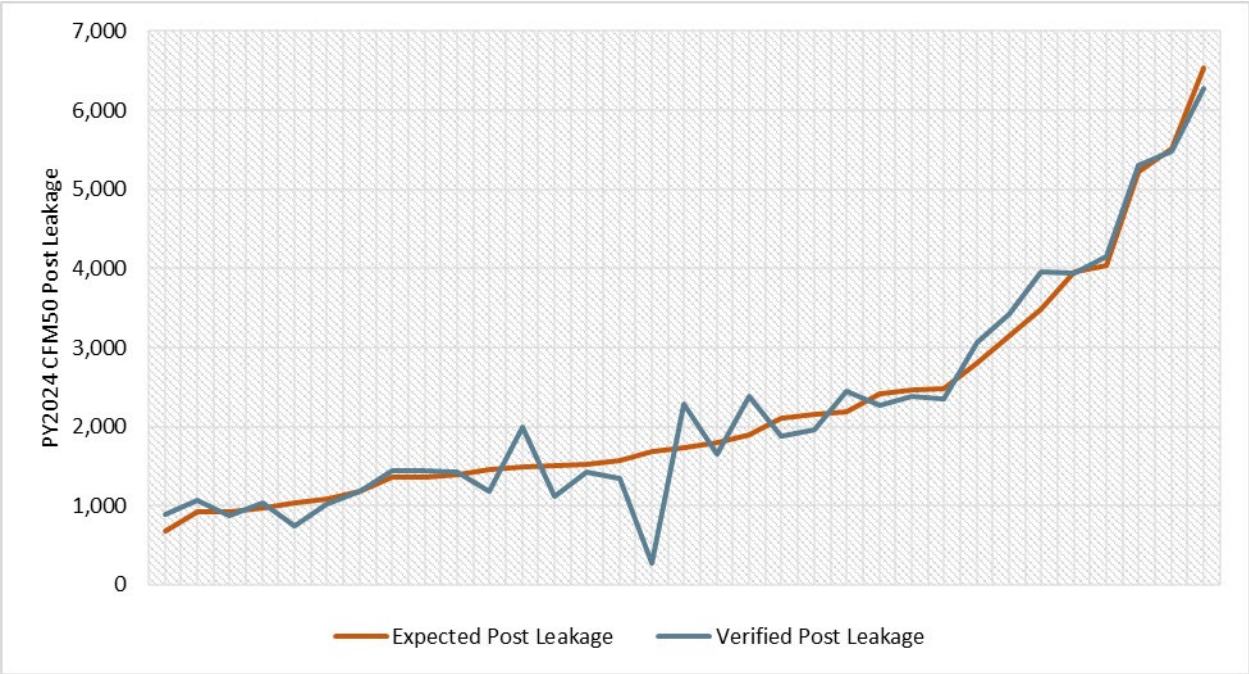

Figure 6-2: Air Infiltration Field Data Collection Results (N = 33)

The Evaluators calculated a weighted average of the in-service rates (ISRs) from both the AOGWP and the Low Income Weatherization program based on program savings, and supplemented the findings with the literature review findings. This resulted in an overall ISR of 102.8%.

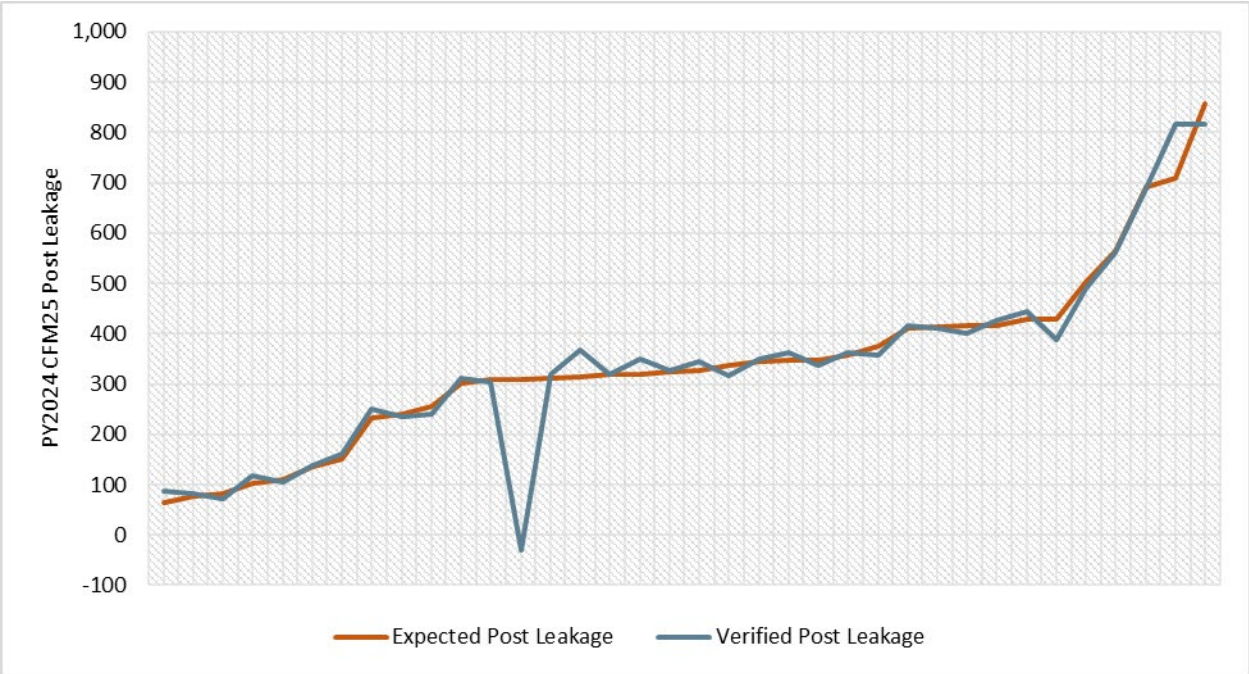

Figure 6-3: Duct Sealing Field Data Collection Results (N = 36)

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The Evaluators calculated a weighted average of the in-service rates (ISRs) from both the AOGWP and the Low Income Weatherization program based on program savings, and supplemented the findings with the literature review findings. This resulted in an overall ISR of 99.6%.

The Evaluators supplemented field verification ISRs for other measures with limited samples with literature review results. The following table outlines the ISRs that were applied to both the AOGWP and the Low Income Weatherization program measures.

Table 6-10 Weatherization Overall ISRs

Measure	In-Service Rate
Air Infiltration	102.8%
Attic Insulation	99.8%
Duct Sealing	99.6%
Faucet Aerator	99.1%
Low-Flow Showerhead	99.2%
LED Lamp	98.4%

6.6.4 Free-ridership

Free-ridership scoring methodology for the Weatherization Program is summarized in Section 4.5.2.1. The 2023 AOG Weatherization survey addressed all major measures in a single NTG battery of questions, rather than attempting to single out individual measures. Direct install measures were inquired about in a separate battery.

6.6.4.1 NTG Ratio Results

The Evaluators applied the PY2023 net savings results to estimate the net savings for PY2024. The NTG was 97.73%.

6.6.5 Ex Post Savings

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Table 6-11 presents the gross savings results of the evaluation of the PY2024 AOGWP.

Table 6-11 AOGWP: Ex Post Gross Savings Summary

Measure	Ex Ante Therms	Ex Post Therms	Realization Rate	EUL	Lifetime Therms
Air Infiltration	47,869	49,643	104%	11	546,068
Attic Insulation	51,901	52,210	101%	20	1,044,191
Duct Sealing	107,015	105,030	98%	18	1,890,547
Faucet Aerator	50	49	99%	10	493
LED Lamp	-	-139	N/A	12.5	-1,743
Low-Flow Showerhead	117	116	99%	10	1,163
Total	**206,952**	**206,909**	**100%**	**17**	**3,480,718**
Sums may differ due to rounding.					

Net savings are summarized in Table 6-12.

Table 6-12: AOGWP Program Net Savings Summary

Measure	Free-ridership Rate		Net Annual Savings		Net Realization Rate	EUL	Net Lifetime Therms Savings
	Ex Ante	Ex Post	Ex Ante	Ex Post			
Air Infiltration	10.5%	2.1%	46,783	48,516	104%	11	533,672
Attic Insulation	10.5%	2.1%	50,723	51,024	101%	20	1,042,068
Duct Sealing	10.5%	2.1%	104,586	102,646	98%	18	1,042,068
Faucet Aerator	24.9%	2.1%	49	48	99%	10	481
LED Lamp	25.0%	2.1%	0	-139	N/A	12.5	-1,704
Low-Flow Showerhead	25.0%	2.1%	115	114	99%	10	1,136
Total	**12.8%**	**2.1%**	**202,254**	**202,212**	**100.0%**	**17**	**3,423,286**
Sums may differ due to rounding.							

6.6.6 Water & Electric NEBs

Water NEBs are calculated in the manner described in Section 5.7.6.

Table 6-13: AOGWP Ex Post Net Water Savings

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Measure	Net Annual Water Saving (Gallons)	Lifetime Net Water Savings (Gallons)	Monetized Benefit
Faucet Aerator	12,104	11,829	$1,133
Low-Flow Showerhead	27,248	26,629	$2,551
Total	**39,352**	**38,459**	**$3,684**
Sums may differ due to rounding.			

The Evaluators calculated electric savings for the weatherization program per AR TRM V9.2 Volume 1, Section II, Protocol L1. This was credited to AOG if the residence was not listed as having been jointly incentivized by SWEPCO or OG&E. Additionally, the Evaluators reviewed AOG addresses and OG&E data to determine which homes were not jointly incentivized. Total avoided costs are in

Table 6-14. Benefits were monetized using OG&E's filed avoided energy and capacity costs, due to the significant overlap in service area between AOG and OG&E.

Table 6-14: AOGWP Ex Post Net Electric Savings

Measure Category	Net Annual kWh	Net Peak kW	Lifetime Net kWh	Monetized Benefit
Air Infiltration	24,052	18.11	264,570	$8,586
Attic Insulation	75,588	53.07	1,511,755	$43,291
Duct Sealing	116,622	70.23	2,099,199	$61,776
LED Lamp	13,629	2.05	170,364	$5,233
Total	**229,891**	**143.46**	**4,054,887**	**$118,885**
Sums may differ due to rounding.				

6.6.7 Avoided Replacement Cost

To calculate avoided replacement costs (ARCs) and incremental costs for LEDs in the AOGWP, the AR TRM V9.2 Protocol L calculator was used with the following assumptions: 1) replacement-on-burnout for all bulbs and 2) EUL for LEDs is 12.50 years [1]. LED costs were sourced from OG&E program tracking data where available. For direct install LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and labor.

Table 6-15 shows the avoided replacement costs for LEDs in PY2024. The total avoided replacement cost for the AOGWP program was $1,204.

The natural gas penalty for LEDs was calculated and incorporated into program net savings estimates. It is not included here as it is the primary fuel for AOG, rather than a cross-fuel, and thus is not a NEB. The resulting natural gas penalty can be seen in

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Table 6-11.

Table 6-15: AOGWP Ex Post ARC

Measure Category	Gross ARC Per Bulb	Total Bulbs	Total Monetized Benefit
LED Lamp	$2.62	485	$1,204

6.7 Conclusions

Comprehensiveness remained consistent.	Participants had an average of 2.59 measures installed in their projects. Incentives per home were slightly less at $1,002 per home, but within the historical range.

6.8 Recommendations

The Evaluators have no recommendations for this program at this time.

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7 Low Income Program

The Low Income Program (LIP) launched in PY2020 to comply with Act 1102. LIP is an extension of the Consistent Weatherization Approach (CWA) targeted to customers who meet the income eligibility requirements of the Low Income Home Energy Assistance Program (LIHEAP). The program is designed to train contractors and home energy consultants to analyze the energy use for single and multifamily homes and identify specific energy efficiency improvements which are then provided at no cost to the customer.

Direct install measures include:

- Faucet aerators;
- Low-flow showerheads; and
- LEDs lamps.

Weatherization measures include:

- Air infiltration;
- Ceiling insulation; and
- Duct sealing.

Much like the AOGWP, the program offers direct installation of LED lamps in municipal/co-op-served homes that are otherwise eligible for weatherization measures. AOG opted to offer this to ensure consistent measure offerings for their customers. This benefit is possible due to the APSC guidance on NEBs allowing for the claiming of cross-fuel savings.

Additionally, the program offers $500 per participating residence for health and safety (H&S) improvements, but may extend funding caps if funding is available. Health and safety funding is eligible to go to carbon monoxide detectors, smoke detectors, air purifiers, and other miscellaneous repairs.

7.1 Program Overview

The LIP is implemented by CLEAResult with trade ally assistance. Table 7-1 summarizes the first-year performance as a standalone program.

Table 7-1: AOG LIP Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	% Spent	Ex Post	Goal	% Achieved
2020	$69,830	$79,689	88%	13,951	10,088	138%
2021	$61,679	$80,003	77%	13,102	10,088	130%
2022	$86,957	$81,342	107%	14,311	10,088	142%
2023	$89,713	$89,742	100%	11,778	10,088	117%
2024	$251,076	$256,435	98%	41,372	40,630	102%

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7.2 Participation Summary

The Low Income Weatherization Program had 133 participants in PY2024. Figure 7-1 summarizes the share of program savings contributed by each measure. Most savings came from duct sealing, ceiling insulation, and air sealing. There was a 47 therm penalty due to the direct installation of LEDs.

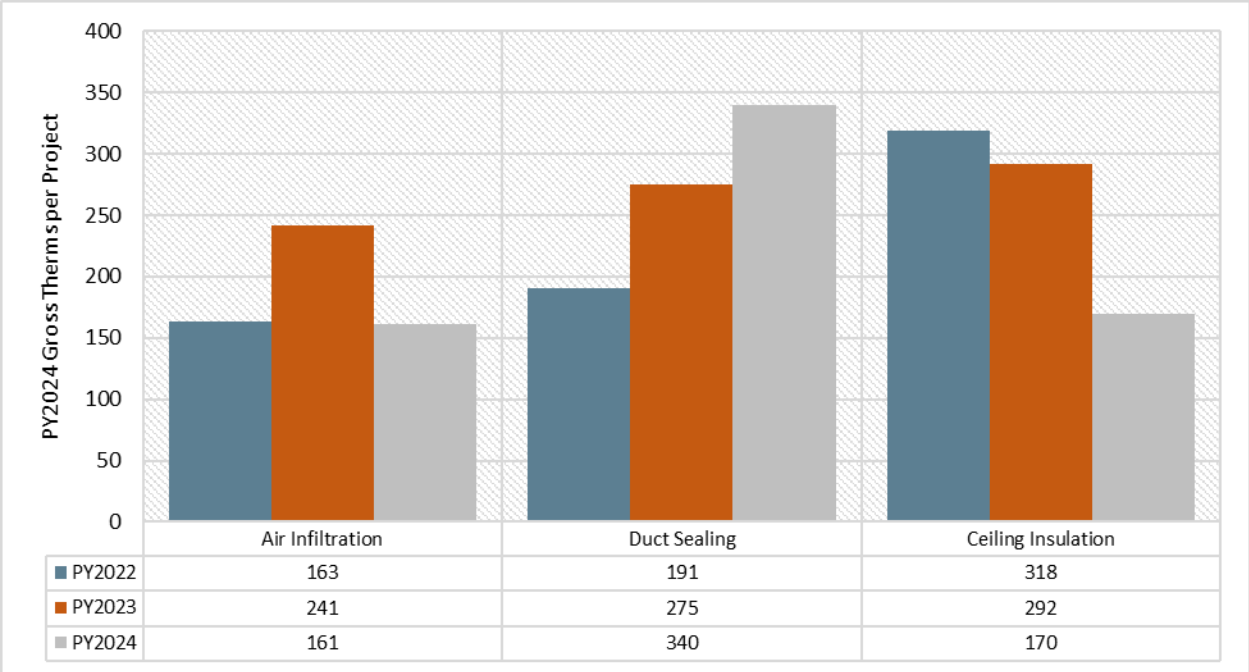

Figure 7-1: Program Net Savings by Measure

In addition, incentives were provided for 113 assessments (85% of participants).

7.3 LIP Process Evaluation

AR TRM V9.2 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 7-2: Determining Process Evaluation Timing

Component	Determination
New and Innovative Components	No. The program design has been maintained from PY2021
No Previous Process Evaluation	No. The program received a limited process evaluation PY2021
New Vendor or Contractor	No. The program implementation contractor is unchanged from PY2021.

Table 7-3: Determining Process Evaluation Conditions

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Component	Determination
Are program impacts lower or slower than expected?	No. The program has met its savings goals.
Are the educational or informational goals not meeting program goals?	No. The program significantly improved comprehensiveness and H&S spending in PY2022 and PY2023 after PY2021 findings identified shortfalls.
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 was at expected levels.
Do participants report problems with the programs or low rates of satisfaction?	No. PY2023 survey results suggest high satisfaction.
Is the program producing the intended market effects?	Yes. Non-program contractors are being informed of opportunities within the non-participant market.

The Evaluators conducted a limited process evaluation for LIP.

7.3.1 Data Collection Activities

The Evaluators completed an interview with program staff. The findings from the interview are summarized in Section 6.4.

7.3.2 LIP Metrics Summary

Table 6-5 and Table 6-6 summarize the required CWA metrics. The number of completed audits and homes with projects increased from PY2023 to PY2024. In PY2023, 65 audits were completed, compared to 113 in PY2024. Similarly, the number of homes with projects rose from 30 in PY2023 to 132 in PY2024.

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Table 7-4: CWA Required Process Evaluation Metrics

Metric	Value
Program name	Low Income Program
CWA implementation	The CWA is implemented using a third-party contractor (CLEAResult) with a network of pre-approved trade allies that market the program. The program coordinates with SWEPCO and Entergy
Total audits completed	113
Total submitted projects	132 (19 projects completed after assessment from previous program year)
Conversion rate*	117%
Measures installed per-project	3.19
Cost per participant	No customer co-pay. AOG paid $1,405/home
Percent of contractors promoting program	100%

* The conversion rate is defined as the ratio between the number of unique jobs completed during the Program Year divided by the number of audits completed during the Program Year (jobs/audits).

Table 7-5 Alignment with CWA Requirements

Requirement	Alignment with Requirement	Percent of Participants Receiving
Includes Applicable DI Measures	Yes	16.7%
Aerators	Yes	3.0%
Showerheads	Yes	0.8%
Prequalifies homes based on year of construction or energy costs	Yes, the customer must have had a bill in the last twelve months that exceeded ten cents per square foot or the home's age is 10 years or greater.	Not in tracking data
TRC is used to assess program cost-effectiveness	Yes	N/A
Measures screened using SIR or comparable metric	Program uses TRC	N/A
Includes Core No Cost Measures	Yes	100.0%
Audit (walk through)	Yes	85.6%
Attic insulation	Yes	40.9%
Duct sealing	Yes	47.7%
Air infiltration reduction	Yes	49.2%
Safety testing and/or measures	Yes	78.0%
Offers other utility measures	Yes	N/A
Contractors are certified BPI Building Analyst or RESNET HERS Rater	Yes, for duct sealing, air infiltration, and assessments. Insulation requires Arkansas Home Improvement Specialty License.	N/A

Table 7-6 summarizes the health and safety measure activity for the LIP during PY2024. The average health and safety spend was $462.87 per home.

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Table 7-6 Health and Safety Summary

IQW H&S Measures	Count of Participant	Total Quantity	Energy Savings (Therms)	Incentive
CO/Fire/Smoke Detectors	80	184	0	$6,795.00
Gas line/appliance work	4	4	0	$525.00
Indoor Air Quality	1	1	0	$200.00
Mechanical Ventilation	41	64	0	$23,700.00
Moisture	6	6	0	$7,600.00
Other	50	73	0	$8,855.92
H&S Total	**103**	**332**	**0**	**$47,675.92**

Figure 7-2 summarizes the Act 1102 demographic criteria data that was included in the program tracking data in PY2024.

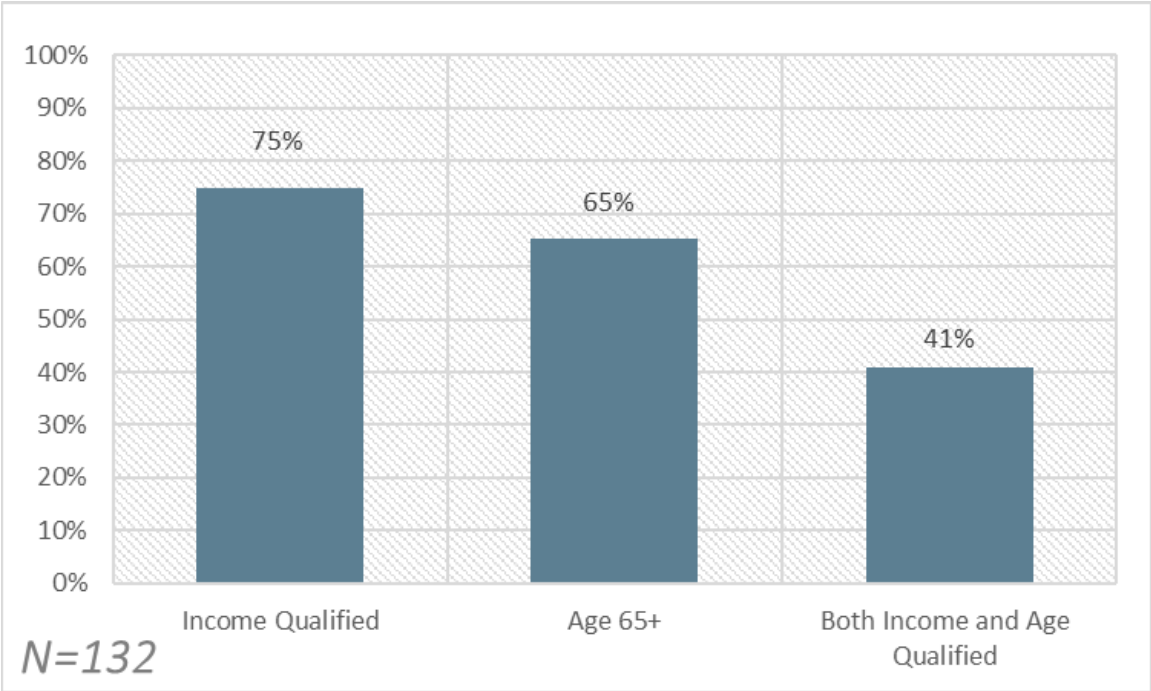

Figure 7-2: LIP Act 1102 Demographic Qualification Summary

7.3.3 Key Project Statistics

The Evaluators reviewed PY2021 - PY2024 LIP projects to assess differences in customer characteristics and project outcomes. Key findings are summarized in Table 7-7.

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Table 7-7: Key Participant Statistics

Metric Group	Metric	PY2021	PY2022	PY2023	PY2024
Participant Overall	Net Therms/Participant*	312	367	407	437
	Average Total Project Cost*	$623	$1,149	$1,451	$1,008
	Health & Safety Cost**	$18	$250	$353	$463
	$/Net Therm	$2.00	$3.13	$3.57	$2.30
Housing Characteristics	Home Total Sq. Ft.	1,623	1,797	1,206	1,714
	AC Size (Tons)	3.08	3.08	2.69	2.69
Gross Savings Parameter	Attic Insulation Sq. Ft.	1,893	1,412	1,501	1,752
	Duct Leakage Reduction	255	249	318	294
	Air Infiltration Reduction	1,396	1,736	2,703	2,346
	LEDs Installed	3.00	10.35	5.63	8.20
*Per-participant with at least one energy-saving measure **Per-participant with at least one H&S measure					

Health and safety spending has continued to increase, reaching $463 per home. Acquisition cost has increased, as result of 1) increased health and safety spending and 2) assessments completed in PY2024 that have not yet had a subsequent measure installation.

7.4 Protocol A: Tracking Data Review

Table 7-8 summarizes the Protocol A tracking data review for the LIP. The CLEAResult DSMT tracking database contained all required fields needed for an impact evaluation.

Table 7-8: LIP Protocol A Summary

Category	Field	Status	Description of Issue(s)
Participating Customer Information	Unique customer identifier, such as account number	-	Account numbers are not included in the program data to limit the distribution of personally identifiable information.
	Customer contact information – name, mailing address, telephone number	✓	
	Date/s of major customer milestones such as rebate application date, approval date, rebate processing date, etc.	✓	
Measure-Specific Information	Measure Group (Equipment Type)	✓	
	Equipment Fuel/Energy Source	-	Heating type is not explicitly reported in the program tracking data.
	Equipment Quantity	✓	
	Efficiency Level	✓	
	Estimated Savings	✓	
	Estimated incremental measure cost	×	
	Equipment Useful Life	×	
	Measure Name – Text Description	✓	
	Measure Name – Numerical Code	N/A	

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	Serial Number	N/A	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	✓	
	Other inputs necessary for the use and compliance with the TRM	✓	
Vendor-Specific Information	Name and Contact Information for Contractor	✓	
	Contractor Type	✓	
	Date of Installation	✓	
	Cost of the installed equipment	×	
	Efficiency level of the installed equipment	✓	
Program Tracking Information	Date of the initial program contact/rebate information	×	
	Date of rebate/incentive paid	✓	
	Incentive amount paid to-date	✓	
	Incentive amounts remaining	✓	
	Application Status (i.e., number of applications approved, pending, or denied)	✓	
	Reason and reason code for application denial	×	
Program Costs	Overall program budgets	N/A	Not applicable to the LIP tracking data.
	Program expenditures to-date	N/A	
	Incentive Costs	N/A	
	Administrative Costs	N/A	
	Marketing/Outreach Costs	N/A	
	Evaluation Costs	N/A	
Marketing and Outreach Activities	Advertising and marketing spending levels	N/A	Not applicable to the LIP tracking data.
	Media schedules	N/A	
	Summary of number of community events/outreach activities	N/A	
	Other media activities – estimated impressions via mailings, television/radio; print ads.	N/A	

7.5 LIP Impact Evaluation

The evaluation effort of the LIP included the following:

- *Desk Review of Residential Calculations.* The Evaluators utilized TRM V9.1 values in assessing savings from measures included in the program.
- *Field Verification.* The Evaluators applied field verification results from the AOGWP field data collection efforts
- *Free-ridership Estimation.* Free-ridership rates were developed from a literature review of low income program NTG practices.

7.5.1 NEBS Summary

Table 7-9 summarizes the NEBs credited to the LIP.

Table 7-9: LIP Non-Energy Benefits

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Measure	Electric Savings	Water Savings	Propane Savings	Avoided Replacement Cost
Air Infiltration	✓			
Attic Insulation	✓			
Duct Sealing	✓			
Faucet Aerator		✓		
Low Flow Showerhead		✓		
LEDs	✓			✓

Water savings from low flow devices are calculated using TRM V9.1 protocols. Electric savings are calculated in a similar manner and credited to AOG when the participant is served by a municipal or rural co-op utility. Though propane savings are hypothetically claimable, the program design requires natural gas space heating or gas water heating for the applicable measures to be installed and as such no propane savings occur.

7.5.2 Tracking Review

The impact evaluation began with a review of program tracking data. The tracking data included had a single row for each customer, with multiple columns detailing savings by measure. Table 7-10 summarizes ex ante savings by measure for the LIP.

Table 7-10: LIP Ex Ante Summary

Measure	Ex Ante Therms
Air Infiltration	10,208
Attic Insulation	9,172
Duct Sealing	21,961
Faucet Aerator	19
LED Lamp	0
Low-Flow Showerhead	26
Total	**41,386**
Sums may differ due to rounding.	

The tracking data provided measured values for duct pressurization testing and blower door tests, allowing for the recreation of ex ante calculations based on leakage reduction. Ceiling insulation included an indicator for baseline R-value.

7.5.3 In-Service Rates

ADM applied the ISRs developed for the PY2024 AOGWP to the LIP (see Section 6.6.3).

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7.5.4 Free-ridership

The Evaluators assigned a NTG of 100%, keeping with industry best practices for low income weatherization programs as specified in the Department of Energy Uniform Methods Project[14].

7.5.5 Ex Post Savings

Table 7-11 gross savings results of the evaluation of the PY2024 LIP.

Table 7-11 LIP: Ex Post Gross Savings Summary

Measure	Ex Ante Therms	Ex Post Therms	EUL	Lifetime Therms
Air Infiltration	10,208	10,450	11	114,946
Attic Insulation	9,172	9,172	20	183,435
Duct Sealing	21,961	21,753	18	520,569
Faucet Aerator	19	19	10	189
Low-Flow Showerhead	26	26	10	259
LED Lamp	0	-47	12.5	-589
Total	**41,386**	**41,372**	**17**	**689,785**
Sums may differ due to rounding.				

Net savings are summarized in Table 7-12.

Table 7-12: LIP Program Net Savings Summary

Measure	Free-ridership Rate		Net Annual Savings		Net Realization Rate	EUL	Net Lifetime Therms Savings
	Ex Ante	Ex Post	Ex Ante	Ex Post			
Air Infiltration	0.0%	0.0%	10,208	10,450	102%	11	114,946
Attic Insulation	0.0%	0.0%	9,172	9,172	100%	20	183,435
Duct Sealing	0.0%	0.0%	21,961	21,753	99%	18	391,546
Faucet Aerator	0.0%	0.0%	19	19	99%	10	189
LED Lamp	0.0%	0.0%	0	-47	99%	12.5	-589
Low-Flow Showerhead	0.0%	0.0%	26	26	99%	10	259
Total	**0.0%**	**0.0%**	**41,386**	**41,372**	**100%**	**17**	**689,785**
Sums may differ due to rounding.							

7.5.6 Water & Electric NEBs

The LIP had 10,683 annual water savings (gal) in PY2024.

The Evaluators calculated electric savings for the weatherization program per AR TRM V9.1 Volume 1, Section II, Protocol L1. This was only credited to AOG if the residence was not listed as having been jointly incentivized by SWEPCO or OG&E. Total avoided costs is in Table 7-13.

[14] https://www.energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf

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Benefits were monetized using OG&E's filed avoided energy and capacity costs, due to the significant overlap in service area between AOG and OG&E.

Table 7-13: LIP Ex Post Net Electric Savings

Measure Category	Net Annual kWh	Net Peak kW	Lifetime Net kWh	Monetized Benefit
Air Infiltration	9,634	7.25	105,977	$3,439
Attic Insulation	31,029	24.93	620,575	$17,771
Duct Sealing	42,467	25.80	764,411	$22,495
LED Lamp	4,716	0.71	58,946	$1,810
Total	**87,846**	**58.69**	**1,549,908**	**$45,516**
Sums may differ due to rounding				

7.5.7 Avoided Replacement Cost

To calculate avoided replacement costs (ARCs) and incremental costs for LEDs in the AOGWP, the AR TRM V9.1 Protocol L calculator was used with the following assumptions: 1) replacement-on-burnout for all bulbs and 2) EUL for LEDs is 12.5 years [1]. LED costs were sourced from OG&E program tracking data where available. For direct install LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and labor.

Table 7-14 shows the avoided replacement costs for LEDs in PY2024. The total avoided replacement cost for the LIP program was $416.43.

The natural gas penalty for LEDs was calculated and incorporated into program net savings estimates. It is not included here as it is the primary fuel for AOG, rather than a cross-fuel, and thus is not a NEB.

Table 7-14: LIP Ex Post ARC

Measure Category	ARC Per Bulb	Total Bulbs	Total Monetized Benefit
LEDs	$2.62	164	$416

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7.6 Progress on PY2023 Evaluation Recommendations

The table below summarizes the response by AOG and CLEAResult to the PY2023 recommendations.

Table 7-15 Status of Recommendations from PY2023 Evaluation

2023 Recommendation	Status	Comment
Update tracking to include Act 1102 eligibility fields. This would entail fields marking "income-qualified' or "65+".	In Progress	N/A

7.7 Conclusions

Program Implementation Success	The program met 102% of its net savings goal while spending 98% of its program budget.
	Health and safety spending increased from $353 to $426 per home.
	The program installed 3.19 energy-saving measures at $1,405 per home, continuing the trend of increased expenditure per-home in alignment with Arkansas Comprehensiveness requirements.
Demand for the program continues to be strong.	Program staff are cautious in marketing the program as demand for services continues to be strong. The program completed its final PY2024 projects in August.
Program Tracking	As in PY2023, Program tracking included names and phone numbers for all participants but did not have email addresses.
	As in PY2023, program tracking data did not include Act 1102 eligibility fields, but this was stored separately by CLEAResult and made available to the Evaluators. The Act 1102 fields will be integrated into the 2025 program tracking data.

7.8 Recommendations

The Evaluators have no recommendations for this program at this time.

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8 Appendix A: Site Reports

Program	C&I Solutions
Project ID	
Facility SIC Code	8062 – General Medical Hospital
Measures	Steam Trap Replacement Hot Water Heat Exchanger Boiler Replacement Boiler Blowdown Reduction Boiler Stack Economizer
Annual Consumption	1,367,582 therms

Project Background

The participant is a medical hospital that received incentives from AOG for implementing the following:

- ECM #1: Steam Trap repairs
- ECM #2: Hot Water Heat Exchanger
- ECM #3: Boiler Replacement
- ECM #4: Boiler Blowdown Reduction
- ECM #5: Boiler Stack Economizer

The site uses steam throughout the facility primarily for three process needs: space heating, domestic water heating, and other process heating loads such as sterilization. Savings will come from repairing the failed steam traps throughout the site's steam system.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Feedwater temperature is 212°F
- Annual operating hours of the steam system are 8,760 hrs./yr, but this boiler will be down for annual safety inspection for up to 15 days each year, leaving annual operation hours for the boiler at 8,400 AOH.
- Combustion efficiency is 85% (for both pre-retrofit and post-retrofit condition)
- Typical blowdown for a boiler is 4-8% based on DOE steam tip sheet #9. An average of 6% is considered the baseline for this calculation.

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Steam Trap Replacement

The following table shows relevant failed steam traps parameters required for annual energy savings.

Steam Trap Parameters

Steam Trap #	*Orifice Size (in.)*	*Inlet Pressure (psig)*	*Outlet Pressure (psig)*	*Service (Drip/Process)*	*Feedwater Temperature (°F)*	*Boiler Efficiency*	*Operating Hours*
1	1 1/2	15	2	Drip	212	85%	0
2	1 1/2	15	2	Drip	212	85%	0
3	3/4	90	2	Drip	212	85%	0
4	3/4	90	2	Drip	212	85%	0
5	3/4	90	2	Drip	212	85%	0
6	3/4	90	2	Drip	212	85%	0
7	3/4	90	2	Drip	212	85%	8760
8	3/4	90	2	Drip	212	85%	8760
9	3/4	90	2	Drip	212	85%	8760
10	3/4	90	2	Drip	212	85%	0
11	3/4	90	2	Drip	212	85%	8760

Calculations for the annual therms savings use the following equation:

Equation 1. Steam Trap Replacement Annual Energy Savings

$$Annual\ \ therms\ Savings = \frac{Steam\ Trap\ Discharge\ Rate \times OpHrs \times h_{fg}}{EC_{Base} \times Therm\ Conversion\ Factor}$$

Where:

Steam Trap Discharge Rate = steam loss from the system (lb/hr)

OpHrs = annual hours system is pressurized (hrs/yr) = 8,760

H_{fg} = latent heat of evaporation (BTU/lb)

EC_{Base} = combustion efficiency of boiler (%), 85%

Therm Conversion Factor = 100,000 (BTU/therm)

The discharge rate (lb/hr) was calculated using Armstrong's "Steam Loss Through Failed Trap Calculator" (found here: https://www.armstronginternational.com/knowledge/resources-library/calculators/steam-loss)

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Heat Exchanger

Calculations for the annual therms savings use the following equation:

$$Savings\left(\frac{therms}{yr}\right) = 500\ \times gpm \times \left(T_{return} - T_{makeup}\right) \times AOH/Eff\ \%$$

Where:

500 = 8.34 lb/gal * 1 btu/lbm-F * 60 min/hr

gpm = measured flow rate of the leak

T_{return} = Condensate temperature at the trap discharge below the HX

T_{makeup} = City Water temperature per the TRM (66.1F)

AOH = Annual Operating Hours

Eff % = boiler efficiency

Boiler efficiency savings

The boiler is new construction, so the estimated annual usage of that boiler from Load Analysis and the measured boiler operating combustion efficiency was used to calculate the savings. That load analysis was based on the average load on the existing boilers at this facility. The CB Hawk controller only shows the combustion efficiency before the economizer, so a portable Testo combustion analyzer was used to take combustion efficiency readings before and after the economizer.

$$Annual\ Energy\ Savings\left(\frac{CCF}{yr}\right) = Boiler\ Annual\ Usage\left(\frac{CCF}{yr}\right) \times \left(1 - \frac{Efficiency_{Pre}}{Efficiency_{Post}}\right) \quad (1)$$

Where:

$$Boiler\ Annual\ Usage\left(\frac{CCF}{yr}\right) = 259{,}808\frac{CCF}{yr}\ (estimated)$$

$Efficiency_{Pre} = Baseline\ Combustion\ \ Efficiency = 79.58\%$ (thermal efficiency of 79%)
$Efficiency_{Post} = Measured\ Combustion\ Efficiency\ before\ economizer = \ 81.7\%$

Boiler Stack Economizer

The boiler stack economizer calculation uses the same algorithm as above but uses the measured boiler combustion efficiency before and after the stack economizer as the two data points.

$$Annual\ Energy\ Savings\left(\frac{CCF}{yr}\right) = Boiler\ Annual\ Usage\left(\frac{CCF}{yr}\right) \times \left(1 - \frac{Efficiency_{Pre}}{Efficiency_{Post}}\right) \quad (1)$$

Where:

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$$Boiler\ Annual\ Usage\left(\frac{CCF}{yr}\right) = 259{,}808\frac{CCF}{yr}\ (estimated)$$

$Efficiency_{Pre} = Measured\ Combustion\ Efficiency\ before\ economizer = 81.7\%$
$Efficiency_{Post} = Measured\ Combustion\ Efficiency\ after\ economizer = 85.7\%$

Boiler blowdown

Energy is saved by reducing boiler blowdown. Energy is used to raise the temperature of the feedwater up to the temperature of the boiler for all feedwater usage. Blowdown is the fraction of water that is discharged from the boiler without ever becoming steam. Reducing the blowdown rate down to the minimum required will optimize the system.
The mass fraction of feedwater that is blown down is defined as percent blowdown (%bd),

$$\%bd = \frac{fw\ conductivity}{boiler\ conductivity}$$

The total annual feed water flow to the boiler is the sum of the steam output and the blowdown. The thermal energy required to produce the steam and blowdown is;

$$heat = \dot{m}_{st}(h_{st} - h_{fw}) + \dot{m}_{bd}(h_{bd} - h_{fw})$$

The reduction in blowdown reduces total feed water volume. The reduction in feedwater volume reduces the total heat transferred to the boiler to the following;

$$heat_{post} = \left({heat_{pre}}/{(1-\%bd_{pre})(\Delta h_{st}) + (\%bd_{pre})(\Delta h_{bd})}\right)(1-\%bd_{pre})(\Delta h_{st}) + \left({heat_{pre}}/{(1-\%bd_{pre})(\Delta h_{st}) + (\%bd_{pre})(\Delta h_{bd})}\right)\left(\frac{1-\%bd_{pre}}{1-\%bd_{post}}\right)(\%bd_{post})(\Delta h_{bd})$$

The energy savings is then;

$$energy\ savings = heat - heat_{post}$$

And the annual natural gas savings is the energy savings divided by the thermal efficiency of the boiler;

$$annual\ gas\ savings\ (therms) = {energy\ savings}/{\eta_{th}}$$

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Measure Life

Estimated Useful Life

Measure	*EUL*
Steam Trap Replacement	5 years
Hot Water Heat Exchanger	15 years
Boiler Replacement	20 years
Boiler Blowdown Reduction	10 years
Boiler Stack Economizer	15 years

Calculated Savings:

Steam Trap Repairs

Steam Trap Repairs Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Percent Failed*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	189	75%	1,164	180	-
2	189	75%	1,164	180	-
3	43	75%	1,164	180	-
4	43	75%	1,164	180	-
5	43	75%	1,164	180	-
6	43	75%	1,164	180	-
7	133	75%	1,164	180	10,372
8	133	75%	1,164	180	10,372
9	43	75%	1,164	180	3,353
10	43	75%	1,164	180	-
11	43	75%	1,164	180	3,353
				Total:	**27,499**

Overall project savings are as follows:

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Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	27,449	27,449	100%	137,247
Hot Water Heat Exchanger	91,218	91,218	100%	1,368,271
Boiler Replacement	6,742*	6,742*	100%	134,840*
Boiler Blowdown Reduction	2,594*	2,594*	100%	25,940*
Boiler Stack Economizer	12,126*	12,126*	100%	181,890*
TOTAL	**144,582**	**144,582**	**100%**	**1,848,188**
* Value reflects total savings from multi-year 40%/60% allocation				

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Program	C&I Solutions
Project ID	
Facility SIC Code	2026 – Dairy Products, Fluid Milk
Measures	Steam Leak Repairs
Annual Consumption	2,343 therms

Project Background

The participant is a food processing facility that received incentives from AOG for implementing the following:

- ECM #1: Steam Leak Repairs

The existing equipment affected was the steam boiler/generator system which provides steam to processes/comfort heating. Steam leaks have occurred across the given system and the leaks range from valves to fittings. This ECM saved energy by repairing these leaks and improved the system efficiency by reducing steam loss in the plant.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2022 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

The key variables that affected the realization of energy savings include:

- Plume Length (ft)
- System Pressure (psig)
- Boiler Feed Water Temperature (°F)
- Makeup Water Temperature (°F)
- Combustion Efficiency of Boiler (%)
- Operating Hours (hrs./yr.)

Table 1 shows the steam leaks identified for repair at Hilland Dairy. The key variables above, the date, and detailed description of the leaks were collected. In addition, the leak will also be tagged to make it easy to locate and verify that the leak was repaired.

Steam Leak #	Description	Qty of Leaks	Plume Length (ft)	Steam Press (psig)	Annual CCF lost	Notes
1	Steam Leak on Roof - Main Header	1	1.5	96	1,567	
2	Above boiler nearest ammonia compressor	1	0.25	96	776	
					2,343	

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Table 8-1: Steam Leaks Identified

Adjustments, Assumptions & Estimated Values

This M&V Report asserts the following assumptions:

1. Annual operating hours of the steam system are 8760
2. Combustion Efficiency is 85% as conservatively estimated in the absence of a recent combustion efficiency report.
3. Makeup city water is based on AR TRM 9.0 Table 148 – Average Water Main Temperature

Analysis

The following equations were used to determine the annual therm savings associated with this project.

Calculations for ECM (Equating Steam Plume Length to Flow Rate)

It should be noted that this approach to estimate steam (and associated natural gas) losses is an alternative approach to the traditional method for estimating steam losses from leaks, which is equating orifice diameter to flow rate (using the orifice diameter of the leak (inches), in conjunction with the steam system's absolute pressure (psia). It should also be noted that the steam plume length method is considered a reasonably accurate method to estimate steam losses and yields similar results – up to active steam plume lengths of about 6 feet. The equation using orifice diameter is not included in this plan, and that method is often more difficult to use since the orifice diameter is frequently unknown and harder to determine than estimating the length of the visible plume resulting from the leak.

The equation derived by G.G. Rajan ("Energy Savings in Steam Systems," Cochin, India) for steam leak rate as a function of the active steam plume length is as follows:

$$Leak\ Rate\ \left(\frac{kg}{hr}\right) = 2.5678\ x \exp[1.845\ x\ Plume\ Length\ (m)]$$

$$Leak\ Rate\ \left(\frac{lb}{hr}\right) = 5.661\ x \exp\ [0.562\ x\ Plume\ Length\ (ft)]$$

Equation 2: Equating Steam Plume Length to Flow Rate

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This method yields similar results as the methods established by the Council of Industrial Boiler Owners (CIBO Energy Efficiency Handbook, Burke, VA, 1997) and Asian Productivity Organization (Training Manual on Energy Efficiency for Small and Medium Enterprises, Tokyo, 2010).

Calculation for Heat Loss

System heat loss from a steam leak will be calculated as:

$$Heat\ Loss\ \left(\frac{Btu}{hr}\right) = Leak\ Rate\ \left(\frac{lb}{hr}\right) x\ [Steam\ Enthalpy\ \left(\frac{Btu}{lb}\right) - MW\ Enthalpy\ \left(\frac{Btu}{lb}\right)]$$

Where:
Leak Rate = 5.661 x exp(0.562 x Plume Length in ft) (lbs / hr)

Steam Enthalpy = Steam look up table (Saturated Steam Region) based on steam pressure (h_g @ system steam pressure)

MW Enthalpy = Steam look up table (Sub-Saturated Water Region) based on MW temperature (h_f @ average city makeup water temp from AR TRM 9.0, Table 148)

Energy Savings

The annual natural gas energy savings from repairing a steam leak will be calculated as follows:

$$Annual\ Energy\ Savings\ (CCF) = \frac{Heat\ Loss\ \left(\frac{Btu}{hr}\right) x\ Annual\ Operating\ Hours\ \left(\frac{hrs}{yr}\right)}{Boiler\ Efficiency(\%)\ x\ 100{,}000\ \frac{Btu}{CCF}}$$

Where:

Annual Operating Hours = Assumption obtained from plant/facility representative

Boiler Efficiency = Assumption of 85%, unless recent analysis provided by customer indicates otherwise (Combustion test to be completed during post inspection)

100,000 Btu/CCF = Conversion factor (BTU/yr to CCF/yr)

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Measure Life

Estimated Useful Life

Measure	*EUL*
Steam Leak Repair	10 years

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Leak Repair	2,343	2,343	100%	23,430
TOTAL	**2,343**	**2,343**	**100%**	**23,430**

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9 Appendix B: Deferred Replacement Cost Calculations

This appendix presents the calculations of deferred replacement costs for residential and commercial tankless water heaters, furnace early retirement, and LEDs.

Measure Type	Water Heater - Residential

Nominal Discount Rate	5.12%
Inflation Rate	1.90%
Real Discount Rate	3.16%

	Program	Baseline
Equipment Type	Tankless WH	Storage WH
Effective UsefulLife	20	11
Remaining Useful Life		0
PW(EUL)	14.66	9.17
PW(RUL)		0.00
Installed Cost	$1,219	$614
Deferred Replacement Cost		$367.46
PWF Formula		$367.46

Figure 9-1: Residential Tankless WH Avoided Replacement Cost Calculation

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Measure Type	Water Heater - Commercial

Nominal Discount Rate	5.12%
Inflation Rate	1.90%
Real Discount Rate	3.16%

	Program	Baseline
Equipment Type	Tankless WH	Storage WH
Effective UsefulLife	20	15
Remaining Useful Life		0
PW(EUL)	14.66	11.80
PW(RUL)		0.00
Installed Cost	$1,219	$614
Deferred Replacement Cost		$148.74
PWF Formula		$148.74

Figure 9-2: C&I Tankless WH Avoided Replacement Cost Calculation

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Measure Type	Furnace

Nominal Discount Rate	5.12%
Inflation Rate	1.90%
Real Discount Rate	3.16%

	Program	Baseline
Equipment Type	HE Furnace	SE Furnace
Effective UsefulLife	20	20
Remaining Useful Life		5
PW(EUL)	14.66	14.66
PW(RUL)		4.56
Installed Cost	$2,548	$2,011
Deferred Replacement Cost		$1,385.63
PWF Formula		$1,385.63

Figure 9-3: Furnace Early Retirement Deferred Replacement Cost Calculation

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Nominal Discount Rate	5.12%
Inflation Rate	1.90%
Real Discount Rate	3.16%

	Program	Baseline
Equipment Type	LED	Halogen
Effective UsefulLife	12.5	2
Remaining Useful Life		
PW(EUL)	$10.20	$1.91
PW(RUL)		
Installed Cost	$5.14	$1.25
Deferred Replacement Cost		$5.43
PWF Formula		$5.43
Incremental Cost	-$1.54	

Equipment Type	LED	Halogen	CFL
Effective Useful Life	12.5	2	7
Remaining Useful Life			
Last Year of Tier I Baseline	1	2	
PWF(EUL)	$10.20	$1.91	$6.19
PWF(Tier I)	$0.97	$1.91	$0.00
PWF(Tier II)	$10.20	$0.97	
Installed Cost	$5.14	$1.25	$2.17
Avoided Replacement Cost	$2.62	-$0.62	$3.23
PWF Formula	$2.62	-$0.62	$3.23
Incremental Cost	$1.27		

Figure 9-4: Direct Install LED Avoided Replacement Cost Calculation

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10 Appendix C: Sample TRM Calculations

10.1 Residential Furnaces (AR TRM V9.2 Section 2.1.3)

The Arkansas TRM V9.2, savings for residential furnaces are calculated as follows:[15]

$$\boldsymbol{Annual\ Therm\ Savings} = \boldsymbol{Heat\ load} \times \left({}^{\mathbf{1}}/_{\boldsymbol{AFUE_{base}}} - {}^{\mathbf{1}}/_{\boldsymbol{AFUE_{eff}}} \right)$$

$$Heat\ load = (therms\ /\ sq.\ ft.\ /\ year) \times heated\ area$$

Where:

Heated area = square footage of the project site. If site area is unknown, use installed capacity (BTUh)/30 (BTUh /ft^2).

$AFUE_{base}$ = baseline efficiency of the furnace, 80% AFUE.

$AFUE_{eff}$ = efficiency of the new furnace installed, in AFUE.

Table 10-1 summarizes the heating load multipliers per square foot from the AR TRM V9.2.

Table 10-1: AR TRM V9.2 Annual Furnace Heating Load

Vintage	Heating Load (Therms/Ft.2/Year)			
	Zone 9 – Fayetteville	Zone 8 – Fort Smith	Zone 7 – Little Rock	Zone 6 – El Dorado
1979 & earlier	0.404	0.360	0.336	0.296
1980-1989	0.303	0.270	0.252	0.222
1990-1999	0.202	0.180	0.168	0.148
2000 & later	0.152	0.135	0.126	0.111

Example savings calculations are as follows:

- Retrofit – 90,000 Input BTU furnace, 95% AFUE
- Output BTU = 90,000 x .95 = 85,500
- Square Feet = 85,500 / 30 = 2,450
- Year built: 1986
- Location: Fort Smith, Zone 8.

[15] Arkansas TRM V9.2 Volume 2, Page 40

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$$\boldsymbol{Retrofit\ Therms\ Savings = 2,450ft.^2 \times .270 \frac{Therms}{ft.^2} \times \left(\frac{1}{.80} - \frac{1}{.95}\right)}$$
$$\boldsymbol{= 130.56\ Therms}$$

The same furnace in a new construction project would save:

$$\boldsymbol{NC\ Therms\ Savings = 2,850ft.^2 \times .135 \frac{Therms}{ft.^2} \times \left(\frac{1}{.80} - \frac{1}{.95}\right) = 75.94\ Therms}$$

10.2 Residential Water Heater Replacement (AR TRM V9.2 Section 2.3.1)

Energy savings values for storage tank water heaters were developed using installed Energy Factor ratings as determined by the Gas Appliance Manufacturers Association Directory of Certified Water Heating Products. Tank sizing must follow AHRI standards.

In AR TRM V9.2 Savings are calculated as:[16]

$$Annual\ Therms_{Savings} = \frac{\rho \times C_p \times V \times \left(T_{SetPoint} - T_{Supply}\right) \times \left(\frac{1}{UEF_{base}} - \frac{1}{UEF_{post}}\right)}{100000}$$

Where:

ρ = Water density, 8.33 lbs./gal.

C_p= Specific heat of water, 1 BTU/lb·°F

V = Estimated annual hot water use (gal per year)

$T_{SetPoint}$= Water heater set point, if unavailable, use 120°F

T_{Supply}= Average supply water temperature

UEF_{base} = Baseline value

UEF_{post} = Energy Factor of new water heater

100,000 = Conversion constant for BTU to therms

Baseline energy factors are summarized in Table 10-2.

[16] Arkansas TRM V9.2, Volume 2. Pg. 129 – 130

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Table 10-2: Residential Water Heating Baseline Uniform Energy Factors

Draw Pattern	Equivalent Gallons	Baseline UEF
Very Small	20	0.3056
Low	30	0.5412
Medium	40	0.5803
High	50	0.6270

Volume estimates are provided in Table 10-3.

Table 10-3: AR TRM V9.2 Estimated Annual Hot Water Use

Weather Zone	Tank Size (Gal) of Replaced Water Heater			
	40	50	65	80
9	18,401	20,911	25,093	30,111
8	18,331	20,831	24,997	29,996
7	18,267	20,758	24,910	29,892
6	17,815	20,245	24,293	29,152

Supply water temperatures are presented in Table 10-4

Table 10-4: Residential Water Supply Inlet Temperatures

Weather Zone		Supply Water Temperature
9	Fayetteville	65.6
8	Fort Smith	66.1
7	Little Rock	67.8
6	El Dorado	70.1

Example savings calculations are as follows:

- Retrofit – 199,000 Input BTU Tankless Water Heater, 96% UEF
- High Draw Pattern
- Location: Fort Smith, Zone 8

$$Therm\ Savings = \frac{8.33 \times 1 \times 20{,}831 \times (120 - 66.1) \times \left(\frac{1}{0.627} - \frac{1}{0.96}\right)}{100{,}000}$$

$$= 51.74\ Therms$$

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10.3 Smart Thermostats (AR TRM V9.2 Section 2.1.12)

The savings multipliers for smart thermostats are shown in Table 10-5[17].

Table 10-5: Smart Thermostat Deemed Savings Factors

Baseline	Therms/Ft.^{2}	kWh/Ft.^{2}
Manual	0.037	0.450
Programmable	0.009	0.113
Default	0.033	0.399

10.4 Commercial Furnaces (AR TRM V9.2 Section 3.1.8)

Therms savings calculations for commercial furnaces apply more facility-specific information than the residential methodology. Savings were calculated as follows:[18]

$$\boldsymbol{Therms\ Savings} = \frac{\boldsymbol{BTU\ Capacity * EFLH_H * \left(\frac{1}{Effic_{pre}} - \frac{1}{Effic_{post}}\right)}}{\boldsymbol{100,000\ Therms/BTU}}$$

$$Therm_{savings} = Capacity \times EFLH_H \times \left(\frac{1}{\eta_{pre}} - \frac{1}{\eta_{post}}\right) \times \left(\frac{1}{100{,}000}\right)$$

Where:

Capacity = Rated equipment output heating capacity, Bth/h
$EFLH_H$ = Equivalent full-load hours from heating
η_{pre} = Efficiency of the existing furnace
η_{post} = Efficiency of the new furnace
100,000 = Converts BTU to therms

The EFLH for a facility is a function of facility type and weather zone. The AR TRM V9.2 EFLH values are summarized in Table 10-6.

Table 10-6: EFLH Values[19]

Building Type	Zone 6	Zone 7	Zone 8	Zone 9
Assembly	615	854	915	1032
College/University	674	936	1002	1130
Fast Food Restaurant	287	439	472	549
Full Menu Restaurant	178	321	362	438
Grocery Store	692	941	1001	1129
Health Clinic	641	878	915	1045
Lodging	391	589	637	722
Large Office (>30k Ft^2)	816	1020	1060	1157
Small Office (<30k Ft^2)	351	534	564	644

[17] AR TRM V9.2 Vol. 2.0 Pg. 81

[18] Arkansas TRM V9.2, Pg. 246

[19] Arkansas TRM V9.2 Volume 2, Table 490. Pg. 527.

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Religious Worship	575	798	854	963
Retail	781	1043	1133	1287
School	777	1030	1094	1236

For example, if a Small Office in Fort Smith (Zone 8) installed a 70,000 BTU 96% AFUE Furnace, the resulting therms savings are calculated as:

$$Therm\ Savings\ =\ 70{,}000 \times 564 \times \left(\frac{1}{0.80} - \frac{1}{0.96}\right) \times \left(\frac{1}{100{,}000}\right) = 82.24\ Therms$$

10.5 Commercial Water Heaters (AR TRM V9.2 Section 3.3.1)

Therms savings for commercial water heaters are calculated as:[20]

$$Therms_{Savings} = \rho \times C_P \times GPD \times \left(T_{SetPoint} - T_{Supply}\right) \times \left(\frac{1}{EF_{base}} - \frac{1}{EF_{post}}\right) \times \frac{Days}{Year} \times \frac{1}{100{,}000}$$

Where:

ρ = Water Density, 8.33 lbs/Gallon

C_P = Specific Heat of Water, 1 BTU/Lb. F

GPD = Average daily hot water use (gallons per day)

$T_{SetPoint}$ = Water Heater setpoint, 120 deg. F

T_{Supply} = Supply water temperature, 58 deg. F

EF_{base} = Energy factor of existing water heater (.62 - .0019V)

EF_{post} = Energy factor of installed water heater

Days/Year = Days per year of operation

100,000 = Conversion constant from Btu to therms

[20] Arkansas TRM V9.2, Volume 2. Pg. 354 – 358

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The required facility-specific inputs are volume and days/year. Volume can be calculated on the basis of square footage of the facility or from units served. Table 10-7 presents the volume and days of usage values for a facility by square footage.[21]

Table 10-7: Hot Water Requirements by Facility Size

Building Type	Gallons / Unit / Day	Unit	Units / 1,000 ft.^{2}	Applicable Days / Year	Gallons / 1,000 ft.^{2} / Day
Small Office	1	Person	2.3	250	2.3
Large Office	1	Person	2.3	250	2.3
Fast Food Rest.	.7	Meal/Day	784.6	365	549.2
Sit-down Rest.	2.4	Meal/Day	340	365	816
Retail	2	Employee	1	365	2.0
Grocery	2	Employee	1.1	365	2.2
Warehouse	2	Employee	.5	250	1.0
Elementary School	.6	Person	9.5	200	5.7
Jr. High/High School	1.8	Person	9.5	200	17.1
Health	90	Patient	3.8	365	342.0
Motel	20	Unit (Room)	5	365	100.0
Hotel	14	Unit (Room)	2.2	365	30.8
Other	1	Employee	.7	250	.7

Table 10-8 presents the volume and days of usage values by unit produced or person served.

Table 10-8: Hot Water Requirements by Unit or Person

Building Type	Size Factor	Average Daily Demand
Commerical/Industrial Laundry Facility	Pounds of Laundry	2.0 Gal. Per Pound
Dormitories	Men	13.1 Gal. per Man
	Women	12.3 Gal. per Woman
Hospitals	Per Bed	90.0 Gal. per Patient
Hotels	Single Room with Bath	50.0 Gal. per Unit
	Double Room with Bath	80.0 Gal. per Unit
Laundromat	Pounds of Laundry	0.56 Gal. Per Pound
Motels	# Units:	
	Up to 20	20.0 Gal. per Unit
	21 to 100	14.0 Gal. per Unit
	101 and up	10.0 Gal. per Unit
Nursing Homes	Per Bed	18.4 Gal. per Bed
Restaurants	Full Meal Type	2.4 Gal. per Meal
	Dive-in Snack Type	0.7 Gal. per Meal
Schools	Elementary	0.6 Gal. Per Student
	Secondary and High School	1.8 Gal. Per Student

[21] Ibid

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10.6 Commercial Faucet Aerators (AR TRM V9.2 Section 3.3.2)

Savings are calculated as follows:[22]

$$\boldsymbol{Annual\ Therms} = [(\boldsymbol{F_B} * \boldsymbol{U_B}) - (\boldsymbol{F_P} * \boldsymbol{U_P}) * \boldsymbol{Days} * (\boldsymbol{T_H} - \boldsymbol{T_C}) * \boldsymbol{C_H} * \boldsymbol{C_G}/\boldsymbol{Eff_G}]$$

$$\boldsymbol{Peak\ Therms} = \boldsymbol{P} * [(\boldsymbol{F_B} * \boldsymbol{U_B}) - (\boldsymbol{F_P} * \boldsymbol{U_P}) * (\boldsymbol{T_H} - \boldsymbol{T_C}) * \boldsymbol{C_H} * \boldsymbol{C_G}/\boldsymbol{Eff_G}]$$

The inputs for this equation are defined in Table 10-9.

Table 10-9: DI Aerator Savings Calculation Parameters

Parameter	Description	Value
F_B	Baseline Flow Rate (GPM)	2.2
F_P	Post Flow Rate (GPM)	≤ 1.5
Days	Annual operating days for the facility[23]	
	Prison	365
	Hospital, Nursing Home	365
	Dormitory	274
	Multifamily	365
	Lodging	365
	Commercial	250
	School	200
T_C	Average supply (cold) water temperature (deg. F)	Zone 9: 65.6
		Zone 8: 66.1
		Zone 7: 67.8
		Zone 6: 70.1
T_H	Average mixed hot water temperature (deg. F)	105
U_B	Baseline water Usage Duration	
	Prison	30 min/day/unit
	Hospital, Nursing Home	3 min/day/unit
	Dormitory	30 min/day/unit
	Multifamily	3 min/day/unit
	Lodging	3 min/day/unit
	Commercial	30 min/day/unit
	School	30 min/day/unit
U_P	Post Water Usage Duration (assumed)	= U_B
C_H	Unit Conversion : 8.33 BTU/Gallons/deg. F	8.33
C_G	Unit Conversion: 1 Therm/100,000 BTU	1/100,000
Eff_G	Efficiency of Gas Water Heater	.8

[22] Arkansas TRM V9.2, Volume 2. Pg. 360 – 363

[23] For facilities that operate year-round: conservatively assume operating days of 360/year; for schools open weekdays except summer: 360 x (5/7) x (9/12) = 193; for dormitories with few occupants in the summer: 360 x (9/12) = 270; and for normal commercial buildings: 360 x (5/7) = 257

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These values translate into per-faucet savings values by facility type, detailed in Table 10-10 and Table 10-11 for 1.0 and 0.5 GPM aerators, respectively.[24]

Table 10-10: 1.0 GPM Commercial Aerator Savings

Facility Type	Fayetteville (Zone 9)	Fort Smith (Zone 8)	Little Rock (Zone 7)	El Dorado (Zone 6)
Prison	53.91	53.22	50.90	47.75
Hospital / Nursing Home	5.35	5.32	5.09	4.78
Dormitory	40.47	39.95	38.21	35.85
Multifamily	5.35	5.32	5.09	4.78
Lodging	5.35	5.32	5.09	4.78
Commercial	36.92	3645	34.86	32.71
School	29.54	29.16	27.89	26.16

Table 10-11: 0.5 GPM Commercial Aerator Savings

Facility Type	Fayetteville (Zone 9)	Fort Smith (Zone 8)	Little Rock (Zone 7)	El Dorado (Zone 6)
Prison	76.37	75.40	72.10	67.65
Hospital / Nursing Home	7.64	7.54	7.21	6.76
Dormitory	57.33	56.60	54.13	50.78
Multifamily	7.64	7.54	7.21	6.76
Lodging	7.64	7.54	7.21	6.76
Commercial	52.31	51.64	49.39	46.33
School	41.85	41.31	39.51	37.07

10.7 Pre-Rinse Spray Valves (AR TRM V9.2 Section 3.7.12)

Low-flow pre-rinse spray valves PRSVs were also direct-installed at a wide range of facility types with food service applications. The savings per unit for these were calculated as follows:[25]

$$\boldsymbol{Annual\ Therms} = [(\boldsymbol{F_B} * \boldsymbol{U_B}) - (\boldsymbol{F_P} * \boldsymbol{U_P})] * \boldsymbol{Days} * (\boldsymbol{T_H} - \boldsymbol{T_C}) * \boldsymbol{C_H} * \boldsymbol{C_G}/\boldsymbol{Eff_G}$$

$$\boldsymbol{Peak\ Therms} = \boldsymbol{P} * [(\boldsymbol{F_B} * \boldsymbol{U_B}) - (\boldsymbol{F_P} * \boldsymbol{U_P})] * (\boldsymbol{T_H} - \boldsymbol{T_C}) * \boldsymbol{C_H} * \boldsymbol{C_G}/\boldsymbol{Eff_G}$$

Table 10-12 presents the definition of these parameters.[26]

Table 10-12: Pre-Rinse Spray Valves Savings Calculation Parameters

Parameter	Description	Value
F_B	Baseline Flow Rate (GPM)	2.25
F_P	Post Flow Rate (GPM)	1.28

[24] Table values interpolated based on data in Arkansas TRM V9.2, Volume 2. Pg. 360 – 362

[25] Arkansas TRM V9.2, Volume 2. Pg. 460 – 482

[26] Ibid

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Days	Annual operating days for the facility[27]	
	Fast Food Restaurant	365
	Casual Dining Restaurant	365
	Institutional	365
	Higher Education	274
	School / K-12	200
T_C	Average supply (cold) water temperature (deg. F)	Zone 9: 65.6
		Zone 8: 66.1
		Zone 7: 67.8
		Zone 6: 70.1
T_H	Average mixed hot water temperature (deg. F)	120
U_B	Baseline water Usage Duration	
	Fast Food Restaurant	45 min/day/unit
	Casual Dining Restaurant	105 min/day/unit
	Institutional	210 min/day/unit
	Higher Education	210 min/day/unit
	School / K-12	105 min/day/unit
U_P	Post Water Usage Duration (assumed)	= U_B
C_H	Unit Conversion: 8.33 BTU/Gallons/deg. F	8.33
C_G	Unit Conversion: 1 Therm/100,000 BTU	1/100,00
Eff_G	Efficiency of Gas Water Heater	.8

10.8 Commercial Low Flow Showerheads (TRM V9.1 Section 3.3.5)

Savings are calculated as follows:[28]

$$\boldsymbol{Annual\ therms} = \frac{\boldsymbol{8.33 * C_p * \Delta V * \left(T_{HW} - T_{Suppy}\right) * \left(\frac{1}{E_t}\right)}}{\boldsymbol{100{,}000\ BTU/therm}} * \frac{\boldsymbol{days}}{\boldsymbol{year}}$$

$$\boldsymbol{Peak\ therms} = \frac{\boldsymbol{8.33 * C_p * \Delta V * \left(T_{HW} - T_{Suppy}\right) * \left(\frac{1}{E_t}\right)}}{\boldsymbol{100{,}000\ BTU/therm}} * \boldsymbol{P}$$

In this formula, $\boldsymbol{\Delta V}$ is calculated as follows:

$$\boldsymbol{\Delta V = U * N * \left(Q_b - Q_p\right) * F_{HW}}$$

Where:

U = average shower duration (7.8 minutes)

[27] For facilities that operate year-round: conservatively assume operating days of 360/year; for schools open weekdays except summer: 360 x (5/7) x (9/12) = 193; for dormitories with few occupants in the summer: 360 x (9/12) = 270; and for normal commercial buildings: 360 x (5/7) = 257

[28] Arkansas TRM V9.2, Volume 2. Pg. 373 – 376

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N = Number of showers per showerhead per day

Q_b = Baseline flow rate (2.5 GPM);

Q_p = Installed flow rate (in GPM); and

F_{HW} = Hot Water Fraction (share of water which is from the water heater)

The inputs for this equation are defined in Table 10-13

Table 10-13: DI Showerhead Savings Calculation Parameters

Parameter	Description	Value
F_B	Baseline Flow Rate (GPM)	2.2
F_P	Post Flow Rate (GPM)	≤ 1.5
Days	Annual operating days for the facility	
	Hospital, Nursing Home	365
	Lodging	365
	Commercial	250
	24 Hour Fitness Center	365
	School	200
T_C	Average supply (cold) water temperature (deg. F)	Zone 9: 65.6
		Zone 8: 66.1
		Zone 7: 67.8
		Zone 6: 70.1
T_H	Average mixed hot water temperature (deg. F)	120
U_P	Post Water Usage Duration (assumed)	= U_B
C_G	Unit Conversion: 1 Therm/100,000 BTU	1/100,00
E_T	Efficiency of Gas Water Heater	.8

Table 10-14: Daily Hot Water Reduction

Installed Flow Rate	Weather Zone	Hospital / Nursing	Lodging	Commercial Employee Shower	24 Fitness Center	Schools
2.0 GPM	9	2.5	3.5	1.9	56.3	2.0
	8	2.5	3.5	1.9	56.1	2.0
	7	2.5	3.5	1.8	55.4	2.0
	6	2.4	3.4	1.8	54.4	2.0
1.75 GPM	9	3.8	5.3	2.8	84.4	3.1
	8	3.8	5.3	2.8	84.1	3.1
	7	3.7	5.2	2.8	83.1	3.0
	6	3.6	5.1	2.7	81.5	3.0
1.5 GPM	9	5.0	7.1	3.8	112.6	4.1
	8	5.0	7.0	3.7	112.2	4.1
	7	4.9	6.9	3.7	110.8	4.0
	6	4.9	6.8	3.6	108.7	.9

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10.9 Commercial Door Air Infiltration (AR TRM V9.2 Section 3.2.10)

Savings are calculated as follows[29]:

$$Therms_{savings,day} = CFM_{pre,day} \times CFM_{reduction} \times 1.08 \times \Delta T \times Hours_{day} \times \frac{1}{0.80} \times \frac{1}{100{,}000}$$

$$Therms_{savings} = Therms_{savings,day} + Therms_{savings,night}$$

$$Peak\ Therms = \frac{Therms_{saving}}{EFLH_H}$$

The inputs for this equation are defined in Table 10-15.

Table 10-15: DI Door Infiltration Savings Calculation Parameters

Parameter	Description	Value
CFM_{pre}	Calculated pre-retrofit air infiltration rate (ft^3/min)	
CFMreduction	Average infiltration reduction	79%
ΔT	Change in temperature across gap barrier	
$Hours_{day}$	12-hour cycles per day, per month	4,380 hours
$Hours_{night}$	12-hour cycles per day, per month	4,380 hours
$EFLH_H$	Equivalent full-load hours	See table below

Table 10-16: $EFLH_H$ By Weather Zone

Building Type	Zone 6	Zone 7	Zone 8	Zone 9
Assembly	615	854	915	1,032
College/University	674	936	1002	1,130
Fast Food Restaurant	287	439	472	549
Full Menu Restaurant	178	321	362	438
Grocery Store	692	941	1,001	1,129
Health Clinic	641	878	915	1,045
Lodging	391	589	637	722
Large Office (>30k Sq.ft)	816	1,020	1,060	1,157
Small Office (≤30k Sq.ft)	351	534	564	644
Religious Worship	575	798	854	963
Retail	781	1,043	1,133	1,287
School	774	1,030	1,094	1,236

These values translate into per linear foot savings values by weather zone, detailed in the table below.

[29] Arkansas TRM V9.1, Volume 2. Pg. 350-356

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Table 10-17: Deemed Annual Therm Savings per Linear Foot

Weather Zone	Gap Width (inches)							
	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1
Zone 9	5.34	10.80	16.08	21.43	26.80	32.16	37.52	42.88
Zone 8	4.64	9.38	13.96	18.62	23.27	27.96	32.58	37.24
Zone 7	3.91	7.92	11.79	15.71	19.65	23.58	27.51	31.44
Zone 6	2.89	5.86	8.72	11.62	14.53	17.44	20.35	23.25

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11 Appendix D: Cost-Effectiveness Inputs

Table 11-1: PY2024 AOG Avoided Cost Values

Year	$/Therm	$/kWh	$/kW	$/Gallon Water
2024	$0.6883	$0.0344	$107.24	$0.0097
2025	$0.7015	$0.0351	$109.39	$0.0102
2026	$0.7150	$0.0358	$111.57	$0.0107
2027	$0.7287	$0.0365	$113.80	$0.0112
2028	$0.7427	$0.0373	$116.08	$0.0117
2029	$0.7570	$0.0380	$118.40	$0.0123
2030	$0.7715	$0.0388	$120.77	$0.0129
2031	$0.7863	$0.0395	$123.19	$0.0135
2032	$0.8014	$0.0403	$125.65	$0.0141
2033	$0.8168	$0.0411	$128.16	$0.0148
2034	$0.8325	$0.0420	$130.73	$0.0155
2035	$0.8485	$0.0428	$133.34	$0.0163
2036	$0.8648	$0.0436	$136.01	$0.0170
2037	$0.8814	$0.0445	$138.73	$0.0179
2038	$0.8983	$0.0454	$141.50	$0.0187
2039	$0.9155	$0.0463	$144.33	$0.0196
2040	$0.9331	$0.0472	$147.22	$0.0206
2041	$0.9510	$0.0482	$150.16	$0.0215
2042	$0.9693	$0.0492	$153.17	$0.0226
2043	$0.9879	$0.0501	$156.23	$0.0237

Table 11-2: PY2024 AOG Discount Rates

Test	Discount Rate
TRC	5.12%
UCT	5.12%
RIM	6.18%
PCT	13.22%

Table 11-3: PY2024 Line & Distribution Losses

Test	Discount Rate
Gas Distribution Losses	2.69%
Line Losses – Energy	8.37%
Line Losses – Demand	8.37%