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May 15, 2024

Ms. Karen Shook, Secretary
Arkansas Public Service Commission
1000 Center Street
Little Rock, AR 72201-4314

Re: 2023 Energy Efficiency Annual Report and SARP Workbook
Docket No. 07-081-TF

Dear Ms. Shook:

Attached please find Summit Utilities Arkansas, Inc.'s 2023 Energy Efficiency Annual Report and SARP workbook.

Should you have any questions, please do not hesitate to reach out with any questions.

Sincerely,

Brooke South Parsons

BSP/at

Enclosures

Cc: All Parties of Record

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Summit Utilities Arkansas, Inc.
Energy Efficiency Program Portfolio
Annual Report
2023 Program Year

Filed: May 15, 2024

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1.0 Executive Summary

1.1 Historical Background

On March 14, 2011, CenterPoint Energy Resources Corp. d/b/a CenterPoint Energy Arkansas Gas ("CenterPoint Arkansas") requested approval from the Arkansas Public Service Commission ("APSC" or the "Commission") of a new comprehensive portfolio of conservation improvement programs ("CIP") for implementation starting on July 1, 2011. The APSC approved the program portfolio on June 30, 2011 and subsequently extended that portfolio in various orders. In August of 2015, CenterPoint Arkansas received approval to replace the Arkansas Weatherization Program with the Saving Homes Weatherization Program for the 2016 program year ("PY") in Order No. 81 in Docket No. 07-081-TF. On June 1, 2016, CenterPoint Arkansas requested approval of an updated comprehensive CIP Portfolio for PY 2017-2019. The APSC approved this request on October 24, 2016, and CenterPoint Arkansas began delivery of this CIP Portfolio on January 1, 2017. On March 15th of 2019, CenterPoint Arkansas submitted for commission approval a comprehensive CIP Portfolio for PY 2020 - 2022. The Commission approved the CIP Portfolio for PY 2020 - 2022 on June 19, 2019. On January 10, 2022, CenterPoint Arkansas was acquired by Summit Utilities, Inc. and is now operating as Summit Utilities Arkansas, Inc ("SUA or Summit Utilities Arkansas or The Company"). Program year 2023 was a bridge year with savings targets and budgets mirroring PY 2022. The bridge year was granted by the Arkansas Public Service Commission on October 15th, 2021, in Order No. 62 in Docket No. 13-002-U.

1.2 Current Portfolio of Programs

Summit Utilities Arkansas's PY 2023 CIP Portfolio consisted of the following nine programs:

- Natural Gas Equipment Program
- Low Flow Showerhead and Faucet Aerator Program
- Home Energy Reports
- Saving Homes Weatherization Program (SHP)

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- Low-Income Savings Homes Program (LISHP)
- Commercial Boiler Program
- Commercial Food Service Program
- Natural Gas Commercial and Industrial Solutions Program

1.3 Major Accomplishments and Milestones Reached

Despite a volatile and uncertain economy, Summit Utilities Arkansas delivered a solidly performing CIP Portfolio for PY 2023. The Company achieved 134% of its energy savings target with a net energy savings total of 3,745,068 therms. Home Energy Reports, Saving Homes Program, Low-Income Saving Homes Program, and the C&I Solutions program all exceeded program savings goals. The Company continued to deliver a comprehensive portfolio with offerings that included prescriptive rebates, direct-install equipment, residential and commercial energy audits, weatherization measures, technical assistance, custom project incentives, and energy usage comparisons. Overall, 135,254 residential and commercial participants were reached. All but one program delivered in PY 2023 were cost-effective with the portfolio achieving a score of 1.67 Total Resource Cost ("TRC"). Summit Utilities Arkansas's CIP portfolio for PY 2023 generated $8.59 million in net economic benefits.

1.4 Goals and Objectives of the CIP Portfolio

Specific objectives associated with the programs are to:

- Reduce end-use natural gas consumption in a cost-effective manner to minimize the long-term cost of utility service and to conserve resources;
- Protect the environment by encouraging installation of efficiency measures that help reduce carbon dioxide emissions and other air pollutant emissions;
- Increase residential and commercial customer awareness of available energy efficiency programs;
- Generate customer awareness of energy efficiency programs available through Summit Utilities Arkansas;
- Provide hard-to-reach and low-income customers the opportunity to participate in the Company's energy efficiency programs by offering weatherization services

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specifically for Low-Income Home Energy Assistance Program ("LIHEAP") eligible customers and customers that are older than 65 years of age, in accordance with ACT 1102.

- Educate trade allies on the value of energy efficiency and increase their participation in Summit Utilities Arkansas's programs; and
- Support a more robust local and state-wide economy by using local labor (when possible) and helping Arkansas residents reduce monthly energy expenses.

1.5 Progress Achieved Versus Goals and Objectives

In PY 2023, Summit Utilities Arkansas reached 134% of the Commission-ordered energy savings target while maintaining a comprehensive and cost-effective portfolio. As a result, the Company was successful at efficiently reducing end-use natural gas consumption throughout its service territory. The Company's PY 2023 energy efficiency efforts are also expected to provide significant environmental benefits. Summit Utilities Arkansas utilized the United States Environmental Protection Agency's Greenhouse Gas Equivalencies Calculator[1] to estimate the impact of reduced emissions attributable to the 3,745,068 in therms savings delivered through the PY 2023 CIP Portfolio. Overall, the Company's programs reduced carbon dioxide (CO2) emissions by 19,815 metric tons. This is equivalent to:

Greenhouse gas emissions from:

- 4,716 passenger vehicles driven for one year; or
- 50,678,597 miles driven by an average passenger vehicle.

Carbon dioxide emissions from:

- Annual energy use of 2,584 homes;
- 21,837,819 pounds of coal burned; or
- 2,229,679 gallons of gasoline consumed

[1] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

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Summit Utilities Arkansas continued to educate its customers and trade allies on the value of energy efficiency and remained focused on creating awareness of the Company's CIP Portfolio offerings. Summit Utilities Arkansas promoted its CIP programs through a variety of channels including its website, email communication, bill inserts, radio, television and print advertising, case studies and supply house displays.

1.6 Portfolio Performance and Prior Year Comparisons

Despite an economy that continues to see increases in the cost of goods and services and high interest rates, Summit Utilities Arkansas' PY 2023 CIP Portfolio had 135,254 distinct participants and produced net energy savings of 3,745,068 therms. In comparison, PY 2022 had 99,906 participants and net energy savings of 3,726,588. Overall program expenditure totaled $8,241,200, which is 80% of the filed budget. Program spend was up when compared to PY2022 and TRC net benefits lower.

Table 1: Portfolio Performance Results and Prior Year Comparison

2023 Energy Savings Summary			
PY	Commission Established Energy Savings Target (Therms)	Achieved Energy Savings (Therms)	% Reached
2022	2,799,934	3,726,588	133%
2023	2,799,934	3,745,068	134%

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Table 2: Portfolio Budget Results and Prior Year Comparison

2023 Budget Summary			
PY	Total Portfolio Budget	Total Portfolio Expenditure	% Reached
2022	$10,241,331	$7,858,634	77%
2023	$10,241,331	$8,241,200	80%

Table 3: Portfolio Cost Effectiveness Results and Prior Year Comparison

2023 Cost Effectiveness Summary		
PY	Portfolio TRC	Portfolio Net Benefits
2022	2.00	$11,306,284
2023	1.67	$8,590,463

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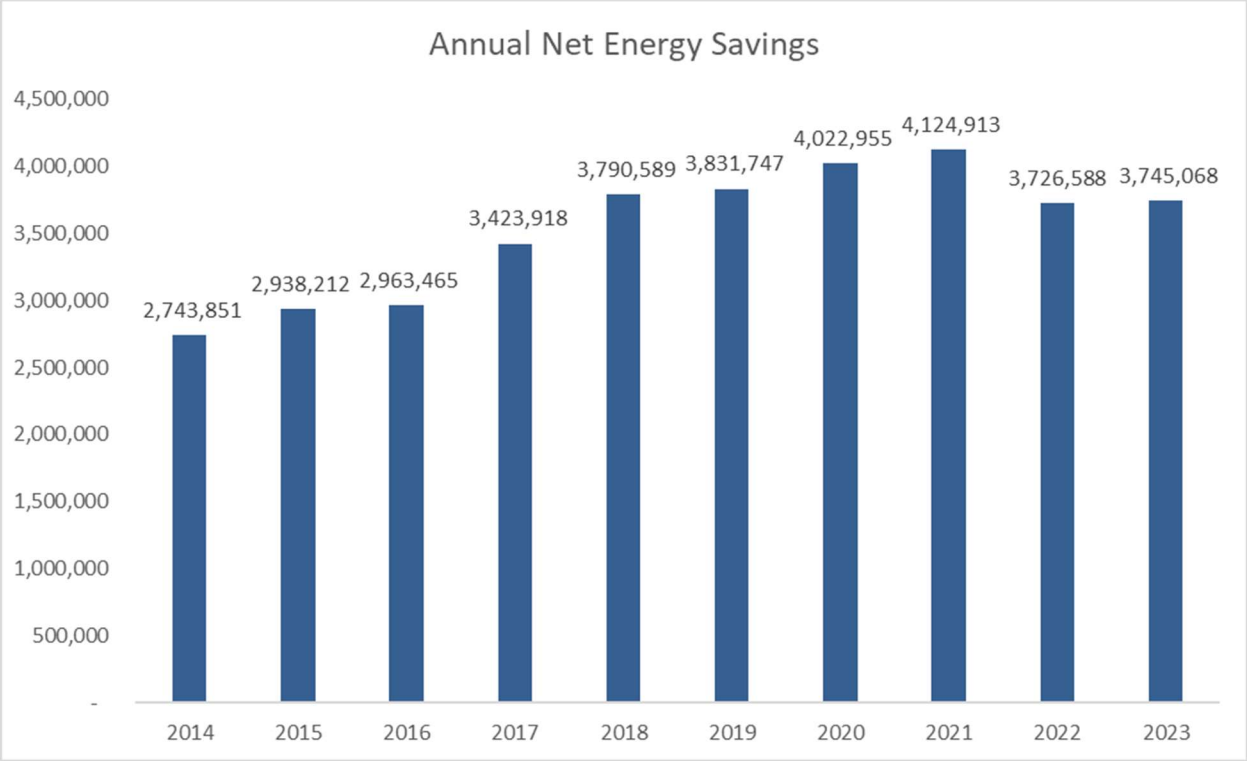
Figure 1: Annual Net Energy Savings in Therms



1.7 PY 2023 Highlights

Saving Homes Program (Weatherization)

Summit Utilities Arkansas Saving Homes Program continues to be strong each year since its inception in 2016. PY 2023 was a good year for the program resulting in energy savings of 492,765 therms and remains cost-effective with a TRC Score of 7.27. Overall, 1,171 distinct customers participated, with a total of 2232 measures installed, in the program in PY 2023.

Low- Income Saving Homes Program (Weatherization)

Summit Utilities Arkansas Low-Income Saving Homes Program is a new offering for PY 2020-2023. PY 2023 was a good year for the program resulting in an increase of energy savings of 58,739 therms, and it remained cost-effective with a TRC Score of 2.70. Overall, 256 distinct customers participated in the program. In addition, health and safety (H&S)

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spending increased from $87 to $229 per participant, and the percent of homes with any H&S spending increased from 43% to 92%.

Natural Gas Commercial and Industrial Solutions Program

The Natural Gas Commercial Solutions Program continued to be a major source of cost-effective energy savings in PY 2023 contributing 47% of the portfolio's total savings. The program delivered a diverse set of custom projects that produced 1,372,301 net therms savings and 1,815,568 gallons of water savings. The Direct Install portion of the program delivered net savings of 387,803 therms and 1,469,778 gallons of water. The program continues to achieve over 100% of goal and has a significant impact on the commercial customers it serves. There were over 35 custom projects completed at 20 sites across the territory and an additional 40 plus customers received direct install measures in PY 2023. The pipeline of projects for this program continues to grow with both return customers as well as new customers benefiting from this program.

Home Energy Reports

The Home Energy Reports programs continues to be a major contributor of savings for the residential program. Total savings for the year were 952,826 therms. The Home Energy Reports Program helps customers make better energy choices every day by making our customers aware of their energy usage habits and helping them make positive changes that reduce consumption and help them save money.

Commercial Food Service Program

The Commercial Food Service Program delivered notably strong performance in PY 2023 with net energy savings totaling 55,329 therms reaching 86% of goal. Program Trade Allies continue to utilize the food service incentives to up-sale customers to high efficiency cooking equipment . The Commercial Food Service Program plays a vital role in the K-12 Schools systems looking to conserve energy in their cafeteria operations. 64% of the program's participants came from these educational institutions.

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Natural Gas Equipment Program

In PY 2023, Summit Utilities Arkansas Natural Gas Equipment Program delivered net energy savings of 371,043 therms. The Company continued to offer the $1,500 (combination) rebate for customers who install both a natural gas tankless water heater, .80 Uniform Efficiency Factor ("UEF") or higher, and a natural gas furnace, .95 Annual Fuel Utilization Efficiency ("AFUE") or higher. Summit Utilities Arkansas staff continues to work to create awareness of this opportunity and the Company has seen the rebates influence builders, homeowners, and housing authorities throughout the state. In total, 66 customers participated producing 12,581 net therms saved. The natural gas equipment PY 2023 experienced a slight increase in participation. However, we continue to see challenges in the market from inflationary pressures and a decline in new housing starts due to rising interest rates.

1.8 Planned Changes to Programs or Budgets

A bridge year was granted by the Arkansas Public Service Commission on October 15th, 2021, in Order No. 62 in Docket No. 13-002-U, which allowed Summit Arkansas to expend the PY 2020 – 2022 portfolio into PY 2023. The savings goals and budgets remained the same as PY 2022. There were no additional changes to programs or budget for PY 2023.

Summit Utilities Arkansas filed a new CIP Portfolio for PY 2024 - 2026, which was filed September 1st, 2023, in Docket No. 07-081-TF. The CIP Portfolio was approved by the APSC on November 9th, 2023, in Docket No. 07-081-TF, Doc. No. 605. Changes to the new CIP Portfolio for PY 2023-2024 include a change in the CIP Portfolio structure, an expansion of low-income programs, and the addition of a R&D and market transformation pathway. The new Summit Utilities Arkansas CIP Portfolio includes the consolidation of programs, as pathways, under three customer categories: residential, low to moderate income, and commercial customers. The three program are as follows: Residential Solutions ("RSOL"), Access to Affordable Energy and Conservation ("AAEC"), and the Natural Gas Commercial Solutions ("NGCS") Programs. The following new Pathways were added to the AAEC Program: Low- to Moderate Income ("LMI") DIY, LMI HERs, LMI LivingWise, Affordable

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Housing Rebate Program, and the Natural Gas Emerging Technology Pathways. The new CIP Portfolio offerings began January 1, 2024.

Table 4: Portfolio Summary

2023 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	$ 3,745,068	$ 8,241,200	$ 1,288,330	$ 819,306	$ 8,590,463	1.67	1.96	0.50%	0.67%	134%

Table 5: Expenditures by Program

EE Portfolio Expenditures by Program					
Program Name	Target Sector	Program Type	2023 Budget ($)	2023 Actual ($)	% of Budget
Home Energy Reports	Residential	Behavior/Education	371,885	371,797	100%
LI Saving Homes Weatherization Program	Residential	Whole Home	462,273	462,225	100%
Low-Flow Showerhead and Faucet Aerator	Residential	Prescriptive/Standard Offer	299,712	165,126	55%
Saving Homes Weatherization Program	Residential	Whole Home	1,871,281	1,871,121	100%
Commercial Boiler Program	Small Business/C&I	Prescriptive/Standard Offer	270,474	233,844	86%
Commercial Foodservice Program	Small Business/C&I	Prescriptive/Standard Offer	179,946	140,086	78%
Natural Gas Commercial Solutions	Small Business/C&I	Custom	3,100,056	3,100,010	100%
Natural Gas Equipment Program	All Classes	Prescriptive/Standard Offer	3,551,100	1,891,326	53%
Energy Efficiency Arkansas	All Classes	Behavior/Education	134,603	5,664	4%
Regulatory	-	-	-	-	-
		Total	**10,241,331**	**8,241,200**	**80%**

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Table 6: Expenditure Summary by Cost Type

EE Portfolio Expenditure Summary by Cost Type				
	2023 Total Expenditures			
Cost Type	% of Total	Budget ($)	Actual ($)	% of Total
Planning / Design	1%	113,316	126,868	2%
Marketing & Delivery	34%	3,513,500	3,311,814	40%
Incentives / Direct Install Costs	55%	5,671,171	3,841,062	47%
EM&V	6%	603,409	702,097	9%
Administration	3%	339,935	259,359	3%
Regulatory	0%	-	-	0%
	100%	**10,241,331**	**8,241,200**	100%

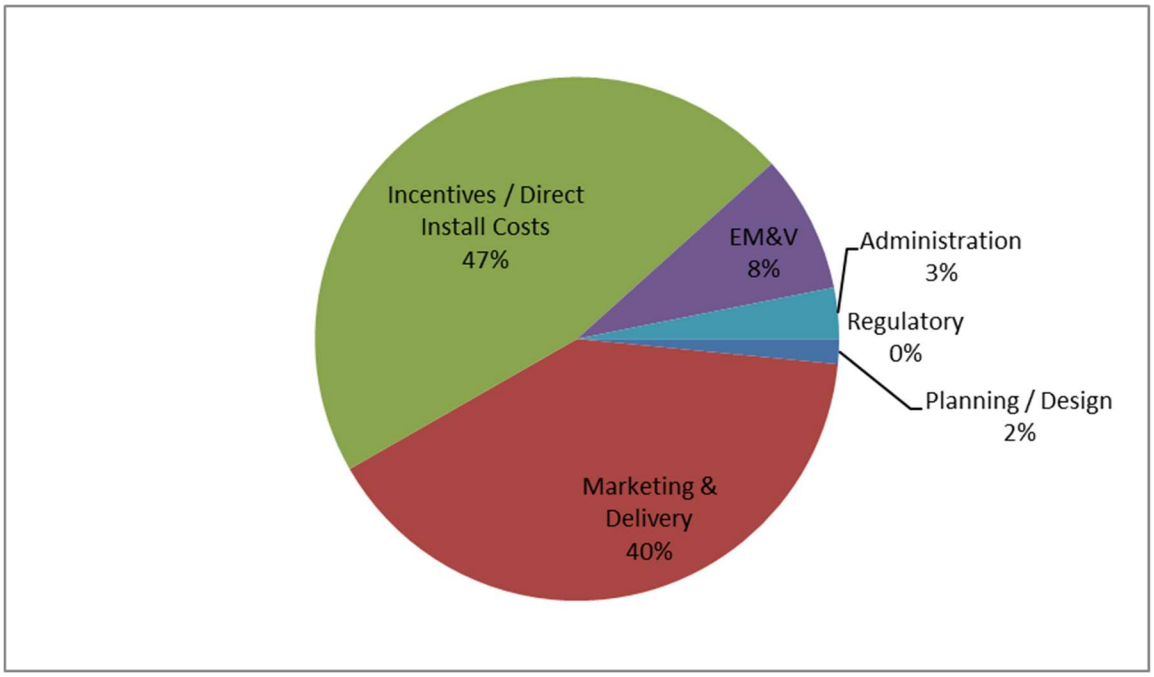

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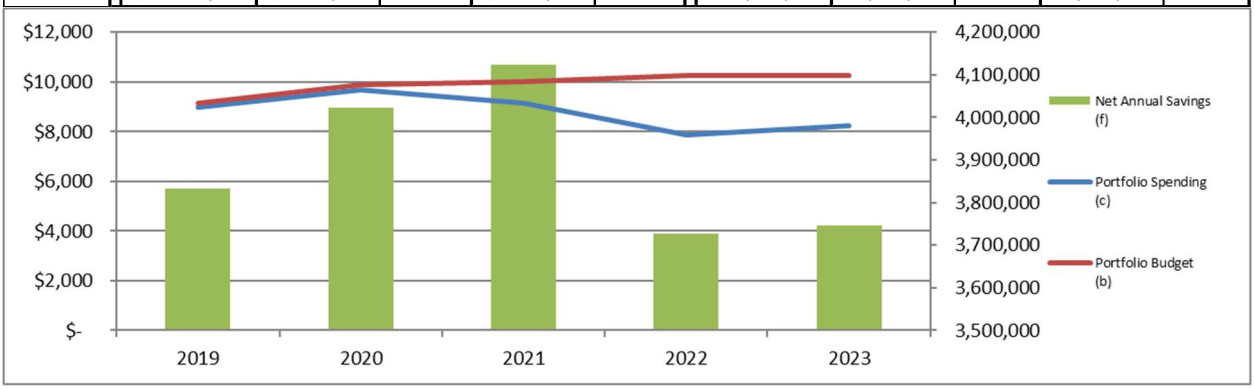
Table 7: Company Statistics

Company Statistics										
	Revenue and Expenditures					Energy				
		Budget		Actual			Plan		Evaluated	
Program Year	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)
2019	$ 371,110	$ 9,140	2.5%	$ 8,972	2.4%	646,420,522	3,544,804	0.55%	3,831,747	0.59%
2020	$ 336,115	$ 9,876	2.9%	$ 9,699	2.9%	646,361,388	3,800,225	0.59%	4,022,955	0.62%
2021	$ 380,361	$ 10,025	2.6%	$ 9,131	2.4%	638,961,284	3,832,796	0.60%	4,124,913	0.65%
2022	$ 447,950	$ 10,241	2.3%	$ 7,859	1.8%	628,497,665	3,934,708	0.63%	3,726,152	0.59%
2023	$ 463,970	$ 10,241	2.2%	$ 8,241	1.8%	590,887,528	3,934,708	0.67%	3,745,068	0.63%



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2.0 Portfolio Programs

2.1 Saving Homes Weatherization Program

Program Description

The Summit Utilities Arkansas Saving Homes Program is designed to provide weatherization retrofits that will improve the efficiency and comfort of Summit Utilities Arkansas's residential customers. Implementation of this program began in 2016, and it follows the guidelines developed for the Core Program approach approved by the Arkansas Public Service Commission in Order Nos. 22 and 23 in Docket No. 13-002-U. Under the management of Summit Utilities Arkansas's vendor, contractors conduct whole-home energy assessments for residential customers and identify comprehensive and cost-effective energy efficiency measures eligible for installation. Following measure installation at the premise, the participating contractor may apply for incentives from Summit Utilities Arkansas, and if applicable, a participating electric utility.

Program Highlights

In PY 2023, the Saving Homes Weatherization Program achieved 113% of the savings target. Overall, 1,171 distinct customers participated in the program, 93% of participants installed at least one measure, and a total of 2,232 energy efficiency improvements were installed overall. The conversion rates, from assessments to measures, achieved by the trade allies was 100%.

Program Budget, Savings & Participants

Table 8: Saving Homes Weatherization Program Savings

Summit Utilities Arkansas's customers saved 492,765 annual therms through the program. Evaluated energy savings for the PY 2023 Saving Homes Weatherization Program are below:

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Saving Homes Weatherization Program												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 1,671,364	$ 1,692,627	101%	425,184	436,278	103%	n/a	n/a	-	3,370	2,165	64%
Program Year 2022	$ 1,736,281	$ 1,857,362	107%	437,939	398,991	91%	n/a	n/a	-	3,471	2,168	62%
Program Year 2023	**$ 1,871,281**	**$ 1,871,121**	**100%**	**437,939**	**492,765**	**113%**	**n/a**	**n/a**	**-**	**3,471**	**2,232**	**64%**

Table 9: Annual Net and Lifetime Savings

Saving Homes Program	
Annual Net Energy Savings (Therms)	492,765
Lifetime Energy Savings (Therms)	8,491,682

Description of Participants

Participants are Summit Utilities Arkansas customers who have received in-home energy assessments and energy efficiency improvements through the Saving Homes Weatherization Program.

Challenges & Opportunities

The Saving Homes Program was very successful in PY 2023, with demand for the program exceeding the capacity of the program to serve all interested customers. With the strong demand for the program in mind, the Company sees it as a challenge to continue achieving high conversion rates to capture higher levels of energy savings and increase cost-effectiveness. There is an opportunity to develop marketing materials for the program, but the Company must be careful to balance increasing awareness of the program with increasing demand that may cause a longer wait for interested customers to be served. Program participation continues to be strong despite the introduction of the Low-Income Saving Homes Program. There were initial concerns that the two programs might dilute the candidate pool; however, the number of eligible participants is large enough to accommodate both programs for now. The Company will continue to monitor the number and type of participants

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who utilize the program and adjust accordingly to make certain all customers receive the appropriate weatherization services for their situation.

Planned or Proposed Changes to Program & Budget

We increased the program budget and shifted dollars from the Natural Gas Equipment Program to accommodate additional homes requesting weatherization services.

2.2 Low-Income Saving Homes Weatherization Program

Program Description

The Summit Utilities Arkansas Low-Income Saving Homes Program is designed to provide weatherization retrofits that will improve the efficiency and comfort of Summit Utilities Arkansas's qualifying residential customers. In addition to weatherization retrofits, the Low-Income Savings Home Program also provides a maximum incentive of $500 towards addressing health and safety issues in the home that might prevent measures from being applied or installed. Implementation of this program began in PY 2020, and it follows the guidelines developed for the Core Program approach approved by the Arkansas Public Service Commission in Order Nos. 22 and 23 in Docket No. 13-002-U. This program specifically addresses hard-to-reach and low-income customers who might not be able to otherwise participate in the Company's energy efficiency programs. This program is administered in accordance with ACT 1102. Under the management of Summit Utilities Arkansas's vendor, contractors conduct whole-home energy assessments for residential customers and identify comprehensive and cost-effective energy efficiency measures eligible for installation. Following measure installation at the premise, the participating contractor may apply for incentives from Summit Utilities Arkansas, and if applicable, a participating electric utility.

Program Highlights

In PY 2023, the Low-Income Saving Homes Weatherization Program achieved 121% of the net savings target. Overall, 124 distinct customers participated in the program, 97% of participants installed at least one measure, and a total of 256 energy efficiency improvements

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were installed. The conversion rates, from assessments to measures, achieved by the trade allies was 97.5%.

Program Budget, Savings & Participants

Table 10: Low-Income Saving Homes Weatherization Program

LI Saving Homes Weatherization Program												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 304,168	$ 301,038	99%	47,243	47,516	101%	n/a	n/a	-	374	256	68%
Program Year 2022	$ 316,273	$ 357,919	113%	48,660	49,170	101%	n/a	n/a	-	386	266	69%
Program Year 2023	**$ 462,273**	**$ 462,225**	**100%**	**48,660**	**58,739**	**121%**	**n/a**	**n/a**	**-**	**386**	**256**	**66%**

Savings

Summit Utilities Arkansas's customers saved 58,739 annual therms through the program. Evaluated energy savings for the PY 2023 Low-Income Saving Homes Weatherization Program are below:

Table 11: Annual Net and Lifetime Savings

Low- Income Saving Homes Program	
Annual Net Energy Savings (Therms)	58,739
Lifetime Energy Savings (Therms)	994,040

Description of Participants

Participants are Summit Utilities Arkansas LIHEAP eligible customers or customers age 65 and over who have received in-home energy assessments and energy efficiency improvements through the Low-Income Saving Homes Weatherization Program.

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Challenges & Opportunities

The Low-Income Saving Homes Program was very successful in PY 2023, with demand for the program exceeding the capacity of the program to serve all interested customers. With the strong demand for the program in mind, the Company sees it as a challenge to continue achieving high conversion rates in order to capture higher levels of energy savings and increase cost-effectiveness. There is an opportunity to develop marketing materials for the program, but the Company must be careful to balance increasing awareness of the program with increasing demand that may cause a longer wait for interested customers to be served. Customer participation dwindled in late Spring/early Summer but ramped back up after the short lull. One opportunity that the Company will address is utilizing more of the health and safety budget to address issues that prevent customers from receiving the full benefits of the weatherization measures implemented or installed. Currently, there is no framework or guidance on how to utilize the health and safety budget. However, the Company, along with the Implementor, created a list of approved health and safety measures for the subcontractors to choose from and implement. The health & safety spend increased from $87 to $229 per home.

Planned or Proposed Changes to Program & Budget

We increased the program budget and shifted dollars from the Natural Gas Equipment Program to accommodate increase spend for health and safety measures.

2.3 Residential Home Energy Reports Program

Program Description

The Residential Home Energy Reports (HER) program provides customers with energy usage information, including energy savings tips and personalized energy usage comparisons, to encourage and motivate recipients to lower their energy usage. Summit Utilities Arkansas's HER program is administered by Oracle, and combines technology, direct marketing, and behavioral science to deliver its Home Energy Reporting System. The Home Energy Reporting System is a unique software platform that combines energy usage data with

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customer demographics, housing and GIS data to develop specific, targeted recommendations that educate and motivate consumers to reduce their energy consumption.

Energy savings for the HER program are quantified by taking the difference in energy usage between a control group that receives no program information and a statistically identical group of customers that receive the home energy reports.

Program Highlights

The HER program continues to impact customers' awareness of their energy usage, influence energy-efficient behaviors, and produce a high level of quantifiable energy savings.

- Oracle analyzed customer data and established a control group and participant group, and program participants received three printed home energy reports throughout the heating season.
- In PY 2023, approximately 95,000 customers were actively available to receive the program reports.
- In PY 2023, the program was eligible for a refill of new participant customers. Approximately 51,000 households were added to the program and received their first Home Energy Report.
- In PY 2023, the program provided annual savings of 952,826 therms.

Program Budget, Savings and Participation

Table 13: Home Energy Reports

Home Energy Reports												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 345,700	$ 367,313	106%	850,000	1,047,335	123%	n/a	n/a	-	85,000	95,394	112%
Program Year 2022	$ 362,485	$ 359,955	99%	850,000	1,096,289	129%	n/a	n/a	-	85,000	90,038	106%
Program Year 2023	**$ 371,885**	**$ 371,797**	**100%**	**850,000**	**952,826**	**112%**	**n/a**	**n/a**	**-**	**85,000**	**127,338**	**150%**

Program Events and Training

To preserve the scientific integrity of calculating energy savings on the differences in usage between a control group and participant group, customers cannot opt in to the program

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if they are not randomly selected into the participant group. For this reason, the program is not widely promoted to non-participants, and no mass marketing of the program is conducted.

Internal training regarding responses and support for customer requests is provided to Summit Utilities Arkansas representatives. A select group of highly trained customer service representatives and energy efficiency program staff were trained on customer service tools provided by Oracle.

Savings

Oracle calculates the energy savings from the program by comparing the program participants against a similar size control group. The difference in energy usage will show the effect the program had on participating Arkansas customers.

The savings reported by the program are net savings, and there are no free riders because the program does not have an open enrollment process. In 2012, Protocol J of the TRM 2.0 was proposed by the IEM and Parties Working Collaboratively and was adopted by the Commission. Protocol J sets guidelines and standards for behavior-based programs. Savings for the program conform to this guideline. The HER program yielded the following residential energy savings in PY 2023:

Table 14: Annual Net and Lifetime Savings

Residential Home Energy Reports	
Annual Net Energy Savings (Therms)	952,826
Lifetime Energy Savings (Therms)	952,826

Description of Participants

Participants in the HER program are Summit Utilities Arkansas customers who receive personalized energy reports.

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Challenges & Opportunities

In early PY 2023, challenges with data transfers were evident, which resulted in an inability to send critical print reports during the heating season. However, this was quickly resolved, and a continued focus was placed on providing customers with information via email and enhanced online resources. These touchpoints continue to be cost-effective ways to engage customers and provide them with gas usage information and recommendations to save energy. The Company will work with the HER implementation contractor to enhance the program to improve the customer experience and get more customer engagement.

Planned or Proposed Changes to Program & Budget

We increased the program budget and shifted dollars from the Natural Gas Equipment Program for costs related to fixing the data transfer issues from the Company transition .

2.4 Low Flow Showerhead and Faucet Aerator Program

Program Description

The Low Flow Showerhead and Aerator Conservation Improvement Program (Low Flow Program) provides free energy-saving low flow showerheads and faucet aerators to Summit Utilities Energy consumers. Customers can receive up to three low flow showerheads (1.5 GPM) or up to three faucet aerators (1.5 GPM).

Program Highlights

Though the Low Flow Program continues to struggle due to program maturation, it is still a valuable tool for reducing water and natural gas consumption. There were some positive outcomes produced by the Program in PY2023:

- The Low Flow Program distributed 183 kits containing low-flow showerheads and faucet aerators to Summit Utilities Arkansas customers in PY 2023.
- The program was promoted through a combination of bill inserts, social media posts, and email campaign. Email promotions have shown to be the most effective means of promoting program participation.
- Therm savings for the Low Flow Program totaled 13,753.

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Program Budget, Savings & Participants

Table 15: Low-Flow Showerhead and Faucet Aerator

Low-Flow Showerhead and Faucet Aerator												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 290,596	$ 157,244	54%	161,622	25,098	16%	n/a	n/a	-	38,100	11,245	30%
Program Year 2022	$ 299,712	$ 72,165	24%	161,622	8,950	6%	n/a	n/a	-	38,100	4,303	11%
Program Year 2023	**$ 299,712**	**$ 165,126**	**55%**	**161,622**	**13,753**	**9%**	**n/a**	**n/a**	**-**	**38,100**	**1,079**	**3%**

Program Events & Training

Most of Summit Utilities Arkansas's customers request low-flow equipment through an online portal, but the Company does provide internal training to its representatives so that customers can request kits and receive support via telephone. Low Flow kits mailed to customers include comprehensive installation instructions. Summit Utilities Arkansas promoted this program through bill inserts and email campaigns.

Savings

The Low Flow program yielded the following residential energy savings:

Table 16: Annual Net and Lifetime Savings

Low-Flow Showerhead and Faucet Aerator Program	
Annual Net Energy Savings (Therms)	13,753
Lifetime Energy Savings (Therms)	149,575

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Description of Participants

Participants in the Low-Flow Program are defined as Summit Utilities Arkansas active gas account customers with a natural gas water heater who requested and received kits containing a combination of faucet aerators and showerheads.

Challenges & Opportunities

In early PY2023 the program faced challenges during the vendor's website overhaul. While customer engagement increased after this challenge was remedied, a continued historical decline in installation rates has resulted in lower savings. To combat this, a greater focus on promotional marketing will drive more customers to the marketplace. Marketing outreach will also engage customers whose eligibility has reset after ten years, bringing additional opportunities for increased installation rates. The Company implemented additional measures, including thermostats, to increase net savings. This addition was successful in driving new and returning customers to the marketplace. The Company aims to rejuvenate this program for PY2024 – 2026 with additional marketing efforts and a relaunch with a new vendor.

Planned or Proposed Changes to Program & Budget.

The Company will utilize a new implementor to revamp the marketplace to increase customer interest and drive engagement. There are no planned or proposed changes to the budget at this time.

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2.5 Natural Gas Equipment Program

Program Description

The Natural Gas Equipment Program is designed to promote efficient heating and water heating solutions to residential and commercial customers. Rebates are offered to consumers to encourage the purchase and installation of new high-efficient natural gas furnaces with an AFUE rating of 90% or higher. HVAC contractors can receive a $50 incentive for each qualifying rebate. Customers who receive furnace rebates are also eligible for a $60 incentive for the installation of a qualifying EnergyStar thermostat.

Summit Utilities Arkansas customers can receive a $75 rebate for qualifying storage tank water heaters (.70 UEF or greater; Btu/hr input less than 75,000), or a $500 rebate for tankless water heaters (.80 UEF or greater). For tank water heaters with a Btu/hr input of 75,000 or greater and a thermal efficiency rating of 88%, customers are eligible for a rebate of $200 per 100,000 Btu. Plumbers can receive a $50 incentive for the installation of each natural gas tankless system or commercial tank water heater that qualifies for the rebate. The Company also offers a $1,500 rebate for the combination of a furnace rated at 95% AFUE or higher and a .80 UEF or greater tankless water heater. This rebate was added in 2017 to provide participants with an incentive for comprehensiveness at the highest efficiency level.

Program Highlights

Overall, Summit Utilities Arkansas rebated 1,132 residential heating systems, 1 combi-boiler, 452 commercial heating systems, 1,552 residential water heaters, 342 commercial water heaters, 66 furnace/tankless water heater combination rebates, and 267 residential and commercial smart thermostats. Most program participants chose the highest efficiency option available. In most cases, customers who received rebates for natural gas furnaces elected 95% or greater AFUE models rather than 90%-94.9% AFUE models, and all water heating inducements were for tankless water heaters.

Summit Utilities Arkansas continued to promote these programs through a variety of channels including bill inserts, printed material, mass media, and supply house displays throughout the state. Events included Home Shows, Home Builder Association events,

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numerous supply house customer appreciation and open house events, the annual conference for Arkansas Housing Authorities, and the annual summer conference of the Arkansas Association of Educational Administrators. Summit Utilities Arkansas also conducted their annual Scoop Meeting for local HVAC and plumbing contractors. Summit Utilities Arkansas also worked closely with school districts and housing authorities to promote energy efficient space heating and water heating solutions.

Program Budget, Savings & Participants

Table 17: Natural Gas Equipment Program

Natural Gas Equipment Program												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 3,883,750	$ 3,084,891	79%	699,842	464,240	66%	n/a	n/a	-	5,325	3,888	73%
Program Year 2022	$ 3,920,500	$ 2,203,985	56%	712,680	325,161	46%	n/a	n/a	-	5,385	2,719	50%
Program Year 2023	**$ 3,551,100**	**$ 1,891,326**	**53%**	**712,680**	**371,043**	**52%**	**n/a**	**n/a**	**-**	**5,385**	**3,812**	**71%**

Program Events & Training

The Company holds annual "Scoop" meetings for plumbers, HVAC contractors, and other stakeholders. The Scoop meetings are held to promote the CIP programs, provide an opportunity for networking, and provide essential information to make participating in the programs a better experience. Scoop meetings are also utilized on occasion to educate trade allies on code changes, industry information, and new equipment entering the market. In PY 2023, the company held three Scoop Meetings in various locations around the state – Little Rock, Hot Springs, and Jonesboro.

Savings

Summit Utilities Arkansas utilized Arkansas TRM 9.0 for all primary heating and water applications. The Natural Gas Equipment program yielded the following results in PY 2023:

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Table 18: Annual Net and Lifetime Savings

Natural Gas Equipment Program	
Annual Net Energy Savings (Therms)	371,043
Lifetime Energy Savings (Therms)	6,160,076

Description of Participants

Participants in the Natural Gas Equipment Program are defined as the number of rebates provided to Summit Utilities Arkansas customers.

Challenges & Opportunities

Summit Utilities Arkansas has been successful in growing and educating its trade ally network, and the Company will continue these efforts as a strong base of trade allies is the primary key to program success. Summit Utilities Arkansas is also working to improve its marketing strategy and deliver targeted promotions to customers and trade allies. Three factors presented challenges in the Natural Gas Equipment Program: inflationary pressures, rising interest rates, and freezing condensate lines. Inflationary pressures causing higher equipment and labor cost. Rising interest rates also made financing equipment replacement and purchasing a home more difficult. Condensate lines freeze each year when temperatures stay below freezing for consecutive days causing the furnaces to shut down. This has deterred customers and contractors from installing high-efficient furnaces in the attic.

Planned or Proposed Changes to Program & Budget

Rebate processing transitioned over to a third-party vendor starting the end of November 2022 with full implantation starting January 1 of 2023. Summit Utilities Arkansas outsourced rebate processing to improve efficiency and offering multiple rebate submittal options that allow customers to submit their own rebates online. We decreased the program budget and shifted dollars to HERs, Commercial Solutions, Saving Homes, and Low-Income Saving Homes Program.

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2.6 Commercial Boiler Program

Program Description

The Commercial Boiler program is designed to promote efficient heating solutions to all commercial customer classes. Rebate incentives are offered to consumers to encourage the purchase and installation of new high efficiency natural gas boilers.

Program Highlights

In PY 2023, 23 boilers were rebated, which generated savings in the amount of 40,509 therms reaching 70% of the program goal. Efforts to educate customers and trade allies on the benefits of the boiler program are paying dividends, and the Summit Utilities Arkansas's CIP staff continues to pursue opportunities to influence the installation of high efficiency equipment in commercial applications.

Program Budget, Savings & Participants

Table 19: Commercial Boiler Program

Commercial Boiler Program												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 270,474	$ 260,602	96%	57,585	70,934	123%	n/a	n/a	-	35	25	71%
Program Year 2022	$ 270,474	$ 190,050	70%	57,585	52,301	91%	n/a	n/a	-	35	25	71%
Program Year 2023	**$ 270,474**	**$ 233,844**	**86%**	**57,585**	**40,509**	**70%**	**n/a**	**n/a**	**-**	**35**	**23**	**66%**

Program Events & Training

Summit Utilities Arkansas CIP staff continues to focus on building and maintaining relationships with boiler manufacturer sales representatives, Engineering and Architecture Firms, key customer accounts, and organizations such as Arkansas Association of Energy Engineers.

Savings

Summit Utilities Arkansas calculated energy savings according to Arkansas TRM 9.1 and yielded the following energy savings:

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Table 20: Annual Net and Lifetime Savings

Commercial Boiler Program	
Annual Net Energy Savings (Therms)	40,509
Lifetime Energy Savings (Therms)	810,175

Description of Participants

Participants in the Commercial Boiler Program are defined as the number of rebates provided to Summit Utilities Arkansas customers.

Challenges & Opportunities

Summit Utilities Arkansas continues its efforts to build and maintain relationships with trade allies both in and out of state. With a limited number of local boiler trade allies, it is important to keep them engaged and supportive of the program so that opportunities for energy savings are not missed. Also, public sector facilities remain the strongest source of participation and energy savings, and the Company will continue to pursue opportunities at schools, government buildings, and other public organizations. The Department of Energy (DOE) increased the minimum efficiency standards to 84%, which went into effect on January 10, 2023, for Commercial Packaged Boilers. SUA has eliminated the lower tier boiler rebate for 2024. The new minimum boiler rebate qualification has been increased to greater than or equal to 88% efficiency.

Planned or Proposed Changes to Program & Budget

There are no planned or proposed changes to the program or budget at this time.

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2.7 Commercial Food Service Program

Program Description

The Commercial Food Service program is designed to promote the installation of high-efficiency food service equipment. Rebate incentives are offered to food service operators to encourage the purchase and installation of new, qualifying natural gas food service equipment. There are also Trade Ally incentives offered to equipment dealers to encourage an up-sale to qualifying high-efficiency cooking equipment.

Program Highlights

2023 proved to be an exceptional year for the Commercial Food Service Program, which included a 50% increase in savings over 2022. The Commercial Food Service Program plays a vital role in the K-12 Schools systems looking to conserve energy in their cafeteria operations. 64% of the program's participants came from these educational institutions.

Program Budget, Savings & Participants

Table 21: Commercial Foodservice Program

Commercial Foodservice Program												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 178,216	$ 150,488	84%	62,873	50,469	80%	n/a	n/a	-	132	108	82%
Program Year 2022	$ 179,946	$ 81,932	46%	64,641	21,283	33%	n/a	n/a	-	134	50	37%
Program Year 2023	**$ 179,946**	**$ 140,086**	**78%**	**64,641**	**55,329**	**86%**	**n/a**	**n/a**	**-**	**134**	**139**	**104%**

Program Events & Training

Summit Utilities Arkansas CIP staff continues to focus on building and maintaining relationships with food service equipment dealers, manufacturer sales representatives, key customer accounts, and organizations such as the Arkansas Restaurant and Hospitality Association.

Savings

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Summit Utilities Arkansas calculated energy savings according to Arkansas TRM 9.1. These savings were evaluated by ADM, and a 77% net-to-gross adjustment was applied. The Commercial Food Service program yielded the following savings:

Table 22: Annual Net and Lifetime Savings

Commercial Food Service Program	
Annual Net Energy Savings (Therms)	55,329
Lifetime Energy Savings (Therms)	663,950

Description of Participants

Participants in the Commercial Food Service program are defined as the number of rebates provided to Summit Utilities Arkansas customers.

Challenges & Opportunities

Summit Utilities Arkansas will continue to leverage the rebates and educate customers and trade allies on the long-run value of efficient equipment. The Company will continue to seek and evaluate additional food service measures that could be viable additions to its existing program offerings.

Planned or Proposed Changes to Program & Budget

There are no planned or proposed changes to the program or budget at this time.

2.8 Natural Gas Commercial & Industrial Solutions Program

Program Description

The Natural Gas Commercial and Industrial (C&I) Solutions Program encourages C&I customers to use natural gas efficiently by installing energy efficient equipment, adopting energy efficient designs, and using energy efficient processes at their facilities. The

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program is implemented by CLEAResult and includes the direct installation of equipment that reduces energy consumption as well as financial incentives for customers that pursue custom energy efficiency projects. For custom measures, CLEAResult provides customers with technical assistance to identify energy efficiency projects and quantify energy savings, assists the customers through the incentive process and conducts the necessary EM&V work.

Program Highlights

In PY 2023, the Natural Gas Commercial and Industrial Solutions Program remained a high performing program achieving 110% of goal and was again the largest single program contributor to energy savings and net economic benefits. Overall, the program yielded energy savings of 1,760,104 net therms, resulting in a TRC of 1.42 and a net benefit total of $2.7 million.

Program Budget, Savings & Participants

Table 23: Natural Gas Commercial Solutions

Natural Gas Commercial Solutions												
	Expenditures			Energy Savings (Therms)			Demand Savings (Therms)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2021	$ 2,954,470	$ 3,079,053	104%	1,528,448	1,983,043	130%	n/a	n/a	-	15,410	926	6%
Program Year 2022	$ 3,021,056	$ 2,595,442	86%	1,601,581	1,774,006	111%	n/a	n/a	-	15,412	332	2%
Program Year 2023	**$ 3,100,056**	**$ 3,100,010**	**100%**	**1,601,581**	**1,760,104**	**110%**	**n/a**	**n/a**	**-**	**15,412**	**375**	**2%**

Program Events & Training

Summit Utilities Arkansas and program implementer CLEAResult continuously pursue opportunities to promote the program to customers and trade allies through site visits, trade shows, and other industry events. Summit Utilities Arkansas utilizes its Commercial and Industrial Transportation Sales Representatives to educate customers on the benefits of the program and identify opportunities for participation. The Company also develops case studies that highlight results of specific custom projects and show the value of the program to customers. In addition, Summit Utilities Arkansas provided training to customers, industry

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professionals and financial institutions regarding the financial benefits of energy efficiency projects.

Savings

Custom energy efficiency projects and the direct installation of pre-rinse spray valves (PRSV), faucet aerators, low-flow showerheads, and weather stripping produced the energy savings delivered through the PY 2023 Natural Gas Commercial and Industrial Solutions Program. TRM 9.1 was utilized to calculate the savings for the direct install portion of program savings. The methodology for calculating the custom projects savings were evaluated by ADM and are discussed in detail in ADM's report, which can be found in Appendix A. The Natural Gas Commercial and Industrial Solutions Program yielded the following savings:

Table 24: Annual Net and Lifetime Savings

Commercial & Industrial Solutions Program	
Annual Net Energy Savings (Therms)	1,760,104
Lifetime Energy Savings (Therms)	19,340,060

Description of Participants

Participants in the Natural Gas Commercial and Industrial Solutions Program are defined as the number of custom commercial projects as well as facilities that have participated in the direct install component of the program provided to Summit Utilities Arkansas customers.

Challenges & Opportunities

With a suite of direct-install measures, custom project incentives, and technical assistance, the Natural Gas Commercial and Industrial Solutions Program has a successful mix of cost-effective energy efficiency opportunities available to commercial customers.

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Summit Utilities Arkansas believes there is an opportunity to leverage this program to promote its other prescriptive rebate offerings. The program was over goal in PY 2023 and is oversubscribed for the current program year. It may be necessary to reallocate resources from other programs to meet the needs of all customers wishing to participate.

Planned or Proposed Changes to Program & Budget

We increased the program budget and shifted dollars from the Natural Gas Equipment Program to accommodate additional projects.

3.0 Supplemental Requirements

3.1 Staffing

Summit Utilities Arkansas has five staff members working on delivering its comprehensive energy efficiency portfolio. A CIP Implementation Manager oversees the day-to-day activities of the CIP team and assures that the programs are compliant with regulatory requirements. Additionally, three Energy Efficiency Consultants, and an Energy Efficiency Analyst deliver, administer, and maintain compliance of CIP programs.

The Energy Efficiency Consultants' responsibilities are to implement energy efficiency programs that meet regulatory and legislative requirements and respond to customer needs. They manage productivity and build relationships with external vendors and trade allies to maximize the performance of programs and ensure those programs comply with Summit Utilities corporate goals. In addition to those responsibilities, some EE Consultants also request rebate checks on behalf of their customers and pay invoices.

The Energy Efficiency Analyst maintains the program data, supports the regulatory function, and performs analysis to monitor and improve the CIP portfolio. The Energy Efficiency Analyst will also keep up with changes to the TRM and implement changes to ensure accurate calculations of program savings.

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3.2 Stakeholder Activities

Summit Utilities Arkansas actively participates in stakeholder collaborative efforts and continues to be an active participant in the collaborative process established by the Commission (also known as the "Parties Working Collaboratively" or PWC).

Summit Utilities Arkansas has also been very active in local trade associations such as home builders associations, HVAC contractors associations, Arkansas Hospitality Associations, Arkansas Association of Healthcare Engineering, Gas Food Equipment Network, Arkansas Education Association, and the local public housing authorities.

Internally, Summit Utilities Arkansas continues to train its Arkansas-based Customer Development Representatives to work with local builders and trade allies, and also utilizes field employees to identify potential program participants throughout their day-to-day activities. In addition, Summit Utilities Arkansas has trained Commercial and Industrial Transportation Sales Representatives that actively educate eligible transportation customers on the programs and make referrals to the C&I Solutions program.

3.3 Information Provided to Consumers to Promote EE.

Summit Utilities Arkansas uses a variety of tools to provide information to consumers about energy efficiency programs. These include:

- Printed factsheets for consumers
- Printed factsheets for trade allies
- Supply house displays
- Bill inserts
- Website
- Emails
- Advertisements on TV, radio and in print
- Retail point of purchase displays and promotions

Select examples of each type of information can be found in Appendix B.

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APPENDIX A – EM&V CONTRACTOR REPORT

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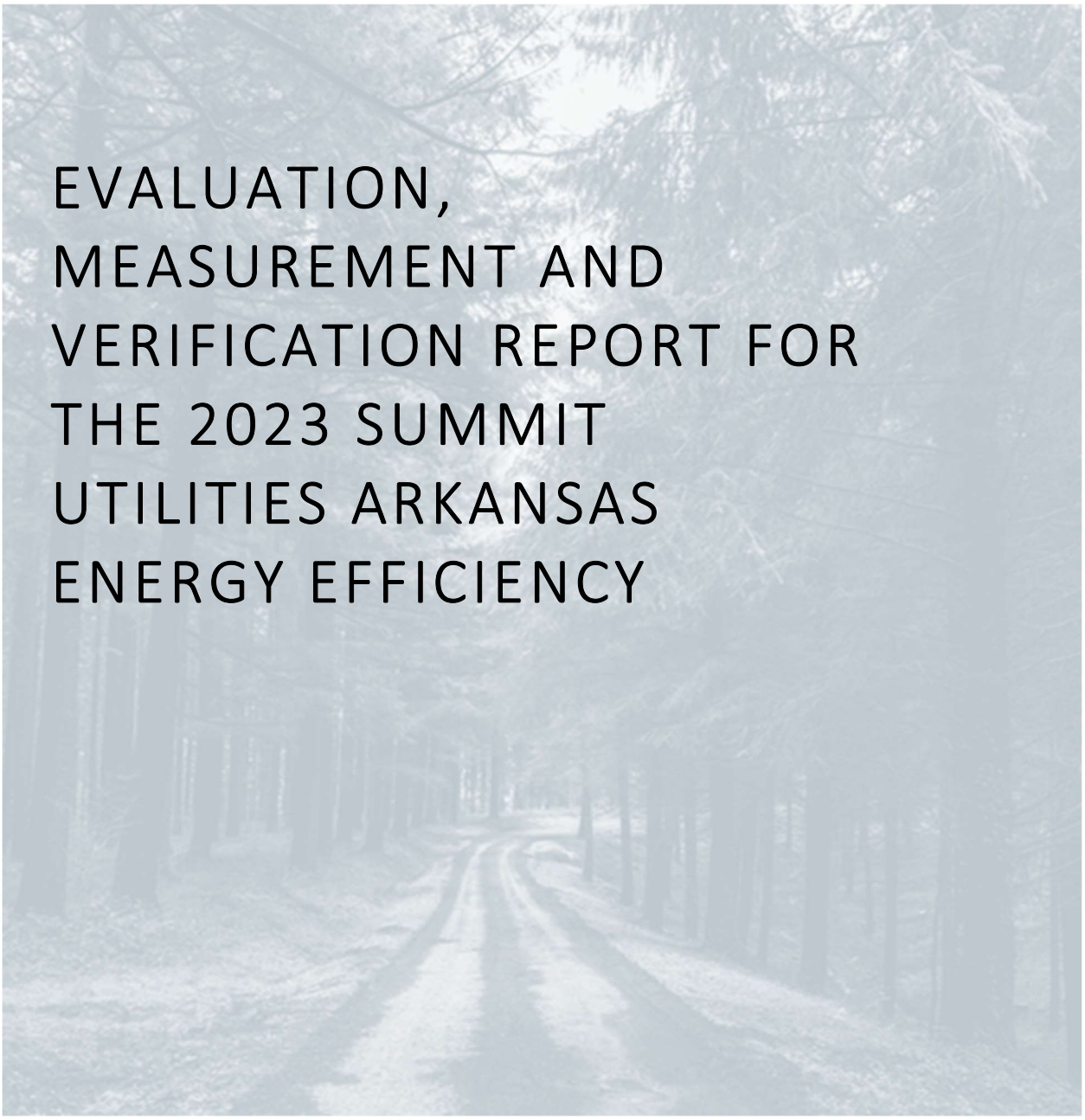

EVALUATION, MEASUREMENT AND VERIFICATION REPORT FOR THE 2023 SUMMIT UTILITIES ARKANSAS ENERGY EFFICIENCY

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We would like to thank the staff at Summit Utilities Arkansas (SUA) for their time and effort in contributing to the EM&V of the PY2023 programs. This evaluation was conducted with regular coordination with staff at SUA, 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 SUA customers, implementation contractor staff, and trade allies. As with the staff at SUA, 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 for their involvement in providing thorough answers and clarification to the evaluation team when higher-level questions arose over the course of the PY2023 EM&V effort.

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1 Executive Summary

In March of 2019, CenterPoint Energy Resources Corporation (CenterPoint, or CNP) filed its 2020-2022 Energy Efficiency Plan[1] in response to Commission Order No. 25 in Docket No. 13-002-U.[2] The APSC approved the 2020–2022 programs (duly extended for 2023), which built upon CNP's Quick Start Energy Efficiency programs that have been implemented since late 2007[3] and the Comprehensive programs that have been implemented in Arkansas since 2011.[4] This was filed in compliance with Order No. 31 of Docket No. 13-002-U,[5] which required investor-owned natural gas utilities in Arkansas to capture energy savings equivalent to 0.50% of their 2018 energy sales. In 2021, CNP AR was acquired by Summit Utilities, and is now known as Summit Utilities Arkansas (SUA).

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 demand reduction goals as appropriate within the modified budgets. Thus, SUA's 2023 budgets and energy savings goals, reflecting allowable adjustments as described above, serve as the basis against which its portfolio of programs were evaluated in 2023.

SUA's Plan includes a portfolio of energy efficiency programs designed to facilitate energy savings in every customer class. SUA services approximately 415,243 customers in Arkansas, and serves southern, central, and northeast Arkansas, including the greater Little Rock metropolitan area, Texarkana, Jonesboro, and Pine Bluff.

The PY2023 SUA evaluation included impact and process analyses that are specified in the APSC rules and follow the Arkansas TRM Version 9.1 protocols and savings algorithms. In addition, ADM developed the program evaluation activities based upon discussions with SUA staff and its implementation contractors, reviews of program tracking and program documentation, a review of prior years' EM&V efforts and SUA annual reports, and input from the IEM.

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[1] PY2017-PY2019 Plan, filed in Docket 07-081-TF: http://www.apscservices.info/pdf/07/07-081-TF_402_1.pdf

[2] Order #25 in Docket 13-002-U: http://www.apscservices.info/pdf/13/13-002-U_198_1.pdf

[3] Quick Start Plan, filed in Docket 07-081-TF: http://www.apscservices.info/pdf/07/07-081-tf_1_1.pdf

[4] Comprehensive Program Plan, filed in Docket 07-081-TF: http://www.apscservices.info/pdf/07/07-081-tf_171_1.pdf

[5] Order #31 in Docket 13-002-U: http://www.apscservices.info/pdf/13/13-002-U_226_1.pdf

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This report presents the EM&V results for SUA's energy efficiency programs implemented in PY2023. In accordance with APSC C&EE Rules,[6] SUA selected an independent, third-party EM&V contractor. The selected EM&V team is led by ADM Associates. The ADM staff, collectively referred to as the Evaluators, evaluated the SUA portfolio.

1.1 Summary of SUA Energy Efficiency Programs

In PY2023, the SUA portfolio contained the following programs:

- Residential Equipment Rebates;
- Commercial Equipment Rebates;
- Commercial Boiler Program;
- C&I Solutions;
- Commercial Food Service Program;
- Home Energy Reports;
- Low Flow Showerhead & Faucet Aerator Program;
- Saving Homes Program[7]; and
- Low Income Savings Homes Program[8].

SUA designed its programs to achieve the following objectives:

- Meet or exceed a PY2023 net savings goal of 3,934,708 therms;
- Significant energy-saving opportunities for all customers and market segments;
- Broad ratepayer benefits; and
- Comprehensiveness in seven areas (i.e., comprehensiveness factors) defined by the APSC.[9]

Through its energy efficiency portfolio, SUA also seeks to provide customers with easy program entry points, flexible options for saving energy, and ongoing support for those who want to

[6] APSC C&EE Rules: http://www.apscservices.info/pdf/16/16-075-SD_5_1.pdf

[7] The SHP is CNP's implementation of the Consistent Weatherization Approach (CWA)

[8] The LISHP is CNP's implementation of the Consistent Weatherization Approach (CWA) for Act 1102

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

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pursue deeper energy savings. Refer to Table 1-1 for a list of the SUA programs and targeted customer segments.

Table 1-1: SUA PY2023 Energy Efficiency Portfolio Sectors Serviced

Program	Single Family	Multifamily	Small Business	Large C&I	Municipal	Agricultural
Residential Equipment Rebates	✓	✓			✓	
Commercial Equipment Rebates		✓	✓	✓	✓	✓
Commercial Boiler			✓	✓		
C&I Solutions			✓	✓	✓	✓
Commercial Food Service			✓	✓	✓	
Home Energy Reports	✓	✓				
Low Flow Program	✓	✓				
Saving Homes Program	✓	✓				
Low-Income Savings Homes Program	✓	✓				

1.2 Evaluation Goals

The goals of the PY2023 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 TRM V9.1 methodologies.
- **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 SUA programs.** Full process evaluations were completed in PY2019 - PY2022 and as a result process evaluation needs in PY2023 were limited.
- **Conduct net-to-gross assessments.** The Evaluators conducted program-specific net-to-gross assessments in from PY2018-PY2022, and as a result, net-to-gross assessment needs in PY2023 were limited.

1.3 Impact Findings

Table 1-2 and Table 1-3 present the gross and net impact by program.

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Table 1-2: Gross Impact Summary

Program	Annual Therms Savings		Lifetime Therms Savings		Gross Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post	
Residential Equipment Rebates	395,085	327,244	4,269,807	5,154,987	82.80%
Comm. Equipment Rebates	110,714	125,739	2,682,775	2,362,200	113.60%
Commercial Boiler	50,459	50,459	1,009,186	1,009,186	100.00%
C&I Solutions	1,763,638	1,762,463	19,378,892	19,340,060	99.90%
Commercial Food Service	71,670	71,670	860,039	860,039	100.00%
Home Energy Reports	928,417	952,826	928,417	952,826	102.60%
Low Flow	21,926	21,926	237,784	237,784	100.00%
Saving Homes Program	558,081	547,516	9,256,590	9,435,202	98.10%
Low-Income Saving Homes	59,938	58,739	974,148	994,040	98.00%
Total	**3,959,927**	**3,918,582**	**39,597,638**	**40,346,324**	**99.00%**

Table 1-3: Net Impact Summary

Program	Annual Therms Savings		Lifetime Therms Savings		NTGR	Net Realization Rate
	Ex Ante	Ex Post	Ex Ante	Ex Post		
Res. Equipment Rebates	328,478	271,717	3,564,960	4,309,669	83.00%	83%
Comm. Equipment Rebates	85,840	99,326	2,141,110	1,850,406	79.00%	116%
Commercial Boiler	40,509	40,509	810,175	810,175	80.30%	100%
C&I Solutions	1,763,638	1,760,104	19,378,892	19,340,060	99.90%	100%
Commercial Food Service	55,329	55,329	663,950	663,950	77.20%	100%
Home Energy Reports	928,417	952,826	928,417	952,826	100.00%	103%
Low Flow	13,753	13,753	149,575	149,575	62.70%	100%
Saving Homes Program	502,273	492,765	8,330,929	8,491,682	90.00%	98%
Low-Income Saving Homes	59,938	58,739	974,148	994,040	100.00%	98%
Total	**3,778,175**	**3,745,068**	**36,942,156**	**37,562,383**	**95.60%**	**99%**

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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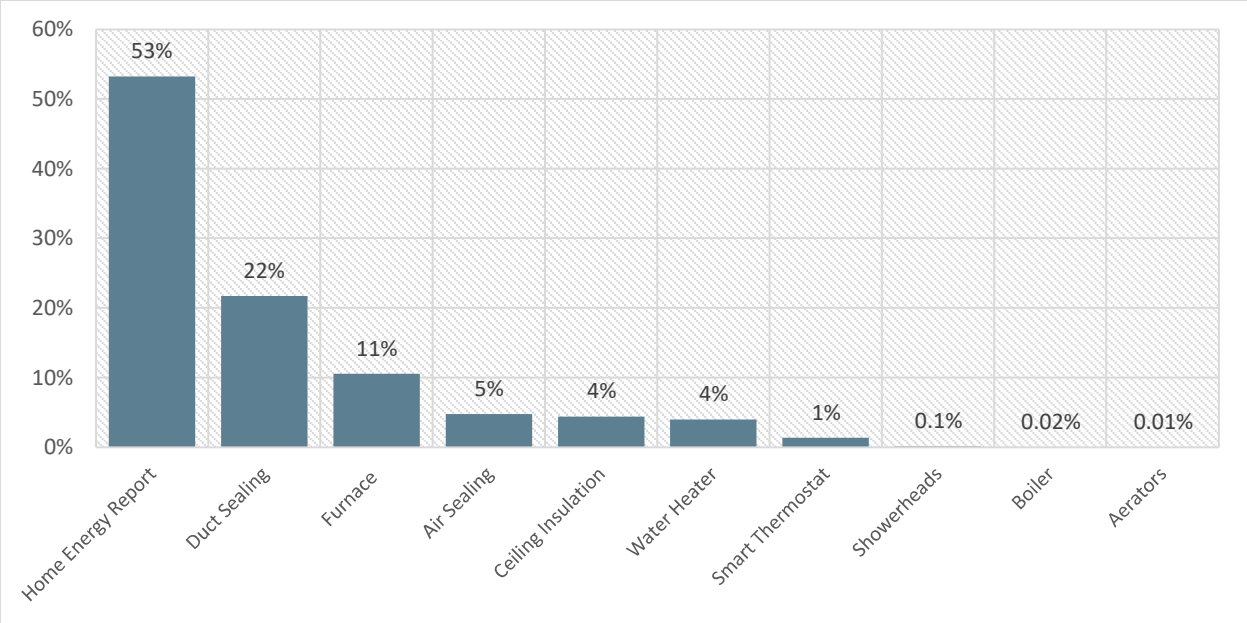

Figure 1-1: Residential Portfolio Savings Share by Measure

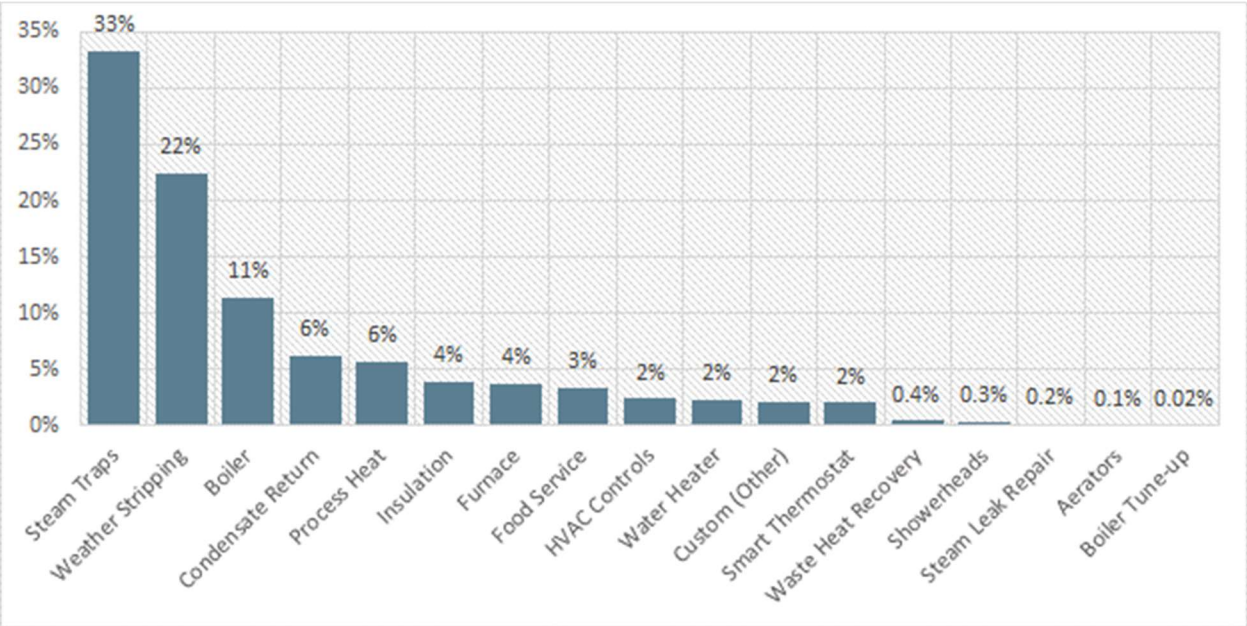

Figure 1-2: C&I Portfolio Savings Share by Measure

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

Residential:

- Home Energy Reports;

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- Duct Sealing;
- Furnaces; and
- Air sealing.

Non-residential:

- Steam traps;
- Weather stripping;
- Boiler replacement;
- Condensate return; and
- Custom process heating improvements.

Further, the Evaluators put the net savings into the context of SUA's PY20232 filed goal[10]. Table 1-4 summarizes the performance against goals of programs evaluated in this report.

Table 1-4: SUA PY2023 EE Portfolio Performance against Goals

Program	PY2023 Verified Net Therms	PY2023 Net Therms Goal	% of Goal Attained
Residential Equipment Rebates	271,717	712,680	52%
Commercial Equipment Rebates	99,326		
Commercial Boiler	40,509	57,585	70%
C&I Solutions	1,760,104	1,601,581	110%
Commercial Food Service	55,329	64,641	86%
Home Energy Reports	952,826	850,000	112%
Low Flow Program	13,753	161,622	9%
Saving Homes Program	492,765	437,939	113%
Low-Income Saving Homes	58,739	48,660	121%
Total	**3,745,068**	**3,934,708**	**95%**

The SUA portfolio reached 95% of their filed savings goal. There was notably strong performance relative to goals in the Home Energy Reports and C&I Solutions programs. This was achieved while spending 80% of the available budget.

[10] This differs from the APSC-required target of .5% of sales. CenterPoint's filed goals are designed to exceed APSC targets.

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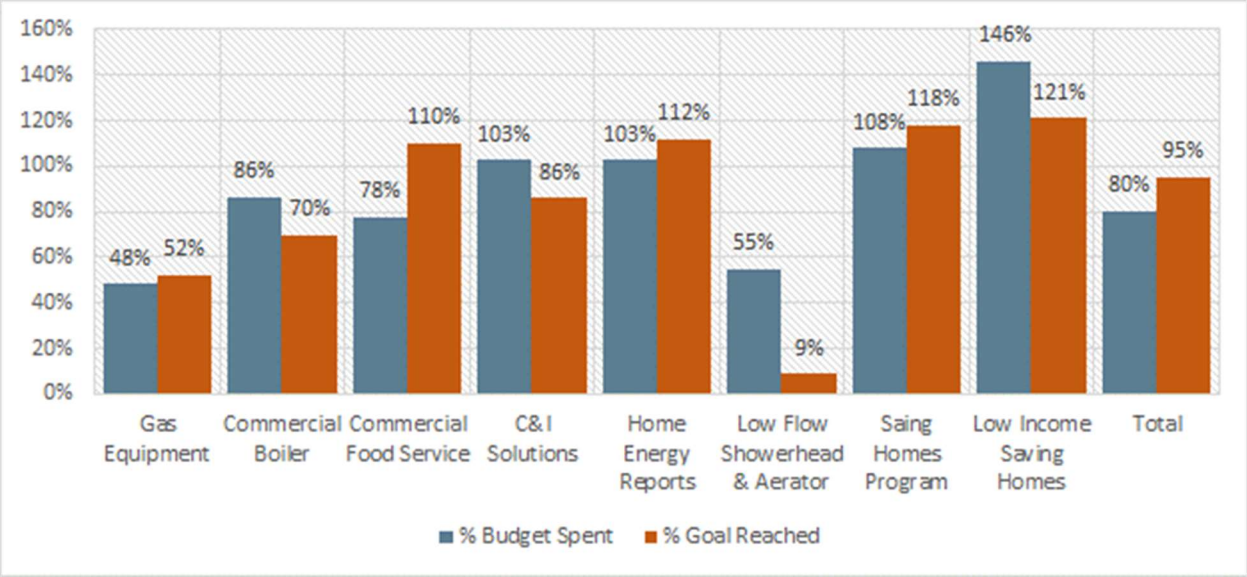

Figure 1-3: Summary of Goal Attainment & Budget Expenditure by Program

The non-energy benefits (NEBs) attained by the SUA portfolio in PY2023 are detailed in the tables to follow.

Table 1-5: SUA PY2023 Verified Electric Savings

Program	Measure	Net Annual kWh	Net Peak kW	Lifetime Net kWh
Res. Equipment Rebates	Smart Thermostats	142,246	-	1,564,705
Comm. Equipment Rebates	Smart Thermostats	2,148	-	23,630
C&I Solutions	Weather Stripping	129,227	91.03	1,421,491
Low Flow Program	Aerators	718	.07	7,184
	Showerheads	5,389	.56	53,887
Saving Homes Program	Air Infiltration	100,185	77.74	1,102,032
	Ceiling Insulation	217,363	262.62	4,347,250
	Duct Sealing	838,129	453.34	15,086,324
Low Income Saving Homes	Air Infiltration	21,039	17.72	231,431
	Ceiling Insulation	20,990	23.96	419,791
	Duct Sealing	190,010	104.43	3,420,172
Total		**1,667,443**	**1,031.48**	**27,677,899**

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Table 1-6: SUA PY2023 Verified Water Savings

Program	Measure	Net Annual Water	Net Lifetime Water
C&I Solutions[11]	Direct Install	1,469,778	16,167,555
	Custom	1,815,568	27,093,963
Commercial Food Service	Combi Ovens	883,380	10,600,564
Low Flow Program	Aerators & Showerheads	475,834	4,758,339
Saving Homes Program	Aerators	6,139	61,389
	Showerheads	30,225	302,247
Low Income Saving Homes Program	Showerheads	36,636	366,360
Total		**4,717,560**	**59,350,416**

Table 1-7: SUA PY2023 Avoided/Deferred Replacement Cost

Program	Measure	Net A/DRC per Unit	Total Net A/DRC
Residential Equipment Rebates	Tankless Water Heater	$304.68	$490,438
	Furnace Early Retirement	$721.92	$638,394
Commercial Equipment Rebates	Tankless Water Heater	$124.34	$36,732
Total			**$1,165,563**

[11] Direct Install comprised showerheads, PRSVs, and faucet aerators. Custom comprised of process boilers, boiler controls, steam leak repair, and condensate return improvement.

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1.4 Process Findings

1.4.1 Residential Equipment Rebates

SUA accurately calculates savings per TRM V9.1 protocols.	Deviations in savings are attributable to updates to early retirement estimates (percent early retirement, average age, etc.).
SUA has endeavored to encourage comprehensiveness via combination rebates.	A rebate of $1,500 is provided for participants who simultaneously install a qualifying furnace and tankless water heater. These rebates comprised 23% of furnace and 14% of water heater projects.

1.4.2 Commercial Equipment Rebates

Tracking data for water heaters has improved significantly.	In PY2020, the Evaluators had to develop DHW load inputs for over 80% of commercial projects. In PY2022, this was only required for a total of 4 projects (3% of total projects). In PY2023, SUA completed this for all projects.
Corrections to BTU capacities increased furnace savings.	Based on review of AHRI certificates, the Evaluators recalculated savings at a higher total capacity installed than shown in ex ante estimates.

1.4.3 Commercial Boiler Program

SUA accurately calculates savings per TRM V9.1 protocols.	All projects at 100% gross realization. SUA's tracking system accurately adjusts baseline to align with code requirements by size category and boiler type.
Participation in the lower efficiency tier has a significantly higher acquisition cost of savings.	The lower tier (<92%) systems had $/therm values 61% higher than the high efficiency tier.

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1.4.4 C&I Solutions

The program met savings goals and was highly cost-effective.	The program met 110% of its savings goal with 1,760,1047 net therms.
	With a TRC of 1.42, the program's cost-effectiveness declined. This was due to higher costs found in custom measures.

1.4.5 Commercial Food Service Program

SUA accurately calculates savings per TRM V9.1protocols.	All projects other than rack ovens had 100% gross realization. Rack ovens did not have calculations automated in the tracking system as there had never been participation in this measure.
Participation has increased significantly compared to PY2022.	The program met 88% of its savings goal, compared to 33% in PY2022.
SUA has adopted recommendations related to increased incentives.	Beginning in 2024, the program has significantly higher incentives across all equipment classes. The PY2024 evaluation will address the impact of increased incentives.

1.4.6 Home Energy Reports

The program continues to provide reliable savings as a percent of billed use but faces ongoing customer attrition.	Waves 1-4 are responsible for 35.0%, 23.1%, 18.1%, and 20.5% of program savings, respectively. However, as of the end of 2023, these same waves have 55.0%, 51.8%, 43.7%, and 38.3% attrition. Collecting data on reasons for attrition and conducting an analysis on those data may be worthwhile.
Savings per customer increased for Wave 6 compared to prior program years.	For wave 6, savings have increased from PY2020 onwards, highlighting the increasing impact of the Home Energy Reports program on customers' usage behaviors.

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Data from Waves 5 and 7 did not demonstrate significant savings.	Wave 5 and 7 have RCT start dates of 10/02/2020 and 10/08/2023, respectively. There were no statistically significant differences between the treatment and control groups in these waves in PY2023. Wave 7 is too new to draw meaningful conclusions; this wave should be reassessed next year.

1.4.7 Low Flow Showerhead & Faucet Aerator Program

The program continues to face participation shortfalls.	From 2018 onward, the program faced significant shortfalls in participation and savings. The program is slated for redesign for the next triennial cycle.

1.4.8 Saving Homes Program

Realization rates were high overall.	The overall realization rate was 98.1%, attributable to slight variations in field testing results for duct sealing and air infiltration.
Project comprehensiveness has improved.	The average measures per-project has increased from 1.78 to 1.97 from PY2022 to PY2023.

1.4.9 Low Income Saving Homes Program

The program met savings goals and was highly cost-effective.	The program met 121% of its net savings goal and had a 2.72 TRC.
Significant progress was made on H&S measures, but the program is not yet meeting Act 1102 requirements	H&S spending increased from $87 to $229 per-participant, putting SUA's program within reasonable norms for utility Act 1102 programs.

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1.4.10 Recommendation Summary

In PY2022, seven program or portfolio level recommendations were provided to SUA as part of the EM&V of their portfolio. The Evaluators reviewed SUA's response to recommendations from the PY2022 EM&V report and categorized them as follows:

1) **Completed.** Recommendation fully implemented.
2) **Continuing.** Recommendation fully implemented. However, due to the nature of the recommendation, this will be an area monitored throughout the next program year.
3) **Rejected.** This applies to recommendations which are reviewed by SUA and rejected.
4) **In progress.** Recommendation accepted and will be adopted before next program year.
5) **Under consideration.** Recommendation still under review by program staff or implementers and no decision yet made.
6) **Reviewed and rejected.** Recommendation considered and subsequently rejected or no longer applicable due to changes in program design or operations.

The responses recommendations are summarized in Figure 1-4.

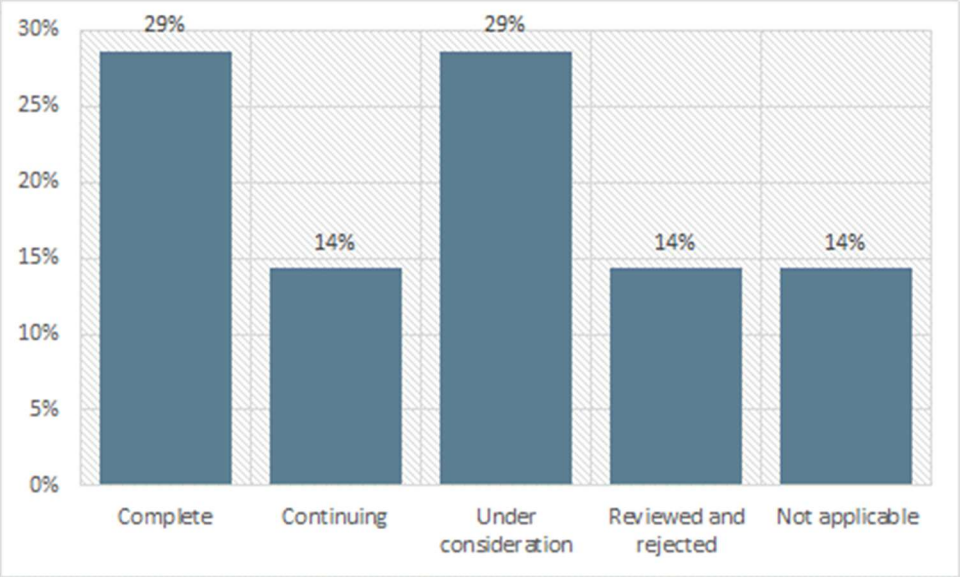

Figure 1-4: Summary of Status of PY2022 Recommendations

1.5 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 3 provides portfolio-level and cross-cutting findings;

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- Chapter 4 provides results for the Residential Equipment Rebates Program;
- Chapter 5 provides results for the Commercial Equipment Rebates Program;
- Chapter 6 provides results for the Commercial Boiler Program;
- Chapter 7 provides results for the C&I Solutions Program;
- Chapter 8 provides results for the Commercial Food Service Program;
- Chapter 9 provides results for the Home Energy Reports Program;
- Chapter 10 provides results for the Low Flow Showerheads & Faucet Aerators Program;
- Chapter 11 provides the results for the Saving Homes Program;
- Chapter 12 provides results for the Low Income Saving Homes Program.
- Appendix A provides the site-level custom reports for the C&I Solutions Program;
- Appendix B summarizes deferred replacement cost calculations; and
- Appendix C provides NTG responses.

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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

A first step to detailing the evaluation methodologies, the Evaluators provide a glossary of terms to follow[12]:

- *Ex Ante* – Savings estimates provided by program administrators prior to review from a third-party- evaluator (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 "something done afterward")
- *Deemed Savings* – An estimate of an energy savings or demand savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources and analytical methods that are widely accepted for the measure and purpose and (b) are applicable to the situation being evaluated. (e.g., assuming 17.36 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 ADM verifies 15 therms per showerhead, Gross Realization Rate = 15/17.36 = 86%)
- *Free-Rider* – A program participant who *would have* implemented the program measure or practice in the absence of the program. Free riders can be total, partial, or deferred.

[12] Arkansas TRM V9.1, Volume 1, Pg. 86-92

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- *Spillover* – Reductions in energy 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 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 drivers, free riders, 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

2.2 Overview of Methodology

The proposed methodology for the evaluation of the PY2023 SUA 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. By leveraging experience and lessons learned from prior evaluations, the PY2023 evaluation is streamlined to focus on areas in needed of research and improvement.

2.2.1 Sampling

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

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- Census of all participants
- Simple random sample
- Stratified random sample

2.2.2 Census of Participants

A census of participant data was used to select programs where such review is feasible. For example, the Home Energy Reports program's savings estimates are based on a regression model that incorporates billing data for a census of program recipients. Programs that received analysis of a census of participants include:

2.2.3 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 enough participation to make a sample of this size cost-effective. In instances of low participation, ADM then applied a finite population correction factor, defined as:

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

Where

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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. Programs subject to Simple Random Sampling include:

- Residential Commercial Equipment Rebates;
- Commercial Equipment Rebates;
- Low Flow Showerhead & Faucet Aerator Program; and
- Saving Homes Program.

2.2.3.1 Stratified Random Sampling

For the SUA Commercial & Industrial 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, we 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 and take a random sample of the remaining sites. To further improve the precision, non-certainty 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 result that have concentrations of sites with atypically high savings or atypically low savings.

2.2.4 Free-Ridership

In determining ex post net savings for the SUA 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 guidelines, free riders are defined as:

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"…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 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)."[13]

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

2.2.4.1 Residential Free-Ridership

The Evaluators determine free-ridership by measure type and installation type for SUA programs. Free-ridership study groups are delineated by technology, delivery mechanism and target market. The taxonomy of residential free-ridership designations is summarized in Figure 2-1. Blocks marked in light blue indicate a final free-ridership category.

[13] Arkansas TRM V9.1, Pg. 49.

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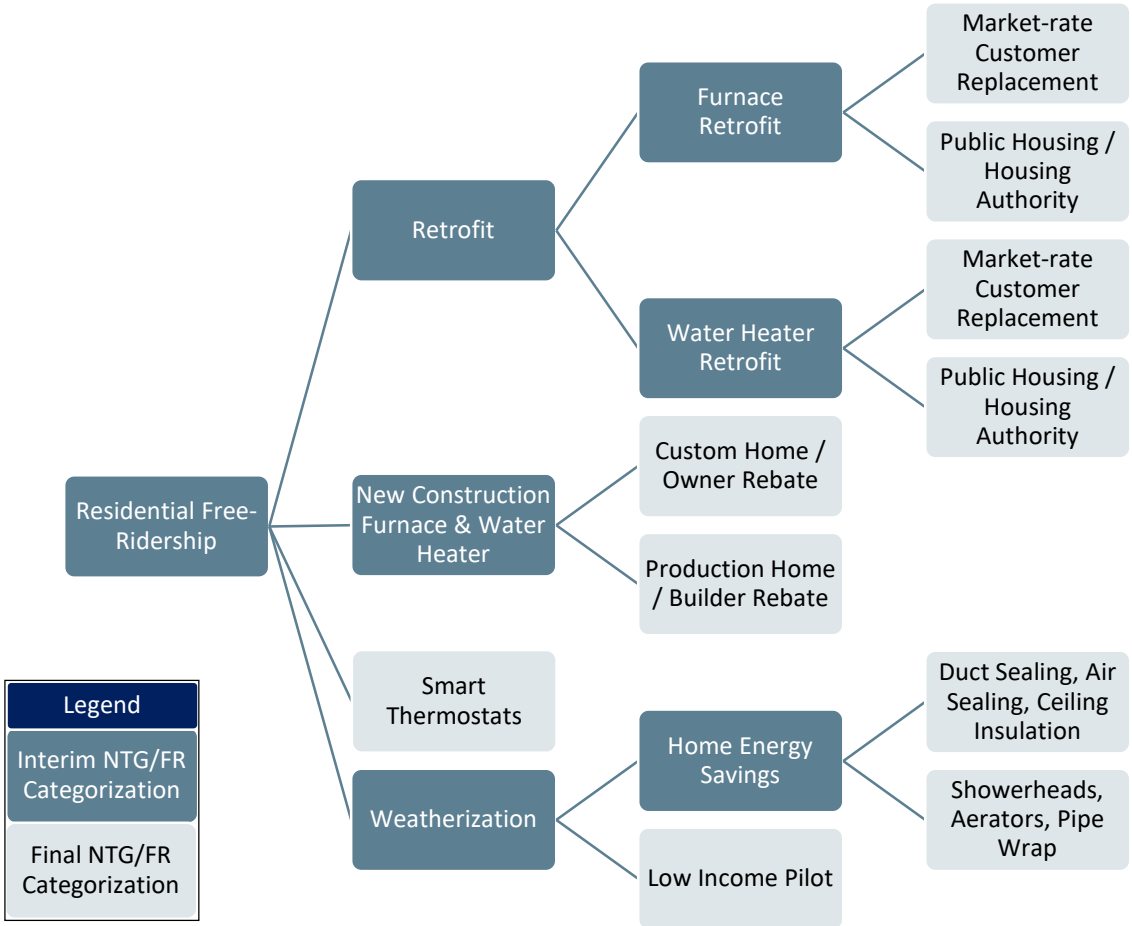

Figure 2-1: Residential Free-ridership Designations

Certain measures were selected to have NTG evaluated by different market segments, as these segments can demonstrate markedly different decision-making processes and cost sensitivities. For example, installation of a high efficiency furnace or tankless water heater is a simpler process in new construction than in retrofit, and the decision is often made by a home builder rather than a homeowner. In instances such as this, the Evaluators segmented participation into key subgroups to better-differentiate the impact of SUA program interventions on various customer segments' decision-making.

Free-ridership for the residential programs was assessed through surveys of program participants. Survey responses were used to assess the following criteria that indicate free-ridership.

(1) The participant was planning to complete the same project/install the same measure in 2023 before learning about the program.

(2) The participant's budget would accommodate the full cost of the project/measure in the absence of program support.

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(3) The participant would have completed the same project or done something more efficient without program support.

(4) The participant would have completed the same project/installed the same measure or something more energy efficient within one year if the program was not available.

Respondents who met all of these criteria were considered free-riders; all others were not considered free riders. Free ridership was calculated as the average score determined for the sample of participants surveyed, for each program, according to measure category.

2.2.4.2 Prescriptive Non-Residential Free-Ridership

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

- Demonstrated financial ability to purchase high-efficiency equipment absent the rebate
- Importance of the rebate in the decision-making process
- Prior planning to purchase high-efficiency equipment
- 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. This value is then applied to the program-level savings to discount savings attributable to free ridership.

2.2.4.3 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;

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- 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%.

In the C&I Solutions chapter, the free rider "case studies" are provided for every custom project.

2.2.5 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. We followed all applicable measure- and program-level guidelines and protocols from the AR TRM 8.0.

To evaluate program impacts, ADM adjusted program-reported gross savings using the results of our research, relying primarily on engineering desk reviews, TRM deemed savings calculation, 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 TRM V9.1. 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 2-1.

Table 2-1: PY20232 Impact Evaluation Activities by Program

Program	Database / Document Review	Engineering Desk Review	Deemed Savings Review	On-site Verification / Metering	Simulation Modeling	Billing Analysis
Res. Equipment Rebates	✓		✓			
Comm. Equipment Rebates	✓	✓	✓			
Commercial Boiler	✓		✓			
C&I Solutions	✓	✓	✓	✓	✓	✓
Comm. Food Service	✓		✓			
Home Energy Reports	✓					✓
Low Flow Program	✓		✓			
Saving Homes Program	✓		✓	✓		

2.2.6 Net-to-Gross Approach by Program

For the PY2023 evaluation, the evaluation team conducted data collection and analysis to support Net-to-Gross (NTG) calculations. Table 2-2 shows the NTG approach the Evaluators

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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 comply with one of the five accepted approaches listed in the TRM V9.1, Protocol F.

Table 2-2: PY2023 NTG Approaches by Program

Program	Assigned PY2022 Value	Literature Review	SUA-specific Survey	Multi-utility Survey	Control Group Billing Analysis
Residential furnace retrofit				✓	
Residential DHW retrofit				✓	
Residential smart thermostats				✓	
Housing authority furnace & DHW	✓				
New construction – builders	✓				
New construction – custom	✓				
Multifamily	✓				
Commercial Equipment Rebates	✓				
Commercial Boiler	✓				
C&I Solutions					
Direct install	✓				
Custom			✓		
Commercial Food Service	✓				
Home Energy Reports					✓
Low Flow Showerhead / Aerator	✓				
Saving Homes Program	✓				

2.3 Process Evaluation

The Evaluators' general approach to process evaluation begins with a review of the tests for timing and appropriateness of process evaluation as defined in Protocol C of the TRM V9.1. In this review, the Evaluators determine what aspects of the program warrant a process evaluation. The process evaluation activities focused on areas of research to support potential program redesign for the next triennial, allowing for adjustments by SUA to address under-performing programs.

The PY2023 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 typically included:

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- *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 SUA program staff, third-party implementation staff, and program Trade Allies. These interviews are semi-structured, in having general topics to be covered, with a general question and answer outline.

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3 Portfolio-Level Findings

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 PY2023;
- A summary of EM&V activities and expenditures in PY2023; and
- High-level findings that cut across programs.

3.1 Summary of EM&V Effort

Table 3-1 summarizes the data collection efforts for the PY2023 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: Summary of Data Collection Efforts

Program	# Site Visits	# Surveys	# Trade Ally Interviews/Survey
Residential Equipment Rebates	0	117	19*
Commercial Equipment Rebates	0	0	0
C&I Boiler	0	0	0
C&I Solutions	4	0	0
Commercial Food Service	0	0	0
Home Energy Reports	0	0	0
Low Flow Showerhead & Faucet Aerator	0	0	0
Saving Homes Program	50	0	2
Low Income Saving Homes Program	0	20*	
Total	54	137	21

*Combined responses from three AR gas utilities.

3.2 Tests of Portfolio Comprehensiveness

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;

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- **Factor 2:** Whether the programs and/or portfolio, have adequate **budgetary**, management, and program delivery resources to plan, design, implement, oversee and evaluate energy efficiency programs;
- **Factor 3:** Whether the programs and/or portfolio, reasonably address all major **end-uses** of electricity or natural gas, or electricity and natural gas, as appropriate;
- **Factor 4:** Whether the programs and/or portfolio, to the maximum extent reasonable, comprehensively address the needs of customers at one time, in order to avoid **cream-skimming** and lost opportunities;
- **Factor 5:** Whether such programs take advantage of opportunities to address the comprehensive needs of **targeted customer sectors** (for example, schools, large retail stores, agricultural users, or restaurants) or to leverage non-utility program resources (for example, state or federal tax incentive, rebate, or lending programs);
- **Factor 6:** Whether the programs and/or portfolio enables the delivery of all achievable, **cost-effective** energy efficiency within a reasonable period of time and maximizes net benefits to customers and to the utility system;
- **Factor 7:** Whether the programs and/or portfolio, have evaluation, measurement, and verification ("EM&V") procedures **adequate** to support program management and improvement, calculation of energy, demand and revenue impacts, and resource planning decisions.

The Evaluators reviewed the SUA programs and portfolio in order to assess whether it complied 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.

The Evaluators note that the SUA portfolio is divided among a greater number of programs than other portfolios in Arkansas, which in the 2020-2023 program cycle consolidated most programs into single umbrella programs by customer sector (residential, non-residential, low income). As a result, when examining individual programs through this lens there may appear to be shortfalls in certain areas (such as the absence of technical assessments or audits, or whether a measure category is targeted). To address this, the Evaluators have added a summary metric for “portfolio overall” category by table and consider this to be the primary metric upon which the breadth and depth of services provided by the SUA portfolio are assessed.

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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 SUA 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:

- SUA'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.
- SUA program staff conducts outreach and education through a wide range of potential program partners, including contractors, retailers, home builders, and local government.

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
Gas Equipment Rebates	●	●	●	●
Commercial Boiler	●	●	●	●
Commercial Food Service	●	●	●	●
C&I Solutions	●	●	●	●
Home Energy Reports	●	NA	●	NA
Low Flow Program	●	●	●	NA
Saving Homes	●	●	●	●
Low Income Saving Homes	●	NA	●	NA
Portfolio Overall	●	●	●	●

● Educational materials broadly provided
◒ Program budgeting includes educational materials, but materials not broadly provided
○ Educational materials not offered

3.2.1.2 Assessment of Training

The Evaluators reviewed each SUA program to assess whether:

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; and
4) Whether the programs need trade ally certification.

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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
Gas Equipment Rebates	●	●	●
Commercial Boiler	●	●	●
Commercial Food Service	●	NA	●
C&I Solutions	●	●	●
Home Energy Reports	NA	NA	NA
Low Flow Program	NA	NA	NA
Saving Homes	●	●	●
Low Income Saving Homes	●	●	●
Portfolio Overall	●	●	●

● Category fulfilled in most instances (deviations are an exception)
◒ Category fulfilled in some instances (deviations occur regularly)
○ Category not offered not offered/not fulfilled at all

The Commercial Food Service Program has several categories marked as "NA" in that it is driven by equipment vendors, but that their training only constitutes being informed on identifying qualifying equipment and instruction on the application process. Technical training was not provided (and was not needed).

SUA does not require trade ally registration to participate, except for in the Saving Homes and Low Income Savings Homes Programs. Their approach has been to allow all licensed dealers or contractors to apply for the appropriate equipment rebates. The Evaluators have concluded that this has not to-date affected the quality assurance of the programs.

The Evaluators assigned a full Harvey Ball for the Low Income Saving Homes Program. PY2023 showed marked improvement in H&S efforts, and all program trade allies are actively engaging in H&S activities.

3.2.1.3 Marketing & Outreach

The Evaluators reviewed the marketing and outreach strategies associated with each of the SUA 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.

Table 3-4 summarizes the Evaluators' assessment of SUA's marketing and outreach.

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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
Gas Equipment Rebates	●	●	●	●
Commercial Boiler	●	●	●	●
Commercial Food Service	●	●	●	●
C&I Solutions	●	●	●	●
Home Energy Reports	●	NA	NA	NA
Low Flow Program	●	NA	NA	●
Saving Homes Program	●	●	●	●
Low Income Saving Homes Program	N/A	●	●	N/A
Portfolio Overall	●	●	●	●

● Category fulfilled in most instances (deviations are an exception)

◒ Category fulfilled in some instances (deviations occur regularly)

○ Category not offered not offered/not fulfilled at all

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

- Most programs have marketing materials that address specific barriers associated with the targeted segments or technologies.
- SUA has initiated sector-specific marketing, including fact sheets for restaurants and food processing plants.
- The SUA 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.
- The Low Income Saving Homes Program is not broadly marketed during pilot phase and as a result the Evaluators have assigned "N/A" to some categories.

3.2.1.4 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
- Cost per Therm saved
- Review of trade ally resources dedicated to program promotion.

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Table 3-5: Assessment of Budgetary, Management, and Program 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
Gas Equipment Rebates	●	●	●	●
Commercial Boiler	●	○	●	●
Commercial Food Service	●	●	●	●
C&I Solutions	●	●	●	●
Home Energy Reports	●	●	●	N/A
Low Flow Program	●	○	●	N/A
Saving Homes	●	●	●	●
Low Income Saving Homes	●	◒	●	●
Portfolio Overall	●	●	●	●

● Quantitative: meets of expectation/requirement

Qualitative: Category fulfilled in most instances (deviations are an exception)

◒ Quantitative: value no lower than 80% of expectation/requirement

Qualitative: Category fulfilled in some instances (deviations occur regularly)

○ Quantitative: value is lower than 80% of expectation/requirement

Qualitative: Category not offered not offered/not fulfilled at all

From this review, the Evaluators concluded that the SUA portfolio overall has adequate budget and staff allocations. Programs were credited with full compliance if acquisition costs exceeded plan values by no more than 10%. Programs were credited with partial compliance if acquisition costs exceeded program plan values by no more than 20%. Figure 3-1 summarizes the planned and actual first-year savings acquisition costs.

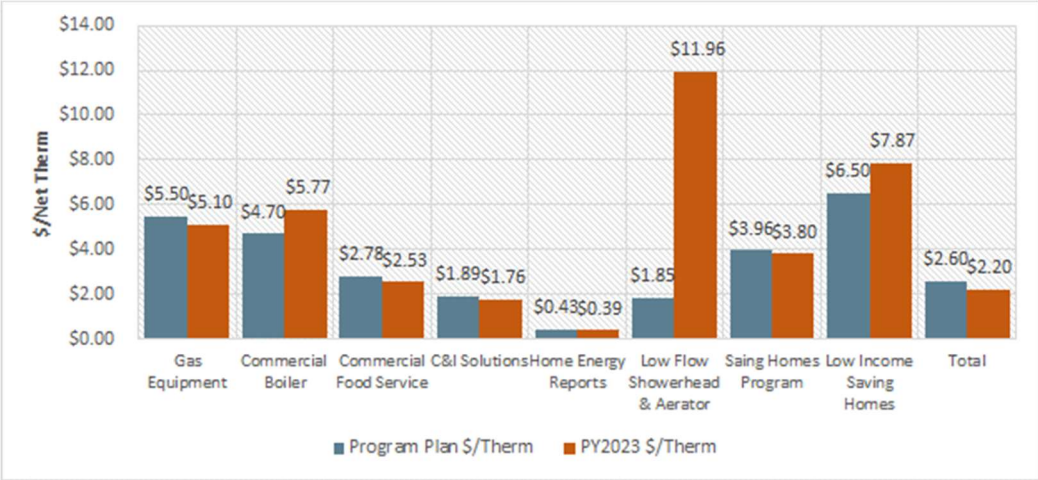

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Figure 3-1: Planned vs. Actual Acquisition Costs

- The portfolio overall had acquisition costs that were 15% lower than the program plan. This is due largely to the effects of the Home Energy Reports and C&I Solutions Programs.
- C&I Solutions had costs that were 7% lower than program plan values. It is the most cost-efficient program for lifecycle savings (the only program with a lower first-year acquisition cost is Home Energy Reports).
- Many programs had marked improvement in acquisition costs – Gas Equipment, Commercial Food Service, and the Saving Homes Program all had lower acquisition costs than in PY2022.

3.2.1.5 Factor 3: Addressing Major End-Uses

The Evaluators identified the end-uses served by each of the SUA programs. Most SUA 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	Food Service	Building Envelope	Industrial Process	Behavioral
Gas Equipment Rebates	●	●	○	○	○	○
Commercial Boiler	●	●	○	○	○	○
Commercial Food Service	○	○	●	○	○	○
C&I Solutions	●	●	◒	●	●	●
Home Energy Reports	○	○	○	○	○	●
Low Flow Program	●	●	○	○	○	○
Saving Homes	●	●	○	●	○	○
Low Income Saving Homes	●	●	○	●	○	○
Portfolio Overall	●	●	●	●	●	●

● Measure targeted ◒ Measure offered ○ Measure not offered

3.2.1.6 Factor 4: Comprehensively Addressing Customer Needs

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

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

The SUA portfolio has no specific requirements for installation of multiple measures. Customers can participate to an extent of their choice. This is a program best-practice in enabling

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customers to engage in energy efficiency in a manner in accordance with their budget constraints.

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
Gas Equipment Rebates	◒	●	●	●	●
Commercial Boiler	◒	●	○	●	●
Commercial Food Service	◒	●	○	●	●
C&I Solutions	●	●	●	●	●
Home Energy Reports	○	●	NA	NA	NA
Low Flow Program	○	○	NA	NA	NA
Saving Homes	●	●	NA	NA	NA
Low Income Saving Homes	●	●	NA	NA	NA
Portfolio Overall	●	●	●	●	●

● Broadly provided ◒ Available ○ Not offered

Findings from the assessment of this factor included:

- Most SUA 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 high-efficiency food service equipment, and boilers.
- The SUA portfolio offers tiered incentives for premium efficiency across all of their rebate programs. This includes:
  - The incentives for efficient furnaces increase from $400 to $600 for units with 95% AFUE or greater.
  - Incentives for efficient water heaters range from $75 for storage tank water heaters to $500 for tankless water heaters, and large commercial water heaters have an incentive that scales with system size ($200 per 100,000 input BTU).
  - High-efficiency boiler incentives are $1,800/MMBtuh for units < 92% efficient and $3,500/MMBtuh for units with 92% efficiency or greater.
  - The Commercial Food Service now offers tiered incentives for different system capacities and efficiencies for key measures (ovens, fryers).
  - The C&I Solutions program pays an incentive per verified Therm, and as a result projects with higher savings are by design paid a higher incentive.

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- The SUA portfolio has programs that bundle on-site technical assistance with direct installation.
- The range of technical assistance varies by program. Equipment Rebates and Commercial Boiler Programs offer technical assistance through program trade allies. The level of on-site technical assistance is lower for the Commercial Food Service Program in that the market is driven by in-store contact with vendors rather than by on-site assessment. C&I Solutions, Saving Homes, and Low Income Saving Homes provide on-site technical assistance that is directly funded by the program.
- The programs have procedures for following up with customers after their participation, which includes thank-you calls or emails and verification inspection.
- Marketing materials typically make attempts at cross-promotion of programs.

3.2.1.7 Factor 5: Targeting Market Sectors & Leveraging Opportunities

The Evaluators reviewed whether the SUA 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

Program	Residential	Multifamily	Mobile Home	Small Commercial	Large Commercial	Industrial	Agricultural	Public Sector
Gas Equipment Rebates	●	●	◒	●	●	◒	◒	●
Commercial Boiler	●	◒	○	◒	●	◒	◒	●
Commercial Food Service	●	◒	○	●	●	◒	◒	●
C&I Solutions	●	◒	○	●	●	●	●	●
Home Energy Reports	●	●	◒	○	○	○	○	○
Low Flow Program	●	●	◒	○	○	○	○	○
Saving Homes	●	◒	◒	○	○	○	○	◒
Low Income Saving Homes	●	◒	◒	○	○	○	○	◒
Portfolio Overall	●	●	N/A	●	●	●	●	●

● Program targets this sector

◒ Sector is eligible for this program

○ Sector is ineligible for this program

Each sector has several programs for which they are eligible, and at least one program that targets them. Segments with fewer targeted outreach avenues include:

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- Mobile/manufactured housing is often not targeted as there is a much higher prevalence of electric space and water heating.
- Agriculture and Industrial sectors are not specifically targeted by the Commercial Equipment Rebates 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.

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

Examples of cross-utility coordination included:

- The Evaluators provide EM&V to SUA, Black Hills Energy, and Arkansas Oklahoma Gas. 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.
- SUA has brought on a third-party implementer (CLEAResult) for their C&I Solutions, Saving Homes, and Low Income Saving Homes Programs. This implementer uses the same program design and similar incentive levels for Black Hills Energy and AOG. This has allowed for reduced program costs for the three programs, which constitute the largest C&I and residential programs in most portfolios.
- SUA engages in several joint-marketing efforts with the other gas utilities as well as with Entergy Arkansas, Inc. (EAI) and Southwestern Electric Power Company (SWEPCO). This has included joint-implementation of education and promotional opportunities when interests with the other gas or electric utilities align.

Examples of coordination with non-utility partners included:

- SUA's programs are marketed through industry partners including professional organizations, trade groups, universities, and homeowners' associations.
- SUA works with a local technical college to help provide training opportunities to trade allies and students interested in careers related to energy efficiency.

3.2.1.8 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.

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Table 3-9: Assessment of Cost-Effectiveness

Program	NTGR	NTGR Within Industry Norms	Met Net Savings Goal	Program TRC
Residential Equipment Rebates	83.0%	Yes	○	1.01
Commercial Equipment Rebates	79.0%	Yes		
Commercial Boiler	80.3%	Yes	○	1.13
C&I Solutions	100.0%	Yes	●	1.42
Commercial Food Service	77.2%	Yes	◒	1.55
Home Energy Reports	100.0%	Yes	●	1.13
Low Flow Showerhead & Aerator	62.7%	Yes	○	.78
Saving Homes	90.0%	Yes	●	7.27
Low Income Saving Homes	100.0%	Yes	●	2.70
Portfolio Overall	95.2%	Yes	●	1.67

Programs were assessed as meeting net savings goal if they had at least 90% of goal. Programs were assessed as "partial" if they met at least 80% of their savings goal. All programs passed TRC except the Low Flow Showerhead & Aerator Program.

3.2.1.9 Factor 7: Adequacy of EM&V Procedures

The Evaluators conducted a review of EM&V procedures by program:

- Quality Assurance and Quality Control (QA/Q)C and EM&V procedures by SUA program staff;
- QA/QC and EM&V procedures by third-party implementation staff (where applicable)
- QA/QC and EM&V procedures by the Evaluators.

The EM&V of the SUA programs incorporated industry best practices and was conducted in an iterative process that incorporated feedback from SUA and implementation contractors as well as the Independent Evaluation Monitor (IEM). The Evaluators developed EM&V plans that corresponded to protocols set out in the Arkansas TRM V9.1.

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 TRM V9.1

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algorithms versus the use of simplifying assumptions[14]. 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
Residential Equipment Rebates	●	●	●	●
Commercial Equipment Rebates	●	●	●	●
Commercial Boiler	●	●	●	●
Commercial Food Service	●	●	●	●
C&I Solutions	●	●	●	●
Home Energy Reports	●	●	●	NA
Low Flow Program	●	●	●	NA
Saving Homes Program	●	●	●	●
Low Income Saving Homes	●	●	●	●

● Data and QA/QC procedures conform to all AR TRM V9.1 guidelines

◒ Data and QA/QC procedures conform to most AR TRM V9.1 guidelines

○ Data and QA/QC procedures fail to conform to most AR TRM V9.1 guidelines

Findings of this review included:

- Water heating projects in Commercial Equipment Rebates had significantly improved data compared to prior program years.
- C&I Solutions tracking data contained all needed fields for evaluation and recreation of energy savings calculations.
- The Saving Homes and Low Income Saving Homes Program tracking data contained all needed fields for evaluation and recreation of energy savings calculations.
- QA/QC inspections are in place for all programs other than Home Energy Reports (where it is not needed) and the Low Flow Showerhead & Faucet Aerator Program. For the Low Flow Showerhead & Faucet Aerator Program, post-inspection of participant

[14] 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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residences is not likely to add value, and savings calculations by SUA already incorporate expected in-service rates. QA/QC is performed by the Evaluators via telephone survey.

3.2.1.10 NEBs Summary

NEBs claimed by-program are as follows:

- **Residential Equipment Rebates:** avoided replacement costs, deferred replacement costs, kWh;
- **Commercial Equipment Rebates:** avoided replacement costs, kWh, kW;
- **C&I Solutions:** water, kWh;
- **Commercial Food Service:** water;
- **Low Flow Showerhead & Faucet Aerator:** water, kWh, kW; and
- **Saving Homes Program:** water, kWh, kW.
- **Low Income Saving Homes Program:** water, kWh, kW.

Table 3-11: Residential NEBs

Measure	Water	kWh / kW	ARC / DRC	AR TRM V9.1 Section
Smart thermostat		✓		2.1.12
Furnace (early retirement only)			✓	2.1.3
Duct sealing		✓		2.1.11
Ceiling insulation		✓		2.2.2
Air infiltration		✓		2.2.9
Tankless water heater			✓	2.3.1
Faucet aerators	✓			2.3.4
Low-flow showerheads	✓			2.3.5

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Table 3-12: Commercial NEBs

Measure	Water	kWh / kW	ARC / DRC	AR TRM V9.1 Section
Furnace (early retirement only) [15]			✓	2.1.3
Smart thermostat[15]		✓		2.1.12
Tankless water heater[15]			✓	3.3.1
Faucet aerators	✓			3.3.2
Low-flow showerheads	✓			3.3.5
Pre-rinse spray valves	✓			3.8.11
Condensate return	✓			N/A - Custom
Steam leak repair	✓			N/A - Custom

3.2.1.11 Calculation of Cost of Carbon

Separate from this report, SUA has filed cost of carbon estimates using low, middle, and high scenarios of $0, $5, and $15 per ton (respectively).

[15] Furnace and smart thermostat projects were residential end-use space types (e.g., multifamily) under a commercial meter. Tankless water heaters included both residential end-use space types and commercial space types.

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4 Residential Equipment Rebates

The Residential Natural Gas Equipment Rebate Program is a component of the Natural Gas Equipment Rebate Program. The program provides prescriptive incentives for space heating and water heating equipment. Eligible measures for this program include:

- $400 for gas furnaces with 90%-94.9% AFUE;
- $600, with 95% or higher AFUE;
- $60 for a smart thermostat installed;
- $75 for storage tank water heaters less than 75,000 BTU with a UEF of .70 or greater;
- $200 per 100,000 input BTU for larger storage tank water heaters with 88% or greater thermal efficiency;
- $500 for tankless water heaters with a UEF of 0.80 or greater;
- $1500 for combined installation of a 95% AFUE furnace and a tankless water heater; and
- $1500 for a combi boiler with 95% AFUE.

The program is targeted at the residential market sector and offers rebates for retrofit and new construction applications. The space heating equipment utilizes an 80% baseline AFUE, while the water heating equipment utilizes the same baseline Uniform Energy Factors as determined through equipment capacity. The marketing efforts were largely directed at plumbing and HVAC contractors; their involvement is seen as crucial, as they are generally a primary source of information for end-use customers when deciding upon a replacement system.

4.1 Participation Summary

4.1.1 Space Heating Participation Summary

In PY2023, the space heating channel had a total of 1,465 processed residential rebates. The participation comprised:

- 1,132 furnaces;
- 1 combi boiler;
- 266 smart thermostats; and
- 66 combination furnace/water heater rebates.

4.1.2 Water Heating Participation Summary

In PY2023, the water heating equipment channel had a total of 1,618 processed rebates. Of these, 66 were from a combination rebate for both a furnace and water heater. All rebates

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were for tankless water heaters.

4.2 Process Evaluation

Table 4-1 and Table 4-2 summarize the Evaluators' review of the Residential Equipment Rebates program compared to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 4-1: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and Innovative Components	No. The program is unchanged from PY2022.
No Previous Process Evaluation	No. The program received a full process evaluation in PY2021 and a limited process evaluation in PY2022.
New Vendor or Contractor	No, implementation is unchanged from PY2022.

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

Component	Determination
Are program impacts lower or slower than expected?	Yes. The program reached only 45% of the PY2022 savings goal.
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?	Yes. The program reached only 48% of the PY2022 savings goal.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. Past 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 was within expected boundaries given participation rates.
Do participants report problems with the programs or low rates of satisfaction?	No. 2017 – 2022 participant surveys found high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program is influencing sales of high efficiency equipment that would not have occurred otherwise.

A limited process evaluation was conducted in PY2023.

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4.3 Response to Program Recommendations

Table 4-3 summarizes the status of issues and recommendations identified in the PY2022 process evaluation.

Table 4-3: Equipment Rebates Response to PY2022 Recommendations

Recommendation	Status of Issue
Increase incentives where the Utility Cost Test allows for it. Many program incentives have remained unchanged for a significant period of time, though costs have increased with higher inflation in recent years. In SUA's next triennial plan, incentives should be increased for residential equipment if increases in SUA's avoided costs allow for the measures to pass Utility Cost Test screening at an increased incentive level	Complete. SUA increased incentives for the PY2024-PY2026 triennial period.

4.3.1.1 Data Collection Activities

The process evaluation of the Residential Equipment Rebates Program included the following data collection activities:

- *Summit AR Program Staff Interviews.* The Evaluators interviewed staff at Summit AR involved in the administration of the Residential Equipment Rebates. These interviews were to collect information from program staff as to any changes or developments, as well as response to program recommendations.
- *Participant Surveys.* The Evaluators surveyed customers who participated in the equipment rebate program to collect feedback about their program awareness, participation, and satisfaction.
- *Trade Ally Surveys.* The Evaluators surveyed trade allies who participated in the equipment rebate program to collect feedback about their program awareness, participation, and satisfaction.

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

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Table 4-4: Summit AR Residential Equipment Rebates Data Collection Summary

Target	Component	Activity	n	Sample Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Programs Manager of Conservation Improvement Senior Energy Efficiency Consultant Energy Efficiency Consultant	Interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, marketing and outreach, data tracking, and rebate processing.
Participants	Participant Survey	Survey	117	±7.6%	Participants responded to questions regarding their program awareness, engagement, and satisfaction.
Trade Allies	Participant	Survey	21	±17.5%	Trade ally participants responded to questions regarding their program awareness, engagement, and satisfaction.

4.3.1.2 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, and surveys with participants, and a literature review.

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4.3.1.3 Protocol A Review

Table 4-5: Equipment Rebates 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	-	Phone numbers provided for 65% of participants. Emails provided for 71% of participants.
	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	✓	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	✓	
	Other inputs necessary for the use and compliance with the TRM	-	Data reported for 39% of participants.
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	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	

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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.	✓	

4.3.1.4 Staff and Implementer Interviews Summary

Evaluators interviewed four Summit AR staff members and one CLEAResult staff member about the program. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, the Senior Energy Efficiency Consultant, and the Energy Efficiency Consultant. The CLEAResult staff member was the program manager for Summit AR's residential portfolio.

Despite concerns regarding the economy and housing market, the residential equipment rebate program performed well in 2023 based on staff reports. Although there were no adjustments to rebate amounts, additional self-install measures were added to the program, including an independent smart-thermostat. Previously customers could only receive rebates for smart thermostats bought in conjunction with a furnace.

Most of the equipment rebate program is implemented by Summit AR directly; CLEAResult helps with rebate processing, but no other major program component.

Staff rely on a combination of trade ally and Summit driven marketing. Typically, customers purchase the equipment from a retailer and receive paperwork directly, rather than receiving a rebate via a contractor.

4.3.1.5 Participant Survey Summary

Evaluators conducted a survey of customers who participated in the equipment rebate program to gather feedback about customers' engagement with and experience of the programs. Tracking data included 773 customers with an email address. Customers were contacted via email 3 times and invited to complete the survey. One-hundred and seventeen participants responded to the survey for a response rate of 15.1%.

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4.3.1.5.1 Respondent Demographics

Table 4-6 demonstrates respondents' demographic characteristics.

Table 4-6: Respondent Demographics (n varies)

Answer	%	Count
Homeownership status (n=117)		
Rent	0.0%	0
Own	96.6%	113
Own but rent to someone else	1.7%	2
Prefer not to answer	1.7%	2
Household size (n=117)		
1 person	8.6%	10
2 people	60.7%	71
3 people	16.2%	19
4 people	4.3%	5
5 people	3.4%	4
6 people	2.6%	3
7 people	0.9%	1
8 people or more	0.0%	0
Prefer not to answer	3.4%	4
Age (n=117)		
18 - 24	1.7%	2
25 - 34	5.1%	6
35 - 44	9.4%	11
45 - 54	18.8%	22
55 - 64	23.9%	28
65 - 74	22.2%	26
75+	16.2%	19
Prefer not to answer	2.6%	3
Someone in home is at least 65 years old (n=117)		
Yes	44.4%	52
No	48.7%	57
Don't know	0.0%	0
Prefer not to answer	6.8%	8

4.3.1.5.2 Program Awareness and Engagement

Respondents learned about the program a variety of ways, most commonly through their contractor (Figure 4-1). **Respondents were most interested in the program to save money on**

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energy bills (55.5%, n=65) followed by improving the comfort of their home (37.6%, n=44) and getting a rebate (6.8%, n=8) (Figure 4-2).

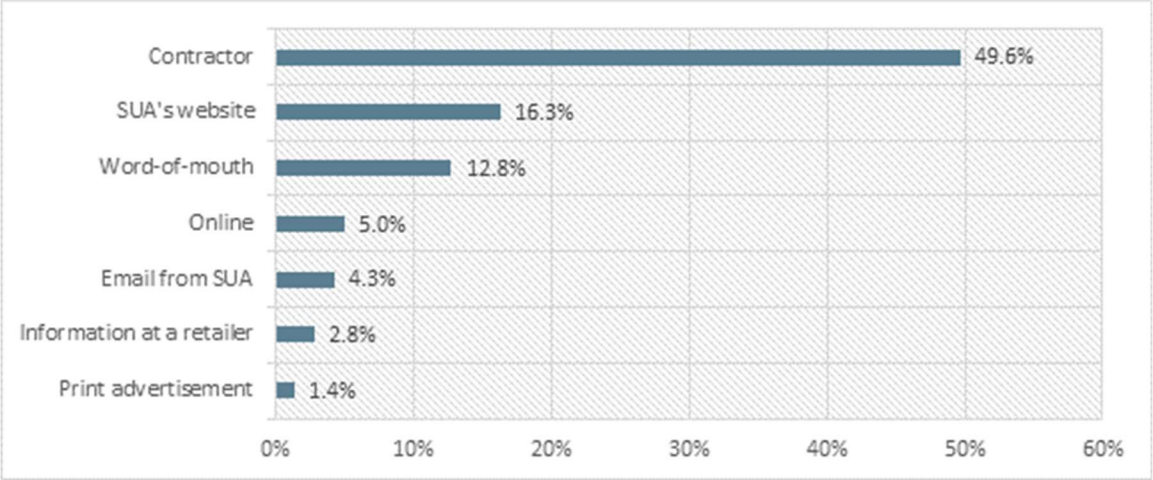

Figure 4-1 Program Awareness (n=117)

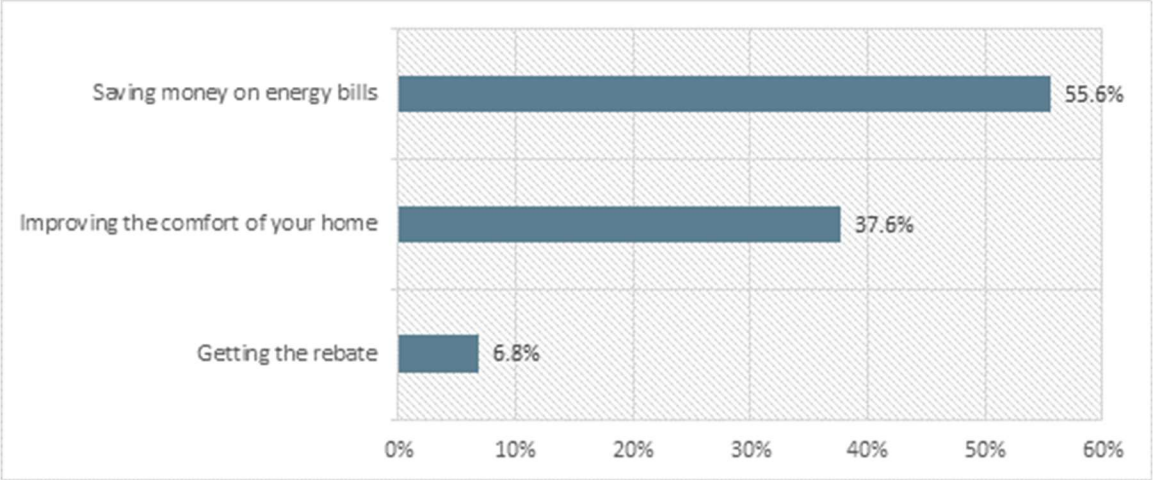

Figure 4-2: Most Important Motivator for Participation (n=117)

Respondents received rebates for water heaters, smart thermostats, furnace, and boilers. Among the 117 respondents, 133 product rebates were distributed. Ninety-three respondents replaced 103 products, more than a fifth of the replaced equipment that was not working (22.3%, n=23), more than a third of replaced products were fully working and not in need of repair, and the remaining products (n=48) were working but in need of some repair (46.6%) (Figure 4-3).

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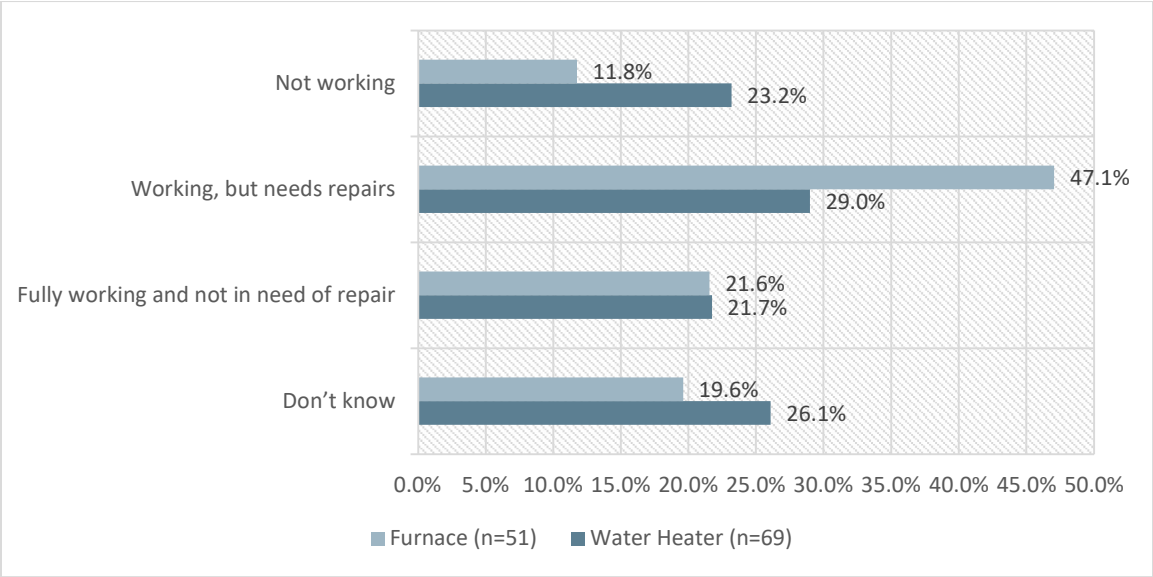

Figure 4-3: Status of Equipment Rebated

Most respondents had to pay some money for the equipment they received a rebate for (90.5%, n=105); more than half of respondents were also planning on purchasing the new equipment before they learned about the rebates (56.0%, n=65). Half of respondents indicated they would have bought the same piece of equipment even if the incentive was not available (50.8%, n=59), however one-quarter noted they would have bought something different (25.9%, n=30).

Contractors tended top emphasized the energy efficiency of the equipment when providing recommendations (Figure 4-5).

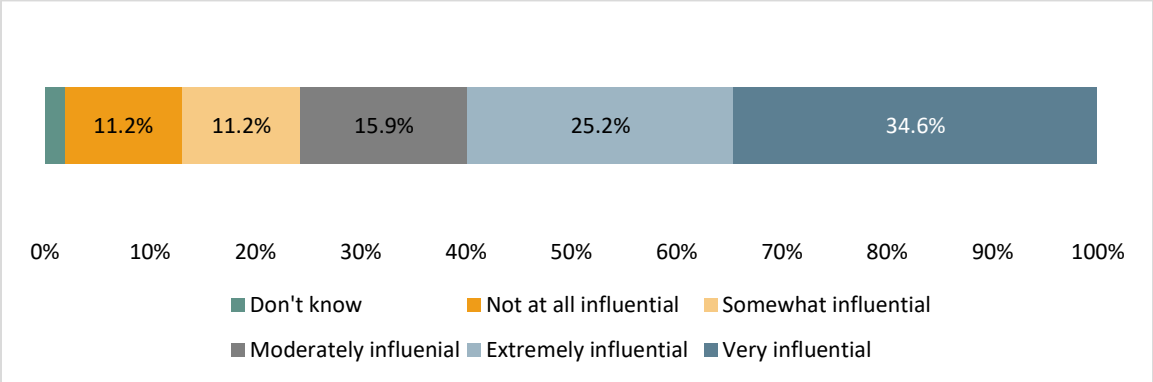

Figure 4-4: Contractors' Role in Equipment Choice (n=107)

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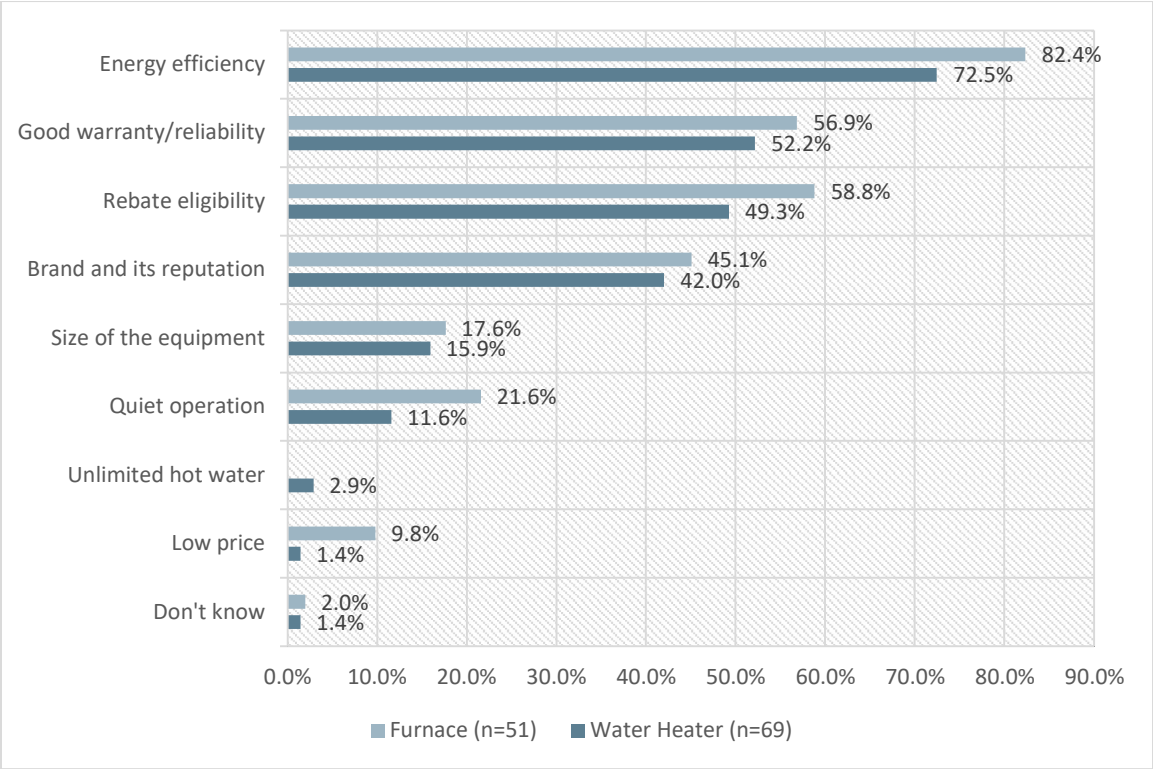

Figure 4-5: Equipment Components Emphasized by Contractor

4.3.1.5.3 Program Satisfaction

In general, respondents were satisfied with the program (Figure 4-6) and SUA as their service provider (Figure 4-7). Twenty-five respondents expressed dissatisfaction with the program; reasons for dissatisfaction included difficulty with the application process (n=11), the time it took to get the rebate (n=10), issues with the contractor (n=3), and product availability (n=1)

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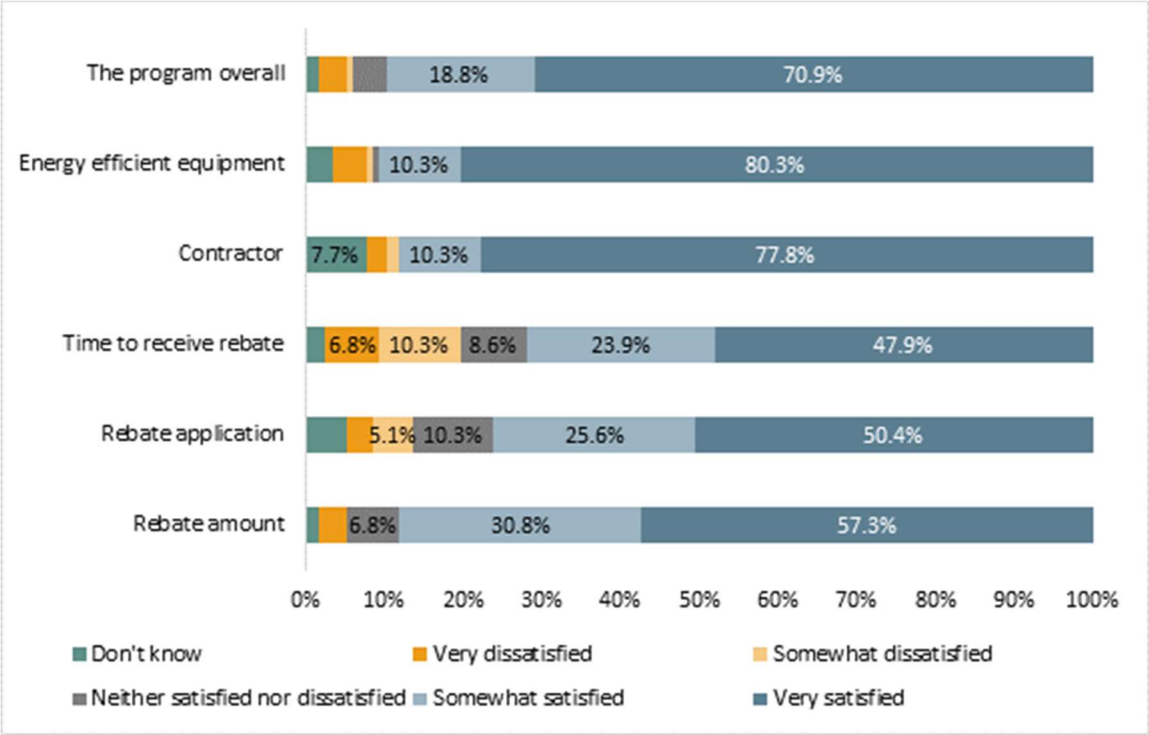

Figure 4-6: Program Satisfaction (n=117)

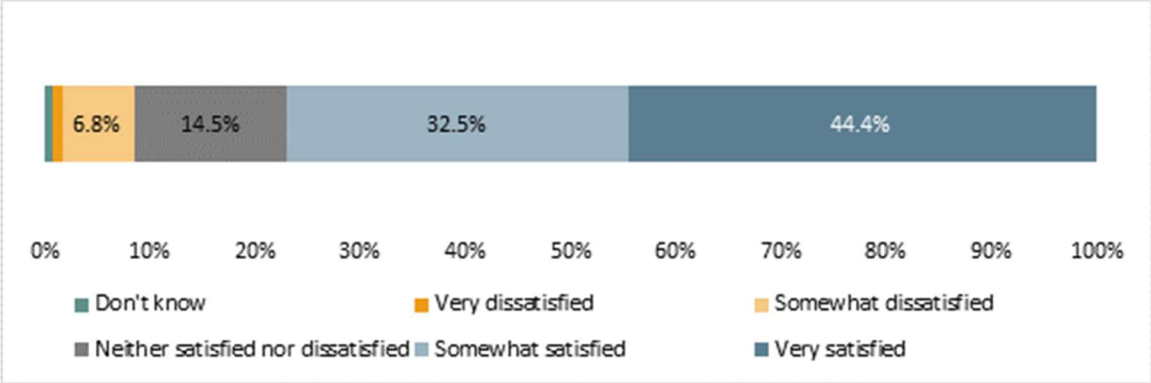

Figure 4-7: Satisfaction with SUA (n=117)

4.3.1.6 Trade Ally Interview and Survey Summary

Evaluators conducted a survey of trade allies who participated in the Arkansas gas utilities' equipment rebate programs to gather feedback about trade allies' engagement with and experience of the programs. Tracking data included 299 unique trade ally contacts across the

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three utilities. Of these participants, 153 had valid email addresses. Trade allies were contacted via email three times and invited to complete the survey. 19 participants responded to the survey for a response rate of 12.4%. In total, 21 trade allies responded to the survey.

Because trade allies participated across all three equipment rebate programs and all three programs are structured similarly, results are combined for all three programs.

4.3.1.6.1 Program Awareness and Engagement

The majority of responding trade allies were HVAC or water heater contractors (Figure 4-8). About half of the survey respondents represented businesses with one to four employees (90.4%, n=2) (Table 4-7). All but two of the respondents had previously participated in the program (89.5%, n=19); the remaining respondents learned about the programs through trade associations.

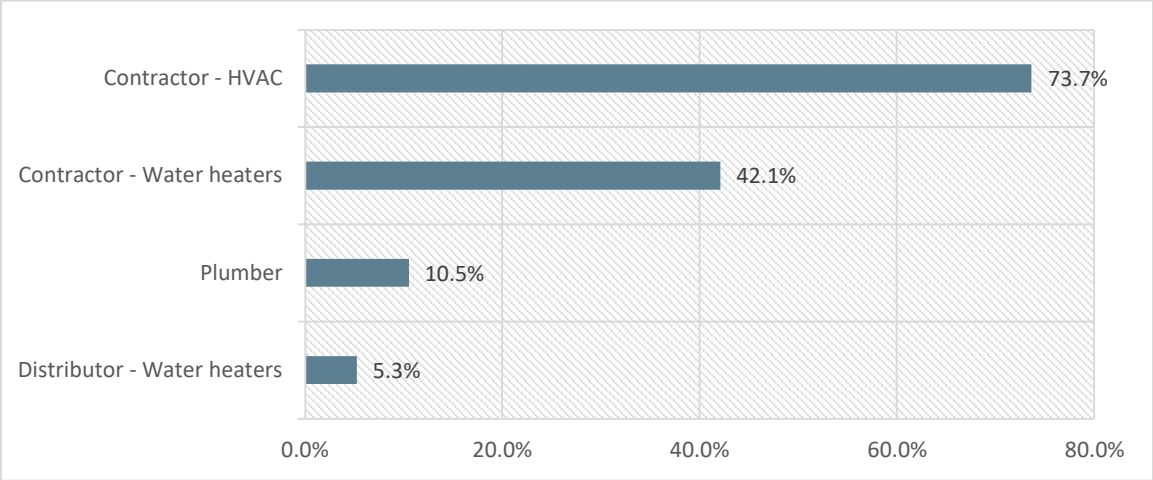

Figure 4-8 Business Type (n=21)

Table 4-7: Number of Employees (n=19)

Employees	%	n
1 to 4	47.4%	9
5 to 9	10.5%	2
10 to 19	21.1%	4
20 to 99	15.8%	3
Prefer not to answer	5.3%	1

On average, about one-third of survey respondents' customers were aware of the incentives

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available through the equipment rebate programs prior to their mentioning it. Respondents noted that the utilities can increase program awareness through simplified application process (n=2), bill inserts (n=1), expanding marketing materials (n=1), and increased promotion of the benefits of efficient equipment (n=1). The majority of respondents actively promote the rebate programs to their customers (90.4%, n=19); popular marketing techniques include mentioning it during home visits, posting on company website, mentioning it in cost estimates, and including information in sent materials (Figure 4-9).

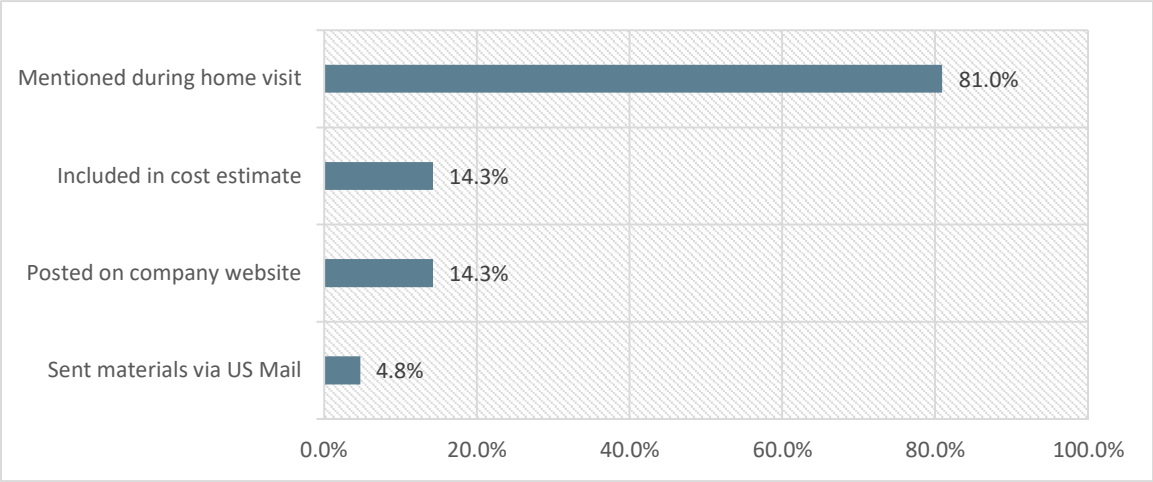

Figure 4-9: Program Marketing (n=19)

Most survey respondents noted they promote some equipment more than other equipment (84.2%, n=16), specifically tankless water heaters (n=6); eight respondents also had preferred brands. In general, survey respondents rely on price (n=8), customer service support (n=6), equipment quality (n=4), and energy savings (n=3) when choosing which equipment to promote. Half of the survey respondents noted that involvement in the program has affected the types of equipment they promote (52.6%, n=10), with all ten respondents indicating they are more likely to promote efficient equipment because of the rebates.

Across all 21 respondents, upfront equipment cost was the main reason their customers do not purchase efficient equipment.

More than half of the respondents complete the entire program application for their customers (57.1%, n=12) and one-quarter assist their customers in completing the application (26.3%, n=5). Seven (36.8%) of respondents noted that some of their customers did not apply for a rebate even though they purchased efficient equipment; these customers did not apply for a rebate due to issues with the application. In open-ended interviews, both trade allies also identified challenges with the application including discrepancies in the amount of the rebate

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applied for versus what is approved (n=1), and issues with AHRI numbers being recognized in the submission portal (n=1).

4.3.1.6.2 Program Satisfaction

In general, respondents were satisfied with the equipment rebate programs (Figure 4-6). More respondents expressed dissatisfaction with the "steps taken to get through the program" than any other category (23.8%, n=5), citing the difficult to use rebate portal and application process. Most respondents believe the incentive levels provided by the programs are appropriate (80.9%, n=17).

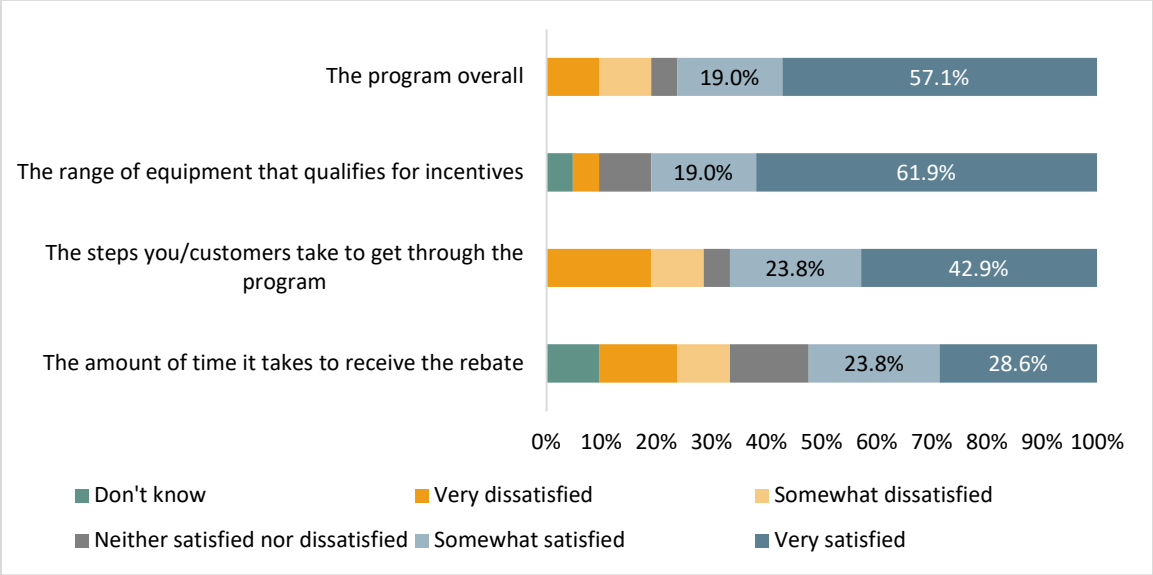

Figure 4-10: Program Satisfaction (n=21)

Survey respondents indicated that email is the most effective way for utilities to keep them updated about programs (Figure 4-11). Among the two-thirds of survey respondents who interacted with program staff during the program year (68.4%, n=13), all but three were satisfied with all aspects of their communication with program staff (Figure 4-12). Dissatisfied survey respondents cited application issues (n=2), staff's professionalism (n=2), and confusion over program components (n=1). Moreover, across all respondents, eleven highlighted issues with the portal and application process, noting the system is frustrating and not user friendly.

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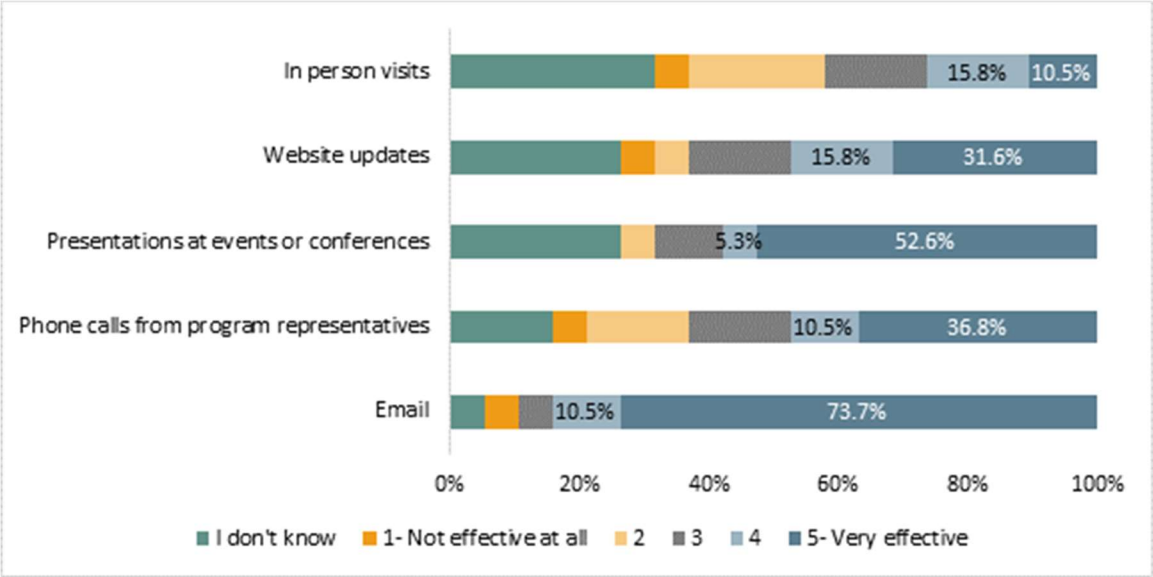

Figure 4-11: Preferred Communication Methods (n=19)

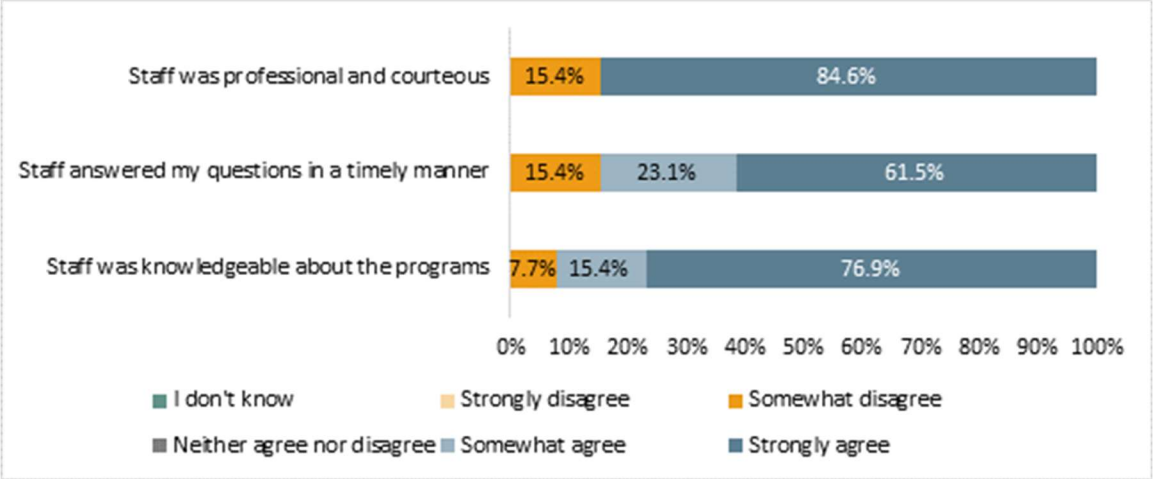

Figure 4-12: Interactions with Utility Staff (n=13)

4.4 Impact Evaluation

The impact evaluation effort of the Residential Equipment Rebates Program included the following:

- *Desk review of residential calculations.* The Evaluators utilized TRM V9.1 values in assessing savings from residential furnaces.

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- *NTG Surveying.* The Evaluators completed NTG surveys to update values for furnaces, water heaters, and smart thermostats.

The resulting deferred replacement cost is $303.05. This is parsed out proportionally to water heater retrofits based on the rate of early retirement and appropriate NTGR. The calculator for this is provided in Appendix B of this report. The resulting net ARC value is $490,438.

4.4.1.1 Free Ridership

To be classified as a free-rider, respondents must have met all three of the following conditions; any respondent that did not meet all three of these conditions was classified as a non-free rider:

- Was already planning to purchase and install the project in the same year before learning about the program.
- Budget would have accommodated the project's full cost in the absence of the program rebate.
- Would have purchased the same or higher efficiency measure within one year in the absence of the program.

Results from a multi-utility survey effort of PY2023 program participants were used to determine the following measure-level NTGRs:

- Furnace: 78.4%
- Water Heater: 71.7%
- Smart Thermostat: 61.2%

4.4.1.2 Impact of Early Replacement

Evaluators conducted a limited process evaluation in PY2022; this limited process evaluation did not include surveys. However, evaluators included early retirement calculations from PY2022 below. For residential furnaces, early retirement AFUE is calculated by a degradation factor of a 78% AFUE unit. This is calculated as:[16]

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

[16] Arkansas TRM V9.1 Volume 2, Section 2.1.3 Gas Furnace Replacement, Pg. 41

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$Base\ AFUE$ = efficiency of the existing equipment when new, 78% AFUE.

M[17] = 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 TRM V9.1 updated the RUL table, which has been reflected in Table 4-8.[18]

Table 4-8: 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		

To assess whether a unit qualified for early retirement, 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?

[17] 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.

[18] AR TRM V9.1 Volume 2, Section 2.1.3, Pg. 43

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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
1.

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

1. ___ # Years
98. DON'T KNOW

Figure 4-13 summarizes the scoring for early retirement based on these three questions.

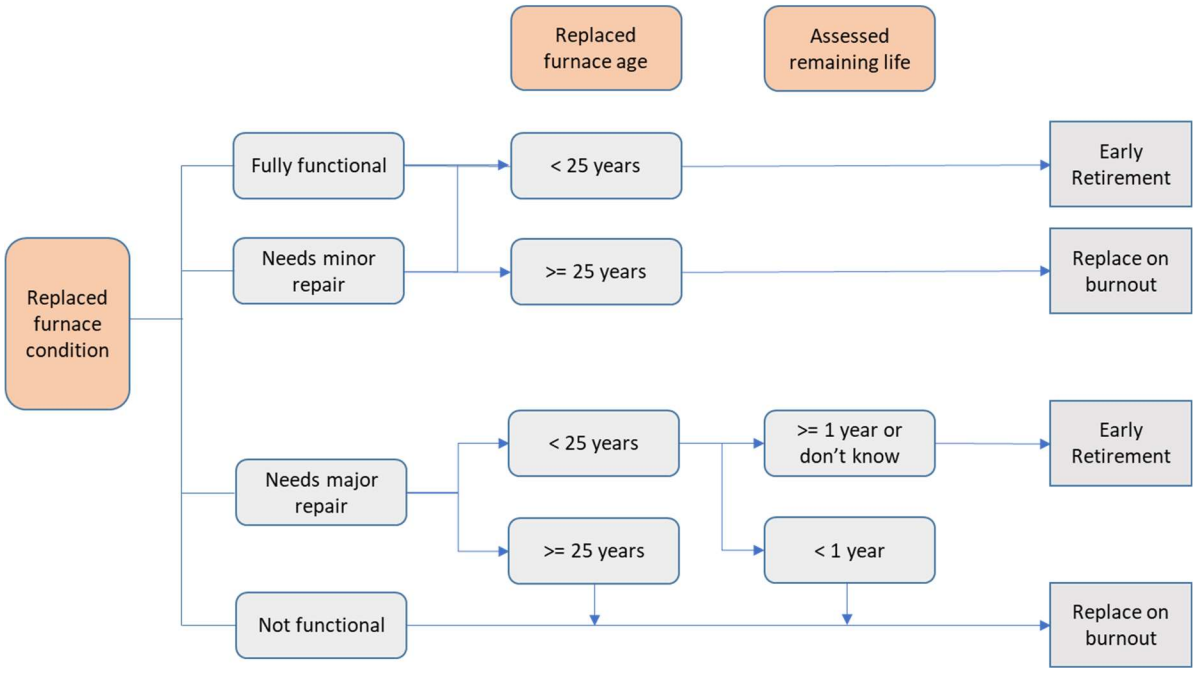

Figure 4-13: Residential Furnace Early Retirement Flowchart

In total, in the PY2023 survey the Evaluators found that 60.98% of Summit furnace retrofits were early retirement. The average age of qualifying units was 16.09 years.

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Based on the degradation equation from TRM V9.1[19], this leads to an Early Retirement AFUE of:

$$AFUE_{base_{early}} = (.78) \times (1 - .01)^{17.49} = .6542$$

Further, based on the values in Table 4-8, the RUL of the early replacement units is four years. For years 5-20 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 60.98% early replacement and 39.02% normal replacement. The resulting weighted average baseline is:

$$AFUE_{base_{early_weighted}} = 60.98\% \times .6542 + 39.02\% \times .80 = .7111$$

4.4.1.3 Residential Water Heating Impact Evaluation

Savings from tankless water heaters were calculated using protocols from Arkansas TRM V9.1 Vol. 2 Section 2.3.1.

4.4.1.4 Ex Post Savings

Table 4-9 presents the gross savings results of the evaluation of the PY2023 Equipment Rebates Program. Total gross savings summarizes the savings calculations performed by TRM V9.1 protocols.

Table 4-9: Equipment Rebates Ex Post Gross Therms Savings

Measure Category	Ex Ante Therms Savings	Ex Post Therms Savings	Gross Realization Rate	EUL	Lifetime Therms Savings
Furnace	293,511	226,683	77.20%	13.4	3,309,204
Combi Boiler	508	426	83.86%		5,995
Water Heater	82,966	82,035	98.90%	20	1,640,693
Smart Thermostat	18,100	18,100	100.00%	11	199,095
Total	**395,085**	**327,244**	**83.00%**	**14.7**	**5,154,987**

[19] AR TRM V9.1 Vol. 2 Pg. 44

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The resulting net savings are presented in Table 4-10.

Table 4-10: Equipment Rebates Net Savings Summary

Project Category	Free Ridership Rate*		Net Annual Savings		Net Realization Rate	Net Lifetime Therms Savings
	Ex Ante	Ex Post	Ex Ante	Ex Post		
Furnace	18.2%	16.9%	240,127	188,317	78.4%	2,749,724
Combi Boiler	14.0%	13.8%	437	367	84.0%	5,155
Water Heater	13.1%	13.1%	72,078	71,269	98.9%	1,425,378
Smart Thermostat	12.5%	35.0%	15,837	11,765	74.3%	129,412
Overall:	**16.9%**	**17.0%**	**328,478**	**271,717**	**82.7%**	**4,309,669**

4.4.1.5 Furnace Early Retirement

Furnace early retirement is eligible for the Deferred Replacement Cost Non-Energy Benefit. This benefit is the present value of the perpetuity of the deferred installation of new equipment. The inputs are as follows:

- Full installed cost of efficient furnace: $2,548
- Full installed cost of baseline furnace: $2,011
- Remaining useful life of existing furnace: 4 years
- Nominal Discount Rate: 5.7%
- Inflation Rate: 1.9%
- Real Discount Rate: 3.7%

The resulting deferred replacement cost is $717.22. This is parsed out proportionally to furnace retrofits based on the rate of early retirement and appropriate NTGR. There were 845 units for which DRC is applicable. The total net DRC is $638,394.

4.4.1.6 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

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Benefit. This NEB was calculated using the IEM calculation tool[20]. This is then scaled by the NTG ratio for the water heater. 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: 5.7%
- Inflation Rate: 1.9%
- Real Discount Rate: 3.7%

The resulting total net ARC was $490,438.

4.4.1.7 Electric Savings

The Evaluators credited smart thermostats with electric savings. Smart thermostats are offered in the program as standalone measures and as an add-on to a furnace retrofit. There were 266 units rebated in the program, with total net electric impacts of:

- 142,246 kWh;
- 0 kW; and
- 1,564,705 lifetime kWh.

4.4.1.8 Summary of Non-Energy Benefits

Table 4-11 summarizes the non-energy benefits by measure that were credited to the Equipment Rebates Program in PY2023.

Table 4-11: Equipment Rebates Non-Energy Benefits

Measure	Electric Savings	Water Savings	Propane Savings	Avoided Replacement Cost	Deferred Replacement Cost
Furnace Early Replacement					✓
Tankless Water Heater				✓	
Smart Thermostat	✓				

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

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4.5 Conclusions

SUA accurately calculates savings per TRM V9.1 protocols.	Deviations in savings are attributable to updates to early retirement estimates (percent early retirement, average age, etc.).
SUA has endeavored to encourage comprehensiveness via combination rebates.	A rebate of $1,500 is provided for participants who simultaneously install a qualifying furnace and tankless water heater. These rebates comprised 23% of furnace and 14% of water heater projects.

4.6 Recommendations

Collect at least one form of contact information for all participants.	453 space heating entries and 435 water heating entries had neither a phone number or email address for the rebate recipient.

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5 Commercial Equipment Rebates

The Commercial Natural Gas Equipment Rebates Program provides incentives to commercial customers for high-efficiency space and water heating equipment. Eligible measures for this program include:

- $400 for Gas furnaces with 90%-94.9% AFUE;
- $600 for Gas furnaces with 95% or higher AFUE;
- $500 for tankless water heaters with an UEF of .80 or greater;
- $75 for a tank unit rated lower than 75,000 BTUh with an UEF of .70 or higher; and
- $200 per 100,000 BTUh for large storage tank units exceeding 88% thermal efficiency.

The program is targeted at the small commercial market sector and retrofit and new construction applications are both allowed. The space heating equipment utilizes an 80% baseline AFUE, while the water heating equipment utilizes the same baseline Uniform Energy Factors as determined through equipment capacity. The marketing efforts for the space and water heating equipment were largely directed at plumbing and HVAC contractors; their involvement is seen as crucial, as they are generally a primary source of information for end-use customers when deciding upon a replacement system. During the staff interview, Summit AR staff expressed concerns about potential Department of Energy changes that will require all new furnaces to be 95% efficient, as this change would reduce the types of equipment eligible for rebates.

5.1 Participation Summary

5.1.1 Space Heating Participation Summary

In PY2023 there were 452 furnaces rebated, increased from 204 in PY2022. Units rebated by facility type are summarized in Figure 5-1.

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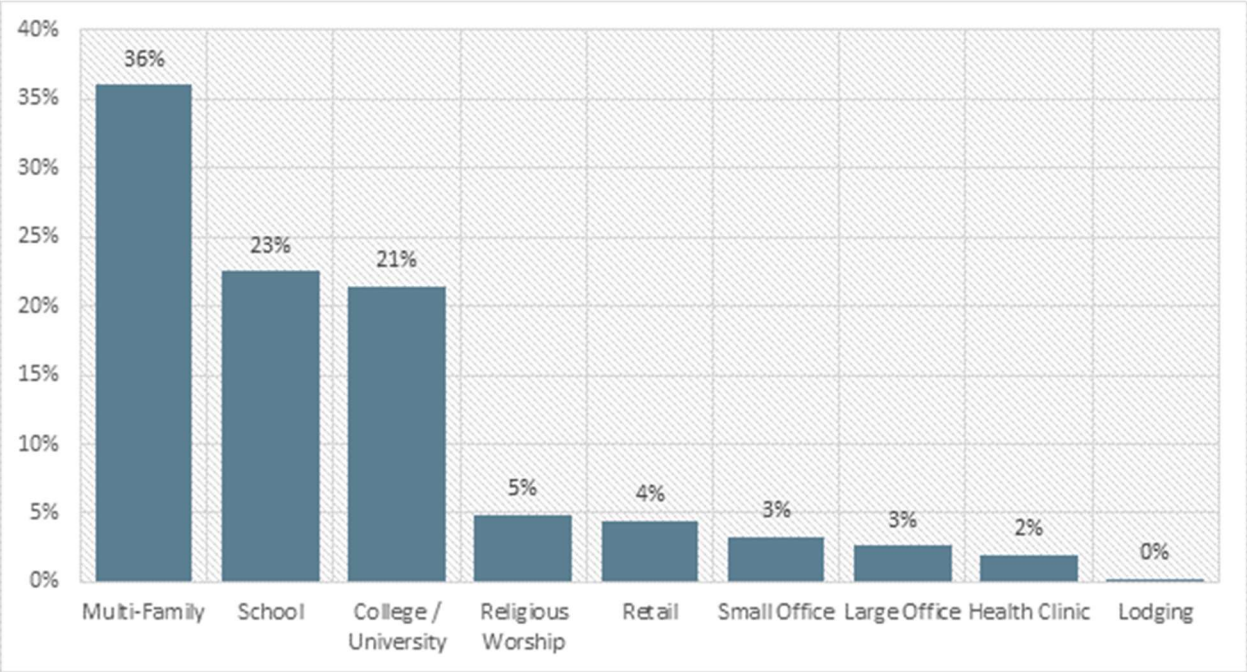

Figure 5-1: Space Heating Participation Summary

5.1.2 Water Heating Participation Summary

In PY2023, there were 342 commercial rebates (increased from 146 in PY2022). All systems were tankless.

. Figure 5-2 summarizes the participation by facility type, denominated both in terms of percent of units rebated and percent of savings. Further, the savings acquisition cost is summarized in the overlain line graph (total rebate spending divided by total annual net therms).

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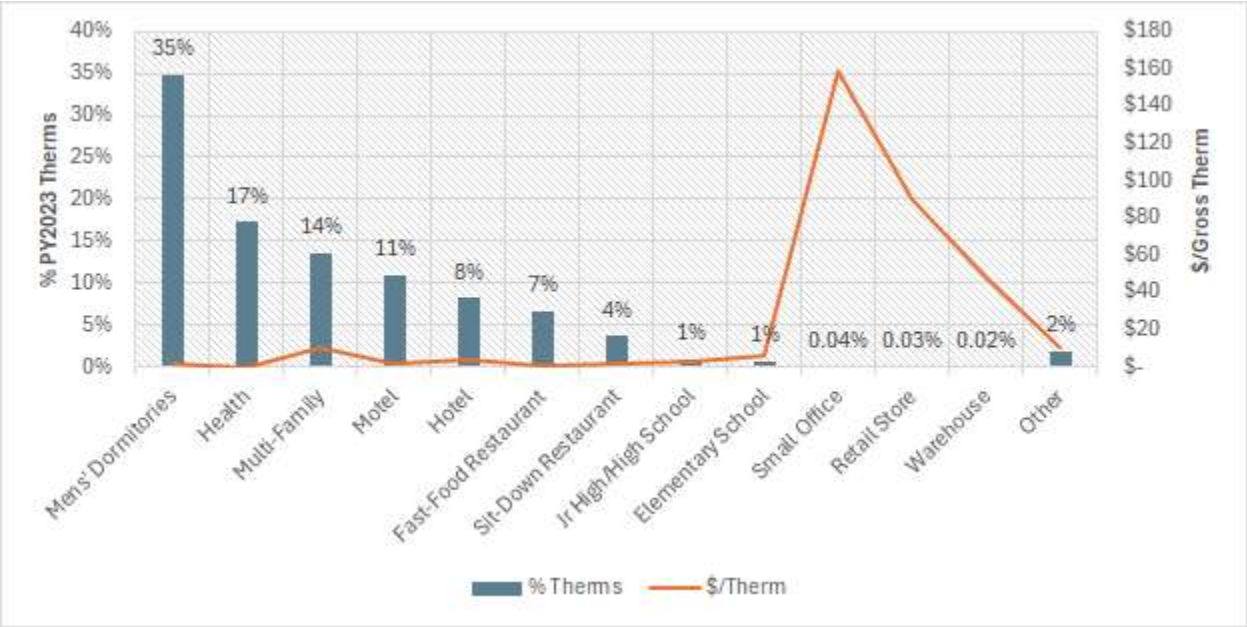

Figure 5-2: Water Heating Participation Summary

As seen in the figure above, the bulk of program savings was driven by men's dormitories, medical clinics, multifamily, and hotel/motel facilities.

Key takeaways include:

- **Mean acquisition cost was $3.24 per therm.**
- **Men's dormitories comprised a significant share of participation (22%) while also being a large contributor to overall savings (35%) for this measure.** This is a high-use building type that is among facilities that was as a result had a below-median acquisition cost per-therm ($2.10).
- **Office, Warehouse, Retail, and Other facilities had significantly higher acquisition costs.** Their costs ranged from $10.52 to $158.46 per therm.

5.2 Response to Program Recommendations

Table 5-1 summarizes the status of issues and recommendations identified in the PY2022 process evaluation.

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Table 5-1: Commercial Equipment Rebates Response to PY2022 Recommendations

Recommendation	***Status of Recommendation***
Consider consolidating space heating and water heating equipment with boilers and food service into a Commercial Prescriptive Program. This consolidation would align the program offerings, give greater budget flexibility, and make the program more reliably cost-effective as shortfalls in one measure group could be overcome by increased participation in others	Reviewed and rejected

5.3 Process Evaluation

The Evaluators conducted a formal process evaluation of the program in the last triennial cycle found that the program was successful in meeting participation, savings, and satisfaction goals. Table 5-2 and Table 5-3 summarize the Evaluators' review of the Commercial Equipment Rebates Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 5-2: 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 comprehensive and limited process evaluations in this cycle.
New Vendor or Contractor	No. Program implementation is unchanged from PY2022.

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

Component	Determination
Are program impacts lower or slower than expected?	No. The program exceeded its savings goal in PY2022.
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. The program exceeded its participant goal in PY2022.

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Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. Data issues that had been identified in prior evaluations had been corrected.
Is the program's cost-effectiveness less than expected?	No, the program's cost-effectiveness was within expected boundaries.
Do participants report problems with the programs or low rates of satisfaction?	No. Prior participant surveys found exceedingly high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program is inducing purchases of energy efficient equipment that would not have otherwise occurred.

On this basis, the Evaluators conducted a limited process evaluation addressing response to recommendations.

5.3.1 Data Collection Activities

The process evaluation of the Commercial Equipment Rebates Program included the following data collection activities:

- *Summit AR Program Staff Interviews.* The Evaluators interviewed staff at Summit AR involved in the administration of the Commercial Equipment Rebates Program. These interviews were to collect information from program staff as to any changes or developments, as well as response to program recommendations.

Table 5-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 5-4: Summit AR Commercial Equipment Rebates Data Collection Summary

Target	Component	Activity	n	Sample Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Programs	Interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day

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	Manager of Conservation Improvement Senior Energy Efficiency Consultant Energy Efficiency Consultant				operation of the program on the part of Summit, marketing and outreach, data tracking, and rebate processing.

5.3.2 Protocol A Review

Table 5-5: Commercial Equipment Rebates 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	-	Contact names are not provided for commercial projects.
	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	✓	
	Reported age of equipment replaced	N/A	
	Reported measure type of equipment replaced	✓	
	Other inputs necessary for the use and compliance with the TRM	-	Square foot and home age not reported in tracking for multifamily furnaces.
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	✓	

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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	✓	
	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.	✓	

5.4 Impact Evaluation

5.4.1 Space Heating

The impact evaluation effort of the Space Heating measures included the following:

- *Commercial Verification*. The Evaluators applied TRM V9.1 deemed savings parameters in assessing savings of the commercial component.
- *Free-Ridership Estimation.* The Evaluators utilized NTGR estimates developed in PY2020.

Energy savings calculation protocols for commercial furnaces are summarized in Appendix C.

5.4.2 Water Heating

For the equipment rebates component, savings were calculated using methodologies detailed in Section 3.3.1 of the TRM Version 9.1 for commercial applications. The details of this methodology are presented in Appendix C.

5.4.2.1 Commercial Desk Review Findings

In past program years, the data submitted by SUA to the Evaluators was often missing energy savings inputs (such as units of production or square feet) and the evaluation of the program necessitated large-scale data collection by the Evaluators to support deemed savings estimates. This was improved significantly in PY2023, with SUA collecting the required inputs for all commercial projects.

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5.4.2.2 Net Savings Estimation

Evaluators conducted a limited process evaluation in PY2023; this limited process evaluation did not include surveys. However, evaluators included free ridership calculations from PY2020 below. Figure 5-3 summarizes the scoring mechanism for commercial free ridership.

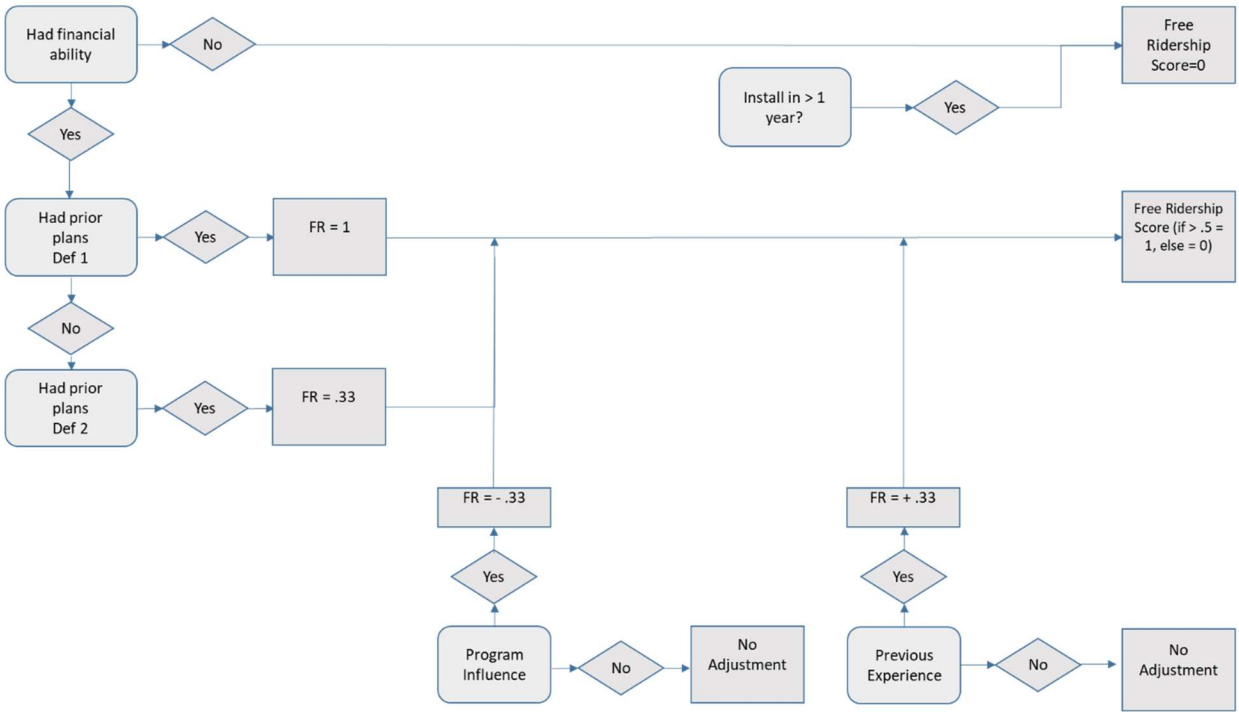

Figure 5-3: Nonresidential Free ridership Scoring Flow Chart

The resulting NTGRs from PY2020 surveys were 76.2%.

5.4.2.3 Verified Savings

Gross Therms are summarized in Table 5-6. Net therms are summarized in

Table 5-7..

Table 5-6: Gross Therms Savings

Measure	Ex Ante Gross Therms	Ex Post Gross Therms	Gross Realization Rate	Lifetime Therms Savings
Furnace	60,201	75,225	125.0%	1,354,388
Smart Thermostat	273	273	100.0%	3,007
Water Heater	50,240	50,240	100.0%	1,004,806
Total	**110,714**	**125,739**	**113.6%**	**2,362,200**

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Table 5-7: Net Therms Savings Summary

Measure	Free Ridership*		Ex Ante Net Therms	Ex Post Net Therms	Net Realization Rate	Lifetime Therms Savings
	Ex Ante	Ex Post				
Furnace	21.40%	19.1%	47,318	60,855	128.61%	1,082,589
Smart Thermostat	12.50%	34.8%	239	178	74.52%	1,954
Water Heater	23.80%	23.8%	38,283	38,293	100.03%	765,863
Total	**22.40%**	**21.0%**	**85,840**	**99,326**	**115.71%**	**1,850,406**

The Evaluators found higher realization for commercial furnaces. This was attributable to calculation error corrections. The evaluators reviewed AHRI certificates by model and found a higher total capacity of furnaces overall than that shown in ex ante estimates.

5.4.2.4 Non-Energy Benefits Summary

Non-energy benefits by measure are summarized in the subsections to follow.

5.4.2.4.1 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[21]. 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: 5.7%
- Inflation Rate: 1.9%
- Real Discount Rate: 3.7%

The resulting avoided replacement cost is $140.91 per unit. This is then scaled by the project NTG ratio. The calculator for this is provided in Appendix B of this report.

The total net ARC value is $36,732.

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

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5.4.2.4.2 Smart Thermostats

The program rebated fourteen smart thermostats. Five thermostats were for small offices, five were for religious buildings, and four were for single-family buildings. The smart thermostats had TRM V9.1 residential smart thermostat inputs used to estimate energy savings. Net kWh from this is as follows:

- 2,148 annual kWh;
- 0 kW; and
- 23,630 lifetime kWh.

5.5 Conclusions

Tracking data for water heaters has improved significantly.	In PY2020, the Evaluators had to develop DHW load inputs for over 80% of commercial projects. In PY2022, this was only required for a total of 4 projects (3% of total projects). In PY2023, SUA completed this for all projects.
Corrections to BTU capacities increased furnace savings.	Based on review of AHRI certificates, the Evaluators recalculated savings at a higher total capacity installed than shown in ex ante estimates.

5.6 Recommendations

Conduct an audit of AHRI certificates for furnaces in the program.	This was the area of greatest deviation in savings and could be addressed by program implementation staff.

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6 Commercial Boiler Program

The Commercial Boiler Program provides incentives for boilers and boiler controls used in HVAC applications. Eligible measures include:

- $1,800/MMBtuh input for boilers that are 83% - 91.9% efficient;
- $3,500/MMBtuh input for boilers that are 92% efficient or greater; and

In addition, trade ally incentives range from $200 to $300 per unit.

The Commercial Boiler Program is targeted at large commercial facilities using boilers in HVAC applications. Boilers serving process loads are required to enter the custom component of the Commercial Boiler Program. During the staff interview, neither Summit staff nor CLEAResult staff expressed concerns with the performance of the boiler program.

6.1 Program Overview

The history of program performance and expenditures is presented in Table 6-1.

Table 6-1: Commercial Boiler Program Historical Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2010	$334,785	$380,074	88%	16,988	171,304	10%
2011	$220,321	$377,967	58%	24,845	128,277	19%
2012	$221,585	$464,618	48%	100,322	371,696	27%
2013	$184,937	$551,650	34%	65,390	580,890	11%
2014	$150,113	$551,661	27%	21,213	92,160	23%
2015	$259,477	$251,650	103%	80,476	92,160	87%
2016	$232,857	$251,650	93%	67,491	92,160	73%
2017	$234,592	$329,879	71%	55,756	83,740	67%
2018	$225,907	$329,496	69%	52,335	83,735	63%
2019	$306,128	$329,301	93%	100,802	83,735	120%
2020	$305,235	$270,444	113%	82,962	59,710	139%
2021	$260,602	$270,474	96%	70,934	57,585	123%
2022	$177,593	$270,474	66%	52,301	57,585	91%
2023	$233,844	$270,474	86%	40,509	57,585	70%

6.1.1.1 Program Design Changes

No changes were made to the program in 2023.

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6.1.1.2 Protocol A Review

Table 6-2: Commercial Boiler 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	-	Contact names are not provided for commercial projects.
	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	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	

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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.	✓	

6.2 Participation Summary

In PY2023, the Commercial Boiler Program had 13 participants and received 23 boiler rebates. Figure 6-1 summarizes the Commercial Boiler Program participation by facility type.

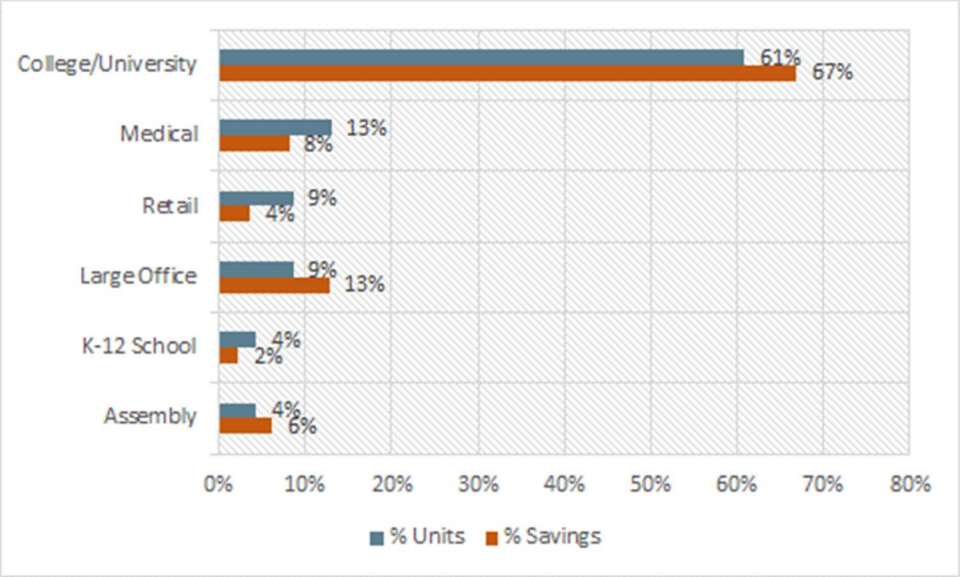

Figure 6-1: C&I Boiler Equipment Participation by Facility Type

All rebates were boiler replacements. 87% percent of these rebated boilers were a minimum of 92% efficient, qualifying for the higher program incentive of $3,500/MMBtuh.

The Evaluators reviewed the acquisition cost of savings from boilers in the high and low rebate tiers. The three boilers in the low tier were 85% efficiency. The Evaluators found that the acquisition cost of savings from these boilers was 64% higher than for boilers greater than 92% efficiency.

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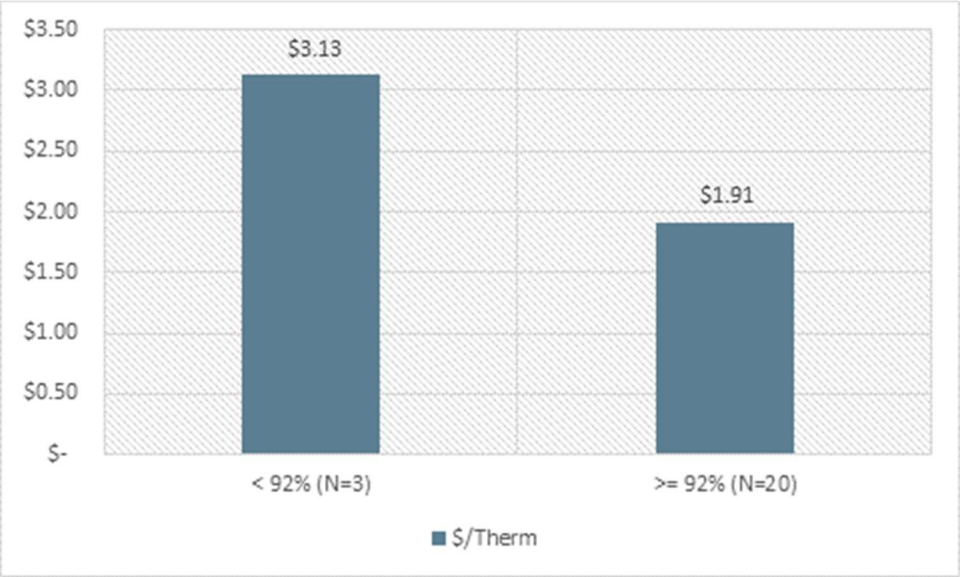

Figure 6-2: Boiler Acquisition Cost of Savings by Efficiency Tier

In response to advancing DOE standards setting minimum efficiency at 84%, SUA has increased the minimum qualifying efficiency for boilers beginning in PY2024 to 88%. The acquisition cost of savings for this lower tier should be tracked going forward to address whether this issue of cost of savings has been adequately addressed with this program change.

6.2.1 Response to Program Recommendations

No boiler program recommendations were identified in the PY2022 evaluation.

6.3 Commercial Boiler Program Process Evaluation

Table 6-3 and Table 6-4summarize the Evaluators' review of the Commercial Boiler Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 6-3: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and Innovative Components	No. The program is implemented in the same manner as PY2022.
No Previous Process Evaluation	No. The program received process overviews in 2020, 2021 and 2022.
New Vendor or Contractor	No. Implementation is unchanged from PY2022.

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Table 6-4: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met greater than 90% of its PY2022 savings goal.
Are the educational or informational goals not meeting program goals?	No. The program has successfully engaged trade allies.
Are the participation rates lower or slower than expected?	No. The program met greater than 90% of its PY2022 savings goal
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. 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 was within expected boundaries.
Do participants report problems with the programs or low rates of satisfaction?	No. Prior participant surveys found exceedingly high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program is encouraging adoption of efficient boiler technology.

The program received a limited process evaluation in PY2023.

6.3.1.1 Data Collection Activities

The process evaluation of the Commercial Boiler Program included the following data collection activities:

- *Summit Program Staff Interviews*. The Evaluators interviewed staff at Summit involved in the administration of the Commercial Boiler Program. These interviews were to collect information from program staff as to any changes or developments, as well as response to program recommendations.

Table 6-5 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

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Table 6-5: Summit Commercial Boiler Program Data Collection Summary

Target	Component	Activity	N	Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Program Manager of Conservation Improvement Senior Energy Efficiency Consultants (2) Energy Efficiency Consultant	Group interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, including assisting in outreach and marketing efforts of the program.

6.3.1.2 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, and surveys with participants, and a literature review.

6.4 Commercial Boiler Program Impact Evaluation

Savings calculations were reviewed to validate compliance with TRM V9.2 protocols. The Evaluators to verify energy savings through two ways: a desk review adhering to methods outlined in AR TRM V9.1 and through linear regression billing analysis.

6.4.1 Commercial Boiler Program Energy Savings Calculations

Therms savings calculations for commercial boilers require facility type, weather zone, and baseline efficiency. Baseline efficiency for boilers is detailed in Table 6-6.[22]

[22] Arkansas TRM V9.1 Pg. 250-255

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Table 6-6: Commercial Boiler Minimum Efficiency Levels

Project Type	Size Category (BTU/hr.)	Subcategory	Minimum Efficiency
Replace-on-Burnout	< 300,000	Hot Water	82% AFUE
		Steam	80% AFUE
	> 300,000 and ≤ 2,500,000	Hot Water	80% E_t
		Steam	79% E_t
	>2,500,000	Hot Water	82% Ec
		Steam	79% E_t
Early Retirement	< 300,000	Hot Water	80% AFUE
		Steam	75% AFUE
	> 300,000 and ≤ 2,500,000	Hot Water	75% E_t
		Steam	75% E_t
	> 2,500,000	Hot Water	80% Ec
		Steam	79% E_t[23]

Savings for commercial boilers are calculated as[24]:

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

SUA correctly calculated energy savings in accordance with TRM V9.1 protocols.

6.4.1.1 Commercial Boiler Program Commercial Free-Ridership

There were no significant changes in program delivery in PY2023 and as a result the Evaluators opted to apply the ex-ante NTGR of 80.28%.

6.4.1.2 Verified Therms

Table 6-7 and Table 6-8 present the gross and net savings results of the evaluation of the PY2023 Commercial Boiler Program.

[23] Arkansas TRM V9.1, Pg. 251

[24] Arkansas TRM V9.1, Pg. 252

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Table 6-7: Commercial Boiler Program Gross Therms Savings

Equipment Type	Expected Therms Savings	Verified Therms Savings	EUL	Realization Rate
Boiler	50,459	50,459	20	100.0%
Burner	0	0	12	-
Total	50,459	50,459	20	100.0%

Table 6-8: Commercial Boiler Program Net Therms Savings

Net-to-Gross Ratio		Net Annual Savings		Net Realization Rate	Net Lifetime Therms Savings
Ex-Ante	Ex-Post	Ex-Ante	Ex-Post		
80.28%	80.28%	40,509	40,509	100.00%	810,175

6.5 Conclusions

SUA accurately calculates savings per TRM V9.1 protocols.	All projects at 100% gross realization. SUA's tracking system accurately adjusts baseline to align with code requirements by size category and boiler type.
Participation in the lower efficiency tier has a significantly higher acquisition cost of savings.	The lower tier (<92%) systems had $/therm values 61% higher than the high efficiency tier.

6.6 Recommendations

Reduce the incentive for systems less than 92% efficiency.	SUA is paying 61% more per therm for lower-tier systems in the current rebate structure. SUA has changed the minimum qualifying efficiency to 88% for PY2024. The Evaluators recommend tracking the acquisition cost of savings under this revised low-tier definition and modifying the incentive for these systems if needed if this issue persists in the new program design.

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7 Commercial and Industrial (C&I) Solutions Program

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

- No-cost direct installation of low flow faucet aerators, showerheads, door air infiltration, pre-rinse spray valves (PRSVs), steam traps, and DrySmart controls;
- $.70 per therm for custom projects; and
- $.90 per therm for custom projects for customers using less than 200,000 Therms per year.

7.1 C&I Solutions Program Overview

The C&I Solutions program began in September 2011. The program is designed to provide no-cost direct installation of water saving and air infiltration measures, energy audits, and incentives for custom projects to large commercial and industrial customers. The C&I Solutions program's historical performance is summarized in Table 7-1.

Table 7-1: C&I Solutions Program Historical Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2011	$1,047,763	$1,152,104	91%	500,906	451,808	111%
2012	1,102,780	$1,257,083	88%	549,005	521,072	105%
2013	$1,643,311	$1,811,073	91%	1,220,261	1,020,310	120%
2014	$1,788,563	$1,811,074	99%	1,019,296	1,020,310	100%
2015	$2,194,215	$2,211,074	99%	1,224,628	1,320,150	93%
2016	$1,989,847	$2,211,074	90%	1,273,739	1,320,150	97%
2017	$2,573,025	$2,688,568	96%	1,505,052	1,534,490	98%
2018	$2,874,811	$2,738,688	105%	1,589,563	1,604,492	99%
2019	$2,869,734	$2,744.123	105%	1,614,082	1,604,491	101%
2020	$2,928,574	$3,080,171	105%	1,696,653	1,528,450	111%
2021	$2,954,470	$3,079,053	104%	1,983,043	1,528,458	130%
2022	$2,595,442	$3,021,056	95%	1,774,006	1,601,581	111%
2023	$3,100,010	$3,021,056	103%	1,760,104	1,601,581	110%

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

- Direct install;
- Custom audit recipients; and
- Closed custom projects.

In PY2023, custom projects accounted for 78% of program savings and direct install accounted for 22%. These participants are detailed in the subsections to follow.

7.2 Participation Summary

7.2.1 Direct Install Participation Summary

In PY2023, 41 facilities participated in the direct install component of C&I Solutions. Figure 7-1 summarizes direct installs savings share by measure.

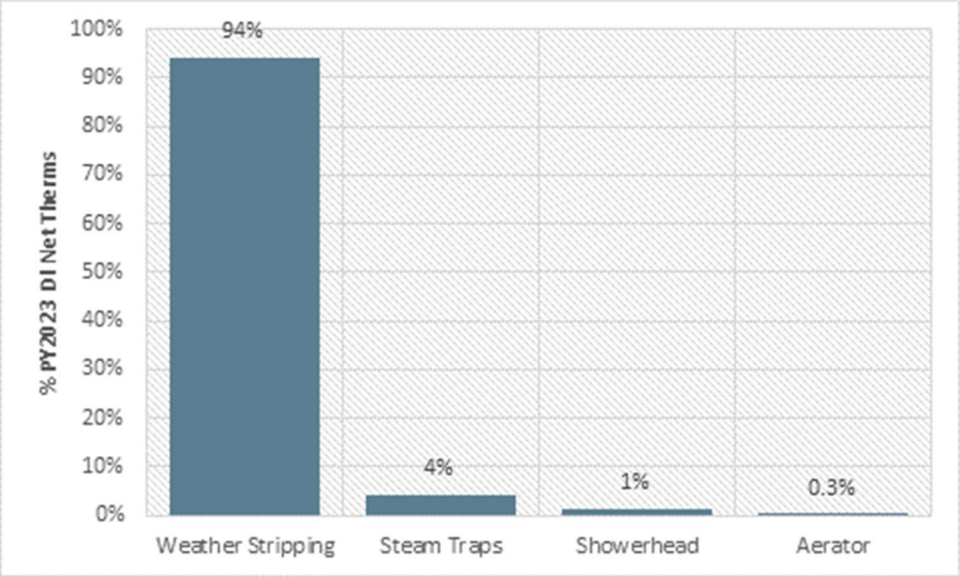

Figure 7-1: DI Savings by Measure

7.2.1.1 Closed Custom Project Participation Summary

Table 7-2 summarizes completed custom projects for the PY2023 C&I Solutions program.

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Table 7-2: Custom Project Participation Summary

Project ID	Facility Type	Measure Name	Therms
EA-0000583141	Food Processing	Boiler Controls	301,343
EA-0000369614	Manufacturing	Linkless Controls	15,912
		Boiler Blowdown	4,332
		Condensate Return	101,498
		Insulation	43,624
		Steam Trap Replacement	71,962
EA-0000669712	Food Processing	Condensate Return	9,188
EA-0000798531	Manufacturing	Boiler Replacement	7,089
EA-0000737918	Food Processing	Steam Trap Replacement	62,706
EA-0001002584	Manufacturing	Steam Trap Replacement	98,611
EA-0000743988	Manufacturing	Steam Trap Replacement	13,011
		Temperature Adjustment	19,704
EA-0000925616	Chemical Processor	Boiler Replacement	2,229
EA-0000962254	Medical	Steam Trap Replacement	55,431
EA-0001008539	Education	ERV	2,759
EA-0001013704	Medical	Steam Trap Replacement	68,222
EA-0001180469	Distillery	Boiler Tune-up	377
EA-0001053692	Manufacturing	Steam Leak Repair	3,238
		Steam Trap Replacement	160,281
EA-0000362793	Manufacturing	Furnace Replacement	16,755
		Smart Thermostats	32,976
		Insulation	2,130
		Boiler Replacement	14,871
EA-0000370105	Waste Disposal	Boiler Retrofit	137,518
EA-0000377012	Correctional Facility	Water Reduction	13,362
		Composting	2,570
		HVAC Controls	39,304
EA-0000945730	Asphalt Plant	Burner Tune-up	13,350
EA-0000946899	Asphalt Plant	Burner Tune-up	9,923
		Insulation	19,345
EA-0000946909	Asphalt Plant	Burner Tune-up	15,750
EA-0000946918	Asphalt Plant	Burner Tune-up	12,930

Savings within the custom component are presented by facility type in Figure 7-2.

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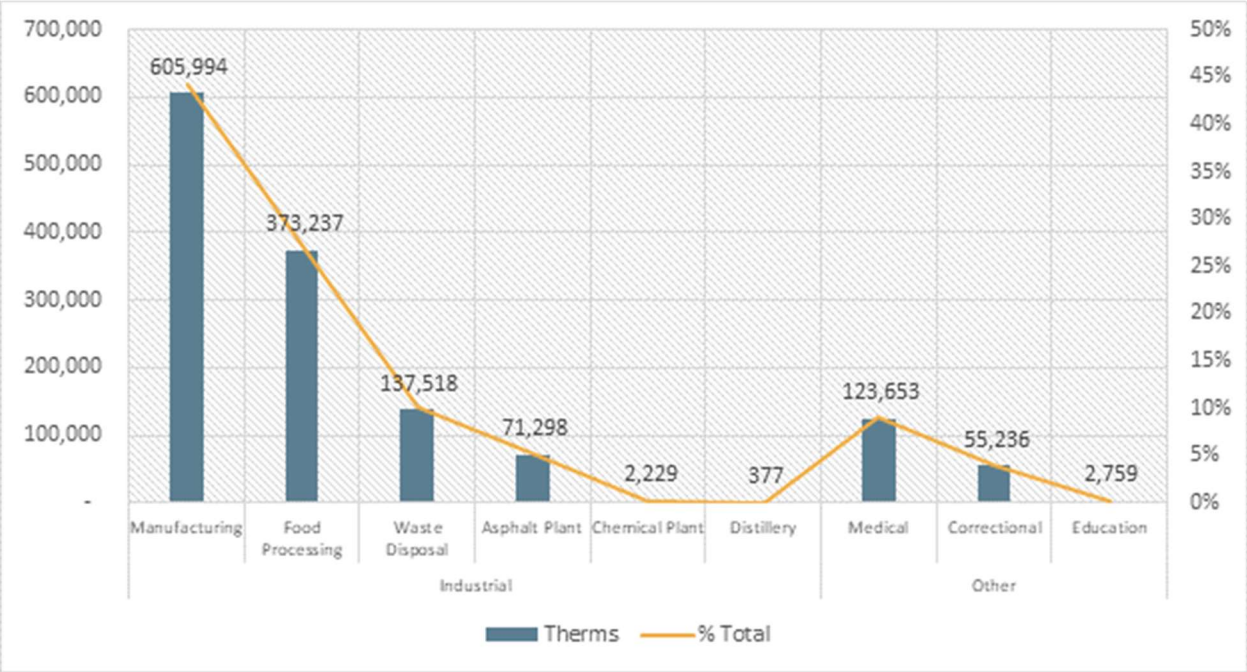

Figure 7-2: C&I Solutions Share Custom Savings by Facility Type

7.3 C&I Solutions Process Evaluation

The Evaluators conducted a formal process evaluation of the C&I Solutions Program in PY2020 and found that the program was successful in meeting participation, savings, and satisfaction goals. Table 7-3 and Table 7-4 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 7-3: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and Innovative Components	No. The program is unchanged from PY2022.
No Previous Process Evaluation	No. The program received a comprehensive process evaluation in the prior cycle and a partial process evaluation in PY2021 and PY2022.
New Vendor or Contractor	No. The program has been implemented by CLEAResult since 2011.

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Table 7-4: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met savings goals in PY2022.
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 PY2022.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. 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.
Is the program producing the intended market effects?	Yes. The program is inducing projects that would not occur without its intervention.

A partial process evaluation was conducted for PY2023.

7.3.1.1 Data Collection Activities

The process evaluation of the C&I Solutions Program included the following data collection activities:

- *Program Actor In-Depth Interviews*. The Evaluators conducted in-depth interviews with a series of program actors. These interviews covered a range of topics, including marketing efforts, feedback on program delivery, an assessment of barriers to program implementation and success, and recommendations for program improvement. Program Actors interviewed include:
  - *Summit Program Staff*. The Evaluators interviewed staff at Summit involved in the administration of the C&I Solutions Program. These interviews built upon interviews conducted in PY2020, keeping apprised of Summit's involvement as the C&I Solutions Program develops.
  - *Third Party Implementation Staff Interviews.* The Evaluators conducted interviews with CLEAResult involved with the C&I Solutions Program. These interviews addressed the development of the program over PY2023 as well as CLEAResult's perspective on a variety of implementation issues, including

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conversion of audits to completed projects and the process flow for direct install and custom projects.

Table 7-5 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

Table 7-5: SUA C&I Solutions Data Collection Summary

Target	Component	Activity	n	Sample Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Programs Manager of Conservation Improvement Senior Energy Efficiency Consultant (2) Energy Efficiency Consultant	Interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, marketing and outreach, data tracking, and rebate processing.
CLEAResult Implementation Staff	CLEAResult Program Manager	Interview	1	NA	Day to day implementation of the program.

7.3.1.2 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 as determined through prior process evaluations.

- **Direct installation of high-return measures.** The C&I Solutions program provides no-cost direct installation of door sweeps, low flow faucet aerators, pre-rinse spray valves, showerheads, and steam traps. 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

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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 incentives of $0.70 per Therm for verified savings from custom projects completed by large commercial and industrial customers. Incentives for small businesses receive $0.90 per Therm. These projects may be driven by a program-funded audit, generated by a trade ally, or be customer-directed.
- **Referral to Summit prescriptive programs.** There are instances where the CLEAResult audit identifies energy savings opportunities that qualify for a prescriptive incentive from one of the above-mentioned programs. In these instances, the project is referred to the appropriate program and savings are not credited to the C&I Solutions Program.

7.3.1.3 Program Administration

The C&I Solutions program is overseen by a Program Manager at Summit. This Manager's responsibilities primarily include interfacing with CLEAResult, who directly implements the program. Other activities by this Manager include providing updated customer lists to CLEAResult to better facilitate their implementation, review of custom applications, and at times assisting CLEAResult in customer interactions.

At CLEAResult's end, the program overall is led by the Senior Program Manager, who oversees the implementation of the C&I Solutions Program for all three Summit C&I Solutions Programs. Much of the day-to-day activity is handled by the Senior Program Manager, who reviews direct install and audit activity, and coordinates with the Evaluators in facilitating EM&V activities.

Audit activities are run by engineering staff at CLEAResult. Titles for staff that engage in this activity may vary depending upon the complexity of the facility[25]. These engineers conduct the energy audits. Additionally, their responsibilities include development of the audit report and recommendations. The Direct Install Program Manager oversees crews that perform direct installation. Further, the Senior Account Manager follows up with customers to gauge interest in completing a project.

[25] Examples include (but are not limited to) Energy Engineer, Senior Energy Engineer, and Senior Program Consultant.

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7.3.1.4 Program Implementation and Delivery

CLEAResult provides the Evaluators with updates regarding their pipeline of custom projects. These updates listed the full scope of facility audits, expected 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 CISP. These participants are customers that have discussed the possibility of a facility audit and indicated interest to CLEAResult. These facilities will receive a Pre-Inspection at a later date and have not signed a project application.
- *Pre-Inspected*. Projects listed as Pre-Inspected are in the phase where CLEAResult has completed a facility audit. During these audits, CLEAResult conducts a comprehensive review of the facility's systems and operational 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 feasibility of recommended measures.
- *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, feasible 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 costs, 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 included as well to provide the customer with a full scope of the benefits of the project. This report is provided at no cost to the participant.
- *Project Application*. At this point, the customer has informed CLEAResult and Summit 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 Evaluators' 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 estimated savings in the MV plan.
- *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. In some instances, the participant may then be paid out for 40% of the reserved incentive, with the

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remainder held in reserve to true-up the final incentive amount after M&V is completed. There are times when this may occur for a project with an M&V period at extends across the calendar year. This occurs for a small number of projects overall. Otherwise, 100% of the incentive is paid upon approval from the Evaluator.

- *M&V*. M&V marks the phase when post-installation data is collected for an installed project to allow for calculation of a final savings estimate, from which the remaining incentive to the customer is determined. There are some measures that do not require post-retrofit data; for such measures, the M&V phase is short and requires completion of calculations based upon inputs verified during the Post-Inspection. For facilities that require post-installation data, the data collection period can range from 2 weeks 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 $.70 or $.90/therm (with higher incentives offered if a customer's annual use is less than 200,000 therms). If the verified savings are higher than the Project Application amount, CLEAResult and Summit 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 displayed in the figure below.

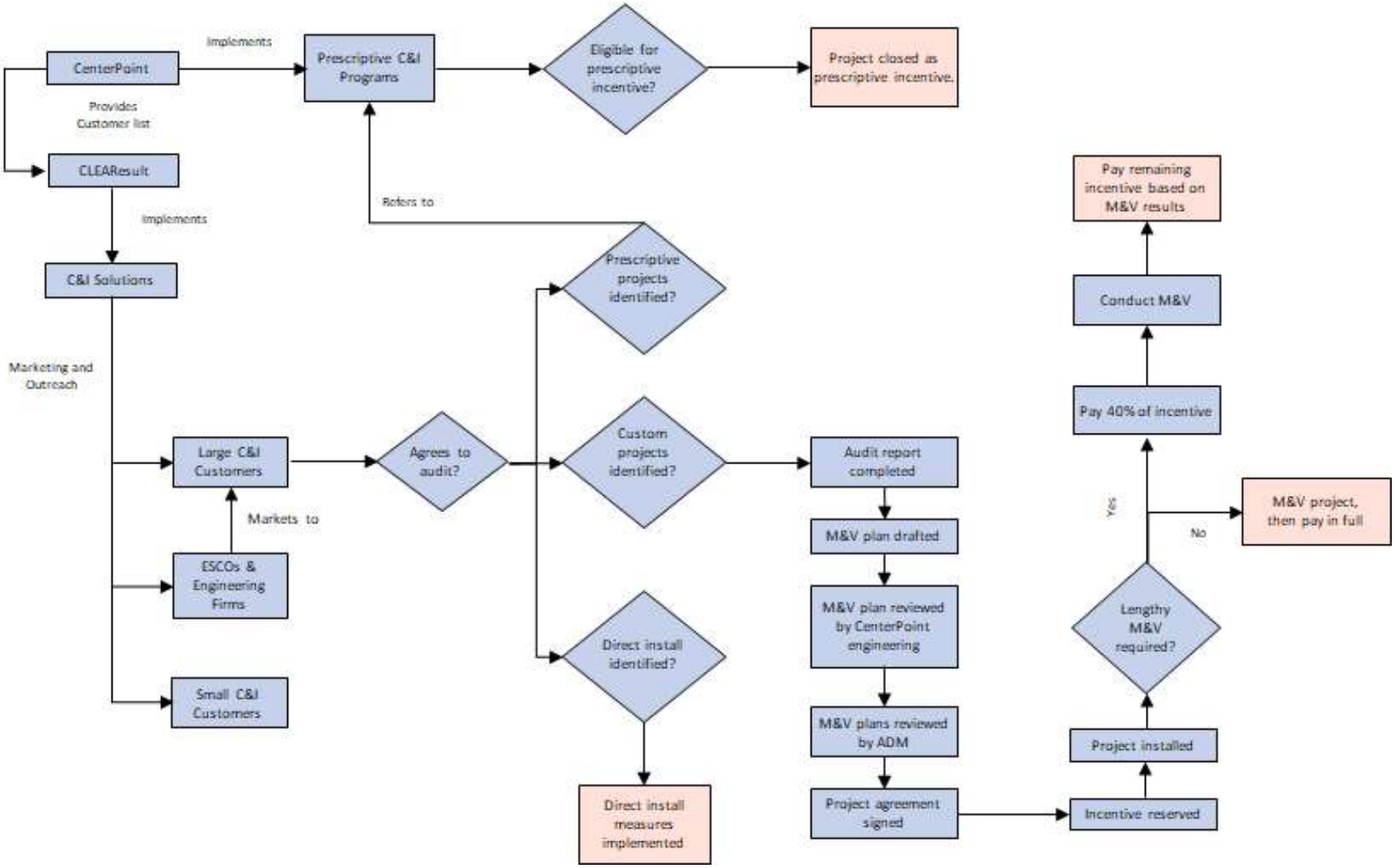

Figure 7-3: C&I Solutions Process Flow

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7.3.1.5 Protocol A Review

Table 7-6: Commercial Boiler 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	✓	
	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	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	

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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.	✓	

7.4 Response to Program Recommendations

Table 7-7 displays updates on recommendations for the C&I Solutions Program in 2022.

Table 7-7: C&I Response to PY2022 Recommendations

Recommendation	***Summit Response***	***Status of Issue***
Develop Strategic Energy Management offerings. Elsewhere in Arkansas, Strategic Energy Management (SEM) has played an increased role in custom programs for large commercial and industrial customers.	To-date this has not been included in the program.	Under consideration

7.4.1.1 Program and Implementation Staff Interview Summary

Evaluators interviewed five Summit AR staff members and one CLEAResult staff member about the commercial programs. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, two Senior Energy Efficiency Consultants, and the Energy Efficiency Consultant. The CLEAResult staff member was the program manager for Summit AR's C&I Solutions Program.

Staff explained that the custom C&I continues to run smoothly: the *"commercial programs are well oiled machines at this point."* 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. As in years' past, the custom program continues to 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.

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7.5 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 20 of 21 custom projects completed through the C&I Solutions program. Each project included an M&V plan and project-specific report. The reports are provided in Appendix A.
- *Free-Ridership Estimation.* A free ridership rate for custom participants was estimated through participant surveying.

7.5.1 C&I Solutions Direct Install Impact Evaluation

The impact evaluation of direct install measures is summarized in the subsections to follow.

7.5.1.1 Deemed Savings Calculations

For examples TRM calculations, see Appendix C.

7.5.1.1.1 Direct Install Free-Ridership

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 to 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

98. Don't know

These are combined into the following factors:

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

B. **Installation counterfactual:** If they 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. The direct install channel was found to have 100% NTGR.

7.5.1.2 Direct Install Spillover

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

7.5.2 C&I Solutions Custom Project Impact Evaluation

The Evaluators opted for a census of custom projects in order 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 7-8 summarizes the custom projects completed and evaluated in PY2023.

Table 7-8: SUA C&I Solutions Large Custom Project Summary

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Facility Type	Project ID	Measure Name	Verified Therms
EA-0000583141	Food Processing	Boiler Controls	301,343
EA-0000369614	Manufacturing	Linkless Controls	15,912
		Boiler Blowdown	4,332
		Condensate Return	101,498
		Insulation	43,624
		Steam Trap Replacement	71,962
EA-0000669712	Food Processing	Condensate Return	9,188
EA-0000798531	Manufacturing	Boiler Replacement	7,089
EA-0000737918	Food Processing	Steam Trap Replacement	62,706
EA-0001002584	Manufacturing	Steam Trap Replacement	98,611
EA-0000743988	Manufacturing	Steam Trap Replacement	13,011
		Temperature Adjustment	19,704
EA-0000925616	Chemical Processor	Boiler Replacement	2,229
EA-0000962254	Medical	Steam Trap Replacement	55,431
EA-0001008539	Education	ERV	2,759
EA-0001013704	Medical	Steam Trap Replacement	68,222
EA-0001180469	Distillery	Boiler Tune-up	377
EA-0001053692	Manufacturing	Steam Leak Repair	3,238
		Steam Trap Replacement	160,281
EA-0000362793	Manufacturing	Furnace Replacement	16,755
		Smart Thermostats	32,976
		Insulation	2,130
		Boiler Replacement	14,871
EA-0000370105	Waste Disposal	Boiler Retrofit	137,518
EA-0000377012	Correctional Facility	Water Reduction	13,362
		Composting	2,570
		HVAC Controls	39,304
EA-0000945730	Asphalt Plant	Burner Tune-up	13,350
EA-0000946899	Asphalt Plant	Burner Tune-up	9,923
		Insulation	19,345
EA-0000946909	Asphalt Plant	Burner Tune-up	15,750
EA-0000946918	Asphalt Plant	Burner Tune-up	12,930
		Total	**1,372,301**

Individual site reports detailing these analyses are provided in Appendix A. All custom projects were post-inspected with M&V as described the site-level analyses.

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7.5.2.1 Custom Project Free-Ridership Methodology

The custom project free ridership methodology is more complicated than that of the DI participants, owing to the more complex nature of the projects and the effects of the facility audit and project incentive. The 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 criteria include:

FI-1 Prior to participating in the C&I Solutions Program, did your organization install any equipment similar to [EQUIPMENT/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 and 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 [EQUIPMENT/MEASURE] that was upgraded 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?

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- ❑ Yes
- ❑ No

FI-2b Would this installation have included the same equipment without the program rebates?

- ❑ Yes
- ❑ No

- *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

The stated payback requirement by the respondent is then compared against the payback of the recommended project with and without the program incentive.

- *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?

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[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
- ❑ Don't know

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

- ❑ In less than 6 months later
- ❑ In 6-12 months later
- ❑ In 1-2 years later
- ❑ In 3-5 years later
- ❑ In more than 5 years later
- ❑ No, did not affect timing of purchase and installation

The scoring mechanism for custom projects is presented in Figure 7-4.

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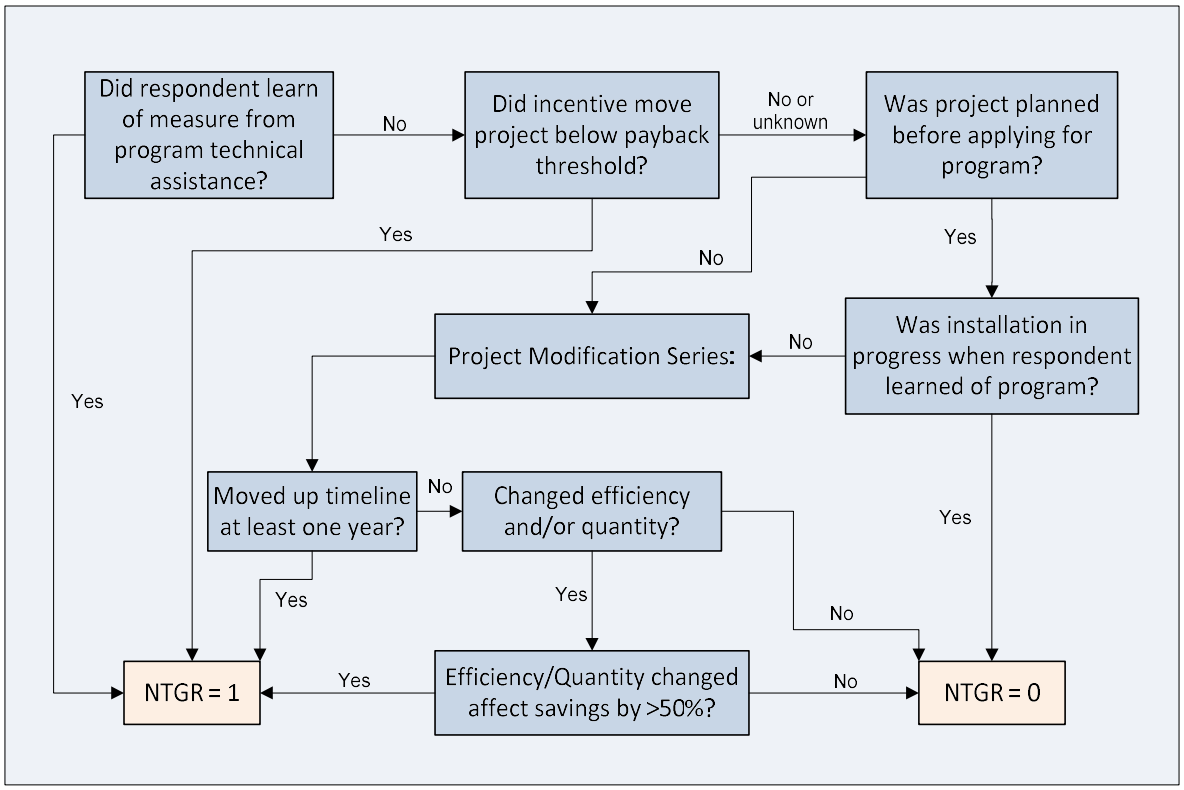

Figure 7-4: C&I Solutions Custom Project Free-Ridership Diagram

The projects reviewed by the evaluators had 100% NTGR. Projects were found to have been induced by-and-large by program-funded audits, and incentives were required bring projects within the participants' required payback period.

Given the small number of participants, the free rider assessments were a series of case studies as opposed to an extrapolated survey.

7.5.2.2 Summary of Non-Energy Benefits

Table 7-9 summarizes the non-energy benefits by measure that will be credited to the C&I Solutions Program.

Table 7-9: C&I Solutions Non-Energy Benefits

Measure	Electric Savings	Water Savings	ARC/DRC
Steam Leak Repair		✓	
Faucet Aerators		✓	
Low Flow Showerheads		✓	
Weather Stripping	✓		
Condensate Return		✓	

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7.5.3 Verified Savings

Table 7-10 presents the gross savings results of the evaluation of the PY2023 C&I Solutions Program. Total Gross Savings summarizes the savings calculations performed by TRM protocols and custom analyses.

Table 7-10 C&I Solutions Verified Therms Savings

Component	Expected Therms Savings	Verified Therms Savings	Realization Rate	EUL	Lifetime Therms Savings
Direct Install	391,337	387,803	99%	10.78	4,179,759
Custom	1,372,301	1,372,301	100%	7.75	15,160,301
Total Gross Savings	**1,763,638**	**1,760,104**	**100%**	**8.42**	**19,340,060**

Net savings for the C&I Solutions program were calculated using free ridership rates based on participant surveys for the direct install and custom components. The resulting net savings are presented in Table 7-11.

Table 7-11 C&I Solutions Net Savings Summary

Component	Free-Ridership Rate		Net Annual Savings		Net Realization Rate	Net Lifetime Therms Savings
	Ex Ante	Ex Post	Ex Ante	Ex Post		
Direct Install	0%	0%	391,337	387,803	99%	4,179,759
Custom	0%	0%	1,372,301	1,372,301	100%	15,160,301
Overall:	**0%**	**0%**	**1,763,638**	**1,760,104**	**100%**	**19,340,060**

Table 7-12: Commercial & Industrial Solutions Verified Net Water Savings

Component	Net Annual Water Saving (Gallons)	Lifetime Net Water Savings (Gallons)
Direct Install	1,469,778	16,167,555
Custom	1,815,568	27,093,963
Total	**3,285,346**	**43,261,518**

kWh and kW NEBs are summarized in Table 7-13.

Table 7-13: Commercial & Industrial Solutions Verified Net Electric Savings

Component	Net kWh	Net kW	Net Lifetime kWh
Direct Install	129,227	91.03	1,421,491
Custom	0	0	0
Total	**129,227**	**91.03**	**1,421,491**

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7.5.3.1 Water Savings Calculation Procedure

The TRM V9.1 provides detail for calculation of water savings for the following measures:

- Faucet Aerators (3.3.2);
- Low Flow Showerheads (3.3.5).

The deemed savings procedures for these measures require calculation of water savings, and the water savings claims comply with TRM protocols.

7.5.3.2 Electric Savings Calculation Procedure

Electric savings were claimed for commercial weather stripping in facilities served by municipal utilities and co-ops. For these projects, SUA is credited with the cooling savings from weather stripping specified in AR TRM V9.1 Section 3.2.11.

7.6 Conclusions

The program met savings goals and was highly cost-effective.	The program met 110% of its savings goal with 1,760,104 net therms.
	With a TRC of 1.42, the program's cost-effectiveness declined. This was due to higher costs found in custom measures.

7.7 Recommendations

Conduct deeper audits of project costs for custom measures.	Custom project costs increased sharply in P2023. It is possible that the costs presented may include components not related to energy efficiency. A deeper audit of project costs by program implementation staff could improve the TRC net benefits of the program.

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8 Commercial Food Service Program

The Commercial Food Service Program provides incentives for a range of food service measures. In PY2023, eligible high-efficiency measures include:

- Combi ovens;
- Convection ovens;
- Conveyor ovens;
- Rotating rack ovens;
- Fryers;
- Conveyor broilers;
- Griddles; and
- Steamers.

Incentives range from $300 to $2,400 for eligible equipment, with an additional dealer/installer incentive ranging from $45 to $225 depending upon equipment type. The program added Third Tier Fryer and Conveyor Broilers incentives for the 2020-2022 program cycle.

8.1 Program Overview

The Commercial Food Service Program is primarily a vendor-driven program, with the marketing targeted at food service equipment distributors. Table 8-1 summarizes the historical performance of the Commercial Food Service Program.

Table 8-1: Commercial Food Service Program Historical Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2010	$121,129	$294,054	41%	354,702	264,327	134%
2011	$215,900	$275,129	78%	144,465	209,341	69%
2012	$164,704	$293,854	56%	54,162	259,752	21%
2013	$180,476	$331,595	54%	59,515	385,040	15%
2014	$182,608	$331,594	55%	77,619	385,050	20%
2015	$152,485	$231,595	66%	85,891	60,210	143%
2016	$163,893	$231,595	71%	66,534	60,210	111%
2017	$199,189	$222,987	89%	83,289	62,260	134%
2018	$164,026	$229,403	71%	71,653	68,196	105%
2019	$155,205	$232,120	67%	53,123	69,951	76%
2020	$120,124	$172,491	70%	21,693	63,195	34%
2021	$150,488	$178,216	84%	50,469	62,873	80%
2022	$79,946	$181,932	46%	21,283	64,641	33%
2023	$140,086	$179,946	78%	57,186	64,641	88%

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8.2 Program Design Changes

No changes were made to the program in 2023.

8.3 Participation Summary

In PY2023, the Commercial Food Service Program had 58 organizations receive rebates for 139 pieces of kitchen equipment. Figure 8-1 summarizes the Commercial Food Service Program participation by facility type.

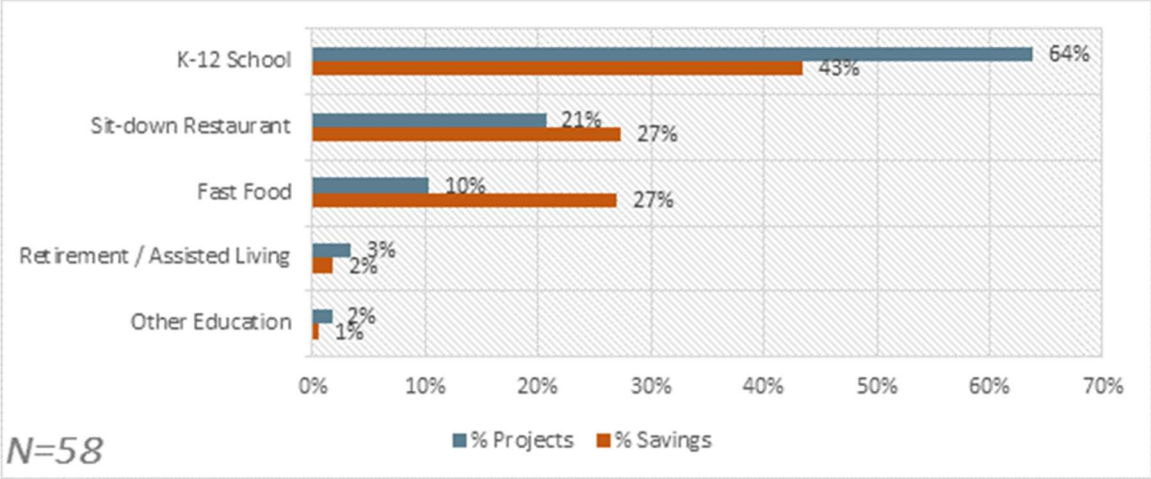

Figure 8-1: Commercial Food Service Program Participation by Facility Type

Figure 8-2 summarizes Commercial Food Service Program participation by measure category.

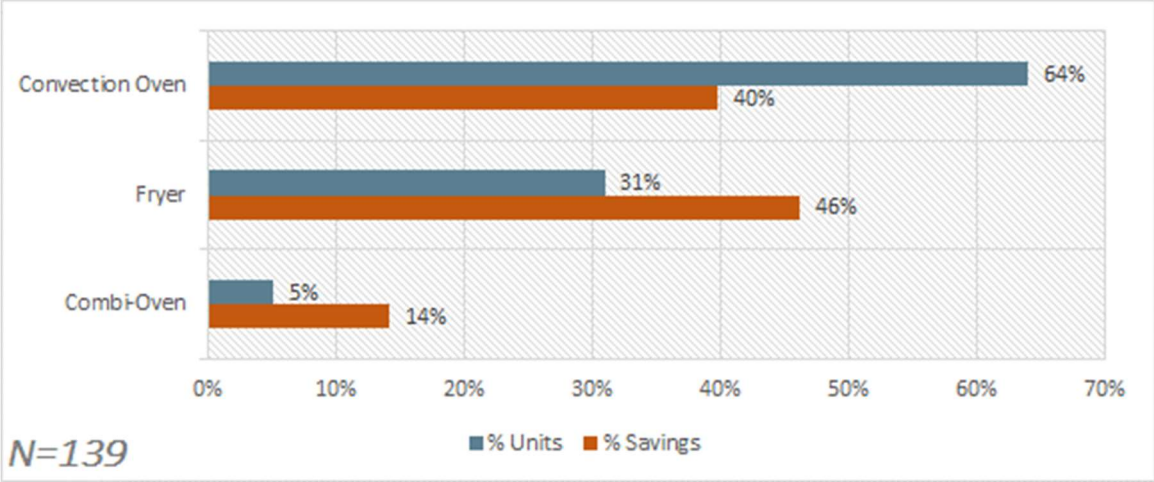

Figure 8-2: Participation by Measure Category

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8.4 Commercial Food Service Program Process Evaluation

In following guidance from the TRM, Protocol C, we conducted limited process evaluation activities for PY2023, consisting of staff interviews and a review of program materials. The program has not recognized any major program changes from PY2020 to PY2022.

Table 8-2 and Table 8-3 summarize the Evaluators' review of the Commercial Food Service Program in comparison to TRM V9.2 Protocol C for timing and conditions of conducting a process evaluation.

Table 8-2: 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 PY2022.
New Vendor or Contractor	No. Implementation is unchanged from PY2022.

Table 8-3: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	Yes. The program only met 33% of its PY2022 net savings goal
Are the educational or informational goals not meeting program goals?	Yes. The program did not meet its participant or savings goal.
Are the participation rates lower or slower than expected?	Yes. The program did not meet its participant or savings goal.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. Past 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 was within expected range.
Do participants report problems with the programs or low rates of satisfaction?	No. Participant surveys in past evaluations found exceedingly high satisfaction levels.
Is the program producing the intended market effects?	Yes. Interviews with participating vendors found that the program has caused a shift in their sales.

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8.4.1 Data Collection Activities

The process evaluation of the Commercial Food Service Program included the following data collection activities:

- *Program Actor In-Depth Interviews*. The Evaluators conducted in-depth interviews with a series of program actors. These interviews covered a range of topics, including marketing efforts, feedback on program delivery, an assessment of barriers to program implementation and success, and recommendations for program improvement. Program Actors interviewed include Summit Program Staff and implementation contractor staff.

Table 8-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, and timeframe of data collection.

Table 8-4: Summit Commercial Food Service Program Data Collection Summary

Target	Component	Activity	N	Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Program Manager of Conservation Improvement Senior Energy Efficiency Consultants (2) Energy Efficiency Consultant	Group interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, including assisting in outreach and marketing efforts of the program.

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8.4.2 Protocol A Review

Table 8-5: Commercial Food Service 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	✓	
	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	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	
Marketing	Advertising and marketing spending levels	-	Not itemized from total marketing costs in data provided to the

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and Outreach Activities			Evaluators.
	Media schedules	N/A	
	Summary of number of community events/outreach activities	✓	
	Other media activities – estimated impressions via mailings, television/radio; print ads.	✓	

8.4.3 Response to Program Recommendations

Table 8-7 summarizes the status of issues and recommendations identified in the PY2022 process evaluation.

Table 8-6: Food Service Program Response to PY2022 Recommendations

Recommendation	Status of Issue
Increase incentives across most measures. The Evaluators found that most measures in the program could have increases in incentive levels while maintaining robust utility cost test benefit ratios	SUA has increased rebates for most equipment classes for the 2024-2026 period. Complete.

8.4.4 Staff Interview Summary

Evaluators interviewed five Summit AR staff members. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, two Senior Energy Efficiency Consultants, and the Energy Efficiency Consultant.

Despite a strong start to the year compared to in years past, the food service program continues to experience low participation. In an attempt to increase participation, staff are considering significant programmatic changes in the new triennial, including a midstream and/or point-of-sale pathways. Staff are working with other implementers to determine the feasibility of a midstream program in their territory.

8.5 Commercial Food Service Program Impact Evaluation

The impact evaluation effort of the Commercial Food Service Program included the following:

- *Unit-Specific Savings Review.* The deemed parameters listed in the TRM V9.1 include assumptions of cooking efficiency, preheat BTU, and capacity. The Evaluators developed a lookup table for key parameters for units rebated through SUA's program, using specific unit characteristics in TRM V9.1 algorithms.

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8.5.1.1 Savings Calculation Methodologies

The Evaluators applied deemed savings algorithms from TRM V9.1 in calculating savings for measures included in the Commercial Food Service Program.

The Evaluators conducted a review of the key parameters contributing to savings for equipment rebated in the Commercial Food Service Program. From this, a table was developed allowing SUA to update energy savings calculations using the characteristics of the equipment purchased. In the subsections to follow, the deemed savings tables will present:

- Baseline specifications from the TRM V9.1;
- Efficient specifications from the TRM V9.1; and
- Verified specifications from the Evaluators' review of units rebated in the program.

Most measures had 100% realization. The Evaluators note that the program had a rack oven with zero savings claimed. The SUA tracking system had not had rebates for this type of equipment before and did not have parameters established. The Evaluators calculated 3,286 therms savings for this project, though realization rate is incalculable as ex ante savings was 0 therms.

8.5.1.2 Free-Ridership

The Evaluators applied the NTGR developed in prior evaluations of 77.2%.

8.5.1.3 Verified Savings

Table 8-7 presents the gross savings results of the evaluation of the PY2023 Commercial Food Service Program. Total Gross Savings summarizes the savings calculations performed by TRM V9.1 protocols for food service equipment.

Table 8-7: Commercial Food Service Program Verified Therms Savings

Measure Category	Expected Therms Savings	Verified Therms Savings	Gross Realization	EUL	Lifetime Therms Savings
Convection Oven	28,480	28,480	100.0%	12	341,758
Combi Oven	10,142	10,142	100.0%	12	121,704
Fryer	33,048	33,048	100.0%	12	396,577
Total	**71,670**	**71,670**	**100.0%**	**12**	**860,039**

The resulting net savings are presented in Table 8-8.

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Table 8-8: Commercial Food Service Program Net Savings Summary

Free-Ridership Rate		Net Annual Savings		Net Realization Rate	Net Lifetime Therms Savings
Ex Ante	Ex Post	Ex Ante	Ex Post		
77.2%	77.2%	55,329	55,329	100%	663,950

Table 8-9: Commercial Food Service Program Verified Water Savings

Measure Category	Gross Annual Water	Net Annual Water	Net Lifetime Water
Combi Oven	1,144,275	883,380	10,600,564
Total	**1,144,275**	**883,380**	**10,600,564**

8.6 Conclusions

SUA accurately calculates savings per TRM V9.1protocols.	All projects other than rack ovens had 100% gross realization. Rack ovens did not have calculations automated in the tracking system as there had never been participation in this measure.
Participation has increased significantly compared to PY2022.	The program met 88% of its savings goal, compared to 33% in PY2022.
SUA has adopted recommendations related to increased incentives.	Beginning in 2024, the program has significantly higher incentives across all equipment classes. The PY2024 evaluation will address the impact of increased incentives.

8.7 Recommendations

The Evaluators do not have recommendations for this program.

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9 Home Energy Reports

The Home Energy Reports Program is a behavioral energy efficiency program run by Oracle, a third-party implementer for Summit. The program is delivered on an opt-out basis and provides a sample of Summit's residential customers with personalized print and email reports that contain a normative comparison of their energy usage compared to similar households, tailored recommendations of ways to save energy, and promotions of other programs in Summit's portfolio. The Home Energy Reports program also includes a web portal that answers frequently asked questions and allows customers to view their current and historical energy usage, update their home profile information via a home energy analysis survey, or remove themselves from the program. The program is designed to deliver energy savings by motivating behavior change and program participation by the recipients of the Home Energy Reports.

9.1 Program Overview

The Home Energy Reports Program began in September 2011. The program is designed to generate quantifiable behavioral savings that cannot be feasibly attained through standard EE efforts. The program differs from standard energy conservation marketing efforts in that it provides unique reports to each customer, comparing their gas bills against those of similar homes in their neighborhood. The program theory asserts that the normative comparison is a motivating force that drives energy-saving behaviors.

Over time, the population of recipients faces attrition. This occurs mostly due to members of the recipient group moving to a new residence. Table 9-1 summarizes the attrition that has occurred in each wave.

Table 9-1: Home Energy Reports Recipient Attrition

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
Inception	49,655	51,910	24,158	21,605	46,327	11,805	48,558
Current	22,341	25,004	13,605	13,323	37,102	9,629	47,332
Attrition %	55.01%	51.83%	43.68%	38.33%	19.91%	18.4%	2.52%

9.2 Process Evaluation

The Evaluators conducted a limited process evaluation of the Home Energy Reports Program PY2020 and found that the program was successful in meeting participation, savings, and satisfaction goal; a limited process evaluation was conducted in PY2023. Table 9-2 and Table 9-3

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the Evaluators' review of the Home Energy Reports Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 9-2: 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. Program implementation is unchanged from PY2022.

Table 9-3: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met of goal in PY2022.
Are the educational or informational goals not meeting program goals?	No. The programs have had successful consumer outreach & education.
Are the participation rates lower or slower than expected?	No. The program met of goal in PY2022.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. 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 exceeded expectations.
Do participants report problems with the programs or low rates of satisfaction?	No. Prior participant surveys found exceedingly high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program produces measurable behavior change among treatment cohorts.

A limited process evaluation was conducted in PY2021 and PY2022.

9.2.1 Data Collection Activities

The process evaluation of the Home Energy Reports included the following data collection activities:

- *Summit AR Program Staff Interviews.* The Evaluators interviewed staff at Summit AR involved in the administration of the Home Energy Reports Program. These interviews

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were to collect information from program staff as to any changes or developments, as well as response to program recommendations.

9.2.2 Program Staff Interview Summary

Evaluators interviewed four Summit AR staff members about the residential programs. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, the Senior Energy Efficiency Consultant, and the Energy Efficiency Consultant.

As of the interview in Fall 2023, the Home Energy Reports program was performing well. Staff explained that participants receive monthly email reports and that some folks have also started receiving paper reports. The program experienced some delays at the beginning of the program year due to issues with the new data platform, but these issues were resolved swiftly.

9.3 Impact Evaluation

9.3.1 Savings Calculation Methodologies

Based on the opt-out program design, savings calculation can be conducted using a randomized controlled trial (RCT) in which the energy use of the program participants (treatment group) is compared to a statistically-equivalent control group. The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the participant and control customers. In particular, energy use in calendar month *t* of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between participants and controls will be reflected in differences in their past energy use, which is highly correlated with their current energy use. The version we estimate includes monthly fixed effects and interacts these monthly fixed effects with the pre-program energy use variable. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

The model specification is as follows:

$$Usage_{it} = \alpha_0 + \beta * treatment_i$$

$$+\alpha_1 * PreUsage_i$$

$$+\alpha_2 * PreUsageSummer_i$$

$$+\alpha_3 * PreUsageWinter_i$$

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$+\gamma * mm_t$

$+\delta_1 * mm_t * PreUsage_i$

$+\delta_2 * mm_t * PreUsageSummer_i$

$+\delta_3 * mm_t * PreUsageWinter_i$

$+\varepsilon_{it}$

Where

- *i* denotes the *i*th customer
- *t* denotes the first, second, third, etc. month of the post-treatment period
- $Usage_{it}$ is the average daily use for reading *t* for household *I* during the post-treatment period
- $PreUsage_i$ is the average daily usage across household *i's* available pre-treatment billing reads.
- mm_t is a vector of month-year dummies

And parameter definitions are:

- α_0 is an intercept term
- α_1, α_2 , α_3 are effects of control variables $PreUsage_i$, $PreUsageSummer_i$, and $PreUsageWinter_i$ on $Usage_{it}$ in the reference month.
- γ is the effect of the control month *t* on the dependent variable.
- $\delta_1, \delta_2, \delta_3$ are the effect of the control variables $PreUsage_i$, $PreUsageSummer_i$, and $PreUsageWinter_i$ in each month-year (mm_t) of the post period.
- ε_{it} is an error term.

In this specification, savings are calculated by:

- Savings = ∑ (Treatment_Coeff * Number of recipients in month i * Number of days in month i)

Where,

- Treatment_Coeff = Coefficient for treatment parameter (daily use is the dependent variable, a negative value for treatment reflects the difference in therms per day used by the treatment group after report delivery)
- Number of recipients in month i = Total recipients in the Wave, after accounting for attrition, for each month
- Number of days in month i = For month i, the number of days in the month

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9.3.2 Home Energy Report Net Savings

The HER program is effectively a randomized controlled trial, comparing recipients to non-recipients. As a result, the savings estimates from the model are net savings estimates, and no further deduction of free ridership is taken.

Table 9-4 shows the pre-period interval for each wave, based on the billing data. For each wave, the same interval was found for both recipient and control groups, which allows for a proper comparison of pre-usage.

Table 9-4: Pre-Period Interval

Wave	Start Year/Month	End Year/Month
1	2010-10	2011-09
2	2011-11	2012-10
3	2013-12	2014-11
4	2018-10	2019-09
5	2019-10	2020-09
6	2021-03	2021-12
7	2022-10	2023-09

9.3.2.1 Wave 1

Table 9-5 provides the model coefficients for the regression of customer billing data in the analysis of Wave 1.

Table 9-5: Regression Coefficients & Model Details – Wave 1

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.41	0.02	18.33	<0.00001
Treatment	-0.04	0.00	-10.44	<0.00001
February	0.17	0.03	5.44	<0.00001
March	-0.10	0.03	-2.86	<0.005
April	-0.23	0.05	-4.62	<0.00001
May	-0.36	0.03	-11.38	<0.00001
June	-0.38	0.03	-12.08	<0.00001
July	-0.37	0.03	-11.72	<0.00001
August	-0.38	0.03	-12.17	<0.00001
September	-0.39	0.03	-12.42	<0.00001

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October	-0.39	0.03	-12.34	<0.00001
November	-0.15	0.03	-4.63	<0.00001
December	0.04	0.03	1.18	0.24
Pre-usage	0.21	0.01	20.89	<0.00001
Pre-summer	0.27	0.01	17.98	<0.00001
Pre-winter	0.49	0.01	40.71	<0.00001
Pre-usage: February	-0.15	0.01	-10.93	<0.00001
Pre-usage: March	0.03	0.01	1.90	0.06
Pre-usage: April	0.00	0.02	-0.06	0.95
Pre-usage: May	0.05	0.02	2.62	0.01
Pre-usage: June	-0.09	0.05	-1.96	0.05
Pre-usage: July	-0.47	0.06	-7.49	<0.00001
Pre-usage: August	0.05	0.05	0.99	0.32
Pre-usage: September	0.17	0.03	5.65	<0.00001
Pre-usage: October	-0.02	0.02	-1.10	0.27
Pre-usage: November	-0.07	0.01	-5.83	<0.00001
Pre-usage: December	-0.24	0.01	-16.70	<0.00001
Pre-summer: February	-0.07	0.02	-3.12	<0.005
Pre-summer: March	-0.12	0.02	-4.92	<0.00001
Pre-summer: April	0.01	0.04	0.18	0.85
Pre-summer: May	0.11	0.03	4.15	<0.005
Pre-summer: June	0.25	0.05	4.62	<0.00001
Pre-summer: July	0.55	0.06	8.62	<0.00001
Pre-summer: August	0.04	0.05	0.83	0.41
Pre-summer: September	-0.04	0.04	-1.05	0.29
Pre-summer: October	0.08	0.02	3.44	<0.005
Pre-summer: November	-0.08	0.02	-3.57	<0.005
Pre-summer: December	-0.07	0.02	-3.23	<0.005
Pre-winter: February	0.04	0.02	2.66	0.01
Pre-winter: March	-0.23	0.01	-17.06	<0.00001
Pre-winter: April	-0.40	0.01	-27.74	<0.00001
Pre-winter: May	-0.46	0.01	-36.15	<0.00001
Pre-winter: June	-0.48	0.01	-37.92	<0.00001

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Pre-winter: July	-0.48	0.01	-38.17	<0.00001
Pre-winter: August	-0.48	0.01	-38.13	<0.00001
Pre-winter: September	-0.47	0.01	-37.61	<0.00001
Pre-winter: October	-0.39	0.01	-30.44	<0.00001
Pre-winter: November	-0.18	0.01	-13.44	<0.00001
Pre-winter: December	0.21	0.02	13.06	<0.00001
Adjusted R-Squared: 0.780				

The resulting annual savings are:

- Annual Savings = ∑ (0.03993 * Number of recipients in month I * Number of days in month i) = 335,442 Therms
- 95% Confidence Interval: +/- 52,850 (15.76%)

9.3.2.2 Wave 2

Table 9-6 provides the model coefficients for the regression of customer billing data in the analysis of Wave 2.

Table 9-6: Regression Coefficients & Model Details – Wave 2

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	1.00	0.01	77.99	<0.00001
Treatment	-0.02	0.00	-10.71	<0.00001
February	-0.23	0.02	-12.65	<0.00001
March	-0.54	0.02	-28.54	<0.00001
April	-0.77	0.04	-19.71	<0.00001
May	-0.89	0.02	-49.66	<0.00001
June	-0.89	0.02	-49.90	<0.00001
July	-0.89	0.02	-49.73	<0.00001
August	-0.90	0.02	-50.03	<0.00001
September	-0.90	0.02	-50.39	<0.00001
October	-0.83	0.02	-46.00	<0.00001
November	-0.57	0.02	-31.61	<0.00001
December	-0.13	0.02	-7.25	<0.00001
Pre-usage	0.20	0.01	13.69	<0.00001

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Pre-summer	-0.20	0.02	-12.56	<0.00001
Pre-winter	0.60	0.02	36.14	<0.00001
Pre-usage: February	-0.39	0.02	-20.74	<0.00001
Pre-usage: March	-0.01	0.02	-0.53	0.6
Pre-usage: April	0.12	0.05	2.27	0.02
Pre-usage: May	0.04	0.03	1.32	0.19
Pre-usage: June	-0.02	0.04	-0.50	0.62
Pre-usage: July	-0.15	0.06	-2.51	0.01
Pre-usage: August	-0.26	0.04	-6.51	<0.00001
Pre-usage: September	-0.09	0.03	-2.85	<0.005
Pre-usage: October	-0.08	0.02	-4.12	<0.005
Pre-usage: November	-0.03	0.02	-1.78	0.08
Pre-usage: December	-0.08	0.02	-4.33	<0.005
Pre-summer: February	0.14	0.02	6.18	<0.00001
Pre-summer: March	0.21	0.03	8.37	<0.00001
Pre-summer: April	0.31	0.07	4.44	<0.00001
Pre-summer: May	0.52	0.03	15.30	<0.00001
Pre-summer: June	0.59	0.05	12.10	<0.00001
Pre-summer: July	0.68	0.06	11.36	<0.00001
Pre-summer: August	0.77	0.04	17.85	<0.00001
Pre-summer: September	0.63	0.03	18.69	<0.00001
Pre-summer: October	0.48	0.03	19.31	<0.00001
Pre-summer: November	0.18	0.02	8.26	<0.00001
Pre-summer: December	0.02	0.02	0.77	0.44
Pre-winter: February	0.24	0.02	11.84	<0.00001
Pre-winter: March	-0.23	0.02	-12.86	<0.00001
Pre-winter: April	-0.46	0.02	-21.92	<0.00001
Pre-winter: May	-0.54	0.02	-31.88	<0.00001
Pre-winter: June	-0.59	0.02	-34.37	<0.00001
Pre-winter: July	-0.59	0.02	-34.64	<0.00001
Pre-winter: August	-0.59	0.02	-34.65	<0.00001
Pre-winter: September	-0.58	0.02	-34.24	<0.00001
Pre-winter: October	-0.47	0.02	-27.53	<0.00001

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Pre-winter: November	-0.26	0.02	-14.18	<0.00001
Pre-winter: December	0.03	0.02	1.32	0.19
Adjusted R-Squared: 0.743				

The resulting annual savings are:

- Annual Savings = ∑ (0.02357 * Number of recipients in month I * Number of days in month i) = 221,158 Therms
- 95% Confidence Interval: +/- 33,964 (15.36%)

9.3.2.3 Wave 3

Table 9-7 provides the model coefficients for the regression of customer billing data in the analysis of Wave 3.

Table 9-7: Regression Coefficients & Model Details – Wave 3

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.69	0.02	32.93	<0.00001
Treatment	-0.03	0.00	-9.62	<0.00001
February	0.10	0.03	3.41	<0.005
March	-0.33	0.03	-9.61	<0.00001
April	-0.34	0.04	-8.70	<0.00001
May	-0.57	0.03	-19.79	<0.00001
June	-0.61	0.03	-20.94	<0.00001
July	-0.57	0.03	-19.72	<0.00001
August	-0.58	0.03	-20.17	<0.00001
September	-0.61	0.03	-20.87	<0.00001
October	-0.59	0.03	-20.49	<0.00001
November	-0.32	0.03	-10.90	<0.00001
December	0.01	0.03	0.28	0.78
Pre-usage	0.05	0.01	4.17	<0.005
Pre-summer	0.16	0.02	10.25	<0.00001
Pre-winter	0.53	0.01	39.69	<0.00001
Pre-usage: February	0.04	0.02	2.33	0.02
Pre-usage: March	0.18	0.02	11.03	<0.00001
Pre-usage: April	0.19	0.02	8.64	<0.00001

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Pre-usage: May	0.13	0.02	5.68	<0.00001
Pre-usage: June	0.21	0.05	4.37	<0.005
Pre-usage: July	-0.22	0.06	-3.53	<0.005
Pre-usage: August	-0.07	0.05	-1.51	0.13
Pre-usage: September	0.11	0.03	3.75	<0.005
Pre-usage: October	0.19	0.02	10.51	<0.00001
Pre-usage: November	0.05	0.01	3.98	<0.00001
Pre-usage: December	0.04	0.02	2.49	0.01
Pre-summer: February	-0.01	0.02	-0.64	0.52
Pre-summer: March	0.05	0.03	2.08	0.04
Pre-summer: April	0.00	0.03	-0.01	0.99
Pre-summer: May	0.22	0.03	7.66	<0.00001
Pre-summer: June	0.13	0.05	2.43	0.01
Pre-summer: July	0.45	0.07	6.92	<0.00001
Pre-summer: August	0.29	0.05	5.91	<0.00001
Pre-summer: September	0.16	0.03	5.12	<0.00001
Pre-summer: October	0.09	0.02	3.77	<0.005
Pre-summer: November	-0.01	0.02	-0.53	0.6
Pre-summer: December	-0.10	0.02	-4.67	<0.00001
Pre-winter: February	-0.14	0.02	-8.31	<0.00001
Pre-winter: March	-0.35	0.02	-23.21	<0.00001
Pre-winter: April	-0.49	0.02	-32.71	<0.00001
Pre-winter: May	-0.50	0.01	-35.71	<0.00001
Pre-winter: June	-0.52	0.01	-37.28	<0.00001
Pre-winter: July	-0.52	0.01	-37.55	<0.00001
Pre-winter: August	-0.52	0.01	-37.42	<0.00001
Pre-winter: September	-0.51	0.01	-36.83	<0.00001
Pre-winter: October	-0.46	0.01	-32.72	<0.00001
Pre-winter: November	-0.26	0.01	-18.42	<0.00001
Pre-winter: December	-0.06	0.02	-3.17	<0.005
Adjusted R-Squared: 0.781				

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The resulting annual savings are:

- Annual Savings = ∑ (0.03395 * Number of recipients in month I * Number of days in month i) = 173,330 Therms
- 95% Confidence Interval: +/- 29,624 (17.09%)

9.3.2.4 Wave 4

Table 9-8 provides the model coefficients for the regression of customer billing data in the analysis of Wave 4.

Table 9-8: Regression Coefficients & Model Details – Wave 4

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.64	0.02	30.67	<0.00001
Treatment	-0.04	0.00	-9.61	<0.00001
February	0.09	0.03	3.15	<0.005
March	-0.26	0.03	-7.99	<0.00001
April	-0.60	0.04	-13.79	<0.00001
May	-0.56	0.03	-19.37	<0.00001
June	-0.58	0.03	-20.01	<0.00001
July	-0.53	0.03	-18.48	<0.00001
August	-0.56	0.03	-19.32	<0.00001
September	-0.59	0.03	-20.47	<0.00001
October	-0.55	0.03	-18.52	<0.00001
November	-0.37	0.03	-12.75	<0.00001
December	-0.01	0.03	-0.35	0.72
Pre-usage	-0.50	0.02	-21.96	<0.00001
Pre-summer	0.25	0.01	18.61	<0.00001
Pre-winter	1.30	0.02	55.02	<0.00001
Pre-usage: February	0.55	0.03	20.44	<0.00001
Pre-usage: March	0.69	0.03	26.36	<0.00001
Pre-usage: April	0.97	0.03	30.12	<0.00001
Pre-usage: May	0.86	0.03	29.91	<0.00001
Pre-usage: June	0.57	0.05	12.37	<0.00001
Pre-usage: July	0.23	0.07	3.20	<0.005

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Pre-usage: August	0.91	0.05	17.43	<0.00001
Pre-usage: September	0.82	0.03	28.53	<0.00001
Pre-usage: October	0.82	0.02	33.69	<0.00001
Pre-usage: November	0.81	0.02	32.78	<0.00001
Pre-usage: December	0.61	0.03	21.63	<0.00001
Pre-summer: February	0.03	0.02	1.56	0.12
Pre-summer: March	0.09	0.02	4.39	<0.005
Pre-summer: April	0.23	0.03	6.70	<0.00001
Pre-summer: May	0.15	0.03	5.49	<0.00001
Pre-summer: June	0.43	0.05	8.94	<0.00001
Pre-summer: July	0.66	0.07	9.35	<0.00001
Pre-summer: August	0.02	0.05	0.41	0.68
Pre-summer: September	0.18	0.02	7.48	<0.00001
Pre-summer: October	0.19	0.02	9.59	<0.00001
Pre-summer: November	0.07	0.02	3.68	<0.005
Pre-summer: December	0.04	0.02	2.03	0.04
Pre-winter: February	-0.75	0.03	-26.34	<0.00001
Pre-winter: March	-1.05	0.03	-41.21	<0.00001
Pre-winter: April	-1.27	0.03	-50.45	<0.00001
Pre-winter: May	-1.26	0.02	-52.69	<0.00001
Pre-winter: June	-1.28	0.02	-53.73	<0.00001
Pre-winter: July	-1.29	0.02	-54.03	<0.00001
Pre-winter: August	-1.29	0.02	-53.95	<0.00001
Pre-winter: September	-1.29	0.02	-53.88	<0.00001
Pre-winter: October	-1.25	0.02	-52.17	<0.00001
Pre-winter: November	-1.13	0.03	-45.00	<0.00001
Pre-winter: December	-0.69	0.03	-24.14	<0.00001
Adjusted R-Squared: 0.811				

The resulting annual savings are:

- Annual Savings = ∑ (0.039 * Number of recipients in month I * Number of days in month i) = 197,253 Therms
- 95% Confidence Interval: +/- 33,761 (17.12%)

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9.3.2.5 Wave 5

Table 9-9 provides the model coefficients for the regression of customer billing data in the analysis of Wave 5. The treatment coefficient was not statistically significant, thus the Evaluators cannot reject the null hypothesis and has assigned Wave 5 zero savings.

Table 9-9: Regression Coefficients & Model Details – Wave 5

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.49	0.01	74.41	<0.00001
Treatment	0.00	0.00	0.17	0.86
February	-0.03	0.01	-3.28	<0.005
March	-0.20	0.01	-19.95	<0.00001
April	-0.36	0.02	-24.14	<0.00001
May	-0.42	0.01	-46.50	<0.00001
June	-0.44	0.01	-47.83	<0.00001
July	-0.42	0.01	-45.70	<0.00001
August	-0.43	0.01	-46.80	<0.00001
September	-0.45	0.01	-49.29	<0.00001
October	-0.42	0.01	-45.32	<0.00001
November	-0.27	0.01	-29.86	<0.00001
December	0.02	0.01	1.70	0.09
Pre-usage	0.60	0.01	58.39	<0.00001
Pre-summer	0.22	0.01	31.02	<0.00001
Pre-winter	0.31	0.01	28.27	<0.00001
Pre-usage: February	-0.33	0.01	-25.56	<0.00001
Pre-usage: March	-0.35	0.01	-27.64	<0.00001
Pre-usage: April	-0.21	0.01	-14.39	<0.00001
Pre-usage: May	-0.35	0.01	-28.65	<0.00001
Pre-usage: June	-0.61	0.02	-26.10	<0.00001
Pre-usage: July	-0.48	0.04	-13.41	<0.00001
Pre-usage: August	-0.41	0.02	-16.62	<0.00001
Pre-usage: September	-0.31	0.02	-18.13	<0.00001
Pre-usage: October	-0.31	0.01	-26.11	<0.00001
Pre-usage: November	-0.44	0.01	-35.00	<0.00001

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Pre-usage: December	-0.79	0.02	-51.67	<0.00001
Pre-summer: February	-0.02	0.01	-1.77	0.08
Pre-summer: March	-0.02	0.01	-1.94	0.05
Pre-summer: April	-0.01	0.02	-0.51	0.61
Pre-summer: May	0.25	0.01	20.14	<0.00001
Pre-summer: June	0.52	0.02	21.20	<0.00001
Pre-summer: July	0.28	0.03	8.38	<0.00001
Pre-summer: August	0.20	0.02	8.51	<0.00001
Pre-summer: September	0.20	0.02	11.47	<0.00001
Pre-summer: October	0.21	0.01	20.93	<0.00001
Pre-summer: November	0.02	0.01	1.64	0.1
Pre-summer: December	-0.07	0.01	-6.71	<0.00001
Pre-winter: February	0.20	0.01	14.26	<0.00001
Pre-winter: March	0.02	0.01	2.05	0.04
Pre-winter: April	-0.23	0.01	-19.30	<0.00001
Pre-winter: May	-0.27	0.01	-24.08	<0.00001
Pre-winter: June	-0.30	0.01	-26.92	<0.00001
Pre-winter: July	-0.30	0.01	-27.09	<0.00001
Pre-winter: August	-0.30	0.01	-27.05	<0.00001
Pre-winter: September	-0.30	0.01	-26.40	<0.00001
Pre-winter: October	-0.25	0.01	-21.92	<0.00001
Pre-winter: November	0.06	0.01	4.79	<0.00001
Pre-winter: December	0.76	0.02	47.53	<0.00001
Adjusted R-Squared: 0.849				

The resulting annual savings are:

- Annual Savings = 0 Therms

9.3.2.6 Wave 6

Table 9-10 provides the model coefficients for the regression of customer billing data in the analysis of Wave 6.

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Table 9-10: Regression Coefficients & Model Details – Wave 6

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.63	0.02	36.37	<0.00001
Treatment	-0.01	0.00	-2.88	<0.005
February	0.11	0.02	4.60	<0.00001
March	-0.31	0.03	-11.58	<0.00001
April	-0.65	0.03	-20.35	<0.00001
May	-0.54	0.02	-23.12	<0.00001
June	-0.54	0.02	-23.04	<0.00001
July	-0.52	0.02	-22.19	<0.00001
August	-0.54	0.02	-23.03	<0.00001
September	-0.62	0.02	-26.31	<0.00001
October	-0.59	0.02	-25.09	<0.00001
November	-0.29	0.02	-12.22	<0.00001
December	0.03	0.02	1.29	0.2
Pre-usage	-0.54	0.01	-63.58	<0.00001
Pre-summer	-0.04	0.01	-3.41	<0.005
Pre-winter	1.33	0.01	129.71	<0.00001
Pre-usage: February	0.55	0.01	50.32	<0.00001
Pre-usage: March	0.72	0.01	62.87	<0.00001
Pre-usage: April	1.04	0.02	68.86	<0.00001
Pre-usage: May	0.87	0.01	60.37	<0.00001
Pre-usage: June	0.69	0.03	20.98	<0.00001
Pre-usage: July	0.64	0.06	11.49	<0.00001
Pre-usage: August	0.60	0.04	15.25	<0.00001
Pre-usage: September	0.81	0.02	40.14	<0.00001
Pre-usage: October	1.06	0.01	79.55	<0.00001
Pre-usage: November	0.93	0.01	79.88	<0.00001
Pre-usage: December	1.10	0.01	96.22	<0.00001
Pre-summer: February	0.14	0.02	7.81	<0.00001
Pre-summer: March	0.18	0.02	8.83	<0.00001
Pre-summer: April	0.37	0.03	13.59	<0.00001

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Pre-summer: May	0.43	0.02	18.69	<0.00001
Pre-summer: June	0.57	0.04	14.33	<0.00001
Pre-summer: July	0.54	0.06	9.72	<0.00001
Pre-summer: August	0.58	0.04	14.51	<0.00001
Pre-summer: September	0.47	0.03	18.07	<0.00001
Pre-summer: October	0.19	0.02	9.59	<0.00001
Pre-summer: November	0.13	0.02	7.15	<0.00001
Pre-summer: December	-0.08	0.02	-4.39	<0.005
Pre-winter: February	-0.73	0.01	-53.60	<0.00001
Pre-winter: March	-1.01	0.01	-88.30	<0.00001
Pre-winter: April	-1.29	0.01	-108.70	<0.00001
Pre-winter: May	-1.30	0.01	-121.39	<0.00001
Pre-winter: June	-1.32	0.01	-122.96	<0.00001
Pre-winter: July	-1.32	0.01	-123.30	<0.00001
Pre-winter: August	-1.32	0.01	-123.13	<0.00001
Pre-winter: September	-1.31	0.01	-121.59	<0.00001
Pre-winter: October	-1.27	0.01	-117.22	<0.00001
Pre-winter: November	-1.13	0.01	-97.07	<0.00001
Pre-winter: December	-0.99	0.01	-85.77	<0.00001
Adjusted R-Squared: 0.854				

The resulting annual savings are:

- Annual Savings = ∑ (0.00861 * Number of recipients in month I * Number of days in month i) = 31,684 Therms
- 95% Confidence Interval: +/- 18,083 (57.07%)

9.3.2.7 Wave 7

Table 9-11 provides the model coefficients for the regression of customer billing data in the analysis of Wave 7. This wave was recently established in October of 2023. The treatment coefficient was not statistically significant, thus the Evaluator cannot reject the null hypothesis and has assigned Wave 7 zero savings.

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Table 9-11: Regression Coefficients & Model Details – Wave 7

Variable Description	Regression Coefficient	Standard Error	T-Stat	PR > |T|
Intercept	0.60	0.01	72.02	<0.00001
Treatment	-0.01	0.01	-1.60	0.11
Pre-usage	0.58	0.00	209.2	<0.00001
Pre-usage: December	0.22	0.00	121.5	<0.00001
Adjusted R-squared: 0.644				

The resulting annual savings are:

- Annual Savings = 0 Therms

9.3.2.8 *Group Comparison*

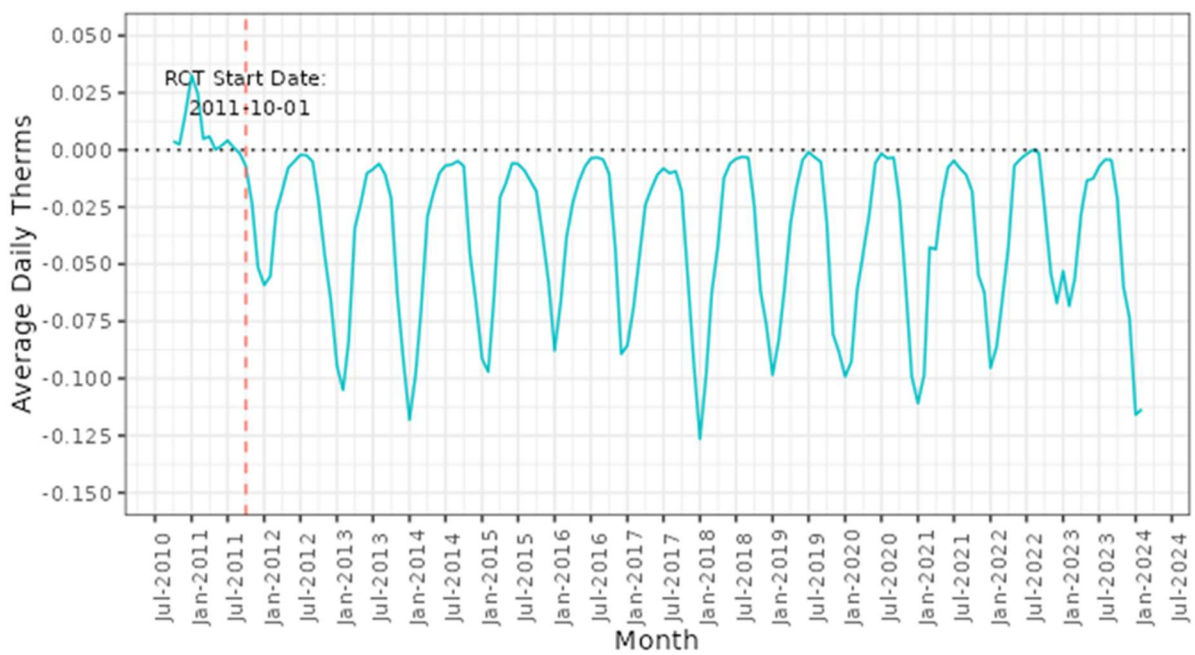

Figure 9-1: Difference in Daily Consumption between Treat. & Control Group – Wave 1

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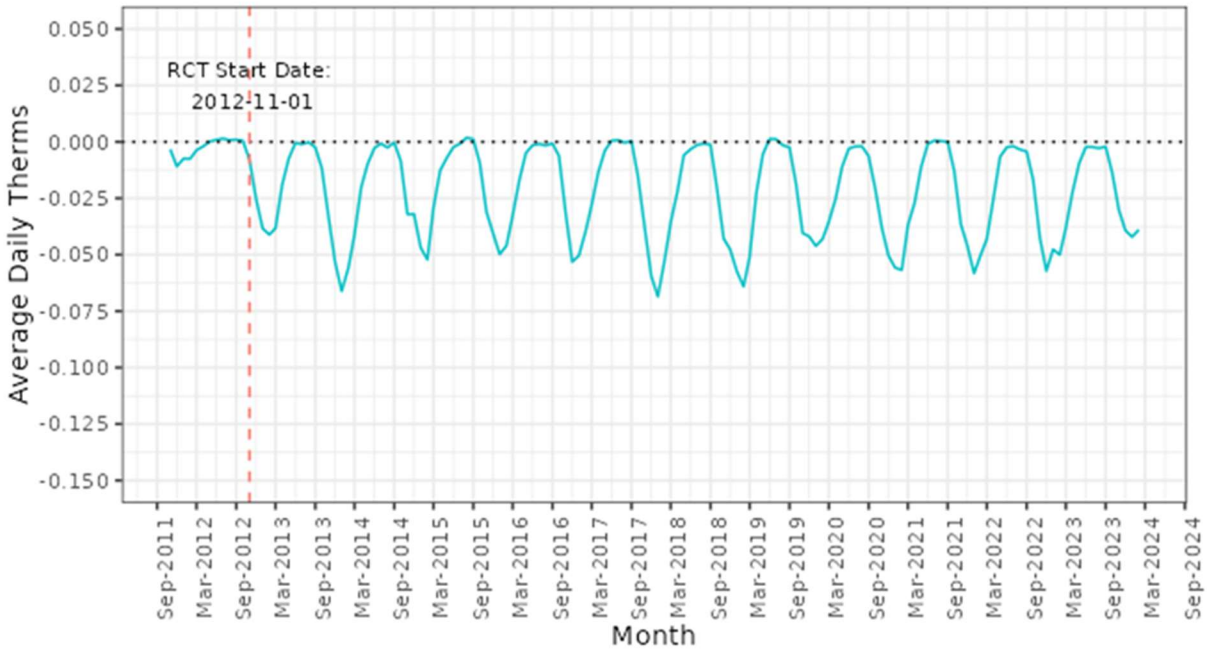

Figure 9-2: Difference in Daily Consumption between Treat. & Control Group – Wave 2

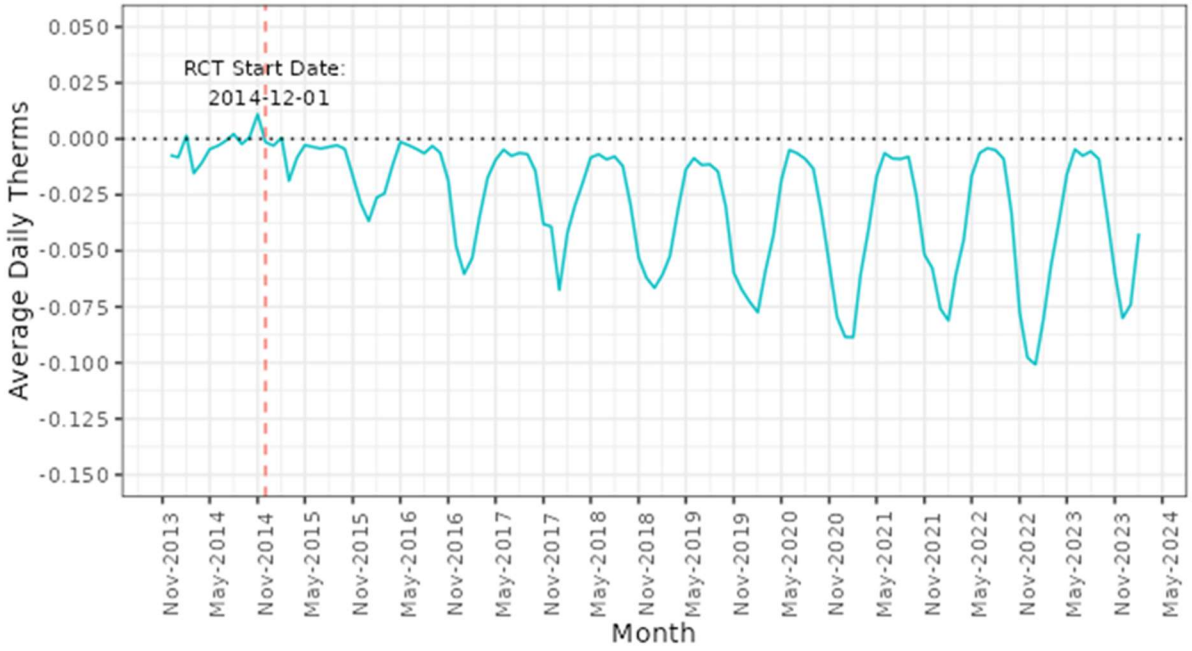

Figure 9-3: Difference in Daily Consumption between Treat. & Control Group – Wave 3

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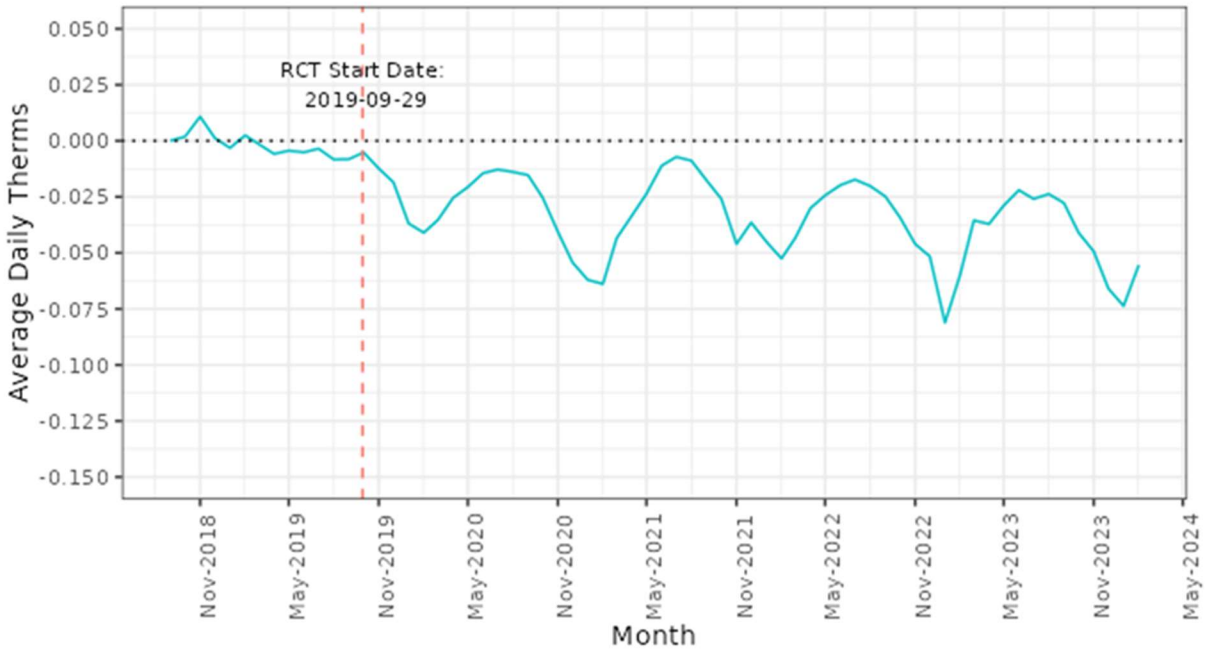

Figure 9-4: Difference in Daily Consumption between Treat. & Control Group – Wave 4

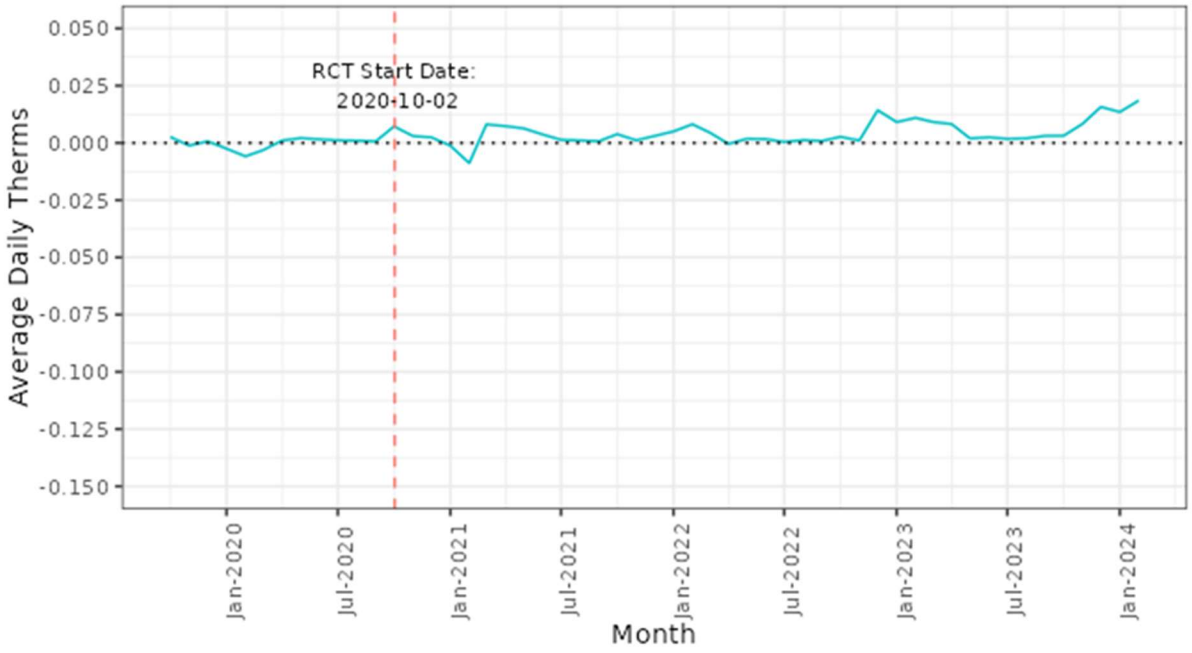

Figure 9-5: Difference in Daily Consumption between Treat. & Control Group – Wave 5

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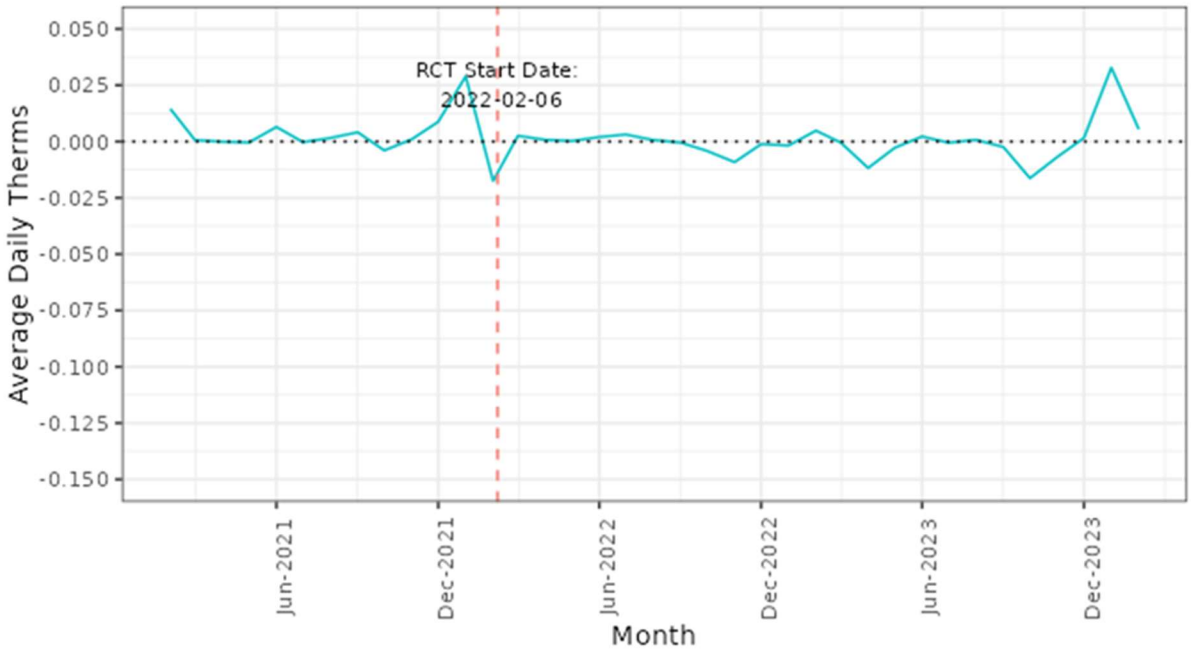

Figure 9-6: Difference in Daily Consumption between Treat. & Control Group – Wave 6

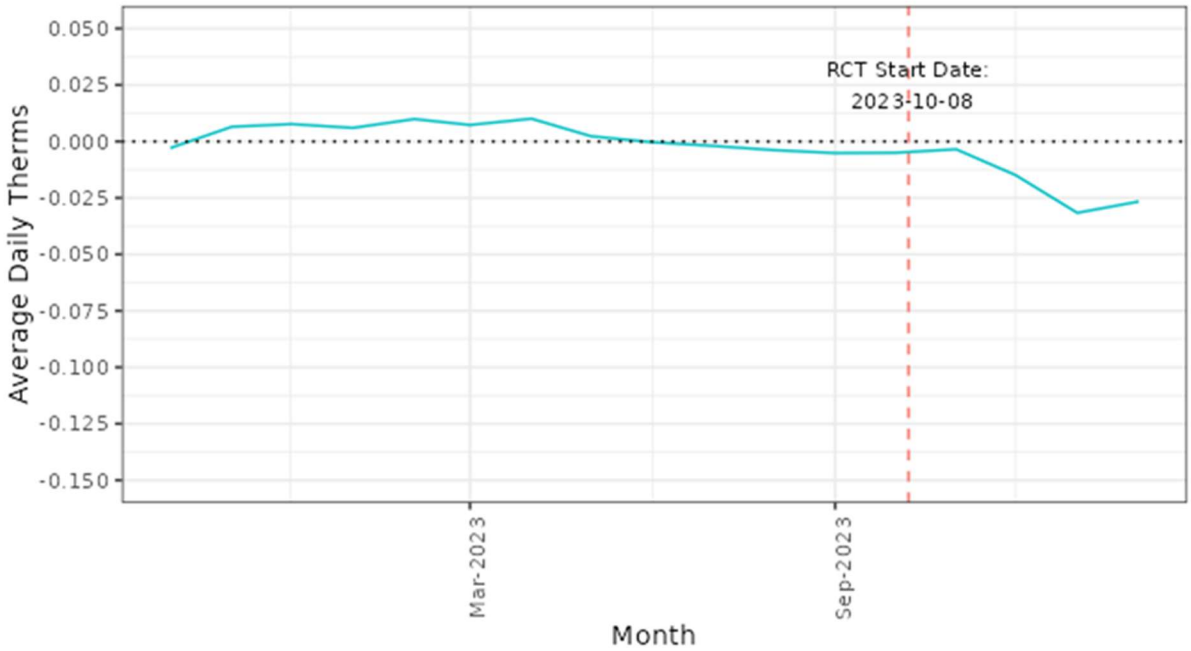

Figure 9-7: Difference in Daily Consumption between Treat. & Control Group – Wave 7

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9.3.2.9 Per-Customer Performance

The change in annual savings per recipient is summarized in Figure 9-8. Waves 1-4 all show a downward trend from PY2022 to PY2023, whereas wave 6 shows an increase in savings. As of PY2023, Wave 1 has the highest annual savings at 14.6 therms per customer. Wave 4 has slightly lower savings at 14.2 therms, while waves 2 and 3 are associated with savings of 8.6 and 12.4 therms per recipient, respectively. Regarding the newer waves, waves 5 and 7 show zero savings for PY2023 as model estimates were not statistically significant. Meanwhile wave 6 shows low, positive savings of 3.1 therms. Additional data are likely necessary to draw meaningful conclusions regarding the relatively newer waves 5-7. Although most waves show a slight decrease in savings from PY2022 to PY2023, savings have generally increased throughout the four-year period.

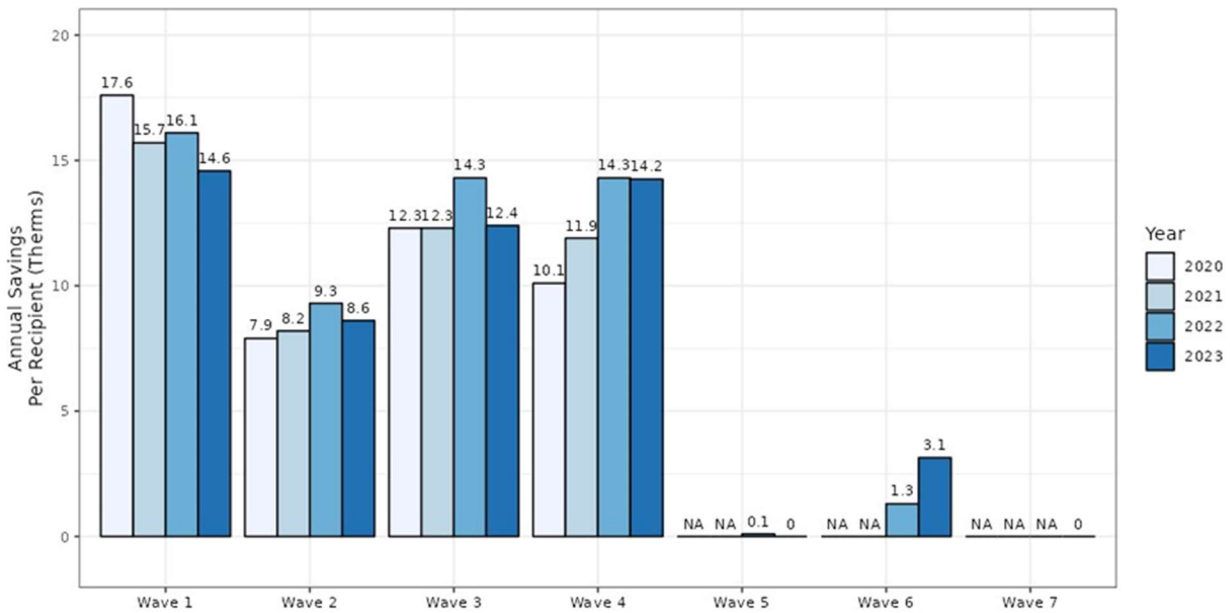

Figure 9-8: Savings per Recipient by Year

Table 9-12 shows the savings per recipient for each wave at both the lower and upper boundaries of the 95% confidence interval. Additionally, the annual pre-period usage per recipient and the percent of annual usage is provided below. For waves 1-4, calculated savings range between 1.47% and 2.05%, consistent with expected general program performance and program performances in previous years. Wave 6 shows savings increased compared to last year while waves 5 and 7 were not found to have statistically significant savings.

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Table 9-12: Pre-Period Usage per Recipient and Percent of Annual

Wave	Annual Savings per Recipient	Annual Savings (Lower 95% CI)	Annual Savings (Upper 95% CI)	Annual Pre-Period Usage per Recipient	Percent Weight of Total Participants	Percent of Annual Therms
1	14.58	11.85	17.32	983.23	13.14%	1.48%
2	8.61	7.03	10.18	419.17	14.99%	2.05%
3	12.4	9.88	14.93	774.72	8.20%	1.60%
4	14.25	11.34	17.15	970.03	7.71%	1.47%
5	0	0	0	702.97	22.77%	0%
6	3.14	1.01	5.28	881.35	6.02%	0.36%
7	0	0	0	184.82*	27.17%	0%
All	**5.51**	**4.35**	**6.67**	**593.66**	**-**	**0.93%**
*Usage over the two-month period studied						

9.3.2.10 Double Counting Analysis

Protocol J in the AR TRM V9.1 specifies double counting as the difference in per-participant other-program savings. Double counted savings are the difference in other-program savings between the recipient and control groups, and this difference is subtracted from behavioral program estimates to avoid double counting. If a program has more recipients than non-recipients in the analysis, then taking the straight sum of savings from other-program savings would dramatically inflate the double counting effect.

Table 9-13 shows the calculated PY2023 program savings after adjusting for double counting. Of note, ADM did not receive sufficient data to calculate PY2023 double counted savings based on customer-specific matching, as such double-counted savings are assumed to be 0.63% per previous program year data.

Table 9-13: PY2023 Program Savings Before and After Double Counting

Ex-post Therms Before Double Counting	Percent Difference	Ex-post Therms After Double Counting
958,867	0.63%	952,826

9.3.3 Verified Savings

When accounting for double counted savings, the Home Energy Reports Program has 958,826 annual therms savings. Table 9-14 summarizes the results of the program analysis.

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Table 9-14: Overall PY2023 HER Program Savings

Ex-ante Therms	Ex-post Therms After Double Counting	Ex-post Therms Before Double Counting	Realization Rate	95% Confidence	Precision
928,417	952,826	958,867	103%	168,282	±17.66%

The overall program realization rate for PY2023 is 103%. Table 9-15 summarizes savings and 95% confidence intervals by wave.

Table 9-15: PY2023 HER Program Savings at 95% Confidence

Wave	Weighted Number of Participants	Ex-post Therms (Before Double Counting)	Double Counted Savings (Therms)	Ex-post Therms (After Double Counting)	Ex-post Therms After Double Counting (Lower 95% CI)	Ex-post Therms After Double Counting (Upper 95% CI)
1	23,017	335,442	2,113	333,328	280,811	385,846
2	25,710	221,158	1,393	219,765	186,015	253,515
3	13,987	173,330	1,092	172,239	142,802	201,675
4	13,855	197,253	1,243	195,010	152,462	229,559
5	38,240	0	0	0	0	0
6	10,086	31,684	200	31,484	13,515	49,454
7	49,379	0	0	0	0	0
All	**174,274**	**958,867**	**6,041**	**952,826**	**785,604**	**1,120,048**

Table 9-16 summarizes the annual gross and net savings by wave.

Table 9-16: Therms Savings Summary by Wave

Wave	Number of Total Participants	Annual Therms Usage	Ex-post Savings	Ex-post Savings after Double Counting	Savings as a Percent of Annual
1	23,017	20,715,285	335,442	333,328	1.47%
2	25,710	10,776,749	221,158	219,765	2.04%
3	13,987	10,835,917	173,330	172,239	1.59%
4	13,855	13,440,122	197,253	195,010	1.46%
5	38,240	26,881,806	0	0	0%
6	10,086	8,889,371	31,684	31,484	0.35%
7	49,379	9,126,189	0	0	0%
All	**174,274**	**102,581,302**	**958,867**	**952,826**	**0.93%**

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When aggregating the savings and confidence intervals, the Evaluators found that the overall 95% confidence interval was ± 17.66% of program savings. In addition, across all waves, savings were 0.93% of annual 2023 usage.

9.4 Conclusions

The program continues to provide reliable savings as a percent of billed use but faces ongoing customer attrition.	Waves 1-4 are responsible for 35.0%, 23.1%, 18.1%, and 20.5% of program savings, respectively. However, as of the end of 2023, these same waves have 55.0%, 51.8%, 43.7%, and 38.3% attrition. Collecting data on reasons for attrition and conducting an analysis on those data may be worthwhile.
Savings per customer increased for Wave 6 compared to prior program years.	For wave 6, savings have increased from PY2020 onwards, highlighting the increasing impact of the Home Energy Reports program on customers' usage behaviors.
Data from Waves 5 and 7 did not demonstrate significant savings.	Wave 5 and 7 have RCT start dates of 10/02/2020 and 10/08/2023, respectively. There were no statistically significant differences between the treatment and control groups in these waves in PY2023. Wave 7 is too new to draw meaningful conclusions; this wave should be reassessed next year.

9.5 Recommendations

Discontinue wave 5.	Wave 5 has failed to provide savings in three years since inception. The Evaluators recommend discontinuing this wave and launching a replacement.

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10 Low Flow Showerhead & Faucet Aerator Program

The Low Flow Showerhead & Faucet Aerator Program provides no-cost mailer kits to SUA residential customers. These kits may contain:

- Up to three 1.5 gallons per minute (GPM) low flow showerheads, available in chrome and ivory finish; and
- Up to three faucet aerators, with options including 1.5 GPM kitchen aerators (with a shutoff valve) and 1.0 GPM bathroom aerators (without a shutoff valve).

In addition, the program provides an online marketplace component that discounts the purchase price of smart thermostats.

10.1 Program Overview

The Low Flow Showerhead & Faucet Aerator Program began in 2010. The program is designed to provide no-cost self-install kits containing low flow showerheads and faucet aerators to SUA residential customers. The program has been markedly popular among SUA customers and exceeded the participation goal most years from 2011 to 2017, then faced declining participation. The history of program performance and expenditures is presented in Table 10-1.

Table 10-1: Low Flow Showerhead & Faucet Aerator Program Historical Performance Against Goals

Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2010	$114,947	$181,404	63%	112,422	414,151	27%
2011	$212,460	$167,117	127%	124,042	120,904	103%
2012	$379,048	$379,048	100%	215,295	129,136	167%
2013	$401,061	$165,227	243%	148,589	169,920	87%
2014	$282,502	$415,227	68%	154,562	147,440	105%
2015	$286,121	$415,227	69%	163,181	147,440	111%
2016	$299,572	$415,227	72%	147,948	147,440	100%
2017	$344,483	$290,732	118%	168,409	165,900	102%
2018	$277,558	$290,487	95%	100,396	165,898	61%
2019	$231,713	$290,362	80%	108,933	165,898	66%
2020	$198,760	$288,292	69%	69,336	167,600	41%
2021	$157,244	$290,596	54%	25,098	161,622	16%
2022	$72,165	$299,712	24%	8,950	161,622	6%
2023	$164,422	$299,712	55%	13,753	161,622	9%

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10.2 Participation Summary

In PY2023, SUA distributed 1,079 kits to their residential customers.

Total equipment distributed in the program included:

- 413 1.5 GPM showerheads
- 159 1.5 GPM kitchen aerators
- 226 1.0 GPM bathroom aerators
- 281 smart thermostats

10.2.1 Declining Savings & Participation

The Low Flow Program has had declining participation in recent years. The program has struggled to fully expend its budget and meet participant goals, and at the same time the NTG for kit measures has declined. Summit staff have concerns related to market saturation as the program has reached the majority of their eligible customers. Though the service territory of course sees new entrants that are thus newly eligible, it is unlikely that the program will reach the scale it had in its earlier years of operation. SUA has altered the program to include smart thermostats, and has a larger-scale overhaul of the program intended for the PY2024-PY2026 triennial cycle.

10.2.2 Response to Recommendations

Table 10-2: Low Flow Program Response to PY2022 Recommendations

Recommendation	*Status of Issue*
Send kits as part of a "welcome package" for new service connections. The program has faced declining participation due to saturation. The program could consider increasing participation by targeting new movers into SUA territory with a "welcome kit.	Not applicable.

10.3 Process Evaluation

The Evaluators conducted a limited process evaluation of the Low Flow Showerhead & Faucet Aerator Program PY2020 and found that the program was not successful in meeting participation and savings goals; a limited process evaluation was conducted in PY2023. Table 10-3 and
Table 10-4 summarize the Evaluators' review of the Low Flow Showerhead & Faucet Aerator Program in comparison to TRM V9.2 Protocol C for timing and conditions of conducting a process evaluation.

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Table 10-3: 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. The program has the same implementation team as in PY2022.

Table 10-4: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	Yes. The program fell short of goal in PY2022.
Are the educational or informational goals not meeting program goals?	No. The programs have had successful consumer outreach & education.
Are the participation rates lower or slower than expected?	Yes. The program has fallen short of participation goals in recent program years.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	No. 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 exceeded expectations.
Do participants report problems with the programs or low rates of satisfaction?	No. Prior participant surveys found exceedingly high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program is generating transactions and installations that would not occur otherwise.

As the program is to be replaced with a new program design in PY2024, the Evaluators elected to not conduct a process evaluation.

Table 10-5 summarizes the data collection for this process evaluation effort. This includes the titles, role, sample sizes, timeframe of data collection.

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Table 10-5: Summit AR Low Flow Showerhead & Faucet Aerator Data Collection Summary

Target	Component	Activity	n	Sample Precision	Role
Summit AR Program Staff	Director of Energy Efficiency Programs Manager of Conservation Improvement Senior Energy Efficiency Consultant Energy Efficiency Consultant	Interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, marketing and outreach, data tracking, and rebate processing.

The process evaluation of the Low Flow Showerhead & Faucet Aerator Program included the following data collection activities:

- *Summit Program Staff Interviews*. The Evaluators interviewed staff at Summit involved in the administration of the Low Flow Showerhead & Faucet Aerator Program. This interview was used to validate that there were no program changes in PY2023 to warrant process evaluation activities.
- *Desk Review*. The Evaluators reviewed calculations provided by SUA to validate that they used prior-year M&V findings for in-service-rates (ISRs) and natural gas water heating rates.

10.3.1 Program Staff Interview

Evaluators interviewed four Summit AR staff members about the residential programs. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, the Senior Energy Efficiency Consultant, and the Energy Efficiency Consultant.

Staff noted that the kits program experienced some setbacks in the beginning of 2023, when the vendor made changes to the website. Customers complained that the new platform was harder to use and interest in the kits waned. Once aware of the issue, staff quickly started working on the website and improving its interface and user friendliness.

In addition to the usual low-flow showerheads and faucet aerators, customers now have the option to purchase a smart thermostat via the program platform. Staff cross check equipment rebate pathway participants to make sure customers do not receive multiple smart thermostat rebates.

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10.3.2 Protocol A Review

Table 10-6: Low Flow Showerhead & Faucet Aerator 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	✓	
	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	✓	
	Program expenditures to-date	✓	
	Incentive Costs	✓	
	Administrative Costs	✓	
	Marketing/Outreach Costs	✓	
	Evaluation Costs	✓	

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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.	✓	

10.4 Impact Evaluation

10.4.1 Energy Savings Calculations

Savings from low flow showerheads are calculated by the following process:

- First, the Evaluators total the per-unit savings as determined by TRM V9.1 algorithms which incorporate weather-zone specific ground water temperatures.
- Further, based upon PY2023 survey results, these values are scaled down by the verified *in-service rate*. This is the percent of distributed equipment installed. This is determined separately for each item in the kit (showerheads, kitchen aerators, and bathroom aerators).
- The Evaluators then parse out the savings based on the percent of electric vs. gas water heating as determined through the participant surveys. This serves to provide a weighted average value of energy savings based upon the electric and natural gas savings algorithms for each measure as indicated in TRM V9.1.

10.4.2 Unit Energy Savings

Unit energy savings apply TRM V9.1 values. Square footage is not collected for smart thermostats and as a result the TRM default of 1,484 feet per residence is applied.

10.4.3 Net-to-Gross

The Evaluators applied the NTG developed in PY2020 participant surveying. The resulting NTG for low flow kits is 50.33%.

The Evaluators conducted a multi-utility NTG survey for Equipment Rebates Programs, from which a 65% NTGR was developed for smart thermostats. This NTGR was applied to rebates thermostats in the Low Flow Showerhead and Faucet Aerator Program.

10.4.4 Verified Savings

Table 10-7 summarizes the total gross savings for the Low Flow Showerhead & Faucet Aerator Program.

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Table 10-7: Low Flow Showerhead & Faucet Aerator Program Verified Gross Savings

Measure Category	Annual Therms Savings		EUL	Lifetime Therms Savings		Gross Realization Rate
	Ex Ante	Ex Post		Ex Ante	Ex Post	
Bathroom Aerator	269	269	10	2,693	2,693	100%
Kitchen Aerator	130	130	10	1,303	1,303	100%
Showerheads	2,998	2,998	10	29,979	29,979	100%
Smart Thermostats	18,528	18,528	11	203,808	203,808	100%
Total gross savings	**21,926**	**21,926**	-	**237,784**	**237,784**	**100%**

Table 10-9 summarizes the net non-energy benefits from the PY2023 Low Flow Showerhead & Faucet Aerator Program.

Table 10-8: Low Flow Showerhead & Faucet Aerator Program Verified Net Savings

Measure Category	Free Ridership Rate		Annual Therms Savings		EUL	Lifetime Therms Savings	
	Ex Ante	Ex Post	Ex Ante	Ex Post		Ex Ante	Ex Post
Kit savings	42%	58%	13,753	13,753	10	149,575	149,575
Total Net Savings			**13,753**	**13,753**	**10**	**149,575**	**149,575**

Table 10-9: Low Flow Showerhead & Faucet Aerator Net Non-Energy Benefits Summary

Non-Energy Benefit	Annual	Lifetime
kWh	6,107	61,072
kW	.65	-
Water savings (gallons)	475,834	4,758,339

10.5 Conclusions

The program continues to face participation shortfalls.	From 2018 onward, the program faced significant shortfalls in participation and savings. The program is slated for redesign for the next triennial cycle.

10.6 Recommendations

The Evaluators have no recommendations for this program.

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11 Saving Homes Program

The Saving Homes Program is a weatherization program launched by Summit in PY2016. 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 may be undertaken by the customer.

The program corresponds to the Consistent Weatherization Approach and provides two tiers of 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;
- Water heater pipe insulation; and
- Water heater wrap.

Weatherization measures include:

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

The program is implemented by CLEAResult.

11.1 Program Overview

The Saving Homes Program (SHP) is intended to be primarily vendor-driven program, with the marketing targeted at contractors in the Summit service territory. Table 11-1 summarizes the historical performance of the Saving Homes Program.

Table 11-1: SHP Historical Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2016	$598,379	$503,910	119%	142,741	87,820	163%
2017	$1,754,790	$1,652,646	106%	386,648	432,000	90%
2018	$1,820,720	$1,733,415	105%	438,656	466,200	94%
2019	$1,849,180	$1,803,822	103%	339,781	495,000	69%
2020	$1,717,720	$1,612,521	107%	410,663	428,074	99%
2021	$1,671,364	$1,692,627	101%	436,278	425,180	103%
2022	$1,857,362	$1,736,281	107%	398,991	437,939	91%
2023	$1,871,121	$1,736,281	108%	492,765	437,939	113%

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11.2 Process Evaluation

The Evaluators conducted a limited process evaluation of the SHP in PY2023. Table 11-2 and Table 11-3 summarize the Evaluators' review of the Saving Homes Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

Table 11-2: 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 2021.
New Vendor or Contractor	No. CLEAResult has implemented the program since program inception.

Table 11-3: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met goal in PY2022.
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. The program met participant goals in 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 was within expected boundaries.
Do participants report problems with the programs or low rates of satisfaction?	No. 2021 and PY2022 participant surveys found high satisfaction levels.
Is the program producing the intended market effects?	Yes. The program has engaged contractors in completing weatherization projects that would not otherwise occur.

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The program received a full process evaluation in PY2020 and limited process evaluation in PY2021 and PY2022. The Evaluators conducted a limited process evaluation for PY2023 to address response to recommendations.

11.2.1Data Collection Activities

The process evaluation of Saving Homes Program included the following activities:

- *Program Actor In-Depth Interviews*. The Evaluators conducted in-depth interviews with a series of program actors. These interviews covered a range of topics, including marketing efforts, feedback on program delivery, an assessment of barriers to program implementation and success, and recommendations for program improvement. Program Actors interviewed include:
  - *Summit program staff*. The Evaluators interviewed staff at Summit involved in the administration of the Saving Homes Program.
  - *Third party implementation staff interviews.* The Evaluators conducted interviews with CLEAResult involved with the Saving Homes Program.
  - *Participant surveying.* The Evaluators surveyed 22 participants in the SHP, collecting feedback on their experiences with the program.

Table 11-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, and sample sizes for data collection.

Table 11-4: Summit SHP Data Collection Summary

Target	Respondents	Activity	n	Precision	Role
Summit AR Program Staff	Portfolio Manager for Summit AR and OK Program Manager of Residential Programs Energy Efficiency Analyst Rebate Program Coordinator	Group interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, including assisting in outreach and marketing efforts of the program.
CLEAResult Staff	Program Portfolio Manager	Interview	1	N/A	Handles day-to-day operations, including mass market outreach,

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					application review, billing, and logistics
Program Participants	Single Family Owner-Occupants	Survey	69	±9.8%	This survey was conducted on a sample of single-family owner-occupants who participated in the program.
		Field Data Collection	40	±12.8%	The Evaluators conducted duct blaster and blower door testing as well as measurement of ceiling insulation at a sample of program participant homes.
Trade Allies	Participating trade allies	Interview	2	N/A	Evaluators interviewed trade allies who participated in the weatherization program.

11.2.2Program Administration

The SHP was overseen by the Program Manager at Summit. This Manager's responsibilities primarily include interfacing with CLEAResult, who directly implements the program. Other activities by this Manager include providing updated customer lists to CLEAResult to better facilitate their implementation, participation in outreach events, and at times assisting CLEAResult in customer interactions.

11.2.3Program Implementation & Delivery

There are two program channels for the SHP, *assessment* and *install-only*.

- **Assessment.** The *assessment* is a comprehensive audit which includes conducting duct blast and blower door testing. This testing is needed to pre-qualify a home for duct sealing and air sealing improvements. Before a home may receive an *assessment*, program trade allies are required to calculate the gas intensity of the residence. In this, the contractor must take the customer's highest winter natural gas bill and divide it by the heated square feet of the home. Figure 11-1 summarizes the calculation process.

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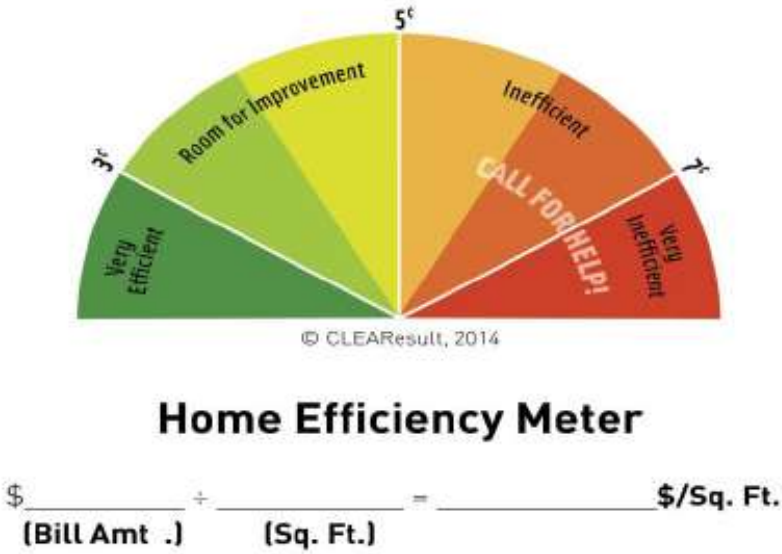

Figure 11-1 Home Efficiency Meter Graphic

A home must have use above $0.10 per square foot during a winter season month to qualify for an *assessment*.

- **Install-only.** Further, residential customers may opt to do directly through a contractor to install eligible measures without receiving an *assessment*. This is allowed if the contractor is a registered trade ally with the program.

The criteria of $0.10/square foot of use on a customer's highest bill is used to ensure that program funds go towards projects which will produce enough savings to be cost-effective. Further, all participating residences are required to have central natural gas space heating to receive an assessment and rebates for building envelope measures and natural gas water heating to be eligible for direct install measures.

Residential customers may enter the program either by contacting the Energy Efficiency Solutions Center (EESC) to request an assessment or by working through a participating contractor who initiates the assessment and coupon process.

11.2.3.1 CWA Metrics Summary

They key CWA metrics are presented in Table 11-5.

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Table 11-5: CWA Program Metrics Summary

Metric	Value
Program name	Saving Homes 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	955
Total submitted projects	1,071 (116 projects completed without assessment)
Conversion rate	100%
Measures installed per-project	1.97
Cost per participant	No customer co-pay. SUA paid $988/home
Percent of contractors promoting program	100%

Table 11-6: Alignment with CWA Requirements

Requirement	Alignment with Requirement	Percent of Participants Receiving
Includes Applicable DI Measures	Yes	.6%
Aerators	Yes	1.2%
Showerheads	Yes	1.5%
Efficient lighting	Yes	N/A
Smart strips	Yes	N/A
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	100.0%
Audit (virtual)		N/A
Ceiling insulation	Yes	49.4%
Duct sealing	Yes	76.6%
Air infiltration reduction	Yes	69.2%
Safety testing and/or measures	Yes	100%
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

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11.2.4Marketing

Recognizing that trade allies are the face of the program, Summit staff rely heavily on their trade allies to get the word about the residential programs to the public. Staff provide trade allies with the materials needed to promote the programs and then trade allies go out and make the connections with customers. Although Summit does not focus on co-branding, as they do not want to appear as though they favor one trade ally over another, they do provide trade allies with flyers, brochures, and other informational materials. Summit also does some of its own marketing including email blasts, mailers, radio ads, etc., but they are more expensive and not as fruitful as word of mouth. To improve its marketing strategies, Summit tracks marketing materials and online behavior to better understand what methods are most effective; they have also recruited an advertisement agency to help with this endeavor.

11.2.5Quality Assurance

Summit staff did not express any issues with quality control and assurance. Staff at CLEAResult conducts post inspections at a minimum of 10% of the projects completed by each trade ally. Post inspections are conducted by a quality assurance specialist. The post-inspection procedure includes designations of *major violations* and *minor violations* for each measure.

- *Major violations* require immediate resolution which may include charging the contractor back for the rebate amount.
- *Minor violations* may be resolved without chargeback.

The definition of *major* and *minor* violations by measure are summarized in Table 11-7.

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Table 11-7: QA Violation Definitions by Measure

Measure	***Definitions***
Direct Install	Major violation examples: ▪ Verified devices installed does not match claimed devices installed. ▪ Device installed on an appliance of non-eligible fuel type ▪ Installation of direct install equipment results in damage or inoperability of existing equipment Minor violation examples: ▪ None
Insulation	Major violation examples: ▪ Stated existing R-value: error>1 step R-value range difference on the coupon. ▪ Stated finished R-value: error of > 10% in R-value ▪ Stated square footage: error of >10% in square feet Minor violation examples: ▪ Improper installation of new insulation (such as varying depths) ▪ Bag count card not properly displayed ▪ Depth markers not properly displayed
Duct Sealing / Air Sealing	Major violation examples: ▪ Starting vs. finished air leakage rate: verification reveals discrepancy > 20% ▪ Minimum Ventilation Requirement (MVR): failure to identify correct MVR or take proper action in the event of the MVR not being met ▪ Duct / air sealing materials: use of improper materials ▪ Combustion Safety Test (CST): not performing the CST or failing to take proper action on the results. Minor violation examples: ▪ None

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11.2.6Trade Ally Outreach

In PY2023, the SHP had five trade allies. The Home Energy Consultant (HEC) trade allies can provide *assessments* through the program, which receive rebates of $100[26] from Summit (split evenly in instances of joint implementation with an overlapping electric IOU). When the home overlaps with a participating electric utility and has equipment that qualifies for both programs, the incentive cost is split equally. HECs must attend program training sessions held by CLEAResult in a classroom setting as well as in the field before being certified and allowed to perform Surveys and *assessments*. Other requirements for HECs include:

- Must have at least one employee with certification as either a Building Performance Institute Building Analyst (BPI-BA) or a RESNET Home Energy Rater (this rater is required to be present on all jobs in progress);
- If the staff member with the appropriate certification leaves the company, the trade ally must hire a replacement or obtain a certification for another employee within 30 days (though this is extended if the needed courses are not available in that time frame).
- Must own and maintain a Blower Door, Duct Blaster, combustion safety testing tools, energy modeling software (provided by the program), and all appropriate hand tools.

Most trade allies procure leads themselves, but CLEAResult will assign trade allies new projects as they come in if the customer does not have a trade ally in mind.

11.2.7Protocol A Review

Table 11-8: SHP 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 Group (Equipment Type)	✓	
	Equipment Fuel/Energy Source	✓	

[26] The incentive is reduced to $150 if the home is 700 ft.^{2} or less.

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Measure-Specific Information	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	✓	
	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.	✓	

11.3 Participation Summary

The SHP had 1,072 distinct participants in PY2023. All participants installed at least one measure.

Figure 11-2 summarizes the share of program savings contributed by each measure. Most savings came from duct sealing, air sealing, and ceiling insulation.

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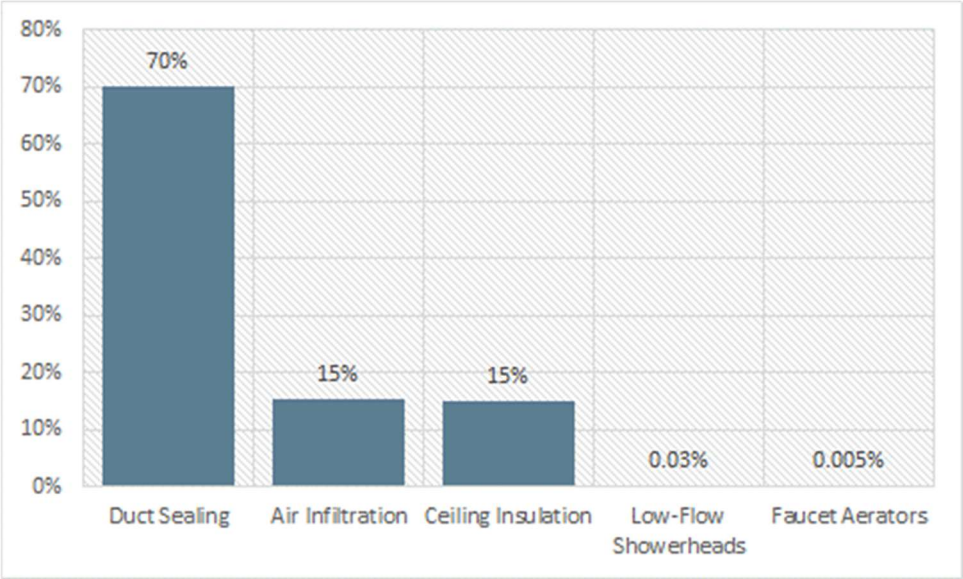

Figure 11-2: SHP Net Savings Share by Measure

In addition, incentives were provided for 955 Assessments.

11.3.1Recommendation Tracking

The status of PY2022 recommendations is provided in the table below.

Table 11-9: SHP Response to PY2022 Recommendations

Recommendation	***Status of Issue***
Focus on completion of comprehensive projects. 33% of PY2022 projects were single-measure. 48% received two measures. With a TRC of 6.61, the program could fund more comprehensive retrofits per-home, achieving savings goals while treating fewer homes annually	Measures per project increased in PY2023. Continuing.

11.3.2Program and Implementation Staff Interview

Evaluators interviewed four Summit AR staff members and one CLEAResult staff member about the residential programs. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, the Senior Energy Efficiency Consultant, and the Energy Efficiency Consultant. The CLEAResult staff member was the program manager for Summit AR's residential portfolio.

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The weatherization program continues to utilize a trade ally network. The trade ally network currently has five members. Four of the participating trade allies also do work for the Arkansas Oklahoma Gas program; the other trade ally works specifically in central Arkansas. Staff considered expanding the trade ally network, but four current trade allies have been able to conduct all the work and staff want to ensure they do not spread the budget too thin.

Program staff rely on trade ally driven marketing for the weatherization programs. Typical marketing channels include television, radio, social media, bill inserts, and emails.

11.3.3Trade Ally Interview Summary

The Evaluators conducted phone interviews with two of the five participating Energy-Saving Homes (SHP) and Low-income Energy Saving Homes (LISHP) trade allies. Evaluators contacted each trade ally three times via email or phone.

Both respondents serve residential customers throughout Arkansas and have been involved with Summit Arkansas' energy saving homes program since its inception. Respondents learned about the program through CLEAResult while working with a similar program in Texas.

11.3.3.1 Engaging Customers, Marketing, and Barriers

Respondents take a varied approach to program promotion, with one respondent relying more on word-of-mouth referrals and one respondent relying more on Summit provided leads. Neither respondent uses Summit AR provided marketing materials; one respondent was unaware of the materials and the other does not use flyers and other marketing materials. When promoting energy efficient equipment to their customers, respondents indicated that improving the comfort of their home and lowering their utility bill resonates most with customers.

11.3.3.2 Program Participation and Incentives

Both respondents work with their customers to fill out the application and then submit it on the customers' behalf. In general, the respondents noted the application process was easy to use; the two issues cited included the five-measure limit on health and safety measures and glitches when "low income" is selected in the system, but program staff noted that this has since been addressed.

Respondents recommended the program expand measure offerings to include furnace filters (n=1) as well as increase the health and safety measure budget to allow for more measures. One respondent explained that the health and safety budget for other Arkansas utilities is upwards of $2,500, while Summits is $500. This respondent noted they would be able to do a

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lot more to improve customers' homes with an increased budget. Additionally, respondents noted that incentive amounts do not always increase proportionally to measure cost increases, highlighting attic insulation as a specific pain point.

11.3.3.3 Training

Both respondents are aware of Summit sponsored training opportunities but noted they do not occur frequently. While neither respondent personally desired more training opportunities, as they have been in the business for a long time, they see the value of having in-field representatives visiting new trade allies and helping them with projects and activities.

11.3.3.4 Program Satisfaction and Suggest Changes

Both respondents are generally satisfied with the Summit program. One respondent cited difficulties in their communication with programs staff and confusion over the budget allotment and project status. This respondent recommended Summit host quarterly meetings to go over trade allies' concerns and questions.

11.4 Impact Evaluation

The evaluation effort of the SHP 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 conducted field verification at 50 homes representing 42 measures in PY2023.

11.4.1Tracking Review

The impact evaluation began with a review of program tracking data. The tracking data included a separate row for each measure installed. Every premise in the program had a unique rebate identifier, and thus one premise would have multiple rows to reflect the different measures completed

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.

11.4.2Field Verification Procedures

The Evaluators conducted field verification at 40 homes in the SHP. Measures included in this sample were as follows:

- Air Infiltration: 26 homes

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- Ceiling Insulation: 38 homes
- Duct Sealing: 40 homes

The Evaluators conducted duct blast and blower door tests at all homes that received duct sealing and air sealing (respectively).

- **Air infiltration:** The Evaluators lower infiltration than shown in ex ante estimates. This resulted in an overall in-service rate (ISR) of 99.6%.
- **Duct sealing:** Field results for duct sealing very closely aligned with expected results, and there was an overall ISR of 97.4%.
- **Ceiling insulation:** Ceiling insulation projects had no discrepancies, and final ISR was 100.0%.

11.4.3Net Savings Estimates

The overall free ridership score for participants with the financial ability to install the measures was based on the average of the prior plans and the likelihood scores. The free ridership scoring is summarized in Figure 11-3.

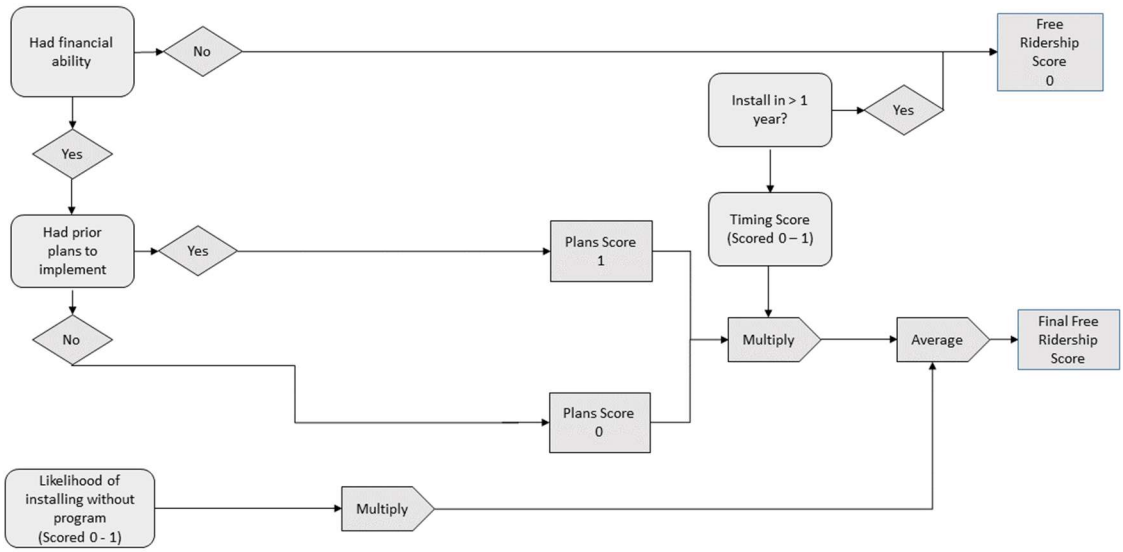

Figure 11-3: Major Measure Free ridership

To assess the program's influence on major measures (i.e., duct sealing, air sealing, and insulation), program participants were asked questions regarding:

- If they could afford to install the equipment if it had not been provided for free through the program;

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- If they had plans to complete the project;
- The likelihood of installing the equipment if it had not been provided for free; AND
- The timing of the project in the absence of the program.

In this methodology, financial ability 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. Respondents that reported they could have afforded to implement the improvements were assigned an overall free ridership score based on a prior plan score, a likelihood of installing the measure in the absence of the program, and a timing score.

11.4.3.1 Prior Plans and Deferred Free ridership

The prior plans score was based on a response to a question regarding the presence of plans. Specifically, respondents were considered to have had prior plans if they answered "Yes" to the following question:

- Prior to learning about the program, did you have plans to implement the [Measure]?

The program influence on the timing of the project was incorporated into the estimation of free ridership in one of two ways. First, consistent with the Arkansas TRM definition of free ridership, respondents who indicated that the project would have been completed in more than one year if the program were not available were assigned a free ridership score of 0. For all other respondents, the plans score was factored by the program impact on timing. Specifically,

- If the respondent stated that they would have installed the measure in 6 months to one year, then the prior plans score was reduced by one-half.
- If the respondent stated that they would have installed the measure at the same time or within 6 months of when it was installed, the prior plans score was not adjusted.

11.4.3.2 Likelihood of Implementing Measure without Program

A likelihood of installing the measure in the absence of the program was developed based on respondents stated likelihood of installing a measure if the financial support was not provided or if the measure had not been recommended through the energy assessment. Specifically, responses to this question were scored as follows:

- Very likely: 1
- Somewhat likely: .75
- Neither particularly likely nor unlikely: .5

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- Somewhat unlikely: .25
- Very unlikely: 0

The likelihood score was based on the lower value of the likelihood of installing the measure if the program financial support was not available or if the measure was not recommended through the energy assessment.

The resulting NTGR from PY2022 was 90.0%. This was applied to all measures in the program.

11.4.4Verified Savings

Table 11-10 presents the gross savings results of the evaluation of the PY2023 Saving Homes Program. Total Gross Savings summarizes the savings calculations performed by TRM protocols for program measures.

Table 11-10: SHP Verified Savings Summary

Measure	Ex Ante Therms	Ex Post Therms	Gross Realization	EUL	Lifetime Therms
Duct Sealing	393,493	383,262	97.4%	18	6,898,719
Air Infiltration	83,325	82,992	99.6%	11	912,908
Ceiling Insulation	81,095	81,095	100.0%	20	1,621,902
Showerhead	141	141	100.0%	10	1,410
Aerators	27	27	100.0%	10	269
Total	**558,081**	**547,516**	**98.1%**	**17.2**	**9,435,207**

Table 11-11: SHP Net Savings Summary

Free-Ridership Rate		Net Annual Savings		Net Realization Rate	EUL	Net Lifetime Therms Savings
Ex Ante	Ex Post	Ex Ante	Ex Post			
10.0%	10.0%	502,273	492,765	98.1%	17.16	**8,491,682**

11.4.5Water & Electric NEBs

Table 11-12: SHP Verified Net Water Savings

Measure	Net Annual Water Saving (Gallons)	Lifetime Net Water Savings (Gallons)
Aerators	6,139	61,389
Showerhead	30,225	302,247
Total	**36,364**	**363,636**

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Table 11-13: SHP Verified Net Electric Savings

Measure	Net Annual kWh	Net Peak kW	Lifetime Net kWh
Air Infiltration	100,185	78	1,102,032
Ceiling Insulation	217,363	263	4,347,250
Duct Sealing	838,129	453	15,086,324
Total	**1,155,676**	**794**	**20,535,606**

11.5 Conclusions

Realization rates were high overall.	The overall realization rate was 98.1%, attributable to slight variations in field testing results for duct sealing and air infiltration.
Project comprehensiveness has improved.	The average measures per-project has increased from 1.78 to 1.97 from PY2022 to PY2023.

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12 Low-Income Savings Home Program

The Low-Income Saving Homes Program (LISHP) began in PY2020 and was designed to comply with Act 1102. LISHP 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 may be undertaken by 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;
- Pipe wrap;
- Tank wrap; and
- Smart thermostats.

Weatherization measures include:

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

The program is implemented by CLEAResult.

12.1 Program Overview

Table 12-1 summarizes the historical performance of the Low-Income Saving Homes Program.

Table 12-1: LISHP Historical Performance against Goals

Program Year	Budget			Net Therms		
	Spent	Allocated	%	Achieved	Goal	%
2020	$299,846	$292,567	102%	45,902	45,871	100%
2021	$301,038	$304,168	99%	47,516	47,243	101%
2022	$357,919	$316,273	113%	49,170	48,660	101%
2023	$462,225	$316,273	146%	58,739	48,660	121%

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12.2 Participation Summary

The LISHP had 122 participants in PY2023. Ninety-eight percent of participants installed at least one measure, and a total of 256 energy efficiency improvements were installed overall.

Figure 12-1 summarizes the share of program savings contributed by each measure. All savings came from duct sealing, ceiling insulation, and air sealing.

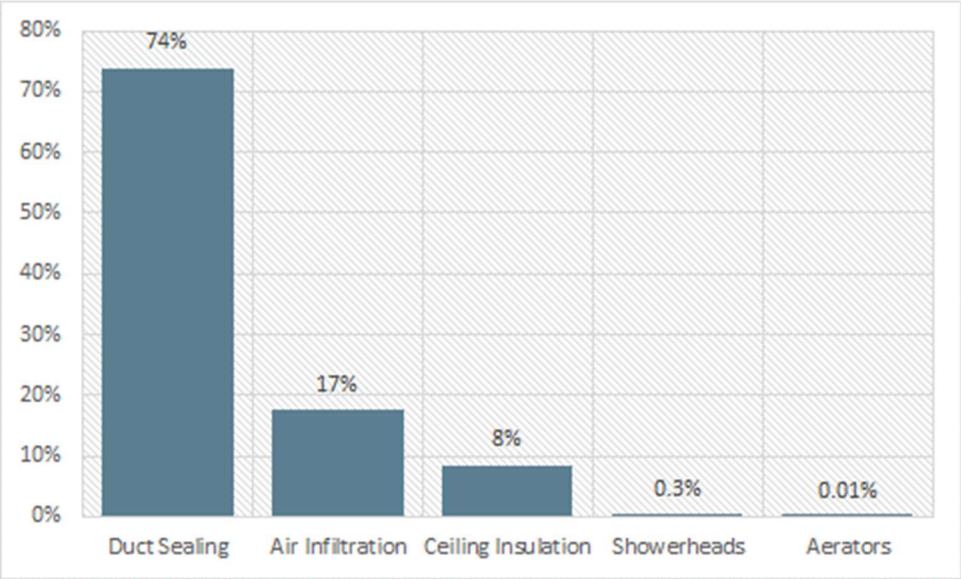

Figure 12-1: Program Expected Savings Share by Measure

In addition, incentives were provided for 118 assessments.

12.3 Contractor Participation

In PY2023, the LISHP had four registered trade allies. All trade allies were active in the program in PY2023.

12.4 Process Evaluation

Table 12-2 and Table 12-3 summarize the Evaluators' review of the Low-Income Saving Homes Program in comparison to TRM V9.1 Protocol C for timing and conditions of conducting a process evaluation.

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Table 12-2: Determining Appropriate Timing to Conduct a Process Evaluation

Component	Determination
New and innovative components	No. Program design is unchanged from PY2022.
No previous process evaluation	No. The program received a process evaluation in PY2021 and PY2022.
New vendor or contractor	No. CLEAResult implements this program and uses contractors from the Savings Home Program.

Table 12-3: Determining Appropriate Conditions to Conduct a Process Evaluation

Component	Determination
Are program impacts lower or slower than expected?	No. The program met PY2022 savings goals.
Are the educational or informational goals not meeting program goals?	Yes. The program improved health and safety efforts in PY2022 but had not yet reached expectations of Act 1102.
Are the participation rates lower or slower than expected?	No. The program met PY2022 participant goals.
Are the program's operational or management structure slow to get up and running or not meeting program administrative needs?	Partial. The program's operations were found to be adequate to ensure savings but did not address all Act 1102 requirements.
Is the program's cost-effectiveness less than expected?	No. The program was cost-effective in PY2022.
Do participants report problems with the programs or low rates of satisfaction?	No satisfaction issues found.
Is the program producing the intended market effects?	No. The program did not adequately address health and safety measures in in PY2022.

The Evaluators conducted a limited process evaluation for LIPP due to small program size and budget. This evaluation focused on issues pertaining to health and safety measures identified in the PY2022 evaluation.

12.4.1Data Collection Activities

The process evaluation of Low-Income Saving Homes Program included:

- *Program actor in-depth interviews*. The Evaluators conducted in-depth interviews with a series of program actors. These interviews covered a range of topics, including marketing efforts, feedback on program delivery, an assessment of barriers to program implementation and success, and recommendations for program improvement. Program actors interviewed include:

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- *SUA Energy program staff*. The Evaluators interviewed staff at SUA involved in the administration of the Saving Homes Program.
- *Third party implementation staff interviews.* The Evaluators conducted interviews with CLEAResult involved with the Saving Homes Program.

- *Program participant surveys.* The Evaluators administered surveys with program participants. These surveys sought to collect data on participant experience with the program including sources of program awareness, motivations for participating, and satisfaction with the program. Due to low responses rates across three AR gas utility low-income programs, Evaluators combined and summarized responses from all three programs together.

Table 12-4 summarizes the data collection for this process evaluation effort. This includes the titles, role, and sample sizes for data collection.

Table 12-4: SUA LISHP Data Collection Summary

Target	Respondents	Activity	n	Precision	Role
Summit AR Program Staff	Portfolio Manager for Summit AR and OK Program Manager of Residential Programs Energy Efficiency Analyst Rebate Program Coordinator	Group interview	1	NA	Overall administration of Summit EE programs. The Portfolio manager is involved in the larger strategic decisions associated with the EE portfolio. The other staff are responsible for day-to-day operation of the program on the part of Summit, including assisting in outreach and marketing efforts of the program.
CLEAResult Staff	Program Portfolio Manager	Interview	1	N/A	Handles day-to-day operations, including mass market outreach, application review, billing, and logistics

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Program Participants	Income qualified participants	Survey	20	±17.5%	This survey was conducted on a sample of income-qualified participants in the program. Due to low response rates, three Arkansas gas utilities are analyzed together.
Trade Allies	Participating trade allies	Interview	2	N/A	Evaluators interviewed trade allies who participated in the weatherization program.

12.4.2Program Administration

The LISHP is overseen by the Program Manager at Summit. This Manager's responsibilities primarily include interfacing with CLEAResult, who directly implements the program. Other activities by this Manager include providing updated customer lists to CLEAResult to better facilitate their implementation, participation in outreach events, and at times assisting CLEAResult in customer interactions.

12.4.3Program Implementation & Delivery

The program is driven by home assessments. The assessment is a comprehensive audit which includes conducting duct blast and blower door testing. This testing is needed to pre-qualify a home for duct sealing and air sealing improvements. Before a home may receive an assessment, program trade allies are required to calculate the gas intensity of the residence. In this, the contractor must take the customer's highest winter natural gas bill and divide it by the heated square feet of the home. Figure 12-2 summarizes the calculation process.

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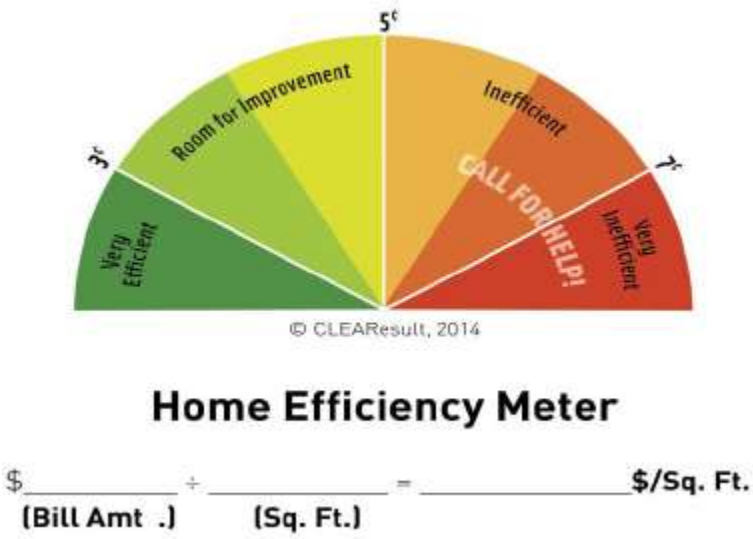

Figure 12-2: Home Efficiency Meter Graphic

A home must have use above $0.10 per square foot during a winter season month to qualify for an assessment.

The criteria of $0.10/square foot of use on a customer's highest bill is used to ensure that program funds go towards project which will produce enough savings to be cost-effective. Further, all participating residences are required to have central natural gas space heating to receive an assessment and rebates for building envelope measures and natural gas water heating to be eligible for direct install measures.

Summit AR staff did note challenges within the low-income program, as they strive to spend the full $500 on participating homes. Staff are working towards better educating their trade allies to understand the types of homes that are eligible and measures that are covered by the low-income program and teaching them how they can best assist those customers. Because the low-income program has a small budget, CLEAResult staff encourage trade allies not to classify homes as low-income (even if they qualify) unless the homes need health and safety measure upgrades; this system allows the program to maximize the number of low-income customers it can assist.

12.4.4Program Changes

There were no changes from PY2022.

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12.4.5Marketing

The LISHP is marketed alongside the SHP. Eligible customers are referred from the SHP to the LISHIP when identified.

12.4.6CWA Metrics Summary

They key CWA metrics are presented in Table 12-5

Table 12-5: CWA Program Metrics Summary

Metric	Value
Program name	Low Income Saving Homes Weatherization Program
CWA implementation	The LISHP is implemented using a third-party contractor (CLEAResult) with a network of pre-approved trade allies. The program coordinates with SWEPCO and Entergy
Total audits completed	118
Total submitted projects	115
Conversion rate	97.5%
Measures installed per-project	2.08
Cost per participant	No customer co-pay. SUA paid $1,345/home
Percent of contractors promoting program	100%

Figure 12-3 summarizes the eligibly of PY2023 LISHP participants by age, income, and joint-qualification.

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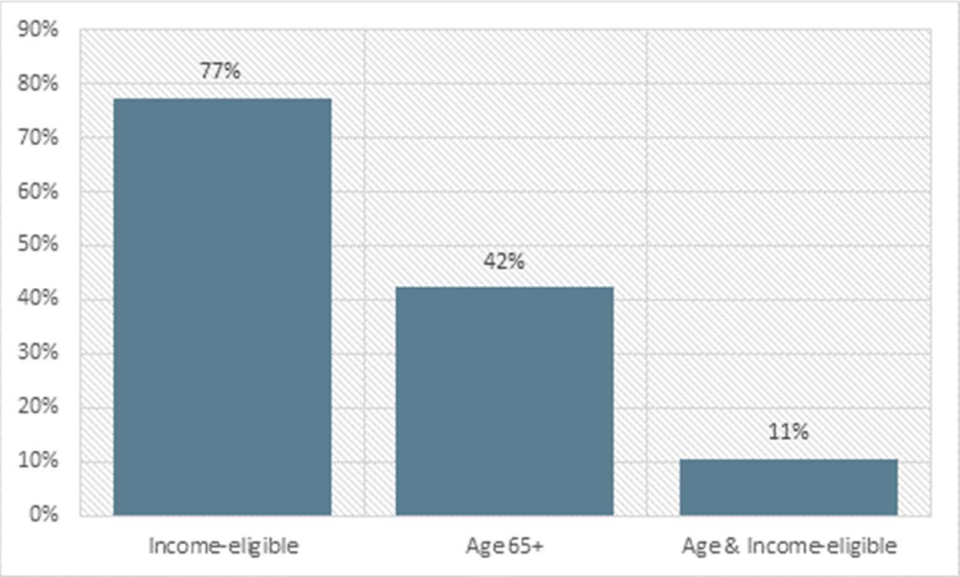

Figure 12-3: Act 1102 Qualification Summary

12.4.7 Quality Assurance

Quality assurance procedures align with those established for the SHP.

12.4.8 Protocol A Review

Protocol A findings align with those for the SHP.

12.4.9 Recommendation Tracking

The status of PY2022 recommendations is provided in the table below.

Table 12-6: LI-SHP Response to PY2022 Recommendations

Recommendation	***Status of Issue***
Establish a payment structure for Trade Allies tied to H&S spending. Trade Allies are paid per-therm saved for the SHP and LIHSP. For the LISHP, this runs in conflict to H&S goals. Though the program reimburses for H&S costs, it is possible that that Trade Allies could overlook H&S opportunities if engaging with them presents an opportunity cost, i.e., forgone time spent on energy-saving projects at other homes. Without a financial incentive for H&S that is equally attractive, or without a hard program requirement introducing punitive measures in response to	Under consideration.

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H&S shortfalls, the incentive structure for the program is misaligned with Act 1102 goals.

12.4.10 Program and Implementation Staff Interview

Evaluators interviewed four Summit AR staff members and one CLEAResult staff member about the residential programs. Summit AR staff included the Director of Energy Efficiency Programs, the Manager of Conservation Improvement, the Senior Energy Efficiency Consultant, and the Energy Efficiency Consultant. The CLEAResult staff member was the program manager for Summit AR's residential portfolio.

As of the interview in Fall 2023, the income qualified weatherization program was behind goal, but staff expected enrollment to pick up. They explained that some of the trade allies who work for both Summit AR and Arkansas Oklahoma Gas were wrapping up their work in AOG's service territory before pivoting to Summit AR.

2023 witnessed an increased focus on health and safety measures. Summit AR and CLEAResult staff worked together to increase money spent on health and safety in each home, expanding the types of measures covered to include things like air purifiers.

The low-income program continues to utilize a trade ally network. The trade ally network currently has four members. Three of the participating trade allies also do work for the Arkansas Oklahoma Gas program; the other trade ally works specifically in central Arkansas. Staff considered expanding the trade ally network, but four current trade allies have been able to conduct all the work and staff want to ensure they do not spread the budget too thin.

12.4.11 Participant Survey Response

Evaluators conducted a survey of Income Qualified Weatherization Program participants to gather feedback about customers engagement with and experience of the programs offered by Arkansas Oklahoma Gas, Summit Arkansas, and Black Hills Energy. Participants were sent a letter in the mail inviting them to complete an online survey, followed by up to three phone and email reminders. Twenty participants responded in total. Due to low response rates, the three Arkansas utilities are analyzed together.

Table 12-7 Responses by Utility (n=20)

Utility	Count
Arkansas Oklahoma Gas	6

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Summit AR	8
Black Hills Energy	6
Total	20

12.4.11.1 Respondent Characteristics

Table 12-8 presents respondents' demographic characteristics.

Table 12-8: Respondent Characteristics (n varies)

Answer	%	Count
Housing Status (n=20)		
Rent	5.0%	1
Own	85.0%	17
Own but rent to someone else	0.0%	0
Prefer not to answer	10.0%	2
Housing Type (n=20)		
Single-family home	85.0%	17
Manufactured or mobile home	10.0%	2
Duplex or townhome	5.0%	1
Apartment or condominium	0.0%	0
Other â€“ please specify	0.0%	0
Prefer not to answer	0.0%	0
Building Age (n=20)		
Before 1960	25.0%	5
1960 to 1969	5.0%	1
1970 to 1979	5.0%	1
1980 to 1989	15.0%	3
1990 to 1999	15.0%	3
2000 to 2009	15.0%	3
2010 or later	0.0%	0
Don't know	20.0%	4
Prefer not to answer	0.0%	0
Building Size (n=20)		
Less than 1,000 square feet	10.0%	2
1,000 to 1,999 square feet	40.0%	8

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2,000 to 2,999 square feet	15.0%	3
3,000 to 3,999 square feet	5.0%	1
4,000 square feet or more	5.0%	1
Don't know	25.0%	5
Prefer not to answer	0.0%	0
Household Size (n=20)		
1 person	25.0%	5
2 people	40.0%	8
3 people	5.0%	1
4 people	20.0%	4
5 people	0.0%	0
6 people	0.0%	0
7 people	0.0%	0
8+ people	0.0%	0
Prefer not to answer	10.0%	2
Age (years) (n=20)		
18 - 24	5.0%	1
25 - 34	0.0%	0
35 - 44	5.0%	1
45 - 54	15.0%	3
55 - 64	10.0%	2
65 - 74	25.0%	5
75+	30.0%	6
Prefer not to answer	10.0%	2
Household includes elderly (65+ years old) (n=5)		
Yes	20.0%	1
No	80.0%	4
Prefer not to answer	0.0%	0
Employment Status (n=20)		
Working or attending school outside of the home	19.1%	4
Working or attending school from home	0.0%	0
Retired	66.7%	14
Unemployed	0.0%	0
On medical, disability or maternity leave	4.8%	1

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Stay-at-home parent or care provider	4.8%	1
Other (please specify):	0.0%	0
Prefer not to answer	4.8%	1

12.4.11.2 Program Awareness

Respondents learned about the program through a variety of avenues, most commonly word of mouth (45.5%, n =10) (Figure 12-4). Respondents decided to participate in the program to save money on energy bills (23.2%, n=13) and improve the comfort of their home (17.9%, n=10) among other reasons (Figure 12-5).

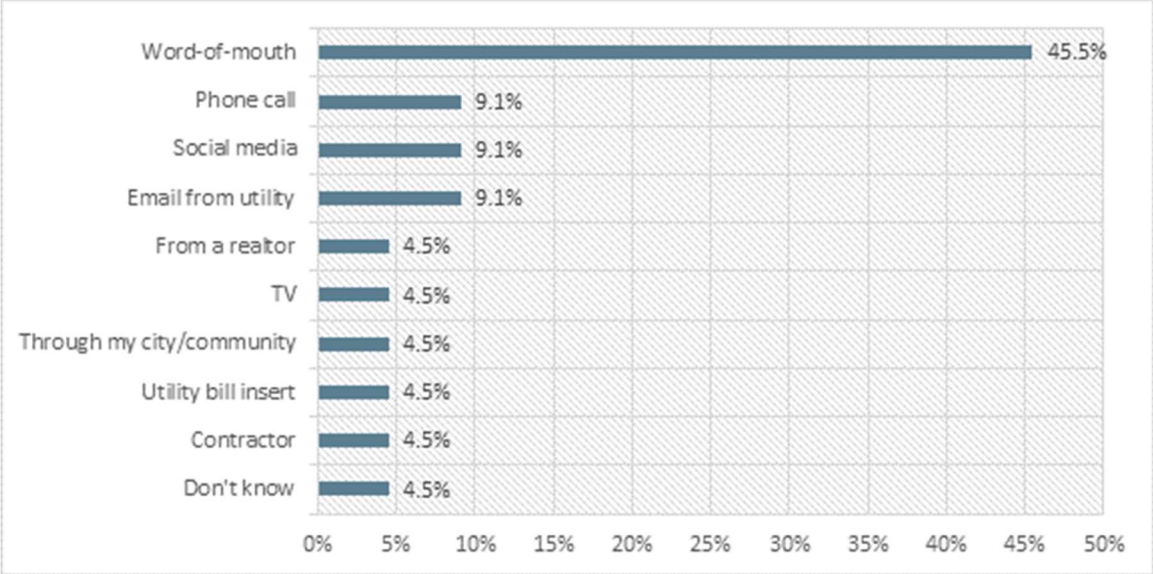

Figure 12-4 Program Awareness (n=20)

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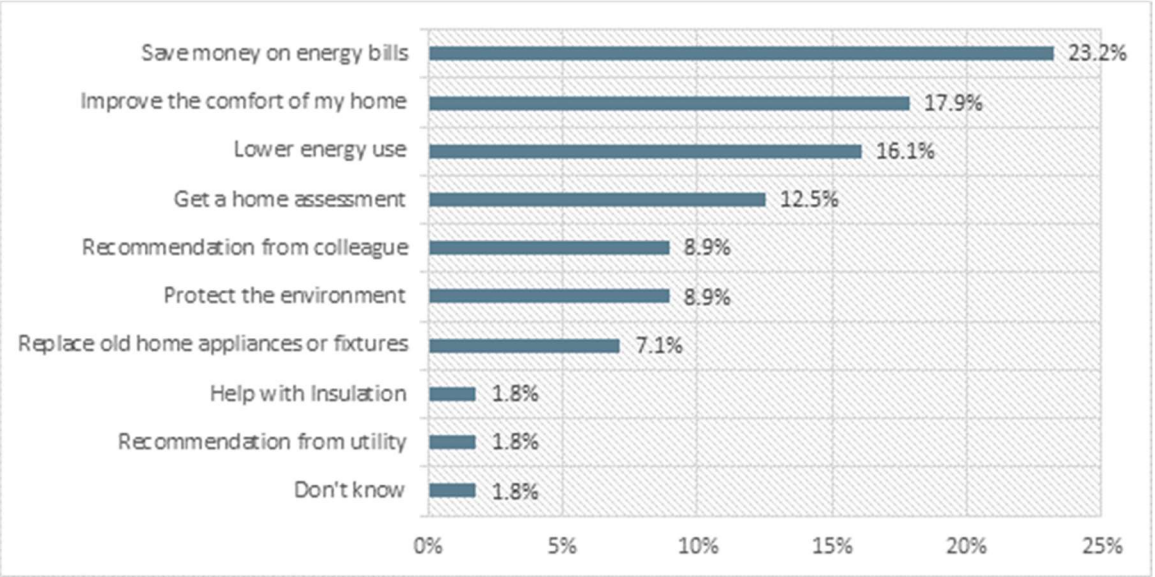

Figure 12-5: Program Enrollment Motivation (n=20)

12.4.11.2.1 Home Energy Assessment

More than a fifth of respondents wanted the assessment to learn how they can save energy to save money on energy bills (29.0%, n=11) (Figure 12-6).

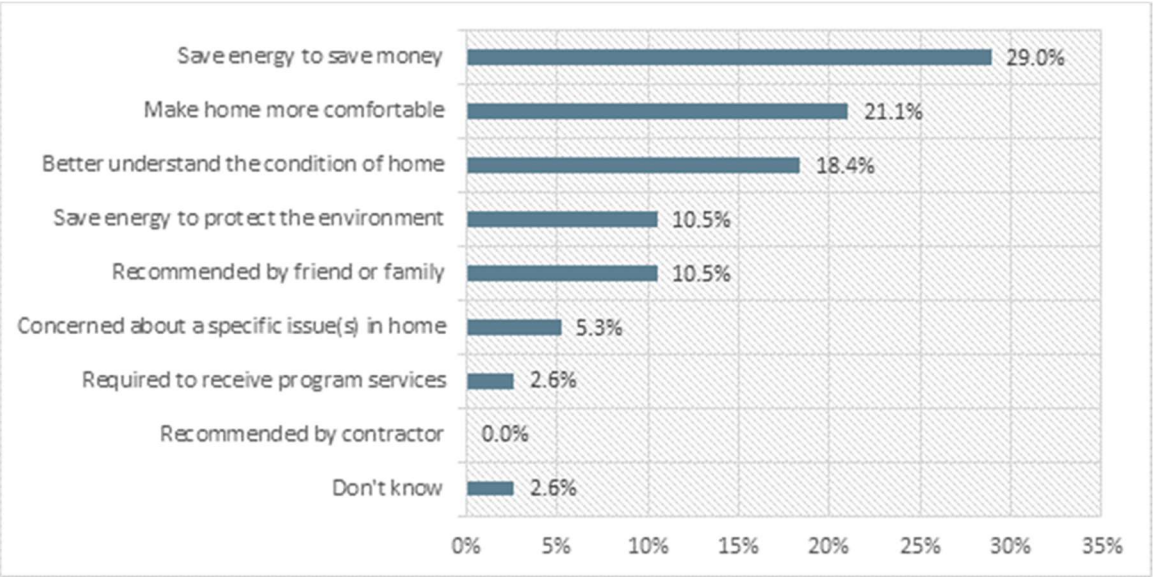

Figure 12-6: Motivation for Assessment (n=20)

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Almost all respondents who received an energy assessment (n=15) were at home when the assessment was conducted (93.3%, n=14). All assessments were done in-person and all but 2 of the energy assessors discussed the assessment findings with the respondents (85.7%, n=12). Almost two thirds of the respondents who were home for the assessment remember receiving a written report after the assessment (64.3%, n=9). **All but two respondents implemented all the recommendations provided by the assessor (66.7%, n=2)**, those who did not complete all the recommendations were due to cost (n=1) and thermostat replacement (n=1).

In general, respondents who received an assessment and were home during the assessment were satisfied with all aspects of the assessment (Figure 12-7); the one respondent who indicated some level of dissatisfaction with the program explained that their door was not properly sealed. More than three quarters of respondents also found the information provided in the assessment to be very or extremely useful (78.6%, n=11) (Figure 12-8).

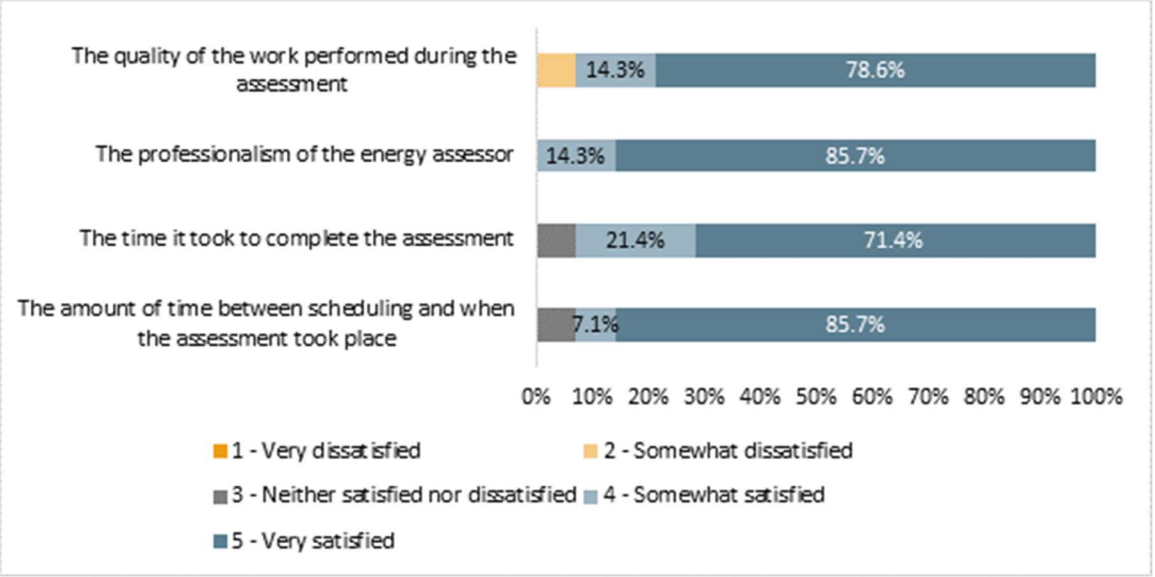

Figure 12-7: Home Energy Assessment Satisfaction (n=14)

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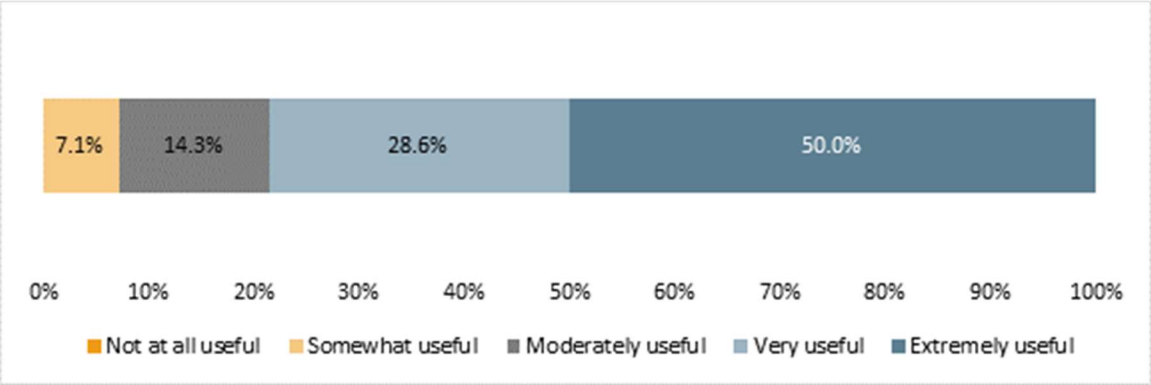

Figure 12-8: Utility of Information Provided (n=14)

12.4.11.2.2 Satisfaction

Respondents were generally satisfied with the weatherization program and the utility company as their service provider (Figure 12-9**).** Three respondents indicated some level of dissatisfaction. Dissatisfaction was due to the quality of work completed (n=1), the impact on bills (n=1), and the non-installation of a thermostat (n=1). The majority of respondents have recommended the program to friends and family (80.0%, n=16). When given the opportunity to provide feedback on the program in general three respondents asked for the chance to have contractors follow-up for additional changes or touch ups (n=3), two respondents desired more skilled contractors (n=2), two respondents asked for more or better advertising of the program (n=2), one respondent did not receive a gift certificate after recommending the program to others (n=1), and one respondent asked for before and after pictures of work done by contractors (n=1).

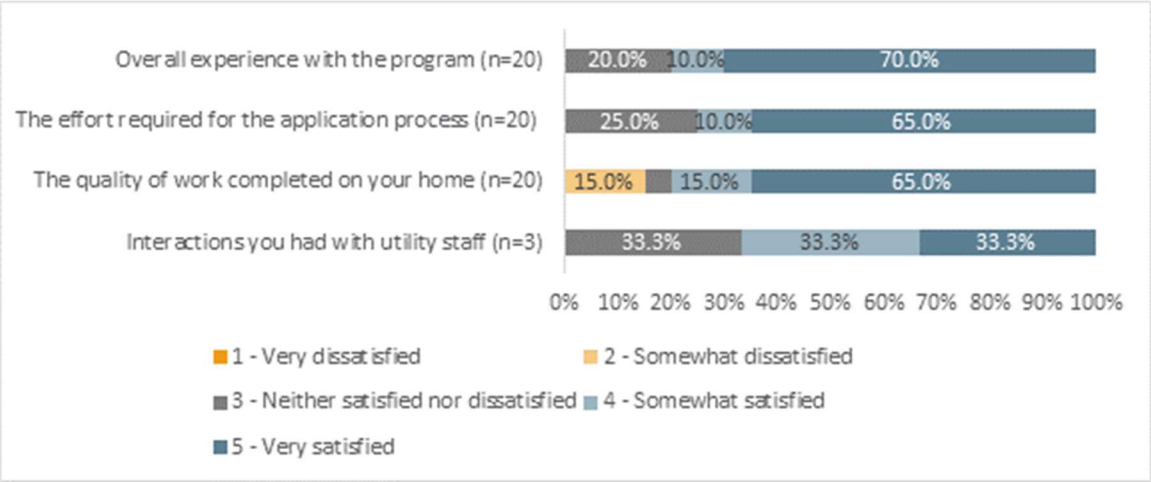

Figure 12-9: Program Satisfaction (n varies)

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12.4.11.3 Trade Ally Interview Summary

The Evaluators conducted phone interviews with two of the five participating Energy-Saving Homes (SHP) and Low-income Energy Saving Homes (LISHP) trade allies. Evaluators contacted each trade ally three times via email or phone. Results from the interview efforts can be found in the Energy Savings Home chapter, section 11.3.3.

12.5 LISHP Impact Evaluation

The evaluation effort of the LISHP included:

- *Desk review of residential calculations.* The Evaluators utilized TRM V9.1 values in assessing savings from measures included in the program.

12.5.1Health & Safety

The program plan for the LISHP specifies up to $500 per home in health and safety spending. In PY2023, SUA significantly increased H&S efforts per-participant. SUA completed H&S measures at 91% of participant homes, spending $229 per-participant. This increased from $87 per home in PY2022.

12.5.2Tracking Review

The impact evaluation began with a review of program tracking data. The tracking data included a separate row for each measure installed. Every premise in the program had a unique rebate identifier, and thus one premise would have multiple rows to reflect the different measures completed. 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. Further, the tracking data was found to include detailed parameters for all measures, such as baseline R-value for insulation.

12.5.3Field Verification Procedures

The Evaluators applied ISRs developed for the SHP (see Section 11.4).

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12.5.4Net Savings Estimates

The Evaluators assigned a NTG of 100% to the LISHP, keeping with industry best practices for low-income weatherization programs as-specified in the Department of Energy Uniform Methods Project[27].

12.5.5Verified Savings

Table 12-9 presents the gross savings results of the evaluation of the PY2023 LISHP.

Table 12-9: LISHP Verified Savings Summary

Measure	Ex Ante Therms	Ex Post Therms	Gross Realization	EUL	Lifetime Therms
Air Infiltration	10,309	10,268	99.6%	11	112,945
Ceiling Insulation	4,933	4,933	100.0%	20	98,660
Duct Sealing	44,540	43,382	97.4%	18	780,876
Faucet Aerators	4	4	100.0%	10	42
Showerheads	152	152	100.0%	10	1,517
Total	**59,938**	**58,739**	**98.0%**	**16.9**	**994,040**

Table 12-10 SHP Net Savings Summary

Free-Ridership Rate		Net Annual Savings		Net Realization Rate	EUL	Net Lifetime Therms Savings
Ex Ante	Ex Post	Ex Ante	Ex Post			
0.0%	**0.0%**	**59,938**	**58,739**	**98.0%**	**16.9**	**994,040**

12.5.5.1 Water & Electric NEBs

Table 12-11 LISHP Verified Net Water Savings

Measure	Net Annual Water Saving (Gallons)	Lifetime Net Water Savings (Gallons)
Faucet Aerators	1,077	10,770
Showerheads	36,636	366,360
Total	**37,713**	**377,130**

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

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Table 12-12 LISHP Verified Net Electric Savings

Net Annual kWh	Net Peak kW	Lifetime Net kWh
232,038	**146**	**4,071,395**

12.6 Conclusions

The program met savings goals and was highly cost-effective.	The program met 121% of its net savings goal and had a 2.72 TRC.
Significant progress was made on H&S measures, but the program is not yet meeting Act 1102 requirements	H&S spending increased from $87 to $229 per-participant, putting SUA's program within reasonable norms for utility Act 1102 programs.

12.7 Recommendations

Assess whether Act 1102 homes have a reasonable path to obtain Inflation Reduction Act (IRA) funding.	In the upcoming triennial cycle, there may be opportunities to leverage IRA funding for home retrofits.

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13 Appendix A: Site Reports

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Program	C&I Solutions
Project ID	EA-0000669712
Facility SIC Code	2048- Prepared and Feed Ingredients for Animals and Fowls
Measures	Condensate Return
Annual Consumption	99,010

Project Background

The participant is an animal feed manufacturer that received incentives from Summit Utilities for implementing the following energy efficient conservation measure (ECM):

- ECM #1 – Condensate Return

Savings will come from reducing the boiler load. The waste heat from the condensate will increase the temperature of the feedwater.

M&V Methodology

This project was reviewed with a site visit to verify the energy conservation measures. The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Condensate Return

Measurement and verification activities are based on the following assumptions:

- Spot condensate flow reading representative of annual loss rate
- The pumps that feed the condensate water into the CRU are activated 3.62% of the time– based on logging data
- Average condensate flow in system is 55 GPM
- Boiler efficiency rate is 86%
- Facility operates 52 weeks per year
- Annual hours of pump operation are 317 hours/year- based on logging data

The following table shows the parameters that were used for the energy savings calculations.

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Condensate Return Parameters

Boiler Efficiency	*Pump Flow Rate (GPM)*	*Makeup Water Temperature (°F)*	*Tank Temperature (°F)*	*Percentage of time Pumps Activate*	*Pump Annual Hours of Operation*
86%	55	66	160	3.62%	317

The heat loss from the condensate is estimated with the formula:

Calculation for Condensate Heat Loss

$$\frac{Btu}{hr} = \frac{1\ Btu}{lb\ x\ F} \times \frac{8.34\ lb}{gal} \times \frac{60\ min}{hr} \times \frac{gal}{min} \times (T_{makeup\ water} - T_{condensate})$$

Energy Savings

Condensate Return

The heat loss determined by the flow and temperature difference of the makeup water and condensate temperature is an input to the following equation to determine the boiler gas savings.

Annual Condensate Return Savings Calculation

$$\frac{CCF}{year} = \frac{Heat\ Loss\ \left(\frac{BTU}{hr}\right) x\ AOH}{Boiler\ efficiency\ (\%) x\ 100{,}000\ \frac{BTU}{CCF}}$$

Where:

$Heat\ Loss$ = 2,504,437 BTU/hr

AOH = Annual Operation Hours (317 hours)

Eff_{post} = Efficiency of the steam boiler = 86%

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Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Condensate Return	15 years

Calculated Savings:

Condensate Return

Condensate Return Savings

Condensate Return	*Annual Pump operating hours*	*Make up water Temp (°F)*	*Tank Temp(°F)*	*Heat Loss (Btu/hr)*	*Therms Savings*
CRU	317	66	160	2,504,437	9,188
				Total:	**9,188**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realizatio n Rate*	*Lifetime therms Savings*
Condensate Return	9,181	9,188	100%	137,715

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $28,015. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
9,188	$0.79	$7,259	$28,015	$6,614	$6,614	2	4

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Program	C&I Solutions
Project ID	EA-0000798531
Facility SIC Code	3011 – Tires and Inner Tubes
Measures	Steam Trap Replacement
Annual Consumption	545,511 therms

Project Background

The participant is a manufacturing facility that received incentives from Summit Utilities for implementing the following:

- ECM #1: Steam Trap Replacement

The site uses steam throughout the facility for process needs.

M&V Methodology

This project was evaluated with a site visit where the installed measures were verified. The M&V effort for this project follows the guidelines of the 2021 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 230°F
- Annual operating hours for the on-site steam system is 1304 hours
- Combustion efficiency is 80% for the pre-retrofit equipment and 85% for the post-retrofit equipment.

Steam Trap Replacement

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

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Steam Trap Parameters

Steam Trap #	*Frequency*	*Orifice Size (in.)*	*Inlet Pressure (psig)*	*Outlet Pressure (psig)*	*Service (Drip/Process)*	*Feedwater Temperature (°F)*	*Boiler Efficiency*	*Operating Hours*
1	29	13/66	150	10	Process	230	85	1,304
2	2	13/66	150	10	Drip	230	85	1,304
3	112	6/77	150	10	Process	230	85	1,304
4	13	6/77	150	10	Drip	230	85	1,304
5	1	2/11	150	10	Drip	230	85	1,304
6	1	2/11	10	1	Drip	230	85	1,304
7	5	13/82	150	10	Process	230	85	1,304
8	1	1/4	10	1	Drip	230	85	1,304
9	1	3/16	10	1	Process	230	85	1,304
10	1	8/51	10	1	Process	230	85	1,304

Calculations for the annual therms savings use the following equation:

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) = 1304 annual hours

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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Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Steam Trap Replacement	5 years

Calculated Savings:

Steam Trap Replacement

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Percent Failed*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	109	100%	1,197	198	1,669
2	170	100%	1,197	198	2,603
3	17	100%	1,197	198	260
4	26	100%	1,197	198	398
5	143	100%	1,197	198	2,190
6	19	100%	1,304	1,160	281
7	110	100%	1,197	198	1,685
8	36	100%	1,304	1,160	532
9	13	100%	1,304	1,160	192
10	9	100%	1,304	1,160	133
				Total:	**29,601**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	98,611	98,611	100%	148,007
TOTAL	**98,611**	**98,611**	**100%**	**148,007**

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Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $69,027. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
98,611	$0.76	$74,944	$69,027	$69,027	$69,027	0.0	1

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Program	C&I Solutions
Project ID	EA-0001008539
Facility SIC Code	8211 - Elementary and Secondary Schools
Measures	Energy Recovery Ventilation

Project Background

The participant is elementary school that received incentives from Summit Utilities for implementing the following:

- ECM #1: Energy Recovery Ventilation

Energy recovery ventilators pre heat/cool incoming outdoor air using exhaust air from building spaces. This is accomplished without mixing air streams and reduces HVAC costs on heating and cooling.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- HVAC equipment efficiency is 80%

Energy Recovery Ventilators

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

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Ventilator Design Information

Unit Name	Quantity	Total Supply Air Flowrate	H_{OA}	$H_{Leaving}$	DB (F) OA Entering	DB (F) Leaving Air	Eff	Δh	ΔT
POAU-1,3	2	3,000	43	36	10	32	0.8	7	22
POAU-2	1	3,250	43	38	10	30	0.8	6	20

Calculations therms savings use the following equation:

Enthalpy Calculations

$$\Delta h \ = h_{OA} - h_{leaving}$$

Where:

h_{OA} = Specific enthalpy of outside air entering the equipment in BTUs/lb

$h_{leaving}$ = Specific enthalpy of air leaving the ERV and going to the HVAC equipment in BTUs/lb

Heat Content Cooling

$$Q_{t,cooling}\frac{BTU}{hr} = 4.5 * Supply\ air\ flowrate\ (CFM) *\ \Delta h$$

Where:

4.5 = Conversion factor for flow rate: $0.075\frac{lbs}{ft^3} * 60\ \frac{min}{hr}$ where 0.075 is the density of air at Standard Temperature and Pressure

CFM = supply air flow rate provided by the Energy Recovery Ventilator equipment specs

Heat Content Heating

$$Q_{t,heating}\frac{BTU}{hr} = 1.08 * Supply\ air\ flowrate\ (CFM) *\ \Delta T_heating$$

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ΔT_heating = Dry bulb temperature difference between air entering and leaving the ERV equipment, Fahrenheit [°F]

1.08 = Sensible Heat gain factor: $60\frac{min}{hr} * 0.075\ \frac{lbs}{ft^3} * 0.24\frac{BTU}{lbs*°F}$ where 0.075 is the specific volume of air at Standard

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
ERV	14 years

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
ERV	2,759	2,759	100%	38,629
TOTAL	**2,759**	**2,759**	**100%**	**38,629**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $11,381. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
2,759	$0.49	$1,353	11,381	$1,931	$1,931	3.5	8.4

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Program	C&I Solutions
Project ID	EA-0001013704
Facility SIC Code	8062—General Medical and Surgical Hospitals
Measures	Steam Trap Replacement
Annual Consumption	906,980 therms

Project Background

The participant is a medical facility that received incentives from Summit Utilities for implementing the following:

- ECM #1: Steam Trap Replacement

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 2021 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 200°F
- Annual operating hours for the on-site steam system is 8,760 hours
- Combustion efficiency is 83 % for the pre-retrofit and post retrofit equipment

Steam Trap Replacement

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

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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	1/8	100	1	Drip	220	83%	8,760
2	3/16	30	1	Drip	200	83%	8,760
3	3/16	30	1	Drip	200	83%	8,760
4	2/11	30	1	Drip	200	83%	8,760
5	17/78	30	1	Process	200	83%	8,760
6	8/73	30	1	Drip	200	83%	8,760
7	1/4	12	1	Drip	200	83%	8,760
8	3/16	30	1	Drip	200	83%	8,760
9	3/16	8	1	Drip	200	83%	8,760
10	6/23	5	1	Process	200	83%	8,760
11	6/23	5	1	Process	200	83%	8,760
12	1/8	80	1	Drip	200	83%	8,760
13	8/73	40	1	Drip	200	83%	8,760
14	1/8	80	1	Process	200	83%	8,760
15	1/8	80	1	Process	200	83%	8,760
16	6/23	10	1	Process	200	83%	8,760
17	11/47	30	1	Process	200	83%	8,760
18	11/64	30	1	Process	200	83%	8,760
19	3/16	30	1	Drip	200	83%	8,760
20	3/16	30	1	Drip	200	83%	8,760
21	3/16	10	1	Process	200	83%	8,760
22	7/32	15	1	Drip	200	83%	8,760
23	5/64	20	1	Drip	200	83%	8,760
24	5/48	5	1	Drip	200	83%	8,760
25	3/16	30	1	Drip	200	83%	8,760

Calculations for the annual therms savings use the following equation:

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) = 8760 annual hours

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

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EC_{Base} = combustion efficiency of boiler (%), 83%

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)

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Steam Trap Replacement	5 years

Calculated Savings:

Steam Trap Replacement

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Percent Failed*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	44	100%	1,191	168	4,753
2	39	50%	1,173	168	2,067
3	39	50%	1,173	168	2,067
4	36	100%	1,173	168	3,821
5	52	100%	1,173	168	5,520
6	13	100%	1,173	168	1,380
7	41	50%	1,16	168	2,154
8	38	100%	1,173	168	4,034
9	20	50%	1,159	168	1,047
10	33	100%	1,156	168	3,435
11	33	100%	1,156	168	3,435
12	36	100%	1,187	168	3,877
13	16	50%	1,176	168	847
14	36	100%	1,187	168	3,877
15	36	100%	1,187	168	3,877
16	41	100%	1,161	168	4,301
17	60	50%	1,173	168	3,185
18	32	100%	1,173	168	3,400
19	38	50%	1,173	168	2,022

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20	38	50%	1,173	168	2,022
21	21	50%	1,161	168	1,104
22	34	100%	1,164	168	3,627
23	5	50%	1,168	168	271
24	5	100%	1,156	168	539
25	30	50%	1,168	168	1,562
				Total:	**68,222**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*	*Annual Water Gallons Savings*	*Lifetime Water Gallons Savings*
Steam Trap Replacement	58,839	68,222	116%	341,110	N/A	N/A
TOTAL	**58,839**	**68,222**	**116%**	**341,110**	**N/A**	**N/A**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $42,005. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
68,222	$0.487	$33,224	$42,005	$42,005	$42,005	0	1.49

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Program	C&I Solutions
Project ID	EA-0000369614
Facility SIC Code	2999 – Products of Petroleum and Coal, Not Elsewhere Classified
Measures	Steam Traps, Steam Line Insulation, Condensate Return, Linkless Controls, Boiler Blowdown
Annual Consumption	433,210 therms

Project Background

The participant is a petroleum production facility that received incentives from Summit Utilities for implementing the following:

- ECM #1: Steam Trap Replacement
- ECM #2: Steam Line Insulation
- ECM #3: Condensate Return Pumps
- ECM #4: Linkless Controls
- ECM #5: Boiler Blowdown Reduction

The site uses steam throughout the facility primarily for three process needs: space heating, domestic water heating, and other process heating loads. Savings will come from repairing the failed steam traps throughout the site's steam system, adding insulation to steam lines, upgrading condensate return pumps, adding linkless controls, and minimizing boiler blowdown.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 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 180°F
- Annual operating hours for the on-site steam system are 6,000 hours for boiler #1 and 3,469 hours for boiler #2

Steam Trap Replacement

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

team Trap Parameters

Steam Trap #	*Orifice Size (in.)*	*Inlet Pressure (psig)*	*Outlet Pressure (psig)*	*Service (Drip/Process)*	*Feedwater Temperature (°F)*	*Boiler Efficiency*	*Operating Hours*
1	0.102	150	0	Process	180	82%	6,000
2	0.102	150	0	Process	180	82%	6,000
3	0.110	150	0	Process	180	82%	3,469
4	0.110	150	0	Drip/Tracer	180	82%	6,000
5	0.110	150	0	Process	180	82%	3,469
6	0.110	150	0	Process	180	82%	3,469
7	0.188	150	0	Process	180	82%	3,469
8	0.110	150	0	Process	180	82%	6,000
9	0.188	150	0	Process	180	82%	6,000
10	0.110	150	0	Process	180	82%	3,469
11	0.110	150	0	Process	180	82%	6,000
12	0.110	150	0	Process	180	82%	6,000
13	0.110	150	0	Process	180	82%	3,469
14	0.110	150	0	Process	180	82%	6,000
15	0.110	150	0	Process	180	82%	6,000
16	0.102	150	0	Process	180	82%	6,000
17	0.102	150	0	Process	180	82%	6,000
18	0.110	34	0	Process	180	82%	3,469
19	0.110	34	0	Process	180	82%	3,469
20	0.110	34	0	Process	180	82%	6,000
21	0.110	34	0	Process	180	82%	6,000
22	0.110	34	0	Process	180	82%	6,000
23	0.110	34	0	Process	180	82%	6,000
24	0.110	150	0	Process	180	82%	3,469
25	0.110	150	0	Process	180	82%	3,469

Calculations for the annual therms savings use the following equation:

Steam Trap Replacement Annual Energy Savings

$$Annual\ therms\ Savings = \frac{Discharge\ Rate \times AOH \times \left(h_{steam} - h_{feed}\right)}{EC_{Base} \times Therm\ Conversion\ Factor}$$

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Where:

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

AOH = Annual Operating Hours that system is pressurized (hrs/yr)

h_{steam} = Enthalpy of steam (BTU/lb)

h_{feed} = Enthalpy of feedwater (BTU/lb)

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

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

Steam Line Insulation

The following table shows relevant steam line insulation parameters required for annual energy savings.

Steam Line Insulation Parameters

Description	***Heat Loss (BTU/hr-ft)***		***Pipe Length or Equiv. (ft)***
	pre	***post***	
Fitting Room Steam 180 ft x ½ in Pipe	120	19	180
Fitting Room Steam 1 Valve	193	23	2.3
Fitting Room Steam 3 ft x 3 in Pipe	475	43	3
Fitting Room Steam 4 in Valve	602	51	3.4
Fitting Room Steam 7 ft x 2 in Pipe	331	33	7
Fitting Room Steam 2 in Valve	331	33	8.5
Addition Downstairs 200 ft x 2 in Pipe	331	33	200
Addition Downstairs 10 ft x 2 in Pipe	331	33	10
Addition 1215 ft x 4 in Pipe	602	51	1,415
Cotton Gin 300 ft x 4 in Pipe	602	51	300

Calculations for the annual therms savings use the following equation:

Steam Line Insulation Annual Energy Savings

$$Gas\ Savings\left(\frac{CCF}{year}\right) = \frac{[h_{pre} - h_{post}] \times Length\ (ft) \times \frac{1\ CCF}{100{,}000\ BTU} \times AOH}{Boiler\ Efficiency\ (\%)}$$

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Where:

H_{pre} = Pre Heat Loss (BTU/h-ft)

H_{post} = Post Heat Loss (BTU/h-ft)

Length = Length of Pipe or equivalent length of valve/fitting (ft)

AOH = Annual Operating Hours

Condensate Return

The following table shows relevant pump parameters required for annual energy savings.

. Condensate Return Pump Parameters

Pump #	***GPM***	***T (°F)***	
		Condensate	***Makeup***
1	15	174	70
2	15	174	70
3	38	174	70
4	12	174	70
5	12	174	70
6	38	174	70

Calculations for the annual therms savings use the following equation:

Condensate Return Pump Annual Energy Savings

$$Gas\ Savings\left(\frac{CCF}{yr}\right) = \frac{Savings\left(\frac{BTU}{hr}\right) \times AOH \times \frac{1\ CCF}{100{,}000\ BTU}}{Boiler\ Efficiency\ (\%)}$$

$$Savings\left(\frac{BTU}{hr}\right) = GPM \times \left(T_{Condensate} - T_{Makeup}\right) \times p_{water} \times c_{water} \times 60\,\frac{min}{hr}$$

Where:

$T_{Condensate}$ = Temperature of condensate water

T_{Makeup} = Temperature of makeup water

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ρ_{water} = Density of water (8.34 lb/gal)

c_{water} = Specific Heat of water (1.00 BTU/lb-°F)

GPM = Gallons per minute of pump

AOH = Annual Operating Hours

Linkless Controls

The following table shows relevant boiler parameters required for annual energy savings.

Boiler Parameters

Boiler	***Base/Variable Load***	***Capacity (BTU/hr)***	***AOH***	***Eff***	
				pre	***Post***
CB Boiler 1A	Base	33,475,000	6,000	80%	82%
CB Boiler 1B	Variable	33,475,000	3,469	80%	82%

Calculations for the annual therms savings use the following equation:

Equation 1. Linkless Controls Annual Energy Savings

$$Gas\ Usage\left(\frac{CCF}{yr}\right) = \sum \frac{Capacity \times AOH \times Load\ Factor}{100{,}000\left(\frac{BTU}{CCF}\right)}$$

$$Gas\ Savings\left(\frac{CCF}{yr}\right) = Gas\ Usage \times \left(\frac{1}{Eff_{pre}} - \frac{1}{Eff_{post}}\right)$$

Where:

Capacity = Output capacity of boiler (BTU/hr)

Load Factor = Percentage of time that boilers are running (%)

AOH = Annual Operating Hours

Eff_{pre} = Efficiency of boiler pre-implementation (%)

Eff_{post} = Efficiency of Boiler post-implementation (%)

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Boiler Blowdown Reduction

The following table shows relevant boiler parameters required for annual energy savings.

Boiler Parameters

Boiler	***Capacity (BTU/hr)***
CB Boiler 1A	33,475,000
CB Boiler 1B	33,475,000

Calculations for the annual therms savings use the following equation:

Equation 2. Boiler Blowdown Reduction Annual Energy Savings

$$Energy\ Savings\left(\frac{CCF}{yr}\right) = \frac{Makeup\ Water\ Savings \times Enthalpy\ Savings \times AOH}{100{,}000 \times TE_{Boiler}}$$

$$Makeup\ Water\ Savings\left(\frac{lb}{hr}\right) = Makeup\ Water_{pre} - Makeup\ Water_{post}$$

$$Enthalpy\ Savings\left(\frac{BTU}{lb}\right) = h_{blow} - h_{makeup}$$

$$Makeup\ Water_{pre/post}\left(\frac{lb}{hr}\right) = \frac{Capacity \times LF \times TE_{Boiler}}{\left(\left(1 - BD_{pre/post}\right) \times \left(h_{steam} - h_{feed}\right)\right) + \left(BD_{pre/post} \times \left(h_{blow} - h_{feed}\right)\right)}$$

Where:

Capacity = Output capacity of boiler (BTU/hr)

h_{makeup} = Enthalpy of makeup water (BTU/lb)

h_{steam} = Enthalpy of steam (BTU/lb)

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h_{blow} = Enthalpy of blowdown water (BTU/lb)

h_{feed} = Enthalpy of feedwater (BTU/lb)

BD = Boiler blowdown (%)

TE_{Boiler} = Boiler Thermal Efficiency (%)

LF = Load Factor (%)

AOH = Annual Operating Hours

pre = Indicates pre-implementation

post = Indicates post-implementation

Measure Life

Estimated Useful Life by Measure

Measure	***EUL (years)***
Steam Trap Replacement	5
Steam Line Insulation	20
Condensate Pumps	15
Linkless Controls	12
Boiler Blowdown Reduction	15

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Calculated Savings:

Steam Trap Replacement

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*AOH*	*Percent Failed*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	41	6,000	100%	1,197	148	3,144
2	41	6,000	100%	1,197	148	3,144
3	48	3,469	100%	1,197	148	2,127
4	48	6,000	100%	1,197	148	3,679
5	48	3,469	100%	1,197	148	2,127
6	48	3,469	100%	1,197	148	2,127
7	140	3,469	100%	1,197	148	6,202
8	48	6,000	100%	1,197	148	3,679
9	140	6,000	100%	1,197	148	10,729
10	48	3,469	100%	1,197	148	2,127
11	48	6,000	100%	1,197	148	3,679
12	48	6,000	100%	1,197	148	3,679
13	48	3,469	100%	1,197	148	2,127
14	48	6,000	100%	1,197	148	3,679
15	48	6,000	100%	1,197	148	3,679
16	41	6,000	100%	1,197	148	3,144
17	41	6,000	100%	1,197	148	3,144
18	14	3,469	100%	1,174	148	616
19	14	3,469	100%	1,174	148	616
20	14	6,000	100%	1,174	148	1,065
21	14	6,000	100%	1,174	148	1,065
22	14	6,000	100%	1,174	148	1,065
23	14	6,000	100%	1,174	148	1,065
24	48	3,469	100%	1,197	148	2,127
25	48	3,469	100%	1,197	148	2,127
					Total	**71,962**

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Steam Line Insulation

Steam Line Insulation Savings

Description	*Heat Loss (BTU/hr-ft)*		*AOH*	*Pipe Length or Equiv. (ft)*	*Therms Savings*
	pre	*post*			
Fitting Room Steam 180 ft x ½ in Pipe	120	19	3,469	180	840
Fitting Room Steam 1 Valve	193	23	3,469	2.3	16
Fitting Room Steam 3 ft x 3 in Pipe	475	43	3,469	3	55
Fitting Room Steam 4 in Valve	602	51	3,469	3.4	79
Fitting Room Steam 7 ft x 2 in Pipe	331	33	3,469	7	88
Fitting Room Steam 2 in Valve	331	33	3,469	8.5	107
Addition Downstairs 200 ft x 2 in Pipe	331	33	3,469	200	2,514
Addition Downstairs 10 ft x 2 in Pipe	331	33	3,469	10	126
Addition 1215 ft x 4 in Pipe	602	51	3,469	1,415	32,838
Cotton Gin 300 ft x 4 in Pipe	602	51	3,469	300	6,962
				Total	**43,624**

Condensate Return Pumps

Condensate Return Pump Savings

Pump #	*GPM*	*T (°F)*		*AOH*	*Boiler Efficiency*	*Therms Savings*
		Condensate	*Makeup*			
All	129	174	70	1,249	82%	101,498
					Total	**101,498**

Linkless Controls

Linkless Controls Savings

Boiler	*Base/Variable Load*	*Capacity (BTU/hr)*	*AOH*	*CCF Usage*	*Eff*		*Therms Savings*
					pre	*Post*	
CB Boiler 1A	Base	33,475,000	6,000	284,778	80%	82%	11,969
CB Boiler 1B	Variable	33,475,000	3,469	93,820	80%	82%	3,943
						Total	**15,912**

Boiler Blowdown Reduction

Boiler Blowdown Reduction Savings

Boiler	*Capacity (BTU/hr)*	*AOH*	*LF*	*Enthalpy, h (BTU/lb)*			*Blowdown %*		*Boiler Thermal Efficiency*	*Therms Savings*
				Blowdown	*Feedwater*	*Makeup Water*	*Pre*	*Post*		
CB Boiler 1A	33,475,000	6,000	14%	339	148	33	8%	4%	82%	3,151
CB Boiler 1B	33,475,000	3,469	8%	339	148	33	8%	4%	82%	1,182
									Total	**4,317**

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Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	52,136	71,962	138%	359,812
Steam Line Insulation	59,221	43,624	74%	872,487
Condensate Return Pumps	101,454	101,498	100%	1,522,469
Linkless Controls	15,912	15,912	100%	190,946
Boiler Blowdown Reduction	4,331	4,332	100%	64,987
TOTAL	**233,053**	**237,329**	**102%**	**3,010,702**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $1,133,657. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
237,329	$0.65	$154,976	$1,133,657	$172,562	$172,562	6.2	7.3

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Program	C&I Solutions
Project ID	EA-0000370105
Facility SIC Code	4953 - Refuse Systems
Measures	Boiler Replacement
Annual Consumption	3,710,362 therms

Project Background

The participant is a waste treatment facility that received incentives from Summit Utilities for:

- ECM#1-Boiler Retrofit

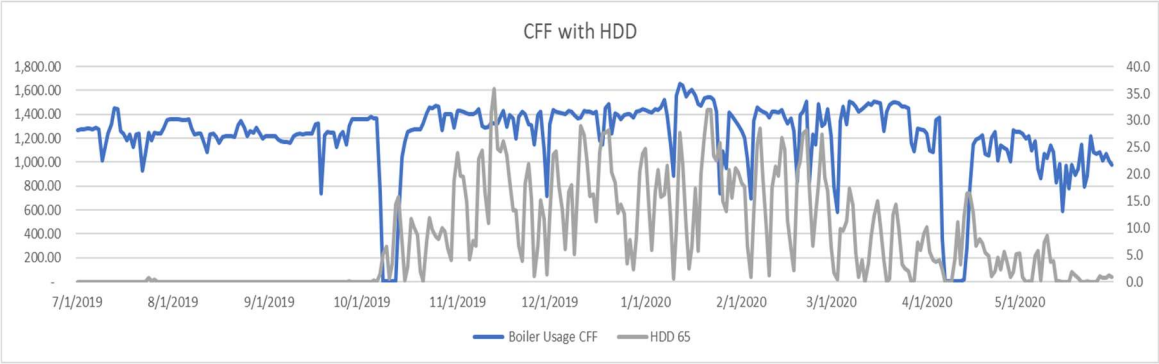
M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option C – Whole Facility.

Measurement and verification activities are based on a regression analysis using a year of monthly billing data monthly weather data. A regression model is created for the baseline period and the post period. These regression models are then normalized to TMY3 weather data for the project location.

The below figures show the natural gas usage and how it relates to heating degree days (HDD) for the facility.

Baseline Condition



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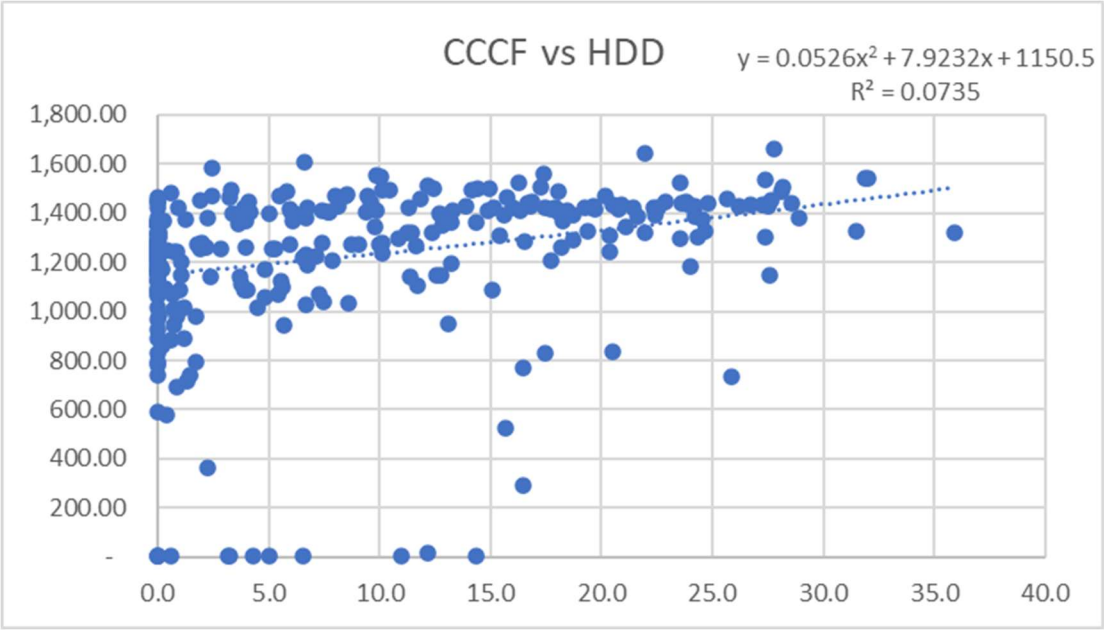
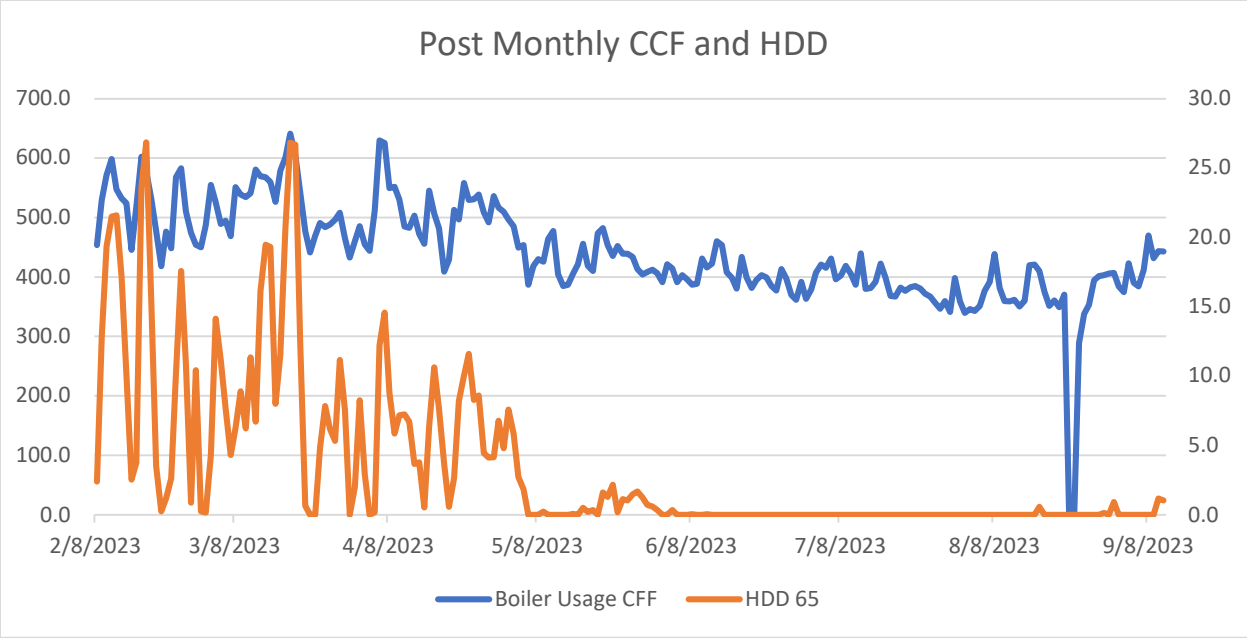


Post Retrofit



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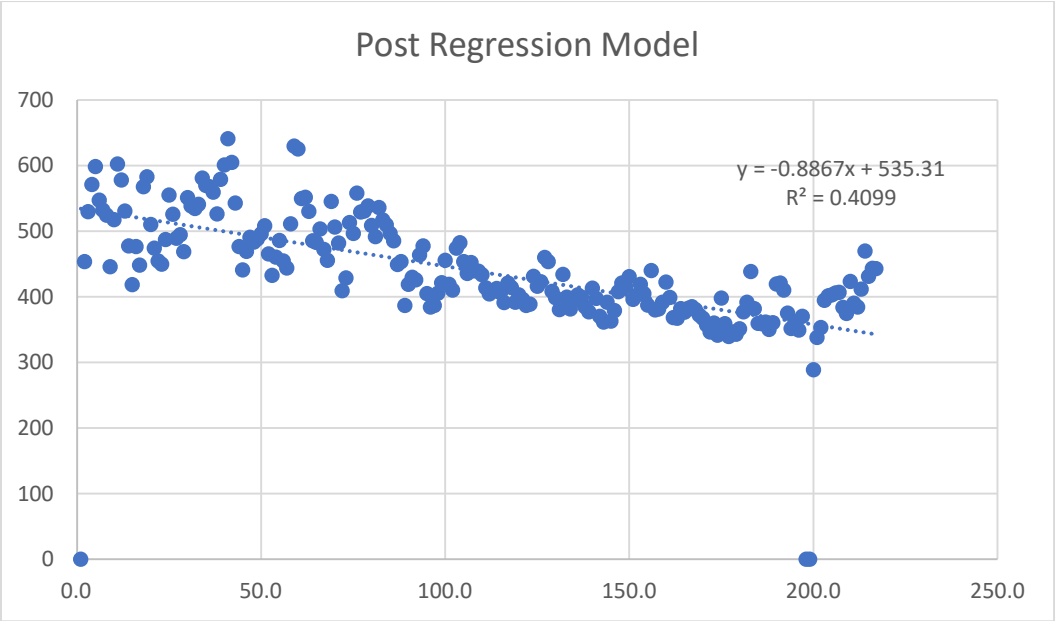

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Boiler Retrofit	20 years

Calculated Savings:

Overall project savings are as follows:

Overall Project Savings

Measure	***Expected Annual therms Savings***	***Realized Annual therms Savings***	***Realization Rate***	***Lifetime therms Savings***
Boiler Retrofit	276,804	275,521	100%	160,654
Total	**276,804**	**275,521**	**100%**	**160,654**

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Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $510,609. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
275,521	$0.52	$143,271	$510,609	PY2023: $96,263 Total: $192,865	PY2023: $96,263 Total: $192,865	2.1	3.5

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Program	C&I Solutions
Project ID	EA-0000945730
Facility SIC Code	2952 - Asphalt Felts and Coatings
Measures	Boiler Tune Ups

Project Background

The participant is an asphalt plant that received incentives from Summit Utilities for implementing the following:

- ECM #1: Boiler tune ups

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Boiler Tune Ups

The following equation was used for the 2 boilers

Equation 1. Boiler Tune Up Annual Energy Savings

$$Annual\ Therm\ Savings = Capacity\left(\frac{\text{BTU}}{\text{hr}}\right) x \frac{Hours}{Yr}\ x\ \%\ Load\ Factor\ x\ \%\ Savings\ x \frac{1}{EC_{base}}\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Where:

Capacity = 100 MMBTU/hr for the kilm burner and 1.2 MMBTU/hr for the hot oil

% Savings = 2%, from AR TRM 9.1

ECbase = 80%, from AR TRM 9.1

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

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Boiler Tune Up Total Annual Energy Savings

$$Annual\ Therm\ Savings\ = Kiln\ Savings + Hot\ Oil\ Burner\ Savings$$

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Boiler Tune Ups	2 years

Calculated Savings:

Boiler Tune Ups

The following equation was used.

Kiln Burner Annual Energy Savings

$$Kiln\ Savings = 100{,}000{,}000\left(\frac{\text{BTU}}{\text{hr}}\right)\ x\ 1500\frac{Hours}{Yr}\ x\ 2\%\ \ x35\ \%\ \ x\frac{1}{80\%}\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)$$

. Hot Oil Burner Annual Energy Savings

$$Kiln\ Savings = 1{,}200{,}000\left(\frac{\text{BTU}}{\text{hr}}\right)\ x1500\frac{Hours}{Yr}\ x\ 2\%\ \ x50\ \%\ \ x\frac{1}{80\%}\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Overall project savings are as follows:

Overall Project Savings

Measure	***Expected Annual therms Savings***	***Realized Annual therms Savings***	***Realization Rate***	***Lifetime therms Savings***
Boiler Tune Up	13,350	13,350	100%	26,700
TOTAL	**13,350**	**13,350**	**100%**	**26,700**

Measure Cost, Incentive, & Payback

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Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
13,350	$0.52	$6,942	$9,345	$9,345	$9,345	0	1.5

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Program	C&I Solutions
Project ID	EA-0000946899
Facility SIC Code	2952 - Asphalt Felts and Coatings
Measures	Steam System Insulation Boiler Tune

Project Background

The participant is an asphalt plant that received incentives from Summit Utilities for implementing the following:

- ECM #1: Steam System Insulation
- ECM #2: Boiler tune ups

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Steam System Thermal Insulation

Through this method, energy savings are calculated using key data and through the North American Insulation Manufacturers Association's 3E Plus software:

(http://www.pipeinsulation.org/).

Measurement and verification activities are based on the following assumptions:

- Two inches of ceramic fiberglass insulation and aluminum jacket for the piping, flanges, and valves
- 0.63 inch (16mm) of fiberglass insulation with aluminum jacket for the tank.
- One inch of cellular glass and colored mastics for the flex hose
- and ambient air temperature varied based on the measure. See table below.

The 3E Plus software was used to calculate heat loss (btu/hr/ft) for bare piping (pre-retrofit) and piping with 1.5-in insulation (post-retrofit). The software required these inputs: process

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temperature, ambient temperature, pipe size, base metal, insulation, and jacket material. Annual therms savings was calculated using the following equation:

. Pipe Insulation Installation Annual Energy Savings

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

Where:

Annual Operating Hours = number of hours facility operates annually

Boiler Efficiency

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

Pipe/Valve Insulation Parameters

Entry #	***Description***	***Object To Insulate***	***Pipe Length***	***Pipe Diameter***	***Valve or Fitting Total Length***	***Valve Fitting Size***
1	Kiln Barrel	Cylindrical Tank				
2	Pipe	Pipe	280	1		
3	Flanges	Valve or Fitting			1.5	16
4	Valves	Valve or Fitting			1.5	6
5	Flex Hose	Pipe	24	0.5		

Boiler Tune Ups

The following equation was used.

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Boiler Tune Up Annual Energy Savings

$$Annual\ Therm\ Savings = Capacity\left(\frac{\text{BTU}}{\text{hr}}\right) x \frac{Hours}{Yr}\ x\ \%\ Load\ Factor\ x\ \%\ Savings\ x \frac{1}{EC_{base}}\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Where:

Capacity = 75.6 MMBTU/hr

% Savings = 2%, from AR TRM 9.1

ECbase = 80%, from AR TRM 9.1

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

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Steam System Thermal Insulation	20 years
Boiler Tune Ups	2 years

Calculated Savings:

Steam System Thermal Insulation

Pipe Insulation Annual Energy Savings

Entry #	***Description***	***Object to Insulate***	***Temperature (°F)***	***Pre Heat Loss***	***Post Heat Loss***	***Therms Savings***
1	Kiln Barrel	Cylindrical Tank	325	757	99	12,710
2	Pipe	Pipe	350	1,046	43	5,262
3	Flanges	Valve or Fitting	350	1,046	43	784
4	Valves	Valve or Fitting	350	1,046	43	294
5	Flex Hose	Pipe	350	717	64	294
					Total	19,345

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Boiler Tune Ups

The following equation was used.

Equation 3. Boiler Tune Up Annual Energy Savings

$$Annual\ Therm\ Savings = 75{,}600{,}000\left(\frac{\text{BTU}}{\text{hr}}\right) x\frac{Hours}{Yr}\ x\ 2\%\ \ x15\ \%\ \ x\frac{1}{80\%}\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Measure Cost, Incentive, & Payback

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam System Insulation	20,671	19,345	95%	290,175
Boiler Tune Up	9,923	9,923	100%	19,846
TOTAL	**30,593**	**29,267**	**96%**	**406,738**

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
29,267	$0.52	$15,219	$53,572	$20,487	$20,487	1.96	3.52

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Program	C&I Solutions
Project ID	EA-0000946909
Facility SIC Code	2952 - Asphalt Felts and Coatings
Measures	Boiler Tune Ups

Project Background

The participant is an asphalt plant that received incentives from Summit Utilities for implementing the following:

- ECM #1: Boiler tune ups

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Annual operating hours for the on-site steam system are 1,500 hours
- Combustion efficiency is 80% for the boiler.

Boiler Tune Ups

The following equation was used for the boilers

Burer Tune Up Annual Energy Savings

$$Annual\ Therm\ Savings = Capacity\left(\frac{\text{BTU}}{\text{hr}}\right) x \frac{Hours}{Yr}\ x\ \%\ Load\ Factor\ x\ \%\ Savings\ x \frac{1}{EC_{base}}\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Where:

Capacity = 120 MMBTU/hr for the kiln burner

% Savings = 2%, from AR TRM 9.1

ECbase = 80%, from AR TRM 9.1

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

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Boiler Tune Ups	2 years

Calculated Savings:

Boiler Tune Ups

The following equation was used.

Annual Energy Savings

$$Annual\ Savings = 120{,}000{,}000\left(\frac{\text{BTU}}{\text{hr}}\right) x\ \frac{Hours}{Yr}\ x\ 2\%\ \ x35\ \%\ \ x\frac{1}{80\%}\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Measure Cost, Incentive, & Payback

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Boiler Tune Up	15,750	15,750	100%	31,500
TOTAL	**15,750**	**15,750**	**100%**	**31,500**

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
15,750	$0.52	$8,190	$11,025	$11,025	$11,025	0	1.35

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Program	C&I Solutions
Project ID	EA-0000946918
Facility SIC Code	2952 - Asphalt Felts and Coatings
Measures	Burner Tune Ups

Project Background

The participant is an asphalt plant that received incentives from Summit Utilities for implementing the following:

- ECM #1: Boiler tune ups

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Burner Tune Ups

The following equation was used for the two burners:

Burner Tune Up Annual Energy Savings

$$Annual\ Therm\ Savings = Capacity\left(\frac{\text{BTU}}{\text{hr}}\right) x \frac{Hours}{Yr}\ x\ \%\ Load\ Factor\ x\ \%\ Savings\ x \frac{1}{EC_{base}}\ x100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Where:

Capacity = 96.8 MMBTU/hr for the kilm burner and 1.2 MMBTU/hr for the hot oil

Hours = 1,500/year, from utility interval data

% Load Factor = 35% for kiln burner and 50% for the hot oil burner, from load analysis

% Savings = 2%, from AR TRM 9.1

ECbase = 80%, from AR TRM 9.1

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

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Burner Up Total Annual Energy Savings

$$Annual\ Therm\ Savings\ = Kiln\ Savings + Hot\ Oil\ Burner\ Savings$$

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Boiler Tune Ups	2 years

Calculated Savings:

Boiler Tune Ups

The following equation was used.

Kiln Burner Annual Energy Savings

$$Kiln\ Savings = 96{,}800{,}000\left(\frac{\text{BTU}}{\text{hr}}\right) x\ \frac{Hours}{Yr}\ x\ 2\%\ \ x35\ \%\ \ x\frac{1}{80\%}\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Hot Oil Burner Annual Energy Savings

$$Kiln\ Savings = 1{,}200{,}000\left(\frac{\text{BTU}}{\text{hr}}\right) x\frac{Hours}{Yr}\ x\ 2\%\ \ x50\ \%\ \ x\frac{1}{80\%}\ x\ 100{,}000\ \left(\frac{BTU}{CCF}\right)$$

Measure Cost, Incentive, & Payback

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*
Burner Tune Up	12,930	12,930	100%	25,860
TOTAL	**12,930**	**12,930**	**100%**	**25,860**

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
12,930	$0.52	$6,724	$9,051	$9,051	$9,051	0	1.35

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Program	C&I Solutions
Project ID	EA-0000743988
Facility SIC Code	3011 – Tires and Inner Tubes
Measures	Steam Trap Replacement Temperature Adjustment

Project Background

The participant is a manufacturing facility that received incentives from Summit Utilities for:

- ECM #1 - Steam trap replacement
- ECM #2 – Temperature Adjustment

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Annual operating hours for the site are 2,169 hours
- Combustion efficiency is 81% (for both pre-retrofit and post-retrofit condition)

Steam Trap Replacement

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

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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	3/4	160	1	Drip	250	82%	2,169
2	3/4	160	1	Drip	250	82%	2,169
3	1/2	160	1	Drip	250	82%	2,169
4	1/2	160	1	Process	250	82%	2,169
5	1/2	160	1	Process	250	82%	2,169
6	1/2	160	1	Process	250	82%	2,169
7	3/4	160	1	Drip	250	82%	2,169

Calculations for the annual therms savings use the following equation:

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 the system is pressurized (hrs/yr)

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

EC_{Base} = combustion efficiency of boiler (%), 82%

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)

Boiler Temperature Reduction

The boiler temperature measure was evaluated using gas meter data, recorded firing rate and production data. During a review of the trend data, it was found that there was no correlation between usage and production data. With no correlation, a daily average gas usage average firing rate was calculated for the different operating conditions (production, start up, off). This

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daily average was used to normalize natural gas usage to the post operating schedule. The below table shows the average daily usages for the pre and post periods.

Average CCF Usage

Production Type	*Pre Average CCF Usage*	*Post Average CCF Usage*	*Days/Year*	*Adj. to 365*
Full Production	648	573	250	251
Startup Production	245	314	52	52
Off	-	-	62	62

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Steam Trap Replacement	5 years
Temperature Adjustment	5 years

Calculated Savings:

Steam Trap Replacement

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	56	1,198	219	1,729
2	182	1,198	219	5,597
3	48	1,198	219	1,486
4	36	1,198	219	1,112
5	36	1,198	219	1,112
6	36	1,198	219	1,112
7	56	1,198	219	863
			Total	**13,011**

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Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	12,206	13,011	107%	65,005
Temperature Adjustment	15,259	19,704	129%	39,408
TOTAL	**25,217**	**34,963**	**119%**	**104,463**

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
34,963	$0.48	$16,782	$40,942	$20,471	$20,471	1.22	2.44

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Program	C&I Solutions
Project ID	EA-0001180469
Facility SIC Code	5182 – Wine and Distilled Alcoholic Beverages
Measures	Boiler Tune-Up
Annual Consumption	6,660 therms

Project Background

The participant is a distillery that received incentives from Summit Energy for:

- ECM #1 – Boiler Burner Tune Up

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement. ADM evaluated the savings associated with this site during a desk review.

Boiler Burner Tune Up

The annual energy savings from replacing a boiler is calculated with the following equation:

Equation 2: Boiler Replacement Annual Energy Savings

$$Annual\ Energy\ Savings\left(\frac{CCF}{yr}\right) = \left(\frac{CCF}{yr}\right) \times \left(1 - \frac{Efficinecy\ Pre\%}{Efficiency\ Post\%}\right)$$

Where:

$\text{Boiler Annual Usage}\left(\frac{\text{CCF}}{\text{yr}}\right)$

$\text{Efficiency}_{\text{Pre}} = \text{CE}$

Calculated Savings:

Boiler Replacement

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Boiler Tune Up Savings

Entry #	*Boiler*	*Capacity (MBH)*	*Pre Boiler Efficiency (%)*	*Efficiency (%)*	*Usage (CCF/yr)*	*Therms Savings*
1	*Boiler 1*	840	*76%*	*83%*	*3,016*	**317**
2	*Boiler 2*	840	*NA**	*NA*	*3,016*	**60**
Total						**377**

*Boiler two had a pre and post combustion efficiency test performed where the pre and post combustion efficiency results seemed unrealistic. As a result a default 2% overall fuel savings was applied for boiler two.

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Boiler Burner Tune-Up	377	377	100%	754
TOTAL	**377**	**377**	**100%**	**754**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $ $4,918. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
377	$1.45	$547	$4,918	$339	$339	5.5	8.9

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Program	C&I Solutions
Project ID	EA-0001053692
Facility SIC Code	2074 – Cottonseed Oil Mills
Measures	Steam Trap Replacement Steam Leak Repairs
Annual Consumption	1,417,580 therms

Project Background

The participant is a food processing facility that received incentives from Summit Utilities for:

- ECM #1 - Steam leak repairs
- ECM #2 - Steam trap replacement

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Supply water temperature 70°F based on the AR TRM91.1
- Annual operating hours for the site range from 8,424 hours to 2,808 hours
- Combustion efficiency is 83% (for both pre-retrofit and post-retrofit condition)

Steam Leak Repairs

An alternative method was used to calculate the steam loss before steam leak repairs. The more traditional method equates the orifice diameter flow rate, using the orifice diameter of the leak and the system's absolute pressure. Due to the difficulty in determining the exact diameter of an orifice leak, the alternate method was used.

Calculations follow the methods established by G.G. Rajan for a steam leak rate as a function of the length of an active steam plume.

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Equating Steam Plume Length to Flow Rate

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

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

Calculation for Heat Loss

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

Where:

Leak Rate = calculated value

Steam Enthalpy = saturated steam region based on system steam pressure

MV Enthalpy = steam look up table based on makeup water temperature,

derived from average temperature of water main in each zone (34.2 BTU/lb)

The following table shows relevant steam leak parameters required for annual energy savings calculations.

Steam Leak #	*Quantity of Leaks*	*Plume Length (ft)*	*Steam Pressure (psig)*	*Leak Rate (lbs/hr)*	*Boiler Efficiency*
1	1	1.00	125	10	83%
2	1	0.75	125	9	83%
3	1	0.83	125	9	83%

Energy Savings

The annual energy savings from repairing a steam leak is calculated with the following equation:

. Steam Leak Repair Annual Energy Savings

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

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Where:

Annual Operating Hours = number of hours facility operates annually

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

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	125	0	Process	160	83%	8,424
2	1	125	0	Process	160	83%	8,424
3	3/4	125	0	Drip	160	83%	8,424
4	1	125	0	Drip	160	83%	8,424
5	1	125	0	Drip	160	83%	8,424
6	1	125	0	Drip	160	83%	8,424
7	1	125	0	Drip	160	83%	8,424
8	1	125	0	Process	160	83%	8,424
9	1	125	0	Drip	160	83%	2,808
10	1	125	0	Drip	160	83%	2,808
11	1	125	0	Drip	160	83%	2,808
12	1	125	0	Drip	160	83%	2,808
13	1	125	0	Drip	160	83%	2,808
14	1	125	0	Drip	160	83%	8,424
15	1	125	0	Drip	160	83%	8,424
16	1	125	0	Process	160	83%	8,424
17	1	125	0	Process	160	83%	8,424
18	1	125	0	Process	160	83%	8,424
19	1	125	0	Process	160	83%	8,424
20	1	125	0	Process	160	83%	8,424
21	1	125	0	Process	160	83%	8,424
22	1	125	0	Process	160	83%	8,424
23	1	125	0	Process	160	83%	8,424
24	1	125	0	Process	160	83%	8,424

Calculations for the annual therms savings use the following equation:

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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 the system is pressurized (hrs/yr)

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

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

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)

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Steam Leak Repairs	10 years
Steam Trap Replacement	5 years

Calculated Savings:

Steam Leak Repairs

Steam Leak Repairs Savings

Steam Leak #	***Description***	***Quantity of Leaks***	***Plume Length (ft)***	***Steam Enthalpy (BTU/lb)***	***System Enthalpy (BTU/lb)***	***Therms Savings***
1	Leak 1	1	1.00	1,194	1,156	1,165
2	Leak 2	1	0.75	1,194	1,156	1,012
3	Lead 3	1	0.83	1,194	1,156	1,061
					Total:	**3,238**

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Steam Trap Replacement

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	111	1,194	128	12,035
2	111	1,194	128	12,035
3	123	1,194	128	13,268
4	45	1,194	128	4,847
5	45	1,194	128	4,847
6	45	1,194	128	4,847
7	45	1,194	128	4,847
8	29	1,194	128	3,116
9	45	1,194	128	1,616
10	45	1,194	128	1,616
11	203	1,194	128	7,316
12	203	1,194	128	7,316
13	173	1,194	128	6,240
14	173	1,194	128	18,721
15	173	1,194	128	18,721
16	29	1,194	128	3,116
17	29	1,194	128	3,116
18	29	1,194	128	3,116
19	38	1,194	128	4,081
20	29	1,194	128	3,116
21	29	1,194	128	3,116
22	29	1,194	128	3,116
23	38	1,194	128	4,081
24	111	1,194	128	12,035
			Total	**160,281**

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Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*	*Annual Water Gallons Savings*
Steam Leak Repair	3,238	3,328	100%	32,377	27,911
Steam Trap Replacement	158,285	160,281	101%	1,602,810	N/A
TOTAL	**161,487**	**163,519**	**101%**	**1,635,190**	**27,911**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $57,366. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
163,519	$0.51	$83,395	$57,366	$57,366	$57,366	0.4	0.7

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Program	C&I Solutions
Project ID	EA-0000737918
Facility SIC Code	2043 – Cereal Breakfast Foods
Measures	Steam Trap Replacement
Annual Consumption	3,946,150

Project Background

The participant is a manufacturing facility that received incentives from Summit Utilities for:

- ECM #1 - Steam trap replacement

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Annual operating hours for the site's steam system range from 8,736 hours to 3,149 hours
- Combustion efficiency is 81% (for both pre-retrofit and post-retrofit condition)

Steam Trap Replacement

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

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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	3/4	50	0	Process	230	81%	3,149
2	3/4	50	0	Process	230	81%	3,149
3	3/4	50	0	Process	230	81%	3,149
4	3/4	50	0	Process	230	81%	3,149
5	3/4	50	0	Process	230	81%	3,149
6	3/4	50	0	Drip/Tracer	230	81%	8,736
7	3/4	50	0	Process	230	81%	8,736
8	3/4	50	0	Process	230	81%	8,736
9	3/4	50	0	Process	230	81%	8,736
10	3/4	50	0	Process	230	81%	8,736
11	3/4	50	0	Process	230	81%	8,736
12	3/4	50	0	Process	230	81%	8,736
13	3/4	50	0	Process	230	81%	8,736
14	3/4	50	0	Process	230	81%	8,736
15	3/4	50	0	Process	230	81%	8,736
16	3/4	50	0	Process	230	81%	8,736
17	3/4	50	0	Process	230	81%	8,736
18	3/4	50	0	Process	230	81%	8,736
19	3/4	50	0	Process	230	81%	8,736
20	3/4	50	0	Process	230	81%	8,736
21	1/2	50	0	Process	230	81%	8,736
22	1/2	50	0	Process	230	81%	8,736
23	3/4	50	0	Drip/Tracer	230	81%	8,736
24	3/4	50	0	Process	230	81%	8,736
25	3/4	50	0	Process	230	81%	8,736

Calculations for the annual therms savings use the following equation:

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 the system is pressurized (hrs/yr) = 2,169 annual hours

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

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EC_{Base} = combustion efficiency of boiler (%), 82%

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)

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Steam Trap Replacement	5 years

Calculated Savings:

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	27	1,180	198	1,202
2	27	1,180	198	1,202
3	27	1,180	198	1,202
4	27	1,180	198	1,202
5	27	1,180	198	1,202
6	42	1,180	198	5,188
7	27	1,180	198	3,335
8	27	1,180	198	3,335
9	27	1,180	198	3,335
10	27	1,180	198	3,335
11	27	1,180	198	3,335
12	27	1,180	198	3,335
13	27	1,180	198	3,335
14	27	1,180	198	3,335
15	27	1,180	198	3,335
16	27	1,180	198	3,335
17	27	1,180	198	3,335
18	27	1,180	198	3,335
19	27	1,180	198	3,335
20	27	1,180	198	3,335
21	6	1,180	198	741
22	6	1,180	198	741

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23	10	1,180	198	1,235
24	6	1,180	198	741
25	6	1,180	198	741
			Total	**62,706**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	62,706	62,706	100%	313,530
TOTAL	**62,706**	**62,706**	**100%**	**313,530**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $146,298. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
62,706	$0.67	$41,824	$146,298	$43,894	$43,894	1.7	3.5

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Program	C&I Solutions
Project ID	EA-0000798531
Facility SIC Code	3296 – Mineral Wool
Measures	Boiler Replacement
Annual Consumption	560,090 therms

Project Background

The participant is manufacturer that received incentives from Summit Energy for:

- ECM #1 – Boiler Replacement

The boiler replacement measure saved energy by integrating controls and has a higher efficiency, thus reducing the gas consumption.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement. ADM evaluated the savings associated with this site during a desk review.

Measurement and verification activities are based on the following assumptions:

- The post combustion efficiency of the new boiler was updated from the assumed 85% to the average measured 84.5%. All other boiler combustion efficiencies stayed the same.
- The Load Analysis was updated to use the latest 12 months of usage.

Calculated Savings:

The annual energy savings from replacing a boiler is calculated with the following equation:

Equation 2: Boiler Replacement Annual Energy Savings

$$Annual\ Energy\ Savings\left(\frac{CCF}{yr}\right) = 75{,}135\left(\frac{CCF}{yr}\right) \times \left(1 - \frac{73\%}{78\%}\right)$$

Where:

$$\text{Boiler Annual Usage}\left(\frac{\text{CCF}}{\text{yr}}\right) = 75{,}135\frac{\text{CCF}}{\text{yr}}$$

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$\text{Efficiency}_{\text{Pre}} = \text{CE} = 73\%$

$\text{Efficiency}_{\text{Post}} = 78\%$

Boiler Replacement

Boiler Replacement Annual Energy Savings

Entry #	*Boiler*	*Load Type*	*% of selected load on boiler*	*Capacity (BTU/hr)*	*Pre Efficiency (%)*	*Post Efficiency (%)*	*Usage (CCF/yr)*	*Therms Savings*
1	*Hot Oil Boiler*	*Base*	*100%*	*1,190,000*	*73%*	*78%*	*75,135*	*7,089*
							Total:	**7,089**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Boiler Replacement	7,089	7,089	100%	141,780
TOTAL	**7,089**	**7,089**	**100%**	**141,780**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $86,472. Measure payback is summarized in the table below.

Table 7. Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
7,089	$0.88	$6,238	$86,472	$4,962	$4,962	7.7	13.9

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Program	C&I Solutions
Project ID	EA-0000377012
Facility SIC Code	9223 – Correctional Institutions
Measures	Water Reduction Composting HVAC Controls
Annual Consumption	796,390 therms

Project Background

The participant is a correctional institution that received incentives from Summit Utilities for:

- ECM# 1-Water Reductions (faucet aerators, low flow shower heads)
- ECM# 2 – Composting
- ECM# 3 – HVAC Controls

This facility installed low flow shower heads, faucet aerators, implemented a waste food composting protocol as well as installed HVAC controls to reduce their facilities natural gas usage. This project was completed and closed out over PY2022 and PY2023. This report showcases the project savings for the entire project.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option C – Whole Facility.

Measurement and verification activities are based on a regression analysis using a year of monthly billing data monthly weather data. A regression model is created for the baseline period and the post period. These regression models are then normalized to TMY3 weather data for the project location.

The below figures show the natural gas usage and how it relates to heating degree days (HDD) for the facility.

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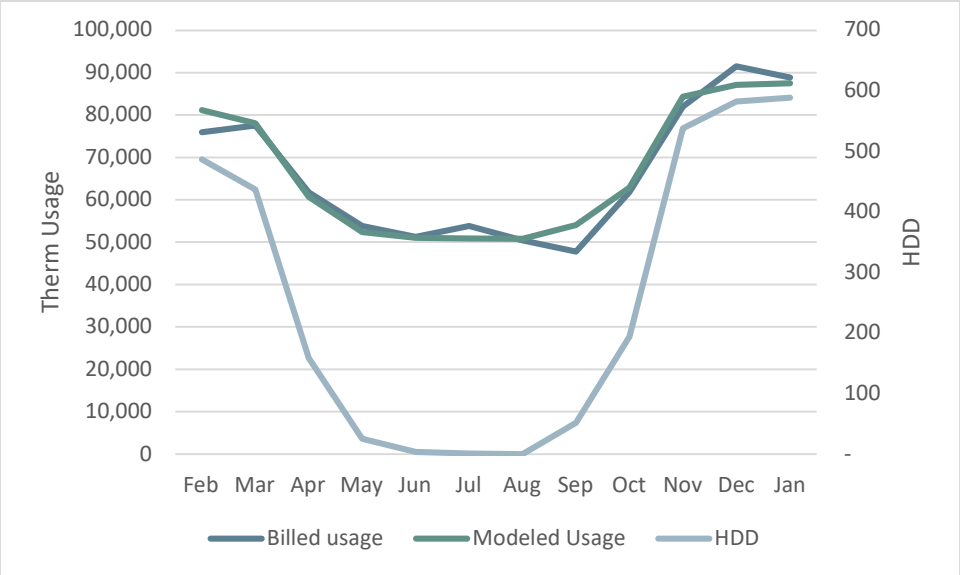
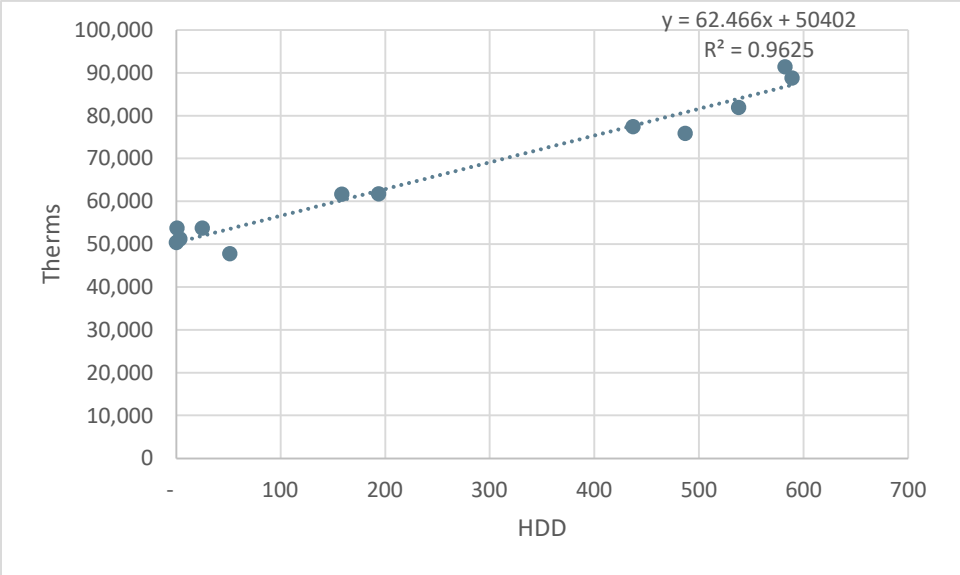
Baseline Condition

Baseline Usage



Baseline Model



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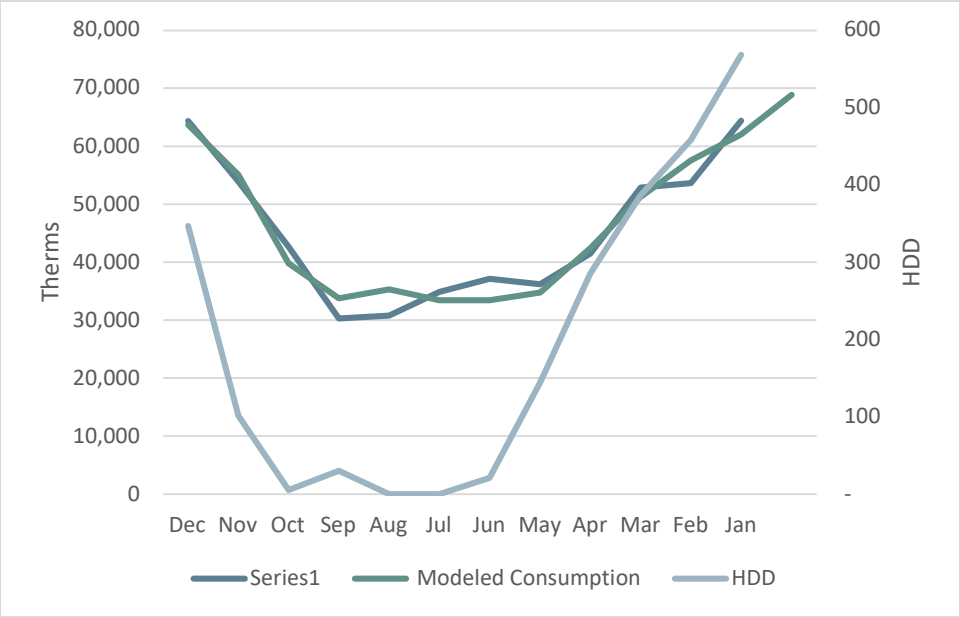
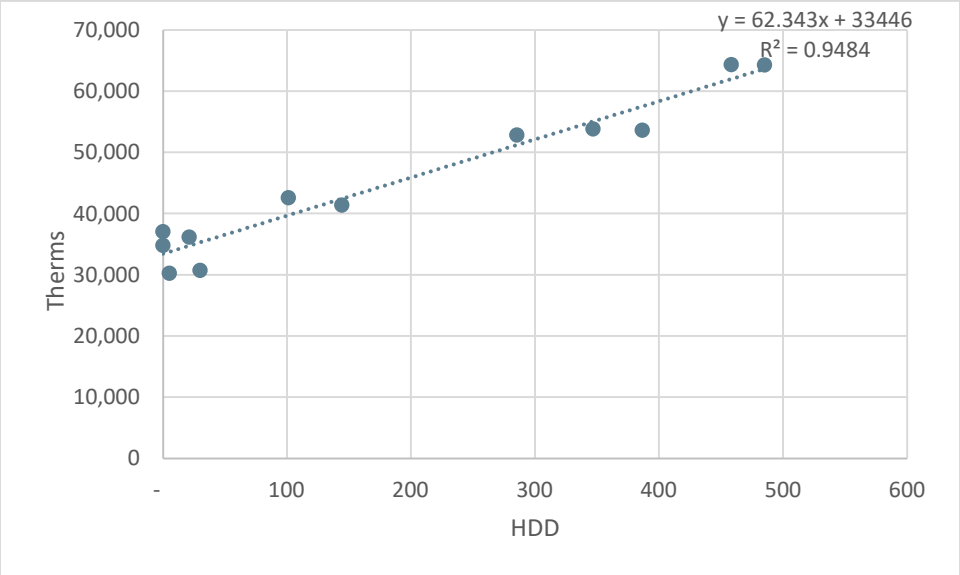
Post Retrofit

Post Usage



Post Model



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Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Water Reduction	10 Years
Composting	20 Years
HVAC Controls	15 Years

Calculated Savings:

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Water Reduction	51,770	45,951	89%	459,513
Composting	9,956	8,837	89%	176,740
HVAC Controls	172,955	153,516	89%	2,302,736
Total	**234,641**	**208,304**	**89%**	**2,938,991**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $684,951. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
208,304	$0.63	$131,232	$684,951	PY2023: $38,665 Total: $134,599	PY2023: $38,665 Total: $134,599	4	5.2

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Program	C&I Solutions
Project ID	EA-0000925616
Facility SIC Code	2899 – Chemicals and Chemical Preparations
Measures	Boiler Replacement Boiler Blowdown
Annual Consumption	781,630 therms

Project Background

The participant is a chemical processor and manufacturer that received incentives from Summit Energy for:

- ECM #1 – Boiler Blowdown
- ECM #2 – Boiler Replacement

The boiler replacement measure saved energy by integrating controls and has a higher efficiency, thus reducing the gas consumption.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement. ADM evaluated the savings associated with this site during a desk review.

Measurement and verification activities are based on the following assumptions:

- The post combustion efficiency of the new boiler was 84%
- The Load Analysis was updated to use the most recent 12 months of usage.

Boiler Blowdown

The annual energy savings boiler blowdown is calculated with the following equation:

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Boiler Blowdown Annual Energy Savings

$$Annual\ Energy\ Savings \left(\frac{CCF}{yr}\right)_i = \frac{Thermal\ Energy\ Savings \left(\frac{BTU}{lb}\right) \times Makeup\ Water\ Savings \left(\frac{lb}{hr}\right) \times AOH \left(\frac{hrs}{yr}\right) \times Load\ Factor(\%)}{100{,}000 \left(\frac{BTU}{CCF}\right) \times Thermal\ Efficiency\ (\%)}$$

Where:

Annual Operating Hours = number of hours facility operates annually

Boiler Efficiency

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

Boiler Blowdown Parameters

Entry #	*Description*	*Operating Hours*	*Boiler Pressure*	*Makeup Water Temperature*
1	Superior 8-5.2-250 (Far end)	4,292	190	67.8

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Boiler Blowdown	12 years
Boler Replacement	20 years

Calculated Savings:

Boiler Blowdown

Boiler Blowdown Annual Energy Savings

Entry #	*Description*	*Capacity (BTU/hr)*	*AOH*	*Boiler Thermal Efficiency (%)*	*Makeup Water Savings (lb/hr)*	*Thermal Energy Savings (BTU/lb)*	*Therms Savings*
1	Superior 8-5.2-250 (Far end)	1,998,000	4,292	79%	29	322	502
						Total	**502**

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Boiler Replacement

The annual energy savings from replacing a boiler is calculated with the following equation:

Boiler Replacement Annual Energy Savings

$$Annual\ Energy\ Savings\left(\frac{CCF}{yr}\right) = 134{,}440\left(\frac{CCF}{yr}\right) \times \left(1 - \frac{79\%}{84\%}\right)$$

Where:

$$\text{Boiler Annual Usage}\left(\frac{\text{CCF}}{\text{yr}}\right) = 30{,}017\frac{\text{CCF}}{\text{yr}}$$

$$\text{Efficiency}_{\text{Pre}} = \text{CE} = 79\%$$

$$\text{Efficiency}_{\text{Post}} = 84\%$$

Calculated Savings:

Boiler Replacement

Boiler Replacement Annual Energy Savings

Entry #	*Boiler*	*Load Type*	*% of selected load on boiler*	*Capacity (BTU/hr)*	*Pre Efficiency (%)*	*Efficiency (%)*	*Usage (CCF/yr)*	*Therms Savings*
1	Superior 8-5.2-250 (Far end)	Base	4%	1,998,000	*79%*	*84%*	*30,017*	**1,726**
							Total:	**1,726**

Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Boiler Blowdown	620	502	81%	9,546
Boiler Replacement	1,726	1,726	100%	34,522
TOTAL	**2,346**	**2,229**	**95%**	**44,068**

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Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
2,229	$0.51	$9,585	$18,795	$1,560	$1,560	15.16	16.53

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Program	C&I Solutions
Project ID	EA-0000962254
Measures	Steam Trap Replacement
Annual Consumption	906,980 Therms

Project Background

The participant is a Medical Center that received incentives from Summit Utilities for:

- ECM #1 - Steam trap replacement

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Measurement and verification activities are based on the following assumptions:

- Annual operating hours for the site are 8,760 hours
- Combustion efficiency is 83% (for both pre-retrofit and post-retrofit condition)

Steam Trap Replacement

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

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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	3/4	80	1	Drip	220	83%	8,760
2	3/4	80	1	Process	220	83%	8,760
3	3/4	80	1	Process	220	83%	8,760
4	3/4	80	1	Process	220	83%	8,760
5	3/4	30	1	Drip	220	83%	8,760
6	3/4	30	1	Drip	220	83%	8,760
7	3/4	30	1	Drip	220	83%	8,760
8	3/4	30	1	Drip	220	83%	8,760
9	3/4	30	1	Drip	220	83%	8,760
10	3/4	30	1	Drip	220	83%	8,760
11	3/4	15	1	Process	220	83%	8,760
12	3/4	15	1	Process	220	83%	8,760
13	1	30	1	Drip	220	83%	8,760
14	3/4	30	1	Drip	220	83%	8,760
15	3/4	30	1	Drip	220	83%	8,760
16	1	15	1	Process	220	83%	8,760
17	3/4	15	1	Drip	220	83%	8,760
18	3/4	30	1	Drip	220	83%	8,760

Calculations for the annual therms savings use the following equation:

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 the system is pressurized (hrs/yr) = 2,169 annual hours

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

EC_{Base} = combustion efficiency of boiler (%), 82%

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

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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)

Measure Life

Estimated Useful Life by Measure

Measure	*EUL*
Steam Trap Replacement	5 years

Calculated Savings:

Steam Trap Replacement Savings

Steam Trap #	*Discharge Rate (lbs/hr)*	*Steam Enthalpy (BTU/lb)*	*Feedwater Enthalpy (BTU/lb)*	*Therms Savings*
1	28	1,187	188	1,461
2	36	1,187	188	3,798
3	56	1,187	188	5,942
4	28	1,187	188	2,921
5	38	1,173	188	1,981
6	38	1,173	188	3,963
7	17	1,173	188	883
8	38	1,173	188	1,981
9	38	1,173	188	3,963
10	38	1,173	188	3,963
11	34	1,164	188	3,553
12	34	1,164	188	3,553
13	38	1,173	188	3,963
14	17	1,173	188	883
15	38	1,173	188	3,963
16	34	1,164	188	3,553
17	34	1,164	188	1,777
18	32	1,173	188	3,331
			Total	**55,431**

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Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Steam Trap Replacement	50,488	55,431	110%	277,157
TOTAL	**50,488**	**55,431**	**110%**	**277,157**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $34,129. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
55,431	$0.49	$27,161	$34,129	$34,129	$34,129	0	1.25

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Program	C&I Solutions
Project ID	EA-0000362793
Facility SIC Code	3999 – Manufacturing Industries, Not Elsewhere Classified
Measures	Burner Upgrade, Roof Insulation, Furnace Upgrade, Smart Thermostat
Annual Consumption	336,015 therms

Project Background

The participant is a large manufacturing facility that received incentives from Summit Utilities for implementing the following:

- ECM #1: Burner Upgrades
- ECM #2: Furnace Upgrade
- ECM #3: Roof Insulation
- ECM #4: Smart Thermostat

Savings will come from upgrading burners, furnace upgrades, insulating the roof, and adding smart thermostats.

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option A - Retrofit Isolation: Key Parameter Measurement.

Burner Upgrades

The following table shows relevant burner parameters required for annual energy savings.

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Burner Parameters

Burner #	Heating Capacity (BTU/hr)	Combustion Efficiency (EC)		EFLH
		Pre	Post	
1	4,000,000	80%	85%	3,160
2	4,000,000	80%	85%	3,160

Calculations for the annual therms savings use the following equation:

Steam Trap Replacement Annual Energy Savings

$$Annual\ \ therms\ Savings = \frac{Capacity \times EFLH \times \left(1 - \frac{EC_{pre}}{EC_{post}}\right)}{Therm\ Conversion\ Factor}$$

Where:

Capacity = Output capacity of burner (BTU/hr)

EFLH = Effective Full Load Hours

EC = Combustion Efficiency of boiler (%)

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

$_{pre}$ = Indicates pre-implementation

$_{post}$ = Indicates post-implementation

Furnace Upgrade

The following table shows relevant furnace parameters required for annual energy savings.

Furnace Parameters

Burner #	Heating Capacity (BTU/hr)	Efficiency, η (%)		EFLH
		Pre	Post	
1	1,200,000	80%	87%	1,734
2	1,200,000	80%	87%	1,734
3	800,000	80%	91%	1,734
4	800,000	80%	91%	1,734
5	800,000	80%	91%	1,734
6	400,000	80%	91%	1,734
7	1,200,000	80%	87%	1,734
8	1,200,000	80%	87%	1,734
9	400,000	80%	91%	1,734

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Calculations for the annual therms savings use the following equation:

Furnace Upgrades Annual Energy Savings

$$Annual\ \ therms\ Savings = \frac{Capacity \times EFLH \times \left(\frac{1}{\eta_{pre}} - \frac{1}{\eta_{post}}\right)}{Therm\ Conversion\ Factor}$$

Where:

Capacity = Output capacity of burner (BTU/hr)

EFLH = Effective Full Load Hours

EC = Combustion Efficiency of boiler (%)

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

$_{pre}$ = Indicates pre-implementation

$_{post}$ = Indicates post-implementation

Roof Insulation

The following table shows relevant insulation parameters required for annual energy savings.

Roof Insulation Parameters

Roof Area (ft²)	***R-Value***		***HDD***	***$Eff_{heating}$***
	Pre	***Post***		
211,219	20	29	2,618	89%

Calculations for the annual therms savings use the following equation:

Equation 3. Steam Trap Replacement Annual Energy Savings

$$Annual\ \ therms\ Savings = \frac{Roof\ Area \times HDD \times 24\left(\frac{hrs}{day}\right)}{R_{pre/post} \times Eff_{heati} \quad \times Therm\ Conversion\ Factor}$$

Where:

Roof Area = Area of roof to be insulated (ft^2)

HDD = Heating Degree Days

$Eff_{heating}$ = Efficiency of heating system (%)

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R = R-value of insulation ($ft^2 \cdot °F \cdot h/BTU$)

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

$_{pre}$ = Indicates pre-implementation

$_{post}$ = Indicates post-implementation

Smart Thermostats

Annual therms savings was calculated using the following equations:

Unoccupied Supply Air Temperature

$$T_{SA,H,Unocc}(°F) = T_{SA,H}(°F) - T_{Setback}(°F)$$

Mixed Air Temperature

$$\text{mixed air temperature} = \begin{cases} \text{when occupied, } T_{MA.H,Occ} = \frac{(V_{SA} - V_{OA}) \times T_{RA,H} + V_{OA} \times T_{OA}}{V_{SA}} \\ \text{when unoccupied, } T_{MA.H,Unocc} = T_{RA,H} \end{cases}$$

Occupied BTUs

$$BTU = 1.08\left(\frac{\text{Btu Min}}{\text{Ft}^3\ °\text{F Hr}}\right) \times V_{SA} \times Load_{H,Occ} \times \left(T_{SA,H}(°F) - T_{MA,H,Occ}(°F)\right)$$

Unoccupied BTUs

$$BTU = 1.08\left(\frac{\text{Btu Min}}{\text{Ft}^3\ °\text{F Hr}}\right) \times V_{SA} \times Load_{H,Unocc} \times \left(T_{SA,H,Unocc}(°F) - T_{MA,H,Unocc}(°F)\right)$$

Therms Savings

$$\text{Natural Gas Savings (Therms)} = \frac{BTU_{\ Existing} - BTU_{Proposed}}{100{,}000\left(\frac{BTU}{Therm}\right) \times Efficiency_{Heating}(\%)}$$

Where:

$T_{SA,H}$ = Supply Air Temperature

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$T_{setback}$ = Setback temperature

V_{SA} = Supply Air Flow Rate (CFM)

V_{OA} = Outdoor Air Flow Rate

$T_{RA,H}$ = Return Air Temperature

T_{OA} = Outside Air Temperature

T_{RA} = Return Air Temperature

$Load_{H,Occ}$ = Occupied Heating Load

$Load_{H,Unocc}$ = Unoccupied Heating Load

$TMA_{,H,Occ}$ = Mixed Air Temperature

Measure Life

Estimated Useful Life by Measure

Measure	***EUL***
Burner Upgrades	12 years
Furnace Upgrades	20 years
Roof Insulation	20 years
Smart Thermostat	11 years

Calculated Savings:

Burner Upgrades

Burner Upgrade Savings

Burner #	***Heating Capacity (BTU/hr)***	***Combustion Efficiency (EC)***		***EFLH***	***Therms Savings***
		Pre	***Post***		
1	4,000,000	80%	85%	3,160	7,435
2	4,000,000	80%	85%	3,160	7,435
				Total	**14,871**

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Furnace Upgrades

Furnace Upgrade Savings

Burner #	*Heating Capacity (BTU/hr)*	*Efficiency, η (%)*		*EFLH*	*Therms Savings*
		Pre	*Post*		
1	1,200,000	80%	87%	1,734	2,093
2	1,200,000	80%	87%	1,734	2,093
3	800,000	80%	91%	1,734	2,096
4	800,000	80%	91%	1,734	2,096
5	800,000	80%	91%	1,734	2,096
6	400,000	80%	91%	1,734	1,048
7	1,200,000	80%	87%	1,734	2,093
8	1,200,000	80%	87%	1,734	2,093
9	400,000	80%	91%	1,734	1,048
				Total	**16,755**

Roof Insulation

Roof Insulation Savings

Roof Area (ft^2)	*R-Value*		*HDD*	*$Eff_{heating}$*	*Therms Savings*
	Pre	*Post*			
211,219	20	29	2,618	89%	2,130
				Total	**2,130**

Smart Thermostat

Smart Thermostat Savings

$Efficiency_{Heating}$	*$BTU_{Existing}$*	*$BTU_{Proposed}$*	*Therms Savings*
89%	9,094,927,289	6,153,991,686	32,976

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Overall project savings are as follows:

Overall Project Savings

Measure	*Expected Annual therms Savings*	*Realized Annual therms Savings*	*Realization Rate*	*Lifetime therms Savings*
Burner Upgrade	14,868	14,871	100%	178,447
Furnace Upgrade	13,331	16,755	126%	335,104
Roof Insulation	7,183	2,130	30%	42,600
Smart Thermostat	32,976	32,976	100%	494,640
TOTAL	**68,358**	**66,732**	**98%**	**1,050,791**

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $279,426. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
66,732	$0.58	$38,705	$279,426	$46,712	$46,712	3.3	7.2

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Program	C&I Solutions
Project ID	EA-0000583141
Facility SIC Code	2013 – Sausages and Other Prepared Meats Products
Measures	Boiler Controls
Annual Consumption	2,073,805

Project Background

The participant is a meat-based pet food manufacturer that received incentives from Summit Utilities for:

- ECM #1 – Boiler Controls

M&V Methodology

The M&V effort for this project follows the guidelines of the 2021 International Performance Measurement and Verification Protocol (IPMVP) Option C – Whole Facility. Billing and production data were gathered over 8 weeks before and after the project was implemented. This data was used to model the relationship between production and energy use so that baseline energy use could be normalized to post-install production levels. The savings were the difference between modeled baseline energy use and measured post-installation energy use, extrapolated over a one-year period.

Measurement and verification activities are based on the following assumptions:

- The plant operates 51 weeks/yr
- Facility energy consumption does not correlate to weather.
- During the baseline period, the customer operated one Saturday every three weeks and had a cleaning operation on Sunday.
- During the reporting period, the customer increased production by operating every Saturday and along with a cleaning operation on Saturday.
- It was noticed there was a shift in the data. Adjusting the data back 1 week corrected this issue as seen in the final calculations.

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Energy Savings

Weekday Savings Analysis

A separate weekend and weekday analysis were completed to account for the shift and increase in production over the weekend.

Baseline

$$Adj\ CCF\ pre\ \left(\frac{CCF}{week}\right) = A\ x\ Production_i + B$$

Where:

A – Slope = 0.006707718

B – Intercept = 17,222.45732

Reporting

The reporting period data was used without adjustment.

Period Usage Weekday

$$Baseline\ Usage\ Weekday\ \left(\frac{CCF}{pd}\right) = \sum_{i=1}^{8} Adj\ CCF\ pre\left(\frac{CCF}{week}\right)_i$$

$$Reporting\ \ Usage\ Weekday\ \left(\frac{CCF}{pd}\right) = \sum_{i=1}^{8} CCF\ post\left(\frac{CCF}{week}\right)_i$$

Annual Usage Weekday

$$Annual\ Usage\ Pre\ Weekday\ \left(\frac{CCF}{yr}\right) = Baseline\ Usage\ Weekday\ \left(\frac{CCF}{pd}\right) x \left(\frac{\frac{Weeks}{yr}}{\#\ of\ Weeks}\right)$$

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$$Annual\ Usage\ POST\ \left(\frac{CCF}{yr}\right) = Reporting\ Usage\ Weekday\ \left(\frac{CCF}{pd}\right) x \left(\frac{\frac{Weeks}{yr}}{\#\ of\ Weeks}\right)$$

Where:

Weeks/yr = 51, # number of weeks in a year assuming 1 week downtime.

# of weeks = 8, # of weeks in logging period,

Weekend Savings Analysis

Pre-Energy Intensity

$$Energy\ Intensity_{pre} = \frac{\sum_{i=1}^{8} Weekday\ usage\ pre\ (CCF)}{\sum_{i=1}^{8} Weekday\ production\ pre\ (lb)} = 0.01037\ CCF/lb$$

Post-Energy Intensity

$$Energy\ Intensity_{post} = \frac{\sum_{i=1}^{8} Weekend\ usage\ post\ (CCF)}{\sum_{i=1}^{8} Weekend\ production\ post\ (lb)} = 0.00929\ CCF/lb$$

Modeled Annual Production

$$Modeled\ annual\ production\ \left(\frac{lb}{yr}\right) = post\ production\ lb\ x \left(\frac{\frac{Weeks}{yr}}{\#\ of\ Weeks}\right)$$

Annual Usage Weekend

$$Annual\ Usage\ Pre\ weekend \left(\frac{CCF}{yr}\right) = Energy\ Intensity_{pre}\ x\ Modeled\ annual\ production\ \left(\frac{lb}{yr}\right)$$

$$Annual\ Usage\ Post\ weekend \left(\frac{CCF}{yr}\right) = Energy\ Intensity_{post}\ x\ Modeled\ annual\ production\ \left(\frac{lb}{yr}\right)$$

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Annual Therm Savings

CCF savings was converted to annual therm savings using the following formulas.

$$Pre\ Annual\ Energy\ Usage\ \left(\frac{CCF}{yr}\right) = Annual\ Usage\ Pre\ \ Weekday\ \left(\frac{CCF}{yr}\right) + \ Annual\ Usage\ Pre\ weekend \left(\frac{CCF}{yr}\right)$$

$$Post\ Annual\ Energy\ Usage\ \left(\frac{CCF}{yr}\right) = Annual\ Usage\ Post\ Weekday\ \left(\frac{CCF}{yr}\right) + \ Annual\ Usage\ Post\ weekend \left(\frac{CCF}{yr}\right)$$

$$Annual\ savings\ \left(\frac{CCF}{yr}\right) = \ Pre\ Annual\ Energy\ Usage\ \left(\frac{CCF}{yr}\right) - \ Post\ Annual\ Energy\ Usage\ \left(\frac{CCF}{yr}\right)$$

Boiler Control Savings

Category	***Description***	***Pre Energy (CCF/yr)***	***Post Energy (CCF/yr)***	***Energy Savings (CCF/yr)***	***Energy Realization Rate***
Weekday	Boiler Control Weekday Savings	2,039,760	1,503,161	536,599	100%
Weekend	Boiler Control Weekend Savings	636,731	570,644	66,087	1,134%
	Total	**2,767,491**	**2,073,805**	**602,686**	**111%**

Measure Life

Estimated Useful Life

Measure	***EUL***
Boiler Controls	12 years

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Calculated Savings:

This project was split across program years. This report shows savings of the entire project and not the partial project close outs. Overall, project savings are as follows:

Overall Project Savings

Measure	*Expected Annual Therms Savings*	*Realized Annual Therms Savings*	*Realization Rate*	*Lifetime Therms Savings*
Boiler Controls	542,425	602,868	111%	7,232,228
TOTAL	**542,425**	**602,868**	**111%**	**7,232,228**

The energy realization rate is 111%. This high realization rate is due to the way weekends and weekdays were treated in the calculations. The post-data seemed offset by one week and when that offset was corrected, the curve fits for both weekday and weekend data improved significantly. The ex ante calculations only corrected the data for weekdays, not weekends which resulted in their model assuming less weekend energy use in the post case. This led to the ex ante Post-Install Energy Intensity being higher than the ex post Post-Install Energy Intensity. Since post-install energy is based on energy intensity, the realized savings were higher than expected.

This project received a partial savings clam in PY2022. It's claimable savings for PY2023 are:

- 301,343 therms

Measure Cost, Incentive, & Payback

The Evaluators reviewed the invoices associated with this project and verified a cost of $399,323. Measure payback is summarized in the table below.

Cost, Incentive, and Payback

Annual Therms Savings	*Cost per Therm*	*Annual Energy Cost Savings*	*Incremental Cost*	*Base Incentive*	*Adjusted Incentive*	*Payback w/Incentive*	*Payback w/o Incentive*
602,868	$0.40	$241,147	$399,323	$286,727	$286,727	.47	1.66

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14 Appendix B: Deferred Replacement Cost Calculations

This appendix presents the calculations of deferred replacement costs for residential and commercial tankless water heaters.

	Inputs		
Measure Type=	Res Tankless (ROB + NC)		
Nominal Discount Rate=	5.66%		
Inflation Rate=	1.9%		
Real Discount Rate=	3.7%		
	Program	**Baseline**	
Equipment Type=	Tankless WH	Storage WH	
Effective UsefulLife=	20	11	
Remaining Useful Life=			
PW(EUL)=	13.97	8.91	
PW(RUL)=			
Installed Cost=	$1,219	$614	
Deferred Replacement Cost=		$ 348.90	
PWF Formula=		$ 348.90	
Incremental Cost=	$ 256.10		
	Assumptions:	**Tech Cost**	**Labor**	**Total Cost**
	Tankless Year 1 Full Cost	$1,219		$1,219
	Storage Tank 2018 Cost	$614		$614
	Source: Illinois TRM			

Figure 14-1 Residential Tankless WH Deferred Replacement Cost Calculation

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	Inputs				
Measure Type=	C&I Tankless (ROB + NC)				
Nominal Discount Rate=	5.66%				
Inflation Rate=	1.9%				
Real Discount Rate=	3.7%				
	Program	**Baseline**			
Equipment Type=	Tankless WH	Storage WH			
Effective UsefulLife=	20	15			
Remaining Useful Life=					
PW(EUL)=	13.97	11.36			
PW(RUL)=					
Installed Cost=	$1,219	$614			
Deferred Replacement Cost=		$ 140.91			
PWF Formula=		$ 140.91			
Incremental Cost=	$ 464.09				
	Assumptions:	**Tech Cost**	**Labor**	**Total Cost**	
	Tankless Year 1 Full Cost	$1,219		$1,219	
	Storage Tank 2018 Cost	$614		$614	
	Source: Illinois TRM				

Figure 14-2 C&I Tankless WH Deferred Replacement Cost Calculation

	Inputs	
Measure Type=	Furnace Early Replacement	
Nominal Discount Rate=	5.66%	
Inflation Rate=	1.9%	
Real Discount Rate=	3.7%	
	Program	**Baseline**
Equipment Type=	HE Furnace	SE Furnace
Effective UsefulLife=	20	20
Remaining Useful Life=		5
PW(EUL)=	20.00	20.00
PW(RUL)=		$4.49
Installed Cost=	$ 2,548	$ 2,011
Deferred Replacement Cost=		$ 1,364.59
PWF Formula=		$ 1,559
	$ 1,183.41	

Figure 14-3 Residential Furnace Early Retirement Deferred Replacement Cost Calculation

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15 Appendix C: Net-to-Gross Survey Outcomes

15.1 Equipment Rebates

The PY2023 Equipment Rebates survey asked questions about decision-making for smart thermostats, water heaters, and furnaces independently to determine measure-level net-to-gross ratios.

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Were you planning to complete the same [MEASURE] project in 2023 before learning about the program?	Water Heater	Smart Thermostat	Furnace
	Response (n = 92)	Response (n = 67)	Response (n = 74)
Yes	66%	57%	55%
No	34%	43%	45%
Would your budget for the planned project have accommodated the project's full cost if you had not completed the project through the program?	**Response (n = 61)**	**Response (n = 38)**	**Response (n = 41)**
Yes	61%	82%	73%
No	21%	11%	15%
I don't know	18%	8%	12%
If the equipment was not available from the program, would you have completed the same project or would you have done something different?	**Response (n = 92)**	**Response (n = 67)**	**Response (n = 74)**
Same project	54%	55%	49%
Something different	26%	16%	26%
Would not have done anything at all	1%	18%	1%
I don't know	18%	10%	24%
Would it have been the same level of energy efficiency, higher energy efficiency, or lower energy efficiency?	**Response (n = 24)**	**Response (n = 11)**	**Response (n = 19)**
Same efficiency	13%	36%	11%
Higher efficiency	4%	9%	5%
Lower efficiency	71%	36%	58%
Not sure	13%	18%	26%
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?	**Response (n = 66)**	**Response (n = 46)**	**Response (n = 73)**
Yes	50%	42%	42%
No	22%	21%	21%
I don't know	28%	37%	37%

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APPENDIX B – CARBON PRICING CALCULATOR INPUTS

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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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APPENDIX C – MARKETING SAMPLES

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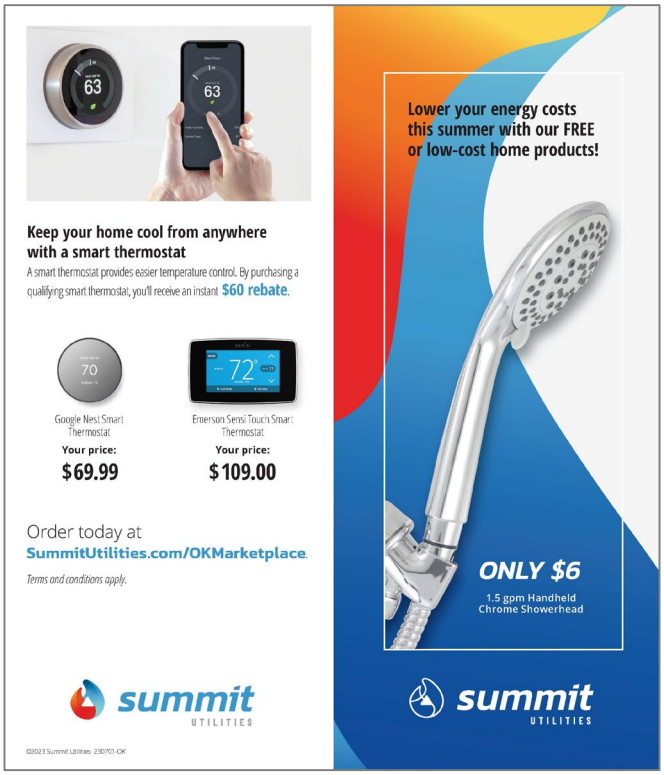
Conservation Improvement Program

Bill inserts

July



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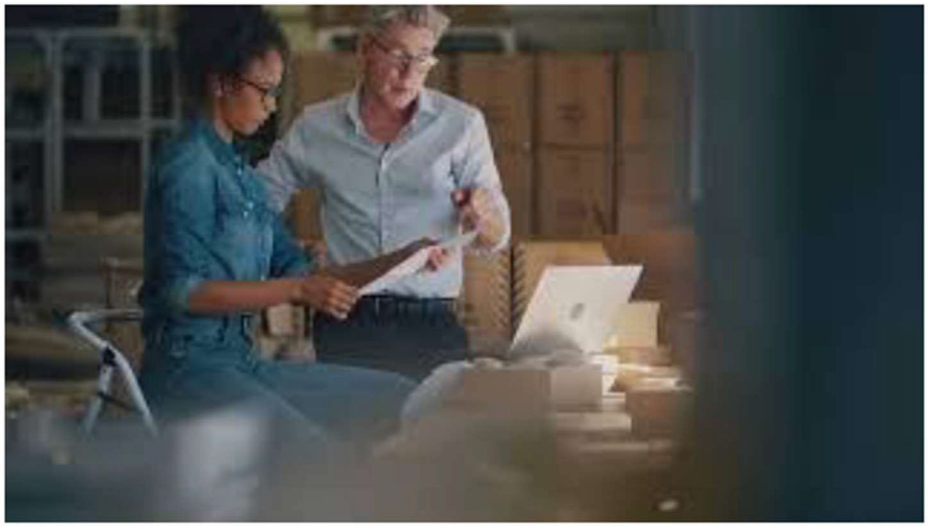
Digital ads

Video digital ads



https://youtu.be/TeAAoCGIrPg

Facebook

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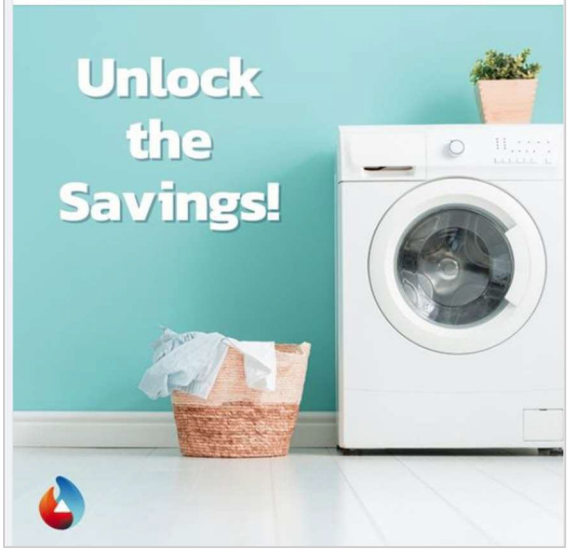
31 posts for Energy Efficiency

Summit Utilities
August 7 ·

Unlock the Savings! Browse our exclusive rebates and savings programs on natural gas appliances and equipment. Upgrade or switch to energy-efficient equipment and enjoy cozy comforts while keeping your wallet happy. Visit https://ow.ly/K3Qb50PnCRw today!

#SmartSavings #CozyComfort #energyefficiency #energyefficient #energyconservation #energysavings #rebates #smartsavings



Summit Utilities
June 28 ·

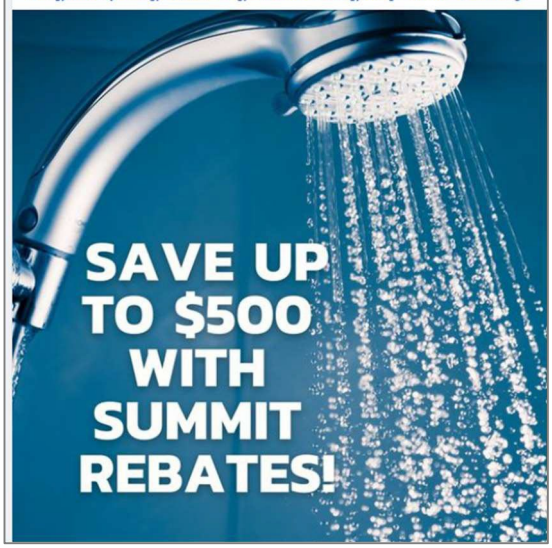
Here comes the sun...and the savings! Take advantage of our smart thermostat summer savings offer to save big for seasons to come! Visit our online marketplace today to enjoy additional savings on a variety of smart thermostats for as low as $29. To shop, visit https://ow.ly/ee3b50OYEr8 for Arkansas residents and https://ow.ly/s9no50OYEr7 for Oklahoma residents.

Sales offer valid through promotion dates only - ends July 14, 2023. To order products you must be a Summit Utili... See more

Summit Utilities
July 24 ·

Ever run out of hot water in the middle of a shower? Check out our rebates on energy-efficient, natural gas tankless water heaters. Upgrading or switching to a new natural gas water heater keeps water temps comfortable for steamy, relaxing showers. Saving money and energy is easy with great rebate opportunities! For more information, visit: https://ow.ly/KxUf50PaZSZ.

#energyefficiency #energyefficient #energyconservation #energysavings #rebates #smartsavings



Summit Utilities
July 7 ·

Take advantage of this deal while it's still hot! Smart thermostats make it a breeze to help save energy, money, and keep you comfortable year-round. Shop our online marketplace to take advantage of additional savings on a variety of smart thermostats for as low as $29. To shop, visit https://ow.ly/iECE50P6scu for Arkansas residents and https://ow.ly/j9Pk50P6sct for Oklahoma residents.

Sales offer valid through promotion dates only - ends July 14, 2023. To order products yo... See more

Summit Utilities
October 26 at 8:03 AM ·

Winter weather will be here before you know it, and now is the perfect time to upgrade to a high-efficiency natural gas furnace! 🔥 Take advantage of our rebates and save on the latest energy-saving technology. 😄 It's an easy and affordable way to make your home cozy and warm this winter! Visit https://summitnaturalgas.com/Rebates to learn more!
#Rebates #EnergyEfficiency #HomeComfort

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Summit Connect QUARTERLY NEWSLETTER

At Summit, we believe giving back to the communities we serve makes us stronger as a company.

Our future depends on healthy, vibrant communities and opportunities for our friends and neighbors to fulfill their potential. That's why community giving is so important to us.

Learn More

Savings Tips When Winter Weather Sets In

Tips that may help you make a difference when it comes to energy conservation

Get the Tips

Understanding and Managing Higher Energy Bills

Receiving higher than normal billscan be stressful, but we are here to keep youin the know

Learn More

Start the New Year with Savings

Rebates, programs, and services to help you save money andbe more energy efficient

Start Saving

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Soup's On!

Stay warm this Winter with this delicious homemade Chicken Noodle Soup

Get Cooking

Be Prepared for Winter Weather

Use our safety checklist to make sure you are winter-weather ready

Check the List

We're Here to Help

We partner with local weatherization and low-income assistance providers to aid our customers who need a little extra help

Explore the Options

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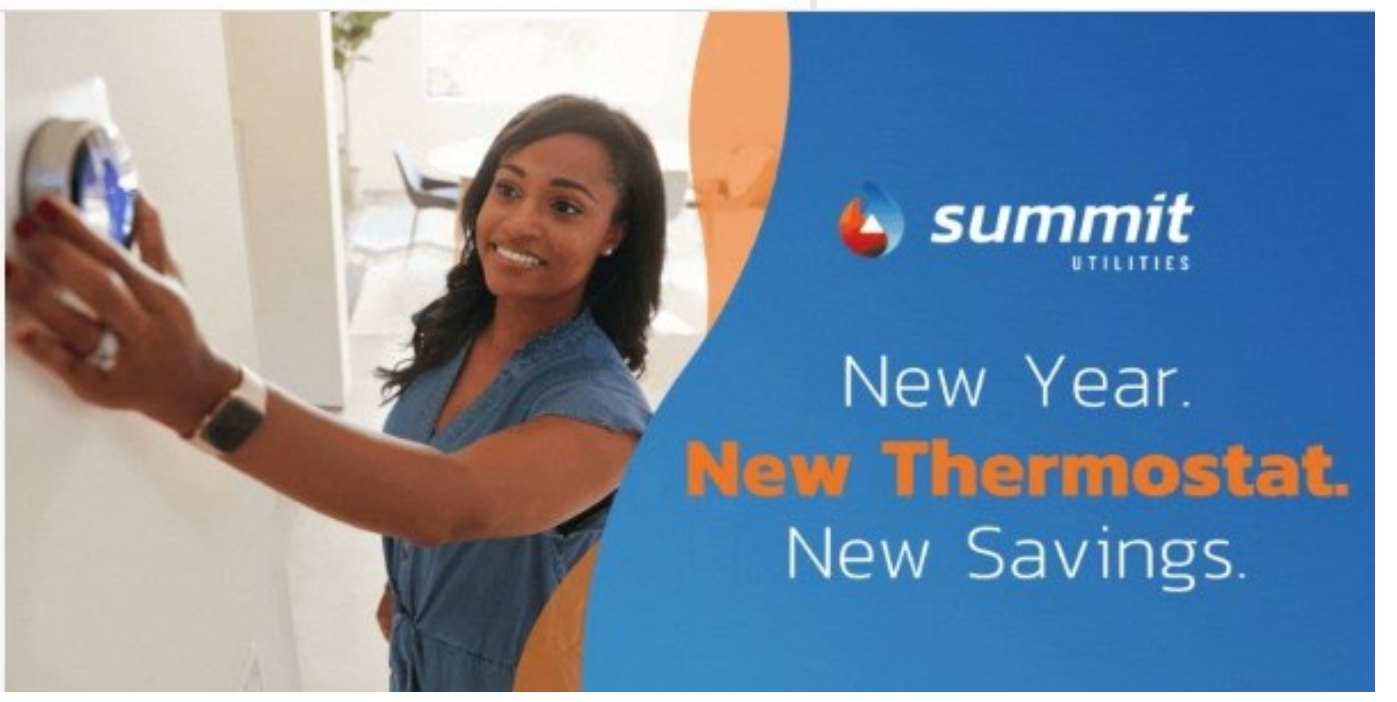

In 2023, take control of your comfort and savings with a smart thermostat.

Did youknow smart thermostats offer convenient features to help save energy and keep you comfortable? This year, give yourself the gift that keeps on giving.

Shop our onlIne marketplace today through February 21, 2023, to take advantage of additional savings on a variety of smart thermostats for as low as $35.

Hurry! This sale Is for a limited time only!

Start Shopping

Smart thermostats offer an array of benefits, including:

Convenience:
Smart thermostats allow you to control your home's temperature from your smartphone, tablet, or computer.

Increased Energy Efficiency:
Smart thermostats can learn your heating and cooling preferences, and automatically adjust the temperature when you're away or sleeping. This can help lead to energy savings, as you're not heating or cooling your home when no one is there.

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Easy to Program:
Smart thermostats are designed to be easy to program and set up, and some even adapt to your schedule andpreference over time. This means you can set them and forget theml

Cost Savings:
By using a smart thermostat, you can help save money on your energy bills. By controlling home temperatures when your house is empty, you're being more energy efficient, which can lead to cost savings over time.

Interested in exploring smart thermostat offers through our online storefront?

Shop Now

Want to learn even more about the amazing benefits a smart thermostat offers?

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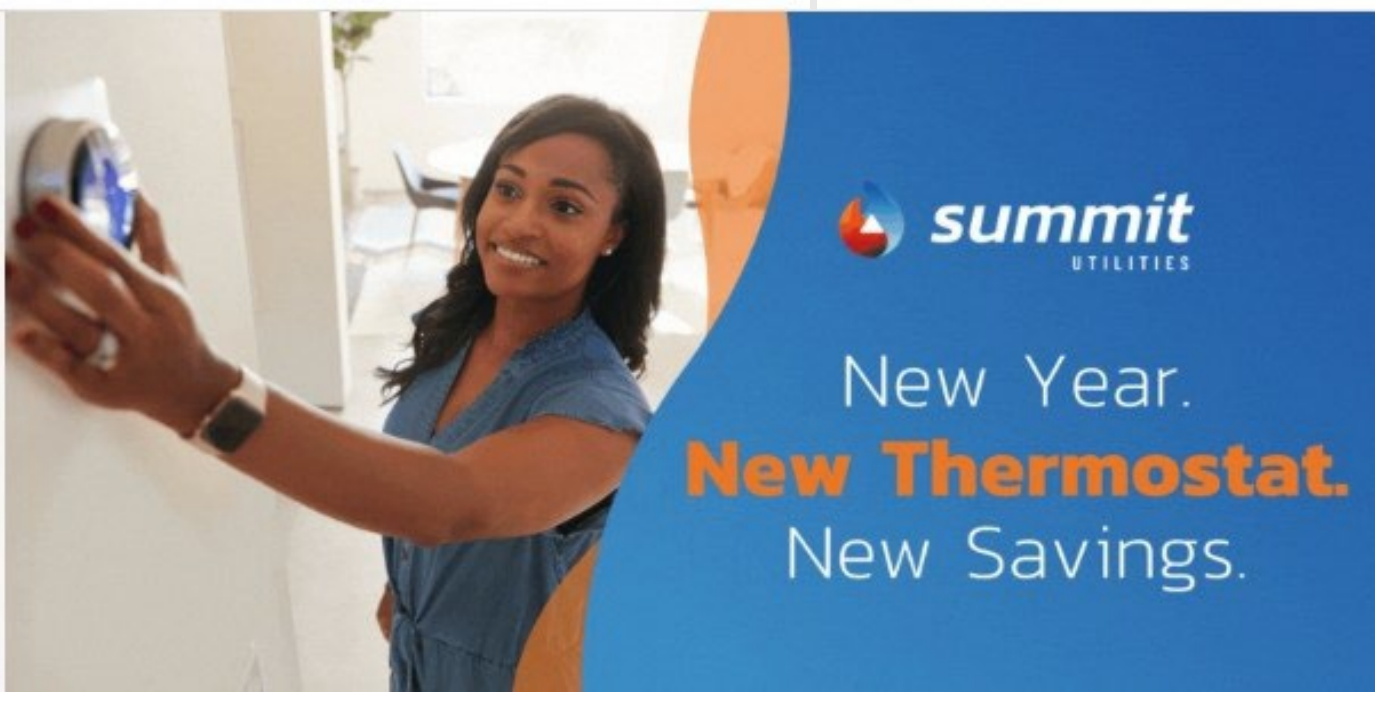

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Energy Efficiency
By learning your preferences & automatically adjusting the temperature when you're away or sleeping.

Easyto Program
This means you can set them and forget them!

Cost Savings
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Easyto Program
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Cost Savings
By controlling the temperature when your home is empty, you're being more energy efficient, which can lead to cost savings over time.

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Summit Connect QUARTERLY NEWSLETTER

We're here to help!

Fromkeeping you in the know about natural gas costs to information about payment assistance offerings, our goal is to provide you with the best experience possible. Visit SummitCares.com to watch educational videos, hear messages from Summit leadership, andlearn more about helpful payment options like Average Monthly Billing (AMB) plans.

Tell Me More

Don't Make a Dig Mistake This Planting Season

If you're planning an outdoor digging project, call 811 before putting a shovel in the ground. It's free, it's safe, and it's the law!

More Info

Your "Go-To" Checklist to Reduce Energy Costs

Use this helpful checklist to help you accomplish tasks and to-do's to make simple updates to your home.

Learn the Tips

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Simple & Tasty BLT Pasta Salad

When the weather's nice, the last thing you want to do is spend all day in the kitchen. Luckily, here is a simple, tasty, and quick recipe to provide a delicious meal the whole family will enjoy.

Get Cooking

Were you Impacted by the severe weather and tornadoes that hit Arkansas on March 31st?

If so, Summit created an information hub to help provideresources and information.

Learn More

If **you have questions or concerns about your bill or your natural gas account, please reach out to us.**

Our team is available Monday-Friday, 7am - 7pm:

Arkansas and Texarkana: 800-992-7552

Oklahoma: 866-275-5265

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Sman thermostats make it a breeze to help save energy and keep you comtonable year-round. Residential customers can shop our online marketplace today through July 14, to take advantage of additional savings on a variety of sman thermostats tor as low as $29.99.

Don't let this deal melt away! This sale is for a limited time only.

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Shop the Sale

Google Nest Snow

$29.99

Emerson Sensi

$39.00

Ecobee 3e Lite

$69.99

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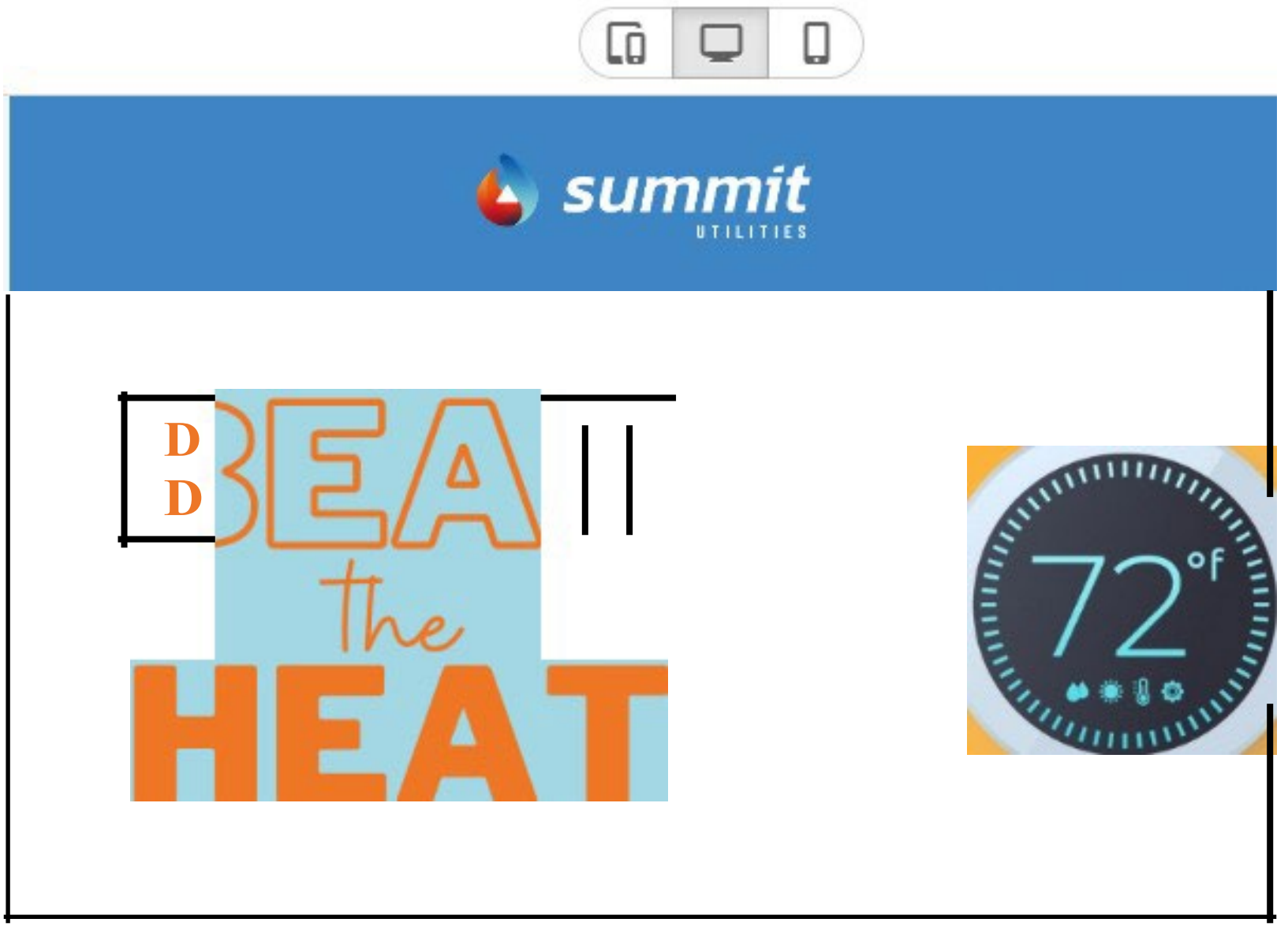

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HTML Version

Smart thermostats make it easy to help save money, energy, and keep you comfortable year-round. Residential customers can shop our online marketplace today through September 5, to take advantage of additional savings on a variety of smart thermostats for as low as $29.

Ace Your Energy Efficiency Goals:

Start the school year off with smart choices by shopping now... This sale is for a limited time only.

Shop the Sale

APSC FILED Time: 5/15/2024 10:54:01 AM: Recvd 5/15/2024 10:53:10 AM: Docket 07-081-TF-Doc. 612

Emerson Sensi

[$29.00)

Ecobee 3e Lite

[$69.99)

Emerson Sensi Smart Touch

[$79.99)

Don't forget the extra credit!

Discover bonus savings with energy-saving showerheads and free water kit bundles

Claim Yours Today

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Save money and energy with rebates and other programs from Summit Utilities!

Our money-saving programs and rebates are designed to help your budget and save energy. Whether it's a long-term solution or an easy low- or no-cost measure, we want to help yoube more energy-efficient andkeep your hard-earned cash for the things you enjoy!

An energy-efficient home can help lower the costs of monthly energy bills. When replacing equipment, opt for high-efficiencymodels that can help with energy and monetary savings you'll benefit from for years!

Up to a $500 Furnace Rebate

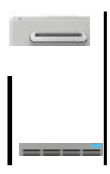
Bring down the cost of your heating bills when you upgrade to a 95% or higher energy-efficient natural gas furnace.

Get the Details

$60 Smart Thermostat Rebate

Smart thermostats can be programmed to control the temperature of your home based on your schedule. Purchase a qualifying smart thermostat tor your home from any retailer and take advantage of extra savings with our rebate!

Learn More



Up to a $900 Water Heater Rebate

Whether you go with a tank or tankless style, you'll save energy andmoney with a high-efficiencynatural gas water heater.

Check it Out

$450 Gas Dryer & $300 Gas Range Rebates

Save big when you replace your electric clothes dryer or stove with natural gas appliances!

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Learn More

Our programs and rebates are only available *tor* homes served with natural gas*trom* Summit Utilties. Applicants have up to 120 days from theinstallation of the natural gas equipment or natural gas meter to submit a rebate application. If the 120 dayshavepassed, the applicant may still be eligible for a rebate if theprogram year budget has not been exhausted.Terms and conditions apply - click here for details.

Applying for rebates is as easy as 1-2-31

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Purchase and install your qualifying equipment.

8

Visit the rebates Rag and click the link to apply online or download the applicable form to mail in.

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Submit your rebate form and receive your payment in 6-1O weeks.

Shop our DIV Marketplace!

Save big on energy-efficient products like smart thermostats, low-flow showerheads, and tree water-savingkits you can install yourself!

Keep your home comfortable year-round with a smart thermostat! Save big and receive an **Instant $60 rebate.**

Start Shopping

These low- or no-cost, easy-to-installshowerheads and faucet aerators are designed to reduce hot water usage without sacrificing comfort. Best of all, they can lower energy costs.

Save Now

FREE water-saving bundles include everything you need to help save money, stay comfortable, andbe more energy efficient.

Get the Kit

Please Note: You must create a new account for the online marketplace, separate from your existing Summit Utilities account.

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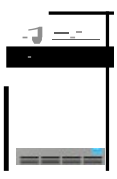

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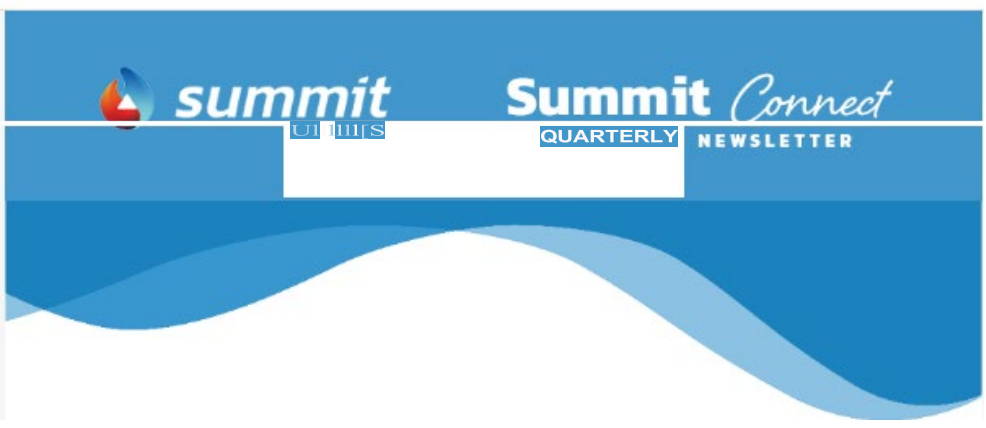

Sizzling Summer Savings!

Did you know that we offer rebates on qualifying heating, water-heating and smart thermostat equipment?

Tell Me More

Temperatures are rising, but saving energy can be a breeze. Get a smart thermostat today for as low as $29. Act now before the sale ends on July 14.

Start Shopping

Why the Pros Go With Natural Gas Grills

Outdoor grilling using natural gas is one of the most convenient ways to serve tasty, sizzling meals the whole family will love.

Beat the Heat: Tips to Stay Comfortable in the Summer Sun

In the heat of the summer, it's important to know how to stay cool while safely enjoying the sun.

Create Your Dream Backyard with the Help of Natural Gas

Whether you want to entertain, socialize, or grill up a great dinner for your family and friends, the backyard is the perfect place to relax.

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Team Summit Assists At Special Olympics Summer Games

At Summit Utilities, we wouldn't exist if it weren't for the communities we serve. Team members volunteered at the Special Olympics Summer Games in Searcy, AR.

Discover More

Questions About Your Bill?

We've listened to your frustrations and feedback over the past several months and are making improvements to our billing and customer experience platforms to serve you, our valued customers, better.

Click Here

For Important bitting Information, account updates, and In case of emergencies, It's Important that we know how to reach you!

Login to your account or call us to update your contact information.

Login Now

If **you have questions or concerns about your bill or your natural gas account, please reach out to us.**

Our team is available Monday-Friday, 7am - 7pm:
Arkansas and Texarkana: 800-992-7552

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Summit Connect QUARTERLY NEWSLETTER

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The leaves are golden, and so are money-saving opportunities!

In honor of Energy Efficiency Day, October 4th, shop our online marketplace today through October 10th to take advantage of additional savings on a variety of smart thermostats for as low as $39.99.

FREE SHIPPING & SALES TAX PAID!

Start Shopping

Sales offer valid through promotion dates only• ends October 10, 2023. To order products, you must be a Summit Utilfties Arl<ansas residential natural gas customer. You will need your account number to complete your order.

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Bonus Savings: FREE Water-Saving Bundles!

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Claim Yours

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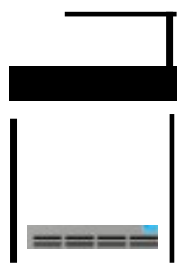
Bring down the cost of your heating bills when you upgrade to a 95% or higher energy-efficient natural gas furnace.

Get The Details



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Whether you go with a tank or tankless style, you'll save energy and money with a high-efficiency natural gas water heater.

Check It Out

Why Energy Efficiency Matters In Your Home

Frominsulation to installation, there's an opportunity in every home to make changes to create a space that's energy-smart.

Read More

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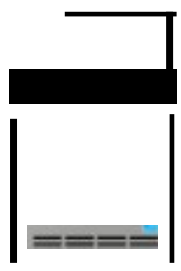

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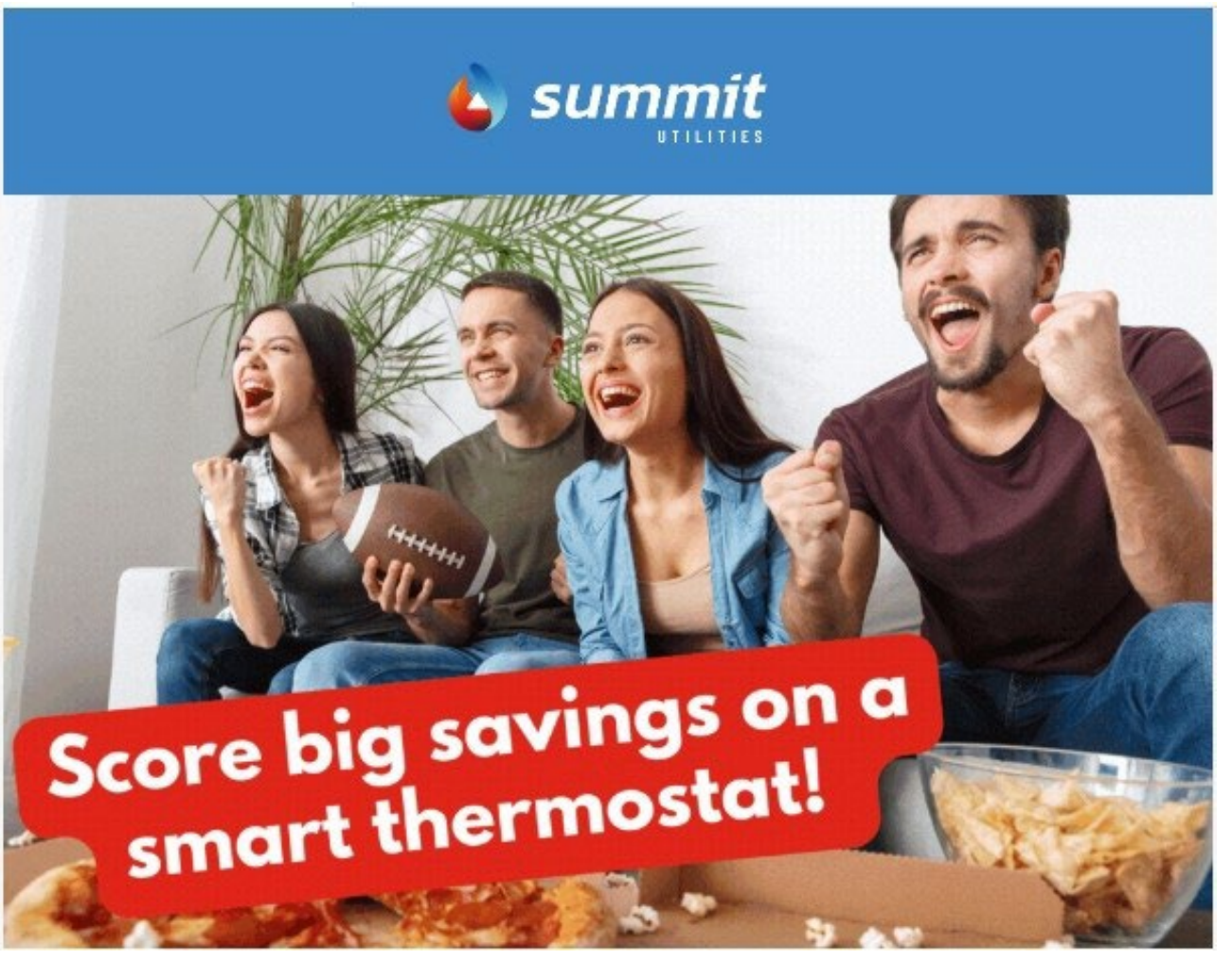

Let's tackle a more efficient home and get outfitted with the latest in smart technology with a smart thermostat for your home. Order yours today for as low as $39, and start saving energy and money just in time for cooler weather!

Visit our online store to make sure you don1miss out on these limited-time deals!

Start Shopping

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Google Nest

$39.99

Emerson Sensi Smart Touch

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Ecobee 3e Ute

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As an added bonus, we're excited to help you save even more with FREE bathroom andkitchen water conservation bundles.

Claim Yours Now

How to Participate

1. **Visit our Online Marketplace:** Click Here!
2. **Build Your Cart:**Add your desired smart thermostat and any additional products to your shopping cart.
3. **Instant Rebates:** Continue to checkout and create an account on our marketplace **to ensure Instant rebates are applied to your order!**
4. **Checkout Hassle-Free:** Proceed to checkout and enjoy free shipping and sales tax on your entire order.
5. **Start Saving:** Receive your energy-saving products and start enjoying the benefits of a smarter, more efficient homel

Start Shopping

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At Summit, we're here to help you make this season as comfortable and cost-effective as possible.

Astemperaturesbeg'wlto dropand the leavechange color'S, It's clear that fall ts uponus.Our goalls to ensure you stay warm while sa g money during the upcoming heating season.

SaveBIGon High-Efficiency Equipment!

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Explore Rebates

Smart Thermostat =Money & Energy Savings

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LearnMore

Easy, At-Home Measures to Stay Warm &Save

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ReadMore

Be sure to follow us on Facebook to learnmore ways to maximize savings and reduce energy usage!

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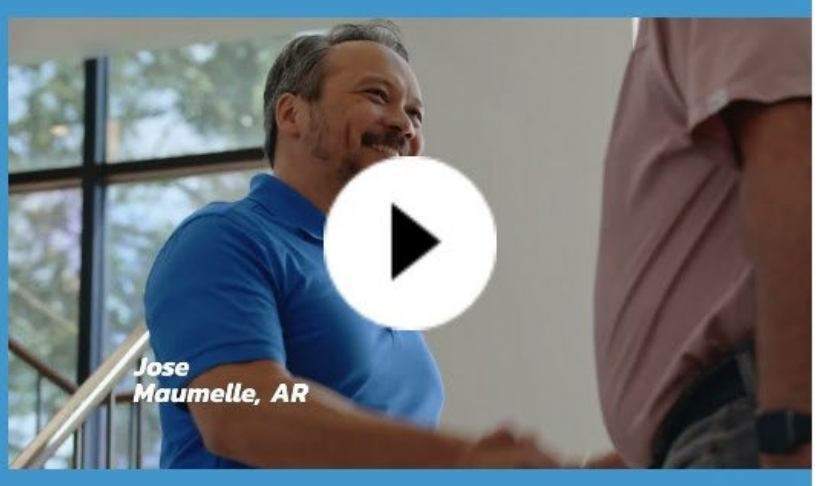
Summit Connect
QUARTERLY NEWSLETTER

We're Here for Our Community Because We're Part of it, Too!

We provide reliable service because we know how much you rely on us. We're a local company, and our bonds with the communities we serve run deeper than utility lines.



Discover More

Falling Leaves, Rising Awareness

Educate yourself with important natural gas safety tips to ensure your autumn is filled with warmth and peace of mind.

Read More

Trick or Treat Yourself with this Spooktacular Cookie Recipe

Easy and ready in a snap, these Halloween cookies are a delight the whole family will want to sink their fangs into!

Start Cooking

The Leaves are Golden, and so are Money-Saving Opportunities

We offer rebate incentives and energy efficiency products, like smart thermostats, to help you use less energy and keep money in your wallet.

Explore Rebates

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Community-Minded Because Community Matters

We recently granted $30,000 in grants to 15 non-profits based in Oklahoma. This will allow the chosen non-profit organizations to launch programs or continue their existing work to strengthen the social fabric of where we live, work, and play.

Read More

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