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May 1, 2023

Arkansas Public Service
Commission 1000 Center Street
PO Box 400
Little Rock, AR 72203-0400

Re: Docket No. 07-076-TF
Annual SARP Filing

The Empire District Electric Company hereby submits its Standardized Annual Report Packet for 2022 for filing in the above-referenced docket.

If you have any questions about the filing, please do not hesitate to contact the undersigned.

Thank you for your assistance with this matter.

Sincerely,

Kimberly Dragoo

Kimberly A. Dragoo
Senior Manager Energy Efficiency

THE EMPIRE DISTRICT ELECTRIC COMPANY
ENERGY EFFICIENCY ANNUAL REPORT
Filed April 28, 2023

1.0 EXECUTIVE SUMMARY

1.1 Brief historical background of the EE portfolio

The Empire District Electric Company ("Liberty" or "Company") began its Quick Start Energy Efficiency ("EE") portfolio in 2007 as directed by the Arkansas Public Service Commission's ("Commission" or "APSC") Rules for Conservation and Energy Efficiency Programs approved in Order No. 18 of Docket No. 06-004-R. This initial portfolio consisted of participation in the two state-wide programs, Energy Efficiency Arkansas ("EEA") and the Arkansas Weatherization Program ("AWP"). Liberty also implemented a Central Air Conditioner ("CAC") Tune-up rebate program and Commercial & Industrial ("C&I") Prescriptive rebate program.

In 2010, the Commission approved the addition of a high efficiency central air conditioner replacement component to the existing CAC tune-up rebate program, along with a rebate for a programmable thermostat. The Commission also approved the Interruptible Program, a voluntary curtailment program for large commercial and industrial customers.

In the spring of 2011, Liberty filed for approval of a High-efficiency Residential Lighting Program and a Home Energy Comparison Program to supplement its portfolio. However, in July 2011 the Commission requested Liberty re-file its portfolio to incorporate data for the 2012 and 2013 program years. During this time Liberty, with the help of its demand-side consultant Applied Energy Group (AEG), decided to completely overhaul the existing portfolio to increase customer participation and overall savings levels. As a result of the Commission's order and Liberty's new portfolio expansion, primary focus was dedicated to the new portfolio and the September 2011 filing deadline. The new portfolio was filed in September 2011. The new portfolio became active January 1, 2012. It excluded the AC tune- up program, and added a Residential Lighting Program, C&I Custom program, Energy Star® Appliance Program, and Small Business Lighting Program.

On December 28, 2012, Liberty made a filing with the APSC that would add two new programs: Residential AC Tune-up and Duct Repair and an independent, contractor-driven Residential Weatherization. These programs leverage the design and contractors of a similar program designed and successfully implemented by Oklahoma Gas & Electric ("OG&E"). These programs were funded using re-appropriated budgets from underperforming programs in Liberty's Arkansas EE portfolio.

In 2016, Liberty filed a new energy efficiency portfolio for 2017-2019. This new portfolio sought to streamline the inefficiencies and alleviate the shortcomings of the program. The new portfolio focused on eliminating underperforming programs and focusing on programs with proven success. In doing so, it also set budgets at a reasonably achievable level, which helped abate Liberty's potential for over-recovering the costs associated with these programs.

In 2019, Liberty filed a new energy efficiency portfolio for 2020-2022. The new portfolio initially featured the reluctant discontinuation of the Weatherization Program, which was not found to be cost-effective in the initial analysis. The portfolio without the Weatherization Program was approved for 2020; alongside a request that Liberty sought through Independent Evaluation Monitor ("IEM") and Parties Working Collaboratively ("PWC") to integrate new variables for cost-effectiveness within its

analysis of the Weatherization program. This modification pushed the Weatherization program into cost- effectiveness, and the addition of this program was approved to be re-introduced for 2021 and 2022. In 2022, this portfolio was extended through 2023.

This annual report provides the results of the portfolio for the 2022 program year.

Table 1.1

2022 Portfolio Summary							
Net Energy Savings		**Costs**			**Cost-Effectiveness**		
Demand MW	**Energy** MWh	**Actual Expenditures**	**LCFC**	**Performance Incentives**	**TRC Net Benefits** (NPV)	**TRC Ratio**	**PAC Ratio**
0	0	$18,422	$92,402	N/A	$(5,991)	0.00	1.28

1.2 2022 Portfolio Overview

In 2022, Liberty's portfolio did not realize energy savings or annual demand savings. The underperformance was attributable to several factors including:

- Understaffing within Liberty's energy efficiency team that occurred from January 2022 through June 2022 and again from September 2022 through December 2022.
- A complete lack of response by customers to participate in the mail order residential products program.
- A limited number of evaluations of commercial and industrial projects that did not convert to actual projects.

Liberty recognizes the factors that led to under performance in 2022 and plans to address these in 2023 and in future energy efficiency plans.

Table 1.2

EE Portfolio Expenditures by Program					
Program Name	**Target Sector**	**Program Type**	**2022 Budget ($)**	**2022 Actual ($)**	**% of Budget**
Residential Products	Residential	Consumer Product Rebate	21,437	1,010	5%
School-Based Energy Education	Residential	Consumer Product Rebate	14,842	-	0%
Weatherization	Residential	Whole Home	42,000	-	0%
Commercial and Industrial (Custom)	Commercial & Industrial	Custom	9,415	540	6%
Commercial and Industrial (Prescriptive)	Commercial & Industrial	Prescriptive/Standard Offer	17,922	-	0%
Online Energy Calculator	All Classes	Behavior/Education	2,000	5,990	300%
Energy Efficiency Arkansas	All Classes	Behavior/Education	1,409	-	0%
Regulatory	-	-	9,500	10,882	115%
		Total	**118,524**	**18,422**	**16%**

1.3 Goals and Objectives for EE portfolio

For its 2022 energy efficiency portfolio, Liberty planned for annual estimated energy savings of 419,337

kWh and for annual estimated demand savings of 56 kW.

Table 1.3

EE Portfolio Expenditure Summary by Cost Type				
	2022 Total Expenditures			
Cost Type	% of Total	Budget ($)	Actual ($)	% of Total
Planning / Design	0%	-	-	0%
Marketing & Delivery	82%	97,069	5,990	33%
Incentives / Direct Install Costs	10%	11,955	1,550	8%
EM&V	0%	-	-	0%
Administration	0%	-	-	0%
Regulatory	8%	9,500	10,882	59%
	100%	**118,524**	**18,422**	100%

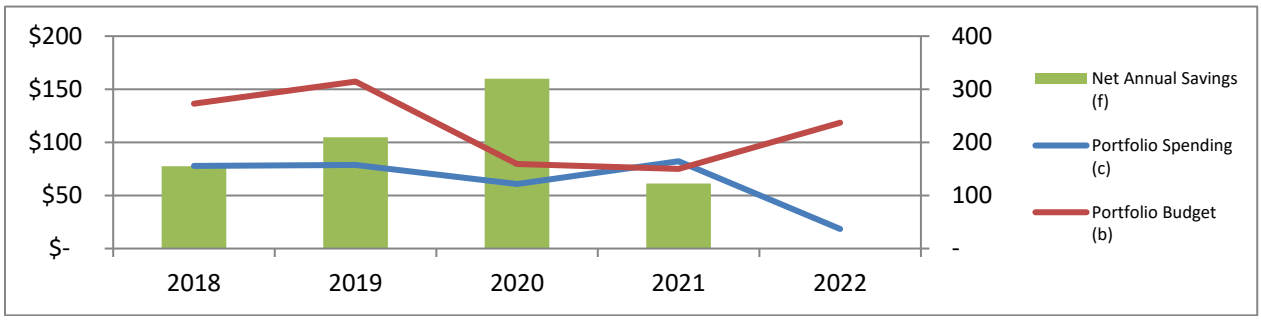
1.4 Progress achieved versus goals and objectives

Since 2012, Liberty has experienced consistent participation in its energy efficiency programs for Arkansas, despite well-documented service territory difficulties (See Section 1.6 – *What's Working and What's Not*). Liberty attempted to set more reasonable savings goals and budgets, allowed by the exemptions to the savings targets, as directed by Order No. 62 in Docket No. 07-076-TF ("Order No. 62"). In 2020, the first year of Liberty's current energy efficiency portfolio, Liberty achieved 20 kW or 13 percent of its demand savings goal. Liberty also achieved 134,484 kWh, or 44 percent of its overall energy savings goal. As stated previously, the Liberty portfolio did not realize kW or kWh saving in 2022.

Table 1.4

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) (MWh)	Net Annual Savings (e) (MWh)	% of Energy Sales (%=e/d)	Net Annual Savings (f) (MWh)	% of Energy Sales (%=f/d)
2018	$ 15,213	$ 136	0.9%	$ 78	0.5%	170,908	227	0.13%	155	0.09%
2019	$ 16,599	$ 157	0.9%	$ 79	0.5%	175,630	228	0.13%	210	0.12%
2020	$ 15,625	$ 80	0.5%	$ 61	0.4%	175,461	229	0.13%	320	0.18%
2021	$ 15,846	$ 75	0.5%	$ 82	0.5%	164,927	419	0.25%	123	0.07%
2022	$ 17,798	$ 119	0.7%	$ 18	0.1%	169,635	419	0.25%	-	0.00%

Chart 1.4



Liberty acknowledges this underspending is the largest gap between the budget and program expenditures the portfolio has seen since 2019. Liberty is working to address the underspending in 2023 and has included additional details to provide corrective actions under each program description in section 1.5 Discussion of Underperformance.

1.5 Discussion of under performance

In 2021, Liberty displayed strong participation in the residential programs, achieving 75 percent of its participation targets. This included the distribution of 397 3-packs of LED bulbs, resulting in evaluated savings of 30,717 kWh. This program is typically marketed to customers in the summer with participation beginning in late Q3 and Q4. In 2022, Liberty used the same marketing tactic in the form of a bill insert and received no response from the customer base. Due to the lead time required for mail-based promotions we were unable to implement a second mailing that would have resulted in savings for 2022. In 2023, Liberty is moving this promotion cycle to begin earlier in the year and will be employing additional marketing strategies to encourage program participation. These may include emails, social media and sharing information through the customer newsletter. Liberty will evaluate the performance of the promotion in July and seek an opportunity to run additional promotions in 2023 if the program is underperforming.

The Liberty C&I program also had strong performance in 2021. In 2022, the program struggled to identify viable projects for evaluation and only reviewed two opportunities for inclusion in the program. Liberty's service territory is predominately residential and rural, limiting the opportunities for C&I projects. As discussed in section 1.6, What's Working and What's Not, this creates a very small pool for project engagement. Additionally, the C&I program is one that relies on the ability of the energy efficiency program manager to recruit projects into the program via customers and contractors. The understaffing of the energy efficiency team due to program additions in the central region and internal movement of Liberty staff created a gap within this team functionality. This was further compounded by the longer lead time needed for C&I projects. Liberty is working to strengthen the C&I pipeline for 2023 to meet savings targets. The energy efficiency team is fully staffed, and the Program Manager assigned to Arkansas is fully engaged in recruiting projects and working with them throughout the project lifecycle. Liberty has a small number of C&I projects in the pipeline for 2023 and is working to recruit more.

Weatherization is typically addressed at Liberty when contractors have excess capacity after other IOUs have met their goals as Liberty does not have a dedicated contractor network. Liberty is currently in the process of vacating this practice and identifying contractors available to do a

limited amount of work within the Liberty service territory throughout the year. The Program Manager is in discussions with a contractor who lives withing a thirty-minute drive of the Liberty service territory. Liberty is working with the contractor to identify weatherization opportunities for completion throughout the year.

Liberty will be resuming the distribution of school kits in the fall of 2023. The Program Manager is currently coordinating the kit content and outreach plan to teachers throughout our service territory. Typically, recruitment for this program starts in the fall but this year Liberty is shifting the start of the recruitment cycle to May to identify early recruitment opportunities.

1.6 What's Working and What's Not

According to the comments of the IEM, "it is unlikely that Liberty's program portfolio will ever reach its participation goals due to the challenges it faces in its service territory[1]." Liberty has expanded on these challenges in various filings over the last three years, beginning with its response to Order No. 40 in APSC Docket 07-076-TF[2]. A summary of these were filed in support of Liberty's 2013 Energy Efficiency Cost Recovery Rider re-determination filing:

> *Liberty serves a very small number of customers in Arkansas (about 4,300) in a predominately rural and relatively remote area with a few small towns ranging in size of roughly 100 to 3,158 residents. The Commission has recognized that due to the size and other demographics that Liberty faces a challenge unique among the public utilities subject to the required EE achievement targets. As outlined in Liberty's other energy efficiency filings, some of these hurdles include:*
>
> - *Energy efficiency overhead costs - administrative/regulatory costs must be recovered over a small customer base*
> - *Size of operations - by customer count Liberty is less than one-tenth the size of the next smallest IOU in Arkansas*
> - *Rural service territory - Liberty's service territory includes no urban population centers that can offer economic activity and diversity*
> - *Scope of operations - by population, Liberty serves only about 3.7% of the only Arkansas County that it provides service*
> - *Composition of customer base - Liberty's Arkansas service territory is comprised of about 82% residential customers*
> - *Service territory demographics - based on 2010 U.S. Census Data about 42% of the citizens in Liberty's Arkansas service territory live in renter-occupied housing*
> - *Industrial/Commercial customer base - nearly half of Liberty's electric sales in Arkansas come from two large commercial/industrial customers[3]*
> - *Service territory economy - nationwide franchises and big box stores that may fill the landscape of high commerce areas are virtually nonexistent in Liberty's Arkansas service territory*
> - *Service territory media - limited cost-effective media outlets for this specific rural area are available to promote Liberty's energy efficiency programs[4]*

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[1] APSC Docket 07-076-TF, Doc. 192. Filed June 3, 2013

[2] APSC Docket No. 07-076-TF, Doc. 169. Filed September 14, 2012

[3] Liberty's two-largest industrial customers—which comprise nearly half of its Arkansas sales—are cited above as hard-to-reach customers upon whom the portfolio's success will inevitably depend. Both customers are now exempt as Self-Direct Opt Out customers, which is still a large barrier to Liberty's energy efficiency success, but in a different way.

[4] APSC Docket No. 13-002-U, Doc. 40. Filed May 15, 2013

Liberty's 2017-2019 and 2020-2022 energy efficiency portfolios were configured in an attempt to remedy this issue. The 2020-2022 portfolio features six programs. This effort is supported by the variances granted to Liberty by Order No. 62[5]. Order No. 62 granted Liberty the following variances.

- Liberty shall set realistically achievable program plans and budget levels;
- Current mechanisms for collecting LCFC and any utility performance incentive shall remain in place, as described in Section 7 of the C&EE Rules;
- Liberty is granted the flexibility listed above from specific items in the Comprehensiveness Checklist described in Order No. 17 in Docket No. 08-144-U in order to streamline program offerings and best serve its customers with programs primarily aimed at cost-effectiveness;
- Pursuant to Section 4.B of the C&EE Rules and Rule 2.05 of the Commission's Rules of Practice and Procedure, the Commission finds that it is in the public interest and good cause has been shown to grant Liberty an exemption from Section 9 of the C&EE rules concerning annual reporting and it is instead required to file this information during each program design cycle, which is anticipated to be a three-year cycle;
- Liberty is required to continue market its EE programs to the best of its ability and resources.

1.7.1 Comprehensiveness Checklist Factors

Per Order No. 62, Liberty is exempt from strict compliance with the Comprehensiveness Checklist, established by Order No. 17 in APSC Docket No. 08-144-U. In its report on 2018 EM&V, the IEM recommends, "Liberty should start tracking its progress in meeting the Commission Comprehensiveness Checklist Factors to the extent possible[6]." Liberty agrees that these recommendations are appropriate as a best practice and a benchmark, and in the following section, in compliance with the IEM's recommendation, details each item in the checklist followed by a description of Liberty's progress toward it.

> *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;*
>
> The School-based Energy Education program features an education curriculum designed to increase the energy awareness of middle schoolers. The goal of this program is for students to take home the awareness and enthusiasm for energy efficiency gained through their participation and share it with their families. To further encourage this, the students are equipped with direct install measures and educational materials to bring home to share what they have learned. Liberty is considering adding new measures to this program for 2023 to make it even more comprehensive and cost-effective.
>
> The Residential Products Program, which primarily offers lighting measures to Liberty customers, promotes future penetration of high-efficiency lighting by offering what will amount

[5] APSC Docket No. 07-076-TF, Doc. 267, filed May 3, 2016.
[6] APSC Docket No. 07-076-TF, Doc. 368, filed July 5, 2019.

to a "sample" of LED Lighting. This, theoretically, will lead to further adoption of this technology by dispelling misinformation regarding this technology and other high-efficiency products.

The reintegration of the Weatherization program into Liberty's energy efficiency portfolio increases the overall comprehensiveness of the program, as it includes both informational items throughout the audit program, as well as a diverse mix of direct-install and home-envelope measures that address the whole home, as well as consumer behavior.

Whether the programs and/or portfolio, have adequate budgetary, management, and program delivery resources to plan, design, implement, oversee, and evaluate energy efficiency programs;

Due to the economies gained by leveraging implementation contractors of other Investor-Owned Utilities ("IOUs") in Arkansas, and from using the same EM&V Consultant in ADM Associates, Liberty is able to continually offer energy efficiency programs that test as cost-effective. The cost-effectiveness of the portfolio overall improved with reintegration of the Weatherization program in 2021—as approved by Order No. 86 in APSC Docket No. 07-076-TF—and should continue to improve as Liberty continues to seek expansion for the items in its direct-install kits to capture richer and deeper energy savings.

Whether the programs and/or portfolio, reasonably address all major end-uses of electricity or natural gas, or electricity and natural gas, as appropriate;

The reintroduction of the Weatherization program in 2021 dramatically increased the diversity of Liberty's residential portfolio end-uses. The Residential Products Program replaced the Residential Lighting Program in 2020, by adding LivingWise Energy Savings kits to customers. These include water saving measures, which increase the diversity of end-uses available through this program. Liberty also plans to continually improve the diversity of its offerings by reconsidering the direct install items included in the kits provided as part of the School-based Energy Education and Residential Products Programs. The commercial program features a wide array of prescriptive measures for its customers, as well as custom rebates in order to address any conceivable end-use for which cost-effective energy savings can be demonstrated. For these reasons, Liberty believes it is delivering a wide array of end-uses that are reasonably achievable in the interest of its customers.

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;

Liberty's energy efficiency programs are focused on giveaways, and kits, in order to minimize the cash investment requirements for its economically-depressed service territory. The Residential Products Program, Weatherization Program, and the School-based Energy Education are offered completely free to participants, and feature as diverse and as many direct install energy efficiency measures as can be cost-effectively delivered. They are designed to be as comprehensive as they can cost-effectively be, offering the customers the greatest value possible.

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);

Due to the well-established challenges of its service territory, it would not be cost-effective for Liberty to offer a wide variety of programs targeted at specific economic sectors. Particularly, the size of its customer base would make segmented programs inefficient. Within its service territory, Liberty has fewer than 700 commercial customers across all sub-sectors. For example, Liberty has 3 school districts in its entire service territory. Offering a commercial program specifically designed for schools is not justified. Instead, Liberty offers one commercial rebate program designed to be as inclusive as possible, both in terms of the types of customers and the types of end uses that can be eligible.

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; and

Liberty believes it has complied with this item through the following actions:

- Placing emphasis on direct install measures, meaning savings begin immediately,
- Incentivizing customers to perform as many energy efficiency measures as can cost-effectively be done through its Weatherization Program and School-based Energy Education Programs,
- Incentivizing customers to change energy usage habits through its School-based Energy Education program and Weatherization Program, meaning savings are both instantaneous and long-term,
- Offering numerous residential programs at no cost to the customer.

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.

By committing to return to annual EM&V where appropriate, and by leveraging ADM Associates, which provides services to other IOUs in Arkansas, Liberty has utilized the available resources to optimize levels of cost and precision in its evaluations; ensuring annual cost-effectiveness throughout its programs.

1.7 Planned changes to programs or budgets

Liberty made no modifications to the budgets as approved in 2022.

1.8 Estimation of EE Resource Potential

Liberty has not conducted a Potential Study solely for its Arkansas service territory, as less than three percent of Liberty's Central Region electric customers reside in Arkansas. Liberty is participating in the current Statewide Potential Study that will be completed in 2024 and used in subsequent planning cycles.

1.9 Training Achievements

Liberty did not offer any trade ally training sessions in 2022.

2.0 Portfolio Programs

2.1 Residential Products Program

2.1.1 Program Description

Customers who respond to a pre-paid postcard inserted into their bills receive a 3-pack of LED Light bulbs. A random sampling of these customers will also receive a direct-install kit.

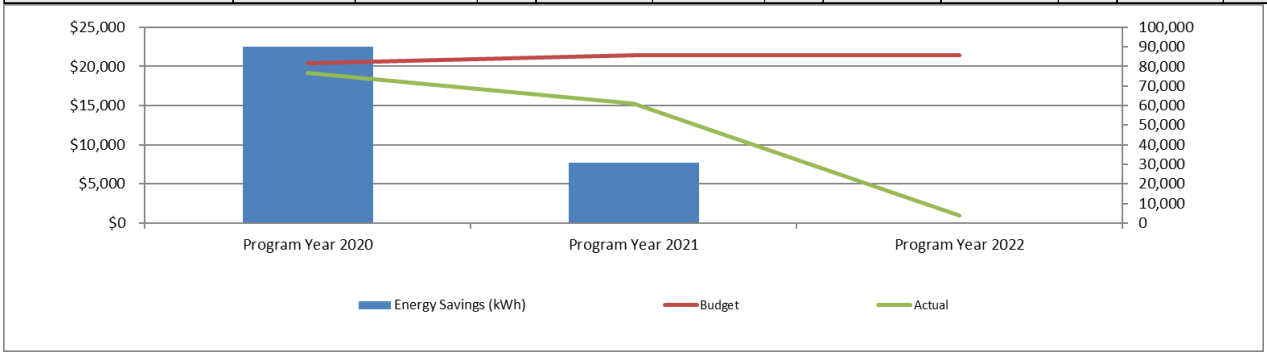
2.1.2 Program Results

This program did not meet expected performance for 2022.

2.1.3 Program Budget, Savings & Participants

Residential Products

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$20,417	$19,118	94%	82,484	90,140	109%	4	6	150%	1,158	1,659	143%
Program Year 2021	$21,437	$15,208	71%	99,138	30,717	31%	43	12	28%	650	699	108%
Program Year 2022	**$ 21,437**	**$ 1,010**	**5%**	**99,138**	**0**	**0%**	**0**	**0**	**-**	**0**	0	**-**



2.1.4 Description of Participants

Liberty defines a participant for this program as a distributed lighting or direct-install kit.

2.1.5 Challenges & Opportunities

The delivery method of this program is rare, as the standard choice tends to be a point-of-purchase program. However, Liberty's lack of a big-box retail store makes such a delivery impossible. Liberty has successfully delivered a lighting-by-mail for 9 years. Liberty was able to previously keep this program viable and cost-effective despite its challenges.

2.1.6 Planned or Proposed Changes to Program & Budget

Liberty made no modifications to the program's budget in 2022. In 2023, Liberty will look to introduce this program to customers earlier in the year and identify its continued viability for 2023. Liberty has introduced an online marketplace in other hard to serve regions as an alternative to mail in fulfillment programs. Liberty is looking to bring this delivery channel to the Arkansas portfolio.

2.2 School-Based Energy Education

2.2.1 Program Description

Liberty provides educational kits with low-cost energy saving items and information to middle school children [7].

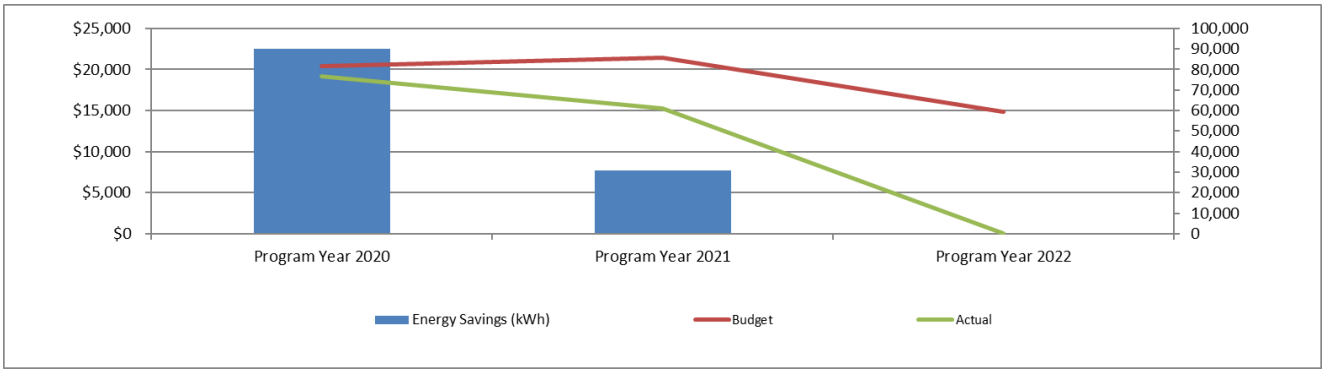
2.2.2 Program Highlights

Liberty did not distribute school kits in 2022, this program is planned to resume in 2023.

2.2.3 Program Budget, Savings & Participants

School-Based Energy Education

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$20,417	$19,118	94%	82,484	90,140	109%	4	6	150%	1,158	1,659	143%
Program Year 2021	$21,437	$15,208	71%	99,138	30,717	31%	43	12	28%	650	699	108%
Program Year 2022	**$ 14,842**	**$ -**	**0%**	**92,418**	**0**	**0%**	**0**	**0**	-	**0**	0	-



2.2.4 Description of Participants

A participant in this program is defined as a sixth-grade student receiving an EnergyWise® kit.

2.2.5 Challenges & Opportunities

The number of customers that can be reached by this program is limited by the number of school districts in Liberty's service territory. Liberty seeks to further educate young customers in new ways.

2.2.6 Planned or Proposed Changes to Program & Budget

Liberty made no modifications to this program's budget in 2022. In 2020 and 2021, Liberty modified the kit, in accordance with recommendations of the AG's office[8], which called into question Liberty's reliance on Non-Energy Benefits ("NEBs") provided by water-saving measures, decreased the *quantity* of kWh savings, but aimed to increase the *quality* of savings by lessening the number of kWh derived from NEBs. However, in line with the recommendation of ADM's 2021 Evaluation and the IEM's recommendation, Liberty reintroduced the low-flow showerhead into the kits.

[7] APSC Docket 07-076-TF, Doc. 121. Filed September 30, 2011.
[8] *Direct Testimony of Christina L. Baker,* APSC Docket 07-076-TF, Doc. 396. Filed July 17, 202

2.3 Weatherization Program

2.3.1 Program Description

Liberty's Weatherization Program utilizes contractors to perform energy audits, and subsequently perform energy efficiency upgrades to qualifying homes.

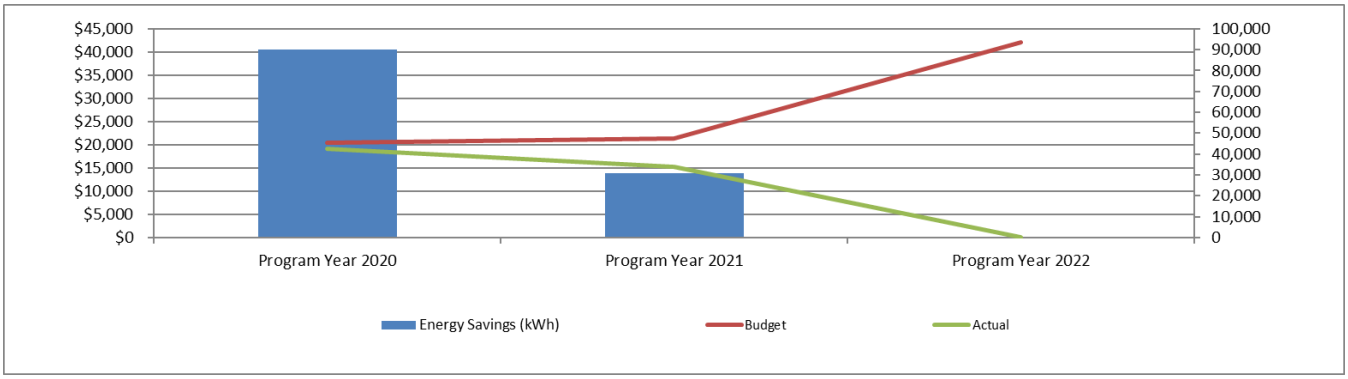
2.3.2 Program Highlights

The program was reintroduced in 2021. There was no participation in this program in 2022.

2.3.3 Program Budget, Savings & Participants

Weatherization

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	**Budget**	**Actual**	**%**	**Plan**	**Evaluated**	**%**	**Plan**	**Evaluated**	**%**	**Plan**	**Actual**	**%**
Program Year 2020	$20,417	$19,118	94%	82,484	90,140	109%	4	6	150%	1,158	1,659	143%
Program Year 2021	$21,437	$15,208	71%	99,138	30,717	31%	43	12	28%	650	699	108%
Program Year 2022	**$ 42,000**	**$ -**	**0%**	**102,270**	**0**	**0%**	**0**	**0**	**-**	**0**	0	**-**



2.3.4 Description of Participants

A participant for this program is defined as a single home.

2.3.5 Challenges & Opportunities

There are inherent challenges in creating the right amount of demand for a program with small participation goals. Traditional marketing campaigns to our Arkansas customers have yielded response rates around ten percent. Even the most conservative response rate of five percent (roughly 4,300 customers) could create unmanageable demand for the program based on its current budgets. Moreover, Liberty does not mass market this program. Participating customers come to us directly through the application on the Liberty website, through word-of-mouth, or by participation in one of Liberty's other energy efficiency programs. Due to the underperformance of this program in 2022, Liberty is working to identify contractors with the capacity to serve our customers.

2.3.6 Planned or Proposed Changes to Program & Budget

Liberty did not make any changes to the approved budget for 2022.

2.4 Commercial and Industrial (Custom)

2.4.1 Program Description

C&I customers receive rebates for the installation or replacement of cost-effective, efficient measures not included in the C&I prescriptive program.

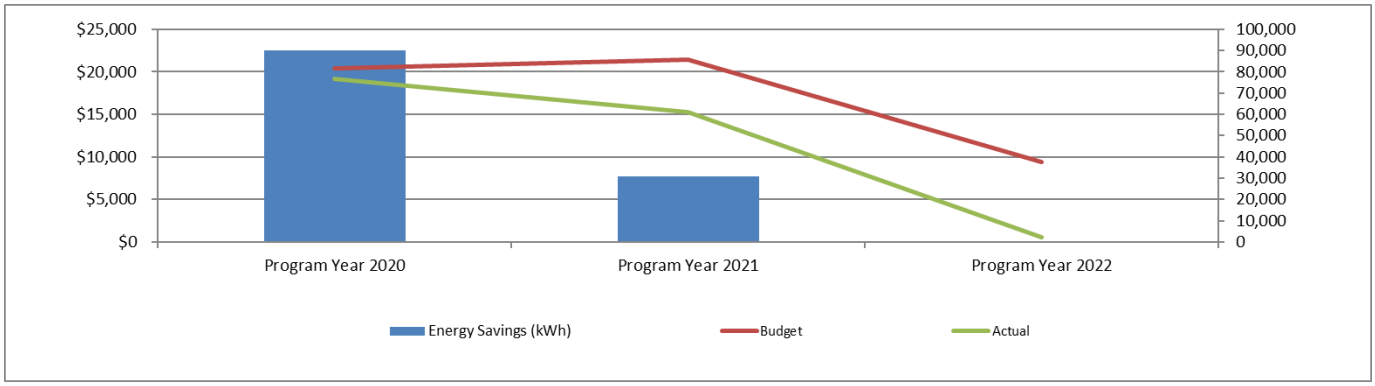
2.4.2 Program Highlights

- This program had no participation in 2022.
- Two projects were evaluated but did not come to fruition.

2.4.3 Program Budget, Savings & Participants

Commercial and Industrial (Custom)

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$20,417	$19,118	94%	82,484	90,140	109%	4	6	150%	1,158	1,659	143%
Program Year 2021	$21,437	$15,208	71%	99,138	30,717	31%	43	12	28%	650	699	108%
Program Year 2022	**$ 9,415**	**$ 540**	**6%**	**25,929**	**0**	**0%**	**0**	**0**	**-**	**0**	0	**-**



2.4.4 Description of Participants

Liberty defines a "participant" for this program as a qualifying customer receiving a rebate. A single customer can receive a rebate for more than one measure.

2.4.5 Challenges & Opportunities

As Liberty described at length in its response to Commission Order No. 40 in APSC Docket No. 07-076-TF[9], and briefly above in Section 1.6 - *What's Working and What's Not*, there are various challenges to successful implementation of energy efficiency programs in its Arkansas service territory. This concern was echoed by the IEM in her 2013 EM&V Report[10].

[9] APSC Docket No. 07-076-TF, Doc. 169. Filed September 14, 2012.
[10] APSC Docket 07-076-TF, Doc. 192. Filed June 3, 2013

Because Liberty contracts Applied Energy Group to process applications for this program, and not all projects that are preapproved will be completed by the customer, sometimes administrative costs are borne that do not directly result in energy savings. These administrative costs, along with website and application maintenance, resulted in administrative costs within a program year that resulted in zero savings.

2.4.6 Planned or Proposed Changes to Program & Budget

Liberty did not make any changes to the approved budget for the 2022.

2.5 Commercial and Industrial (Prescriptive)

2.5.1 Program Description

C&I customers receive rebates for the installation, replacement or retrofit of qualifying electric savings measures.

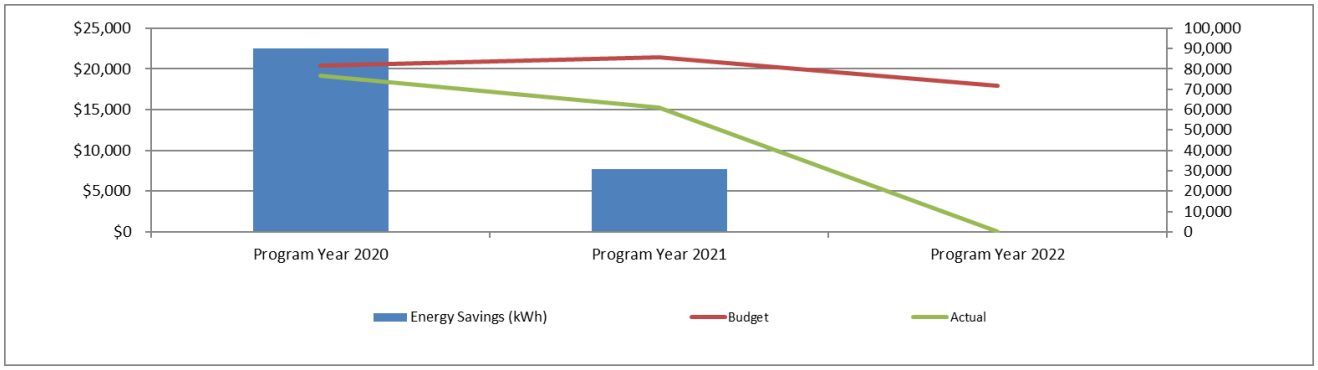
2.5.2 Program Highlights

This program saw no participation in 2022.

2.5.3 Program Budget, Savings & Participants

Commercial and Industrial (Prescriptive)

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$20,417	$19,118	94%	82,484	90,140	109%	4	6	150%	1,158	1,659	143%
Program Year 2021	$21,437	$15,208	71%	99,138	30,717	31%	43	12	28%	650	699	108%
Program Year 2022	**$ 17,922**	**$ -**	**0%**	**99,582**	**0**	**0%**	**0**	**0**	**-**	**0**	0	**-**



2.5.4 Description of Participants

Liberty defines a “participant” for this program as a qualifying customer receiving a rebate. A single customer can receive a rebate for more than one measure.

2.5.5 Challenges & Opportunities

Because there are few or no commercial energy efficiency vendors with offices in Liberty's service territory, the program counts on contractors from nearby metropolitan areas. It is a consistent struggle to find vendors with an interest in the small number of commercial customers in this area.

2.5.6 Planned or Proposed Changes to Program & Budget

Liberty did not make any changes to this program's approved budget for the 2022 program year.

2.6 Online Energy Calculator

2.6.1 Program Description

Liberty customers are eligible to conduct an online energy assessment, use the online energy calculator, and sign up for regular energy efficiency tips and information regarding how to reduce their bills through Liberty's partnership with Apogee.

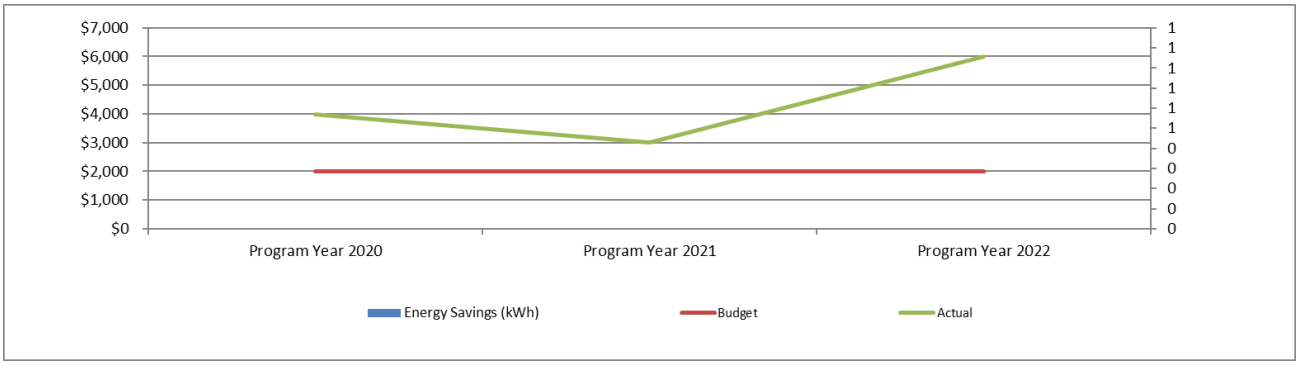
2.6.2 Program Highlights

This program is well-used but does not directly provide measurable energy savings.

2.6.3 Program Budget, Savings & Participants

Online Energy Calculator

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$2,000	$3,995	200%	0	0	-	0	0	-	1,158	1,659	143%
Program Year 2021	$2,000	$3,006	150%	0	0	-	0	0	-	0	0	-
Program Year 2022	**$ 2,000**	**$ 5,990**	**300%**	**0**	**0**	**-**	**0**	**0**	**-**	**0**	0	**-**



2.6.4 Description of Participants

Liberty does not measure specific participants at a level attributable to its Arkansas jurisdiction.

2.6.5 Challenges & Opportunities

While Liberty is confident in the spillover effects of this program, which would lead participants to other programs and energy efficiency upgrades, there is no way to calculate this at its current level of evaluation. Liberty is continually evaluating ways to better utilize this program.

2.6.6 Planned or Proposed Changes to Program & Budget
Liberty did not make any changes to this program's approved budget for the 2022 program year.

2.7 Energy Efficiency Arkansas

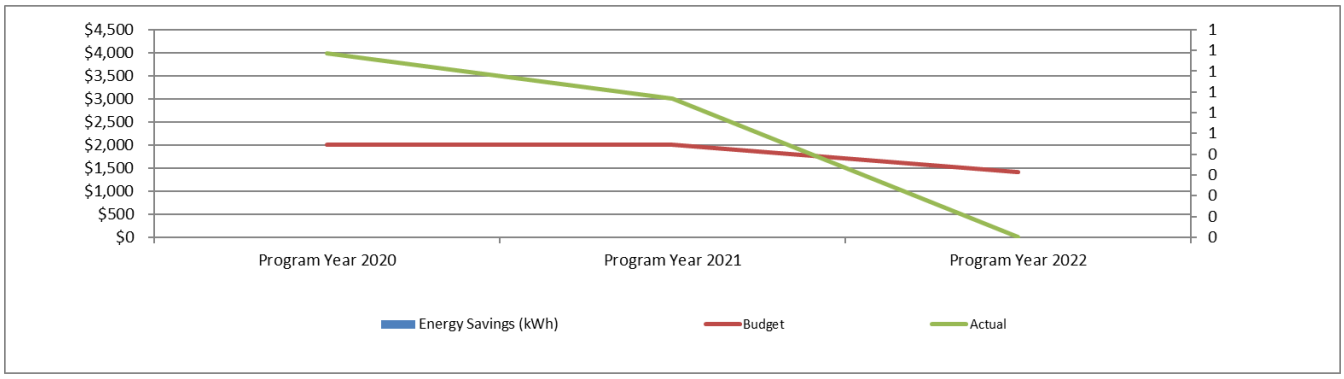
2.7.1 Program Description
This program provides education to residential customers and technical training to contractors and business customers[11].

2.7.2 Program Highlights
- Liberty is pleased to cooperate with the Arkansas Energy Office on this program.
- This program is a statewide education and awareness campaign and does not produce measurable demand or energy savings.
- There were no expenses assigned to Liberty for this program in 2022.

2.7.3 Program Budget, Savings, & Participants

Energy Efficiency Arkansas

	Expenditures			Energy Savings (kWh)			Demand Savings (kW)			Participants		
Program	Budget	Actual	%	Plan	Evaluated	%	Plan	Evaluated	%	Plan	Actual	%
Program Year 2020	$2,000	$3,995	200%	0	0	-	0	0	-	1,158	1,659	143%
Program Year 2021	$2,000	$3,006	150%	0	0	-	0	0	-	0	0	-
Program Year 2022	**$ 1,409**	**$ -**	**0%**	**0**	**0**	**-**	**0**	**0**	**-**	**0**	0	**-**



2.7.4 Description of Participants
This program is a statewide education and awareness program and does not measure participation.

2.7.5 Challenges & Opportunities
Liberty does not implement any of these programs, and thus, does not face any challenges.

2.7.6 Planned or Proposed Changes to Program & Budget
There were no changes to this budget in 2022.

3.0 Supplemental Requirements

[11] APSC Docket 07-076-TF, Doc. 121. Filed September 30, 2011.

3.1 Staffing

At the start of 2022, Liberty expanded its staffing needs in the central region to include two full-time staff members to accommodate the expansion of energy efficiency efforts across the region. From January to June, only one of these positions was filled due to a long recruitment cycle that has been experienced across the organization. The team was fully staffed in July and August. In September, one staff member moved on to a new position in the company again leaving a staffing gap. This position was backfilled in mid-December 2022. As a result, the team was understaffed for three quarters of 2022.

Liberty also has additional staff that supports energy efficiency. This includes management, marketing, regulatory, customer service, and analysts.

As of the time of this report, the energy efficiency team in the central region is currently fully staffed.

3.2 Stakeholder Activities

Liberty participates in frequent meetings of the Parties Working Collaboratively ("PWC"). This includes discussions of the TRM, Statewide Potential Studies, Weatherization Collaboratives, and other collectives. Liberty generally participates via phone and/or Webinar, as a means to minimize administrative and travel costs.

3.3 Information Provided to Consumers to Promote EE

Because Liberty operates within a dramatically smaller and more rural customer base than any of its peers—described at length in its response to Commission Order No. 40 in APSC Docket No. 07-076-TF[12] and other subsequent filings—customer surveys and experience have shown that direct mail is the preferred method of communication with Liberty's Arkansas customers. Alongside these communications, the proliferation of social media has allowed Liberty new opportunities to reach its customers. Liberty continues to learn how to fully utilize social media to raise awareness of its energy efficiency programs. Liberty occasionally makes presentations on the programs available to community organizations in its service territory. Liberty also appears at some community events to meet with customers and answer questions. To better inform its customers, Liberty coordinates with the Arkansas Energy Office for as many of these appearances as possible. Lastly, as a part of a larger corporation in the Liberty family, Liberty has access to knowledge, resources, and practices of its peers in other regions of Liberty.

4.0 Appendix A: EM&V Contractor Report

Attached as Appendix A to this report is Liberty's 2021 EM&V Report and cost-benefit analysis, prepared by ADM Associates. This report was previously presented in the 2021 SARP. The cost associated with the development of this EM&V Report were accounted for in 2022. As a result, the report is being reintroduced in support of the regulatory expense identified in the 2022 budget.

[12] APSC Docket No. 07-076-TF, Doc. 169. Filed September 14, 2012.

The Empire District Electric Company in Arkansas Portfolio Evaluation, Verification and Measurement Report for Program Year 2021

Pursuant to Section 9 the Rules for Conservation and Energy Efficiency Programs:

Annual Reporting Requirements, Order No. 29, Docket No. 06-004-R, May 20, 2014

May 2, 2022

PREPARED BY ADM Associates, Inc.

PREPARED FOR The Empire District Electric Company, Arkansas

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Acknowledgements

ADM Associates, Inc. (ADM) would like to acknowledge the many talented individuals who contributed to this evaluation, measurement, and verification (EM&V) report for the program year 2021 (PY2021).

Empire staff participated in ongoing evaluation deliverable reviews and discussions, attended regular meetings, and responded to follow-up questions, data requests and document requests. They are an ongoing partner in our evaluation efforts.

The Independent Evaluation Monitor (IEM) led by Dr. Katherine Johnson also provided guidance and input throughout the evaluation process.

Additionally, we would like to thank the evaluation staff who supported the creation of this report.

ADM Staff

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Acronyms and Abbreviations

TABLE 1 COMMONLY USED ACRONYMS AND ABBREVIATIONS

Acronym	Term
AC	Air conditioner
AOH	Annual Operating Hours
APS	Advanced Power Strip
APSC	Arkansas Public Service Commission
BSP	Business/Industrial Solutions Program
C&I	Commercial and Industrial
CWA	Consistent Weatherization Approach
C&EE	Conservation and Energy Efficiency
C&I	Commercial and Industrial
CEE	Consortium for Energy Efficiency
CF	Coincidence factor
CFL	Compact Fluorescent Lamp (bulb)
CFM	Cubic feet per minute
DI	Direct Install
DLC	Design Lights Consortium
EEA	Energy Efficiency Arkansas
EER	Energy efficiency ratio
EFLH	Equivalent Full-Load Hours
EISA	Energy Independence and Security Act
EL	Efficiency loss
EM&V	Evaluation, Measurement, and Verification
EUL	Estimated Useful Life
ES	ENERGY STAR®
FR	Free-rider
FVR	Field Verification Rate
GPM	Gallons per minute
HDD	Heating Degree Days
HID	High Intensity Discharge
HOU	Hours of Use
HP	Heat pump
HSPF	Heating seasonal performance factor
HVAC	Heating, Ventilation, and Air Conditioning
IEF	Interactive Effects Factor
IEM	Independent Evaluation Monitor
IEER	Integrated Energy Efficiency Ratio
IPLV	Integrated Part Load Value
ISR	In-service rate
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light Emitting Diode
M&V	Measurement and verification

Acronym	Term
NC	New Construction
NEB	Non-Energy Benefit
MW	Megawatt
MWh	Megawatt-hour
NTG	Net-to-Gross
OLAT	Online Audit Tool
PCT	Participant Cost Test
PY	Program Year
QA	Quality Assurance
QC	Quality Control
RCA	Refrigerant charge adjustment
RIM	Ratepayer Impact Measure
ROB	Replace on Burnout
SEER	Seasonal Energy Efficiency Ratio
SO	Spillover
TRM	Technical Reference Manual
UCT	Utility Cost Test
VFD	Variable Frequency Drive

Savings Types

TABLE 2 TYPES OF SAVINGS REFERENCED IN THIS EVALUATION REPORT

Savings Types	Definition
Energy Savings (kWh)[1]	The change in energy (kWh) consumption that results directly from program-related actions taken by participants in a program.
Demand Reductions (kW)	The time rate of energy flow. Demand usually refers to electric power measured in kW (equals kWh/h) but can also refer to natural gas, usually as Btu/hr., kBtu/hr., therms/day, etc.
Other Fuels (Natural Gas & Propane)	Other fuel savings, such as propane and natural gas, which are estimated based on dual fuel savings that are not incentivized by both of the utilities that participated in the project.
Water (Gallons)	Water savings that are reported in association with the installation of water saving devices.
Ex Ante Gross	Latin for "from something done beforehand" gross savings. The change in energy consumption and/or peak demand that results directly from program-related actions taken by participants in a program, regardless of why they participated.
Ex Post Gross	Latin for "from something done afterward" gross savings. The energy and peak demand savings estimates reported by the evaluators after the gross impact evaluation and associated M&V efforts have been completed.
Ex Post Net	The energy and peak demand savings estimates reported by the evaluators after application of the results of the net impact evaluation. Typically calculated by multiplying the *ex post* gross savings by a NTG ratio.
Annual Savings	Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand a measure or program can be expected to save over the course of a typical year. The AR TRM v8.2 provides algorithms and assumptions to calculate annual savings and are based on the sum of the annual savings estimates of installed measures or behavior change.
Lifetime Savings	Energy savings (kWh) expressed in terms of the total expected savings over the useful life of the measure. Typically calculated by multiplying the annual savings of a measure by its EUL. The TRC Test uses savings from the full lifetime of a measure to calculate the cost-effectiveness of programs.

[1] Definitions are from the Glossary in AR TRM v8.2.

1 Executive Summary

The following sections outline the results of the program year 2021 (PY2021) portfolio evaluation.

1.1 Introduction

In March of 2019, Empire District Electric Company (Empire) filed its three-year EE Portfolio Plan for PY 2020-2022.[2] The plan was found to be in compliance with Order No. 25, Docket No. 13-002-U,[3] which set the time for the next three-year Portfolio to be filed and with Order No. 43[4] of Docket No. 13-002-U, which set the targets requiring electric investor-owned utilities to capture energy savings in the amount of a percentage of sales, net opt-outs. However, Order No. 62[5] states that Empire is exempt from these Commission set targets.

Empire's budgets and energy savings and demand reduction goals, included within their energy efficiency plans, serve as the basis against which its portfolio of programs was evaluated. Empire's Plan includes a portfolio of energy efficiency programs designed to facilitate reductions in electricity and peak demand in every customer class. Empire is an operating company of Liberty Utilities. Empire offers retail electric service in Missouri, Kansas, Oklahoma and Arkansas, servicing approximately 4,300 customers in Arkansas. Empire's Arkansas service territory encompasses the City of Gentry and several nearby municipalities.

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

1.2 Portfolio Overview

Empire offered a portfolio of energy efficiency programs, which provided a comprehensive range of customer options focused on energy efficiency and educational options. Empire designed its programs to achieve the following objectives:

- Achieve the PY2021 net energy savings goal of 308,862 kWh and demand reduction goal of 159.9 kW;
- Significant energy-savings opportunities for all customers and market segments;
- Broad ratepayer benefits; and

[2] The PY2020-PY2022 Plan can be found in Docket 07 -076-TF, here: http://www.apscservices.info/pdf/07/07-076-TF_348_1.pdf

[3] http://www.apscservices.info/pdf/13/13-002-U_198_1.pdf

[4] http://www.apscservices.info/pdf/13/13-002-U_293_1.pdf

[5] http://www.apscservices.info/pdf/07/07-076-TF_267_1.pdf

- Comprehensiveness in designing its portfolio to have programs that are cost-effective and to market its energy efficiencyprograms.[6]

For PY2021, the Evaluators evaluated the results for three residential programs. The C&I Rebate program had no participation in PY2021. This report only includes chapters for the three residential programs. Although, the Evaluators included this program in accounting for goals and minor administrative expenditures.

A summary of those residential programs can be found in the table below.

TABLE 1-1 PY2021 EMPIRE ENERGY EFFICIENCY PROGRAM SUMMARY

Program	Description
Residential Products Program	LEDs are delivered by mail to participating customers who respond to a prepaid billing insert postcard. Empire implements this program.
School-Based Energy Education Program	Educational materials and energy efficiency kits distributed to students within the service territory. The kit includes LED lamps, a toilet leak repair kit[7] and a kitchen aerator. AM Conservation Group implements this program.
Independent Weatherization	Residential customers receive weatherization measures, along with direct install measures. This program serves as a proximity to the CWA program, however, less comprehensive due to budget and service territory size. The program offers ceiling insulation, air infiltration, duct sealing, advanced power strips, LED lamps and a low-flow showerhead. There is also a walk-through assessment. There is no low income component to this offering.

Through its energy efficiency portfolio, Empire also seeks to provide customers with easy program entry points, flexible options for saving energy, and ongoing support for those who want to pursue deeper energy savings or demand reduction. Refer to

Table 1-2 for a list of the Empire programs and targeted customer segments for each program in PY2021.

[6] "The PWC also recommend that Empire not be required to meet certain aspects of the Commission's energy efficiency program comprehensiveness checklist, including offering programs that meet all major end-uses for each customer sector; taking advantage of opportunities to address the comprehensive needs of targeted customer sectors; and enabling the delivery of all achievable cost-effective EE within a reasonable period of time, maximizing net benefits to customers and to the utility system. The PWC note that relaxing the reporting and comprehensiveness requirements will allow Empire to include only cost-effective programs and reduce administrative expense. The PWC recommend that Empire be required to file annual Energy Efficiency Cost Recovery Rider (Rider EECR) rate adjustments on the same schedule as other IOUs; design its portfolio and programs to be cost-effective; and market its EE programs." Order #62.

[7] The toilet repair kit does not claim energy savings (kWh) or demand reductions (kW), however, there are water (gallon) savings.

TABLE 1-2 EMPIRE PY2021 ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS

Program	Residential	Multi-family[8]	Small Business	C&I	Institutional & Municipal
Residential Products	x	x			
School Based Energy Education	x	x			
Independent Weatherization	x				

The table below presents the energy savings (kWh) and demand reduction (kW) goals and how the portfolio performed towards goal.

TABLE 1-3 PY2021 EMPIRE PORTFOLIO PERFORMANCE

Program	Ex Post Net Energy Savings (kWh)	Net Energy Savings (kWh) Goal	% of Goal	Ex Post Net Demand Reduction (kW)	Net Demand Reduction Goal (kW)	% of Goal
Independent Weatherization[9]	67,429	102,270	66%	23.80	14.40	165%
Residential Products	30,717	99,138	31%	4.99	8.30	60%
School-Based Energy Education	24,444	92,418	26%	2.83	8.50	33%
C&I Rebate	0	125,510	0%	0.00	24.8	0%
Total	**122,590**	**419,336**	**29%**	**31.62**	**56.1**	**56%**

Sums may differ due to rounding

The contribution to portfolio energy (kWh) savings by program, by program year, is summarized in the figures below.

[8] All multifamily are duplexes that are single-metered.

[9] The Independent Weatherization Program was not included in the Triennial Plan for PY2020 to PY2022 and therefore had no filed goals.

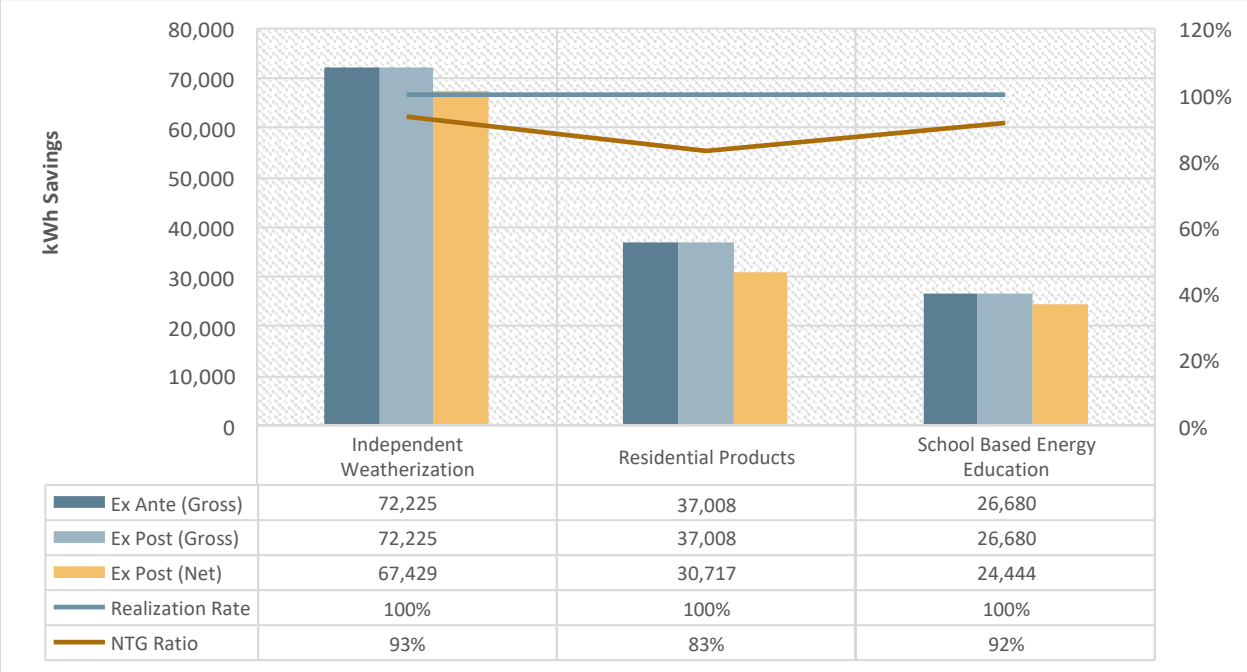

FIGURE 1-1 PY2021 CONTRIBUTION BY PROGRAM, BASED ON ENERGY SAVINGS (KWH)

Each bar in the figures below shows the ex ante gross energy savings (kWh) and the line represents the percentage of savings for each measure in the residential sector by program for PY2021.

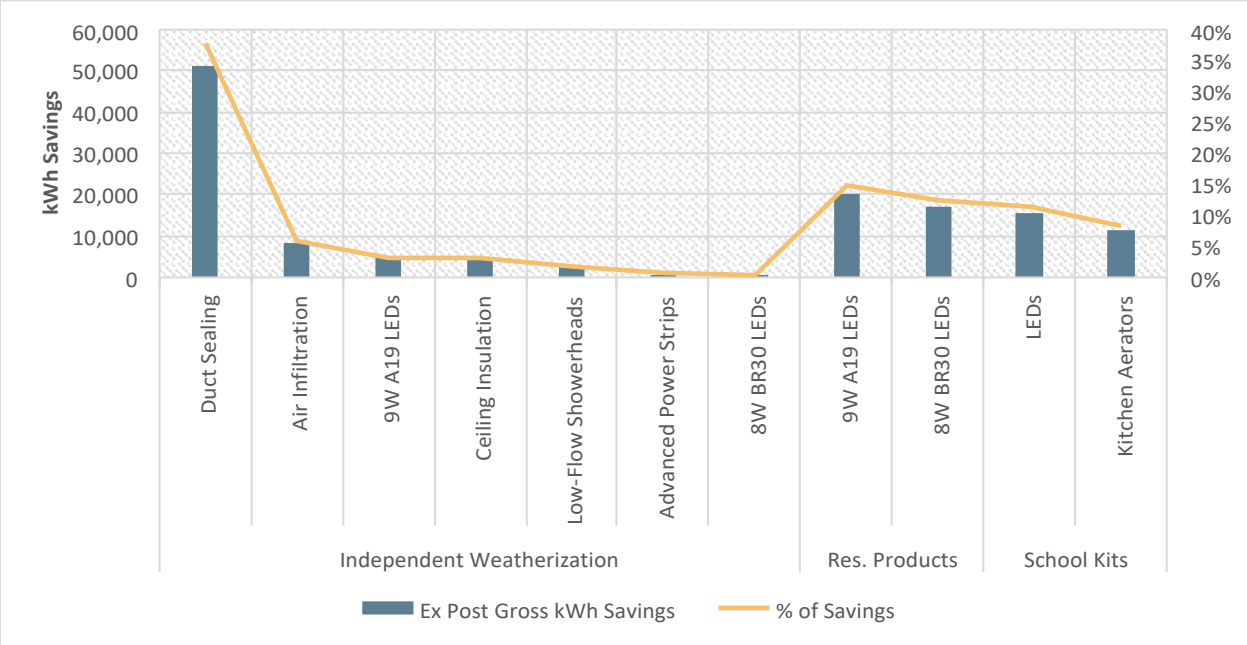

FIGURE 1-2 PY2021 PERCENTAGE OF ENERGY SAVINGS BY MEASURE FOR THE RESIDENTIAL SECTOR BY PROGRAM

The PY2021 budgets and actual spend are summarized in the table below.

TABLE 1-4 SUMMARY OF BUDGETS AND ACTUAL SPEND IN PY2021

Program	Budgeted Spend	% of Budget Spent	Utility Admin	EM&V Expenses	Incentive	Total Costs
Independent Weatherization	$46,137	59%	$0	$3,579	$23,808	$27,387
Residential Products	$23,865	64%	$945	$3,579	$10,684	$15,208
School Based Energy Education	$15,571	111%	$0	$3,579	$13,664	$17,243
C&I Rebate	$29,297	40%	$3,808	$0	$0	$3,808
Online Energy Calculator	$2,000	150%	$3,006	$0	$0	$3,006
EEA	$1,501	23%	$353	$0	$0	$353
Regulatory	$3,000	0%	$0	$0	$0	$0
Total	**$121,371**	**57%**	**$8,112**	**$10,737**	**$48,156**	**$67,005**

Sums may differ due to rounding.

1.3 Evaluation Objectives

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

- Verify program tracking data and correctly apply the AR TRM v8.2 to calculate savings following AR TRM v8.2 Volume 1 Protocol A and estimate program year 2021 (PY2021) gross and net energy and demand impacts at the high impact measure, program, and portfolio levels;
- Adjust program-reported gross savings using the results of evaluation research, relying primarily on tracking system and desk reviews;
- In consultation with the IEM, estimate net-to-gross (NTG) values[10], which was performed following AR TRM v8.2 Volume 1 Protocol H and provide complete documentation and transparency of all evaluated savings estimates, and where relevant, compare with AR TRM v8.2 calculations, as recommended in the IEM's PY2021 EM&V Annual Summary Report;
- Review tracking system data to assess data captured for new measure offerings following AR TRM v8.2 Volume 1 Protocol A;
- Support the calculation of portfolio non-energy benefits (NEB) in accordance with AR TRM v8.2 Volume 1 Protocol L;
- Complete a limited process evaluation[11] of all programs in compliance with Protocol C in TRM v8.2 Volume 1; and
- Update the assessment of Empires' success in achieving the goals and objectives established in the Commissions Comprehensiveness Checklist, as is applicable and appropriate for Empire.

[10] Due to budget and time constraints, the Evaluators apply a combination of NTG values from neighbor utilities (e.g., SWEPCO) or literature reviews.

[11] Due to budget and time constraints, there is only staff interviews. The Evaluators apply impacts (e.g., in-service rates) from neighbor utilities (e.g., SWEPCO) or perform literature reviews.

1.4 Structure of the Report

This report is structured as shown below:

- Section 1 Executive Summary;
- Section 2 Evaluation Methodology;
- Section 3 Evaluation Findings;
- Section 4 Residential Products Program Findings;
- Section 5 School Based Energy Education Program Findings;
- Section 6 Independent Weatherization Program findings;
- Appendix A – Portfolio Cost-Effectiveness; and
- Appendix B – Literature Review Outcomes.

2 Evaluation Methodology

The following subsections provide an overview of both the impact and process evaluations for each of the program's list in the table above.

2.1 Introduction

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;
- Net-to-Gross estimation;
- Process evaluation methodologies; and
- Data collection procedures.

2.2 Glossary of Terminology

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

- *Deemed Savings* – An estimate of an energy savings or energy 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) is applicable to the situation being evaluated.
- *Ex Ante Gross Savings* – Forecasted savings used for program and portfolio planning purposes (from the Latin for "beforehand").[12] These savings are also referred to as Expected or Claimed savings.
- *Ex Post Gross Savings* – Savings estimates reported by an evaluator after the energy impact evaluation has been completed (from the Latin for "from something done afterward"). [13] These savings are sometimes also referred to as Realized or Evaluated savings.
- *Ex Post Net Savings* – When Ex Post Evaluation Estimated Savings are multiplied by the Net-to-Gross Ratio.
- *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.
- *Gross Realization Rate* – The ratio of Ex Post Gross Savings and Ex Ante Gross Savings.
- *Participant* – A consumer who received a service offered through the subject efficiency program in a given program year.
- *Net-to-Gross (NTG)* – A factor representing net program savings divided by Ex Post gross program savings that is applied to Ex Post Evaluated gross program impacts, converting them into net program load impacts after adjustments for free ridership and spillover. (1 – Free ridership % + Spillover %).

[12] Definition provided in the Glossary of the AR TRM v8.2 for '*Ex ante* Savings Estimate', page 100.

[13] Definition provided in the Glossary of the AR TRM v8.2 for '*Ex post* Evaluation Estimated Savings', page 100.

- *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).
- *Estimated 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.

This glossary is drawn from several evaluation-related reference documents, such as the 2007 IPMVP, 2004 California Evaluation Framework, 2006 DOE EERE Guide for Managing General Program Evaluation Studies and the AR TRM v8.2.[14]

2.3 Methodology Overview

The proposed methodology for the evaluation of the PY2021 Empire portfolio is intended to provide:

- Net impact results at the 90% confidence and +/-10% precision at the program 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 evaluation is streamlined to focus on areas in needed of research and improvement.

2.3.1 Impact Evaluation

2.3.1.1 Sampling

Due to the limited budget associated with Empire programs, the Evaluators did not develop samples for participant surveying or site visits. The analysis of savings was based on desk review of a census of program tracking, along with a review of supporting invoices for the work completed.

2.3.1.2 Net Impact

In determining ex post net savings for the Empire portfolio, the Evaluators performed literature reviews for each measure in each program. More information about the results of those Literature Reviews can be found in Appendix C. Literature Review Outcomes.

Table 2-2 lists the NTGR sources by program for Empire. The rationale for the NTGR sources is as follows:

- Residential Products: Empire does not administer a retail markdown lighting program as seen elsewhere in Arkansas. Due to a lack of large retailers in their service area and concerns over program leakage, Empire's Residential Products Program instead provides free-of-charge mailer kits with three LEDs. There is no analogous program administered by other Arkansas IOUs. The NTG for this program is based on a literature review of similar programs administered in other states. The details of this literature review can be found in Appendix B: Literature Review Outcomes.

[14] Full AR TRM v8.2 Glossary is found on page 98.

- School-based Energy Education: The Southwestern Electric Power Company (SWEPCO), in Arkansas, does not administer a school kit offering. The Evaluators cited Oklahoma Gas and Electric's (OG&E) PY2021 LivingWise® (school kits) channel within their Home Energy Efficiency Program (HEEP) and applied the resulting NTGR to Empire. The details of this literature review can be found in Appendix B: Literature Review Outcomes.
- Independent Weatherization: SWEPCO administers a weatherization program, which is somewhat similar to the Empire program. The Empire program is less comprehensive (e.g., there is no low income offering or health and safety spend, etc.), due to budget and territory size. However, the Evaluators determine that this was the best source of NTG values for the program. The SWEPCO NTG values were based on a participant survey performed in PY2021. See those results in the table below. The SWEPCO NTG is from the Home Solutions Program's (HSP) Home Performance with ENERGY STAR® pathway.

Table 2-1 below summarizes survey data collection efforts for the HSP HPwES pathway. Survey responses were used to assess the net savings of the HSP, and then applied to the Empire Independent Weatherization program.

TABLE 2-1 SUMMARY OF SWEPCO HSPHPWES PY2021 SURVEY DATA COLLECTION

Mode of Administration	Fielding Period	Number of Surveys Completed
Online and Telephone	October 2021	63

The table below outlines the NTG impacts by program and measure.

TABLE 2-2 NTGR SOURCES FOR EMPIRE

Program	Measure	NTG Value	NTG Source
Residential Products	9W A19 LEDs	83%	PY2020 Literature Review
	8W BR30 LEDs	83%	
School Based Energy Education	LEDs	87%	PY2020 Literature Review (HEEP LivingWise®)
	Kitchen Faucet Aerator	98%	
	Toilet Leak Repair	100%	
Independent Weatherization	Assessment	100%	PY2021 Participant Survey (HSP HPwES)
	Advanced Power Strips	68%	
	Air Infiltration	97%	
	Ceiling Insulation	97%	
	Duct Sealing	97%	
	9W A19 LEDs	68%	
	8W BR30 LEDs	68%	
	Low-Flow Showerheads	68%	

2.3.1.3 Gross Impact

The Evaluators used established, industry-standard approaches to estimate energy savings and demand reductions at the measure, program, and portfolio levels. The Evaluators followed all applicable measure- and program-level guidelines and Protocols from the AR TRMv8.2.

To evaluate program impacts, the Evaluators adjusted program-reported ex ante gross savings using the results of our research, relying primarily on engineering desk reviews, and TRM deemed savings calculation for applicable programs. To calculate deemed savings, the Evaluators verified the appropriateness of savings algorithms and values in program tracking data as compared to guidelines in the AR TRM. There were no site visits or surveys administrated by the Evaluators to support this evaluation. There were survey responses provided by AM Conservation to support the Schools Based Energy Efficiency program.

For each program and measure category, the Evaluators estimated energy savings and demand reduction by applying a ex post gross savings adjustment to ex ante gross savings provided by the implementors.

The types of activities performed to support the evaluation are listed below:

- Tracking Database Verification: Verify that program tracking data supported total claimed savings and quantities and are in compliance with the AR TRM v8.2.
- Tracking Database Review: Verify that the tracking database captured adequate and complete information.
- Desk Reviews: Verify that AR TRM v8.2 values were used correctly and evaluated per-unit savings for program measures. See the AR TRM v8.2 for specific details on each measure.
- Net Impacts: Apply net-to-gross (NTG) values to program savings. Due to its geographical proximity and similar market conditions, the Evaluators largely derived NTG values from its evaluation work conducted in the neighboring territories and literature reviews. See Appendix B: Literature ReviewOutcomes for more information.
- Site Visits: Due to budget and time constraints there were no site visits performed to support this evaluation.
- Surveys: Due to budget and time constraints there were no surveys performed to support this evaluation.
- Market Actor Interviews: Due to budget and time constraints there were no market actor interviews performed to support this evaluation.

See the table below for the list of measures and their associated AR TRM v8.2 sections.

TABLE 2-3 AR TRM V8.2 SECTIONS BY MEASURE TYPE

Measure Category	Measure	Subsection(s)
Appliances	Advanced Power Strip	2.4.4
Hot water	Faucet Aerator	2.3.4
	Showerhead	2.3.5
Envelope	Air Infiltration	2.2.9
	Ceiling Insulation	2.2.2
HVAC	Duct Sealing	2.1.11
Lighting	LED Lamps	2.5.1.3

2.3.1.3.1 DIVERSIONS FROM THE AR TRM V8.2

There were no diversions from the AR TRM v8.2.

2.3.1.4 Non-Energy Benefits

Electric energy efficiency programs claimed primary fuel savings after the installation of measures that achieve energy (kWh) savings and demand (kW) reductions. Savings are monetized with the avoided costs. In Arkansas, the IEM, in coordination with investor-owned utilities (IOUs) and other stakeholders through the Parties Working Collaboratively (PWC), has also acknowledged that other non-energy benefits (NEBs) are associated with the implementation of these measures. These other benefits can include reductions in water usage, fossil fuel consumption, and avoided and deferred replacement costs.

These NEBs are an addition to Arkansas programs under the authorization of AR TRM 6.1. Volume 1 - Protocol L. After reviewing the guidance from the PWC, the Arkansas Public Service Commission (Commission) issued Order No. 30 on December 10, 2015, which provided direction and guidance regarding the inclusion of Non-Energy Benefits ("NEBs") in the Technical Reference Forum (p. 21 of 21):[15]

"The Commission therefore directs that the IEM be requested to recommend an approach for quantification of deferred equipment replacement NEBs in individual instances when they are material and quantifiable. Approval of deferred customer equipment NEBs, however, is conditioned as follows: The Commission directs that each recommended approach for customer deferred equipment replacement NEB quantification shall be included within the annual TRM update filing, and that its reasonableness shall be addressed in testimony by the IEM and/or Staff, and may be addressed by other parties, so that the Commission may approve or disapprove such proposed NEB quantifications.

The Commission therefore orders and directs that the following three categories of NEBs be consistently and transparently accounted for in all applications of the TRC test, as it is applied to measures, programs, and portfolios:

- *benefits of electricity, natural gas, and liquid propane energy savings (i.e., other fuels);*
- *benefits of public water and wastewater savings;*
- *benefits of avoided and deferred equipment replacement costs as conditioned herein."*

Per this Protocol[16] the recommended approach to quantify the NEBs will fall within these three categories.

2.3.1.4.1 NEB PROTOCOLS

Per Commission orders, NEBs are concentrated on other fuels, water, and deferred equipment costs. In response to the Commission Order for NEBs, a recent protocol addition is Protocol L, which encompasses NEBs:

- Protocol L1: Non-Energy Benefits for Electricity, Natural gas, and Liquid Propane ("other fuels");
- Protocol L2: Non-Energy Benefits for Water Savings; and
- Protocol L3: Non-Energy Benefits of Avoided and Deferred Equipment Replacement Costs.

[15] Arkansas TRM v8.0, Protocol L.
[16] Protocol L of the Arkansas TRM v8.0.

Empire's tracking system captures inputs needed for NEB calculations based on the AR TRM v8.2 algorithm. In reviewing NEBs development in PY2021, the Evaluators review included assessing the consistency of inputs for all assumptions for each measure.

2.3.1.4.2 POTENTIAL NEBS BY SECTOR AND MEASURE

The tables below outline the potential residential NEBs for the PY2021 Empire portfolio.

TABLE 2-4 PY2021 RESIDENTIAL NEBS BY MEASURE[17]

Measure	Water	Other Fuel	ARCs/ DRCs	AR TRM v8.2 Section
Advanced power strips				2.4.4
Toilet leak repair kit	x			N/A
Air infiltration		X		2.2.9
Ceiling insulation		X		2.2.2
Duct sealing - AC with resistance heat				2.1.11
Duct sealing - electric cooling with gas heat		X		2.1.11
Duct sealing - heat pump				2.1.11
Duct sealing electric resistance no cooling				2.1.11
LED Lamps		X	x	2.4.1
Faucet aerators	X			2.3.4
Low-flow showerheads	X			2.3.5

NEB estimates are found in each of the program chapters within this report.

2.3.2 Cost-Effectiveness Evaluation

For additional information on approach and inputs see Appendix A: Portfolio Cost-Effectiveness.

2.3.3 Process Evaluation

The Evaluators took the following steps to determine the scope of the process evaluation for the PY2021 programs in Empire's portfolio.

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 v8.2. In this review, the Evaluators determine what aspects of the program warrant a process evaluation.

In general, process evaluations assess organizational and procedural aspects of programs to provide feedback on features of programs that are functioning well and contribute recommendations when areas of improvement are identified. Specifically, Protocol C defines the criteria that require a process evaluation be undertaken as well as the criteria that justify conducting a process evaluation.

Table 2-5 provides details on specific criteria that must be met prior to proceeding with a process evaluation.

[17] This tables represents potential NEBs for each measure. In some cases, there is either not enough data available to calculate those NEBs, or that NEB was not applicable in that application.

TABLE 2-5 TRM 8.2 VOLUME 1 PROTOCOL C: PROCESS EVALUATION GUIDANCE

AR TRM v8.2 Process Evaluation Criteria
Process evaluation required if: ▪ Program is new/modified ▪ No process evaluation has been undertaken during current funding cycle ▪ A change in program implementation occurred
Process evaluation potentially needed if: ▪ Program impacts are lower than expected ▪ Goals (both informational and educational) are not being achieved ▪ Rates of participation are lower/slower than expected ▪ Program's operational system is slow to get up and running ▪ Cost effectiveness of the program is less than expected ▪ Participants (both customers and market actors) report problems/low rates of satisfaction with program.

Based on Protocol C guidance, the Empire portfolio in its entirety required process evaluation. The Evaluators performed the extent of process evaluation activities supportable with the available program budget: review of participant survey responses provided by AM Conservation, program staff interviews, and a program documentation review. There are no surveys or interviews with other program implementers or market actors.

3 Evaluation Findings

This chapter provides a summary of the portfolio-level findings and any cross-cutting evaluation activities that occurred over the course of the PY2021 EM&V efforts. Specifically, this chapter includes:

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

3.1 Data Collection Summary

PY2021 primary data collection activities are included in the table below.

TABLE 3-1 SUMMARY OF PY2021 DATA COLLECTION EFFORTS

Program	# Site Visits	# Staff Interviews	# Participant Surveys	# of Measure-level Lit. Reviews
Residential Products	N/A	1	0	1
School Based Energy Education			291	1
Independent Weatherization			0	0
Total	**0**	**1**	**291**	**2**

Participant surveys indicated in the table above were completed by the implementation contractor, AM Conservation Group, as part of implementation process. There were no surveys performed by the Evaluator.

3.2 Impact Evaluation Summary

The evaluation of Empire's PY2021 portfolio is included in this evaluation report. In addition to verifying the savings reported by Empire, the Evaluators calculated lifetime impacts for the programs and measures. As part of this process, in the body of the report the Evaluators refer to the impacts (energy savings or peak demand reduction) accrued during the program year being evaluated as "first year" impacts.

Table 3-2 shows the Empire PY2021 goals, reported gross impacts, the Evaluators evaluated first year ex post gross energy savings (135,913 kWh) and demand reductions (34.08 kW), gross realization rates (100% for kWh, 100% for kW), net impacts (122,590 kWh and 31.62 kW), net-to-gross (NTG) ratios, and ex post net lifetime impacts (2,116,101 kWh).[18] The levelized cost of energy savings (kWh) for the PY2021 portfolio is $0.0471 ($/kWh).

The C&I Rebate program is excluded from report as there were no savings in PY2021. That program had an energy savings goal of 125,510 kWh and demand reduction goal of 24.80 kW. There were minimal administrative expenditures associate with the program, these costs are either a) website application changes, or b) projects that were evaluated and not approved. These costs were included in this report and the cost-effectiveness evaluation.

[18] Lifetime impacts are the sum of energy savings over the course of the measure's estimated useful life (EUL) and the weighted average demand reduction across the lifetime of the measure divided by the EUL (in years).

TABLE 3-2 PY2021 EMPIRE PORTFOLIO EVALUATION IMPACTS

Impact	Metric	Res. Products	School Kits	Ind. Wx	Total
Energy Savings (kWh)	Goals (Net)	86,759	60,611	N/A	**147,370**
	Ex Ante (Gross)	37,008	26,680	72,225	**135,913**
	Ex Post (Gross)	37,008	26,680	72,225	**135,913**
	Realization Rate	100%	100%	100%	**100%**
	Ex Post (Net)	30,717	24,444	67,429	**122,590**
	NTG Ratio	83%	92%	93%	**90%**
	% of Goal (Net)	31%	26%	66%	**29%**
	Lifetime (Net)	597,626	365,574	1,152,900	**2,116,101**
Annual Demand Reduction (kW)	Goals (Net)	45.50	82.30	N/A	**127.80**
	Ex Ante (Gross)	6.02	3.10	24.96	**34.08**
	Ex Post (Gross)	6.02	3.10	24.96	**34.08**
	Realization Rate	100%	100%	100%	**100%**
	Ex Post (Net)	4.99	2.83	23.80	**31.62**
	NTG Ratio	83%	91%	95%	**93%**
	% of Goal (Net)	60%	33%	165%	**56%**

The contribution to portfolio energy (kWh) savings by program, by program year, is summarized in the figures below.

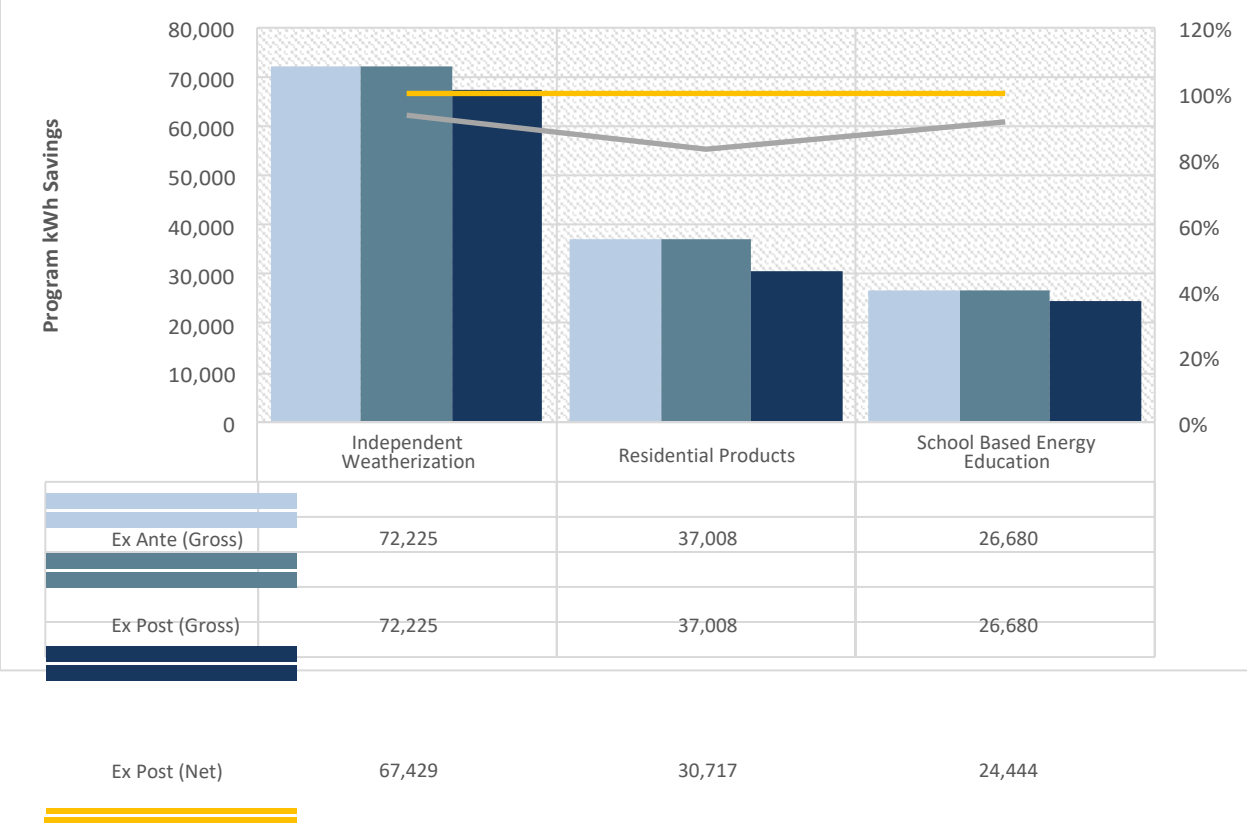

FIGURE 3-1 PY2021 CONTRIBUTION BY PROGRAM, BASED ON ENERGY SAVINGS (KWH)

3.2.1 High Impact Measures (HIMs)

LED lamps (42%), duct sealing (38%) and aerators (8%) are the high impact measures (HIM) for the portfolio. This figure below outlines the measures, all residential, in the portfolio of programs.

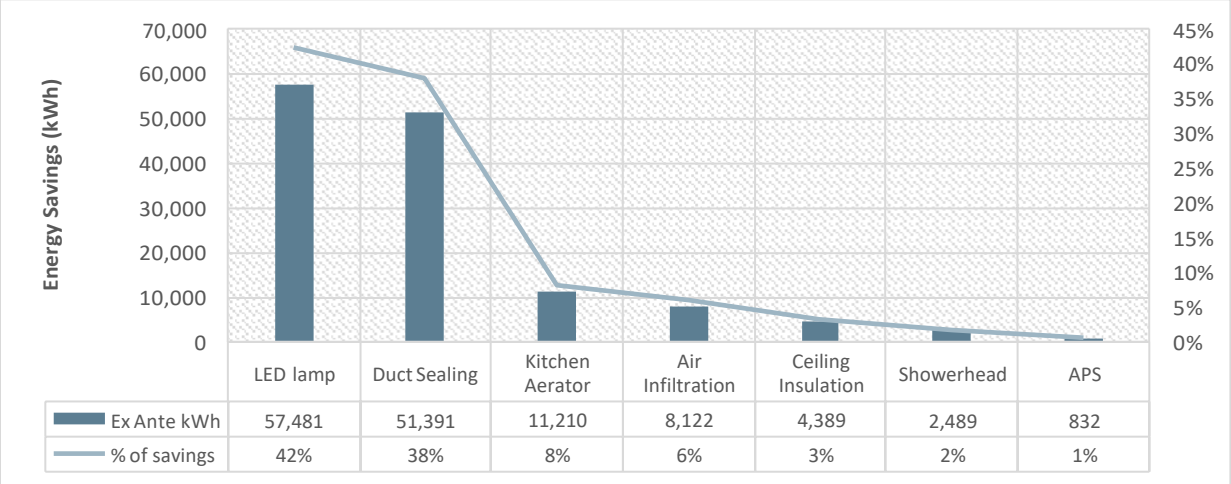

FIGURE 3-2 EX ANTE ENERGY SAVINGS (KWH) BY MEASURE

Additionally, the figure below outlines the ex-ante energy (kWh) savings by end-use across all residential programs in the PY2021 portfolio.

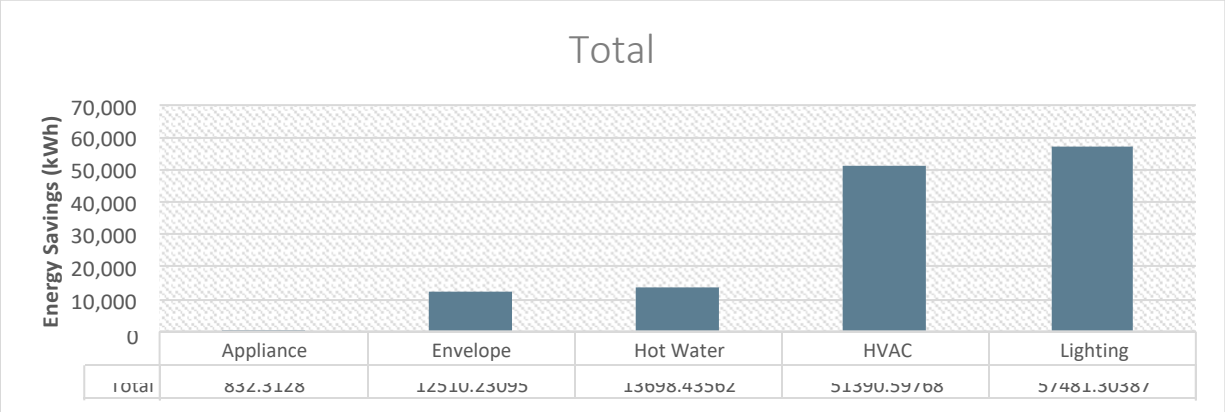

FIGURE 3-3 PY2021 RESIDENTIAL EX ANTE ENERGY SAVINGS (KWH) BY END-USE

Table 3-3 below summarizes the performance against goals of programs evaluated in this report.

TABLE 3-3 EMPIRE'S PY2021 PERFORMANCE AGAINST ENERGY SAVINGS (KWH) GOALS

Program	Ex Post Net Energy Savings (kWh)	Net Energy Savings (kWh) Goal	% of Goal	Ex Post Net Demand Reductions (kW)	Net Demand Reduction Goal (kW)	% of Goal
Independent Weatherization	67,429	102,270	66%	23.80	14.40	165%
Residential Products	30,717	99,138	31%	4.99	8.30	60%
School Based Energy Education	24,444	92,418	26%	2.83	8.50	33%
C&I Rebate	0	125,510	0%	0.00	24.80	0%
Total	**122,590**	**419,336**	**29%**	**31.62**	**56.1**	**56%**

Sums may differ due to rounding.

The PY2021 budgets and actual spend are summarized in Table 3-4 below.

TABLE 3-4 SUMMARY OF BUDGETS AND ACTUAL SPEND IN PY2021

Program	Budgeted Spend	Actual Spend	% of Budget Spent
Independent Weatherization	$42,000	$27,388	59%
Residential Products	$20,770	$15,208	64%
School Based Energy Education	$14,175	$17,244	111%
C&I Rebate	$26,669	$3,808	13%
Online Energy Calculator	$2,000	$3,006	150%
Regulatory	$3,000	$0	0%
Marketing	$2,000	$0	0%
EM&V	$6,500	$0	0%
Total	**$121,371**	**$67,006**	**55%**

Sums may differ due to rounding.

The table below shows the total expenditures, evaluation expenditures and the percentage of total.

TABLE 3-5 EVALUATION EXPENDITURE SUMMARY

Total EM&V Expenditures	PY2021 Program Expenditures	EM&V as % of Budget
$10,000	$67,006	15%

3.3 Cost Effectiveness Summary

Table 3-6 below outlines the results from the cost-effectiveness analysis performed on the PY2021 portfolios, by program.

TABLE 3-6 PY2021 COST EFFECTIVENESS TEST RESULTS

Program	TRC	UCT	RIM	PCT	TRC Net Benefits
Independent Weatherization	3.96	1.86	0.41	4.93	$77,984
Residential Products	1.75	1.40	0.34	6.02	$10,063
School Based Energy Education	3.05	0.79	0.28	6.39	$32,590
C&I Rebate	0.00	0.00	0.00	0.00	-$3,808
Online Energy Calculator	0.00	0.00	0.00	0.00	-$3,006
EEA	0.00	0.00	0.00	0.00	-$353
Total	**2.81**	**1.28**	**0.35**	**5.56**	**$116,829**

Sums may differ due to rounding.

Additional results can be found in Appendix A: Portfolio Cost-Effectiveness.

3.4 Non-Energy Benefits Summary

Below is a summary of the NEBs that were calculated in each program in PY2021.

- Residential Products: this program captured avoided replacement costs and natural gas;
- School Based Energy Education: this program captured avoided replacement costs, propane, natural gas, and water; and

- Independent Weatherization: this program captured avoided replacement costs, water, and natural gas.

The table below summarize of the net present value (NPV) of all NEBs in the Empire portfolio. Additional details are found in the program chapters.

TABLE 3-7 PY2021 EMPIRE NEB FINDINGS SUMMARY

Program	NPV NGS ($)	NPV LPGS ($)	NPV Water/ WW ($)	ARC ($)	Total NPV of NEBs ($)
Residential Products	-$1,602	$0	$0	$3,727	$2,125
School Based Energy Education	$3,571	$2,259	$26,970	$1,994	$34,794
Independent Weatherization	$51,879	$0	$979	$435	$53,293
Total	**$53,848**	**$2,259**	**$27,949**	**$6,156**	**$90,212**

Sums may differ due to rounding.

3.5 Process Evaluation Summary

Following a review of present program offerings and interviews with Empire staff, the Evaluators found the following.

3.5.1 Overview of Barriers

Citing the comments of the IEM, "it is unlikely that Empire's program portfolio will ever reach its participation goals due to the challenges it faces in its service territory.[19]" Empire has expanded on these challenges in various filings over the last three years, beginning with its response to Order No. 40 in APSC Docket 07-076-TF[20]. The Commission has recognized that due to the size and other demographics that Empire faces a challenge unique among the public utilities subject to the required EE achievement targets. As outlined in Empire's other energy efficiency filings, some of these hurdles include:

- Energy efficiency overhead costs - administrative/regulatory costs must be recovered over a small customer base.
- Size of operations - by customer count Empire is less than one tenth the size of the next smallest IOU in Arkansas.
- Rural service territory - Empire's service territory includes no urban population centers that can offer economic activity and diversity.
- Composition of customer base - Empire's Arkansas service territory is comprised of about 82% residential customers.
- Industrial/Commercial customer base - nearly half of Empire's electric sales in Arkansas come from two large commercial/ industrial customers.
- Service territory economy - nationwide franchises and big box stores that may fill the landscape of high commerce areas are limited in Empire's Arkansas service territory.

[19] APSC Docket 07-076-TF, Doc. 192. Filed June 3, 2013
[20] APSC Docket No. 07-076-TF, Doc. 169. Filed September 14, 2012

- Service territory media – as a small rural area, there are limited cost-effective media outlets available to promote Empire's energy efficiency programs.

3.6 Tests of Portfolio Comprehensiveness

The Tests of Portfolio Comprehensiveness is characterized by seven factors. These factors become a guide for all parties invested in energy efficiency programs to analyze proposals. These factors cover a broad range of topics involved in running an energy efficiency programs, including targeted customer sectors, budgets and management, and addresses different types of heating and cooling types. Most utilities in Arkansas service a large geographical footprint, thus those utilities are required to meet all seven factors in their program.

Since Empire is servicing a smaller geographical location than most other utilities located in Arkansas, the PWC decided that Empire did not have to meet all seven criteria. The PWC recommended that Empire, "design its portfolio and programs to be cost-effective; and market its EE programs". The PWC decided this for Empire so they would only need to include cost effective programs and be able to reduce costs all around their portfolio.

3.6.1 Summary of Marketing Efforts

The Evaluators received summaries of marketing spend for PY2021 as well as a copy of the bill insert used by Empire. Since PY2018, Empire moved away from using print media advertisement. They have since focused on direct mail bill inserts. The Marketing & Development (M&D) expenditures percent for the Empire portfolio by program year is as follows: PY2019: 3.1%; PY2020: 5.7%; and PY2021: 5.7%.

3.6.2 Summary of Goal Attainment

The table below summarizes the spending as a percentage of budget, energy savings (kWh) as a percentage of goal, and the levelized cost of each program.

TABLE 3-8 SUMMARY OF GOAL ATTAINMENT FOR EMPIRE

Program	Spending (% of Budget)	Energy Savings (% of Goal)	Levelized ($ per kWh)
Independent Weatherization	59%	N/A	$0.04
Residential Products	64%	35%	$0.03
School Based Energy Education	111%	40%	$0.07
C&I Rebate	40%	0%	$0.00
Online Energy Calculator	150%	N/A	$0.00
Energy Efficiency Arkansas (EEA)	23%	N/A	$0.00
Total	**55%**	**40%**	**$0.05**

Sums may differ due to rounding.

3.7 Conclusions by Program

3.7.1 Residential Products

- The program achieved 35% of its energy savings goal (86,759 kWh).
- 1,191 LEDs were incentivized in the program.
- Non-energy benefits (NEBs) account for 9.1% of program TRC benefits.

3.7.2 School Based Energy Education

- Although the program performed consistently well compared to prior years, the program experienced a slight overall drop in both participation and verified savings, both accounting for a 6.7% difference compared to PY2020.
- The Evaluators were not provided ex ante claimed savings for the kits or calculation workbooks to demonstrate how the expected savings were calculated. Documentation was limited to a summary of inputs in PDF reports provided by the program implementer to Empire.
- Non-energy benefits (NEBs) accounting for 71.8% of program TRC benefits.
- The program only met 26% of the savings goals for PY2021 (92,418 kWh).
- The Evaluators were not provided calculation workbooks to demonstrate how the expected savings were calculated; documentation was limited to a summary of inputs in PDF reports provided by the program implementer to Empire.

3.7.3 Independent Weatherization Program

- The program completed 17 weatherization projects in PY2021, 2 more projects compared to PY2019 (no PY2020 projects). Empire had anticipated completing 20 weatherization projects in collaboration with BHE, but just missed the target by 3 projects.
- 51.1% of TRC net benefits were from NEBs, including water, ARCs and natural gas savings.
- Due to the lack of participant data in the provided tracking data, the Evaluators opted to take average ceiling insulation, air infiltration, and duct sealing values from BHE's PY2021 Home Energy Savings Program (HSP) and apply to Empire's 17 homes. This was done since there was a collaboration with BHE to complete the projects.
- Due to the lack of participant home characteristics information in the provided tracking data, the Evaluators opted to calculate percent of heating types based on BHE data. This was done since there was a collaboration with BHE to complete the projects.
- The program measure offerings were consistent with prior years.
- Although participation slightly increased (13%) from PY2019, overall verified program savings remained consistent with prior years. In PY2021, the ceiling insulation projects alone experienced a significant drop in participation and savings compared to PY2019.

3.8 PY2021 Recommendations

The recommendations for each program are listed below.

- Residential Products:
  - There were no new recommendations for this program.
- School Based Energy Education:
  - **Advanced power strips are proven cost-effective** in similar kit programs administered in Arkansas, such as OG&E Arkansas's HEEP LivingWise® channel. *Consider adding APS to the school kit program.*
  - **If implementor reporting aligned with the program year** and not the school year, there is a potential to garner more information from the program for the evaluation. *Consider requiring AM Conservation Group reporting requirements to align with the program year.*
- Independent Weatherization:
  - The evaluators were not provided with adequate tracking data and therefore potentially not capturing the full potential of the program. *Consider aggregating participant project data to include home heating type, measure information required for calculations, and incentive data.*

3.9 Progress on PY2020 Recommendations

In PY2020, two program or portfolio level recommendations were provided to Empire as part of the EM&V of their portfolio. The Evaluators reviewed Empire's response to recommendations from the PY2020 EM&V report and categorized them as follows:

- Completed: which means the recommendation has been fully implemented.
- Continuing: which means the recommendation has been fully implemented in the previous year. However, due to the nature of the recommendation, this will be an area will be monitored throughout the next program year.
- In Progress: which identifies those recommendations that have been accepted and will be adopted before the next program year.
- Under Consideration: which identifies those recommendations that are still under review.
- Reviewed and Rejected: which identifies those recommendations that have been considered and subsequently rejected. This could also apply to recommendations that are no longer applicable due to changes in program design or operations.

The table below outlines the status of the recommendations.

TABLE 3-9 SUMMARY OF STATUS OF PY2020 RECOMMENDATIONS

PY2020 Recommendation	Response	Status in PY2021
RESIDENTIAL PRODUCTS: Consider expanding kit contents with other cost-effective measures. Possibilities include and advanced power strips.	Completed	Due to a miscommunication with the vendor, we were unable to issue the kits this year. There are plans to add to the kit in PY2022.
SCHOOL BASED ENERGY PROGRAM: Incorporate low flow showerheads into the kit. This measure is proven cost-effective in similar kit programs administered in Arkansas (such as the program administered by OG&E).	Completed	Due to a distribution issue, these were planned but not included in PY2021. There are plans to add these in PY2022.

4 Residential Products Program

The Residential Products Program provides a free lighting kit which includes a 3-pack of light emitting diodes (LEDs) when customers respond to a billing insert offering a pre-paid coupon. Additionally, in PY2021, Empire offered a free-of-charge self-install mailer kits which included three (3) LEDs, which include the following:

- (2) 9W A19 Omni-Directional LEDs
- (1) 8W BR30 Directional LED

The program has received an impact and process evaluation. The evaluations included desk reviews to estimate ex post gross savings estimates, the estimation of NTG through a literature review, incentive level benchmarks against other similar programs, and strategic recommendations for program improvement.

4.1 Impact Evaluation

4.1.1 Gross Impact

Empire provided the Evaluators a description of the LED kits issued in the program. The LEDs were evaluated through a desk review adhering to the methodologies outlined in the AR TRM v8.2. Specific inputs came from the following sections:

- PY2021: AR TRM v8.2: 2.5.1.3 ENERGY STAR® Directional LEDs
- PY2021: AR TRM v8.2: 2.5.1.4 ENERGY STAR® Omni-Directional LEDs

In PY2021, a total of 397 lighting kits (1,191 LEDs) were delivered through the program. Ex ante savings were not provided in program tracking data, therefore the Evaluators assumed ex ante equaling ex post savings. Ex ante gross and ex post gross annual savings are presented in the table below.

TABLE 4-1 PY2021 RESIDENTIAL PRODUCTS GROSS SAVINGS SUMMARY

Measure	Ex Ante Gross kWh Savings	Ex Post Gross kWh Savings	Realization Rate	Ex Ante Gross kW Reduction	Ex Post Gross kW Reduction	Realization Rate
9W A19 LEDs	20,132	20,132	100%	3.27	3.27	100%
8W BR30 LEDs	16,876	16,876	100%	2.74	2.74	100%
Total	**37,008**	**37,008**	**100%**	**6.02**	**6.02**	**100%**

Sums may differ due to rounding.

4.1.2 Net Impact

The Evaluators established the NTG (82.9%) based on secondary research through the use of a literature review. More information on this literature review can be found in Appendix B: Literature Review Outcomes. Ex post gross and ex post net annual savings for the program are presented in Table 4-2.

TABLE 4-2 PY2021 RESIDENTIAL PRODUCTS NET SAVINGS SUMMARY

Measure	Ex Post Gross kWh Savings	Ex Post Net kWh Savings	NTG	Ex Post Gross kW Savings	Ex Post Net kW Savings
9W A19 LEDs	20,132	16,710	83%	3.27	2.72
8W BR30 LEDs	16,876	14,007	83%	2.74	2.28
Total	**37,008**	**30,717**	**83%**	**12.23**	**4.99**

Sums may differ due to rounding.

Ex post gross and ex post net lifetime savings for the Residential Products program are presented in Table 4-3.

TABLE 4-3 PY2021 RESIDENTIAL PRODUCTS LIFETIME SAVINGS SUMMARY

Measure	EUL	Ex Post Gross Lifetime Energy Savings (kWh)	Ex Post Net Lifetime Energy Savings (kWh)
9W A19 LEDs	19	382,517	317,489
8W BR30 LEDs	20	337,515	280,137
Total	**20**	**720,032**	**597,626**

Sums may differ due to rounding.

4.2 Non-Energy Benefits

Protocol L of the AR TRM v8.2 states that programs must account for non-energy benefits (NEBs) resulting from each program. Specifically, the categories of NEBs that are to be calculated for each are as follows:

- Benefits of electricity, natural gas, and liquid propane energy savings (i.e. other fuels);
- Benefits of public water and wastewater savings; and
- Benefits of avoided and deferred equipment replacement costs.

As discussed below, the NEBs applicable to the Program in PY2021 are avoided replacement costs (ARCs) and therms.

Measures with zero entries are included to ensure consistency of table structure and to demonstrate that no measures or potential energy and non-energy impacts were omitted.

4.2.1 Natural Gas Energy Savings

Natural Gas NEB summary is found in the table below.

TABLE 4-4 NATURAL GAS SAVINGS (THERM) BY MEASURE IN PY2021

Measure	Ex Post Gross Therm	Ex Post Net Therm	Ex Post Net Lifetime Therm	Therm Benefit ($)	NPV of Therm ($)
8W BR30 LEDs	-240	-200	-4,676	-$122	-$1,602
9W A19 LEDs	-110	-91	-2,192	-$56	-$743
Total	**-350**	**-290**	**-6,869**	**-$177**	**-$2,345**

Sums may differ due to rounding.

4.2.2 Propane Savings

There were no propane savings identified in the program.

4.2.3 Water Savings

There were no water savings in this program.

4.2.4 Avoided and Deferred Replacement Costs

To calculate avoided replacement costs (ARC) and incremental costs for LEDs in the Residential Products program the AR TRM v8.2 Protocol L calculator was used with the following assumptions: 1) replacement-on-burnout for all bulbs and 2) EUL for LEDs is 19 years [1]. For direct install LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and labor.

In cases where project cost was not available and the project was not direct install, the Evaluators cited costs from IL TRM V6.0 Volume 3[21].

The tables below show the ARC benefits for the program in PY2021.

TABLE 4-5 AVOIDED REPLACEMENT COSTS (ARCS) BY MEASURE IN PY2021

Measure	Ex Post Gross ARC ($)	Ex Post Net ARC ($)	NPV of ARCs ($)
8W BR30 LEDs	$1,497	$1,242	$1,242
9W A19 LEDs	$2,993	$2,485	$2,485
Total	**$4,490**	**$3,727**	**$3,727**

Sums may differ due to rounding.

4.2.5 Deferred Replacement Costs

There were no deferred replacement costs (DRC) in the program.

4.2.6 NEBs Summary

The table below summarizes the net present value (NPV) of NEBs attributable to the program, including only avoided replacement cost.

TABLE 4-6 PY2021 NON-ENERGY BENEFITS (NEBS) SUMMARY

Program	NPV NGS ($)	NPV LPGS ($)	NPV Water/ WW ($)	NPV ARC ($)	Total NPV NEBs ($)
8W BR30 LEDs	-$1,602	$0	$0	$1,242	**-$360**
9W A19 LEDs	-$743	$0	$0	$2,485	**$1,741**
Total	**-$2,345**	**$0**	**$0**	**$3,727**	**$1,381**

Sums may differ due to rounding.

[21] http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_6/Final/IL-TRM_Effective_010118_v6.0_Vol_3_Res_020817_Final.pdf

4.3 Process Evaluation

This section outlines the findings of the PY2021 Program process evaluation.

4.3.1 Data Collection Activities

The Residential Products program does not maintain a tracking system. At the request of the Evaluators, Empire compiled a summary of kit distribution.

4.3.2 Program Marketing

The residential products program involves a pre-packaged kit sent to eligible customers. Customers receive a prepaid post card in the mail and those who return it receive a pack of three LED bulbs. Empire does not have many ways to publicly market their program due to being in a small and rural territory. If they were to market via television ads or radio, the ads would reach other utility territories and potentially result in market confusion.

4.3.3 Process Results and Findings

This section presents the results and key findings from the process evaluation activities. These findings are based upon interviews with utility staff and a program documentation review. The findings presented pertain to program communications and marketing, program delivery, participant energy efficiency awareness and behaviors, and customer characteristics.

4.3.3.1 Empire Staff Interview Findings

Empire does the marketing for the Residential Products program. Empire uses a subcontractor, AM Conservation Group, to distribute the mailer kits to participants. The residential program uses mailer kits because the service territory is small to use a retailer to sell and track the bulbs. Using mailer kits helps reduce the administration costs of using contractors.

4.3.3.2 Implementation Staff Interview Findings

Empire has a supporting firm that sends the mailer kits to residential homes. Staff estimate, just under 10% of customers sent back their postcards to claim the lights. In previous years 400 to 500 customers were also randomly chosen to receive a direct install kit like the school kit, however this program did not occur in PY2021 due to communication issues with the vendor.

4.4 Adherence to Protocol A

The Evaluators also previously reviewed program tracking data in PY2021 to assess its compliance with Protocol A of the AR TRM v8.2 which specifies that tracking data should be checked for:

- Participating Customer Information;
- Measure Specific Information;
- Vendor Specific Information;
- Program Tracking Information;
- Program Costs; and
- Marketing & Outreach Activities.

Due to the small size of Empire's portfolio, tracking systems are often limited, and it is not economically feasible to maintain tracking to the same level of detail observed in the programs administered by other utilities in Arkansas. In the program-level Protocol A Assessments, the Evaluators have endeavored to constrain comments to areas that would be financially feasible and cost-effective to execute.

The Residential Products Program maintained a tracking system of applicants and whether they were approved to participate in the program. The Evaluators determined quantities shipped in the program based on a review of program tracking data. It is recommended that Empire develop a tracking system that shows full customer account number, unit cost, and energy impacts.

4.5 Response to PY2020 Recommendations

The table below shows the responses to the PY2020 recommendations.

TABLE 4-7 PY2020 RECOMMENDATIONS AND STATUS IN PY2021

PY2020 Recommendation	Response	Status in PY2021
Consider expanding kit contents with other cost-effective measures. Possibilities include and advanced power strips.	Under Consideration	Open to exploring ways of diversifying kits.

4.6 Planned Program Changes

There are no planned program changes for PY2022.

4.7 Conclusions & Recommendations

4.7.1 Conclusions

The key conclusions from the PY2021 evaluation of the Program are as follows:

- The program achieved 31% of its energy savings goal (99,138 kWh).
- 1,191 LEDs were incentivized in the program.
- Non-energy benefits (NEBs) account for 9.1% of program TRC benefits.

4.7.2 Recommendations

There were no new recommendations for this program.

5 School Based Energy Education Program

Through the School Based Energy Education program, Empire conducts energy efficiency education and provides direct-install measures to sixth grade middle school students within its service territory. Empire provides energy efficiency kits, containing low-cost measures for students to install in their homes, including the following:

- Kitchen aerator;
- Toilet leak repair; and
- LED lamps.

In addition to the kit, students receive unlimited access to an interactive program website and a toll-free help line, where they can ask questions. Empire also provides teachers with teaching aids and supplemental materials, such as a teacher book, a step-by-step program checklist, lesson plans, program videos, program evaluation forms, an Arkansas State Education Standards Correlation Chart, a pre-test and post-test answer key, and electricity, water, and natural gas posters that can be used to increase student awareness of and appreciation for energy efficiency.

The program has received an impact and process evaluation. The evaluations included desk reviews to estimate ex post gross savings estimates, the estimation of NTG through a literature review and recommendations for program improvement.

5.1 Impact Evaluation

5.1.1 Gross Impact

All measures installed in this program have deemed savings provided in the AR TRM 8.2. Specific inputs came from the following sections:

- PY2021: AR TRM v8.2: 2.3.4 Kitchen Aerators
- PY2021: AR TRM v8.2: 2.5.1.4 ENERGY STAR® Omni-Directional LEDs

In PY2021, a total of 304 school kits were delivered through the program. Ex ante gross and ex post gross annual savings are presented in the table below.

TABLE 5-1 PY2021 SCHOOL BASED ENERGY EDUCATION GROSS SAVINGS SUMMARY

Measure	Ex Ante Gross kWh Savings	Ex Post Gross kWh Savings	Realization Rate	Ex Ante Gross kW Reduction	Ex Post Gross kW Reduction	Realization Rate
LED Lamp	15,470	15,470	100.0%	1.93	1.93	100.0%
Faucet Aerator	11,210	11,210	100.0%	1.17	1.17	100.0%
Total	**26,680**	**26,680**	**100.0%**	**3.10**	**3.10**	**100.0%**

Sums may differ due to rounding.

5.1.2 Net Impact

The Evaluators established an overall NTG ratio (91.6%) based on secondary research in PY2021 using a literature review. More information on this literature review can be found in Appendix C – Literature Review Outcomes.

Ex post gross and ex post net annual savings for the School Based Energy Education Program are presented in Table 5-2.

TABLE 5-2 PY2021 SCHOOL BASED ENERGY EDUCATION NET SAVINGS SUMMARY

Measure	Ex Post Gross kWh Savings	Ex Post Net kWh Savings	NTG	Ex Post Gross kW Savings	Ex Post Net kW Savings
LED Lamp	15,470	13,459	87.0%	1.93	1.68
Faucet Aerator	11,210	10,986	98.0%	1.17	1.14
Total	**26,680**	**24,444**	**91.6%**	**3.10**	**2.83**

Sums may differ due to rounding.

Ex post gross and ex post net lifetime savings for the School Based Energy Education Program are presented in Table 5-3.

TABLE 5-3 PY2021 SCHOOL BASED ENERGY EDUCATION LIFETIME SAVINGS SUMMARY

Measure	EUL	Ex Post Gross Lifetime Energy Savings (kWh)	Ex Post Net Lifetime Energy Savings (kWh)
LED Lamp	19	293,928	255,717
Faucet Aerator	10	112,099	109,857
Total	**15**	**406,027**	**365,574**

Sums may differ due to rounding.

5.2 Non-Energy Benefits

Protocol L of the AR TRM v8.2 states that EM&V must account for non-energy benefits (NEBs) resulting from each program. Specifically, the categories of NEBs that are to be calculated for each are as follows:

- Benefits of electricity, natural gas, and liquid propane energy savings (i.e. other fuels);
- Benefits of public water and wastewater savings; and
- Benefits of avoided and deferred equipment replacement costs.

Applicable NEBs for this program in PY2021 are avoided replacement costs (ARCs), propane savings, natural gas savings, and water savings. Measures with zero entries are included to ensure consistency of table structure and to demonstrate that no measures or potential energy and non-energy impacts were omitted.

5.2.1 Natural Gas Savings

Customers can have either electric or natural gas heating. When a customer has natural gas heating, they can claim the natural gas therms savings as NEBs. Participant survey responses provided by the program implementer determined the percentage of students who lived in homes with natural gas

heating. The table below presents the ex post net natural gas can be claimed as NEBs for cost-effectiveness purposes.

TABLE 5-4 THERM SAVINGS BY MEASURE IN PY2021

Measure	Ex Post Gross Therms	Ex Post Net Therms	Ex Post Net Lifetime Therms	Therm Benefit ($)	NPV of Therms ($)
LED Lamp	822	806	8,224	$492	$4,037
Faucet Aerator	-68	-59	-1,286	-$36	-$466
Toilet Leak Repair	0	0	0	$0	$0
Total	**755**	**747**	**6,938**	**$456**	**$3,571**

Sums may differ due to rounding.

5.2.2 Propane Savings

When a customer has propane, Empire can claim the savings as NEBs. Participant survey responses provided by the program implementer, AM Conservation, determined the percentage of students who lived in homes with propane heating. The table below presents the ex post net propane savings can be claimed as NEBs for cost-effectiveness purposes.

TABLE 5-5 PROPANE SAVINGS BY MEASURE IN PY2021

Measure	Ex Post Gross LPG Savings (gallons)	Ex Post Net LPG Savings (gallons)	LPG Benefit ($)	NPV LPGS ($)
LED Lamp	163	160	$327	$2,499
Faucet Aerator	-11	-10	-$20	-$240
Toilet Leak Repair	0	0	$0	$0
Total	**152**	**150**	**$307**	**$2,259**

Sums may differ due to rounding.

5.2.3 Water Savings

In PY2021, the water saving measures implemented through the Program included faucet aerators, and toilet leak repair. The water savings for faucet aerators were determined using the AR TRM v8.2. The water savings estimates for the toilet leak repair is 200 gallons per day. [22] Table 5-6 below presents the estimates.

[22] https://blog.epa.gov/2013/03/21/around-the-water-cooler-is-your-toilet-leaking/

TABLE 5-6 WATER SAVINGS BY MEASURE TYPE IN PY2021

Measure	Ex Post Gross Water/WW Savings (gallons)	Ex Post Net Water/WW Savings (gallons)	Water/WW Benefit ($)	NPV Water/WW ($)
LED Lamp	533,035	525,363	$4,039	$26,970
Faucet Aerator	383,612	375,940	$2,890	$22,079
Toilet Leak Repair	0	0	$0	$0
Total	**916,647**	**901,303**	**$6,929**	**$49,049**

Sums may differ due to rounding.

5.2.4 Avoided Replacement Costs

To calculate avoided replacement costs (ARCs) and incremental costs for LEDs in the School Based Energy Education Program, the AR TRM v8.2 Protocol L calculator was used with the following assumptions: 1) replacement-on-burnout for all bulbs and 2) EUL for LEDs is 19 years [1]. For direct install LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and labor. For kit-installed LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and administrative costs to assemble the kits.

In cases where project cost was not available and the project was not direct install, the Evaluators cited costs from IL TRM V7.0 Volume 3[23].

The tables below show the ARC claimed in the program.

TABLE 5-7 AVOIDED REPLACEMENT COSTS (ARCS) BY MEASURE IN PY2021

Measure	Ex Post Gross ARC ($)	Ex Post Net ARC ($)	NPV of ARCs ($)
LED Lamp	$0	$0	$0
Faucet Aerator	$2,292	$1,994	$1,994
Toilet Leak Repair	$0	$0	$0
Total	**$2,292**	**$1,994**	**$1,994**

Sums may differ due to rounding.

5.2.5 Deferred Replacement Costs

There were no deferred replacement costs (DRCs) estimated in the PY2021 programs.

5.2.6 NEBs Summary

The table below summarizes the net present value (NPV) of NEBs attributable to the program, including natural gas, propane savings, water savings and avoided replacement cost.

[23] http://s3.amazonaws.com/ilsag/IL-TRM_Effective_010119_v7.0_Vol_3_Res_092818_Final.pdf

TABLE 5-8 PY2021 NON-ENERGY BENEFITS (NEBS) SUMMARY

Program	NPV NGS ($)	NPV LPGS ($)	NPV Water/ WW ($)	NPV ARC ($)	Total NPV of NEBs ($)
LED Lamp	$4,037	$2,499	$22,079	$0	**$28,616**
Faucet Aerator	-$466	-$240	$0	$1,994	**$1,288**
Toilet Leak Repair	$0	$0	$4,891	$0	**$4,891**
Total	**$3,571.10**	**$2,258.86**	**$26,970.12**	**$1,994.28**	**$34,794**

Sums may differ due to rounding.

5.3 Process Evaluation Findings

This section outlines the findings of the PY2021 process evaluation findings.

5.3.1 Data Collection Activities

The Evaluators reviewed invoices to confirm quantity and type of measures provided in each kit in the program.

5.3.2 Program Marketing

The program is marketed by the program implementer, AM Conservation Group. The implementation team, with the approval of Empire, identifies eligible school and teachers for the program. During the outreach process, the team introduce the program to teachers and interested teachers are enrolled individually. The implementation team is also the ones responsible for incorporating Empire branding on program materials to increase awareness within the community. Through a Teacher Program Elevation Form, 100% of the participating teachers indicated they would conduct the program again. 100% of the participating teachers also indicated they would recommend the program to their colleagues.

5.3.3 Process Results and Findings

This section presents the results and key findings from the process evaluation activities. These findings are based upon interviews with utility staff and a program documentation review. The findings presented pertain to program communications and marketing, program delivery, participant energy efficiency awareness and behaviors, and customer characteristics.

5.3.3.1 Empire Staff Interview Findings

The Evaluators conducted an interview with Empire staff to gain insights regarding various aspects of the program, reporting, data management, and marketing. One staff member participated in the interview.

Empire staff discussed that marketing for this program is conducted by AM Conservation Group. The Implementer is responsible for distributing the kits to participating schools and for calculating the energy, gas, and water savings from the kits. They then provide a report to Empire that summarizes these findings, as well as survey findings from program participants. The report is provided on a school-year basis while Empire operates on a calendar year. This is problematic in that it does not align results with Empire reporting requirements, and the Evaluators recommend realigning their reporting schedule to correspond to the program year.

The program manager indicated that the school kit program had a "*great year*" and he credited AM Conservation Group for their hard work. Similarly, to previous years, about 300 kits were sent out to all sixth graders in the three participation middle schools. The program is identical to the LivingWise® program and since it is so small, the program cannot afford to do much customization. Because schools were back in-person, the COVID-19 pandemic did not effect on the program's operations in PY2021.

5.3.3.2 Implementation Staff Interview Findings

The Evaluators were not able to reach AM Conservation Group for an implementation staff interview during the evaluation.

5.4 Adherence to Protocol A

The Evaluators also previously reviewed program tracking data in PY2021 to assess its compliance with Protocol A of the AR TRM v8.2 which specifies that tracking data should be checked for:

- Participating Customer Information;
- Measure Specific Information;
- Vendor Specific Information;
- Program Tracking Information;
- Program Costs; and
- Marketing & Outreach Activities.

Due to the small size of Empire's portfolio, tracking systems are often limited, and it is not economically feasible to maintain tracking to the same level of detail observed in the programs administered by other utilities in Arkansas. In the program-level Protocol A Assessments, the Evaluators have endeavored to constrain comments to areas that would be financially feasible and cost-effective to execute. The School-Based Energy Education Program does not maintain a program tracking system. Savings estimates were derived from summary reporting submitted by Empire to the Evaluators.

The reports provided by AM Conservation group are not annualized; they are provided to Empire on a school-year basis. This is problematic in that the summary savings values need to be split across program years. The Evaluators cross-referenced the survey results (in-service rates, electric water heating rates, etc.) with participation dates on the supporting invoices to parse out each batch of kits to the appropriate program year.

There are inherent difficulties in maintaining an Excel-based tracking system for this program, due to the low budget for program administration. However, AM Conservation Group should be required to submit reports to Empire that reflect a calendar year of operation, rather than a school year. The corresponding invoices should then be identified and appended to this report, along with a detailed description of the contents of the kits delivered. This will allow for an easier audit of the program savings in the next three-year evaluation.

5.5 Response to PY2020 Recommendations

The table below shows the responses to the PY2020 recommendations.

TABLE 5-9 PY2020 RECOMMENDATIONS AND STATUS IN PY2021

PY2020 Recommendation	Response	Status in PY2021
Incorporate low flow showerheads into the kit. This measure is proven cost-effective in similar kit programs administered in Arkansas (such as the program administered by OG&E).	In Progress	Plans to add measures to School Kits in 2022.

5.6 Planned Program Changes

There are no planned program changes for the program.

5.7 Conclusions & Recommendations

5.7.1 Conclusions

The key conclusions from the evaluation are as follows:

- Although the program performed consistently well compared to prior years, the program experienced a slight overall drop in both participation and verified savings, both accounting for a 6.7% difference compared to PY2020.
- The Evaluators were not provided ex ante claimed savings for the kits or calculation workbooks to demonstrate how the expected savings were calculated. Documentation was limited to a summary of inputs in PDF reports provided by the program implementer to Empire.
- Non-energy benefits (NEBs) accounting for 71.8% of program TRC benefits.
- The program only met 26% of the savings goals for PY2021 (92,418 kWh).
- The Evaluators were not provided calculation workbooks to demonstrate how the expected savings were calculated; documentation was limited to a summary of inputs in PDF reports provided by the program implementer to Empire.

5.7.2 Recommendations

The key recommendations from the evaluation of the program are as follows.

- **Advanced power strips are proven cost-effective** in similar kit programs administered in Arkansas, such as OG&E Arkansas's HEEP LivingWise® channel. *Consider adding APS to the school kit program.*
- **If implementor reporting aligned with the program year** and not the school year, there is a potential to garner more information from the program for the evaluation. *Consider requiring AM Conservation Group reporting requirements to align with the program year.*

6 Independent Weatherization Program

The Independent Weatherization program provides energy efficiency improvements to severely inefficient homes, thereby decreasing demand and energy usage for those customers. Through the Program, customers will engage with home energy auditors and contractors to receive an in-home energy audit that identifies potential efficiency improvements such as lighting, insulation, and hot water conservation. Contractors and other service providers will perform the energy audits and install approved measures at no cost to the participant.

The program is designed to facilitate the installation of a wide range of cost-effective weatherization measures that have been approved as “core measures” to be provided under the CWA framework, including the following. Empire marketed the program to residential customers and contractors. Customer marketing activities included, but not be limited to bill inserts, newspaper advertisements, email blasts, bill messaging and community events.

Additionally, the program coordinates with Black Hills Energy (BHE) to provide the program to shared customers when possible. In PY2021, the program offered the following measures:

- Advanced power strips;
- Air infiltration;
- Ceiling insulation;
- Duct sealing;
- Assessment;
- LED lamps; and
- Low-flow showerheads.

The program has received an impact and process evaluation. The evaluations included desk reviews to estimate ex post gross savings estimates, the estimation of NTG through a literature review and strategic recommendations for program improvement.

6.1 Impact Evaluation

6.1.1 Gross Impact

In PY2021, a total of 17 weatherization projects were completed through the program. Ex ante savings estimations were not provided in the tracking data; however, the Evaluators have opted to assume ex ante to equal ex post savings. Program ex post savings by measure are presented below in Table 6-1.

TABLE 6-1 PY2021 INDEPENDENT WEATHERIZATION PROGRAM GROSS SAVINGS SUMMARY

Measure	Ex Ante kWh Savings	Ex Post kWh Savings	Realization Rate	Ex Ante kW Reductions	Ex Post kW Reductions	Realization Rate
Advanced Power Strip	832	832	100%	0.09	0.09	100%
Air Infiltration	8,122	8,122	100%	1.60	1.60	100%
Ceiling Insulation	4,389	4,389	100%	2.27	2.27	100%
Duct Sealing	51,391	51,391	100%	19.97	19.97	100%
9W A19 LEDs	4,480	4,480	100%	0.69	0.69	100%
8W BR30 LEDs	523	523	100%	0.08	0.08	100%
Low-Flow Showerhead	2,489	2,489	100%	0.26	0.26	100%
Total	**72,225**	**72,225**	**100%**	**24.96**	**24.96**	**100%**

Sums may differ due to rounding.

6.1.2 Net Impact

The Evaluators established an overall program NTG ratio (93%) based on secondary research in PY2019 through the use of a literature review. More information on this literature review can be found in Appendix B: Literature Review Outcomes.

Ex post gross and ex post net annual savings for the program are presented in Table 6-2.

TABLE 6-2 PY2021 INDEPENDENT WEATHERIZATION PROGRAM NET SAVINGS SUMMARY

Measure	Ex Post Gross kWh Savings	Ex Post Net kWh Savings	NTG	Ex Post Gross kW Reductions	Ex Post Net kW Reductions	NTG
Advanced Power Strip	832	568	68%	0.09	0.06	68%
Air Infiltration	8,122	7,848	97%	1.60	1.55	97%
Ceiling Insulation	4,389	4,241	97%	2.27	2.19	97%
Duct Sealing	51,391	49,659	97%	19.97	19.30	97%
9W A19 LEDs	4,480	3,058	68%	0.69	0.47	68%
8W BR30 LEDs	523	357	68%	0.08	0.06	68%
Low-Flow Showerhead	2,489	1,698	68%	0.26	0.18	68%
Total	**72,225**	**67,429**	**93%**	**24.96**	**23.80**	**95%**

Sums may differ due to rounding.

Ex post gross and ex post net lifetime savings for the program are presented in Table 6-3 below.

TABLE 6-3 PY2021 INDEPENDENT WEATHERIZATION PROGRAM LIFETIME SAVINGS SUMMARY

Measure	EUL	Ex Post Gross Lifetime Energy Savings (kWh)	Ex Post Net Lifetime Energy Savings (kWh)
Advanced Power Strip	10	8,323	5,681
Air Infiltration	11	89,337	86,326
Ceiling Insulation	20	87,774	84,816
Duct Sealing	18	925,031	893,857
9W A19 LEDs	19	85,125	58,098
8W BR30 LEDs	20	10,458	7,138
Low-Flow Showerhead	10	24,886	16,984
Total	**17**	**1,230,934**	**1,152,900**

Sums may differ due to rounding.

6.2 Non-Energy Benefits

Protocol L of the AR TRM v8.2 states that programs must account for non-energy benefits (NEBs) resulting from each program. Specifically, the categories of NEBs that are to be calculated for each measure are as follows:

- Benefits of electricity, natural gas, and liquid propane energy savings (i.e., other fuels);
- Benefits of public water and wastewater savings; and
- Benefits of avoided and deferred equipment replacement costs.

Applicable NEBs for this program in PY2021 are avoided replacement costs (ARCs), natural gas savings, and water savings.

Measures with zero entries are included to ensure consistency of table structure and to demonstrate that no measures or potential energy and non-energy impacts were omitted.

6.2.1 Natural Gas Savings

In the Program, Empire customers can have either electric or natural gas heating. When a customer has natural gas heating, they can claim the natural gas therms savings as NEBs. This information is reported in the project data provided by the contractor. The table below presents the ex post net natural gas can be claimed as NEBs for cost-effectiveness purposes.

TABLE 6-4 PY2021 NATURAL GAS SAVINGS SUMMARY

Measure	Ex Post Gross Therms	Ex Post Net Therms	Ex Post Net Lifetime Therms	Therm Benefit ($)	NPV of Therms ($)
8W BR30 LEDs	-4	-3	-81	-$2	-$23
9W A19 LEDs	-35	-24	-657	-$14	-$187
Advanced Power Strips	0	0	0	$0	$0
Air Infiltration	1,148	1,109	12,630	$677	$5,985
Assessment	0	0	0	$0	$0
Ceiling Insulation	382	369	7,640	$225	$3,016
Duct Sealing	5,830	5,633	104,939	$3,440	$43,087
Low-Flow Showerheads	0	0	0	$0	$0
Total	**7,321**	**7,086**	**124,471**	**$4,326**	**$51,879**

Sums may differ due to rounding.

6.2.2 Propane Savings

There were no propane savings identified in the program.

6.2.3 Water Savings

Water saving measures implemented through the program only included low-flow showerheads. Water savings for the low-flow showerheads were determined using the AR TRM v8.2. The table below presents the estimated water savings for the program.

TABLE 6-5 PY2021 WATER AND WASTE WATER SAVINGS SUMMARY

Measure	Ex Post Gross Water/WW Savings (gallons)	ex Post Net Water/WW Savings (gallons)	Water/WW Benefit ($)	NPV Water/WW ($)
8W BR30 LEDs	0	0	$0	$0
9W A19 LEDs	0	0	$0	$0
Advanced Power Strips	0	0	$0	$0
Air Infiltration	0	0	$0	$0
Assessment	0	0	$0	$0
Ceiling Insulation	0	0	$0	$0
Duct Sealing	0	0	$0	$0
Low-Flow Showerheads	24,424	16,669	$128	$979
Total	**24,424**	**16,669**	**$128**	**$979**

Sums may differ due to rounding.

6.2.4 Avoided Replacement Costs

To calculate avoided replacement costs (ARC) and incremental costs for LEDs in the program, the AR TRM v8.2 Protocol L calculator was used with the following assumptions.

- Benefits of electricity, natural gas, and liquid propane energy savings (i.e., other fuels);
- Benefits of public water and wastewater savings; and
- Benefits of avoided and deferred equipment replacement costs.

For direct install LEDs, the Evaluators assumed that the incentive was equal to the total cost of equipment and labor. In cases where project cost was not available and the project was not direct install, the Evaluators cited costs from IL TRM V7.0 Volume 3[24].

The tables below show the ARC and DRC benefits for the program.

TABLE 6-6 PY2021 AVOIDED REPLACEMENT COSTS (ARCS) SUMMARY

Measure	Ex Post Gross ARC ($)	Ex Post Net ARC ($)	NPV of ARCs ($)
8W BR30 LEDs	$41	$28	$28
9W A19 LEDs	$596	$407	$407
Advanced Power Strips	$0	$0	$0
Air Infiltration	$0	$0	$0
Assessment	$0	$0	$0
Ceiling Insulation	$0	$0	$0
Duct Sealing	$0	$0	$0
Low-Flow Showerheads	$0	$0	$0
Total	**$637**	**$435**	**$435**

Sums may differ due to rounding.

6.2.5 Deferred Replacement Costs

There were no deferred replacement costs (DRC) estimated in the program.

6.2.6 NEBs Summary

The table below summarizes the net present value (NPV) of NEBs attributable to the program, including natural gas and avoided replacement cost.

[24] http://s3.amazonaws.com/ilsag/IL-TRM_Effective_010119_v7.0_Vol_3_Res_092818_Final.pdf

TABLE 6-7 PY2021 NON-ENERGY BENEFITS (NEBS) SUMMARY

Program	NPV NGS ($)	NPV LPGS ($)	NPV Water/ WW ($)	NPV ARC ($)	Total NPV of NEBs ($)
8W BR30 LEDs	-$23	$0	$0	$28	**$6**
9W A19 LEDs	-$187	$0	$0	$407	**$220**
Advanced Power Strips	$0	$0	$0	$0	**$0**
Air Infiltration	$5,985	$0	$0	$0	**$5,985**
Assessment	$0	$0	$0	$0	**$0**
Ceiling Insulation	$3,016	$0	$0	$0	**$3,016**
Duct Sealing	$43,087	$0	$0	$0	**$43,087**
Low-Flow Showerheads	$0	$0	$979	$0	**$979**
Total	**$51,879**	**$0**	**$979**	**$435**	**$53,293**

Sums may differ due to rounding.

6.3 Process Evaluation

This section outlines the findings of the process evaluation.

6.3.1 Data Collection Activities

The Program Manager indicated that he tracks project progress in excel. He reviews all projects and invoices.

6.3.2 Consistent Weatherization Approach Metrics

There was insufficient project data to estimate and report Consistent Weatherization Approach (CWA) metrics for this program as is required by the AR TRM v8.2.

6.3.3 Program Marketing

Empire does not have many ways to publicly market their program due to being in a small and rural territory. If they were to market via television ads or radio, the ads would reach other utility territories and potentially result in market confusion.

6.3.4 Process Results and Findings

This section presents the results and key findings from the process evaluation activities. These findings are based upon interviews with utility staff and a program documentation review. The findings presented pertain to program communications and marketing, program delivery, participant energy efficiency awareness and behaviors, and customer characteristics.

6.3.4.1 Empire Staff Interview Findings

Following a one year pause in the CWA program in 2020, Empire relaunched its weatherization program in 2021. The program mirrored the program that was offered in 2019 including the same approach and same trade ally as used previously. The participating trade ally was instructed to follow the same rules and procedures outlined by neighboring utilities, such as SWEPCO, BHE, and OGE, to ensure consistency across the region. The program manager indicated that the participating trade ally is " *one of the big ones in the area,"* noting that they also do jobs for the other utilities. Program manager mentioned that

the program had a goal of reaching 20 homes and they were able to reach 17. He went on to explain that the biggest challenge with the CWA is managing the applicant list. He explained that Empire has 3000 residential customers but only 20 slots, and thus they need to manage this list judiciously: "we *want to get a lot of folks, but not too many."* Generally, the manager prioritized customers who have participated in other Empire programs, as well as direct referrals from the contact center. From those 300-400 participates, about 20 people are usually eligible for CWA. The manager noted that the program is "*open to advice on managing the contact list, but don't want to blow it up. Don't want to say no to people."*

6.4 Adherence to Protocol A

The Evaluators also previously reviewed program tracking data to assess its compliance with Protocol A of the AR TRM v8.2 which specifies that tracking data should be checked for:

- Participating Customer Information;
- Measure Specific Information;
- Vendor Specific Information;
- Program Tracking Information;
- Program Costs; and
- Marketing & Outreach Activities.

Due to the small size of Empire's portfolio, tracking systems are often limited, and it is not economically feasible to maintain tracking to the same level of detail observed in the programs administered by other utilities in Arkansas. In the program-level Protocol A assessment, the Evaluators have endeavored to constrain comments to areas that would be financially feasible and cost-effective to execute.

The program maintained a tracking system of applicants and whether they were approved to participate in the program. The Evaluators determined quantities shipped in the program based on a review of program tracking data. It is recommended that Empire develop a tracking system that shows full customer account number, unit cost, and energy impacts.

6.5 Response to PY2020 Recommendations

Since the program did not operate in PY2020, there were no recommendations to track in the current planning cycle.

6.6 Planned Program Changes

There are no planned program changes for PY2022.

6.7 Conclusions & Program Recommendations

After completing the program evaluation, the Evaluators have compiled the following conclusions and recommendations for PY2021.

6.7.1 Conclusions

The key conclusions from the evaluation are as follows.

- The program completed 17 weatherization projects in PY2021, 2 more projects compared to PY2019 (no PY2020 projects). Empire had anticipated completing 20 weatherization projects in collaboration with BHE, but just missed the target by 3 projects.
- 51.1% of TRC net benefits were from NEBs, including water, ARCs and natural gas savings.
- Due to the lack of participant data in the provided tracking data, the Evaluators opted to take average ceiling insulation, air infiltration, and duct sealing values from BHE's PY2021 Home Energy Savings Program (HSP) and apply to Empire's 17 homes. This was done since there was a collaboration with BHE to complete the projects.
- Due to the lack of participant home characteristics information in the provided tracking data, the Evaluators opted to calculate percent of heating types based on BHE data. This was done since there was a collaboration with BHE to complete the projects.
- The program measure offerings were consistent with prior years.
- Although participation slightly increased (13%) from PY2019, overall verified program savings remained consistent with prior years. In PY2021, the ceiling insulation projects alone experienced a significant drop in participation and savings compared to PY2019.

6.7.2 Recommendation

The key recommendation from the evaluation are as follows.

- The Evaluators were not provided with adequate tracking data and therefore potentially not capturing the full potential of the program. *Consider aggregating participant project data to include home heating type, measure information required for calculations, and incentive data.*

Appendix A. Portfolio Cost-Effectiveness

Overview

The Evaluators estimated the cost-effectiveness for the overall energy efficiency portfolio and programs, based on 2021 costs and savings estimates provided by Empire and their third-party implementers. This appendix provides the cost-effectiveness results, as well as a brief overview of the approach taken by the Evaluators. The tables below present the cost effectiveness results for the PY2021 portfolios.

TABLE A-1 PY2021 COST EFFECTIVENESS RESULTS

Program	TRC	UCT	RIM	PCT	TRC Net Benefits
Independent Weatherization	3.96	1.86	0.41	4.93	$77,984
Residential Products	1.75	1.40	0.34	6.02	$10,063
School Based Energy Education	3.05	0.79	0.28	6.39	$32,590
C&I Custom	0.00	0.00	0.00	0.00	-$3,808
C&I Prescriptive	0.00	0.00	0.00	0.00	$0
Online Energy Calculator	0.00	0.00	0.00	0.00	-$3,006
EEA	0.00	0.00	0.00	0.00	-$353
Total	**2.81**	**1.28**	**0.35**	**5.56**	**$116,829**

Sums may differ due to rounding.

Approach

The California Standard Practice Model was used as a guideline for the calculations, along with guidance from the AR TRM v8.2. The cost-effectiveness analysis methods that were used in this analysis are among the set of standard methods used in this industry and include the Utility Cost Test (UCT)[25], Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), and Participant Cost Test (PCT). All tests weigh monetized benefits against costs. These monetized amounts are presented as Net Present Value (NPV) evaluated over the lifespan of the measure. The benefits and costs differ for each test based on the perspective of the test. The definitions below are taken from the California Standard Practice Manual.

The TRC measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs.

The UCT measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are defined more narrowly.

The PCT is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on

[25] The UCT is also referred to as the Program Administrator Cost Test (PACT).

quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.

The RIM test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills would go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

A common misperception is that there is a single best perspective for evaluation of cost-effectiveness. Each test is useful and accurate, but the results of each test are intended to answer a different set of questions. The questions to be addressed by each cost test are shown in the table below.[26]

TABLE B-6-8 QUESTIONS ADDRESSED BY THE VARIOUS COST TESTS

Cost Test	Questions Addressed
Participant Cost Test (PCT)	▪ Is it worth it to the customer to install energy efficiency?
	▪ Is it likely that the customer wants to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure (RIM)	▪ What is the impact of the energy efficiency project on the utility's operating margin?
	▪ Would the project require an increase in rates to reach the same operating margin?
Utility Cost Test (UCT)	▪ Do total utility costs increase or decrease?
	▪ What is the change in total customer bills required to keep the utility whole?
Total Resource Cost Test (TRC)	▪ What is the regional benefit of the energy efficiency project (including the net costs and benefits to the utility and its customers)?
	▪ Are all of the benefits greater than all of the costs (regardless of who pays the costs and who receives the benefits)?
	▪ Is more or less money required by the region to pay for energy needs?

Overall, the results of all four cost-effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC cost test addresses whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM address whether the selection of measures and design of the program are balanced from the perspective of the participants, utilities, and non-participants. The scope of the benefit and cost components included in each test are summarized in the table below.[27]

[26] https://www.epa.gov/energy/understanding-cost-effectiveness-energy-efficiency-programs

[27] *Ibid*.

TABLE B-6-9 BENEFITS AND COSTS INCLUDED IN EACH COST-EFFECTIVENESS TEST

Test	Benefits	Costs
PCT (Benefits and costs from the perspective of the customer installing the measure)	▪ Incentive payments ▪ Bill Savings ▪ Applicable tax credits or incentives	▪ Incremental equipment costs ▪ Incremental installation costs
UCT (Perspective of utility, government agency, or third party implementing the program	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Utility/program administrator incentive costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution ▪ Additional resource savings ▪ Monetized non-energy benefits as outlined by the TRM v8.2	▪ Program overhead costs ▪ Program installation costs ▪ Incremental measure costs
RIM (Impact of efficiency measure on non-participating ratepayers overall)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Lost revenue due to reduced energy bills ▪ Utility/program administrator installation costs

Non-Energy Benefits

In Arkansas, the IEM, in collaboration with Empire and the other investor-owned utilities (IOUs) and other stakeholders through the Parties Working Collaboratively (PWC), have developed a uniform set of benefits to be associated with measures implemented in the portfolio. These Non-Energy Benefits (NEBs) are an addition to programs under the authorization of Arkansas TRM v8.2. Volume 1 - Protocol L. After reviewing the guidance from the PWC, the Arkansas Public Service Commission (Commission) issued Order No. 30 on December 10, 2015, which provided direction and guidance regarding the inclusion of NEBs in the Technical Reference Forum, as follows.[28]

[28] AR TRM v8.2, Protocol L.

"The Commission therefore orders and directs that the following three categories of NEBs be consistently and transparently accounted for in all applications of the TRC test, as it is applied to measures, programs, and portfolios:

- *benefits of electricity, natural gas, and propane energy savings (i.e., other fuels);*
- *benefits of public water and wastewater savings; and*
- *benefits of avoided and deferred equipment replacement costs as conditioned herein."*

In response to the Commission Order for NEBs outlined above, Protocol L was added to the Arkansas TRM in version 8.2, which encompasses NEBs:

- Protocol L1: Non-Energy Benefits for Electricity, Natural gas, and Liquid Propane ("other fuels")
- Protocol L2: Non-Energy Benefits for Water Savings
- Protocol L3: Non-Energy Benefits of Avoided and Deferred Equipment Replacement Costs.

This recommended approach has been developed jointly by the IEM and the PWC for each category as directed by the Commission. Below is a summary of the NEBs that were calculated in each program in PY2021.

- Residential Products Program: this program captured natural gas savings and avoided replacement costs (ARCs).
- School Based Energy Education Program: this program captured propane, natural gas, water, and ARCs.
- Independent Weatherization: this program captured natural gas, water, and ARCs.

Methodologies and measure-level results for each NEB are found in each of the program chapters within this report.

Marginal Line Losses

The Evaluators used the marginal line losses provided by Empire for the PY2021 evaluation.

Economic Inputs for Cost-effectiveness Analysis

The Evaluators used the economic inputs provided by Empire for the cost benefit analysis, this included avoided costs that were estimated using the Real Economic Carrying Charge (RECC) approach. The rates utilized for avoided water and avoided propane use were from Protocol L in the AR TRM v8.2.

The Evaluators used the discount rates provided by Empire to perform the cost benefit analysis, and these values align with the rates used in the PY2020 to PY2022 Plan. The evaluated net energy savings (kWh) and demand reductions (kW) values utilized in the cost benefit analysis include a line loss factor, those values are in the table below. Additionally, the table below outlines the discount rates, escalation rate and avoided costs used in the PY2021 cost-effectiveness analysis.

TABLE 6-10 PY2021 ECONOMIC INPUTS FOR COST EFFECTIVENESS ANALYSIS

Discount Rates	
Utility (TRC)	7.33%
Utility (UCT)	7.33%
Utility (RIM)	7.33%
Societal (SCT)	7.33%
Participant (PCT)	7.33%
Line Losses	
Line Losses (demand)	6.88%
Line Losses (energy)	6.88%
Line Losses (therm)	6.88%
Escalation rate	2.50%
Avoided Costs	
Avoided Energy ($/kWh)	$0.0347
Avoided Demand ($/kW)	$95.40
Avoided Natural Gas ($/therm)	$0.4173
Avoided Water ($/gallon)	$0.0079
Avoided Propane ($/gallon)	$2.3740

Results

The tables below outline the results for each test, for both the programs and the portfolio as a whole. Summations may differ by $1 due to rounding.

TABLE A-5 PY2021 COST-EFFECTIVENESS RESULTS BY PROGRAM

Program	TRC	UCT	RIM	PCT
Independent Weatherization	3.96	1.86	0.41	4.93
Residential Products	1.75	1.40	0.34	6.02
School Based Energy Education	3.05	0.79	0.28	6.39
C&I Rebate	0.00	0.00	0.00	0.00
Online Energy Calculator	0.00	0.00	0.00	0.00
EEA	0.00	0.00	0.00	0.00
Total	**2.81**	**1.28**	**0.35**	**5.56**

Sums may differ due to rounding.

Table A-6 PY2021 Cost-Effectiveness Benefits by Program

Program	TRC Benefits	UCT Benefits	RIM Benefits	PCT Benefits
Independent Weatherization	$104,353	$51,061	$51,061	$112,347
Residential Products	$23,456	$21,331	$21,331	$53,345
School Based Energy Education	$48,472	$13,678	$13,678	$78,593
C&I Rebate	$0	$0	$0	$0
Online Energy Calculator	$0	$0	$0	$0
EEA	$0	$0	$0	$0
Total	**$176,281**	**$86,069**	**$86,069**	**$244,284**

Sums may differ due to rounding.

Table A-7 PY2021 Cost-Effectiveness Costs by Program

Program	TRC Costs	UCT Costs	RIM Costs	PCT Costs
Independent Weatherization	$26,370	$27,388	$124,087	$22,790
Residential Products	$13,392	$15,208	$63,361	$8,867
School Based Energy Education	$15,882	$17,244	$48,789	$12,303
C&I Rebate	$3,808	$3,808	$3,808	$0
Online Energy Calculator	$3,006	$3,006	$3,006	$0
EEA	$353	$353	$353	$0
Total	**$62,810**	**$67,006**	**$243,403**	**$43,960**

Sums may differ due to rounding.

Table A-8 PY2021 Cost-Effectiveness Net Benefits by Program

Program	TRC Net Benefits	UCT Net Benefits	RIM Net Benefits	PCT Net Benefits
Independent Weatherization	$77,984	$23,673	-$73,026	$89,556
Residential Products	$10,063	$6,122	-$42,030	$44,477
School Based Energy Education	$32,590	-$3,566	-$35,111	$66,290
C&I Rebate	-$3,808	-$3,808	-$3,808	$0
Online Energy Calculator	-$3,006	-$3,006	-$3,006	$0
EEA	-$353	-$353	-$353	$0
Total	**$113,471**	**$19,064**	**-$157,333**	**$200,324**

Sums may differ due to rounding.

Appendix B. Literature Review Outcomes

This appendix includes summaries of NTG literature reviews, organized by program and measure.

Residential Products Program

This literature review includes regionally-applicable net-to-gross results for residential lighting kit programs. The kits include a three-pack of LEDs.

TABLE C-1 LITERATURE REVIEW RESULTS RESIDENTIAL LIGHTING

Reference Number	FR	SP	NTG	PY	State
1	0%	0%	100%	2017	OK
2	23%	0%	77%	2015	IN
3	29%	0%	71%	2013	IL
4	16%	0%	84%	2015 -2016	IL
Average	**17%**	**0%**	**83%**		

1. https://www.occeweb.com/PU/EnergyEfficiency/2017AnnualReportFinal_CenterPoint.pdf
2. https://www.indianamichiganpower.com/global/utilities/lib/docs/info/projects/IMDemandSideManagement/44841%20Jon%20C.%20Walter%20Direct%20Testimony%20&%20Attachments%20Vol%20II.pdf 3. http://ilsagfiles.org/SAG_files/Evaluation_Documents/Ameren/AIU%20Evaluation%20Reports%20EPY6/AIC_PY6_EEKits_Report_FINAL_2015-07-20.pdf
4. http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

School Based Energy Education

The NTG from this program derived from a literature review performed for the OG&E HEEP LivingWise program. The OG&E school kits include LED lamps, aerators and showerheads and are provided to elementary school students. This program is nearly identical, except showerheads are excluded.

TABLE C-3 PY2021 SOURCES OF LITERATURE REVIEW FOR SCHOOL KITS

Utility	State	Year
Ameren Missouri	Missouri	2016
Duke Energy	North and South Carolina	2015
ComEd	Illinois	2017
I&M	Indiana	2016
Duke	Kentucky	2015
Energy New Orleans	Louisiana	2015

TABLE C-4 PY2021 SOURCES OF LITERATURE REVIEW FOR SCHOOL KITS

Program Measure	Number of Studies	Average Value
LED light bulbs	2	87%
Kitchen Faucet Aerators	6	98%

Other Programs

There were no literature reviews performed for the Independent Weatherization program. There were no claimed savings for the C&I Rebate program, therefore NTG was not needed.

CERTIFICATE OF SERVICE

This is to certify that the undersigned has served a copy of the foregoing instrument via email, to all parties of record on this 1st day of May, 2023.

/s/ Letisha Castor
Letisha Castor