

AEP OHIO EXHIBIT NO. _____

BEFORE
THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of)	
Ohio Power Company for Authority to)	Case No. 23-23-EL-SSO
Establish a Standard Service Offer)	
Pursuant to §4928.143, Ohio Rev. Code,)	
in the Form of an Electric Security Plan.)	

In the Matter of the Application of)	
Ohio Power Company for Approval of)	Case No. 23-24-EL-AAM
Certain Accounting Authority)	

DIRECT TESTIMONY OF
BRIAN F. BILLING
IN SUPPORT OF AEP OHIO'S
ELECTRIC SECURITY PLAN

Filed: January 6, 2023

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BRIAN F. BILLING

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DIRECT TESTIMONY OF
BRIAN BILLING
ON BEHALF OF
OHIO POWER COMPANY

1 **I. PERSONAL BACKGROUND**

2 **Q1. WHAT IS YOUR NAME AND BUSINESS ADDRESS?**

3 A. My name is Brian Billing. My business address is 700 Morrison Road, Gahanna, Ohio
4 43230.

5 **Q2. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?**

6 A. I am employed by Ohio Power Company (“AEP Ohio” or the “Company”), and my
7 position is Energy Efficiency & Consumer Programs Manager.

8 **Q3. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL**
9 **BACKGROUND.**

10 A. I earned a Bachelor of Arts Degree in Mathematics from Capital University in 2010. I have
11 worked for AEP Ohio since 2012, starting as an Energy Efficiency Analyst. In that role, I
12 was responsible for data and energy savings calculations for AEP Ohio’s energy efficiency
13 programs. In 2015, I was promoted to Energy Efficiency Compliance Manager, where I
14 oversaw Evaluation, Measurement, and Verification (“EM&V”) and cost-effectiveness
15 modeling for AEP Ohio’s energy efficiency portfolio. In 2020, I was promoted to my
16 current role of Energy Efficiency & Consumer Programs Manager. I am a Certified Energy
17 Manager licensed by the Association of Energy Engineers.

1 **Q4. WHAT ARE YOUR RESPONSIBILITIES AS ENERGY EFFICIENCY &**
2 **CONSUMER PROGRAMS MANAGER?**

3 A. I manage all consumer programs for AEP Ohio. I am responsible for the design,
4 development, and implementation of customer programs that help customers understand,
5 reduce, and optimize their energy and demand. I manage AEP Ohio's Home Energy
6 Management Tools, the C&I Energy Management Platform, Electric Vehicle Rate
7 Education, the Smart Street Lighting Program, customer satisfaction reporting, and the
8 Neighbor-to-Neighbor Program.

9 **II. PURPOSE OF TESTIMONY**

10 **Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?**

11 A. The purpose of my testimony is to support AEP Ohio's proposed Energy Efficiency Plan
12 ("EE Plan"). As discussed below, the Company's EE Plan includes a diverse suite of cost-
13 effective programs to help customers reduce their energy usage and manage their peak
14 energy demand through more efficient technology and education. Under the EE Plan, AEP
15 Ohio will offer incentives to encourage customers to make more efficient energy choices,
16 and AEP Ohio will implement energy efficiency programs targeted at specific goals, such
17 as low-income programs, residential and business programs, pilot programs, and customer
18 education and awareness programs. Also, through this plan, EE will be studied as a form
19 of grid resiliency, by reducing the load on given circuits during peak periods. AEP Ohio's
20 overall EE Plan is cost-effective because it provides customers far more benefits than costs,
21 and AEP Ohio's EE Plan promotes many of the State's policy objectives in Ohio Revised
22 Code Section 4928.02.

1 **Q6. ARE YOU SPONSORING ANY EXHIBITS?**

2 A. Yes, I sponsor the following exhibits:

- 3 • Exhibit BFB-1 – Energy Efficiency Plan
- 4 • Exhibit BFB-2 – Energy Efficiency Plan Appendices

5 **III. CUSTOMER PROGRAM – EE PLAN**

6 **Q7. PLEASE SUMMARIZE YOUR TESTIMONY IN SUPPORT OF THE EE PLAN.**

7 A. The proposed EE Plan will help customers save energy while also managing system
8 demand at peak periods. All AEP Ohio customers may participate in the EE Plan, and it
9 includes a suite of residential, business, and cross-sector programs. Among other things,
10 the EE Plan includes energy efficiency programs specifically targeted at low-income
11 communities and small businesses; demand response programs; residential and business
12 incentive programs; innovation funding for pilots to test new technology and approaches
13 to optimize energy use; community education and training; and targeted outreach to raise
14 customer awareness. AEP Ohio customers who participate in the EE Plan will save energy
15 and reduce demand, thereby reducing their electric costs. In addition, all AEP Ohio
16 customers – participants and non-participants alike – will benefit from the EE Plan through
17 avoided generation costs, reduced capacity obligations, market suppression, and economic
18 development. Together, these benefits outweigh the EE Plan's costs, so the EE Plan is
19 cost-effective. The EE Plan's overall cost is significantly lower than previous AEP Ohio's
20 EE/PDR Plans in place from 2010 to 2020. These EE Plan costs include an annual
21 administration fee based on a sliding scale of EE Plan spending that AEP Ohio will earn
22 only if the EE Plan is cost-effective each year. AEP Ohio will file an annual report of EE
23 Plan performance with the Commission.

Q8. WHAT ARE THE EE PLAN’S COSTS, AND HOW IS IT COST-EFFECTIVE?

A. Annually, the total costs of the EE Plan are \$43.4 million and the total benefits are \$144.7 million. That is, for every \$1 AEP Ohio spends on the EE Plan, AEP Ohio generates over \$3.3 in benefits.

AEP Ohio is measuring the EE Plan’s cost-effectiveness under the modified Utility Cost Test (“mUCT”) and modified Total Resource Cost test (“mTRC”) at the EE Plan level and for each measurable program. See Exhibit BFB-1, Part V, Benefit-Cost Analysis. Figure BFB-1 below shows annual program demand and energy savings goals, annual program budgets, annual program mUCT benefits and ratios, and annual mTRC benefits and ratios.

Figure BFB-1 – Energy Efficiency Plan Benefit-Cost Details

Proposed Program	Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	Benefits	Non-Energy Benefits	Total Benefits	mUCT	mTRC
Lifetime Energy Efficiency Program (LEEP)	35,958	9,006	\$ 9,544,812	\$ 30,062,722	\$ -	\$ 30,062,722	3.1	1.9
Home Energy Management*	18,269	25,602	\$ 2,821,119	\$ 3,370,026	\$ -	\$ 3,370,026	1.2	1.2
e3smart	6,331	909	\$ 912,674	\$ 2,322,433	\$ -	\$ 2,322,433	2.5	2.5
High Efficiency for Low-Income Program (HELP)	6,888	1,556	\$ 7,965,920	\$ 4,287,639	\$ 12,100,233	\$ 16,387,872	2.1	2.1
Residential Subtotal	67,446	37,073	\$ 21,244,525	\$ 40,042,820	\$ 12,100,233	\$ 52,143,053	2.5	1.9
Midstream Efficiency	89,107	22,439	\$ 13,686,872	\$ 58,720,469	\$ 14,047,790	\$ 72,768,259	5.3	2.1
Customized Energy Efficiency	8,661	611	\$ 1,153,061	\$ 4,124,637	\$ 1,359,165	\$ 5,483,802	4.8	1.6
Continuous Energy Improvement	40,585	1,144	\$ 1,468,618	\$ 5,514,172	\$ 3,213,624	\$ 8,727,796	5.9	2.9
C&I Demand Response*	-	48,510	\$ 2,809,176	\$ 5,583,401	\$ -	\$ 5,583,401	2.0	2.0
Business Subtotal	138,353	72,704	\$ 19,117,727	\$ 73,942,679	\$ 18,620,579	\$ 92,563,258	4.8	2.1
Innovation and Technology			\$ 800,000					
Education and Training			\$ 1,450,000					
Community Energy Savings			\$ 800,000					
Cross Sector Subtotal			\$ 3,050,000					
Total	205,799	109,778	\$ 43,412,252	\$ 113,985,499	\$ 30,720,812	\$ 144,706,311	3.3	1.9

*Average annual benefits over ESP term length

1 **Q9. WHY IS THE COMPANY PROPOSING AN EE PLAN AT THIS TIME?**

2 A. AEP Ohio created millions of dollars of energy and demand reduction benefits for its
3 customers through cost-effective energy efficiency programs in 2009-2020, and AEP Ohio
4 continues to support cost-effective energy efficiency programs as a means of benefiting
5 customers and supporting state policy objectives. I am advised by counsel that the Electric
6 Security Plan statute,¹ among other statutory sections, authorizes utilities to “implement,”
7 “energy efficiency programs,” AEP Ohio has included the EE Plan as part of its proposed
8 Electric Security Plan in this proceeding due to its cost effectiveness and high levels of
9 customer satisfaction with the programs over the years.

10 **Q10. WHAT ARE THE BENEFITS OF THE EE PLAN?**

11 A. The EE Plan will lower peak demand and energy use, which avoids generation costs.
12 Generation costs, current and forecasted, are higher than the cost of the EE Plan. *See*
13 Exhibit BFB-2, Section V, Avoided Costs. That is, the EE Plan is cost-effective through
14 avoided generation costs alone. The EE Plan is even more cost-effective when other
15 benefits are considered.

16 Another benefit of the EE Plan is avoided distribution and transmission costs. To
17 calculate avoided distribution costs, AEP Ohio relied on the *Current Values Approach* that
18 had been utilized by MidAmerican Energy Company in multiple jurisdictional Energy
19 Efficiency filings as detailed in the direct testimony of Jennifer L. Long in Iowa Docket
20 No. EEP-2018-0002. MidAmerican calculates avoided T&D costs,² which was approved
21 by the Iowa utilities board on February 18, 2019.

¹ R.C. 4928.143(B)(2)(h)

² *Application for Approval of Energy Efficiency Plan for 2019-2023* (Iowa Public utilities Board Docket EEP-2018-0002), Direct Testimony of Jennifer L. Long, at p. 4 (July 9, 2018).

1 To calculate avoided distribution costs, AEP Ohio divided (a) AEP Ohio's
2 incremental distribution spending from prior FERC Form 1 reports by (b) AEP Ohio's total
3 load from its long-term load forecasts.³ This resulted in a dollars per kilowatt (\$/kW) ratio
4 for avoided distribution costs – that is, the amount that AEP Ohio will avoid spending on
5 new distribution infrastructure for each kW of peak demand reduction caused by the EE
6 Plan programs. To calculate avoided transmission costs, AEP Ohio divided (a) its annual
7 PJM transmission costs based on its Network Service Peak Load (“NSPL”) by (b) the total
8 kW of AEP Ohio's NSPL. This resulted in a dollars per kilowatt (\$/kW) ratio for avoided
9 transmission costs – that is, the amount that AEP Ohio will avoid spending on PJM
10 transmission costs for each kW of peak demand reduction caused by the EE Plan programs.
11 These values are listed in Exhibit BFB-2, Section V, Avoided Costs.

12 AEP Ohio calculated other EE Plan benefits as well. One benefit is a reduction in
13 AEP Ohio charge-offs from the Percentage of Income Payment Plan (“PIPP”) program.
14 When eligible customers successfully complete the PIPP program, AEP Ohio charges-off
15 a portion of unpaid arrearages. The High Efficiency for Low-Income Program (“HELP”)
16 in AEP Ohio's EE Plan will help low-income customers reduce their energy usage and
17 thereby reduce the amount of the arrearages from PIPP customers that AEP Ohio may need
18 to charge-off. *See* Exhibit BFB-2, Section IV, CAP Non-Energy Benefits.

19 Other EE Plan benefits include significant operations and maintenance savings for
20 business customers who participate in plan programs, *see* Exhibit BFB-2, Section III, AEP
21 Ohio C&I Non-Energy Benefits Study, as well as environmental benefits to all customers.
22 *See* Exhibit BFB-1, Section IV.e., Benefits - Greenhouse Gas Reductions.

³ *See AEP Ohio Long-Term Forecast Report*, Case No. 22-501-EL-FOR, at Form FE-D4 (April 12, 2022)

1 Additionally, the Company will bid EE Plan resources into PJM as opportunities
2 are available. The Company will bid eligible resources into base residual auctions,
3 incremental auctions, or both at the Company's discretion. AEP Ohio proposes to utilize
4 the previously approved Commission practice in which 80% of PJM net revenues received
5 offset the EE Plan budget in the years the revenues are realized, with 20% retained by the
6 Company.⁴ This will allow the Company to monetize these demand resources to the
7 greatest extent possible for our customers, while managing risk of underperformance
8 penalties and the consistent changes to the PJM forward capacity market. In addition to
9 lowering EE Plan costs with capacity revenues, bidding AEP Ohio's EE Plan capacity
10 savings into PJM auctions may reduce the overall PJM capacity price, which would reduce
11 generation capacity costs for all customers.

12 **Q11. HOW WILL THE EE PLAN HELP CUSTOMERS SAVE ENERGY AND HELP**
13 **AEP OHIO MANAGE ITS SYSTEM PEAK DEMAND?**

- 14 A. With these proposed programs, AEP Ohio will help customers use energy efficiency as an
15 effective countermeasure to increasing energy usage and costs. The EE Plan includes:
- 16 - Low-income programs to fund efficient equipment upgrades for customers below
17 200% of the Federal Poverty Level, which is the same threshold for the federal Home
18 Weatherization Assistance Program ("HWAP").
 - 19 - Midstream rebates to provide customers with incentives for efficient products at the
20 time of purchase.

⁴ *In the Matter of the Application of Ohio Power Company for Approval of Its Energy Efficiency and Peak Demand Reduction Program Portfolio Plan for 2017 Through 2020*, Case No. 16-574-EL-POR, Opinion and Order at ¶26 (Jan. 18, 2017).

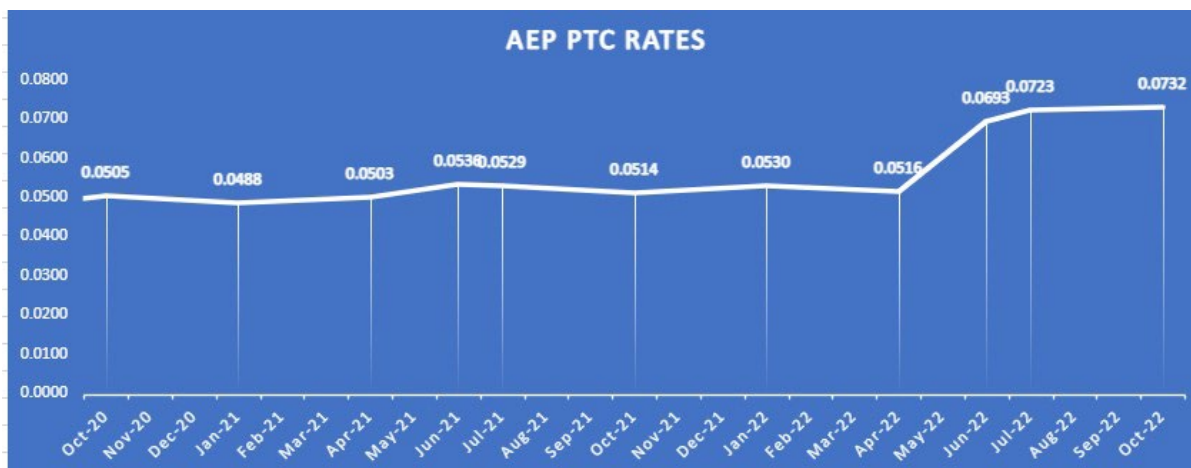
- Demand response programs to provide customers an economic incentive to reduce their energy consumption at times of peak demand, which saves all customers money by lowering peak system load.
- Energy Efficiency programs to provide customers an economic incentive to upgrade to efficient equipment that reduces their usage and peak demand, which thereby saves all customers money.
- Education programs to help customers understand the benefits of managing their energy use and taking action to participate in the programs.

As noted below in the Commission's historic price-to-compare chart,⁵ which is the Standard Service Offer auction to procure generation to serve default customers, generation rates have increased from the historical mean. The most recent auction in November cleared at \$119.98 per MWh (~\$0.12 per kwh).⁶ In a time when inflation and uncertainty continue to drive up power prices, energy efficiency is critically important to help customers manage their bills.

⁵ Public Utilities Commission of Ohio, AEP Ohio's Price to Compare Historical Chart" available at <https://puco.ohio.gov/utilities/electricity/resources/historical-ptc-chart-aep/>

⁶ *In the Matter of the Procurement of Standard Service Offer Generation for the Customers of Ohio Power Company*, Case No. 17-2391-EL-UNC, Notice of Auction Results Under AEP Ohio's CBP – Updated Redacted Version (Nov. 23, 2022).

Figure BFB-2 – AEP Ohio Price to Compare Chart



Q12. DOES THE COMPANY'S EE PLAN SUPPORT STATE POLICY OBJECTIVES?

A. Yes, the EE Plan encourages the state policy objectives in Ohio Revised Code 4928.02, including:

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Figure BFB-3

Policy Objective	EE Plan Contribution
(A) Ensure the availability to consumers of adequate, safe, efficient, nondiscriminatory, and reasonably priced retail electric service	<ul style="list-style-type: none"> • Helping customers manage their peak demand, ensuring adequate and efficient service. (Exhibit BFB-1, Section III., Programs) • Increasing customers' home or business energy efficiency while also managing demand helps to ensure reasonable cost of energy. (Exhibit BFB-1, III., Programs)
(D) Encourage innovation and market access for cost-effective supply- and demand-side retail electric service including, but not limited to, demand-side management, time-differentiated pricing, waste energy recovery systems, smart grid programs, and implementation of advanced metering infrastructure	<ul style="list-style-type: none"> • The EE Plan is positioned to respond to current, and adjust to new, opportunities for energy efficiency, demand response, and maximize the smart grid benefits. • Pilot opportunities are included to support innovation and adopt new approaches for cost-effective energy efficiency customer solutions. (Exhibit BFB-1, Section III. c., Cross Sector Programs).
(J) Provide coherent, transparent means of giving appropriate incentives to technologies that can adapt successfully to potential environmental mandates	<ul style="list-style-type: none"> • The EE Plan is designed to provide incentives for cost-effective technologies generating other benefits, including environmental, that will be captured and reported. (Exhibit BFB-1, Section IV.e., Benefits - Greenhouse Gas Reductions)
(L) Protect at-risk populations, including, but not limited to, when considering the implementation of any new advanced energy or renewable energy resource	<ul style="list-style-type: none"> • The EE Plan has a focus on low-income programs and low-income geographic area support to provide both programming and incentive levels that are aligned with means (Exhibit BFB-1, Section III., Programs)
(M) Encourage the education of small business owners in this state regarding the use of, and encourage the use of, energy efficiency programs and alternative energy resources in their businesses	<ul style="list-style-type: none"> • Small Businesses will have a dedicated budget in midstream to allow for energy efficiency audits, to help customers identify savings opportunities. After the audit customers will be eligible for increased incentives to participate in the Midstream program (Exhibit BFB-1, Section III., Programs).
(N) Facilitate the state's effectiveness in the global economy	<ul style="list-style-type: none"> • The EE Plan supports economic development through a focus on improving the energy density of products and services, reducing the cost of those products and services and making customers more competitive. • The EE Plan is an added benefit for new business and industry considering local communities throughout the Company's service territory.

Q13. PLEASE PROVIDE A BRIEF OVERVIEW OF THE RESIDENTIAL CUSTOMER PROGRAMS.

A. AEP Ohio has proposed a broad suite of programs to serve all residential customers. The residential programs include low-income programs, a marketplace to help educate customers on efficient equipment, a midstream program for point-of-sale efficient products, a school education program, and demand response incentives to help residential customers manage their peak demand. For more detailed descriptions see Exhibit BFB-1, Section III.a., Residential Programs.

Q14. PLEASE PROVIDE A BRIEF OVERVIEW OF THE BUSINESS CUSTOMER PROGRAMS.

A. The business programs include a midstream efficiency program for point-of-sale efficient rebates, a continuous energy improvement program to help customers find low cost/no cost ways to save energy, a custom program designed for large measures that require in-depth analysis, and demand response incentives to help business customers manage their peak demand. For more detailed descriptions see Exhibit BFB-1, Section III.b., Business Programs.

Q15. PLEASE PROVIDE A BRIEF OVERVIEW OF THE CROSS-SECTOR PROGRAMS.

A. The cross-sector programs (Exhibit BFB-1, Section III.c, Cross-Sector Programs) are designed to raise customer awareness of energy efficiency through community-based efforts and targeted customer outreach. The programs will involve education and training to help customers learn the opportunities and benefits of energy efficiency and demand

1 reduction. Cross-sector programs also include Innovation and Technology Programs to
2 pilot emerging technology and foster more cost-effective program implementation.

3 **Q16. COULD YOU PLEASE ELABORATE ON THE INNOVATION AND**
4 **TECHNOLOGY PROGRAMS MENTIONED ABOVE.**

5 A. Energy Efficiency products and technologies are constantly changing, and AEP Ohio needs
6 to continuously review new products and technologies to determine whether they should
7 be added to the EE Plan to benefit our customers. The Innovation and Technology
8 Programs will measure the performance and cost-effectiveness of new products and
9 technologies before adding them to the EE Plan. The Company will investigate if location-
10 based demand reduction through program participation could assist in optimizing the
11 distribution system. AEP Ohio also will determine the most effective channel for a given
12 measure and how to maximize participation among our customer classes. *See Exhibit BFB-*
13 *1, Section III.c.iii, Innovation and Technology.*

14 **Q17. HOW DID AEP OHIO DEVELOP THE EE PLAN PROGRAMS?**

15 A. The Company utilized its significant experience running cost effective programs for many
16 years to select the measures and programs based on several factors, including cost-
17 effectiveness and opportunities for customer participation across customer classes. AEP
18 Ohio also considered whether programs covered a critical customer segment, such as low-
19 income customers and small businesses, where additional customer assistance is needed to
20 manage costs and increase efficiency. AEP Ohio has included demand response incentives
21 to manage peak demand, increase customer awareness of the benefits of reducing system
22 demand at peak, and reduce future costs needed to meet peak demands.

1 **Q18. IS THE EE PLAN SUPPORTED BY AN ENERGY EFFICIENCY POTENTIAL**
2 **STUDY?**

3 A. Yes. The EE Plan is supported by an energy efficiency potential study completed by
4 Navigant (Now Guidehouse) in 2019. As defined by American Council for an Energy-
5 Efficient Economy (ACEEE), “An energy efficiency potential study is a tool that quantifies
6 the size and costs of the energy efficiency resources in a given location and identifies major
7 opportunities for energy savings.”⁷ The energy efficiency potential study is available for
8 review with the Company by request due to its complexity and size. The Company took
9 the results of the energy efficiency potential study, the Ohio Technical Reference Manual,⁸
10 and prior evaluated program performance from historical programs to determine the
11 measures and programs to include in this EE Plan (Exhibit BFB-2, Section I, Energy
12 Efficiency Plan Measure List).

13 **Q19. IS THE COMPANY PROPOSING A FEE FOR PROGRAM ADMINISTRATION?**

14 A. Yes, under the Company’s proposal, the Company will earn a fee if the EE Plan is cost-
15 effective in a program year according to the mUCT. The modified Utility Cost Test utilizes
16 administrative costs as part of the denominator, whereby managing these costs the
17 Company can drive more benefits to customers. This incentivizes the Company to keep
18 administrative costs low while increasing participation as high as possible (within funding
19 limits) through effective implementation and incentive level management. If the EE Plan

⁷ American Council for an Energy-Efficient Economy, “Energy Efficiency Potential,” available at <https://www.aceee.org/topic/efficiency-potential#:~:text=An%20energy%20efficiency%20potential%20study,major%20opportunities%20for%20energy%20savings.>

⁸ *In the Matter of the Auditor of the Energy Efficiency and Peak Demand Reductions Achieved by the Electric Distribution Utilities Pursuant to R.C. 4928.66*, Case No. 19-0002-EL-UNC, Report for 2020 Ohio Technical Reference Manual (Nov. 29, 2019).

1 is cost-effective for the year based on the mUCT as defined in the EE Plan (Exhibit BFB-
2 1, Section V., Cost-Benefit Analysis), the program administration fee will be calculated by
3 multiplying the overall EE Plan spending in the twelve-month program by a performance-
4 based percentage. The Company has proposed a sliding scale based on the level of cost
5 effectiveness for the mUCT as shown in Figure BFB-4.

6 **Figure BFB-4**

mUCT	Administration Fee %
1.0	10%
2.0	12.5%
3.0	15%
4.0	17.5%
5.0	20%

7
8 If the EE Plan is not cost-effective in a program year, the Company will not receive the
9 program administration fee in that year. The program year will begin two months
10 following the date of approval of this ESP to allow for ramp-up of programs.

11 **Q20. HOW WILL EE PLAN COSTS BE MANAGED?**

12 A. The Company has estimated an annual program budget of \$43.4 million. The Company
13 proposes to have the flexibility to shift program dollars between programs within
14 residential and business sectors to meet customer needs and improve cost effectiveness,
15 except that AEP Ohio will not shift funding away from low-income programs. Also, the
16 Company will not shift funding between residential and business sectors. AEP Ohio will
17 seek PUCO Staff approval before shifting more than 25% of the of sector allocated dollars.

1 **Q21. HOW WILL AEP OHIO MEASURE PROGRAM SAVINGS AND REPORT**
2 **PERFORMANCE?**

3 A. AEP Ohio will engage in EM&V activities to verify gross program demand and energy
4 savings and will file an annual report of EE Plan performance. AEP Ohio will use the Ohio
5 Technical Reference Manual (“TRM”) as long as it is available. The Company will do
6 additional research as new measures come to market to supplement the energy and demand
7 savings calculations. These activities will determine actual program level gross savings
8 and help maximize the net benefits of each program and the EE Plan overall. The Company
9 will file annual reports with the Commission on performance and cost/benefits achieved at
10 the EE Plan and program level, including justification for the performance-based program
11 administration fee, no later than five months following the end of the EE plan year.

12 **Q22. WILL AEP OHIO IMPLEMENT EE PLAN PROGRAMS INTERNALLY OR**
13 **HIRE EXTERNAL RESOURCES?**

14 A. Both. While limited in numbers, some AEP Ohio personnel have extensive experience in
15 managing energy efficiency programs and will bring that experience to implement the EE
16 Plan. It is expected that the Company will hire additional personnel to implement the EE
17 Plan. AEP Ohio will also hire external contractors to implement programs, process
18 applications, and pay incentives. Some programs are better implemented by external
19 parties (such as a marketplace for efficient products or an application and incentive
20 processor). These include the High Efficiency for Low-Income Program, where AEP Ohio
21 will rely on community action agencies, and the programs for residences and business
22 which involves repetitive processes. Other programs may be more cost-effective to run in-
23 house as they require substantial internal coordination with other groups within the

1 Company, such as the Community Energy Savers Program and the Education and Training
2 Programs. For programs implemented externally, AEP Ohio will select qualified third-
3 party contractors through a competitively bid process to the extent possible, and the costs
4 will be comparable to or lower than the cost of implementing the programs internally.

5 **Q23. HOW DOES THE EE PLAN SUPPORT ECONOMIC DEVELOPMENT AND**
6 **JOB IN OHIO?**

7 A. For each year of the program, approximately 1,281 direct and indirect jobs in the energy
8 services industry will be created and retained as a result of the implementation of the EE
9 Plan (Exhibit BFB-1, Section IV.f., Economic Development). Ohio-based employers who
10 manufacture, distribute, sell and install energy efficiency measures have consistently
11 benefitted from programs to raise awareness, inform customers, and incentivize highly
12 efficient equipment and process sales. A 2021 study commissioned by the Midwest Energy
13 Efficiency Alliance (“MEEA”) titled “Missed Opportunities,”⁹ modeled the impacts for
14 Ohio with and without statewide energy efficiency programs. This study showed that a
15 single year without energy efficiency programs results in a net loss of Gross Domestic
16 Product (“GDP”) for Ohio of approximately \$300 million dollars. AEP Ohio’s EE Plan
17 will begin to recapture these lost economic development benefits for our customers and all
18 of Ohio.

⁹ Midwest Energy Efficiency Alliance, “Missed Opportunities – The Impacts of Recent Policies on Energy Efficiency Programs in Midwestern States,” (Nov. 16, 2021) available at https://www.mwalliance.org/sites/default/files/meea-research/missed_opportunities_-_midwest_ee_policy_impacts.pdf?current=/taxonomy/term/11

1 **Q24. IS THE FREE MARKET SUFFICIENT TO MEET THE ENERGY EFFICIENCY**
2 **NEEDS OF AEP OHIO CUSTOMERS?**

3 A. No. The free market cannot address all of AEP Ohio’s customers’ needs. However, the
4 market is supplying the energy efficiency equipment and installations. The EE Plan
5 supports the market and is complementary to it. Customers need education and incentives
6 to increase awareness and maximize participation in energy efficiency. There are many
7 opportunities for AEP Ohio’s EE Plan to supplement the market by encouraging more
8 customers to participate. Some examples are the EE Plan’s incentives will offset some of
9 the high incremental cost of energy efficiency measures some customers might not have
10 been able to afford, provide opportunities for demand response to help all AEP Ohio
11 customers, educate customers on the benefits of energy efficiency, and provide low-income
12 customers with fully funded energy efficiency measures they otherwise could not afford.

13 **Q25. HOW WILL AEP OHIO’S PROPOSED PROGRAMS WORK WITH THE NEWLY**
14 **PASSED INFLATION REDUCTION ACT?**

15 A. The newly passed Inflation Reduction Act (“IRA”) provides substantial dollars for energy
16 efficiency improvements to Ohio.¹⁰ The IRA recognizes the value of energy efficiency.
17 The Company will work with our customers to take advantage of these rebates and tax
18 credits and the EE Plan will be used to raise customer awareness of the IRA rebates and
19 tax credits as well, but we need to do more. Ohio has 4.7 million households,¹¹ which
20 means the IRA provides only \$53 per household. This shows that there is still substantial

¹⁰ United States Department of Energy, “Biden-Harris Administration Announces State and Tribe Allocations for Home Energy Rebate Program,” (Nov. 2, 2022) available at <https://www.energy.gov/articles/biden-harris-administration-announces-state-and-tribe-allocations-home-energy-rebate>

¹¹ United States Census Bureau, “Quick Facts Ohio,” available at <https://www.census.gov/quickfacts/fact/table/OH/BZA010220?>

1 opportunity to provide other incentives and educate our customers for energy efficient
2 products. It will take a larger investment to unlock the true potential of energy efficiency
3 for our customers, as Insulation, Water Heating, and HVAC upgrades typically require
4 thousands of dollars to replace, much less upgrade the efficiency of the new unit. AEP
5 Ohio is proposing to provide incentives to support that efficient upgrade. For instance,
6 through the EE Plan, AEP Ohio will incentivize roughly 3,500 efficient heat pump
7 installations for residential customers annually. Residential upgrades such as heat pump
8 water heaters, heat pump clothes dryers, induction cooking, and weatherization products
9 are also included in the plan, and AEP Ohio's proposed incentives will also help defray the
10 cost of efficient upgrades and will assist Ohio customers in combating rising energy costs.
11 As more details emerge about how the IRA will be implemented in Ohio, the Company
12 will work with the relevant state agency to ensure funds are maximized for our customers
13 and the EE Plan will help raise that awareness.

14 **Q26. HOW DOES THE COMPANY EXPECT CUSTOMER SATISFACTION TO BE**
15 **IMPACTED BY OFFERING Energy EFFICIENCY PROGRAMS?**

16 A. From previous experience and customer feedback from similar programs, AEP Ohio
17 expects customer satisfaction will continue to be very positive. Several recent studies
18 support this expectation. In JD Power surveys in 2019-2021, AEP Ohio residential
19 customers who were familiar with AEP Ohio's Energy Efficiency Programs rated their
20 overall satisfaction with AEP Ohio 10% higher than customers did who were not at all
21 familiar with energy efficiency. In a January 2020 survey by Opinion Dynamics, 72% of
22 AEP Ohio customers rated their satisfaction with the AEP Ohio Marketplace a 4 or 5 on a
23 5-point scale. Less than one percent of customers said they were not at all satisfied. And

1 when AEP Ohio commercial customers were asked in a recent Deloitte survey how
2 “interested” their companies would be in using certain energy efficiency programs included
3 in the EE Plan, 75% of respondents said that they were *extremely interested* or *very*
4 *interested*.¹²

5 **Q27. DOES THE COMPANY INTEND TO USE A COLLABORATIVE PROCESS**
6 **WITH STAKEHOLDERS TO OBTAIN FEEDBACK ON THE EE PLAN AND**
7 **PROGRAMS?**

8 A. Yes. AEP Ohio historically ran successful collaboratives since 2010 and would restart that
9 effort to help inform and gain input on EE Plan performance and ways to improve the
10 programs.

11 **Q28. HOW DOES THE COMPANY PROPOSE TO RECOVER COSTS OF THE EE**
12 **PLAN?**

13 A. The Company is proposing to recover the costs of the EE Plan through the new EE Rider
14 which is supported by Company witness Heitkamp. Residential costs will be recovered
15 from residential customers and non-residential (business) costs will be recovered from non-
16 residential (business) customers. To the extent the Commission does not approve the
17 Energy Efficiency Plan set forth in testimony, the EE Rider should be and approved as a
18 placeholder for any potential future programs implemented pursuant to existing laws and/or
19 new laws implementing during the term of the proposed ESP V.

¹² Deloitte, “Utility 2.0 Winning Over the Next Generation of Utility Customers,” available at
<https://www2.deloitte.com/content/dam/Deloitte/us/Documents/energy-resources/us-e-r-utility-report.pdf>

1 **Q29. IS AEP OHIO PROPOSING TO UTILIZE LOST REVENUES IN ITS EE RIDER?**

2 A. Yes. The Company has approved base rates which include volumetric distribution charges
3 to recover fixed costs, based on usage at the time the base rates were approved. I have
4 been advised by counsel that the Electric Security Plan statute¹³ has a provision to recover
5 lost revenue. By implementing EE programs, AEP Ohio brings about a discrete reduction
6 in customer energy and demand use. Absent a lost revenue mechanism, this discrete
7 reduction of energy and demand would result in lower billed revenues for AEP Ohio until
8 billing determinants can be recalculated in a subsequent base rate proceeding. The
9 Company proposes a cost recovery mechanism which allows it to continue to recover these
10 lost revenues. Under the Company's proposal, an annual calculation of lost revenue would
11 be made throughout the term of the ESP V based on program participation.

12 **Q30. WILL LARGE CUSTOMERS BE ABLE TO OPT IN TO THE PROGRAMS?**

13 A. Yes. As noted in the plan introduction, mercantile customers, as defined by Ohio Revised
14 Code 4928.01(A)(19), will be automatically opted out of the programs' benefits and cost
15 recovery. If they so choose, these customers have the option to participate in the programs.
16 If customers opt into the programs, they must stay in the programs for a minimum of twelve
17 months. AEP Ohio will educate these customers on the benefits and costs associated, as
18 well as manage the process for opt ins.

19 **Q31. ARE YOU SUPPORTING ANY OTHER ANALYSIS TO SUPPORT THIS ESP**
20 **CASE?**

21 A. Yes. I was also responsible for creating the benefits associated to the Electric
22 Transportation plan, which is used by Company witness Jaynes in her testimony.

¹³ R.C. 4928.143(B)(2)(h)

1 **Q32. DOES THIS CONCLUDE YOUR TESTIMONY?**

2 A. Yes.

AEP Ohio Energy Efficiency Plan

1/6/2023

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I. Introduction

In this application, Ohio Power (“AEP Ohio”, or “Company”) seeks approval of its Energy Efficiency Plan (“EE Plan”) by the Public Utilities Commission of Ohio (“Commission”). The EE Plan is designed to achieve a number of objectives, including delivering a cost-effective and comprehensive suite of Energy Efficiency programs that provide participation opportunities for all classes of customers and every major customer segment of the Company’s service territory in a manner that optimizes electricity usage while managing the peak demand on the AEP Ohio system. In addition, the EE Plan seeks to reduce inefficient uses of electricity while improving customer productivity, enhancing customer comfort and safety, increasing customer satisfaction, and supporting economic development and retention in Ohio. The Company seeks to accomplish these goals by overcoming barriers that prevent residential and business customers from adopting energy efficient technologies. The EE Plan aims to help customers manage electricity demand during peak periods and encourage flexible load to be shifted to lower cost off peak periods. All things being equal, this in turn avoids the cost of building new generators and transmission lines through a more cost-effective Energy Efficiency approach, while also lowering emissions from electric generators serving Ohio customers. AEP Ohio is committed to helping its customers use energy more efficiently by implementing this EE Plan.

AEP Ohio proposes to invest an average of approximately \$43.4 million annually for the programs described in the EE Plan. In addition, a performance based sliding scale administration fee, which is based on the percent of the annual spend, is earned for cost effective delivery of the EE Plan to customers. The focus of the EE Plan is on Energy Efficiency opportunities where the Company can work with customers and solution providers to deliver programs that help customers manage their peak demand. In addition, the Company will continue to help customers save energy, particularly in the residential, low income, small and medium business segments. An area of significant projected electricity growth is electric transportation, and the EE Plan include an Electric Transportation Program to provide overall support for this growth while managing the system peak demand.

In conjunction with the return to a voluntary EE Plan, the Company has taken the learnings from programs offered over previous mandated programs to build a suite of programs that are combined to be both cost effective and comprehensive, yet significantly smaller and more focused on Energy Efficiency. Ongoing EE Plan performance, customer acceptance, customer satisfaction and cost effectiveness are critically important; therefore, the EE Plan continues a rigorous research and development function in order to ensure continuous improvement of programs that deliver innovation and strong performance. The research and development function will also allow new program opportunities to be tested, measured and integrated into the program offerings. AEP Ohio contracted with Guidehouse (formerly known as Navigant) in 2019 to conduct a study on the necessary potential for applicable Energy Efficiency measures. AEP Ohio further refined this study in 2022 using market conditions, budget estimates, and potential baseline changes. These estimates were used to incorporate the assumptions as a basis for program design and goal setting. In addition, the EE Plan will initially exclude mercantile¹ customers from our programs however, these customers will have the opportunity to opt in to participate. Mercantile Customers who want to participate in the programs must pay the EE

¹ [https://codes.ohio.gov/ohio-revised-code/section-4928.01\(A\)\(19\)](https://codes.ohio.gov/ohio-revised-code/section-4928.01(A)(19))

Plan portion of the CER rider a minimum of twelve months. The exact number of customers is not known and the impact of any opt ins to performance requirements is difficult to predict. We have estimated budgets based on full participation, but actual spending can be adjusted to reflect any future level of opt in participation including those impacts on the EE Plan goals and requirements.

II. Objectives

The key objectives of the Energy Efficiency Program are to:

- Provide programs that help all customers segments with opportunities for participation.
- Support at-risk customer segments with focused programs to help them manage their demand and energy use.
- Encourage peak load management in a way that ensures a cost effective, healthy and reliable grid.
- Maximize the capabilities and benefits of the Smart Grid.
- Provide customer-oriented solutions for Energy Efficiency services.
- Provide the lowest cost alternative to new generation.
- Reduce inefficient uses of electricity while improving customer productivity, providing comfort and safety, and increasing customer satisfaction.
- Help provide and increase sustainable jobs for Ohio.
- Identify and promote non-energy related benefits to support program delivery, providing customers total financial benefits of participation.
- Provide environmental benefits.
- Increase and complement economic development in Ohio by reducing energy density per product or service provided and improving competitiveness.
- Help delay the need for new electricity generation and future related rate impacts.

III. Programs

The Company used a four-pronged approach for designing the programs within the EE Plan:

1. Meet the objectives set forth in the Energy Efficiency EE Plan,
2. Design programs to satisfy customer needs,
3. Achieve a cost-effective plan to benefit to all customers, and
4. Provide programs for all customer segments.

Using these metrics, AEP Ohio has designed the following suite of programs. AEP Ohio proposes an annual budget of \$43.4 million for all programs, with total annual demand savings of 110 MW and annual energy savings of 206 GWhs. The EE Plan is cost effective, delivering total benefits of \$144.7 million. Figure 1 shows the summary of proposed programs investments.

Figure 1. Energy Efficiency Plan Savings, Budget, and Cost Effectiveness

Proposed Program	Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	Benefits	Non-Energy Benefits	Total Benefits	mUCT	mTRC
Lifetime Energy Efficiency Program (LEEP)	35,958	9,006	\$ 9,544,812	\$ 30,062,722	\$ -	\$ 30,062,722	3.1	1.9
Home Energy Management*	18,269	25,602	\$ 2,821,119	\$ 3,370,026	\$ -	\$ 3,370,026	1.2	1.2
e3smart	6,331	909	\$ 912,674	\$ 2,322,433	\$ -	\$ 2,322,433	2.5	2.5
High Efficiency for Low-Income Program (HELP)	6,888	1,556	\$ 7,965,920	\$ 4,287,639	\$ 12,100,233	\$ 16,387,872	2.1	2.1
Residential Subtotal	67,446	37,073	\$ 21,244,525	\$ 40,042,820	\$ 12,100,233	\$ 52,143,053	2.5	1.9
Midstream Efficiency	89,107	22,439	\$ 13,686,872	\$ 58,720,469	\$ 14,047,790	\$ 72,768,259	5.3	2.1
Customized Energy Efficiency	8,661	611	\$ 1,153,061	\$ 4,124,637	\$ 1,359,165	\$ 5,483,802	4.8	1.6
Continuous Energy Improvement	40,585	1,144	\$ 1,468,618	\$ 5,514,172	\$ 3,213,624	\$ 8,727,796	5.9	2.9
C&I Demand Response*	-	48,510	\$ 2,809,176	\$ 5,583,401	\$ -	\$ 5,583,401	2.0	2.0
Business Subtotal	138,353	72,704	\$ 19,117,727	\$ 73,942,679	\$ 18,620,579	\$ 92,563,258	4.8	2.1
Innovation and Technology			\$ 800,000					
Education and Training			\$ 1,450,000					
Community Energy Savings			\$ 800,000					
Cross Sector Subtotal			\$ 3,050,000					
Total	205,799	109,778	\$ 43,412,252	\$ 113,985,499	\$ 30,720,812	\$ 144,706,311	3.3	1.9

*Average annual benefits over ESP term length

a. Residential Programs

i. Lifetime Energy Efficiency Program (LEEP)

This Energy Efficiency program provides retail incentives for LED specialty lighting and incentives for efficient heating and air conditioning (Energy Star Heat Pumps and Mini Split Heat Pumps), appliances, heat pump water heaters and emerging technologies. In addition, incentives for demand control devices are included such as smart thermostats, load controllers and other managed demand devices. This program includes a digital marketplace to help educate consumers about energy efficient appliances, potentially receive an energy efficiency rating to help them make a more informed decision, and shop for efficient products. The program will also explore midstream opportunities for delivering incentives.

This program also encourages energy efficient construction of new single and multifamily homes well above the current building codes along with new technology opportunities in new highly efficient homes including smart thermostats, heat pump water heating, lighting controls, and electric vehicle charging. The program will also explore enhanced building envelope improvements with air sealing, and insulation.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
35,958	9,006	\$9,544,812	3.1	1.9
Other Benefits	Improved lighting quality, comfort, improved property values, water savings. Energy efficiency education through a Marketplace.			

ii. Home Energy Management

This Energy Efficiency program lowers peak demand through behavioral coaching and incentivizing demand response (DR) by residential customers. Demand response and peak shaving will be provided with combinations using electric water heating, air conditioning, space heating with smart thermostats, EV charging control, and education to our customers. These DR events will be targeted for reducing the demand for PJM critical peaks, and the Network Service Peak Load (NSPL). In doing this, AEP Ohio will be able to reduce its capacity obligation for all customers, thus lowering all customer costs. Incentives will be provided to customers who participate in the DR events. In addition, the program will cover fees to third party thermostat and other appliance manufacturers to control their devices via a centralized load management system managed by AEP Ohio; however, use of those devices without ongoing fees will be encouraged and promoted to reduce overall costs. The goal of the program is to initially use incentives and customer communications to shift demand, then educate the benefits of changing behavior, and finally migrate customer to a Time of Use distribution rate plan that benefits the customer. Once this successful transition of modifying customer behavior occurs and customers are potentially saving through the off-peak rate that fits their household usage, incentives will be transitioned to recruit new participants in the program. The demand response program also includes a customer home energy report element targeted to high usage and high demand customers to educate the customer on rate designs, incentives, etc. to influence energy and demand savings over the course of the year.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
18,269	25,602	\$2,821,119	1.2	1.2
Other Benefits	Customers retain direct control over energy usage. Real time information can be provided as a component of Energy Efficiency education.			

iii. E3Smart

This Energy Efficiency program educates and engages Ohio children grades 4-12 about energy, how to save energy at their homes, and learn about new energy efficient technologies. Classroom curriculum is provided to each participating teacher and each teacher is provided hands on training to review and go over the curriculum. Each student is provided a classroom exercise and take-home project which includes a weatherization kit that the student, with the assistance of a parent, can install to utilize the energy saving measures. A parent survey is returned to the teacher to gauge the success of the project. This program is recognized as part of the Ohio STEM curriculum and has good coverage in low-income school districts.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
6,331	909	\$912,674	2.5	2.5
Other Benefits	Educates and engages the next generation on the importance of Energy Efficiency. Gives teachers additional educational materials to enhance their curriculum and support STEM.			

iv. High Efficiency for Low-Income Program (HELP)

This Energy Efficiency program is comprised of 2 components.

- 1) The Community Assistance Program (\$5.9 million) serves low-income customers (below 200% of the Federal Poverty Level) by providing energy efficiency retrofit upgrades (lighting, heat pumps, refrigerators and shell measures) in single and multifamily dwellings through local impact agencies. These local agencies identify households requesting and needing assistance and provide an audit to determine which measures are needed. The local agency then completes the request, and each project is recorded and shared with the utility.
- 2) The Supplemental Low-Income Program (\$2 million) supplements and provides financial assistance to lower-income customers between 200-300% of the Federal Poverty Level. Within our service territory there is a significant percentage of households that would qualify, and AEP Ohio wants to help these customers. These customers can have difficulty purchasing big ticket items, the focus of this budget is to provide deeper discounts and/or incentives on the standard energy efficiency programs. This includes but not limited to smart thermostats, air source heat pumps, heat pump water heating, and insulation.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
6,888	1,556	\$7,965,920	2.1	2.1
Other Benefits	Lowering total electric bill, thus lowering the amount needed to be collected through the Universal Service Fund. Better health, indoor air quality, improved comfort, and increased safety for customers. Education on Energy Efficiency to help set behaviors to help keep customer bills low.			

b. Business Programs

i. Midstream Efficiency

This Energy Efficiency program provides incentives for businesses to install efficient systems, including, lighting, heating, ventilation and air-conditioning (HVAC), food service, compressed air, and refrigeration. All measures will be sold and incentivized through a point-of-sale program, providing low program administration costs. In addition to Energy Efficiency benefits, there are significant non-energy benefits for operation and maintenance cost reduction have been characterized for this program. There is also a focus on helping our small businesses with an on-site assessment for small businesses that do not have the energy expertise that larger customers can have. These assessments can identify savings and allow for increased incentives through the midstream program to encourage participation.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
89,107	22,439	\$13,686,872	5.3	2.1
Other Benefits	Productivity improvements, O&M reductions, access to Green Loans.			

ii. Customized Energy Efficiency

This Energy Efficiency program is for cost-effective energy efficiency improvements that reduce energy consumption, peak demand, and/or increase productivity. The program will assist commercial and industrial customers with the analysis and selection of high-efficiency equipment or processes not covered under other program offerings. The program approach will identify more complex energy savings projects, provide economic analysis and aid in the design and completion of the project. The program will target measured energy savings on a per kWh and per peak kW reduction basis.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
8,661	611	\$1,153,061	4.8	1.6
Other Benefits	Productivity improvements, O&M reductions, access to Green Loans.			

iii. Continuous Energy Improvement

The program contains platforms and tools that small and large customers can use to monitor and control their energy and demand. These tools may include automated benchmarking of buildings (Energy Star), energy model regression analysis tool, and actionable data to educate and help lower businesses' energy density of products/services.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
40,585	1,144	\$1,468,618	5.9	2.9
Other Benefits	Productivity improvements, O&M reductions, access to Green Loans.			

iv. C&I Demand Response

This Energy Efficiency program has multiple components. DR events will target 2 components: (1) where control of thermostat/HVAC, electric transportation, managed process, water heating is available, and (2) where control of networked lighting can reduce lighting levels during peak periods. AEP Ohio will call these DR events when the system demand is at its highest. These DR events will be targeted for reducing the demand for PJM critical peaks, and the NSPL. In doing this, AEP Ohio will be able to reduce its capacity obligation for all customers, thus lowering all customer costs.

Energy Savings (MWh)	Coincident Demand Savings (kW)	Annual Budget	mUCT	mTRC
0	48,510	\$2,809,176	2.0	2.0
Other Benefits	Customers retain direct control over energy usage and actionable data to help manage peak events.			

c. Cross-Sector Programs

i. Community Energy Savings

This program will work with communities to increase participation in Energy Efficiency programs for residential and business customers. If successful, the community would be eligible to receive an award that can be used for an energy efficient project in their community such as LED community park lighting upgrade, upgrade to school classroom lighting or other support initiatives in that community.

ii. Education & Training

This program will provide Energy Efficiency education and training for all customers, customer groups, contractors, trade associations, and civic associations. Activities and materials will be tailored to specific audiences: facilities managers, building operators, financial decision makers, builders, contractors, trade associations, civic organizations, workforce development practitioners and students, and AEP Ohio employees whose work brings them in contact with customers. Customer education events will continue to be offered via webinar and face-to-face seminars at multiple sites throughout the service area as needed to permit customers to participate while minimizing travel. Seminars will continue to feature subject-matter experts, trade allies, and hands-on demonstrations of Energy Efficiency technologies. When available, we will offer Continuing Education Units (CEUs) from these trainings to our customers to help maintain their professional licenses. Education and training participants will be surveyed for feedback on relevance, quality and satisfaction with activities.

This effort will also focus on activities that will encourage participation in our Energy Efficiency programs by completing multi-channel outreach and customer communication activities that will help customers be aware of Energy Efficiency programs available to help them save money and improve comfort. Our goals are to:

- (1) increase awareness of energy savings and demand response opportunities and motivating customers to act by providing education on the financial, social and environmental benefits,
- (2) drive Energy Efficiency program participation through targeted outreach efforts utilizing segmentation data from a third party and internal data resources,
- (3) position AEP Ohio as a key source of information on Energy Efficiency with a robust website, solution center product knowledge and various outreach efforts for communities in our service territory,
- (4) use cost effective channels, and
- (5) focus on digital and social media channels.

iii. Innovation and Technology

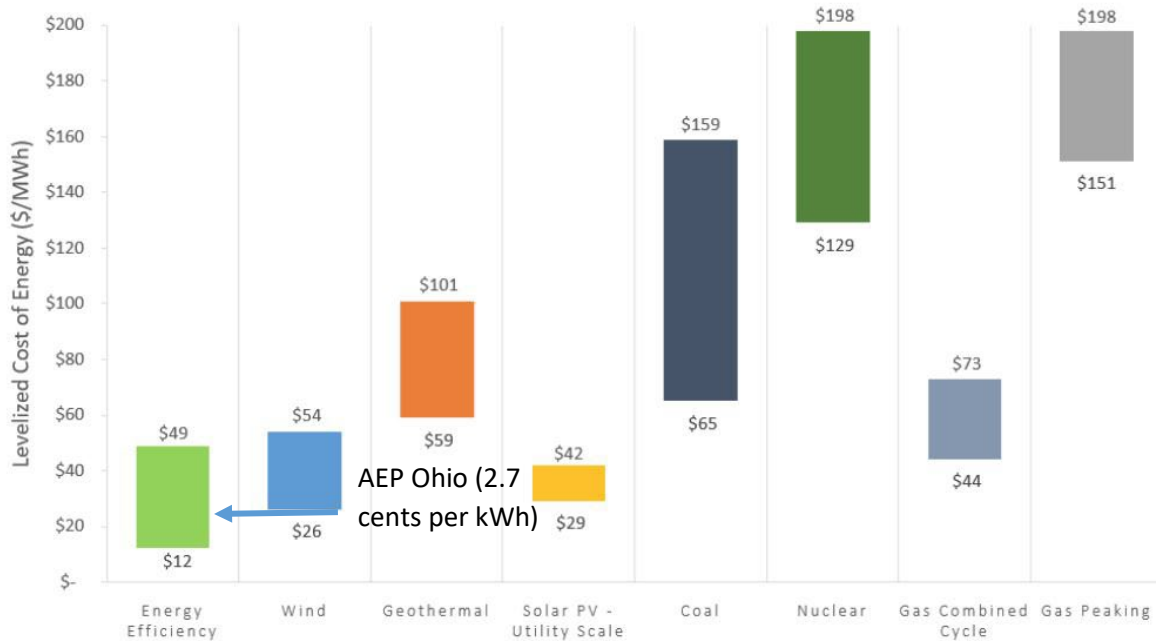
This Energy Efficiency program is designed to develop and test new technologies and methodologies for Energy Efficiency programs that, when successful, can be included with other residential and business programs in the EE Plan. Potential technologies could include new heat pump applications in packaged units, 120V Heat Pump Water Heaters, Thermal Energy Storage, additional

networked lighting opportunities, and advanced networked management systems. In addition, segment-specific innovation is needed to meet the unique opportunities with various customer segments on the business side and demographic needs on the residential side. For example, reaching lower income customers, AEP Ohio will look for efficient ways to focus higher incentives in census tracts in AEP Ohio's service territory where 50% of households have income less than two times the federal poverty threshold as defined by the most recent American Community Survey (ACS). Small businesses are another segment that can be difficult to reach, and innovative approaches are needed. Other opportunities will include looking at innovative ways, such as financing, to deliver incentives to our customers more effectively.

IV. Benefits

The levelized cost of saved energy is estimated to be \$0.027/kWh for the Company's EE Plan, comparing favorably to any supply-side generation investment alternative. As compared with supply-side generation investment alternatives (including non-dispatchable technologies such as wind and solar), the AEP Ohio's EE Plan cost compares favorably, and is the lowest cost alternative. AEP Ohio is proposing a cost-effective portfolio below the industry average levelized costs. As noted in an ACEEE paper "Energy efficiency today is an important utility system resource, typically the lowest-cost system resource compared to supply-side investments. Saving energy via customer energy efficiency programs generally can be achieved at one-third to one-fourth the cost of fossil-fuel based supply-side alternatives." See Figure 2 below.

Figure 2. Energy Efficiency is the lowest cost resource²



a. Avoided Supply Costs

The value of avoided generation and capacity refers to the costs of the electric resources that are deferred or avoided by the Energy Efficiency resources. The value of the avoided generation and capacity is a fundamentally established concept in Energy Efficiency. AEP Ohio is using marginal cost values as forecasted by AEP Fundamentals group, which have been used historically as a dependable benefit for Energy Efficiency programs. The avoided energy generation values are separated by On

² [Energy Efficiency as a Resource | ACEEE](#)

Peak/Off Peak price, and these will be blended together by the load shapes of each specific sector. For more detail, please refer to BFB-2 Appendix Section V.

b. Avoided Transmission and Distribution Costs

To quantify avoided transmission benefits, it is based on mitigating the Network Service Peak Load (NSPL) value that is used to quantify this value. When looking at this reduction, this value is approximately \$36.00 per kW-year. The value of avoided distribution is difficult to quantify until AEP Ohio has demand response capability at sufficient scale on a given circuit or station, AEP Ohio has included a conservative average value of \$7.60 per kW for Distribution. To calculate avoided distribution costs, AEP Ohio relied on the Current Values Approach that had been utilized by MidAmerican Energy Company in multiple jurisdictional Energy Efficiency filings, which utilize prior FERC form 1 filings³. For more detail, please refer to BFB-2 Appendix section V.

c. Discount Rate for Present Value Benefits/Costs

For the discount rate in net present value calculations, AEP Ohio will use its Weighted Average Cost of Capital (WACC) as defined by NARUC⁴. The cost of capital is a weighted average cost of all elements in the capital structure. AEP Ohio used the Company's proposed value of 7.80% as its discount rate as supported by witness Minton.

d. Non-Energy Benefits

There are multiple benefits to Energy Efficiency outside of reduced energy costs. For the residential side, AEP Ohio has only quantified a portion of available benefits to use for cost effectiveness test purposes. For the retrofit low-income program, AEP Ohio has incorporated an analysis done for the Community Assistance Program. This analysis, as shown in BFB-2 Appendix section IV, shows that every dollar spent on the program, provides approximately \$1.52 in benefits to all customers in reduced collections to the Universal Service Fund, and a reduction in charge-offs. Non-energy benefits identified by AEP Ohio non-residential customers can be found in Figure 5. For more detail, please see BFB-2 Appendix section III. For the business programs there are many various quantifiable operations and maintenance reductions associated to Energy Efficiency participation, AEP Ohio proposes an additional \$18.3 per MWh of benefits. These benefits will be incorporated into the testing values shown below.

³ "Direct Testimony of Jennifer L. Long," Application for Approval of Energy Efficiency Plan for 2019-2023 (Docket EEP-2018-0002), Submitted to Iowa Public Utilities Board by MidAmerican Energy Company, July. 9, 2018, p. 4. Approved February 18th, 2019.

⁴ [COST OF CAPITAL AND CAPITAL MARKETS PRIMER FOR UTILITY REGULATORS](#)

Figure 3. Percent of measures resulting in non-energy benefits by type of benefit (n=79)

Benefit category	Measures resulting in benefit	Percent
Comfort Increased	41	52%
Safety Increased	34	43%
Productivity Increased	22	28%
Other Revenue Increased	3	4%
Sales Increased	2	3%
Other Increase	2	3%
Downtime Decreased	19	24%
Labor Costs Decreased	10	13%
Other Decrease	10	13%
Material Costs Decreased	5	6%
License Costs Decreased	2	3%
Waste Disposal Costs Decreased	0	0%

e. Greenhouse Gas Reductions

This proposed EE Plan will promote the public interest by reducing total generating plant emissions and, as a result, will provide significant environmental benefits to all customers. This EE Plan estimates that the energy savings from one year of programs will save 1,474,000 tons of CO₂.

f. Economic Development

To capture the full economic impacts of the investments in energy efficiency, the Midwest Energy Efficiency Alliance commissioned a study in 2021⁵ that determines not implementing energy efficiency programs we lose approximately 5,460 full-time equivalent (FTE) jobs. This analysis was done in IMPLAN, which is a standard tool for economists to assess macroeconomic impacts.

AEP Ohio has utilized this analysis to correlate its economic impact that each year of its programs would create an additional 1,281 FTE jobs in its service territory.

⁵ [MEEA Research: New Report Demonstrates EE's Immense Value to the Region | Midwest Energy Efficiency Alliance \(mwalliance.org\)](https://mwalliance.org/research/new-report-demonstrates-ee-s-immense-value-to-the-region/)

g. Customer Satisfaction

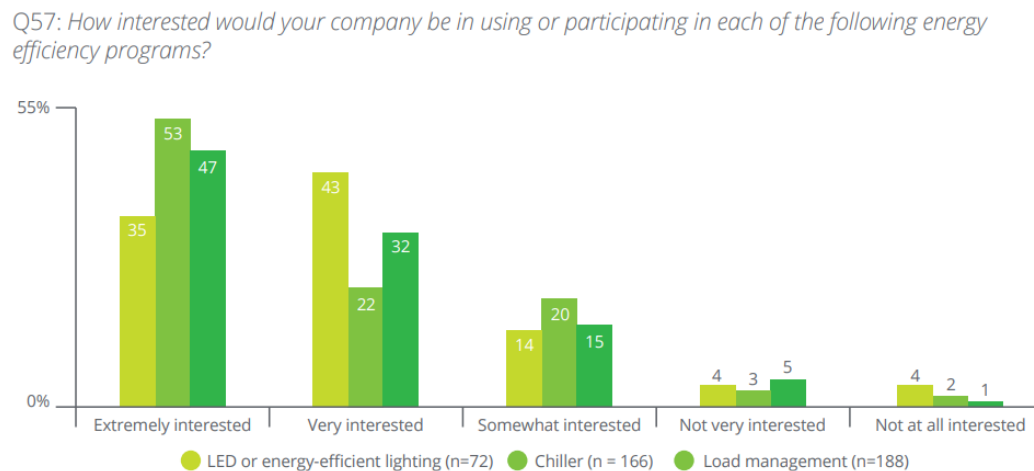
AEP Ohio listens to our customers and programmatic adjustments are made per their feedback. We use various tools to measure customer satisfaction with AEP Ohio that includes surveys, social media and the call center. Customer satisfaction is a key focus, and we take it very serious and place emphasis on the customer. It is AEP Ohio's belief is that our customers want us to provide programs to meet their needs such as saving on their bill and for environmental purposes.

Based on the 2019-2021 JD Power results⁶, on a 1000-point scale respondents familiar with AEP Ohio's Energy Efficiency Programs were 74 points (10% higher) more satisfied with AEP Ohio overall than those respondents not at all familiar with energy efficiency. Other key findings include:

A survey completed by Opinion Dynamics in January 2020 showed 72% of customers rated the AEP Ohio Marketplace a satisfaction of 4 or 5 on a 5-point scale. Less than one percent (0.9%) said they were not at all satisfied.

From a Deloitte survey of Utility 2.0⁷, which surveyed Commercial customers, "How interested would your company be in using or participating in each of the following energy efficiency programs?" As shown in their Question 57, the response for each of the three programs totaled 75% or higher that they were 'Extremely interested' or 'Very interested'. In AEP Ohio's proposal, we offer versions of these three programs. See Figure 4 below.

Figure 4. Deloitte survey of Utility 2.0, Question 57



The 2020 Program Year Evaluations conducted by Guidehouse (formerly Navigant) showed over 97%⁸ of the teachers agreed that e3Smart program activities helped students better understand energy efficiency. For Community Assistance - the low-income program, customer's average program satisfaction was 9.57 out of 10⁹.

⁶ Source: JD Power 2019-2021 Year End results - Residential only.

⁷ [us-e-r-utility-report.pdf \(deloitte.com\)](https://www.deloitte.com/us/e-r-utility-report.pdf)

⁸ [AEP OH Appendicies 2020 A-H Part1.pdf \(state.oh.us\)](https://www.state.oh.us/aep-oh-appendicies-2020-a-h-part1.pdf) – Appendix D

⁹ [AEP OH Appendicies 2020 A-H Part1.pdf \(state.oh.us\)](https://www.state.oh.us/aep-oh-appendicies-2020-a-h-part1.pdf) – Appendix F

V. Benefit-Cost Analysis

Energy efficiency has a long history of being valued using the California Standard Practice Manual (“CaSPM”) tests. These tests were standardized in the National Standards Practice Manual (NSPM), and programs have been historically evaluated with respect to each of the four benefit-cost tests¹⁰: Utility Cost Test, Total Resource Cost Test, Ratepayer Impact Measure Test, and Participant Cost Test. From the NSPM, AEP Ohio is utilizing variations of the UCT and TRC, as defined below.

a. Modified Utility Cost Test (“mUCT”)

The purpose of the UCT is to indicate whether the benefits of an EE resource will exceed its costs from the perspective of only the utility system. The UCT includes all costs and benefits that affect the operation of the utility system and the provision of electric and gas services to customers. For vertically integrated utilities, this test includes all of the costs and benefits that affect utility revenue requirements. For utilities that are not vertically integrated, this test includes all costs and benefits that affect utility revenue requirements, plus additional costs and benefits associated with market-based procurement of electricity and gas services. The UCT is sometimes referred to as the Program Administrator Cost test, to include those cases where ratepayer-funded EE programs are implemented by non-utility administrators. The UCT is a more accurate name because the costs and benefits included in this test are those that affect the utility system, not those that affect the Program Administrator. AEP Ohio has incorporated additional non-energy benefits into the UCT, such as the quantification of C&I non-energy benefits. These function as additional benefits to participants which allow to properly set incentive values that can help keep program costs in line to serve more customers. Also included are the reduction of charge offs and reduced collections from Universal Service fund, thus calling it the modified UCT, or mUCT. These benefits are listed in the benefits section in section V.

b. Modified Total Resource Cost Test (“mTRC”)

One of the key principles of cost-effectiveness assessment is that utility EE investments should be evaluated as a resource and compared with other demand-side and supply-side resources. The TRC does so from the combined perspective of the utility system and participants. Thus, this test includes all impacts of the mUCT, plus all impacts on the program participants. AEP Ohio has incorporated additional non-energy benefits into the TRC as explained above, thus calling it the modified TRC, or mTRC. These benefits are listed in the benefits section in section V.

¹⁰ https://nationalefficiencyscreening.org/wp-content/uploads/2017/05/NSPM_May-2017_final.pdf

Figure 5. Benefit-Cost Test Formulae

Cost Test	Formula	Key of Terms	
Modified Utility Cost Test (mUCT)	$mUCT = (A + D) / (B + C)$	A = PV Avoided Costs	D = PV Non-Energy Benefits
Modified Total Resource Cost Test(mTRC)	$mTRC = (A + D) / (B + C + E)$	B = PV Administrative Costs	E = PV Incremental Costs
		C = PV Incentive Costs	PV = Present Value

c. Benefit / Costs Tests

For purposes of Cost effectiveness, AEP Ohio will use these tests to determine the value and effectiveness of a program. AEP Ohio used the mUCT test to guide which Energy Efficiency programs to include in the proposed plan. The EE Plan as a whole was valued through the mUCT; including the administrative costs, cross sector costs, non-energy benefits, and customer incentives. AEP Ohio plans to study more Non-Energy Benefits, and if more Non-Energy Benefits become quantifiable, AEP Ohio reserves the right to incorporate them into the mUCT and mTRC.

Figure 6. Projected Benefit Cost Tests

Program	mUCT	mTRC
Lifetime Energy Efficiency Program (LEEP)	3.1	1.9
Home Energy Management*	1.2	1.2
e3smart	2.5	2.5
High Efficiency for Low-Income Program (HELP)	2.1	2.1
Residential Subtotal	2.5	1.9
Midstream Efficiency	5.3	2.1
Customized Energy Efficiency	4.8	1.6
Continuous Energy Improvement	5.9	2.9
C&I Demand Response*	2.0	2.0
Business Subtotal	4.8	2.1
Total	3.3	1.9

*Average annual benefits over ESP term length

VI. Evaluation, Measurement, and Verification

The program plan shall be cost-effective on a portfolio basis using the modified Utility Cost Test. In general, each program proposed within the plan must also be cost-effective using the modified Utility Cost Test. The portfolio may include programs that are not cost-effective when those programs provide substantial non-energy benefits.

The Company plans to use a variety of methods to measure performance: directly measure savings, calculate using methods found in the Ohio technical reference manual, or other reasonable statistical and/or engineering methods. The Company will use the Ohio TRM as long as it is available and current, with recommendations to justify additional measurements as needed to supplement the TRM.

Stakeholder shall be given an opportunity for participation in program portfolio updates and refinement. At a minimum, updates on the energy efficiency and peak demand reductions achieved by programs shall be presented at quarterly stakeholder meetings.

Costs incurred in implementation of programs, new programs or measures are being considered, and input from stakeholders on existing and potential new programs shall be discussed.

a. Annual Performance Verification

Five months after the end of each program year, a portfolio performance report shall be filed addressing the performance of its energy efficiency and peak demand reduction programs over the previous calendar year.

The portfolio performance report shall detail achieved annualized energy savings, achieved demand reductions, and the demand reductions that programs were reasonably designed to achieve, relative to the corresponding energy and peak demand portfolio reductions. At a minimum, this section of the portfolio status report shall include each of the following:

- i. A comparison of actual annualized energy savings and peak demand reductions achieved against plan goal.
- ii. A description of each energy efficiency or peak demand reduction program implemented in the previous calendar year.
- iii. The key activities undertaken in each program, the number and type of participants, a comparison of the forecasted savings to the verified savings achieved by such program.
- iv. An evaluation, measurement, and verification report that documents the energy savings and peak demand reduction values and the cost effectiveness of the energy efficiency and peak demand reduction management portfolio to be filed every year.

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1/6/2023

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I. Energy Efficiency Plan Measure List

AEP Ohio contracted with Guidehouse (Navigant) to produce a Market Potential study in 2019. AEP Ohio has used this recent study to build the foundational information for its Energy Efficiency plan, please see below for the measure level breakdown.

Figure 1. Measure level breakdown by program

Program Code	Sector / Measure	Per unit kW	Per unit kWh	Total kW	Total kWh	Quantity	Unit
CIDR	Com Commercial Load Control	40.000	-	48,509.7	-	1,213	per Participant
CEI	Com Strategic Energy Management	0.000	0.035	1,144.4	26,882,085.578	9,463	per kWh
CEI	Ind Strategic Energy Management	-	0.030	-	13,702,826.419	294	per kWh
CEE	Ind Air Compressor Control and Optimization	0.000	0.013	35.6	1,785,714.000	21	per kWh
CEE	Ind Air Compressor VFD	0.000	0.002	4.5	53,882.238	21	per kWh
CEE	Ind Combined Heat and Power (CHP)	0.000	0.430	463.8	5,541,422.516	8	per kWh
CEE	Ind Fan VFD	0.000	0.001	3.6	42,979.172	21	per kWh
CEE	Ind HE Aerators	0.000	0.005	13.3	158,367.324	21	per kWh
CEE	Ind HVAC Chiller Upgrade	0.000	0.002	5.3	63,749.892	21	per kWh
CEE	Ind HVAC Equipment Upgrade	0.000	0.002	4.6	55,231.145	21	per kWh
CEE	Ind HVAC System Controls	0.000	0.005	14.9	178,464.935	21	per kWh
CEE	Ind HVAC VFD Upgrade	0.000	0.000	0.0	182.125	21	per kWh
CEE	Ind Injection Molding	0.000	0.018	2.0	23,857.643	1	per kWh
CEE	Ind Process Optimization Controls	0.000	0.001	2.7	31,881.549	21	per kWh
CEE	Ind Pump Sizing and Optimization	0.000	0.001	2.5	29,862.978	21	per kWh
CEE	Ind Pump VFD	0.000	0.005	56.7	677,147.044	84	per kWh
CEE	Ind Refrigeration System Optimization	0.000	0.001	1.5	18,398.555	21	per kWh
E3S	Res Advanced Smart (Tier 2) Power Strip	0.022	269.786	101.3	1,215,862.355	4,507	per advanced power strip
E3S	Res LED Screw-in Specialty Bulbs	0.004	14.238	249.0	913,589.198	64,166	Per Bulb
E3S	Res Low flow aerator	0.010	49.000	66.8	327,509.015	6,684	per faucet
E3S	Res Low flow showerhead	0.030	237.000	462.0	3,649,839.975	15,400	per shower
E3S	Res Pipe wrap (hot water)	0.010	64.000	2.5	16,024.828	250	per house
E3S	Res Standard flow showerhead with TSV	0.010	76.000	26.1	198,238.449	2,608	per shower
E3S	Res Water Heater set to 120F	0.005	45.500	1.1	9,548.102	210	per water heater
HELP	Res Advanced Smart (Tier 2) Power Strip	0.022	269.786	10.1	121,586.235	451	per advanced power strip

HELP	Res ENERGY STAR Freezer Replacement	0.098	655.000	23.8	159,102.440	243	per Freezer
HELP	Res ENERGY STAR Heat Pump	0.389	2,516.300	82.8	535,564.525	213	Per System
HELP	Res ENERGY STAR Mini Split HP	0.055	300.900	9.5	51,734.931	172	Per Heat Pump
HELP	Res ENERGY STAR Refrigerator Replacement	0.098	655.000	190.4	1,272,819.517	1,943	per Refrigerator
HELP	Res Heat Pump WH	0.423	1,654.000	294.8	1,151,809.097	696	per water heater
HELP	Res Home that has air sealing performed	0.417	416.670	327.2	327,240.469	785	Residential Households
HELP	Res LED Outdoor Flood Light Fixture	-	33.883	-	279,199.698	8,240	Per Fixture
HELP	Res LED Screw-in Specialty Bulbs	0.004	14.238	415.0	1,522,648.664	106,944	Per Bulb
HELP	Res Low flow aerator	0.010	49.000	16.7	81,877.254	1,671	per faucet
HELP	Res Low flow showerhead	0.030	237.000	115.5	912,459.994	3,850	per shower
HELP	Res Pipe wrap (hot water)	0.010	64.000	4.2	26,708.047	417	per house
HELP	Res Residential Weatherization	0.008	459.900	3.6	205,958.558	448	Residential Households
HELP	Res Sealed duct in unconditioned spaces	0.075	212.000	49.6	140,136.763	661	Per Household
HELP	Res Standard flow showerhead with TSV	0.010	76.000	13.0	99,119.224	1,304	per shower
HEM	Res Electric Vehicle Controls: Demand Response	1.053	-	3,918.9	-	3,722	Residential Households
HEM	Res Home Energy Management	0.035	131.840	4,777.9	18,227,986.450	138,258	Residential Households
HEM	Res HVAC Controls: Demand Response	0.760	-	16,165.6	-	21,271	Residential Households
HEM	Res Water Heater: Demand Response	0.187	10.366	740.0	41,019.727	3,957	Residential Households
LEEP	Res Advanced Smart (Tier 2) Power Strip	0.022	269.786	202.6	2,431,724.710	9,014	per advanced power strip
LEEP	Res ENERGY STAR Heat Pump	0.389	2,516.300	827.9	5,355,645.248	2,128	Per System
LEEP	Res ENERGY STAR Mini Split HP	0.055	300.900	47.3	258,674.655	860	Per Heat Pump
LEEP	Res ENERGY STAR Most Efficient Refrigerator	0.006	75.000	15.7	203,651.123	2,715	per Refrigerator
LEEP	Res Heat Pump Clothes Dryer	0.017	153.082	31.8	278,298.649	1,818	per dryer

LEEP	Res Heat Pump Water Heaters	0.260	1,905.000	786.0	5,759,045.484	3,023	per water heater
LEEP	Res Induction Cooktop Stove	0.004	41.900	0.8	7,928.992	189	per stove
LEEP	Res LED Outdoor Flood Light Fixture	-	504.519	-	594,695.356	1,179	Per Fixture
LEEP	Res LED Replacement Lamp (Tube)	0.020	11.900	1,348.2	802,166.715	67,409	Per Bulb
LEEP	Res LED Screw-in Specialty Bulbs	0.004	14.238	4,108.9	15,074,818.136	1,058,786	Per Bulb
LEEP	Res Networked/ Connected - Indoor LED Lamp	0.004	45.129	27.2	290,672.174	6,441	Per Bulb
LEEP	Res Outdoor motion sensor	0.034	124.960	5.0	18,401.386	147	Residential Households
LEEP	Res Smart Thermostat	0.230	329.630	1,079.0	1,546,456.675	4,691	Per Thermostat
LEEP	Res VRF Heat Pump	0.052	6,707.500	18.4	2,383,750.256	355	Per VRF System
LEEP	Res Home that has air sealing performed	0.417	416.670	454.5	454,500.651	1,091	Residential Households
LEEP	Res Residential Weatherization	0.008	459.900	6.5	367,906.518	800	Residential Households
LEEP	Res Sealed duct in unconditioned spaces	0.075	212.000	45.9	129,756.262	612	Per Household
ME	Ind Air Compressor Control and Optimization	0.000	0.013	80.1	1,785,714.000	47	per Project
ME	Ind Air Compressor VFD	0.000	0.002	10.1	121,235.035	47	per Project
ME	Ind Combined Heat and Power (CHP)	0.000	0.430	58.0	692,677.814	1	per Project
ME	Com Networked/Connected - High Impact Application	0.150	1,158.292	1,341.7	10,352,247.559	8,938	per 1000 sq ft
ME	Ind HE Aerators	0.000	0.005	29.8	356,326.478	47	per Project
ME	Com LLLC - High Impact Application	0.128	985.024	1,139.9	8,799,848.844	8,934	per 1000 sq ft
ME	Com Heat Pump WH	1.976	776.400	8,654.9	3,400,757.216	4,380	unit
ME	Com LED Replacement Lamp (Tube)	0.092	487.840	3,110.5	16,546,437.386	33,918	per 1000 sq ft
ME	Com LED Troffer/Surface/Suspended	0.146	706.270	3,255.3	15,765,367.289	22,322	per 1000 sq ft
ME	Ind Injection Molding	0.000	0.018	11.2	134,199.241	5	per Project
ME	Ind Process Optimization Controls	0.000	0.001	6.0	71,733.485	47	per Project

ME	Ind Pump Sizing and Optimization	0.000	0.001	5.6	67,191.701	47	per Project
ME	Ind Pump VFD	0.000	0.005	114.8	1,371,222.763	170	per Project
ME	Ind Refrigeration System Optimization	0.000	0.001	3.5	41,396.749	47	per Project
ME	Com LED Low/High Bay	0.132	588.470	1,320.4	5,881,226.299	9,994	per 1000 sq ft
ME	Com LED Parking Garage and Canopy	0.017	148.700	247.8	2,170,957.269	14,600	per 1000 sq ft
ME	Com Interior Occupancy Sensor	0.057	366.725	596.9	3,809,956.717	10,389	per 1000 sq ft
ME	Com Horticulture Interior LED Grow Lighting	0.083	547.500	357.0	2,362,222.786	4,315	per 1000 sq ft
ME	Com LED Other Linear Fixture	0.014	64.206	196.9	923,402.828	14,382	per 1000 sq ft
ME	Com Daylight Dimming Control	0.057	427.846	79.9	594,860.200	1,390	per 1000 sq ft
ME	Com Parking garage exhaust fan (office)	0.211	925.000	250.6	1,098,496.505	1,188	1000 ft2 of floor space
ME	Com LED Pole/Arm Mounted	-	144.808	-	1,593,853.124	11,007	per 1000 sq ft
ME	Com Exterior Occupancy Sensor	-	163.440	-	1,590,288.568	9,730	per 1000 sq ft
ME	Com LED Outdoor Building Exterior	-	62.340	-	763,675.971	12,250	per 1000 sq ft
ME	Com HVAC with CO2-based control	0.089	82.685	142.9	133,141.859	1,610	Per 1000 sqft
ME	Com LED Track Lighting	0.019	89.220	295.3	1,360,674.496	15,251	per 1000 sq ft
ME	Com Smart Thermostat	0.230	465.790	262.9	532,370.316	1,143	per thermostat
ME	Com ENERGY STAR Commercial Refrigerator	0.045	395.673	3.3	29,105.497	74	per Refrigerator
ME	Com PTAC/PTHP with occupancy sensor	0.022	305.389	9.0	127,278.728	417	Per ton
ME	Com Commercial Griddles	0.145	758.000	139.6	727,938.914	960	Per linear foot
ME	Com Bi-Level Stairway Lighting	0.016	90.730	76.4	434,317.731	4,787	per 1000 sq ft
ME	Com ENERGY STAR Electric Convection Oven	0.442	1,661.165	12.3	46,293.017	28	per oven
ME	Com Advanced Lighting Design (Performance Lighting) - Tier 2	-	1,363.550	-	36,837.144	27	per 1000 sq ft
ME	Com Furnace with ECM Fan Motor	-	1.600	-	408.675	255	Per kBtu/h

ME	Com Ultra Low Freezer Upgrade	-	2,938.602	-	10,407.677	4	Per Freezer
ME	Ind HVAC System Controls	0.000	0.005	151.2	1,806,957.465	212	per Project
ME	Com LED Traffic Signals	0.104	911.540	8.9	77,489.095	85	per Fixture
ME	Com Energy Star Servers and Storage Devices	0.000	0.170	6.1	53,655.684	4	per Project
ME	Com Power Delivery (Primarily UPS but also PDS, transformers, etc.)	0.000	0.020	2.6	22,700.453	14	per Project
ME	Com Advanced Smart (Tier 2) Power Strip	0.022	118.470	8.1	43,499.345	367	per Power Strip
ME	Ind HVAC Chiller Upgrade	0.000	0.002	59.4	710,014.417	233	per Project
ME	Com Solid State (LED) Recessed Downlight	0.036	210.640	234.7	1,355,698.936	6,436	per 1000 sq ft
ME	Com Commercial Fryers	0.355	1,858.000	1.4	7,580.509	4	Per Fyer
ME	Com 4.4 CEF Heat Pump Multi-Family Laundrymat Dryer	0.212	1,845.660	2.0	17,842.566	10	per Dryer
ME	Ind HVAC Equipment Upgrade	0.000	0.002	41.6	497,080.307	189	per Project
ME	Com ENERGY STAR High Temperature Commercial Dishwasher, Conveyor	1.849	10,415.970	5.0	28,034.006	3	Per Dishwasher
ME	Ind Fan VFD	0.000	0.001	8.1	96,703.137	47	per Project
ME	Com Low Flow Pre-Rinse Spray Valves	0.642	6,925.230	27.0	290,990.041	42	Unit
ME	Com IT Load Optimization (server refresh and virtualization)	0.000	0.039	1.7	14,284.433	4	per Project
ME	Com Commercial Faucet Aerator	0.132	468.490	49.7	175,955.392	376	Unit
ME	Com Common area clothes washer (Lodging, university)	0.044	186.333	0.6	2,746.763	15	Clothes Washer
ME	Com Refrigerated Vending Machine with control system	0.155	1,355.056	1.5	13,087.343	10	Vending Machine
ME	Com Refrigerator Case Light Sensor	-	29.133	-	21,368.492	733	per 1000 sq ft
ME	Com Commercial Steam Cookers	8.250	43,014.500	4.8	24,906.010	1	per cooker
ME	Com Add Door to Open Display Case	0.026	1,016.833	0.0	1,669.349	2	Per foot
ME	Com Floating Head- Air Cooled	0.137	2,167.600	0.3	5,269.399	2	Per Ton
ME	Com ES 3.0 Beverage Vending Machine	-	110.540	-	5,598.109	51	per Vending Machine

ME	Com Cooling Tower Fan with VFD	0.038	1,257.180	0.0	1,628.756	1	per HP
ME	Com ENERGY STAR Office All-in-one Printer	0.007	46.930	1.5	10,677.763	228	per printer
ME	Com LED Refrigerator Case	0.004	36.420	9.1	80,131.843	2,200	per 1000 sq ft
ME	Com Electronically Commutated Motor on Walk-In	0.166	1,450.680	0.3	2,902.972	2	Motor
ME	Com Anti sweat heat control	0.025	171.810	0.1	560.700	3	Per foot
ME	Com Refrigeration – Cooler Night Covers LT	-	57.816	-	250.582	4	Per foot
ME	Ind HVAC VFD Upgrade	0.000	0.000	0.0	409.782	47	per Project
ME	Com Electronically Commutated Motor on Display Case	0.050	438.520	0.3	2,473.003	6	Motor
ME	Com Zero-Energy Doors and Frames MT	0.022	188.900	0.1	749.032	4	Per foot

II. Federal Poverty Level Definition

AEP Ohio wants to utilize its Supplemental Low-Income tract of the High Efficiency for Low-Income (HELP) program to ensure all customers have the financial means to participate, AEP Ohio will review and utilize the Federal Poverty level definition. This review can help the company provide the best possible incentive levels to those that need it most. These values are updated annually and will also help inform the income levels for the HELP program.

What Is the Federal Poverty Level?

The Federal Poverty Level (FPL), or the "poverty line" is an economic measure that is used to decide whether the income level of an individual or family qualifies them for certain federal benefits and programs. The FPL is the set minimum amount of income that a family needs for food, clothing, transportation, shelter, and other necessities.

Understanding the Federal Poverty Level (FPL)

Each year, the [US Census Bureau](#) issues a public report on the level of poverty in the country. The report provides an estimate of the number of people that are poor; the percentage of people living below the poverty level; the poverty distribution by age, sex, ethnicity, location, etc.; and the level of income inequality. The [Department of Health and Human Services](#) (HHS) uses this report to set a poverty guideline on who should be eligible for certain federal programs. The Federal Poverty Level (FPL) is typically issued annually in January by the HHS which uses household income and size to determine the poverty level. The information on the annual report shows the total cost needed by the average person per year to cover basic necessities like food, utilities, and accommodation. This number is adjusted annually for [inflation](#). To calculate percentage of poverty level, divide income by the poverty guideline and multiply by 100. A family of five in New Jersey with annual income of \$80,000 has a poverty level that is $(\$80,000/\$28,780) \times 100 = 278\%$ of the federal poverty guidelines, and will likely not qualify for Utility Assistance or Medicaid, but may be eligible for an [advanced premium tax credit](#) subsidy.

Figure 3. 48 Contiguous States and D.C. – 2022 Poverty Guidelines

Persons in Household	48 Contiguous States and D.C. Poverty Guidelines (Annual)						
	100%	138%	150%	200%	250%	300%	400%
1	\$13,590	\$18,754	\$20,385	\$27,180	\$33,975	\$40,770	\$54,360
2	\$18,310	\$25,268	\$27,465	\$36,620	\$45,775	\$54,930	\$73,240
3	\$23,030	\$31,781	\$34,545	\$46,060	\$57,575	\$69,090	\$92,120
4	\$27,750	\$38,295	\$41,625	\$55,500	\$69,375	\$83,250	\$111,000
5	\$32,470	\$44,809	\$48,705	\$64,940	\$81,175	\$97,410	\$129,880
6	\$37,190	\$51,322	\$55,785	\$74,380	\$92,975	\$111,570	\$148,760

III. AEP Ohio C&I Non-Energy Benefits Study

Non-energy impacts (NEIs) include positive (Non-Energy Benefits) or negative effects attributable to energy efficiency (EE) programs separate from energy savings. *“Participant benefits (or NEIs) are monetary and non-monetary benefits (positive or negative) that directly benefit a program partner, stakeholder, trade ally, participant, or the participant’s household.”*¹ AEP Ohio engaged DNV GL (Now DNV) to estimate NEIs resulting from their commercial and industrial (C&I) programs. DNV GL conducted the study presented in this report to document and monetize the following types of NEIs that are experienced by program participants and attributable to AEP Ohio’s EE programs:

- Operations and maintenance (O&M) cost savings
- Revenue / sales increases
- Increased worker and equipment productivity
- Increased safety
- Reduced downtime
- Decreased compliance costs
- Reduction in product loss

DNV GL provided the following recommendation based on the study results:

- DNV GL recommends inclusion of NEIs in regulatory cost-effectiveness testing for EE programs.
- DNV GL recommends using O&M cost savings derived from the life-cycle cost analysis for the lighting, motors, VSD, custom, and “other” (agriculture and compressed air) measure categories. DNV GL recommends that AEP Ohio use the accompanying NEI Excel spreadsheet for more granular O&M cost savings by industry and measure type.
- DNV GL recommends using industry specific estimates of NEIs resulting from productivity or sales increases for HVAC, VSD, compressed air, and lighting measures.
- DNV GL recommends that AEP Ohio use the industry specific key findings and quotes to develop marketing materials for customers that address customer pain points specific to firms in their industry.

The report details DNV GL’s study of the NEIs resulting from AEP Ohio’s EE C&I programs.

- Our analysis shows that O&M cost savings for lighting measures varies by the type and quantity of lamps installed and being replaced as well as the height above the ground or floor in which lamps are placed and whether labor rates are union or non/union workers.
- EE HVAC, lighting, and VSD/compressed air measure can reduce downtime, which is a key pain point across industries. For example, HVAC improvements in hospitals can result in increased use of surgical rooms, recovery rooms, nurseries, and laboratories other spaces for which the temperature, humidity, air pressure and ventilation are tightly governed by CDC and local regulations. Expanding the hours of operation of these spaces can increase revenue for hospitals. In office settings, improved lighting is shown to increase staff performance by increasing focus and alertness leading to fewer breaks, and greater attention on tasks.

¹ Non-Energy Impacts Approaches and Values: an Examination of the Northeast, Mid-Atlantic, and Beyond. NEEP. June 2017.
<http://www.neep.org/sites/default/files/resources/NEI%20Final%20Report%20for%20NH%206.2.17.pdf>

- Evidence that natural light improves learning, mood, and attention dates back over 100 years. More recent studies have proven that increasing daylight and luminescence contributes to worker performance, resulting in fewer breaks and increased cognitive function.² Further, controlling lighting color to represent the Circadian Rhythms decreases the release of melatonin, the brain's natural chemical to induce restfulness in the afternoon and evening.³ Unlike LEDs, convectional fluorescent tubes cannot control the color index to provide greater blue (morning) light. This can result in workers having melatonin released during times in which they are expected to be more productive at work, resulting in fatigue, increase in errors, and decreased productivity. Increase luminescence can also minimize safety hazards that would otherwise result from poor lighting.
- Recent studies have shown that LED lighting can mimic natural morning light, resulting in increased attention, performance, and mood.^{4 5} In contrast, fluorescent lighting can suppress melatonin release toward the end of the worker's shift, which can result in sleep disorders such as insomnia, a common problem for second- and third-shift workers. For example, improved lighting in hospitals is shown to increase surgical and nursing staff performance by enhancing mood and alertness, particularly during night shifts.
- Improved HVAC systems better regulate the temperature of retail areas, resulting in increased comfort for customers and reducing humidity and temperature fluctuations that can result in product loss. In fact, increased comfort can have interactive effects with other NEIs. For example, increased comfort in retail settings results in customers staying in the store longer, which likely translates into increased revenue.
- VFD/VSDs result in less wear on pumps and other equipment by allowing variation in motor operation. This can increase the overall operation of the system, decrease equipment failures, and reduce downtime. Integrating control systems into a process can provide for better predictive maintenance of equipment, reduces equipment/system failure, product/material loss, and downtime. For chemical and petrochemical manufacturers, system failure is a major concern as it often results in loss of material inputs, extensive downtime, and lost revenue. Use of control systems that can aid in predictive maintenance can provide substantial gains to profitability.⁶
- Downtime is a major concern for manufacturers. *"Power quality problems cost U.S. manufacturers up to \$188 billion a year—\$9.6 billion in the plastics industry alone—with 80 percent of those problems created by manufacturers' own internal power systems. Bad power is wrecking motors, transformers, electronics and other components way before their times. It's causing lost production and product quality issues, and it's unnecessarily driving energy bills up higher and higher."*⁷ VFDs can help reduce downtime by reducing wear and tear on other equipment. Integrating control systems into a process can provide for better predictive maintenance of equipment, and reduces equipment/system failure, product/material loss, and downtime. For chemical and petrochemical

² *Natural Light and Productivity: Analyzing the Impacts of Daylighting on Students' and Workers' Health and Alertness Int'l Journal of Advances in Chemical Engg., & Biological Sciences (IJACEBS) Vol. 3, Issue 1 (2016) ISSN 2349-1507 EISSN 2349-1515 N. Shishegar, M. Boubekri*

³ Riemersma-van der Lek, Rixt F. MD, Dick F. Swaab, MD, PhD, Jos Twisk, PhD, Elly M. Hol, PhD, Witte J. G. Hoogendijk, MD, PhD, Eus J. W. Van Someren, PhD. Effect of Bright Light and Melatonin on Cognitive and Noncognitive Function in Elderly Residents of Group Care Facilities: A Randomized Controlled Trial." *American Medical Association. JAMA*, June 11, 2008—Vol 299, No. 22.

⁴ Eo, Ik-soo and Keum-yeon Choi. "Study of learning by Changing the Color-Temperature LED Lamp." *Honam University, Gwang-Ju City, Korea. International Journal of Multimedia and Ubiquitous Engineering. Vol. 9, No 3 (2014). Pp. 309-316.*

⁵ *Natural Light and Productivity: Analyzing the Impacts of Daylighting on Students' and Workers' Health and Alertness Int'l Journal of Advances in Chemical Engg., & Biological Sciences (IJACEBS) Vol. 3, Issue 1 (2016) ISSN 2349-1507 EISSN 2349-1515 N. Shishegar, M. Boubekri*

⁶ *"Plastics Manufacturing Systems Engineering: A System Approach. Kazmer, David O. Hansfer Publisher, Munich. Cincinnati, Oh. June. 2006.*

⁷ <https://www.ptonline.com/articles/Bad-Power-is-the-Root-of-Many-Plastics-Production-Problems>

manufacturers, system failure is a major concern, as it often results in loss of material inputs, extensive downtime, and lost revenue. Control systems that aid in predictive maintenance can provide substantial gains to profitability.

Program or Portfolio Cost-Effectiveness Testing

Accounting for NEIs in the evaluation of EE programs allows for more optimal program evaluation and planning, as NEIs, along with program costs and energy savings, account for the full range of impacts that EE programs have on the population. An increasing number of states allow investor-owned utilities and EE program administrators to include NEIs as potential benefits that are included in the BCA of portfolios. For example, in 2008, Massachusetts passed the Green Communities Act, which directed all gas and electric program administrators to seek out and implement all cost-effective EE measures that are less expensive than supply. The Massachusetts program administrators, per direction from the Department of Public Utilities, use the TRC test to determine cost-effectiveness.⁸

Benefits vs. Costs

DNV GL classified respondent-reported impacts into benefits and costs based on whether the impact would be regarded as increasing or decreasing the profitability (or net revenue for public entities) of the organization and asked whether end-users' measures resulted in those impacts.

Figure 4. Percent of measures resulting in NEI by non-energy benefits by type of benefit

Benefit category	Measures resulting in benefit	Percent
Comfort Increased	41	52%
Safety Increased	34	43%
Productivity Increased	22	28%
Other Revenue Increased	3	4%
Sales Increased	2	3%
Other Increase	2	3%
Downtime Decreased	19	24%
Labor Costs Decreased	10	13%
Other Decrease	10	13%
Material Costs Decreased	5	6%
License Costs Decreased	2	3%
Waste Disposal Costs Decreased	0	0%

Reported possible non-energy costs, which include *decreases* in sales/revenue, productivity, comfort, and safety, as well as *increases* in costs, downtime, and waste disposal. Just 2 out of 79 measures were reported to result in non-energy costs. Due to the rarity of non-energy costs cited by end-users, the results section focuses on non-energy benefits.

⁸ Final Report – Commercial and Industrial Non-Energy Impacts Study.” Prepared for the Massachusetts Program Administrators by DNV KEMA and TetraTech. June 29, 2012

Figure 5. Respondents reporting NEI non-energy cost by type cost

Non-energy cost category	Measures resulting in cost	Percent
Materials Costs Increase	1	1%
Labor Costs Increase	1	1%
Downtime Increase	0	0%
Waste Disposal Increase	0	0%
Sales Decrease	0	0%
Other Revenue Decrease	0	0%
Productivity Decrease	0	0%
Comfort Decrease	0	0%
Safety Decrease	0	0%

NEIs that result from O&M cost savings by industry, as determined by the life-cycle cost analysis. In the far-right column in Figure 6, the table shows the average payback period, which indicates the number of years required to pay off the initial measure cost given the program incentive, annual energy savings, and O&M cost savings. The payback value does not consider other NEIs such as productivity gains, reduced downtime, or increased sales; only O&M cost savings.

The table shows that all industries receive positive NEIs from their installed measures. The average annual O&M cost savings (Average NEI \$/yr column) range from just over \$170 per year for Utilities to over \$2,200 per year for Warehousing. Select industry-specific NEIs resulting from O&M cost savings are presented for Manufacturing, Retail, Grocery, Hospitals, and Offices in the sections that follow. For these industries, O&M cost savings vary considerably by measure type and industry; therefore, average results do not represent the actual impacts that individual firms should expect.

Figure 6. NEI's from O&M savings

Sector	Industry	NEI \$/kWh savings	Average of kwh savings	Incentives	Average of Energy cost savings	NEI \$/yr	Average of Measure Cost	Average of Payback Years
Commercial	Construction	\$0.0202	52,229	\$4,354	\$6,268	\$665	\$ 14,542	1.90
	Hospitality	\$0.0152	13,945	\$890	\$1,673	\$187	\$ 11,017	1.74
	Hospitals	\$0.0205	31,323	\$1,821	\$3,759	\$548	\$ 10,826	1.61
	Other Service	\$0.0225	8,985	\$673	\$1,078	\$204	\$ 7,833	1.45
	Professional Services	\$0.0202	18,809	\$2,012	\$2,257	\$299	\$ 10,901	2.47
	Public Assembly	\$0.0188	25,745	\$1,877	\$3,089	\$443	\$ 10,652	1.89
	Retail	\$0.0175	14,701	\$1,148	\$1,764	\$213	\$ 9,330	2.35
	Transportation	\$0.0112	36,975	\$3,688	\$4,437	\$271	\$ 20,229	2.10
	Utilities	\$0.0194	9,208	\$597	\$1,105	\$172	\$ 7,790	1.79
	Warehousing	\$0.0209	128,026	\$17,524	\$15,363	\$2,233	\$ 44,270	1.65
	Wholesale Trade	\$0.0205	25,451	\$2,017	\$3,054	\$433	\$ 9,670	1.86
Commercial Total		\$0.0188	19,345	\$1,549	\$2,321	\$297	\$ 10,097	2.07
Manufacturing and Industrial	Agriculture and Forestry	\$0.0217	49,797	\$3,415	\$5,976	\$1,129	\$ 6,507	0.81
	Discrete	\$0.0156	101,324	\$7,211	\$12,118	\$918	\$ 31,409	1.67
	Process	\$0.0173	79,528	\$4,465	\$9,543	\$1,023	\$ 22,396	1.47
Manufacturing and Industrial Total		\$0.0168	86,690	\$5,457	\$10,390	\$987	\$ 25,249	1.54
Public	Education	\$0.0202	22,745	\$2,004	\$2,729	\$338	\$ 11,705	2.61
	Government	\$0.0210	37,311	\$1,938	\$4,477	\$304	\$ 10,122	3.16
Public Total		\$0.0204	27,322	\$1,983	\$3,279	\$327	\$ 11,208	2.82
Grand Total		\$0.0183	29,565	\$2,331	\$3,547	\$381	\$ 12,211	1.95

Participant economic benefits resulting from EE programs are good for Ohio as they reverberate through the overall economy. Increased C&I profitability can result in an increase in jobs for Ohio residents or put money back on the pockets of companies and individuals. The money saved can be reinvested in the local economy in greater wages or capital investments. Health benefits translate into lower state healthcare costs, and increased security and safety will decrease the strain on state and local law enforcement budgets. Finally, increased sales, output, and property values provide additional tax revenue for the state.

IV. CAP Non-Energy Benefits

There are substantial Non-Energy Impacts associated to the Community Assistance Program such as:

1. Reduced Charge offs
2. Increased Safety
3. Increased Indoor Air Quality
4. Increased Comfort and Health
5. Reduced bill collections through USF
6. Economic Development and Job Creation
7. Other Fuel Benefits
8. Water and Other Resource Benefits

For this plan, we have only quantified the reduction in Charge offs and the reduction in collections needed for the Universal Service Fund. If more research becomes available that has quantified other Non-Energy impacts, AEP Ohio will look at potential ways to incorporate into Benefit / Cost tests.

For the reduction in amount collected, we monetized the energy savings from the previous program year filings for the participant benefits used for the Participant test (PCT). See below for the outputs:

Figure 7. Annual spend and benefits for Community Assistance Program

Year	Program Costs	Nominal Bill Reduction	PV Bill Reductions (3%)	Docket ⁹
2010	\$ 292,341	\$ 1,133,819	\$ 1,009,548	11-1299-EL-EEC
2011	\$ 12,457,533	\$ 13,143,898	\$ 11,376,777	12-1537-EL-EEC
2012	\$ 6,836,262	\$ 14,140,045	\$ 11,295,801	13-1182-EL-EEC
2013	\$ 12,739,555	\$ 28,337,770	\$ 22,527,870	14-0853-EL-EEC
2014	\$ 11,709,065	\$ 28,255,099	\$ 22,222,938	15-0919-EL-EEC
2015	\$ 6,651,548	\$ 14,723,345	\$ 11,553,249	16-1099-EL-EEC
2016	\$ 9,213,291	\$ 18,506,547	\$ 14,266,232	17-1229-EL-EEC
2017	\$ 6,280,112	\$ 12,052,628	\$ 8,970,201	18-0835-EL-EEC
2018	\$ 5,755,596	\$ 7,481,105	\$ 5,666,183	19-1099-EL-EEC
Total	\$ 71,935,303	\$ 137,774,256	\$ 108,888,799	

Using the societal discount rate, this provides a present value benefit of \$108,888,799 dollars that we do not need to collect from all residential customers. To calculate the reduction in charge offs, we looked at the rate participants in the CAP program are subject to charges off versus the non-participants. This value provides a benefit of \$396,406 dollars.

⁹ The values shown are used in the Participant Cost Test for bill reductions.

Figure 8. Charge off Comparison

Variable	Value
(A) 2019 PIPP Annualized Charge off %	10.15%
(B) 2019 CAP Participant Charge off %	5.63%
(C) Cost of a PIPP Charge off	\$182.57
(D) Total Participants Estimated Through CAP	48,009
Total Value = (A - B) * C * D	\$396,406.11

Using these values we take the benefits divided by the costs $(108,888,799 + 396,406) / 71,935,303 = 1.519$. Another way of looking at this value is, for every \$1 spent in Community Assistance, there is \$1.52 dollars that does not need collected from all residential customers. This multiplier is then then applied to the program spend to derive the quantified Non-Energy Benefits for the Community Assistance Program.

V. Avoided Costs

For the purposes of cost tests, Avoided Costs refers to the costs of the electricity resources that are avoided by the Energy Efficiency resources. AEP Ohio has defined these values in Exhibit BFB-1, and their use in the cost effectiveness tests. These forecasted generation costs come from the AEP Fundamentals team. The values used are most recent available titled “2021H1_LT-FF_15CO2_Nominal.” Please see below for the total quantified values table.

Figure 9. Avoided Cost values

Avoided Costs	The calculations are first year + NPV (remaining years)						
Discount Rate		A	B	C	D	E	F
7.80%	Year	On-Peak	Off-Peak	Total KW (D + E + F)	Avoided Capacity	Avoided D	Avoided T
		\$/Annual kWh	\$/Annual kWh	\$/KW	\$/KW	\$/KW	\$/KW
	2024	\$0.02945	\$0.02162	\$60.92	\$17.33	\$7.60	\$36.00
	2025	\$0.02902	\$0.02133	\$132.98	\$89.39	\$7.60	\$36.00
	2026	\$0.02908	\$0.02134	\$146.54	\$102.95	\$7.60	\$36.00
	2027	\$0.02990	\$0.02198	\$148.08	\$104.48	\$7.60	\$36.00
	2028	\$0.03114	\$0.02291	\$149.86	\$106.26	\$7.60	\$36.00
	2029	\$0.03224	\$0.02371	\$150.94	\$107.35	\$7.60	\$36.00
	2030	\$0.04563	\$0.04320	\$148.84	\$105.24	\$7.60	\$36.00
	2031	\$0.04775	\$0.04523	\$150.77	\$107.17	\$7.60	\$36.00
	2032	\$0.04847	\$0.04579	\$158.12	\$114.52	\$7.60	\$36.00
	2033	\$0.05024	\$0.04737	\$163.93	\$120.33	\$7.60	\$36.00
	2034	\$0.05190	\$0.04899	\$166.27	\$122.67	\$7.60	\$36.00
	2035	\$0.05629	\$0.05242	\$168.65	\$125.05	\$7.60	\$36.00
	2036	\$0.05802	\$0.05396	\$164.71	\$121.12	\$7.60	\$36.00
	2037	\$0.06036	\$0.05589	\$170.34	\$126.74	\$7.60	\$36.00
	2038	\$0.06211	\$0.05743	\$175.26	\$131.66	\$7.60	\$36.00
	2039	\$0.06460	\$0.05972	\$178.06	\$134.46	\$7.60	\$36.00
	2040	\$0.06182	\$0.05732	\$180.82	\$137.22	\$7.60	\$36.00
	2041	\$0.06223	\$0.05762	\$183.28	\$139.68	\$7.60	\$36.00
	2042	\$0.06387	\$0.05929	\$185.76	\$142.16	\$7.60	\$36.00
	2043	\$0.06483	\$0.05999	\$188.24	\$144.64	\$7.60	\$36.00
	2044	\$0.06708	\$0.06197	\$190.73	\$147.13	\$7.60	\$36.00
	2045	\$0.07098	\$0.06529	\$193.19	\$149.59	\$7.60	\$36.00
	2046	\$0.07348	\$0.06752	\$195.64	\$152.04	\$7.60	\$36.00
	2047	\$0.07529	\$0.06935	\$198.10	\$154.50	\$7.60	\$36.00
	2048	\$0.07906	\$0.07232	\$200.54	\$156.95	\$7.60	\$36.00
	2049	\$0.08112	\$0.07378	\$203.03	\$159.43	\$7.60	\$36.00
	2050	\$0.08453	\$0.07587	\$205.55	\$161.95	\$7.60	\$36.00
	2051	\$0.08752	\$0.07798	\$208.12	\$164.52	\$7.60	\$36.00
	2052	\$0.08962	\$0.07978	\$210.73	\$167.13	\$7.60	\$36.00

In accordance with Rule 4901-1-05, Ohio Administrative Code, the PUCO's e-filing system will electronically serve notice of the filing of this document upon the following parties. In addition, I hereby certify that a service copy of the foregoing Ohio Power Company's Direct Testimony of Brian F. Billing was sent by, or on behalf of, the undersigned counsel to the following parties of record this 6th day of January 2023, via electronic transmission.

/s/ Steven T. Nourse

Steven T. Nourse

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Case No(s). 23-0023-EL-SSO, 23-0024-EL-AAM

Summary: Testimony DIRECT TESTIMONY OF BRIAN BILLING ON BEHALF OF
OHIO POWER COMPANY electronically filed by Mr. Steven T. Nourse on behalf of
Ohio Power Company