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May 15, 2020

Tanowa Troupe
Docketing Division Chief
Public Utilities Commission of Ohio
180 East Broad Street
Columbus Ohio 43215-3793

*Re: In the Matter of the Annual Portfolio Status Report Under
Rule 4901:1-39-05(C), Ohio Administrative Code, by Ohio
Power Company, Case No. 20-1042-EL-EEC.*

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Dear Ms. Troupe:

Ohio Power Company (AEP Ohio) submits the enclosed 2019 Portfolio Status Report, pursuant to Rule 4901:1-39-05(C), Ohio Administrative Code (OAC).

In Case Nos. 11-5568-EL-POR, et al., the Commission approved the Stipulation and Recommendation on March 21, 2012, and granted the requested waiver of Rule 4901:1-39-05(C), OAC, such that AEP Ohio may file its annual portfolio status report by May 15 instead of March 15 during each year of the EE/PDR Action Plan in order to provide sufficient time for adequate evaluation, measurement and verification of plan results.

Thank you for your attention to this matter.

Respectfully Submitted,

/s/ Steven T. Nourse

2019 Portfolio Status Report of the Energy Efficiency and Peak Demand Response Programs

Volume I: Main Report, Affidavit of Jon Williams, and Appendices A
through S

Ohio Power Company
Gahanna, Ohio
May 15, 2020

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INTRODUCTION

In Docket No. 08-888-EL-UNC, the Public Utilities Commission of Ohio (“the Commission”) approved Rules for Energy Efficiency and Peak Demand Reduction Programs of electric utilities (“the Green Rules”). These Green Rules first became effective December 10, 2009. In accordance with Amended Substitute Senate Bill 221 (S.B. 221), the Rules require that each electric utility in the Commission’s jurisdiction implement energy efficiency and peak demand reduction programs and file an annual Portfolio Status Report, originally due March 15 of each year but extended to May 15 in the January 18, 2017 order in Docket No. 16-0574-EL-POR for AEP Ohio.

In 2012, the General Assembly enacted Senate Bill 315 (S.B. 315) which, among other items, classified combined heat and power projects as energy efficiency projects. In 2014, the General Assembly then enacted Senate Bill 310 (S.B. 310) which froze energy efficiency targets at the 2014 levels for two years. After the freeze expired, the targets have resumed and AEP Ohio is operating under an approved 2017-2020 four-year plan.

Per Ohio Administrative Code (OAC) 4901:1-39-05(C), these Status Reports are required to address all approved energy efficiency and peak demand reduction (EE/PDR) programs’ performance over the prior calendar year. The Ohio Power Company (“the Company” or “AEP Ohio”) filed a Program Portfolio Plan for 2017-2020 under Docket No. 16-0574-EL-POR, which the Commission approved January 18th, 2017.

AEP Ohio submits this 2019 Portfolio Status Report in compliance with the above-cited Rules. In accordance with OAC 4901:1-39-05(C)(2)(b), AEP Ohio has contracted with Guidehouse Consulting, Inc. (“Guidehouse”), formerly Navigant, to review the Company’s programs; perform the impact and process evaluations; and provide evaluation, measurement, and verification reports.

This report is divided into three major sections: The first section covers how the Company has met all the requirements in the Green Rules in 2019 and achieved its S.B. 310 benchmark requirements. The second section reviews each of AEP Ohio’s EE/PDR programs and how they have performed this past year. The third and final section contains Ohio Power Company’s recommendations going forward for each of the programs.

Attached with this report are 19 appendices: Appendix A lists individual units incented and measures installed, at a detailed level, under each of Ohio Power Company’s EE/PDR programs. Appendices B through P contain the Evaluation Reports of each program from Guidehouse. Appendix Q covers transmission and distribution projects related to EE/PDR. Appendix R contains the comprehensive process evaluation for the C&I sector. Finally, Appendix S contains the joint utility standardized reporting template that contains performance information at a program level.

DEMONSTRATION OF COMPLIANCE

BENCHMARK UPDATES

AEP Ohio filed its Initial Benchmark Report on February 8, 2010¹ and has made regular updates in its intervening Portfolio Status Reports for both energy usage and peak demand. The Company has adjusted both its gross energy sales and peak demand to include the impacts of mercantile² customers' energy efficiency resource commitments and economic development. These adjusted figures are shown in Figures 1 and 2 below.

The annual benchmark target is calculated as the average of the prior three years' adjusted load, multiplied by the yearly statutory benchmark requirements from S.B. 310. The amounts for 2019 are 1.0 percent incremental energy reduction and 8.5 percent cumulative demand reduction.

For purposes of this compliance filing, the 2019 benchmark adjustments include the following: Economic growth exclusions, the associated opt outs legislated under S.B. 310³, and the load generated by the Combined Heat and Power projects that existed during the period used to establish the baseline⁴. Figure 1 shows the calculation of the adjusted 2019 benchmark for energy usage savings: 379.5 gigawatt-hours (GWh). Figure 2 shows the calculation for the adjusted 2019 benchmark for peak demand savings: 671.5 megawatts (MW).

FIGURE 1: ADJUSTED ENERGY USAGE BASELINES

Year	Actual Retail Sales	Econ. Devel. Adj.*	S.B. 310 Opt Out*	Combined Heat and Power*	2013-18 Merc. Savings	2019 Merc. Savings	Adjusted Retail Sales
2016	43,393.4	0.0	-5,263.4	95.7	23.3	1.5	38,250.5
2017	42,715.2	0.0	-6,008.5	95.7	25.7	2.1	36,830.2
2018	44,568.6	0.0	-5,950.4	136.3	25.7	4.0	38,784.3
Three-Year Average:							37,955.0
Benchmark Rate:							1.00%
2019 Benchmark Target:							379.5

All figures are in GWh - Docket 20-501-EL-FOR.

*This baseline differs from the AEPs baseline filed in 20-0738-EL-ACP to reflect the above adjustments.

¹ *In the Matter of the Initial Benchmark Report of Columbus Southern Power Company and Ohio Power Company*, Case No. 10-153-EL-EEC, February 8, 2010.

² "Mercantile customer" means a commercial or industrial customer if the electricity consumed is for nonresidential use and the customer consumes more than seven hundred thousand kilowatt hours per year or is part of a national account involving multiple facilities in one or more states. See Ohio Revised Code § 4928.01(A)(19).

³ <http://codes.ohio.gov/orc/4928.6611v1>

⁴ <http://codes.ohio.gov/orc/4928.66v1> - See Ohio Revised Code §4928.66(A)(2)(c)

FIGURE 2: ADJUSTED PEAK DEMAND BASELINES

Year	Coincident Peak Demand	Econ. Devel. Adj.*	S.B. 310 Opt Out*	Combined Heat and Power*	2013-18 Merc. Savings	2019 Merc. Savings	Adjusted Peak Demand
2016	8,685.0	0.0	-635.9	9.2	3.4	0.2	8,061.9
2017	8,349.0	0.0	-687.9	9.2	3.8	0.3	7,674.3
2018	8,599.0	0.0	-652.2	13.8	3.8	0.7	7,965.2
Three-Year Average:							7,900.4
Benchmark Rate:							8.50%
2019 Benchmark Target:							671.5

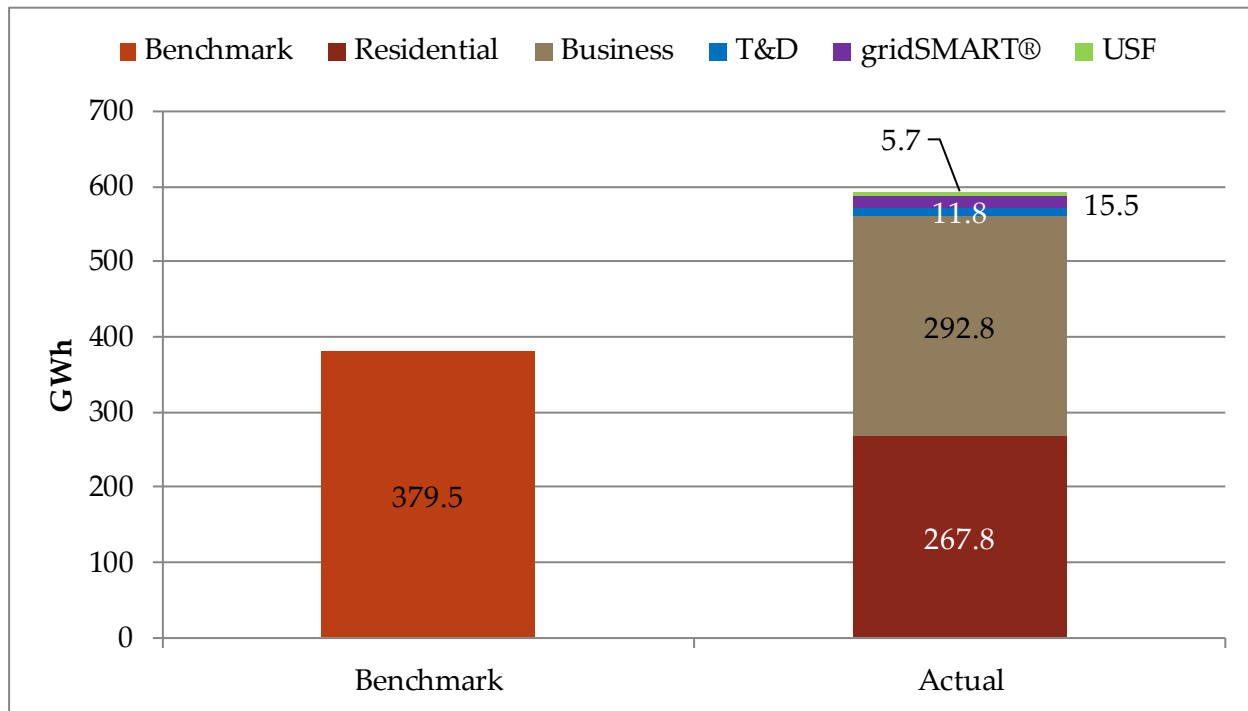
All figures are in MW - Docket 20-501-EL-FOR.

ACHIEVED SAVINGS

The Company has met all its EE/PDR benchmarks for both energy and demand savings for 2019, with all of Ohio Power's EE/PDR programs saving a combined 560.6 GWh of energy.

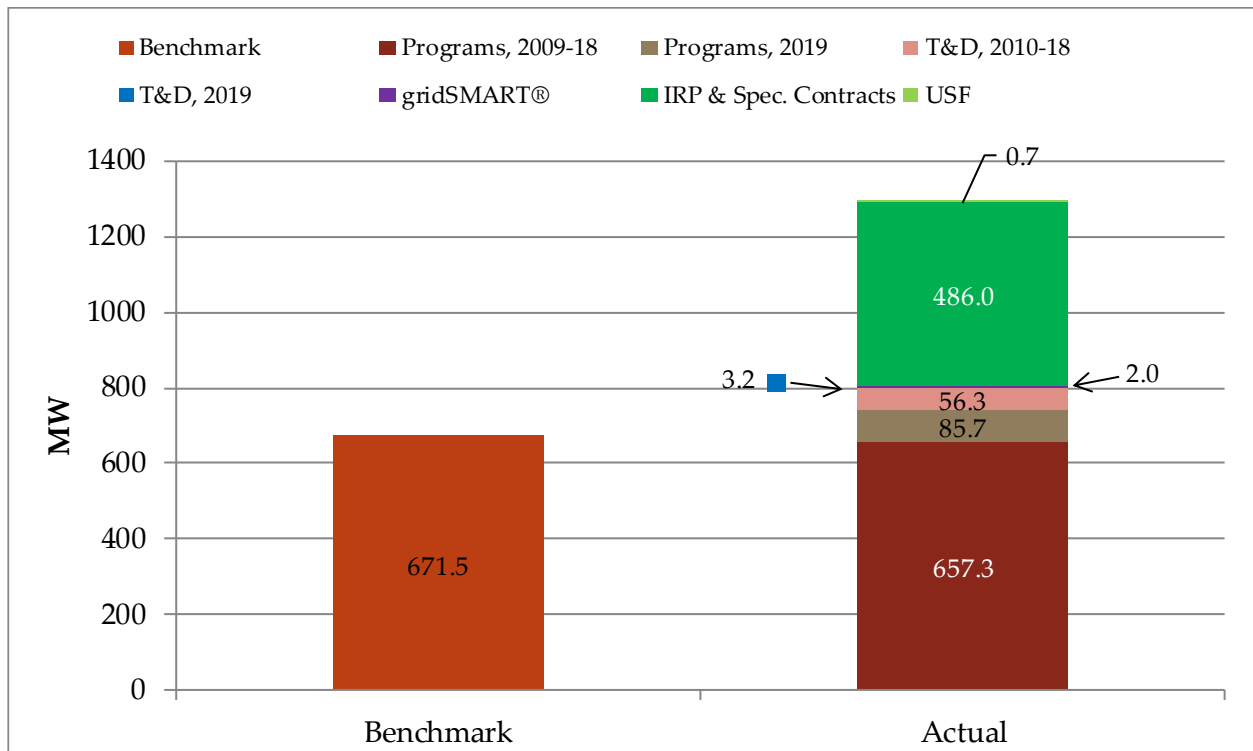
AEP Ohio is also permitted to add savings resulting from transmission and distribution (T&D) projects that reduce losses (see pages 35-36). In 2019, the Company saved 11.8 GWh of energy from T&D projects. AEP Ohio is also allowed to claim savings from the Universal Service Fund established by section 4928.51 of the Revised Code that benefits low-income customers, these savings are 5.7 GWh. Additionally, 2019 savings from Home Energy Reports for gridSMART® Phase I/II customers totaled 15.5 GWh. Together this yielded a grand total of 593.7 GWh, well above the benchmark target. Figure 3 illustrates the breakout of these savings between residential programs, business programs, T&D improvements, the Universal Service Fund, and gridSMART®. The majority of energy savings in 2019 came from business programs (49.3 percent). Residential programs, T&D projects, gridSMART®, and Universal Service Fund accounted for 45.1 percent, 2.0 percent, 2.6 percent, and 1.0 percent of the total, respectively.

FIGURE 3: ACHIEVED ANNUAL ENERGY SAVINGS, BY SEGMENT, 2019



The Company's portfolio yielded 85.7 MW in permanent peak demand reductions in 2019, shown in Figure 4. The cumulative permanent peak demand reduction impact of programs from 2009 through 2018 was 657.3 MW. Combined with other sources of demand reduction, including past year T&D projects (56.3 MW), current year T&D projects (3.2 MW), special contracts and interruptible tariffs (486 MW), the Universal Service Fund (0.7 MW), and gridSMART® Phase I/II (2.0 MW) AEP Ohio reduced peak demand by 1,291.2 MW in total.

FIGURE 4: ACHIEVED PEAK DEMAND SAVINGS, BY SOURCE, 2019



COST EFFECTIVENESS

The Company's portfolio of EE/PDR programs has been cost-effective. There are four common tests to determine cost effectiveness, differing in which costs and benefits are included and for whom:

- **Participant Test (PCT):** Participation is cost effective from this perspective if the reduced electric costs to the participating customer from the measure exceed the after-incentive cost of the measure to the customer.
- **Utility Cost Test (UCT):** Programs are cost effective from this perspective if the costs avoided by the program's energy and demand savings are greater than the utility's EE/PDR program costs to promote the program, including customer incentives.
- **Ratepayer Impact Measure (RIM) Test:** Programs are cost effective from this perspective if their avoided costs are greater than the sum of the EE/PDR program costs and the "lost revenues" caused by the program.
- **Total Resource Cost (TRC) Test:** Programs are cost effective from this perspective if their avoided costs are greater than the sum of the measures cost and the EE/PDR program administrative costs.

Figure 5 shows benefit-cost ratios for each of the cost effectiveness tests listed above. These ratios are based on *ex ante* savings. A ratio higher than one indicates that net benefits are greater

than net costs, and the portfolio is beneficial by the test's standards. Also included is the TRC levelized cost of energy.

FIGURE 5: PORTFOLIO EX ANTE BENEFIT-COST RATIOS AND TRC LEVELIZED COST, 2019

Test	Ratio or Cost
Total Resource Cost	1.5
Participant Cost	4.7
Ratepayer Impact	0.5
Utility Cost	3.9
TRC Levelized Cost per kWh (¢)	3.2

Total resource cost ratios and levelized energy costs for each individual program are shown in Figure 6. Again, a ratio greater than one indicates that the program's benefits exceed its costs. Note that the ratios presented in this table are based on *ex ante* savings and may differ from the *ex post* figures contained in Appendices B through P.

FIGURE 6: TOTAL RESOURCE COST RATIOS AND LEVELIZED COSTS, 2019

Program	Benefit- Cost Ratio	Levelized Cost per kWh (¢)
Efficient Products	2.7	1.9
Appliance Recycling	1.8	2.4
<i>e³ smart</i> SM	1.4	3.6
Community Assistance	0.2	23.4
EfficiencyCrafted SM New Homes	1.0	7.7
Manu. New Homes	0.4	15.9
Home Energy Reports	2.6	1.5
It's Your Power	0.1	115.1
Efficient Products for Bus.	1.1	4.5
Process Efficiency	1.3	3.8
Self Direct	0.7	6.2
Business New Construction	1.3	3.7
Express	1.0	5.3
Data Center	1.4	3.8
Continuous Energy Improvement	1.4	2.5
Combined Heat and Power	1.4	3.9

BANKING OF ENERGY EFFICIENCY ACHIEVEMENTS

In accordance with Senate Bill 310 Section 4928.662(G)⁵, AEP Ohio presents its banking methodology. The Company reserves the right to bank all achievements exceeding the benchmark. At a minimum for 2019, Ohio Power is banking all achievement in excess of 115 percent of benchmark, shown in Figure 7.

FIGURE 7: BANKING OF ENERGY EFFICIENCY ACHIEVEMENTS

Year	GWh
2009	141.9
2010	103.3
2011	148.7
2012	252.6
2013	186.5
2014	182.2
2015	72.7
2016	152.2
2017	125.7
2018	125.9
2019	157.2
Total	1,648.9

SUMMARY

In 2019, Ohio Power Company met its benchmark targets for both energy usage and peak demand. The Company's EE/PDR portfolio as a whole was cost-effective.

⁵ <http://codes.ohio.gov/orc/4928.662>

PROGRAM ACTIVITY DESCRIPTIONS

This section of the report discusses program activity from January 1 through December 31, 2019. AEP Ohio operated sixteen programs this year, not counting T&D improvements:

Residential Programs:

- Efficient Products
- Appliance Recycling
- *e³smart*SM
- Intelligent Home & DR
- Community Assistance
- EfficiencyCraftedSM New Homes
- New Energy Efficient Manufactured Homes
- Home Energy Reports

Business Programs:

- Efficient Products for Business
- Process Efficiency
- Self Direct
- Business New Construction
- Express
- Continuous Energy Improvement
- Data Center
- Combined Heat & Power

Figure 8 summarizes each program's direct and allocated department costs to AEP Ohio; the number of participants or units sold; and ex ante energy and demand savings. Descriptions of each program follow Figure 8. Not all figures seen below may sum due to rounding.

FIGURE 8: SUMMARY OF DIRECT PROGRAM COSTS AND BENEFITS, 2019

Program	Customer Incentives	Third Party Costs	Utility Admin. Costs*	Total Costs	Number of Participants / Units	Coincident Peak MW Saved	Annual GWh Saved
Efficient Products	\$7,954.0	\$3,511.3	\$1,502.3	\$12,967.6	4,693,394	24.0	134.6
Appliance Recycling	1,425.3	1,165.0	338.9	2,929.2	18,230	4.0	24.7
<i>e³ smart</i> SM	551.5	318.3	108.5	978.3	25,313	0.4	3.0
Intelligent Home & DR	629.3	512.1	595.9	1,737.3	45,281	1.4	1.5
Community Assistance	4,249.7	678.2	561.7	5,489.6	4,150	0.4	2.7
Residential New Homes	1,161.7	987.7	265.3	2,414.8	1,866	2.9	6.5
Manu. New Homes	58.1	212.3	60.8	331.2	51	0.1	0.3
Home Energy Reports	0.0	1,234.1	177.1	1,411.2	524,337	12.3	94.5
Efficient Products for Bus.	7,893.5	3,409.5	2,224.0	13,527.1	3,091	23.2	117.1
Process Efficiency	1,602.6	852.7	544.2	2,999.5	66	2.3	39.6
Self Direct	176.4	127.3	96.2	399.9	42	0.7	4.0
Bus. New Construction	2,123.0	991.1	713.5	3,827.6	173	5.0	35.3
Express	3,002.8	0.0	699.4	3,702.2	655	2.5	12.3
Retro-Commissioning	0.0	0.0	0.0	0.0	0	0.0	0.0
Data Center	1,249.9	659.3	359.9	2,269.1	18	3.1	26.4
Demand Response	0.0	0.0	0.0	0.0	0	0.0	0.0
CEI	415.5	1,342.5	419.0	2,177.0	115	-0.8	20.5
Combined Heat & Power	731.4	0.0	65.1	796.5	1	4.2	37.6
Total	\$33,224.9	\$16,001.3	\$8,731.9	\$57,958.1	5,316,783	85.7	560.6

Education and Media	3,028.8
Pilot Programs, Research & Development	1,564.0
Grand Total	\$62,550.9

*Programs' utility administrative costs include allocated departmental, evaluation, and capital carrying charge costs. All cost figures are in thousands of dollars. Columns may not sum due to rounding.

RESIDENTIAL PROGRAMS

EFFICIENT PRODUCTS

This program provides incentives and marketing support through retailers to encourage purchases of ENERGY STAR®-approved lighting and appliances. The Efficient Products program contains multiple savings paths: The first is customer rebates at the point of sale. Over 200 participating retailers in the Company's service territory are equipped to offer instant rebates on certain ENERGY STAR®-approved lighting devices. Other retailers without the capability to offer electronic markdowns may also offer retailer-reimbursed rebates on these same approved lighting products. These products include various Light Emitting Diode (LED)

bulbs. In addition, the program offers customers the opportunity to mail-in rebate applications for refrigerators, smart thermostats, pool pumps, clothes washers, dehumidifiers, HVAC replacements, and heat pump water heaters. These applications are available from the retailer, on the AEP Ohio website, or the AEP Ohio Marketplace. These rebates and incentives range from approximately one dollar each for 6-watt LEDs to \$400 for heat pump water heaters.

As available technologies and ENERGY STAR® standards continue to evolve over time, AEP Ohio maintains and regularly updates the list of qualifying devices.

In addition, AEP Ohio offers marketing support to retailers. These services include in-store signage to promote efficient devices and training for sales associates to help them understand the benefits of energy-efficient lights and appliances.

In the 2017-2020 plan approved stipulation, AEP Ohio has combined the In Home program with the Efficient Products program. AEP Ohio offers the *Online Energy Checkups*, a free online tool available on AEP Ohio's website that customers may use to quickly identify their home energy costs, receive recommendations on how to save energy, and learn how to qualify for a kit of free energy-saving items. AEP Ohio provided 27,346 kits to Energy Checkup participants in 2019. This is a noticeable increase from prior years, likely due to the Energy Checkup being utilized as an option for communities to meet their Energy Saver's goals. Another option that is cost shared with Columbia Gas is the *In-Home Energy Assessments* for customers with dual fuel. This offering includes an in-home visit, visual inspection, prioritized suggestions for efficiency improvements, and installation of several energy-saving devices such as LEDs, programmable thermostats, or low-flow showerheads, at a subsidized price. In 2019, 813 customers had In-Home Assessments.

Additionally, program implementers work with property managers in multi-family housing complexes to schedule home assessments and installations with residents, as well as to identify potential savings in common areas. All individually metered residential multi-family housing in AEP Ohio's service territory is eligible to participate. This part of the program receives some marketing assistance from property manager associations around the state. In 2019, 41 properties had assessments, with a total of 4,344 units having measures installed.

Figure 9 below shows the number of products for which AEP Ohio provided incentives or distributed at no cost in 2019. Please see Appendix A for a detailed measure listing.

FIGURE 9: EFFICIENT PRODUCTS INCENTED OR PROVIDED, 2019

Product	Number	kWh	kW
Lighting	3,486,556	129,117,491	22,923.3
Appliances	7,053	1,449,989	248.7
HVAC	465	518,337	94.1
Hot Water	13,931	1,187,306	151.1
Smart Strips	350	21,595	1.9
Thermostats	4,811	1,302,165	290.2
Pool Pumps	194	226,980	335.6
Air Sealing	1,174,877	763,972	3.2
Audits	5,157	0	0.0
Total	4,693,394	134,587,836	24,048.2

Energy and demand savings were calculated using the Draft Ohio Technical Resource Manual (TRM)⁸ when calculations were presented. The Draft Ohio TRM does not provide energy savings for smart thermostats. The calculations for smart thermostats are taken from the Illinois TRM, page 152⁹.

The Company's Action Plan goals for 2019 were 65.6 GWh of savings in energy consumption and 7.3 MW of savings from peak demand. Figure 10 below shows the Efficient Products program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 10: EFFICIENT PRODUCTS PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	134.6	65.6	205.2%
Demand Savings (MW)	24.0	7.3	329.4%
Program Costs (\$M)	13.0	13.5	96.1%
First Year Cost per kWh Saved (¢)	9.6	20.6	46.8%

The Efficient Products program exceeded its goals for both energy and demand savings in 2019. The program saved 134.6 GWh of energy, 105.2 percent more than what was planned. The program also reduced peak demand by 24.0 MW, 229.4 percent more than planned. The

⁸ In the Matter of the Protocols for the Measurement and Verification of Energy Efficiency and Peak Demand Reduction Measures, Case No. 09-512-GE-UNC, August 6, 2010.

⁹ https://s3.amazonaws.com/ilsag/IL-TRM_Effective_010119_v7.0_Vol_3_Res_092818_Final.pdf

program came in below budget at \$13.0 million, yielding an average first year cost of 9.6 cents per kWh saved.

APPLIANCE RECYCLING

This program seeks to remove functioning but inefficient refrigerators and freezers from the power grid. Often, older appliances, especially refrigerators, remain in use as second or “backup” appliances—still plugged in and using an inordinate amount of energy. By removing these high-usage appliances from the grid, the Company reduces unnecessary load and usage. This program’s primary focus is on these second refrigerators, but recycling for stand-alone freezers is also available. In return for recycling appliances, AEP Ohio paid the customer an incentive of \$50 in 2019. For all of 2019, appliance replacement for the Community Assistance Program has been included into the Appliance Recycling Program. With this economy of scale, AEP Ohio was able to procure a low cost source with all products from a large Ohio manufacturer. This scale also gave AEP the ability to extend the warranty provided for the measures to three years.

Customers enroll in the program either through the Company’s website or over the phone, and schedule an at-home pickup. Figure 11 shows the number of appliances that were recycled through this program in 2019. Energy and demand savings were calculated using the Draft Ohio TRM. Please see Appendix A for a detailed measure listing.

FIGURE 11: APPLIANCES RECYCLED, 2019

Appliances	Number	kWh	kW
Freezers	2,985	3,715,778	597.2
Refrigerators	15,245	20,980,783	3,354.1
Total	18,230	24,696,561	3,951.3

The Company’s Action Plan goals for 2019 were 11.9 GWh of savings in energy consumption and 1.8 MW of savings from peak demand. Figure 12 shows the Appliance Recycling program’s energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 12: APPLIANCE RECYCLING PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	24.7	11.9	207.5%
Demand Savings (MW)	4.0	1.8	219.5%
Program Costs (\$M)	2.9	3.3	88.8%
First Year Cost per kWh Saved (¢)	11.9	27.7	42.8%

The Appliance Recycling program exceeded its goals for energy and demand savings for 2019. The program saved 24.7 GWh of energy, 107.5 percent above target. The program also reduced peak demand by 4.0 MW, 119.5 percent above goal. The program spent less than budgeted at \$2.9 million, yielding an average first year cost of 11.9 cents per kWh saved.

e³smartSM

AEP Ohio offers an educational program covering energy efficiency for students in grades 4 through 12, which are in schools throughout the Company's service territory. It includes a curriculum designed to meet state and national science standards for these grades, teacher training, and supplies for classroom instruction. Students served by the program will learn about different forms of energy, their sources, and how electric power reaches their homes. Students are then given a box of energy-efficient devices—Light Emitting Diode (LED) bulbs, LED night lights, low-flow showerheads, faucet aerators, and weather-stripping—to install at home with their parents' or guardians' supervision. Kits also include tools students can use to measure energy use and efficiency losses.

In the 2018-2019 school year, there were 25,313 kits distributed to students in *e³smartSM* (Of these, 20,385 students returned surveys). Figure 13 shows how many of which items were included in their kits. Please see Appendix A for a detailed measure listing.

FIGURE 13: ITEMS INCLUDED IN *e³smartSM* KITS, 2019

Item	Number	kWh	kW
Faucet Aerators	5,653	430,573	53.7
Hot Water Temp. Setback	621	50,674	5.6
Lighting	38,366	1,151,673	181.2
Low-Flow Showerheads	3,468	971,942	124.3
Weather-Stripping	7,340	81,474	5.8
Allocated Kits*	4,928	324,706	44.8
Total	60,376	3,011,041	415.5

*These are kits for participants who had not returned surveys; AEP Ohio reduced the installation rates of these cases.

Energy and demand savings were calculated using the Draft Ohio TRM when calculations were available. The Draft Ohio TRM does not include calculations for LED nightlights or weather-stripping.

The calculation for LED nightlights is taken from the 2012 Portfolio Status Report, Navigant Program Evaluation (“2012 Navigant Evaluation”).¹⁰

The formula for weather-stripping is shown below, where ΔE is energy savings in kWh; x_1 is maximum energy savings potential from weatherization measures; y_1 is average annual energy usage in all-electric residences; y_2 is average annual energy usage in non-all-electric residences; e is the percentage of homes that are all-electric; L_{shell} is the fraction of air leaks through windows, doors, ceilings, walls, and floors; L_{HT} is the fraction of total heat transfer due to air leaks; Q is total inches of weather-stripping applied; L_{wid} is the average width of the leakage area in inches; and L_{area} is the average leakage area per house in inches.

$$\Delta E = x_1 \times \left((y_1 \times e) + (y_2 \times (1 - e)) \right) \times L_{\text{shell}} \times L_{\text{HT}} \times \frac{Q \times L_{\text{wid}}}{L_{\text{area}}}$$

AEP Ohio’s Action Plan goals for 2019 were 6.9 GWh of savings in energy consumption and 0.5 MW of savings from peak demand. Figure 14 below shows the *e³smartSM* program’s energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 14: *e³smartSM* PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	3.0	6.9	43.6%
Demand Savings (MW)	0.4	0.5	83.1%
Program Costs (\$M)	1.0	1.2	81.5%
First Year Cost per kWh Saved (¢)	32.5	17.4	186.8%

The *e³smartSM* program did not meet either its energy or demand goals for 2019. The program saved 3.0 GWh of energy, 56.4 percent below goal. The program also reduced peak demand by 0.4 MW, 16.9 percent below goal. The program came in slightly under budget at \$0.9 million, yielding an average first year cost of 32.5 cents per kWh saved.

INTELLIGENT HOME & DR

AEP Ohio launched its Intelligent Home and DR program titled “It’s Your Power” in 2019. This program offers a mobile smartphone app that customers may download for information to illustrate electricity consumption patterns, how their decisions and actions influence their usage, how that usage affects their energy bill, and actions they may take to manage and reduce their usage. Specifically targeting AMI customers, this app features includes a weather overlay,

¹⁰ *In the Matter of the Annual Portfolio Status Report Under Rule 4901:1-39-05(C), Ohio Administrative Code, by Ohio Power Company*, Case No. 13-1182-EL-EEC, May 15, 2013, Appendix E, page 22.

estimated billing based on usage, energy project and tip tracking. In addition, AEP Ohio offers a smart hub (Energy Bridge) that can communicate with the AMI meter and with the app to give customers near real-time, highly granular usage information, and through which customers may control various smart devices.

Coupled with the AEP Ohio “It’s Your Power” app this offers customers control of electric space cooling and heating load using a thermostat with two-way communication capabilities. Load control is achieved through temperature set point adjustments on individual thermostats for both cooling and heating loads and/or through cycling of compressors. The app will enable customers to change heating and cooling settings remotely. AEP Ohio had program to date adoption of 63,721 AMI customers download the mobile app. From this participant segment, 19,623 customers have bound an energy bridge. In 2019, AEP Ohio removed the randomized control group as it was negatively impacting customer satisfaction. AEP Ohio implemented the savings values from the 2018 evaluation to assign per unit savings for Energy Bridges and Connected Thermostats.

FIGURE 15: MEASURES INSTALLED THROUGH THE INTELLIGENT HOME PROGRAM, 2019

Item	Number	kWh	kW
Energy Bridge	19,623	870,848	136.2
AMI Mobile App	63,721	0.0	0.0
Connected Thermostat	4,774	638,979	1,285.4
Total	88,118	1,509,827	1,421.6

With a paired energy bridge, a customer is then eligible for a communicating thermostat, this allows for additional control and functionality for the It’s Your Power program. This engagement resulted in 4,774 customers who installed a communicating thermostat.

FIGURE 16: INTELLIGENT HOME PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	1.5	36.1	4.2%
Demand Savings (MW)	1.4	75.0	1.9%
Program Costs (\$M)	1.7	3.4	51.1%
First Year Cost per kWh Saved (¢)	115.1	9.4	1221.8%

The It’s Your Power program did not meet its energy or demand savings goals, in 2019. The program saved 1.5 GWh of energy and reduced peak demand by 1.4 MW. The program came in under budget at \$1.7 million, yielding an average first year cost of 115.1 cents per kWh saved. Unlike other residential programs, this program only has a one-year measure life.

COMMUNITY ASSISTANCE

This program offers energy efficiency services to those AEP Ohio customers with limited income to assist them in reducing their electric energy use and making their utility bills more manageable. Residential customers with incomes up to 200 percent of the federal poverty level are eligible to participate.¹¹ The program offers services such as home assessments, efficient lighting, appliance replacement, HVAC replacement, water heating upgrades, health and safety repairs, and weatherization; at no cost to the customer. For the entirety of 2019, the appliance replacement portion of the CAP program is running through one single implementer. With this economy of scale, AEP is able to provide: Lower pricing, better quality product sourced from an Ohio manufacturer, and a 3 year warranty. The appliance recycling implementer does the recycling portion; this gives certainty that the appliance was recycled in an environmentally friendly manner.

In 2019, there were 4,150 accounts serviced in the Community Assistance program. Figure 17 below shows which measures were installed. Please see Appendix A for a detailed measure listing.

FIGURE 17: MEASURES INSTALLED THROUGH COMMUNITY ASSISTANCE PROGRAM, 2019

Item	Number	kWh	kW
Fridges & Freezers	2,996	302,865	54.1
Audits	3,845	0	0.0
Appliance Metering	2,393	0	0.0
HVAC	160	16,911	2.8
Hot Water	1,827	131,951	15.3
Lighting	49,681	1,790,595	308.7
Other	17	443	0.1
Smart Strips	3,120	255,348	0.0
Air Sealing & Insulation	100,898	173,406	2.1
Total	164,937	2,671,520	383.2

Energy and demand savings were calculated using the Draft Ohio TRM when calculations were available. The savings for replaced fridges and freezers is the assumed savings for the new Energy Star unit when compared to a baseline model.

Ohio Power's Action Plan goals for 2019 were 8.5 GWh of savings in energy consumption and 0.8 MW of savings from peak demand. Figure 18 below shows the Community Assistance

¹¹ In 2019, this came to roughly \$51,500 per year for a family of four. See U.S. Department of Health and Human Services, "2019 Poverty Guidelines," <https://aspe.hhs.gov/2019-poverty-guidelines>.

program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 18: COMMUNITY ASSISTANCE PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	2.7	8.5	31.4%
Demand Savings (MW)	0.4	0.8	47.9%
Program Costs (\$M)	5.5	5.1	107.6%
First Year Cost per kWh Saved (¢)	205.5	60.0	342.5%

The Community Assistance program did not meet its energy or demand savings goals in 2019. The program saved 2.7 GWh of energy and reduced peak demand by 0.4 MW. The program came in over budget at \$5.5 million, yielding an average first year cost of 205.5 cents per kWh saved.

EFFICIENCYCRAFTEDSM NEW HOMES

EfficiencyCraftedSM New Homes (formerly known as ENERGY STAR® New Homes) seeks to effect the construction of single-family residences that meet specific ENERGY STAR® or EnergyPathSM standards. Such structures use at least 20 percent less energy than residences built to the minimum code requirements. AEP Ohio will pay various incentives to participating builders of single-family residences to help offset incremental construction costs. In addition, builders receive training, marketing (including site signage), consumer brochures, model home displays, advertising, and other consumer education tools. All new single-family and multifamily residential construction that meets these standards are eligible. In 2019, this program incented the construction of 1,812 efficient single-family homes and 54 multifamily homes. Energy and demand savings were calculated as the difference between a baseline residence constructed at the applicable code and the as-built *REM/Rate* model. *REM/Rate* is software that analyzes energy usage in residential buildings.

The Company's Action Plan goals for 2019 were 6.1 GWh of savings in energy consumption and 1.2 MW of savings from peak demand. Figure 19 below shows the program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 19: EFFICIENCYCRAFTEDSM NEW HOMES PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	6.5	6.1	105.8%
Demand Savings (MW)	2.9	1.2	240.0%
Program Costs (\$M)	2.4	2.8	86.2%
First Year Cost per kWh Saved (¢)	37.4	45.9	81.5%

The EfficiencyCraftedSM New Homes program exceeded both its energy and demand savings goals in 2019. The program saved 6.5 GWh of energy. The program also reduced peak demand by 2.9 MW, 140 percent over the annual goal. The program came in under budget at \$2.4 million, yielding an average first year cost of 37.4 cents per kWh saved.

NEW ENERGY EFFICIENT MANUFACTURED HOME

The New Energy Efficient Manufactured Home Program will improve the energy performance of manufactured homes. AEP Ohio initially offered incentives to manufacturers to outfit new manufactured homes at the plant with high efficiency equipment, appliances, lighting and electronics for homes to be sited in AEP Ohio service territory. AEP Ohio utilizes the retail channel of manufactured homes by giving an incentive for the more efficient manufactured homes. In addition, since the HVAC unit is installed after the manufactured home has been delivered, HVAC dealers/contractors were incentivized to supply the home with an efficient heat pump instead of an electric furnace.

This program incented the construction of 51 efficient manufactured homes in 2019. Energy and demand savings were calculated as the difference between a baseline residence constructed at the applicable code and the as-built *REM/Rate* model. *REM/Rate* is software that analyzes energy usage in residential buildings.

AEP Ohio's Action Plan goals for 2019 were 2.5 GWh of savings in energy consumption and 0.1 MW of savings from peak demand. Figure 20 below shows the New Energy Efficient Manufactured Home program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 20: NEW ENERGY EFFICIENT MANUFACTURED HOME, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	0.3	2.5	12.2%
Demand Savings (MW)	0.1	0.1	134.6%
Program Costs (\$M)	0.3	0.5	66.2%
First Year Cost per kWh Saved (¢)	108.8	20.0	544.2%

The New Energy Efficient Manufactured Home program did not meet energy savings goals, but exceeded the demand savings goals. The program saved 0.3 GWh of energy, 87.8 percent below target. The program also reduced peak demand by 0.1 MW, this amount was 34.6 percent above the goal. The program came in below budget at \$0.3 million, yielding an average first year cost of 108.8 cents per kWh saved.

HOME ENERGY REPORTS

This program targets high-usage and/or low-income customers in the Company's service territory to receive a comparison mailing of how occupied homes of similar size and heating source use electricity. This is designed to spur these selected customers to save energy and use electricity more efficiently. Customers who wish to opt out of receiving these reports may call a toll-free number to do so. In 2019 there were 524,337 customers receiving reports.

Savings calculations for this program begin with the vendor using a proprietary model. Each year, AEP Ohio analysts compare participation in other residential EE/PDR programs between these two groups to determine whether savings in these other programs are being double-counted. This year, a significant difference was found, indicating report recipients participated in certain programs at higher levels than the control group. Savings in both energy and demand were therefore adjusted downward by 153,253 kWh and 19.9 kW in the Efficient Products and It's Your Power programs. AEP Ohio found a decrease in participation in Appliance Recycling and Community Assistance programs. Subtracting negative double counted savings would inaccurately attribute decreased participation as savings, therefore AEP Ohio claims zero saving for these two programs. AEP Ohio will continue to run cross participation tests to validate and remove double counted savings.

AEP Ohio's Action Plan goals for 2019 were 75.0 GWh of savings in energy consumption and 3.8 MW of savings from peak demand. Figure 21 below shows the Home Energy Report program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 21: HOME ENERGY REPORTS PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	94.5	75.0	126.1%
Demand Savings (MW)	12.3	3.8	323.5%
Program Costs (\$M)	1.4	1.4	100.8%
First Year Cost per kWh Saved (¢)	1.5	1.9	80.0%

The Home Energy Report program exceeded both its energy and demand savings goals for 2019. The program saved 94.5 GWh of energy, 26.1 percent above goal. The program also reduced peak demand by 12.3 MW, 224 percent above goal. The program came in just over budget at \$1.4 million, yielding an average first year cost of 1.5 cents per kWh saved; however, unlike other residential programs, this program only has a one-year measure life.

BUSINESS PROGRAMS

EFFICIENT PRODUCTS FOR BUSINESS

This program offers fixed incentives for the installation and implementation of certain pre-approved types of energy efficient lighting; heating, ventilation, and air conditioning (HVAC) systems; variable frequency drives (VFDs); motors; controls; refrigeration equipment; and compressed air systems, among other commercial- and industrial-grade equipment. Incentive amounts offered to customers typically range between 10 and 50 percent of the incremental cost to purchase energy-efficient equipment. All non-residential customers in AEP Ohio's service territory are eligible to participate.

In 2019, there were 3,091 projects completed in the Efficient Products for Business program. Figure 22 shows which measures were installed through these projects. A single project may involve multiple measures. Please see Appendix A for a detailed measure listing.

FIGURE 22: MEASURES INSTALLED THROUGH THE EFFICIENT PRODUCTS FOR BUSINESS, 2019

Type	Number	kWh	kW
Agriculture	19,217	91,043	16.7
Compressed Air	4,046	2,804,868	378.1
Comm. Kitchen	9	39,856	4.9
HVAC	1,716,183	6,071,939	1,328.1
Controls	1,893,480	2,339,427	1,512.8
Advanced Lighting	743,093	2,200,095	601.0
Lighting	427,241	100,144,940	18,871.0
Other	13	2,197	0.0
Process/Motors	215	1,458,136	198.7
Refrigeration	4,871	1,991,581	310.7
Total	4,808,369	117,144,083	23,222.0

Energy and demand savings for prescriptive measures were calculated using the vendor-internal Technical Reference Manual that is consistent with the Draft Ohio 2010 Technical Reference Manual.

The Company's Action Plan goals for 2019 were 99.1 GWh of savings in energy consumption and 25.6 MW of savings from peak demand. Figure 23 shows the Efficient Products for Business program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 23: EFFICIENT PRODUCTS FOR BUSINESS PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	117.1	99.1	118.2%
Demand Savings (MW)	23.2	25.6	90.7%
Program Costs (\$M)	13.5	17.0	79.6%
First Year Cost per kWh Saved (¢)	11.5	17.2	67.3%

The Efficient Products for Business program met its energy goals, but did not meet its demand goals for 2019. The program saved 117.1 GWh of energy, 18.2 percent above goal. The program also reduced peak demand by 23.2 MW, 9.3 percent below goal. The program came in below budget at \$13.5 million, yielding an average first year cost of 11.5 cents per kWh saved.

PROCESS EFFICIENCY

This program is for cost-effective energy efficiency improvements in existing buildings that reduce energy consumption or peak demand and have more complicated measures that are not included in the Efficient Products for Business program. All non-residential customers in the Company's service territory are eligible to participate. Customers work closely with their Ohio Power account managers and other employees to determine measure eligibility and verify energy savings. Customers receive an incentive customized to the specific results of the energy savings technologies implemented. Program management will assist commercial and industrial customers with the analysis and selection of high-efficiency equipment or processes.

There were 56 Process Efficiency projects completed in 2019. Figure 24 summarizes the measures installed in these projects. A single project may involve multiple measures. Please see Appendix A for a detailed measure listing.

FIGURE 24: MEASURES INSTALLED THROUGH THE PROCESS EFFICIENCY PROGRAM, 2019

Type	Number	kWh	kW
Compressed Air	18	3,316,106	350.0
Comm. Kitchen	2	8,834	0.7
HVAC	16	3,391,494	358.7
Lighting	181,990	498,321	73.9
Process	18	23,910,163	687.2
Refrigeration	88	8,512,026	805.2
Total	182,131	39,636,945	2,275.8

Energy and demand savings in the Process Efficiency program were individually computed for each measure in each project using methodologies consistent with the Draft Ohio TRM.

The Company's Action Plan goals for 2019 were 38.1 GWh of savings in energy consumption and 6.1 MW of savings from peak demand. Figure 25 below shows the Process Efficiency program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 25: PROCESS EFFICIENCY PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	39.6	38.1	104.0%
Demand Savings (MW)	2.3	6.1	37.3%
Program Costs (\$M)	3.0	4.5	66.7%
First Year Cost per kWh Saved (¢)	7.6	11.8	64.1%

The Process Efficiency program exceeded its energy goal but missed its demand savings goal for 2019. The program saved 39.6 GWh of energy, 4.0 percent above goal. The program also reduced peak demand by 2.3 MW, 62.7 percent below goal. The program came in below budget in 2019 at \$3.0 million, yielding an average first year cost of 7.6 cents per kWh saved.

SELF DIRECT

This program is designed for large customers able to internally administer their own energy management initiatives. Participants design their own energy efficiency programs and submit an application documenting their energy savings. Customers may apply for inclusion in the Self Direct program up to three years after implementing their energy efficiency measures. All applications are subject to approval by both Ohio Power and the Commission. If approved, participants may either receive a one-time payment, up to 75 percent of an equivalent incentive under the Efficient Products for Business or Process Efficiency programs, or an equivalent EE/PDR rider exemption. (The accounts may not participate in any other EE/PDR programs while under such an exemption.)

Participation in this program is limited to mercantile customers. In 2019, Ohio Power submitted 42 Self Direct applications to the Commission. Figure 26 below shows which measures were installed under these projects. A single project may involve multiple measures. For a detailed measure listing, see Appendix A.

FIGURE 26: MEASURES INCENTED THROUGH SELF DIRECT PROGRAM, 2019

Type	Number	kWh	kW
Compressed Air	30	51,969	7.2
HVAC	49,765	654,483	73.6
Controls	1,970	2,071	0.8
Lighting	6,223	1,202,209	269.8
Misc. Motors & Process	4	862,198	232.7
Refrigeration	1,973	936,191	135.4
New Construction	1	307,968	27.8
Total	59,966	4,017,089	747.3

Energy and demand savings in the Self-Direct program are calculated using the same methods employed in the Efficient Products for Business and Process Efficiency programs.

AEP Ohio's Action Plan goals for 2019 were 13.4 GWh of savings in energy consumption and 1.9 MW of savings from peak demand. Figure 27 below shows the Self Direct program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 27: SELF DIRECT PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	4.0	13.4	30.0%
Demand Savings (MW)	0.7	1.9	39.3%
Program Costs (\$M)	0.4	0.8	50.0%
First Year Cost per kWh Saved (¢)	10.0	6.0	166.7%

The Self Direct program did not meet either its energy or demand savings goals in 2019. The program saved 4.0 GWh of energy, 70.0 percent below goal. The program also reduced peak demand by 0.7 MW, which is 60.7 percent below the target level. The program came in under budget at \$0.4 million, yielding an average first year cost of 10.0 cents per kWh saved.

BUSINESS NEW CONSTRUCTION

This program targets non-residential customers who are either building new facilities or making major renovations to existing sites, encouraging building owners, designers, and architects to exceed requirements in current construction practices and codes—specifically, measures that exceed the ASHRAE 90.1-2010 minimum requirements. Because of the lag time associated with new construction, any project certified before the ASHRAE 90.1 2010 code adoption is required to exceed the former ASHRAE 90.1 2007 requirements. The program includes incentives for the installation of high-efficiency lighting, HVAC systems, building envelopes, industrial refrigeration equipment, and other equipment and controls. The New Construction program offers four tracks: prescriptive and custom, similar to what is offered in those respective programs, a “whole building” approach based on building simulation modeling, and a “My Solutions” track that is based on a prescriptive model for smaller new construction customers. All non-residential customers building new facilities are eligible to participate.

There were 173 New Construction projects completed in 2019. Figure 28 below shows which measures were installed under these construction projects. A single project may involve multiple measures. A detailed measure list is available in Appendix A.

FIGURE 28: MEASURES INSTALLED THROUGH BUSINESS NEW CONSTRUCTION PROGRAM, 2019

Type	Number	kWh	kW
Compressed Air	2	182,649	21.0
Comm. Kitchen	25	25,990	2.6
HVAC	75,401	1,711,417	164.3
Controls	266,635	352,745	69.1
Lighting	3,771,563	16,823,293	2239.9
Other	58	665,134	75.4
Misc. VFD	16	6,947,394	1029.7
Whole Building Models	15	7,906,914	1281.6
Prescriptive Model	466,327	167,388	27.7
Refrigeration	100	453,428	44.1
Shell Insulation	36,783	55,983	2.6
Total	4,616,925	35,292,334	4,958.2

Energy and demand savings were calculated using the same methods as employed in the Efficient Products for Business and Process Efficiency programs, the ENERGY STAR® website, or with simulation calculations in projects using whole building models.

The Company's Action Plan goals for 2019 were 28.8 GWh of savings in energy consumption and 6.3 MW of savings from peak demand. Figure 29 below shows the New Construction program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 29: BUSINESS NEW CONSTRUCTION PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	35.3	28.8	122.5%
Demand Savings (MW)	5.0	6.3	78.7%
Program Costs (\$M)	3.8	5.5	69.6%
First Year Cost per kWh Saved (¢)	10.8	19.1	56.8%

The Business New Construction program exceeded its energy goal but did not meet its demand goal for 2019. The program saved 35.3 GWh of energy, 22.5 percent over goal. The program reduced peak demand by 5.0 MW, which equates to 21.3 percent below goal. The program was under budget this year at \$3.8 million, yielding an average first year cost of 10.8 cents per kWh saved.

EXPRESS

This program provides a streamlined, one-stop, turn-key energy efficiency service for small businesses. The program implementer first conducts a free on-site assessment to identify potential energy-saving opportunities. Based on recommendations from this assessment the implementer provides the participant with a proposal for installing energy efficiency measures. If the customer approves, the implementer then hires local contractors to perform the installation work. Once the work is completed, and after the customer has signed off on the work performed, the implementer bills the participant directly, after applying incentives from AEP Ohio. Incentive levels are generally higher in this program than in the Efficient Products for Business or Process Efficiency programs, up to 80 percent of project cost. This program is designed for small business customers with annual energy consumption levels no greater than 400 MWh or peak billing demands no higher than 100 kW.

Figure 30 below shows the number of measures installed through the Express program. Again, a single project may involve multiple measures. In total, there were 655 projects completed. See Appendix A for a complete listing of installed measures.

FIGURE 30: MEASURES INSTALLED THROUGH EXPRESS PROGRAM, 2019

Type	Number	kWh	kW
Delamping	13	10,561	0.8
LEDs	36,808	11,529,684	2,408.0
T5/T8	84	14,969	0.4
Exit Signs	524	84,517	16.1
Controls	431	32,301	0.0
Refrigeration	382	589,703	58.1
Total	38,242	12,261,735	2,483.4

Due to the granularity with respect to small business types, energy and demand savings are calculated using the New York TRM¹² and the Pennsylvania TRM¹³.

The Company's Action Plan goals for 2019 were 14.7 GWh of savings in energy consumption and 4.0 MW of savings from peak demand. Figure 31 below shows the Express program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

¹² New York State Department of Public Service, *New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs: Residential, Multi-Family, and Commercial/Industrial Programs*, version 2, December 10, 2014.

¹³ State of Pennsylvania, *Technical Reference Manual, Act 129 Energy Efficiency and Conservation Program & Act 213 Alternative Energy Portfolio Standards*, June 2016.

FIGURE 31: EXPRESS PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	12.3	14.7	83.4%
Demand Savings (MW)	2.5	4.0	62.1%
Program Costs (\$M)	3.7	4.1	90.3%
First Year Cost per kWh Saved (¢)	30.2	27.9	108.3%

The Express program did not meet either the energy or the demand savings goals for 2019. The program saved 12.3 GWh of energy, 16.6 percent below goal. The program also reduced peak demand by 2.5 MW, 37.9 percent below its goal. The program came in below budget at \$3.7 million, yielding an average first year cost of 30.2 cents per kWh saved.

CONTINUOUS ENERGY IMPROVEMENT

The Continuous Energy Improvement Program (CEI) is designed to target industrial customers and institutional facilities served by AEP Ohio. CEI focuses on low-cost or no-cost measures to reduce usage, primarily through system efficiency and process optimization. Participants join a targeted cohort of 10 to 20 companies, with care taken to avoid placing competitors in the same cohort, to protect participants' trade secrets. Each participant designates an internal team to act as *energy champions* and coordinate efforts within their companies to implement changes. Over a period of one year, energy champions attend workshops and work closely with program implementers to understand how their facilities' loads change and identify opportunities for reducing energy usage. Program implementers, using information on electric consumption, weather, and participants' internal metrics (such as production levels), develop a predictive model of energy usage for each participant. Subsequent usage levels below model predictions are counted as savings. First-year energy savings pay an incentive of 2 cents per kWh.

At the close of 2019, there were 46 participating customers with a combined 115 accounts in eight cohorts in the CEI program. Savings were estimated based on individual regression models for each participant and, in some cases, multiple premises.

The Company's Action Plan goals for 2019 were 23.1 GWh of savings in energy consumption and 0.5 MW of savings from peak demand. Figure 32 shows the CEI program's energy savings, demand savings, program costs, and average cost per first-year energy savings during calendar year 2019.

FIGURE 32: CONTINUOUS ENERGY IMPROVEMENT PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	20.5	23.1	88.5%
Demand Savings (MW)	-0.8	0.5	-167.6%
Program Costs (\$M)	2.2	1.9	114.6%
First Year Cost per kWh Saved (¢)	10.6	8.2	129.4%

The CEI program did not meet its energy or demand savings goal for 2019. The program saved 20.5 GWh of energy, 11.5 percent below the target level. The program had -0.8 MW in demand. This year, when AEP Ohio used the coincident hours for Ohio, the energy intensity analysis was shown to be negative for demand savings. Thus a negative value will be claimed for 2019. This can be due to various factors and should not be taken as indicative of future program performance. The program came in above its budget at \$2.2 million, yielding a first year cost of 10.6 cents per incremental kWh saved.

DATA CENTER

The Data Center program is a capital improvement program specially geared toward the unique needs of business IT operations and space. Such equipment can be highly energy-intensive, incorporate heavy HVAC loads, and have strict uptime requirements. Measures covered under this program may include ENERGY STAR® servers and telecommunications equipment; high-efficiency uninterruptible power supplies; high-efficiency power rectifiers; server virtualization; high-efficiency computer room air conditioner units; variable-speed drives on chilled water pumps; and airflow management and controls to optimize data center cooling. An additional track covers IT load growth when measured against an industry standard baseline.

Figure 33 below shows which measures were implemented through the Data Center program. A single project may involve multiple measures. In total, there were 18 projects completed. Please see Appendix A for a complete list of installed measures.

FIGURE 33: MEASURES INSTALLED THROUGH DATA CENTER PROGRAM, 2019

Type	Number	kWh	kW
HVAC	10	520,264	89.3
IT Equipment	1	1,430,851	161.9
Whole Building Model	12	24,475,006	2,890.7
Total	23	26,426,121	3,141.9

Energy and demand savings were modeled individually for each project by the program implementer.

The Company's Action Plan goals for 2019 were 14.3 GWh of savings in energy consumption and 1.3 MW of savings from peak demand. Figure 34 below shows the Data Center program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 34: DATA CENTER PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	26.4	14.3	184.8%
Demand Savings (MW)	3.1	1.3	241.7%
Program Costs (\$M)	2.3	3.5	64.8%
First Year Cost per kWh Saved (¢)	8.6	24.5	35.1%

The Data Center Program exceeded both its energy and demand savings goals for 2019. The program saved 26.4 GWh of energy, 84.8 percent above goal. The program also reduced peak demand by 3.1 MW, 141.7 percent above the goal. The program came in under budget at \$2.3 million, yielding an average first year cost of 8.6 cents per kWh saved.

COMBINED HEAT AND POWER

The Combined Heat and Power program is a cogeneration strategy that involves the generation of both electricity and useful heating (and/or cooling). CHP is a thermodynamically efficient method of generating electricity because it utilizes waste heat for local heating and/or cooling. The CHP Program is focused on incentivizing and enabling development of efficient CHP systems for large customers typically in the industrial, institutional, and healthcare sectors. All incentive payments are subject to AEP Ohio approval and are based on measured production kWh generated by the CHP/WER project. The minimum total CHP system efficiency is 60 percent with a minimum 20 percent useful thermal energy.

For 2019, there was one project completed for the Combined Heat and Power program. The Company's Action Plan goals for 2019 were 106.0 GWh of savings in energy consumption and 15.1 MW of savings from peak demand. Figure 35 below shows the Combined Heat and Power program's energy savings, demand savings, program costs, and average cost per first year energy savings during calendar year 2019.

FIGURE 35: COMBINED HEAT AND POWER PROGRAM SUMMARY, 2019

	Actual	Goal	Percent of Goal
Energy Savings (GWh)	37.6	106.0	35.5%
Demand Savings (MW)	4.2	15.1	27.7%
Program Costs (\$M)	0.8	2.4	33.2%
First Year Cost per kWh Saved (¢)	2.1	2.3	93.6%

The Combined Heat and Power program did not meet its energy and demand savings goals for 2019. The program saved 37.6 GWh of energy, 64.5 percent below goal. The program also reduced peak demand by 4.2 MW, 72.3 percent below the goal. The program came in under budget at \$0.8 million, yielding an average first year cost of 2.1 cents per kWh saved.

CUSTOMER OUTREACH CHANNELS

ENERGY EFFICIENCY AUCTION

The Energy Efficiency Auction is a unique reverse auction in which pre-qualified non-residential customers and solution providers can submit bids to deliver energy savings at a price per annual kilowatt-hour saved or watts reduced, either at a single site or spread out among multiple sites. The Energy Efficiency Auction is ideal for larger projects. Bidding processes are conducted online, with competing bids placed in real time and the winning bid being that with the lowest cost per kilowatt-hour. The participant or participants with the winning bid or bids are then eligible to receive incentive payments for their projects' completion at the winning price. Auctions are typically conducted in the fall of the year for projects to be submitted through the Efficient Products for Business or Process Efficiency program during the following calendar year.

Because the projects are submitted to the Efficient Products for Business or Process Efficiency program using auction incentive pricing, the energy and demand savings from these projects were evaluated in those programs. The auction simply serves as a pricing vehicle for these larger projects. The energy efficiency auction follows the standard Efficient Products for Business and Process Efficiency policies and procedures. Therefore, AEP Ohio is not submitting a separate evaluation report for this pricing alternative.

Figure 36 below shows which measures utilized the Energy Efficiency Auction. A single project may involve multiple measures. In total, there were 79 projects completed. These savings are captured in the Efficient Products for Business and Process Efficiency programs. This figure is for informative purposes only.

FIGURE 36: MEASURES INSTALLED THROUGH ENERGY EFFICIENCY AUCTION, 2019

Type	Number	kWh	kW
Compressed Air	513	2,845,182	308.1
HVAC	672,290	4,647,474	623.5
Lighting Controls	673,008	825,420	266.5
Lighting	42,324	18,216,567	3,474.4
Process	20	23,129,724	676.6
Refrigeration	246	8,490,644	797.4
Total	1,388,401	58,155,010	6,146.4

Energy and demand savings in the Energy Efficiency Auction are calculated using the same methods employed in the Efficient Products for Business and Process Efficiency programs.

AGRICULTURE

The main focus of the Agriculture Outreach is targeted outreach to the agricultural customers in AEP Ohio's service territory. The agricultural community is hard to reach, particularly residential farms, which may not be identified as such in AEP Ohio customer information. The agricultural market sector has not had strong historical participation with the EE/DR program, and will be approached through an outreach strategy that demonstrates understanding of the agricultural business and concerns.

Because the projects are submitted to the Efficient Products for Business, Process Efficiency, or New Construction program through the standardized application process, the energy and demand savings from these projects were evaluated in those programs. The Agriculture outreach follows the standard policies and procedures of the business programs, thus AEP Ohio is not submitting a separate evaluation report.

Figure 37 below shows which measures were utilized through the Agriculture outreach. A single project may involve multiple measures. In total, there were 25 projects completed. The savings for these measures are captured in the Efficient Products for Business, Process Efficiency, and Business New Construction programs. This figure is for informative purposes only.

FIGURE 37: MEASURES INSTALLED THROUGH AGRICULTURE OUTREACH, 2019

Type	Number	kWh	kW
Agriculture	19,217	91,043	16.7
HVAC	19,171	87,563	11.9
Lighting Controls	49,549	61,009	8.4
Lighting	57,120	620,652	132.0
VFD	3	56,376	8.2
Total	145,060	916,644	177.3

Energy and demand savings in the Agriculture outreach are calculated using the same methods employed in the Efficient Products for Business, Process Efficiency, and Business New Construction programs.

TRANSMISSION AND DISTRIBUTION PROJECTS

Inherent in the operation of any electric power system is the electrical resistance of its various elements, such as conductors, transformers, or regulators. The greater the distance the power must travel from generation to end use, the greater the amount of power lost in this transfer. The Ohio Revised Code allows a utility to include transmission and distribution infrastructure improvements to reduce line losses to meet benchmarks¹⁴, and T&D projects are a major part of Ohio Power's plan for compliance. These projects include reconductoring, substation improvements, capacitor bank installation, and voltage regulator replacement.

- **Reconductoring** projects involve the replacement of existing wires with improved wires designed for lower losses at transmission or distribution voltages, lowering the system's resistance and the power lost over transmission to the end-user.
- **Substation improvements** typically include connecting previously unconnected T&D lines and the addition or upgrade of transformers and circuits, balancing loads between circuits, changing lines to multi-phase current, or the construction of altogether new substations. Such projects improve efficiency and reduce load losses by adding new transformation points closer to customers' loads. A greater portion of energy is carried in higher-voltage transmission lines than lower-voltage distribution lines.
- **Capacitor banks** reduce losses by improving system power factors closer to 100 percent.
- **Voltage regulators** assist in maintaining delivery voltage within the Commission's guidelines.

AEP Ohio had 12 distribution projects and 23 transmission projects completed in 2019 related to energy efficiency and peak demand reduction. These improvements prevented the loss of 11.8

¹⁴ Ohio Revised Code § 4928.66(A)(2)(d).

GWh of energy and lowered peak demand by 3.2 MW. The report in Appendix Q contains a complete list of the Company's 2019 T&D projects and their estimated impacts.

RECOMMENDATIONS TO THE COMMISSION

RESIDENTIAL PROGRAMS

EFFICIENT PRODUCTS

In 2019, AEP Ohio rebated various LED light bulbs via retailers and the online marketplace with strong energy savings results and high customer satisfaction. AEP Ohio will continue aggressive promotional tactics centered on LED and specialty LED awareness and education. ENERGY STAR® certified appliances such as clothes washers, smart thermostats, VSD Pool Pumps, Electric Heat Pump Water Heaters, Air Source Heat Pumps, Mini-split Ductless Heat Pumps, and Geothermal Heat Pumps will also be rebated. In addition, the free home energy profile through our mobile application (home assessment) and direct install for multi-family units will continue. AEP Ohio recommends that the program continue as described in the Plan.

APPLIANCE RECYCLING

AEP Ohio gave \$50 incentives to the Appliance Recycling program participants. In addition, AEP Ohio negotiated a program with OPAE and Recleim called Community Assistance Appliance Recycling (CAAR). This program removes and recycles old inefficient refrigerators and customers receive an energy efficient refrigerator and/or freezer with an extended warranty. AEP Ohio recommends the program continue as described in the Plan.

e³smartSM

This program provides energy efficiency education to over 25,000 students annually and continues to receive high satisfaction from teachers and students with over 350 teachers involved. AEP Ohio receives numerous letters from students thanking us for the program and educating them on energy efficiency. AEP Ohio recommends the program continue as described in the Plan.

INTELLIGENT HOME & DR

The program marketed as It's Your Power offers real time energy measurement of AMI metered customers through an innovative mobile phone app and energy bridge in the customer's home. The app also disaggregates the various types of usage in the home and provides customers the opportunity to control usage through smart thermostats, switches, plugs and sensors for energy savings and convenience. In 2019, AEP Ohio called 11 demand response events with a weighted average of over 69% participation rate. AEP Ohio is exploring the feasibility of combining the behavioral program with Intelligent Home since both are behavioral based. AEP Ohio recommends the program continue as described in the Plan.

COMMUNITY ASSISTANCE

This program, like previous years, provides low income customers energy efficiency measures to reduce energy costs and provide more comfort. Any customers who are enrolled in the Percentage of Income Payment Plan (PIPP), Home Weatherization Assistance Plan (HWAP) or Home Energy Assistance Program (HEAP), or are at or below 200% of the Federal Poverty Level are eligible to participate in AEP Ohio's Community Assistance Program. AEP Ohio recommends continuing this program as described in the Plan, except for the modification with CAAR, which is mentioned above.

EFFICIENCYCRAFTEDSM NEW HOMES

The AEP Ohio EfficiencyCraftedSM Homes Program had another very successful year with more builders joining the program and more homes built under this program. AEP Ohio and Columbia Gas of Ohio no longer share the same vendor to manage the program; Builders continue to have high satisfaction with the program and AEP Ohio won another year of Energy Star Partner of the Year award. AEP Ohio recommends the program continue as described in the Plan.

NEW ENERGY EFFICIENT MANUFACTURED HOME

This program did not meet year-end energy targets. The program was redesigned in 2018 to address the HVAC dealer market to drive energy savings and incentivize them along with the home retailers. Targeted marketing to retailers started in 2019 to improve program performance. AEP Ohio recommends that the program continue, with the modifications detailed in the Residential section.

HOME ENERGY REPORTS

AEP Ohio provided home energy reports to over 500,000 customers. This program provides an opportunity to educate our customers on all of the residential energy efficiency programs they can participate in and change behavior to use energy wisely. AEP Ohio recommends the program continue as described in the Plan.

BUSINESS PROGRAMS

EFFICIENT PRODUCTS FOR BUSINESS

The Efficient Products for Business program began June 1, 2009, focused in the first year on prescriptive lighting only. In addition and according to the Plan, AEP Ohio expanded the list of prescriptive measures in 2010 under this program beyond lighting, to include HVAC, motors, drives and other cost effective measures to simplify and market this program effectively. Over

200 prescriptive measures are currently offered. After a successful pilot, “Advanced Lighting Controls” were added to the program. In the 2017-2020 approved Plan, the Prescriptive Program was renamed the Efficient Products for Business Program to better characterize the nature of the program to AEP Ohio customers. In 2019, a midstream component was added to the program to allow customers to purchase the measures at the point-of-sale and immediately receive the incentive. The midstream approach lowers administrative costs in the program. AEP Ohio recommends that the program continue as described in the Plan.

PROCESS EFFICIENCY

The Process Efficiency program is designed to be a “kitchen sink” program to handle customer energy efficiency projects not addressed through other business programs. Target segments may also be explored to engage more non-participants in AEP Ohio programs. Each targeted marketing effort will be monitored and listed as a subset of the Process Efficiency Program to track performance and participation. Since 2011, measures which show increased usage as technology develops, such as LED lighting, are moved to the Efficient Products for Business Program to remove barriers to participation. In the 2017-2020 approved Plan, the Custom Program was renamed to Process Efficiency to better characterize the nature of the program to AEP Ohio customers. AEP Ohio recommends that the program continue as described in the Plan.

DEMAND RESPONSE

The demand response program is used to supplement the peak demand reductions achieved from EE/PDR programs. AEP Ohio recommends that the program continue as described in the Plan.

SELF DIRECT

This program has achieved significant impacts and participation since 2009. The Self Direct program has also helped drive participation in other programs through its unique allowance of previously completed projects and the option of either the payment of an energy efficiency credit or an exemption from the EE/PDR Rider. AEP Ohio recommends that the program continue as described in the Plan.

BUSINESS NEW CONSTRUCTION

The Business New Construction program started in 2011 with strong participation. In 2013 through 2019, participation continued to increase as customer recognition of the program increased. New construction continues to increase as the economy stabilizes and energy savings from new construction is a good opportunity for long-lived savings. AEP Ohio recommends that the program continue as described in the Plan.

EXPRESS

The Express program changed in 2012 from a program marketed by local contractors, to a program with dedicated program marketing staff that would present signed contracts and materials to local contractors for installation. Results from 2019 continue to be positive as customer knowledge of the program increases. AEP Ohio recommends that the program continue as described in the Plan.

CONTINUOUS ENERGY IMPROVEMENT

The Continuous Energy Improvement program was a new program launched in early 2013. This program seeks to facilitate a comprehensive and enduring strategic approach to energy reduction at customer facilities. The program focuses on low/no cost operational savings opportunities while also delivering capital projects into other business programs. The program continues to illicit high customer acceptance and good customer satisfaction. Strong enlistment of large industrial customers led to expansion of the program to include hospitals, universities, commercial buildings and k-12 schools Savings for this group of participants remains strong as a number of customers have continued to participate in the program since their first year of participation. AEP Ohio recommends that the program continue as described in the Plan.

DATA CENTER

The Data Center program was a new program launched in early 2013. This program is designed to assist customers in addressing energy efficiency opportunities in both new and existing data centers (facilities used to house computer systems and associated components). The program reaches business customers with small data rooms or data closets and services large colocation and enterprise data centers. The program has been instrumental in attracting new large data centers into the AEP Ohio service territory. AEP Ohio recommends that the program continue as described in the Plan.

COMBINED HEAT AND POWER

A new program launched in 2017 after two successful CHP projects were filed in 2015 under the Custom Program following passage of SB 315. In 2017, several applications for CHP were received and projects started, however no projects operated beyond start-up to be able to quantify participation, savings, and incentives. In 2018, two CHP projects were completed and several applications received for future projects. In 2019, one CHP project was completed and three new projects started. AEP Ohio recommends that the program continues as described in the plan.

AFFIDAVIT OF JON F. WILLIAMS

State of Ohio :
 : ss
County of Franklin :

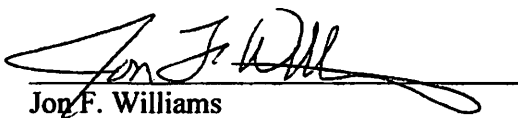
Jon F. Williams, being first duly cautioned and sworn, states as follows:

1. I am the Managing Director of Customer Experience & Distribution Technology & Innovation for AEP Ohio.
2. I am responsible for the design, development and implementation of customer programs relating to *Energy Efficiency (EE)* and *Peak Demand Reduction (PDR)* for AEP Ohio, including overseeing compliance with the EE/PDR mandates of Senate Bill 310 (S.B. 310) and the rules adopted by the Public Utilities Commission of Ohio (Commission) for inclusion in Ohio Administrative Code Chapter 4901:1-39 (Green Rules).
3. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio's energy baseline to be used for the 2019 reporting year is 37,955 GWh.
4. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio's 1.00% EE benchmark for the 2019 reporting year is 379.5 GWh.
5. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio complied with the EE benchmark for the 2019 reporting year.
6. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio's demand baseline to be used for the 2019 reporting year is 7,900.4 MW.
7. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio's 8.50% PDR benchmark for the 2019 reporting year is 671.5 MW. On that basis, AEP Ohio could achieve compliance for 2019 by either implementing

programs (including programs offered through a tariff) designed to achieve a cumulative peak demand reduction of 671.5 MW in 2019 or if peak demand is less than 7,228.9 MW (*i.e.*, 7,900.4 MW less 671.5 MW).

8. Based on my understanding of S.B. 310 and the Commission's Green Rules, AEP Ohio complied with the PDR benchmark for the 2019 reporting year.

FURTHER AFFIANT SAYETH NAUGHT.


Jon F. Williams

Sworn to before me and subscribed in my presence this 13 day of May, 2020.


Notary Public



Jeffery C. Stewart
Notary Public, State of Ohio
My Commission Expires
May 14, 2022

This foregoing document was electronically filed with the Public Utilities

Commission of Ohio Docketing Information System on

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in

Case No(s). 20-1042-EL-EEC

Summary: Report - In the Matter of the Annual Portfolio Status Report Under Rule 4901:1-39-05(C), Ohio Administrative Code, by Ohio Power Company (Part 1 of 3) electronically filed by Mr. Steven T Nourse on behalf of Ohio Power Company