EVERGREEN ECONOMICS

Independent Audit of the DP&L 2014-2018 Energy Efficiency and Demand Reduction Programs

Submitted by Evergreen Economics to the Public Utilities Commission of Ohio

FINAL Report

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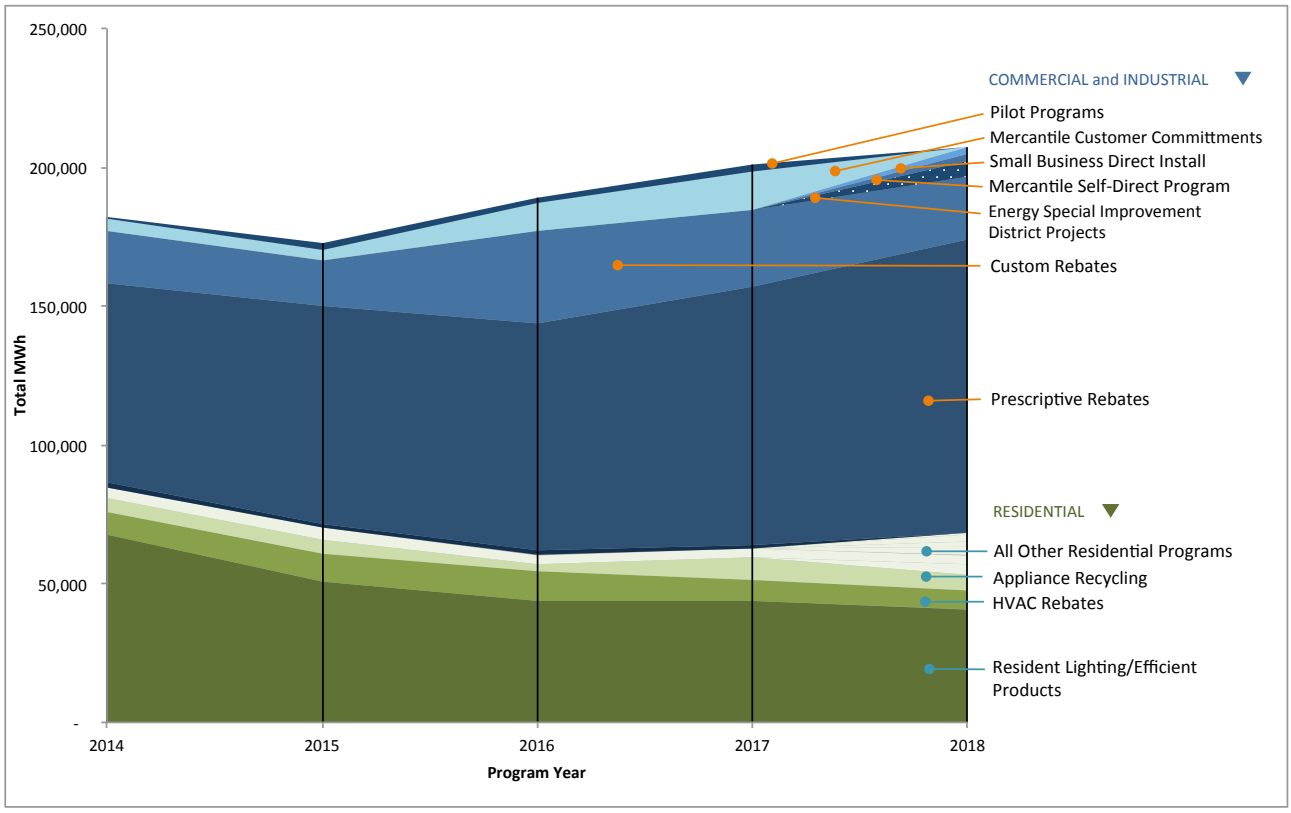
Executive Summary

In March 2019, the Public Utilities Commission of Ohio (PUCO) chose the Evergreen Economics team to conduct an independent audit of the Ohio electric utilities' energy efficiency and peak demand reduction programs. The audit team consists of staff from the following companies:

- Evergreen Economics
- Michaels Energy
- Dr. Philippus Willems / PWP

This report covers the audit review of all the energy efficiency and demand reduction programs for Dayton Power and Light (DP&L) over the 2014-2018 period. Figure 1 shows the annual energy savings claimed for each DP&L program covered by this audit.

Figure 1: DP&L Annual Energy Savings by Program



The primary objectives for the audit established by the PUCO were as follows:

1. Review the annual energy and demand impacts reported by each utility and make recommended adjustments to the savings estimates as needed;
2. Review the various PUCO rulings that are relevant to these programs and confirm that the utilities have adhered to these directives;
3. Characterize the utility programs in terms of utilization of channel partners, independent evaluators, program costs, and opt out and mercantile customers; and
4. Update the Ohio Technical Reference Manual (TRM) to reflect current market conditions, technologies, and evaluation best practices.

As part of the background review of the DP&L programs, we conducted the following activities.

- ***Review of annual portfolio status reports.*** Each of the annual reports was reviewed for the 2014-2018 period. These annual reports were the primary source of the claimed energy savings and program cost information whenever possible.
- ***Review of annual evaluation reports.*** The evaluation reports were typically included as appendices to the annual portfolio status reports; these were reviewed in detail for each year.
- ***Review of additional filings related to the DP&L programs.*** Related utility filings such as the Green Rules, comments by intervenors on DP&L filings, and DP&L program plans were also reviewed as needed.
- ***Analysis of program-related data from DP&L.*** Additional data supplied by DP&L included information on channel partners and third-party contractors that implemented and evaluated the programs, information on mercantile customers and opt out customers, and program cost details that were not included in the portfolio status reports.
- ***Interviews of DP&L program managers.*** Interviews of the DP&L program managers were conducted to collect additional information on the programs that were not captured in the related documents.

The majority of the audit was spent reviewing the annual savings calculations and program evaluations. All of the savings information from the evaluation reports was covered in an initial review, followed by a more in-depth review of selected programs and equipment types that accounted for the majority of program savings. The measures and programs selected for additional review were based on several criteria including the amount of total savings provided, the uncertainty surrounding the savings estimates, and whether or not the savings calculation methods had changed significantly during the audit period.

Based on these criteria, the following measures were selected for a more in-depth savings review:

- **Residential LEDs.** LEDs sold through the Residential Lighting/Efficient Products program are the largest contributor to residential sector savings, and the savings calculations are well described in the evaluation reports.
- **Commercial LED/T8 replacements.** The LED/T8 replacements through the Prescriptive Rebates program provide the largest share of savings in the non-residential sector and therefore are an appropriate candidate for further review by the audit team.

By including the LED and LED/T8 measures in the audit review, we estimate that over 50 percent of the total energy savings claimed by DP&L for the entire portfolio came from just these two measure types.

Additional in-depth review topics included the following:

- **Smart Thermostats.** The savings impacts for 2018 rely on a billing regression that more than doubled the savings value from the engineering estimates used in the prior year. This measure also accounts for a small portion of portfolio savings (less than 2%), but smart thermostats have seen increased promotion in efficiency programs nationwide and therefore may become more important in the future for DP&L.
- **Custom Projects.** The Custom program also produces a significant amount of savings each year (10-18%) and therefore, a review of the evaluation methods used for this program is appropriate.
- **Retrocommissioning.** While this is a new measure with relatively low savings, retrocommissioning is becoming more popular, and so a review of the savings estimation methods is appropriate given that this measure will likely grow in popularity in future program years.
- **Variable Frequency Drives (VFDs)**. VFDs are offered through the Commercial Prescriptive Rebates program and are one of the largest contributors to savings among the non-lighting prescriptive measures.

The audit found that the annual program evaluations were generally consistent with best evaluation practices and conformed to the rules established in Ohio for estimating and reporting savings. In many cases, the savings calculations rely on algorithms that are recommended in the Ohio TRM. Based on the audit review, we have no recommendations for retroactive savings adjustments.

For future program evaluations, we have the following recommendations:

1. **Use 10 years as the average expected life value for residential LEDs.** This value is consistent with the one recommended in the updated Ohio TRM and represents a significant increase from the 4.7-year average value estimated by Cadmus for program year 2017. The current 2018 average measure life of 20 years is not reasonable given that the program is essentially unchanged from prior years.
2. **Future 'as found' baseline assumptions for residential LEDs should be adjusted to account for the high number of energy efficient bulbs distributed through the program.** Given that over 12,000,000 bulbs have been distributed in DP&L's service territory since 2011, the average efficiency for installed lamps will be improving over time. The baseline efficiency used to estimate average savings in the future needs to be adjusted to account for the higher number of existing LEDs in these households.
3. **Separate custom savings calculations should be done for VFDs installed on HVAC systems versus other process applications.** Given the operating differences, the impacts should be calculated separately for VFDs installed on HVAC systems versus those that are used in other process applications. The evaluation should also confirm that the VFDs are installed in eligible applications that adhere to the program requirements.

1 Introduction

In March 2019, the Public Utilities Commission of Ohio (PUCO) chose the Evergreen Economics team to conduct an independent audit of the Ohio electric utilities' energy efficiency and peak demand reduction programs.[1] The audit team consists of staff from the following companies:

- Evergreen Economics
- Michaels Energy
- Dr. Philippus Willems / PWP

The programs reviewed are for the 2014-2018 period and include those of the following Ohio utilities:

- American Electric Power Ohio (AEP Ohio)[2]
- The Dayton Power and Light Company (DP&L)
- Duke Energy Ohio (Duke Energy)
- FirstEnergy[3]

As part of this process, the PUCO identified several primary objectives for the Independent Evaluator that can be summarized as follows:

1. Review the annual energy and demand impacts reported by each utility and make recommended adjustments to the savings estimates as needed;
2. Review the various PUCO rulings that are relevant to these programs and confirm that the utilities have adhered to these directives;

[1] Ohio utilities are required to propose energy efficiency plans and file annual status reports with the PUCO per the 2009 PUCO rules for implementing the Ohio law adopted in 2008 that established an Energy Efficiency Resource Standard with energy savings goals for electric utilities and that allows for cost recovery and decoupling. Each annual status report (called a Portfolio Status Report) must include a compliance demonstration and a program performance assessment (including a description of all transmission and distribution infrastructure improvements and an evaluation, measurement, and verification report, along with recommendations for the future of the programs).

[2] AEP Ohio had two operating companies in 2011: Columbus Southern Power Company (CSP) and Ohio Power Company (OPCo). As of December 31, 2011, CSP merged with OPCo, with OPCo as the surviving entity.

[3] FirstEnergy has three Ohio operating companies: The Cleveland Electric Illuminating Company (CEI), Ohio Edison Company (Ohio Edison), and The Toledo Edison Company (Toledo Edison). In this report, these three are referred to collectively as FirstEnergy or Companies, where noted.

3. Characterize the utility programs in terms of utilization of channel partners, independent evaluators, program costs, and opt out and mercantile customers; and
4. Update the Ohio Technical Reference Manual (TRM) to reflect current market conditions, technologies, and evaluation best practices.

This report presents the audit review of the DP&L programs from 2014-2018.

1.1 Ohio Energy Efficiency Regulatory Background

On April 23, 2008, the Ohio legislature adopted Amended Substitute Senate Bill No. 221 (SB 221),[4] which went into effect on July 31, 2008. Among the provisions of SB 221 was the requirement in Section 4928.66, Revised Code,[5] for the PUCO to take certain actions related to the implementation of energy efficiency and peak-demand reduction programs by the electric utilities. Section 4928.66(B), Revised Code, requires the PUCO to verify the annual levels of energy efficiency and peak-demand reduction achieved by each electric utility.

In order to assess the benefit of these activities, the PUCO must be in a position to be able to determine, with reasonable certainty, the energy savings and demand reductions attributable to the energy efficiency programs undertaken by the electric utilities and mercantile customers. Specifically, the PUCO needs the capability to: (a) verify each electric utility's achievement of energy and peak-demand reduction requirements, pursuant to Section 4928.66(B), Revised Code; (b) consider exempting mercantile customers from cost recovery mechanisms pursuant to Section 4928.66(A)(2)(c), Revised Code; and (c) review cost recovery mechanisms for energy efficiency and/or peak-demand reduction programs implemented by the electric utilities.

Other important information is contained in the Green Rules promulgated by the PUCO in Chapter 4901:1-39, Ohio Administrative Code (O.A.C.).[6] As stated in Sec. 4928.662 of SB 310,[7] for the purpose of measuring and determining compliance with the energy efficiency and peak demand reduction requirements, the public utilities commission shall count and recognize compliance as follows:

> (A) Energy efficiency savings and peak demand reduction achieved through actions taken by customers or through electric distribution utility programs that comply

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[4] Am. Sub. SB221 (Schuler, May 1, 2008). Amended Substitute Senate Bill Number 221. 127th General Assembly. 2007-2008.
[5] Ohio General Assembly, Ohio Revised Code. (Ohio, Amended by 129th General Assembly Effective Date September 10, 2012). Chapter 4928.66. http://codes.ohio.gov/orc/4928.66
[6] Ohio General Assembly, Ohio Administrative Code. (Ohio, Effective Date December 10, 2009). Chapter 4901: 1-39. http://codes.ohio.gov/oac/4901%3A1-39.
[7] SB 310 text taken from http://archives.legislature.state.oh.us/BillText130/130_SB_310_EN_N.pdf

with federal standards for either or both energy efficiency and peak demand reduction requirements, including resources associated with such savings or reduction that are recognized as capacity resources by the regional transmission organization operating in Ohio in compliance with section 4928.12 of the Revised Code, shall count toward compliance with the energy efficiency and peak demand reduction requirements.

(B) Energy efficiency savings and peak demand reduction achieved on and after the effective date of SB 310 of the 130th general assembly shall be measured on the higher of an as found or deemed basis, except that, solely at the option of the electric distribution utility, such savings and reduction achieved since 2006 may also be measured using this method. For new construction, the energy efficiency savings and peak demand reduction shall be counted based on 2008 federal standards, provided that when new construction replaces an existing facility, the difference in energy consumed, energy intensity, and peak demand between the new and replaced facility shall be counted toward meeting the energy efficiency and peak demand reduction requirements.

(C) The commission shall count both the energy efficiency savings and peak demand reduction on an annualized basis.

(D) The commission shall count both the energy efficiency savings and peak demand reduction on a gross savings basis.

(E) The commission shall count energy efficiency savings and peak demand reductions associated with transmission and distribution infrastructure improvements that reduce line losses. No energy efficiency or peak demand reduction achieved under division (E) of this section shall qualify for shared savings.

(F) Energy efficiency savings and peak demand reduction amounts approved by the commission shall continue to be counted toward achieving the energy efficiency and peak demand reduction requirements as long as the requirements remain in effect.

(G) Any energy efficiency savings or peak demand reduction amount achieved in excess of the requirements may, at the discretion of the electric distribution utility, be banked and applied toward achieving the energy efficiency or peak demand reduction requirements in future years.

Finally, on July 23, 2019, the Ohio legislature passed House Bill 6 (HB 6) that gives the PUCO authority to end the requirement that utilities provide efficiency and demand response programs once the cumulative savings goal of 17.5 percent is achieved and no

later than February 1, 2021. Despite this rule change, we have structured our report and the Ohio TRM update to be prospective in nature and are assuming (for the purposes of this report) that the programs will continue indefinitely. As a result, we have presented our recommendations and the Ohio TRM update for use in future program years.

2 Audit Methods

The audit followed the same general process for each utility, beginning with a kickoff meeting held via webinar in April 2019. During this meeting, the Evergreen team discussed with DP&L staff the specific tasks that would be completed as part of the audit review. Shortly after the kickoff meeting, a data request memo was sent to DP&L that covered the program background information needed to complete the audit. Additional background material for each utility was also supplied by PUCO staff.

The various audit activities that followed the kickoff meeting are summarized below.

Program Characterization

After the kickoff meeting, we reviewed as much background material as possible to familiarize ourselves with the DP&L programs and to assess which programs and measure types should be subjected to a more thorough engineering review of savings. As part of the background review, we conducted the following:

- ***Review of annual portfolio status reports.*** Each of the annual reports was reviewed for the 2014-2018 period. These annual reports were the primary source of the claimed energy savings and program cost information whenever possible.
- ***Review of annual evaluation reports.*** The evaluation reports were typically included as appendices to the annual portfolio status reports; these were reviewed in detail for each year. While evaluation reports were provided by DP&L for each year, not all programs were evaluated each year. In these cases, the evaluation results were typically applied from the most recent evaluation.
- ***Review of additional filings related to the DP&L programs.*** Related utility filings such as the Green Rules, comments by intervenors on DP&L filings, and DP&L program plans were also reviewed as needed.
- ***Analysis of program-related data from DP&L.*** Additional data supplied by DP&L included information on channel partners and third-party contractors that implemented and evaluated the programs, information on mercantile customers and opt out customers, and program cost details that were not included in the portfolio status reports.
- ***Interviews of DP&L program managers.*** Interviews of the DP&L program managers were conducted to collect additional information on the programs that were not captured in the related documents.

The conclusion of this background research culminated in a "Program Characterization" memo that summarized the annual program accomplishments and identified measures for additional in-depth review. Most of the memo results are provided in the following *Program Characterization* chapter of this report and in Appendix A.

Savings Prioritization

The purpose of the program characterization was to review all of the programs and measures over the 2014-2018 program years, and then identify those measures and/or programs that would benefit from a more in-depth review of the savings calculations. To identify which measures would receive a more in-depth review, several criteria were used to prioritize measures. Questions that were asked as part of this prioritization included:

- Which programs and measures are accounting for the largest share of savings?
- Which measures have the most uncertainty around their estimated savings?
- What are the relative costs associated with improving savings estimates? Are there secondary data sources that can easily be applied to measures in Ohio?
- How much evaluation work has been done for each specific program/measure and how much additional work is needed?
- Which programs have the highest realization rates relative to the original *ex ante* savings values? Which have the lowest? Have the realization rates changed over time?

The final measures selected are discussed in the next chapter and cover the majority of DP&L savings over the 2014-2018 period.

In-depth Savings Review

As discussed in the next chapter, the DP&L in-depth savings review focused primarily on several lighting measures that accounted for the majority of program savings. In most cases, the in-depth savings review was conducted by engineers from Michaels Energy, with additional review conducted as needed by Evergreen staff.

There were several elements relating to the Ohio regulatory requirements that influenced the in-depth savings review and what recommendations were made.

1. ***The Ohio TRM.*** The Ohio TRM is considered a "safe harbor," meaning that if this source is used for the deemed savings values, the audit team did not attempt to make changes to the savings numbers. The Ohio TRM is outdated, however, with the current version updated in September 2013. In our in-depth savings review, we note if the Ohio TRM is used and make recommendations as needed for future savings values if the Ohio TRM source is outdated.
2. ***SB 310 and* Ex Ante *Savings.*** Ohio SB 310 states that savings "shall be measured on the higher of an as found or deemed basis" (Section 4928.662(B), Revised Code), which effectively allows the utilities to use either the *ex ante* savings values or the current evaluation savings estimates—whichever is higher. This system provides a disincentive for utilities to adopt the evaluation results if they are lower than the existing *ex ante* values, and in general, the utilities did not appear to regularly update their *ex ante* savings values with the evaluation results from the prior year.

This same section also states that "solely at the option of the electric distribution utility, such savings and reduction achieved since 2006 may also be measured using this method." Based on this guidance, Duke Energy Ohio went back to prior years and re-estimated savings based on the new definition of how eligible savings can be defined.

3. ***SB 310 and Non-program Savings*.** One part of SB 310 states that eligible energy efficiency savings and peak demand reductions can be claimed from "actions taken by customers or through electric distribution utility programs that comply with federal standards"(Section 4928.662(A), Revised Code). This has been interpreted by FirstEnergy as allowing the utility to claim savings for equipment upgrades made by their customers without having to show that these purchases were at all influenced by FirstEnergy. This was approved by the PUCO for FirstEnergy but subsequently was not allowed for the other utilities.

With this regulatory context in mind, our in-depth savings review has resulted in two types of possible recommendations. The first is for ***retroactive adjustments*** to savings where we recommend that some or all of the savings be adjusted for the 2014-2018 programs. The retroactive adjustments are reserved for the most egregious calculations that clearly contain basic errors and/or are not adequately supported in the evaluation reports. The retroactive adjustments also take into account the considerable leeway that is provided by the three Ohio-specific issues described above.

The second type of adjustment is ***prospective adjustments*** that we are recommending for future program years. These are instances where the audit team has issues with how the savings are calculated, but the disagreement falls within the bounds of normal differences of interpretation that are commonly found between different evaluation teams. It also takes into account the information that was available to the evaluation team for each program year. In these cases, we recommend that savings values be modified for future program years. Where possible, our recommended savings values are also included in the update to the Ohio TRM that is being completed concurrently with these program reviews.

The results from each of these activities are presented in the following chapters.

3 Program Characterization

This chapter provides our characterization of the DP&L energy efficiency and demand reduction programs, including a brief summary of the program achievements for this period and identification of specific energy efficient measures or programs that were identified to receive a more in-depth review as part of this audit.

The programs are summarized by year (2014-2018), followed by additional contextual information that we obtained through our interviews with the utility program staff. Tables summarizing additional information on annual program budgets and impacts are included as Appendix A at the end of this report.

The materials used for this program characterization include the following:

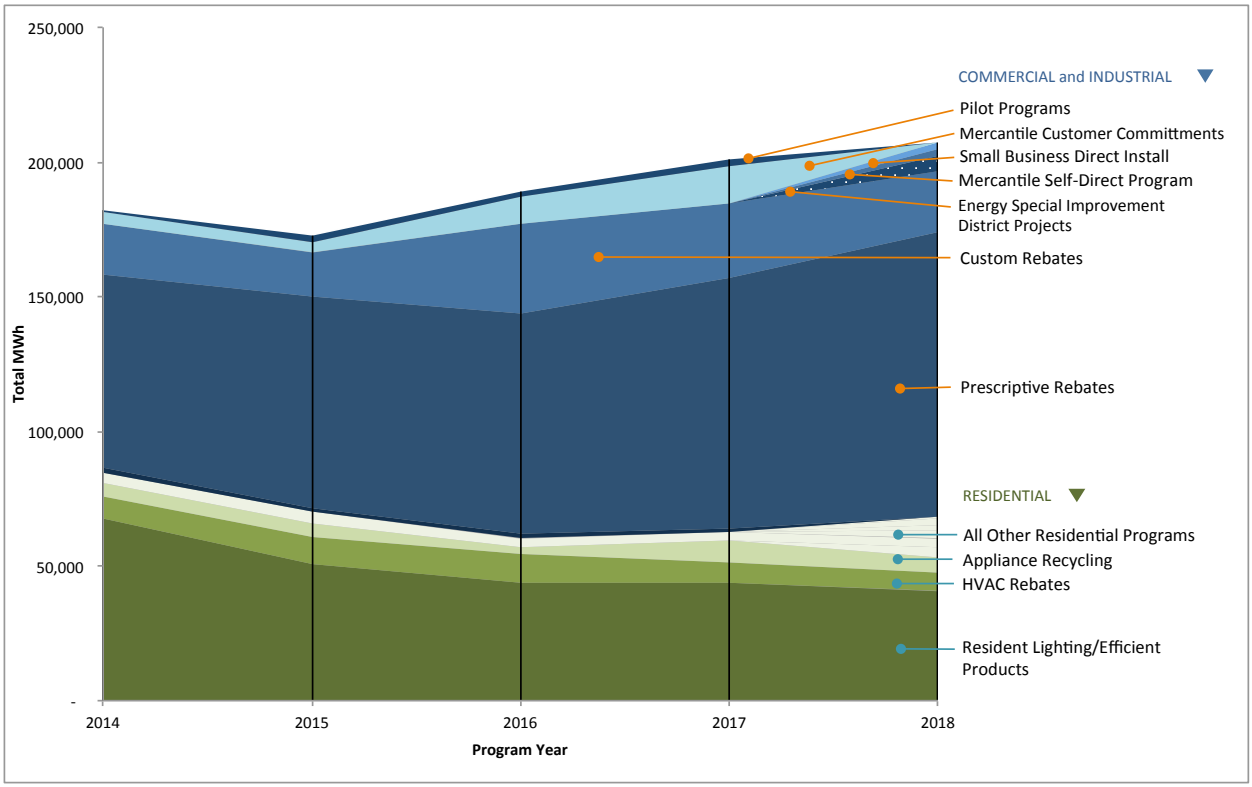
- DP&L's Annual Reports
- DP&L Evaluation Reports
- Additional filings and rulings available on the PUCO website
- Interviews with DP&L staff involved with managing the programs

In total, we interviewed five program managers that covered all of the DP&L programs. These interviews typically lasted about 30 minutes, with one interview lasting an hour that also covered more general portfolio and policy topics.

3.1 DP&L Program Summary

DP&L offers a range of energy efficiency programs targeting both the residential and commercial sectors. The program offerings and savings achievements have been relatively consistent throughout the 2014-2018 period, as shown in Figure 2. There was a general decline in program savings from 2014 to 2015. Savings increases in 2017 for the Prescriptive Rebates for Business program and in 2016 for the Custom program were large enough to lead to an increase in overall portfolio savings even while the other programs were scaled back.

Figure 2: DP&L Annual Energy Savings by Program



In addition to the savings trends shown above, the number of mercantile projects and opt out customers for each year are summarized in Table 1, along with the program implementation and evaluation budgets. Table 2 shows the lost revenue and shared savings amounts claimed by DP&L for each year.

Additional detail on individual program costs for each year are included in Appendix A.

Table 1: DP&L Mercantile Projects, Opt Out Customers, EM&V Budgets

Project Type	2014	2015	2016	2017	2018
Mercantile Projects	21	46	9	19	5
Opt Out Customers (Cumulative)	0	0	0	9	9
Program Budgets	$21,179,006	$21,626,573	$21,626,573	$21,626,573	$24,573,967
EM&V Budgets	$748,400	$808,272	$808,272	$808,272	$1,031,523

Table 2: Lost Revenue, Shared Savings, Carrying Costs

Residential Programs			
Year	Lost Revenue	Shared Savings	Carrying Cost
2014	$12,753,128	$3,032,772	($195,308)
2015	$11,106,654	$1,880,994	($180,303)
2016	$16,004,808	$2,175,449	($225,040)
2017	$14,414,768	$2,175,449	($80,751)
2018	-	$2,175,449	($71,506)

Non-Residential Programs			
Year	Lost Revenue	Shared Savings	Carrying Cost
2014	$2,521,112	$3,966,978	$143,066
2015	$2,441,197	$5,118,756	($187,375)
2016	$4,133,897	$4,846,351	($497,820)
2017	$4,023,751	$4,846,351	($815,465)
2018	-	$4,846,351	($358,465)

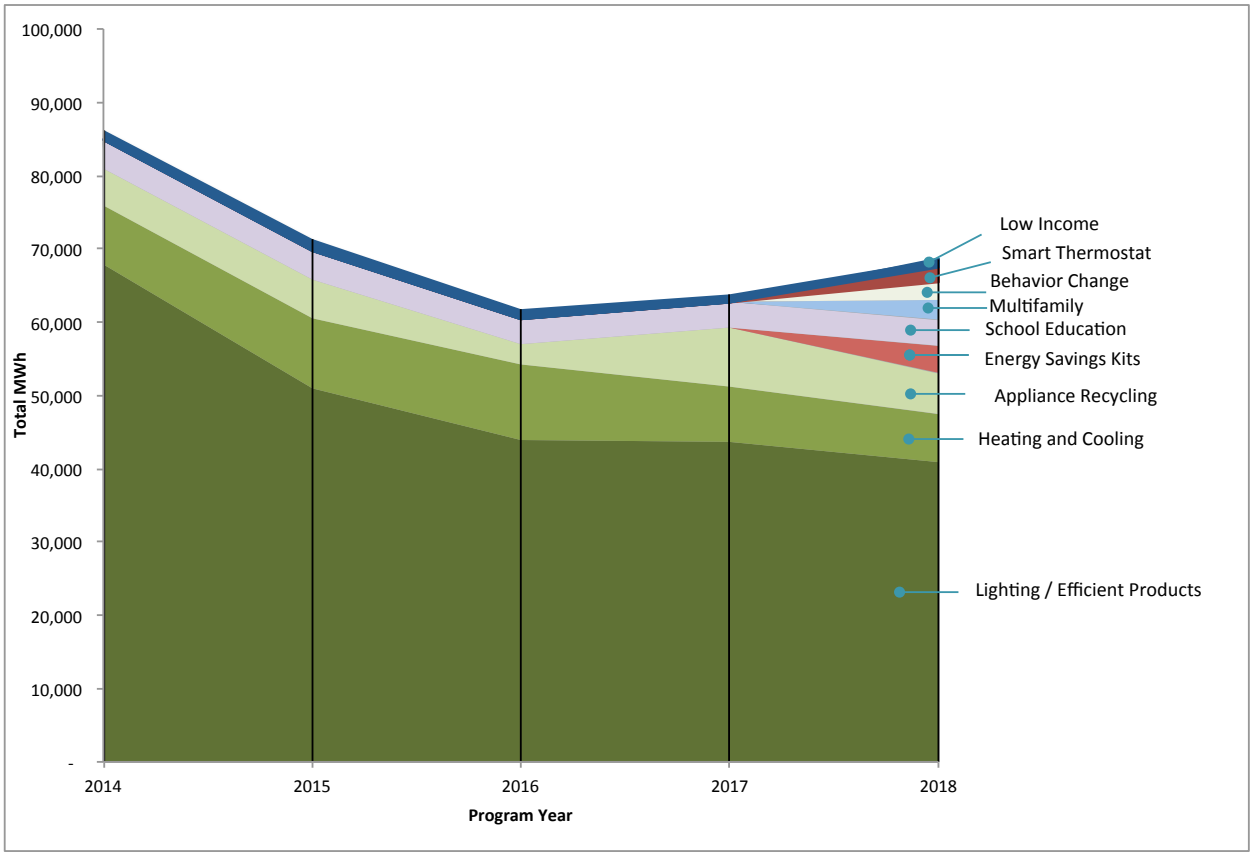
Each of the DP&L programs is described below, along with any significant changes or issues that occurred over the analysis period.

3.2 Residential Programs

Figure 3 shows the savings over time for the DP&L residential sector programs, with the Residential Lighting/Efficient Products program accounting for the vast majority of savings each year. Lighting measures account for the majority of the sector savings, with the remainder fairly evenly distributed across the remaining programs.

The DP&L residential programs during the period from 2014 to 2018 are described in more detail below.

Figure 3: DP&L Residential Sector Programs 2014-2018



Residential Lighting / Efficient Products. This program was called the Residential Lighting program from 2014 to 2017 and provided discounted CFL and LED lamps via an upstream rebate through participating retailers. Applied Proactive Technologies (APT) implemented this program in 2014 followed by CLEAResult in 2015-2018 after it purchased APT. The name was changed to the Efficient Products Program in 2018 so that additional measures (showerheads, faucet aerators) could be offered. As part of this program change, DP&L added its online DP&L Marketplace that provides rebates to residential customers to purchase high efficiency lighting, smart thermostats (captured through the Smart Thermostat program) and other energy efficient measures. This program accounted for 79 percent of the residential sector savings in 2014 and 59 percent in 2018. In 2018, the vast majority of savings still came from LEDs.

Heating and Cooling Rebates. This program provides rebates for a range of HVAC measures, with energy efficient air conditioners and heat pumps accounting for most of the savings (both early retirement, new construction and replace on failure applications). The program also includes some insulation, ECM, and smart thermostat measures. The savings contributions had increased from 2014-2016 before declining the last two years.

Conservation Services Group (CSG) implemented this program from 2014-2017, followed by CLEAResult in 2018 after it purchased CSG.

Multifamily Direct Install. This program was new in 2018 (implemented by CLEAResult) and provides energy efficient measures to multifamily households after a walkthrough audit is completed. In 2018, there were 64,371 measures installed, with the vast majority being lighting (87%). Savings were calculated generally using the Ohio TRM or based on the energy savings calculations done for the DP&L programs (LED night-lights from School Kits, LEDs from the Efficient Products program).

Smart Thermostats. The thermostats are delivered through five different channels (including the Heating and Cooling program), and the evaluation is designed to measure impacts from all channels. Additional channels include the DP&L online store (beginning in 2018), the Nest online store, Rebates for Retail, and other third-party suppliers. The 2018 evaluation used a billing regression, which led to a very large increase in energy savings from 2017 (approximately 630 kWh vs. 302 kWh).

Appliance Recycling. This program recycles older (but still functioning) equipment. In 2018, the majority of savings (76%) came from recycling refrigerators, but the program will also dispose of room air conditioners and dehumidifiers if they are already at the home. This program was implemented by JACO from 2014-2015 and by ARCA in 2016, and Recleim took over implementation in 2018.

Energy Education. DP&L provides education and selected measures as part of an education in schools program. Measures distributed to students include LEDs, LED night-lights, and faucet aerators. Installation rates are estimated based on the results of a follow up survey with parents. In 2018, there were 9,194 kits distributed through the program, and savings were calculated primarily using the Ohio TRM parameters. The Ohio Energy Project implemented this program for the entire 2014-2018 period.

Income Eligibility. This program serves low income households and provides for the direct installation of energy saving measures. While there are potentially additional funds available for these customers, the measures funded by DP&L include lighting, refrigerators, freezers, insulation, and additional smaller measures. The majority of savings come from refrigerators and LEDs (over 75% in 2018). The program is implemented by Ohio Partners for Affordable Energy (OPAE) and People Working Cooperatively.

Behavior Change. The DP&L Behavior Change program is a home energy reports program (implemented by Simple Energy), where customers are sent a monthly report (either email or mail) comparing their energy use with a peer group of similar customers in an effort to get them to reduce usage. The mailing also includes tips on how to reduce energy use in the home. Savings are estimated using a fixed regression based on customer

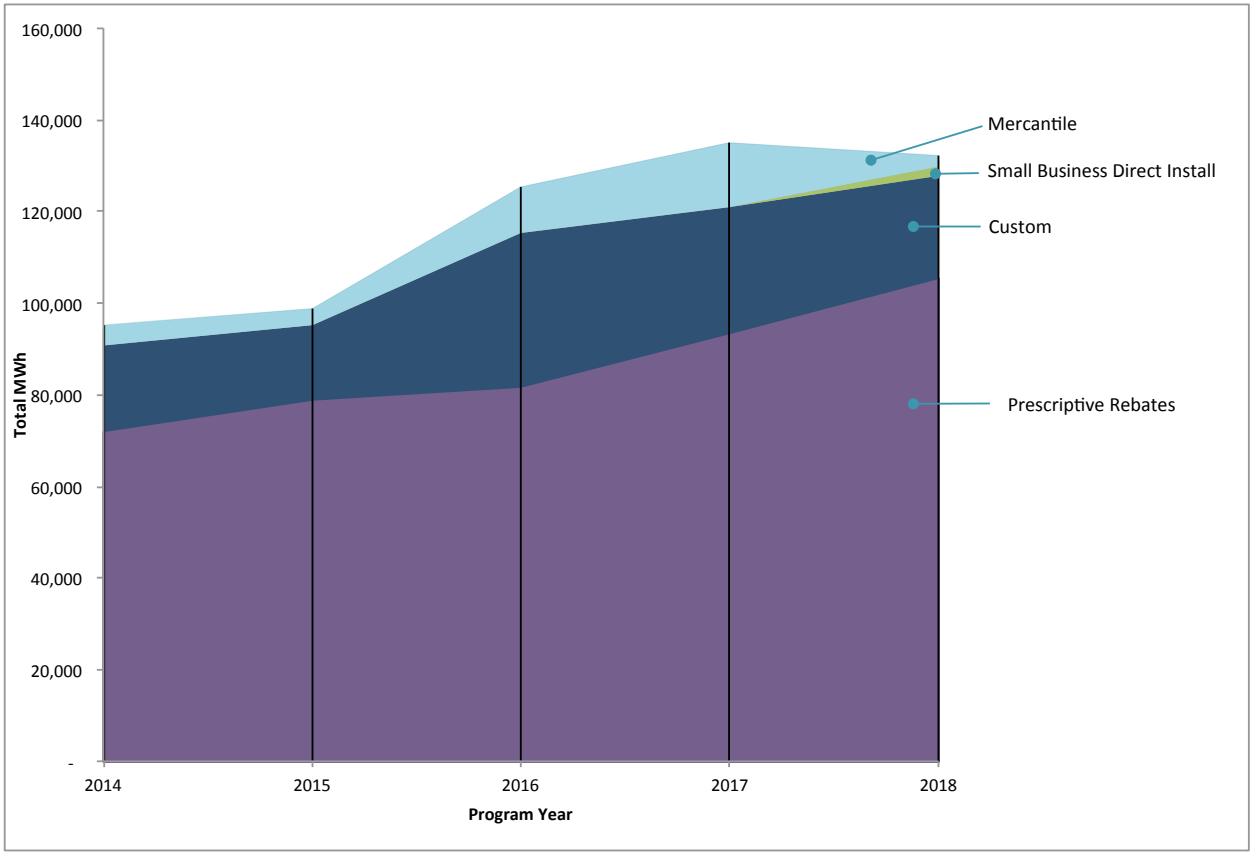
bills and utilizes a randomly selected control group to account for external factors that may be affecting energy use for all households. Savings ranged from 0.44 to 0.51 percent of control group consumption, which is consistent with savings from similar programs in other states.

Energy Savings Kits. These kits are distributed to DP&L customers requesting them, and include similar measures to the Energy Education program (LEDs, aerators, showerheads). This program grew from a pilot program first offered in 2016. In 2018, 15,025 kits were distributed. Savings values are calculated mostly from the Ohio TRM values, with installation rates determined from a survey of kit recipients.

3.3 Commercial Programs

Figure 4 summarizes the annual energy savings for the DP&L commercial sector programs. The Prescriptive Rebates program provides most of the sector savings at about 75 percent of sector savings each year (40-45 percent of the total portfolio savings).

Figure 4: DP&L Commercial Sector Programs 2014-2018



Prescriptive Rebates. The largest of all DP&L's programs provides rebates to a wide range of measures. The evaluation covers measures that are provided through four different channels:

- Rapid Rebate measures incented through the program
- Measures from the Midstream Incentive Channel
- LEDs that are distributed through the Residential Efficient Products program but that were installed at commercial sites
- Recycled appliances that were collected at commercial sites

Most of the savings come from lighting, but additional measures include HVAC, motors, and compressed air. The savings calculations were based in part on the Ohio TRM, but were adjusted based on the results of desk review and on-sites for a sample of projects.

Custom Program. This program provides incentives for energy efficiency projects where the installed measures do not align with the set rebates and measures offered in the Prescriptive Rebates program. Within this program, the projects are identified as Custom, New Construction, or Retrocommissioning (beginning in 2017). For the Custom component, most of the measures are either lighting or HVAC and therefore follow the same savings calculation methods used for the Prescriptive Rebates program where appropriate.

Small Business Direct Install. This was a new program for 2018 that provides free direct install measures to targeted businesses, with office, retail, and food sales being the most common building types. There were 24,789 measures installed at 234 business locations. The program is mostly lighting measures (98%), with the most popular measure being 4-foot LED T8 replacements. The savings were calculated using Ohio TRM algorithms with some additional sources used as needed for specific inputs, such as baseline wattage assumptions. CLEAResult implements this program.

3.4 Audit Portfolio Assessment

The interviews with DP&L program staff confirmed that the programs have been fairly consistent throughout the 2014-2018 period, with few changes in program design. There was a "pause" in the efficiency program goals in 2015-2016 as the annual savings requirements were reduced to zero percent. Despite this, DP&L was for the most part able to achieve consistent savings over this period. The number of residential programs offered was increased from five to nine in 2018 to provide additional measures through a wider range of delivery channels.

In addition to the staff interviews, the audit team also reviewed each of the evaluation reports produced by Cadmus for the 2014-2018 period. In general, these evaluations follow standard practice for the industry, and savings calculations rely heavily on the Ohio TRM. DP&L staff are also involved with reviewing the savings calculations as part of their review of the project applications for some of the non-residential programs. Between the Cadmus evaluation efforts and the DP&L staff review, it appears that these programs are receiving an appropriate amount of oversight.

Given our preliminary review of the evaluation reports, our interviews with DP&L program staff, and the annual energy savings claims, we identified several measures to receive a more in-depth review of the savings calculations as part of this audit. As discussed previously, these measures were chosen based on several criteria, including:

- The contribution to overall savings;
- The uncertainty around the savings estimates; and
- Changes in savings estimation methods across years.

Based on these criteria, the following measures were selected for a more in-depth savings review:

- **Residential LEDs.** LEDs sold through the Residential Lighting/Efficient Products program are the largest contributor to residential sector savings, and the savings calculations are well described in the evaluation reports.
- **Commercial LED/T8 replacements.** The LED/T8 replacements through the Prescriptive Rebates program provide the largest share of savings in the non-residential sector and therefore are an appropriate candidate for further review by the audit team.

Note that the LEDs and LED/T8 replacement measures show up in other programs (e.g., Energy Efficiency Kits, Energy Education, Low Income, Small Business Direct Install), and Cadmus has used the same savings estimation methods across programs for the same measures where appropriate. By including the LED and LED/T8 measures in the audit review, we believe that we are covering over 50 percent of the total energy savings claimed by DP&L for the entire portfolio with just these two measure types.

In addition to these two specific measures, the in-depth savings review also included several other topics that could affect savings. Additional review topics included the following:

- **Smart Thermostats.** The savings impacts for 2018 rely on a billing regression that more than doubled the savings value from the engineering estimates used in the prior year. This measure also accounts for a small portion of portfolio savings (less than 2%), but smart thermostats have seen increased promotion in efficiency

programs nationwide and therefore may become more important in the future for DP&L.

- **Custom Projects.** The Custom program also produces a significant amount of savings each year (10-18%) and therefore, a review of the evaluation methods used for this program is appropriate.
- **Retrocommissioning.** This was offered as an option within the Custom program beginning in 2017 and has had low participation in both 2017 and 2018. Nevertheless, the retrocommissioning measure is becoming more popular, and so a review of the savings estimation methods is appropriate given that this measure will likely grow in popularity in future program years.
- **Variable Frequency Drives (VFDs).** VFDs are offered through the Commercial Prescriptive Rebates program and are one of the largest contributors to savings among the non-lighting prescriptive measures.

The next chapter presents the results of the more in-depth review of the savings calculations in these areas.

4 Savings Review

The savings review is intended to verify that the evaluations and claimed program savings are consistent with industry standards and are compliant with the Ohio energy efficiency program rules. As discussed above, the audit team conducted an initial review of all the savings reported for all the DP&L programs from 2014 through 2018. Following the initial review, selected measures were chosen for a more in-depth examination of the savings calculations.

DP&L and its evaluator Cadmus utilize several different definitions of program savings that take into account various adjustments made as part of the evaluation process:[8]

- ***Ex Ante* Claimed Gross Savings.** *Ex ante* estimates are generally the same values as used by DP&L in its filed and approved plans. These estimates establish savings goals for DP&L's portfolio. Comparing *ex ante* values to approved plan goals presents an appropriate metric for program and portfolio accomplishments.
- **Verified Gross Savings.** Adjustments to *ex ante* participation, based primarily on survey or on-site verification, result in verified gross savings. The unit energy savings (UES) estimation approach (used in the 2010 Ohio TRM and for deemed savings) remains the same as that used in *ex ante* claimed savings. A verified gross savings realization rate represents how well a program or portfolio is performing; it assesses metrics that are reasonably within DP&L's control. Per Ohio Administrative Code rules, the verification process is intended to confirm that measures were actually installed, that installation meets reasonable quality standards, that measures are operating correctly, and that measures are expected to generate predicted savings.
- **Adjusted Gross Savings.** Adjustments to *ex ante* participation (based on survey or on-site verification) and adjustments to UES and per-unit demand reduction estimates (based on engineering reviews of savings, statistical models, or other approaches) yield adjusted gross savings. Cadmus provides these estimates to present a more refined level of assessment, and they should be used for future program planning.

Below, we discuss the audit review of selected measures.

Residential Lighting/Residential Efficient Products

Over the past five years, lighting measures have dominated the savings for the residential portfolio. In 2018, the residential lighting program offerings were enlarged to include appliances, faucet aerators, and various other energy-saving consumer goods. Lighting

[8] The definitions for the different savings values are taken from the Cadmus report *2018 Evaluation, Measurement and Verification Final Report*, pp. 1-2, (May 6, 2019).

measures incented through the Residential Efficient Products program accounted for more than 99.6 percent of the program energy savings, and more than 59 percent of the total energy savings for the residential portfolio in 2018.

This assessment of the Residential Efficient Products program was focused on lighting measures. Generally, the verified and adjusted gross savings appear to comply with Ohio requirements. The verified gross savings were calculated using Ohio-metered residential hours of use, as found baseline wattages, and historic in-service rates based on survey data conducted in the DP&L service territory. The as found savings are representative of a typical bulb being replaced by an LED. The method used to calculate the as found wattage involves mapping the lumen output of the bulb to the appropriate lumen bin that contains the typical wattage of a removed bulb for that bulb type and brightness. These bins were created based on regression from field data in Wisconsin, which correlated the wattage to the lumen output of the bulb being removed.

Generally, the methodology used by Cadmus to calculate savings was in line with Ohio requirements. In program year 2018, residential LED bulbs saved 30.17 kWh and 0.0036 kW per bulb, which reflect as found savings.

While the general methodology for residential LED savings is sound, we did identify two issues that should be resolved for future program years. The first relates to the assumed measure life used in the cost-benefit calculations for LED lighting, and the second relates to concerns with the in-service rate (ISR) utilized, given the historic performance of the program for DP&L.

Weighted Program Measure Life

The total resource cost (TRC) test is the primary metric used to assess the cost-effectiveness of specific programs and measures, and a key component of the benefit calculation involves the assumed measure life. In the 2018 evaluation, it appears that a 20-year measure life was assumed for LED lighting, which is a significant increase from the 4.7-year average life estimated by Cadmus for program year 2017. We do not believe that the 20-year measure life is reasonable, and this was the primary driver in the change in the TRC for the Residential Portfolio from 1.42 in 2017 to 2.92 in 2018. In the current updated Ohio TRM, a measure life of 10 years is provided for residential LEDs, and we recommend that this value be used for future program years.

In-service Rates and As Found Baseline Wattages

Between 2011 and 2018, over 12,000,000 bulbs were rebated through the Residential Lighting/Efficient Products program for DP&L. This represents approximately 10 bulbs for every person living in DP&L's service territory over the last eight years, or more than 25 per household. Cadmus conducted a survey to inform the in-service rate (ISR) used to calculate the savings for LED bulbs for program year 2018. The survey results indicated

that 91.7 percent of LEDs in a 6-pack were installed in the first year, and 59.8 percent of LEDs in 12-packs were installed in the first year. An average lifetime ISR of 91 percent was calculated using the Uniform Methods Protocol. The baseline wattage used in the savings calculation represented the as found wattage (i.e., the wattage of the bulbs that were replaced). Going forward, care should be taken to ensure that a lifetime ISR utilizes a baseline wattage that is consistent with the fact that a large number of LEDs were installed in DP&L's service territory over the last few years.

Commercial Prescriptive—T8s & LEDs

Over the past five years, the Commercial Prescriptive Rebates program has consistently been the largest program in the portfolio, contributing between 38 percent and 50 percent of the savings in each year. Within the Commercial Prescriptive Rebates program, the vast majority of the savings are due to the installation of T8 or LED lighting.

The option to use the greater of the deemed or as found savings adds some uncertainty to mature program savings. The as found baseline wattages and operating hours were updated and used to calculate the lighting savings claimed by DP&L for 2018. Cadmus used the baseline fixture and bulb information provided by the customer to determine the savings for prescriptive lighting measures. The Ohio TRM provides hours-of-use (HOU) recommendations for facility types. Cadmus used the HOU reported by the customer for evaluated savings, unless the HOU deviated significantly from the Ohio TRM HOU recommendations and no additional project documentation was provided to support the variance.

This approach is reasonable, and the baseline wattages used in the analysis appear to be consistent with the expected mix of lighting types that are retrofit through the program.

Commercial Prescriptive—VFDs

In addition to lighting, variable frequency drives have also contributed a significant portion of the savings for the Commercial Prescriptive Rebates program. As noted in the 2018 evaluation report, DP&L uses the Ohio TRM to calculate savings for the VFD installations for HVAC projects.

Based on the audit review of the evaluation reports, the use of the Ohio TRM values is reasonable and appropriate for HVAC VFD installations. However, many of the VFD projects evaluated (especially the larger projects) were for VFDs installed on process equipment. The savings for all of the process VFD projects evaluated in 2018 were found to have less savings than claimed. The reduced savings levels were reflected in the adjusted savings, but were not applied to the verified savings estimates.

Additionally, the Ohio TRM requires that "The application must have a load that varies and proper controls (two-way valves, VAV boxes) must be installed." The evaluation report indicates that several VFD installations were found to operate without controls and

were generally operated at close to full speed. The projects generated substantially less savings than the improperly-applied deemed savings for these measures. Cadmus correctly accounted for this variance in the adjusted gross savings, which more closely reflect the actual savings realized by the installation of the motor measures.

The audit team recommends that process VFD savings be estimated using a custom analysis approach, or else additional research should be completed in order to develop a separate deemed savings value. Both HVAC and process VFDs should have clear eligibility requirements established to limit inappropriate applications. Per the program website, for example, variable speed drives must meet minimum hours of operation requirements, must result in energy savings, and cannot be used as a motor soft-start. Under Ohio rules, it is appropriate for evaluators to reduce claimed savings for individual measures and projects that do not meet installation requirements and do not save energy.

Smart Thermostats

Residential Smart Thermostats was added as a pilot program to DP&L's portfolio in 2017 and was expanded to a full program in 2018. In each year, the program provided incentives for the purchase of a smart thermostat through a variety of channels, including retail outlets, DP&L's online store, and from participating HVAC contractors. This measure is not included in the 2010 Ohio TRM, and consequently, the *ex ante* savings values were estimated in the evaluation based on an analysis of smart thermostat installations from 2016.

Table 3: *Ex Ante*, Verified, and Adjusted Savings for Smart Thermostats

	Ex Ante		**Verified *Ex Ante***		**Adjusted *Ex Ante***	
Year	**kW**	**kWh**	**kW**	**kWh**	**kW**	**kWh**
2017	249	1,727,141	248	1,722,140	0	1,420,611
2018	289	2,025,484	287	2,015,450	0	3,471,750

The 2017 evaluation used a calculated approach to evaluate the savings estimates while the 2018 evaluation used a billing analysis approach. Either approach is reasonable and acceptable. However, the billing analysis approach is likely to produce a more accurate estimate of savings.

The billing analysis used to evaluate the 2018 program savings utilized a PRISM modeling approach and fixed-effect model to control for weather. This approach is robust and included an analysis of more than 2,800 accounts that received smart thermostats through the program, and 700 nonparticipant accounts. The results of the billing analysis give an adjusted gross realization rate of 207 percent overall for smart thermostats.

It should be noted that although the 2018 adjusted *ex ante* savings (based on the billing analysis) were significantly greater than the original *ex ante* savings estimates, this increase was not claimed as allowed under the guidelines of SB 310. Instead, the lower savings numbers (the verified *ex ante* estimates that only accounted for minor discrepancies in installed quantities) were used as the *ex post* savings estimate.

Custom/Retrocommissioning

DP&L offered its Custom Program throughout the 2014-2018 period, and this program provides incentives for energy efficiency projects that involve measures where savings calculations are too complicated for simply assigning a prescriptive deemed value. Although this program included a variety of technologies and measure types, the majority of the projects for the 2014-2018 period are from lighting and HVAC projects.

Table 4 provides a summary of the custom projects sampled by Cadmus for review as part of the program impact evaluation. The savings for these projects were evaluated using a combination of desk reviews, onsite inspections, and metering, depending on the project and the year. Overall, the number of sites sampled and the evaluation approaches were found to be reasonable and appropriate.

Table 4: *Ex Ante*, Verified, and Adjusted Savings for Sampled Custom Projects

		Ex Ante		Verified *Ex Ante*		Adjusted *Ex Ante*	
Year	Qty	kW	kWh	kW	kWh	kW	kWh
2014	32	3,951	9,821,200	3,951	9,821,200	3,881	9,706,793
2015	23	2,126	16,483,813	2,126	16,483,813	2,029	16,561,765
2016	38	982.9	16,786,550	982.9	15,786,550	935.4	18,429,832
2017*	36	2,747.0	19,051,426	2,747.0	19,051,426	1,161.8	10,350,391
2018*	25	2,860.3	17,295,631	2,860.3	17,295,631	2,860.3	17,235,536

*The savings for 2017 and 2018 custom projects include the savings for the retrocommissioning projects.

DP&L began offering a retrocommissioning track within the Custom Program in 2017, where savings for upgrading or optimizing existing building control systems are identified through a site study. Savings values for individual customers and projects are then custom-calculated based on site-specific information. A total of eight projects were completed in 2017, five of which were included in the evaluation. An additional twelve were completed in 2018, five of which were included in the evaluation.

Table 5 summarizes the evaluation results for these projects.

Table 5: *Ex Ante*, Verified, and Adjusted Savings for Sampled Retrocommissioning

	Ex Ante		Verified *Ex Ante*		Adjusted *Ex Ante*	
Year	kW	kWh	kW	kWh	kW	kWh
2017	2.1	1,289,900	2.1	1,289,900	2.1	1,256,382
2018	110.0	3,795,712	110.0	3,795,712	110.0	3,735,616

The savings for the sampled retrocommissioning projects were evaluated using a review of the savings algorithms as well as through the inspection of site conditions to verify completion of the claimed retrocommissioning measures. The audit team found this approach to be reasonable, especially given the small amount of savings and limited number of projects. No retroactive adjustments to savings are recommended.

5 Conclusions and Recommendations

For this audit, Evergreen Economics and Michaels Energy reviewed DP&L's energy efficiency and demand reduction programs covering the 2014-2018 period. The audit process involved a thorough review of the annual reports and associated program evaluations that DP&L filed each year. DP&L provided additional program cost information as part of a data request made by the audit team. The audit team also interviewed members of DP&L staff to obtain additional contextual details about these programs.

Based on our review of these materials, we identified measures for a more in-depth savings review based on several factors, including the total amount of savings and the potential uncertainty surrounding the savings estimates. Specific measures identified for the in-depth review included:

- Residential lighting (LEDs)
- Commercial T8/LED replacements
- Smart thermostats
- VFDs
- Custom projects
- Retrocommissioning

We estimate that these measures accounted for over 60 percent of the total savings that DP&L claimed over the 2014-2018 period.

From the in-depth savings review, overall we found that the evaluation methods were sound and conformed to the regulatory requirements established for Ohio during the 2014-2018 period. While we have a few recommendations for changes to some savings values for future program years, the existing values are consistent with the rules that guide how energy savings are estimated in Ohio for this period. In many cases, the savings calculations rely on algorithms that are recommended in the Ohio TRM.

Retroactive Savings Adjustments

None.

Prospective Savings Adjustments

We recommend that future evaluations adopt the following:

1. **Use 10 years as the average expected life value for residential LEDs.** This value is consistent with the one recommended in the updated Ohio TRM and represents a significant increase from the 4.7-year average value estimated by Cadmus for

program year 2017. The current 2018 average measure life of 20 years is not reasonable given that the program is essentially unchanged from prior years.

2. **Future 'as found' baseline assumptions for residential LEDs should be adjusted to account for the high number of energy efficient bulbs distributed through the program.** Given that over 12,000,000 bulbs have been distributed in DP&L's service territory since 2011, the average efficiency for installed lamps will be improving over time. The baseline efficiency used to estimate average savings in the future needs to be adjusted to account for the higher number of existing LEDs in these households.
3. **Separate custom savings calculations should be done for VFDs installed on HVAC systems versus other process applications.** Given the operating differences, the impacts should be calculated separately for VFDs installed on HVAC systems versus those that are used in other process applications. The evaluation should also confirm that the VFDs are installed in eligible applications that adhere to the program requirements.

Appendix A: Detailed Annual Savings and Cost Tables

The following tables show the program costs and claimed savings by year for each DP&L program. All of the information for these tables was taken directly from the DP&L Annual Reports, or else supplied by DP&L in response to the data request made as part of this audit.

5.1 Program Year 2018

Table 6: DP&L Energy Efficiency Programs – Energy Impacts (2018)

Program Name	Budget	MWh Savings	Share of Total Savings
Residential Efficient Products	$3,223,155	40,791	20%
Residential HVAC Rebates	$1,243,023	6,681	3%
Residential Multifamily	$648,358	2,740	1%
Residential Smart Thermostats	$600,000	2,025	1%
Residential Appliance Recycling	$687,675	5,612	3%
Residential Energy Education Program	$385,988	3,565	2%
Residential Income Eligible Efficiency	$1,292,086	1,105	1%
Residential Behavior Change	$576,471	2,362	1%
Residential Energy Savings Kits	$399,662	3,698	2%
Non-Residential Prescriptive Rebates	$7,575,108	105,223	50%
Non-Residential Custom Rebates	$3,910,255	22,505	11%
Small Business Direct Install	$987,693	2,109	1%
Mercantile Self-Direct Program	$197,547	2,565	1%
Energy Special Improvement	$0	6,029	3%
Education and Marketing	$1,628,418	--	--
Pilot Program	$573,528	--	--
Stakeholder Initiatives	$645,000	--	--
Total	**$24,573,967**	**206,784**	

Table 7: DP&L Energy Efficiency Programs – MW Impacts (2018)

Program Name	MW Savings	Share of Total Savings
Residential Efficient Products	4.83	15.8%
Residential HVAC Rebates	1.31	4.3%
Residential Multifamily	0.27	0.9%
Residential Smart Thermostats	0.29	1%
Residential Appliance Recycling	1.12	3.7%
Residential Energy Education Program	0.22	0.7%
Residential Income Eligible Efficiency	0.15	0.5%
Residential Behavior Change	0.40	1.3%
Residential Energy Savings Kits	0.41	1.3%
Non-Residential Prescriptive Rebates	16.86	55.2%
Non-Residential Custom Rebates	3.79	12.4%
Small Business Direct Install	0.43	1.4%
Mercantile Self-Direct Program	0.32	1%
Energy Special Improvement	0.12	0.4%
Education and Marketing	--	--
Pilot Program	--	--
Stakeholder Initiatives	--	--
Total	**30.52**	

Evaluation Contractor: Cadmus

5.2 Program Year 2017

Table 8: DP&L Energy Efficiency Programs – Energy Impacts (2017)

Program Name	Budget	MWh Savings	Share of Total Savings
Residential Lighting	$2,772,789	43,777	22%
Residential HVAC Rebates	$2,784,246	7,422	4%
Residential Appliance Recycling	$1,089,656	8,003	4%
Residential School Education	$335,373	3,602	2%
Residential Low Income Affordability	$1,249,726	926	<1%
Non-Residential Prescriptive Rebates	$7,765,393	93,401	47%
Non-Residential Custom Rebates	$2,827,052	27,542	14%
Mercantile Self-Direct Program	$831,519	14,057	7%
Pilot Programs	$1,068,326	2,029	1%
T&D Infrastructure Improvements	$902,493	--	--
Total	**$21,626,573**	**200,759**	

Table 9: DP&L Energy Efficiency Programs MW Impacts (2017)

Program Name	MW Savings	Share of Total Savings
Residential Lighting	5.23	17.1%
Residential HVAC Rebates	1.59	5.2%
Residential Appliance Recycling	1.64	5.4%
Residential School Education	0.19	0.6%
Residential Low Income Affordability	0.13	0.4%
Non-Residential Prescriptive Rebates	14.56	47.6%
Non-Residential Custom Rebates	4.45	14.5%
Mercantile Self-Direct Program	2.40	7.8%
Pilot Programs	0.41	1.3%
T&D Infrastructure Improvements	--	--
Total	**30.60**	

Evaluation Contractor: Cadmus

5.3 Program Year 2016

Table 10: DP&L Energy Efficiency Programs – Energy Impacts (2016)

Program Name	Budget	MWh Savings	Share of Total Savings
Residential Lighting	$3,072,789	43,966	23%
Residential HVAC Rebates	$2,784,246	10,266	5%
Residential Appliance Recycling	$789,656	2,724	1%
Residential School Education	$335,373	3,440	2%
Residential Low Income Affordability	$1,249,726	1,389	1%
Non-Residential Prescriptive Rebates	$7,131,386	81,682	43%
Non-Residential Custom Rebates	$3,427,052	33,794	18%
Mercantile Self-Direct Program	$831,519	9,925	5%
Non-Res PJM DR Pilot	$34,007	--	--
Pilot Programs	$1,068,326	1,712	<1%
T&D Infrastructure Improvements	$902,493	--	--
Total	**$21,626,573**	**188,898**	

Table 11: DP&L Energy Efficiency Programs MW Impacts (2016)

Program Name	MW Savings	Share of Total Savings
Residential Lighting	5.25	20.8%
Residential HVAC Rebates	1.86	7.4%
Residential Appliance Recycling	0.59	2.3%
Residential School Education	0.21	0.8%
Residential Low Income Affordability	0.18	0.7%
Non-Residential Prescriptive Rebates	12.76	50.5%
Non-Residential Custom Rebates	3.40	13.5%
Mercantile Self-Direct Program	0.81	3.2%
Non-Res PJM DR Pilot	--	--
Pilot Programs	0.20	0.8%
T&D Infrastructure Improvements	--	--
Total	**25.26**	

Evaluation Contractor: Cadmus

5.4 Program Year 2015

Table 12: DP&L Energy Efficiency Programs – Energy Impacts (2015)

Program Name	Budget	MWh Savings	Share of Total Savings
Residential Lighting	$3,072,789	50,865	29%
Residential HVAC Rebates	$2,784,246	9,603	6%
Residential Appliance Recycling	$789,656	5,232	3%
Residential School Education	$335,373	4,204	2%
Residential Low Income Affordability	$1,249,726	1,536	1%
Non-Residential Prescriptive Rebates	$7,131,386	78,556	45%
Non-Residential Custom Rebates	$3,427,052	16,484	10%
Mercantile Customer Commitments	$831,519	3,736	2%
Non-Res PJM DR Pilot	$34,007	--	--
Pilot Programs	$1,068,326	2,550	1%
T&D Infrastructure Improvements	$902,493	--	--
Total	**$21,626,573**	**172,766**	

Table 13: DP&L Energy Efficiency Programs MW Impacts (2015)

Program Name	MW Savings	Share of Total Savings
Residential Lighting	6.09	24.1%
Residential HVAC Rebates	1.66	6.6%
Residential Appliance Recycling	0.82	3.2%
Residential School Education	0.29	1.1%
Residential Low Income Affordability	0.19	0.8%
Non-Residential Prescriptive Rebates	13.04	51.5%
Non-Residential Custom Rebates	2.12	8.4%
Mercantile Customer Commitments	0.58	2.3%
Non-Res PJM DR Pilot	--	--
Pilot Programs	0.52	2.1%
T&D Infrastructure Improvements	--	--
Total	**25.3**	

Evaluation Contractor: Cadmus

5.5 Program Year 2014

Table 14: DP&L Energy Efficiency Programs – Energy Impacts (2014)

Program Name	Budget	MWh Savings	Share of Total Savings
Residential Lighting	$3,577,528	67,760	37%
Residential HVAC Rebates	$2,674,843	8,004	4%
Residential Appliance Recycling	$695,488	5,084	3%
Residential School Education	$307,529	4,003	2%
Residential Low Income Affordability	$1,190,987	1,375	1%
Non-Residential Prescriptive Rebates	$7,102,257	71,765	39%
Non-Residential Custom Rebates	$2,980,151	18,975	10%
Mercantile Customer Commitments	$725,938	4,535	2%
Non-Res PJM DR Pilot	$36,671	--	--
Pilot Programs	$1,044,163	513	<1%
T&D Infrastructure Improvements	$843,451	--	--
Total	**$21,179,006**	**182,014**	

Table 15: DP&L Energy Efficiency Programs MW Impacts (2014)

Program Name	MW Savings	Share of Total Savings
Residential Lighting	8.11	25.9%
Residential HVAC Rebates	1.47	4.7%
Residential Appliance Recycling	0.79	2.5%
Residential School Education	0.27	0.9%
Residential Low Income Affordability	0.14	0.4%
Non-Residential Prescriptive Rebates	13.63	43.5%
Non-Residential Custom Rebates	5.33	17.0%
Mercantile Customer Commitments	1.38	4.4%
Non-Res PJM DR Pilot	--	--
Pilot Programs	0.19	0.6%
T&D Infrastructure Improvements	--	--
Total	**31.3**	

Evaluation Contractor: Cadmus

Summary: Report Independent Audit of Dayton Power & Light 2014-2018 Energy Efficiency and Demand Reduction Programs electronically filed by Kristin DuPree on behalf of PUCO Staff