

2017 Portfolio Status Report of the Energy Efficiency and Peak Demand Response Programs

VOLUME IV

APPENDICES J - K



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TABLE OF APPENDICES

- J. Self Direct Program Evaluation Report
- K. Business New Construction Program Evaluation Report

APPENDIX J



SELF DIRECT PROGRAM

2017 Evaluation Report

Prepared for:

AEP OHIO



A unit of American Electric Power

May 2, 2018

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TABLE OF CONTENTS

| | |
|---|------------|
| Executive Summary | iv |
| ES.1 Program Participation | iv |
| ES.2 Data Collection Activities | v |
| S.3 Key Impact Findings and Recommendations | vi |
| ES.4 Key Process Findings and Recommendations | vii |
| 1. Introduction and Purpose of Study | 1 |
| 1.1 Evaluation Objectives | 1 |
| 1.2 Evaluation Methods | 1 |
| 2. Methodology | 3 |
| 2.1 Overview of Approach | 3 |
| 2.2 Key Evaluation Questions | 4 |
| 2.3 Tracking Data Review | 4 |
| 2.4 Review of Marketing Activities | 4 |
| 2.5 Review of Participation | 4 |
| 2.6 Interviews with Program and Implementation Contractor Staff | 4 |
| 2.7 Methods Used to Analyze Impact Data | 5 |
| 2.7.1 Impact Sample of Project Files | 5 |
| 2.7.2 Ex Post Energy Savings Calculation | 5 |
| 2.7.3 Realization Rates Calculation Method | 6 |
| 2.8 Methods Used to Analyze Process Data | 6 |
| 3. Detailed Evaluation Findings | 7 |
| 3.1 Program Activity | 7 |
| 3.2 Impact Evaluation Findings | 11 |
| 3.2.1 Summary of Impact Findings | 11 |
| 3.2.2 Driving Factors of Realization Rate | 12 |
| 3.3 Process Evaluation Findings | 16 |
| 3.3.1 Marketing Efforts and Program Awareness | 17 |
| 3.3.2 Program Requirements | 20 |
| 3.3.3 Barriers to Participation | 20 |
| 3.3.4 Customer Enrollment Process | 21 |
| 3.3.5 Incentive Payment Process | 21 |
| 3.3.6 Program Tracking Data Review | 21 |
| 3.3.7 Verification and Due Diligence | 22 |
| 3.4 Cost Effectiveness Review | 22 |
| 4. Key Findings and Recommendations | 24 |
| 4.1 Key Impact Findings and Recommendations | 24 |
| 4.2 Key Process Findings and Recommendations | 25 |
| 4.3 Key Tracking System and Project File Findings and Recommendations | 26 |
| APPENDIX A. Program Manager Interview Guide | A-1 |
| AEP Ohio Program Manager Interview Guide | A-1 |

APPENDIX B. Implementation Contractor Interview Guide B-1

AEP Ohio Implementing Contractor Interview Guide..... B-1

LIST OF TABLES

| | |
|--|----|
| Table ES-1. Self Direct Summary, 2016 and 2017 Program Years | iv |
| Table ES-2. Self Direct 2017 Program Summary | iv |
| Table ES-3. 2017 Program Activity by Building Type | v |
| Table ES-4. Impact Sampling Strata and Achieved Sampling..... | vi |
| Table ES-5. Impact Savings, Realization Rate and Sample Precision..... | vi |
| Table 1-1. Summary of Data Collection Activities | 2 |
| Table 2-1. Impact Sampling Strata and Achieved Sampling | 5 |
| Table 3-1. Program <i>Ex Ante</i> Summary, 2016 and 2017 Program Years | 7 |
| Table 3-2. 2017 Program Activity by Economic Sector | 9 |
| Table 3-3. Impact Savings, Realization Rate and Precision of Sample | 12 |
| Table 3-4. Summary of 2017 Self Direct Program Materials | 18 |
| Table 3-5. Website Clicks | 20 |
| Table 3-6. Inputs to Cost-Effectiveness Model for the AEP Ohio Self Direct Program | 22 |
| Table 3-7. Cost Effectiveness Results for the Self Direct Program | 23 |

LIST OF FIGURES

| | |
|---|----|
| Figure 3-1. Percentage of Measures Installed by Electricity Savings (n=146) | 8 |
| Figure 3-2. Percentage of Measures Installed by Demand Reduction (n=146) | 8 |
| Figure 3-3. 2017 <i>Ex Ante</i> Electricity Savings – Percent by Building Type (n=63) | 10 |
| Figure 3-4. Cumulative Sum of Installed Energy Timeline..... | 11 |
| Figure 3-5. <i>Ex Ante</i> vs. <i>Ex Post</i> Energy Savings..... | 13 |
| Figure 3-6. <i>Ex Ante</i> vs. <i>Ex Post</i> Coincident Demand Reduction | 15 |

LIST OF EQUATIONS

| | |
|---|---|
| Equation 1. Realization Rates..... | 6 |
| Equation 2. Realization Rates Per Stratum | 6 |

EXECUTIVE SUMMARY

This report presents the results of the evaluation of the 2017 AEP Ohio Self Direct Program. The Executive Summary provides a high-level description of the program, key impact evaluation findings, and recommendations stemming from these findings. Detailed methodology and findings are contained in the body of the report following this Executive Summary.

The goal of the Self Direct Program is to educate AEP Ohio Mercantile customers on all of AEP Ohio's energy efficiency and peak demand reduction (EE/PDR) business sector programs and allow qualifying business customers to commit their already completed energy efficiency and summer peak demand reduction resources to AEP Ohio. The Self Direct Program incentives are intended to 'prime the market' for more energy efficiency projects by providing participants start-up funds to re-invest for their next project that qualifies for other AEP Ohio energy efficiency programs. The Self Direct Program is marketed, administered, and delivered by an implementation contractor in coordination with AEP Ohio.

ES.1 Program Participation

The 2017 program year represents the ninth year of operation for the Self Direct Program and the sixth year in which Navigant has evaluated its operation. In 2017, 63 projects were completed compared to 73 projects in 2016. Overall, the number of projects is similar to previous years, while energy savings is much lower. In 2017, *ex ante* electricity savings decreased by almost 70 percent compared to 2016 (Table ES-1), additionally the program saved half of the electric energy savings target (Table ES-2).

Table ES-1. Self Direct Summary, 2016 and 2017 Program Years

| | 2017 Program | 2016 Program |
|---------------------------------------|--------------|--------------|
| Total Incremental Participant Cost | \$3,308,868 | \$6,874,975 |
| Amount of Incentives Paid by AEP Ohio | \$302,538 | \$959,857 |
| <i>Ex Ante</i> Energy Savings (MWh) | 6,533 | 22,472 |
| <i>Ex Ante</i> Demand Savings (MW) | 0.866 | 3.04 |

NOTE: Total Incremental Participant Cost is calculated by subtracting Total Incentives from Total Project Costs.

Table ES-2. Self Direct 2017 Program Summary

| | 2017 Program Goals | 2017 Program, Reported |
|-------------------------------------|--------------------|------------------------|
| Program Budget | \$800,000 | \$807,221 |
| <i>Ex Ante</i> Energy Savings (MWh) | 13,227 | 6,533 |
| <i>Ex Ante</i> Demand Savings (MW) | 1.858 | 0.866 |

The Self Direct Program had three measures providing the majority of the savings – lighting, variable frequency drives (VFDs) and heating, ventilation, air conditioning (HVAC). Lighting measures provided 44 percent of the energy and demand savings.

As in past years, most projects completed in 2017 were from industrial/manufacturing buildings (Table ES-3). Thirteen other building types participated in the program, accounting for more than 70 percent of projects completed.

Table ES-3. 2017 Program Activity by Building Type

| Economic Sector | Project Count | | Ex Ante Energy Savings (kWh/yr) | | Ex Ante Demand Savings (kWh/yr) | |
|--------------------------|---------------|-------------|---------------------------------|---------------|---------------------------------|---------------|
| Assembly | 2 | 3.2% | 27,616 | 0.4% | 5.8 | 0.7% |
| College/University | 2 | 3.2% | 76,310 | 1.2% | 12.6 | 1.5% |
| Conditioned Warehouse | 1 | 1.6% | 42,548 | 0.7% | 8.8 | 1.0% |
| Government/Municipal | 6 | 9.5% | 507,297 | 7.8% | 88.2 | 10.2% |
| Grocery | 4 | 6.3% | 169,776 | 2.6% | 4.1 | 0.5% |
| Hotel/Motel | 2 | 3.2% | 48,943 | 0.7% | 21.8 | 2.5% |
| Industrial/Manufacturing | 18 | 28.6% | 4,484,691 | 68.6% | 424.1 | 48.9% |
| Large Retail/Service | 2 | 3.2% | 63,319 | 1.0% | 8.7 | 1.0% |
| Medical/Hospital | 1 | 1.6% | 259,687 | 4.0% | 176.0 | 20.3% |
| Miscellaneous | 2 | 3.2% | 382,717 | 5.9% | 62.9 | 7.3% |
| Restaurant | 2 | 3.2% | 104,661 | 1.6% | 17.9 | 2.1% |
| School | 7 | 11.1% | 53,770 | 0.8% | 6.6 | 0.8% |
| Small Retail/Service | 13 | 20.6% | 291,069 | 4.5% | 26.0 | 3.0% |
| Unconditioned Warehouse | 1 | 1.6% | 21,089 | 0.3% | 3.0 | 0.3% |
| Total | 63 | 100% | 6,533,494 | 100.0% | 866.5 | 100.0% |

Note: Totals may not sum due to rounding.

ES.2 Data Collection Activities

As part of the impact study, the evaluation team completed an engineering review on project files accounting for 63 percent of the claimed *ex ante* energy savings. Projects accounting for 34 percent of the *ex ante* energy savings also underwent an onsite review. Table ES-4 provides an illustration of the impact measurement and verification (M&V) sample stratification and the level of review completed by the evaluation team within each stratum.

Table ES-4. Impact Sampling Strata and Achieved Sampling

| Stratum by Approach and Energy Savings | Number of Buildings | Strata weight by Energy | Number of Desk Reviews | Number of Onsite Reviews ¹ | Relative Precision For Energy | Relative Precision for Demand |
|--|---------------------|-------------------------|------------------------|---------------------------------------|-------------------------------|-------------------------------|
| Large (>750 MWh/yr) | 2 | 2,302,871 | 2 | 1 | - | - |
| Medium (>100 MWh/yr, <750 MWh/yr) | 11 | 2,823,421 | 8 | 3 | 0.04 | 0.09 |
| Small (<100 MWh/yr) | 50 | 1,407,202 | 6 | 1 | 0.46 | 0.49 |
| Total or Value | 63 | 6,533,494 | 16 | 5 | 0.10 | 0.12 |

S.3 Key Impact Findings and Recommendations

The *ex post* energy and summer coincident demand savings are 6,362 MWh/year and 0.85 MW respectively. As summarized in Table ES-5, the *ex post* savings fell short of the 2017 goals of 13.227 GWh and 1.86 MW coincident summer peak demand reduction. The realization rate for energy is 0.97, while the demand realization rate is 0.98.

Table ES-5. Impact Savings, Realization Rate and Sample Precision

| Metric | 2017 Program Goals (a) | Ex Ante (b) | Ex Post (c) | Realization Rate RR = (c) / (b) | Percent of Goal = (c) / (a) | Relative Precision |
|--|------------------------|-------------|-------------|------------------------------------|--------------------------------|--------------------|
| Annual Energy Savings (MWh) | 13,227 | 6,533 | 6,362 | 0.97 | 48% | 10.16% |
| Coincident Summer Peak Demand Reduction (MW) | 1.86 | 0.87 | 0.85 | 0.98 | 46% | 12.22% |

Source: Volume 1: 2017 To 2019 Energy Efficiency/Peak Demand Reduction (EE/PDR) Action Plan, June 15, 2016.

Following are other key impact findings and recommendations. These impact recommendations are also included in Section 4.1 (Key Impact Findings and Recommendations).

Impact Finding 1: Multiple mistakes were found in the *ex ante* calculations pertaining to the onsite post claimed hours of use.

Impact Recommendation 1a: Incorporate a means of project quality control (QC) that addresses operational schedule that can be verified with the project site prior to submitting calculations. This will avoid submitting documents with potential HOU inconsistencies. For instance, lighting measures with large savings should be verified with a light logger. Less critical operational schedules should be verified with a walk through and asking questions about each space type.

¹ Onsite reviews are a subset of desk reviews. All buildings in the sample received at least a desk review, while some received an onsite review in addition to the desk review. If a building received both an onsite and a desk review, it is counted in both the onsite and desk review totals.

Where schedules cannot be better verified, use a consistent deemed hours approach that addresses building type and space type.

Impact Finding 2: Multiple mistakes were found in the *ex ante* calculations pertaining to the onsite post equipment quantities and sizes.

Impact Recommendation 2a: Incorporate a means of project quality control (QC) that addresses equipment quantities and sizes, specifically for HVAC equipment such as VFDs or motors. These items can be verified with the project site prior to submitting calculations. This will avoid submitting documents with potential equipment inconsistencies. Use invoices and visual inspections as tools to verify quantity and sizes. Do a desk review of model numbers to verify sizes.

Impact Recommendation 2b: For projects that include onsite verification include a clear onsite report that highlights any equipment visually verified that contradicts other project file documents.

Impact Finding 3: The level of detail pertaining to *ex ante* calculations was ambiguous and unclear as to what was driving savings values. Multiple projects lacked key details regarding either the baseline or the efficiency measure.

Impact Recommendation 3a: Ensure submitted calculations are presented in a clear and concise manner that plainly identify all calculations steps, highlighting the main drivers for savings.

Impact Recommendation 3b: Consider requiring a project calculations summary where calculation steps are summarized in words. This step would offer dual benefits as calculations would be more easily presented, and any issues or oddities within the *ex ante* calculations would be captured and communicated.

ES.4 Key Process Findings and Recommendations

The following process recommendations are offered to help improve program effectiveness and efficiency, and further improve the overall experience of program participants. Additional process recommendations are included in section Key Process Findings and Recommendations 4.2).

Process Finding 1: Program tracking data analysis suggests there is room for improvement in the role the Self Direct Program plays as a feeder for the Efficient Products for Business and Process Efficiency Programs. Of the 63 completed projects, 33, or 49 percent had previously participated in other AEP Ohio projects.

Process Recommendation 1: Survey customers who have participated in Self Direct and other programs to understand why they are continuing to participate in Self Direct.

Process Finding 2: The streamlined application process involves another implementation contractor who manages a separate tracking database from the main implementation contractor.

Process Recommendation 2: Require all dates from both contractors' flow through to the final tracking database.

1. INTRODUCTION AND PURPOSE OF STUDY

The Self Direct Program allows qualifying business customers to commit their already completed energy efficiency and peak demand reduction resources to AEP Ohio. AEP Ohio accepts projects on a case-by-case basis, and each must be approved by the Public Utility Commission of Ohio through a special arrangement. Business customers are eligible if they meet one of the following criteria:

- The customer has energy consumption greater than 700,000 kWh per year from AEP Ohio, or
- The customer is part of a national account involving multiple facilities in one or more states.

Submitted projects must have an installation date within three years of the date of acceptance into the program. Each project is required to produce verifiable and persistent energy savings and/or peak demand reduction for at least five years from the date of installation. Projects are also required to have a payback period between one and seven years without the incentive applied, and pass cost-effectiveness tests determined by AEP Ohio.

The goal of the Self Direct Program is to educate qualifying business customers on all of AEP Ohio's business sector programs. Self-Direct incentives are designed to 'prime the market' for more energy efficiency projects by providing participants start-up funds to re-invest in future projects outside of the Self Direct Program.

1.1 Evaluation Objectives

This report presents the findings from the impact and process evaluations of the AEP Ohio Self Direct Program for 2017. The three major objectives of the evaluation were to:

- 1) Quantify energy and summer peak demand savings impacts at the meter from the program during 2017.
- 2) Determine key process-related program strengths and weaknesses and identify ways in which the program can be improved.
- 3) Determine program cost-effectiveness.

Specific process evaluation questions are summarized in Section 2.2 (Key Evaluation Questions) and Section 3.3 (Process Evaluation Findings).

1.2 Evaluation Methods

Program impacts for the 2017 Self Direct Program were evaluated in terms of electric energy and summer peak demand savings. A portion of the completed project population was sampled with the goal of achieving 90 percent confidence and a +/- 10 percent precision for both the program energy and demand savings.

The *ex post* energy and demand savings of the sampled projects were determined by engineering review of the project files, engineering review of the *ex ante* savings analysis, inspection of the building energy models and/or site verification of the installed components of the energy efficiency measures designed for

the subject buildings. Coincident summer peak savings are determined by engineering analysis of the savings potential during the peak period or by adjusting demand savings with a published coincidence factor for summer peak demand.

Data collection activities are summarized in Table 1-1. During the 2017 program evaluation, Navigant interviewed staff from AEP Ohio and the implementation contractors; reviewed program materials; and reviewed strategy documents to gain an understanding of program logic, expected inputs, outputs, and outcomes for the program.

Table 1-1. Summary of Data Collection Activities

| Data Collection Type | Targeted Population | Supported Evaluation Activities |
|---------------------------------|---|---------------------------------|
| Review of Program Documentation | Program documentation and marketing materials for 2017 program. | Process Evaluation |
| Secondary Literature Review | Publicly-available evaluations of other utility Self Direct programs. | Impact and Process Evaluation |
| In-depth Telephone Interviews | AEP Ohio Program staff | Process Evaluation |
| | Implementer staff | Process Evaluation |
| Project File Review | Sample of completed projects | Impact Evaluation |
| Telephone Verification | Where project files were incomplete | Impact Evaluation |
| Onsite Verification | Where uncertainties in the savings calculations existed | Impact Evaluation |
| Tracking Data Review | All program participants | Impact and Process Evaluation |

2. METHODOLOGY

This section describes the methodology used to conduct the process and impact evaluations. A high-level overview of the steps taken to collect and analyze the data for this evaluation is described in Section 2.1. This is followed by a discussion of the research questions that guided the evaluation and the tasks completed as part of the process evaluation; including the review of tracking data, the marketing activities and participation. Finally, the methods used for primary data collection tasks and in analyzing the impact and process data are discussed.

2.1 Overview of Approach

The evaluation was driven by three overarching objectives: (1) quantify electric energy and coincident summer demand savings impacts from the 2017 program year, (2) determine key process-related program strengths and weaknesses and identify ways in which the program can be improved, and (3) determine program cost-effectiveness. To meet these objectives, the evaluation team undertook the following activities.

- 1) **Evaluation Questions.** Established key evaluation questions as part of developing the 2017 Evaluation Plan with AEP Ohio staff.
- 2) **Tracking Data Review.** Reviewed the program tracking data collected by the implementation contractor and provided to the evaluation team by AEP Ohio.
- 3) **Review of Marketing Activities.** Reviewed the overall marketing activities and approach as implemented by the implementation contractor.
- 4) **Review of Participation.** Reviewed program participation by building type, program path, completion date, and geographic location.
- 5) **Primary Data Collection.** Performed primary data collection, including in-depth interviews with program staff and the implementation team, a file review for a randomly-selected sample of projects, and onsite verification for a subset of the sampled projects.
- 6) **Methods Used to Analyze Impact Data.** Navigant quantified energy and coincident summer peak demand reduction savings by reviewing project files. File reviews included verifying engineering calculations. Telephone verifications were conducted if clarifications from the project files were needed to complete the analysis. Telephone verifications included clarifications of the project scope, determination of incremental cost, quantifying operation hours, requests for missing files or drawings, and any other clarification needed to accurately determine the impact of the project.

Where uncertainties still existed in the savings calculations, onsite visits were conducted. Onsite visits included verification of equipment specifications and quantities, collection of energy management system data, and metering of equipment.

- 7) **Methods Used to Analyze Process Data.** Navigant assessed the effectiveness of the program processes by analyzing program documents, the results of in-depth interviews with program staff at AEP Ohio as well as the implementation contractors, and conducted a review of program tracking data.

2.2 Key Evaluation Questions

Navigant worked with AEP Ohio to identify many key evaluation questions regarding the 2017 Self Direct Program. The evaluation was driven by three overarching objectives: 1) quantify electric energy and coincident summer peak demand savings impacts from the 2017 program year, 2) determine program cost effectiveness, and 3) determine key process-related program strengths and weaknesses and identify ways in which the program can be improved. In addition, the Navigant team explored the following questions specific to the Self Direct Program:

1. How effective has the program been at channeling customers to future participation in the other AEP Ohio Business programs for energy efficiency?
2. How many customers have participated in the Self Direct Program multiple times instead of transitioning to the other business programs?

2.3 Tracking Data Review

Program tracking data is critical for determining the impacts of the Self Direct Program. A copy of the program tracking data collected by the implementation contractors was provided by AEP Ohio to the evaluation team. The evaluation team reviewed all fields recorded on the application forms and key data fields in the database were reviewed to identify missing, incomplete, or inconsistent data. The data collected was also reviewed to identify any additional information that would be helpful in evaluating program performance. The evaluation team did not assess whether the tracking system was adequate for regulatory prudence reviews or corporate requirements.

2.4 Review of Marketing Activities

Marketing collateral, application forms and other materials available from the AEP Ohio website were reviewed by the evaluation team. Additional marketing materials were requested from AEP Ohio and the implementation contractors. Information on marketing, communications and outreach efforts was also obtained from both AEP Ohio and the implementation contractors.

2.5 Review of Participation

The evaluation team used the program tracking data to analyze program participation by several key factors including but not limited to economic sector and completion date. The analysis focused on metrics such as number of participants and impact results. The results of this analysis are presented, in part, in the discussion of program activity in Section 3.

2.6 Interviews with Program and Implementation Contractor Staff

In-depth qualitative interviews were completed with AEP Ohio and the implementation contractor staff. The purpose of these interviews was to understand how the program worked and how it was marketed for 2017. Discussion guides were developed allowing a structured but open-ended interview and provided to AEP Ohio for review. A free-flowing discussion resulted between interviewer and respondent. Staff experienced in program evaluations were used to perform the interviews. Interviews were conducted by telephone to provide flexibility to the respondents' schedules.

2.7 Methods Used to Analyze Impact Data

Through a review of the tracking data, the evaluation team divided the completed projects into three strata based on *ex ante* energy savings. A random sample was selected from each stratum to be reviewed by the evaluation team. Desk reviews were conducted on all sampled projects, including engineering calculations of energy savings claims and verification of baseline and as-built assumptions. Where the project files were incomplete, telephone verifications were conducted. Telephone verification consisted of a conversation with the site representative most familiar with the project details. The site representative was asked about the project scope and missing information was requested. Additionally, if uncertainties in the savings calculation existed, a site visit was conducted. Site visits inspected equipment specifications and quantities, verified hours of operation, collected energy management system data and/or metered systems where required, and answered any outstanding questions. The results of the verification of the sampled projects were statistically applied to the entire population of projects to determine *ex post* savings.

2.7.1 Impact Sample of Project Files

The evaluation team sorted the projects from largest to smallest *ex ante* kWh savings and placed these into strata, attempting to achieve a relatively even distribution of cumulative standard deviation in electric energy savings between strata and minimize overall sample size. This approach resulted in a total sample of 16 buildings to be selected for engineering review. Navigant completed desk reviews on a sample comprising 63 percent of the reported program MWh savings. Table 2-1 provides an illustration of the impact measurement and verification (M&V) sample stratification and the level of review complete by the evaluation team within each stratum.

Table 2-1. Impact Sampling Strata and Achieved Sampling

| Stratum by Approach and Energy Savings | Number of Buildings | Strata Weight by Energy | Number of Desk Reviews | Number of Onsite Reviews ² | Relative Precision For Energy | Relative Precision for Demand |
|--|---------------------|-------------------------|------------------------|---------------------------------------|-------------------------------|-------------------------------|
| Large (> 750 MWh/yr) | 2 | 2,302,871 | 2 | 1 | - | - |
| Medium (> 100 MWh/yr, < 750 MWh/yr) | 11 | 2,823,421 | 8 | 3 | 0.04 | 0.09 |
| Small (< 100 MWh/yr) | 50 | 1,407,202 | 6 | 1 | 0.46 | 0.49 |
| Total or Value | 63 | 6,533,494 | 16 | 5 | 0.10 | 0.12 |

2.7.2 Ex Post Energy Savings Calculation

Navigant requested project-specific documentation for each of the 16 sampled projects from the implementation contractor, and conducted a detailed technical review of each. The assessment included a review of the tracking databases, customer applications, invoices, and equipment specifications.

² Onsite reviews are a subset of desk reviews. All buildings in the sample received at least a desk review, while some received an onsite review in addition to the desk review. If a building received both an onsite and a desk review it is counted in both the onsite and desk review totals.

Adjustments were made to project-specific savings wherever project documentation clearly showed different values from the database, or where obvious calculation mistakes were present.

Ex post savings were calculated by employing a custom engineering approach to each individual project. Additional metered data was obtained onsite for projects that were either large in stratum, documentation was insufficient, or the project was complex in nature. Energy savings calculations were conducted in accordance with the 2016 Appendix A - AEP Ohio Prescriptive Measures Protocols, the 2010 Draft Ohio Technical Reference Manuals (Draft TRM), or other published methodologies, such as regional TRM's and accepted engineering approaches, as appropriate. Building energy code, which is referenced as the baseline in many of these Self Direct projects, is defined by the State of Ohio.

2.7.3 Realization Rates Calculation Method

Realization rates for each stratum were calculated with the following Equation 1:

Equation 1. Realization Rates

$$RR = \frac{\sum_{sampled} E_{ex-post}}{\sum_{sampled} E_{ex-ante}}$$

Where:

E = the electric energy savings or peak demand reduction for each project in the stratum

Realization rates in each stratum were applied to the project population of that stratum with the following Equation 2:

Equation 2. Realization Rates Per Stratum

$$E_{i,ex-post} = RR_{stratum} * E_{i,ex-ante}$$

2.8 Methods Used to Analyze Process Data

The purpose of the process evaluation is to assess the effect of the program structure and program implementation on program performance and customer satisfaction. The evaluation team's process efforts help to provide insights and recommendations to support the continued success of the Self Direct program. The process activities for 2017 were relatively limited as there were no significant program changes between the 2016 and 2017 program years.

The main activity of the 2017 process evaluation for the Self Direct Program was interviews with key program and implementation contractor staff. In-depth qualitative interviews were completed with program managers and implementation contractor staff using interview guides designed to allow an open-ended discussion of key issues with respect to program operation, outreach and interactions with participants, and the challenges faced during 2017.

3. DETAILED EVALUATION FINDINGS

The following section includes evaluation findings from both the process and impact evaluation of the Self Direct Program.

3.1 Program Activity

The 2017 program year represents the ninth year of operation for the Self Direct Program. In 2017, AEP Ohio completed 63 projects which is similar to the number of projects completed in 2016 (73 projects). Program spending was close to goal, while the *ex ante* energy savings were half of the program goal.

Total 2017 *ex ante* electricity savings reported for the program amounted to 6,533 MWh (Table 3-1), compared to 22,472 MWh in 2016. The *ex-ante* demand reduction totaled 0.87 MW, compared to 3.04 MW in 2016. The total amount of incentives issued in 2017 decreased to \$302,538 compared to \$959,857 in 2016. While the program saw a decrease in energy and demand savings in 2017, the decrease was proportional to the decline in incentives.

Table 3-1. Program *Ex Ante* Summary, 2016 and 2017 Program Years

| | 2017 Program | 2016 Program |
|---|--------------|--------------|
| Total Incremental Participant Cost | \$3,308,868 | \$6,874,975 |
| Amount of Incentives | \$302,538 | \$959,857 |
| <i>Ex Ante</i> Energy Savings Reported to Program (MWh) | 6,533 | 22,472 |
| <i>Ex Ante</i> Demand Savings Reported to Program (MW) | 0.87 | 3.04 |

The Self Direct Program had three measures providing the majority of the savings – lighting, heating, ventilation, air conditioning (HVAC) and “other” measures. Lighting measures provided over 40 percent of the energy and demand savings, as shown in Figure 3-1 and Figure 3-2. “Other” measures provided 23 percent of the energy savings, while HVAC measures provided 32 percent of the summer peak demand savings. There exists a variety of measure end uses within the program, which is favorable given that there is no control over project measures submitted to the Self Direct Program. In the instance where project measures were denoted as “Custom”, the measure category was assigned based on the measure subcategory.

Figure 3-1. Percentage of Measures Installed by Electricity Savings (n=146)

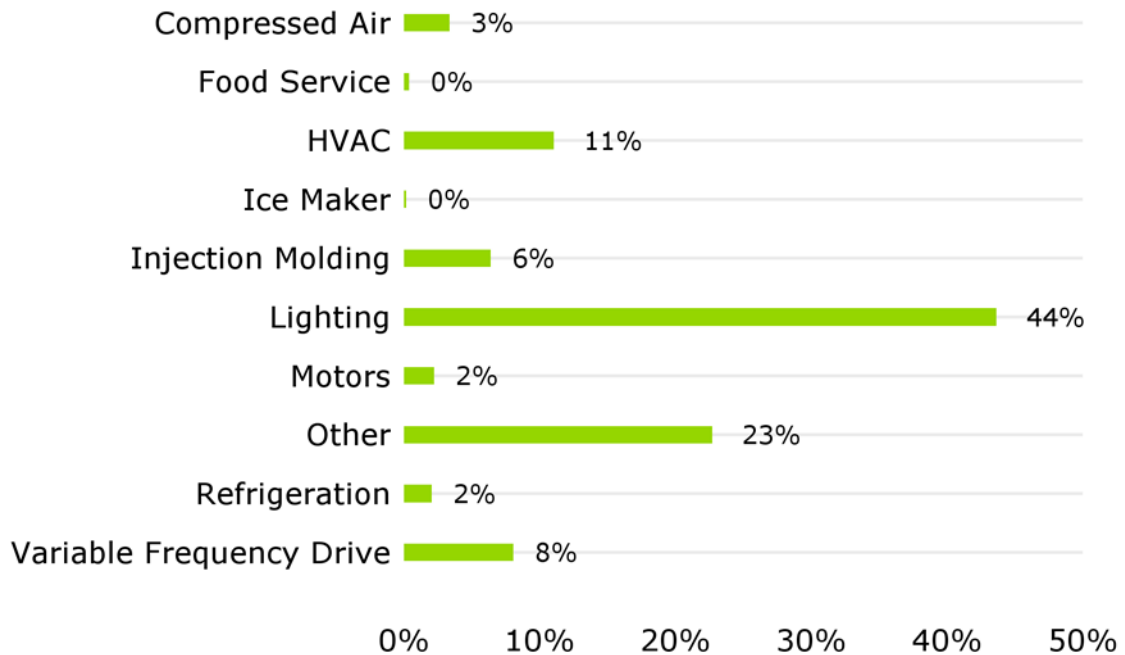


Figure 3-2. Percentage of Measures Installed by Demand Reduction (n=146)

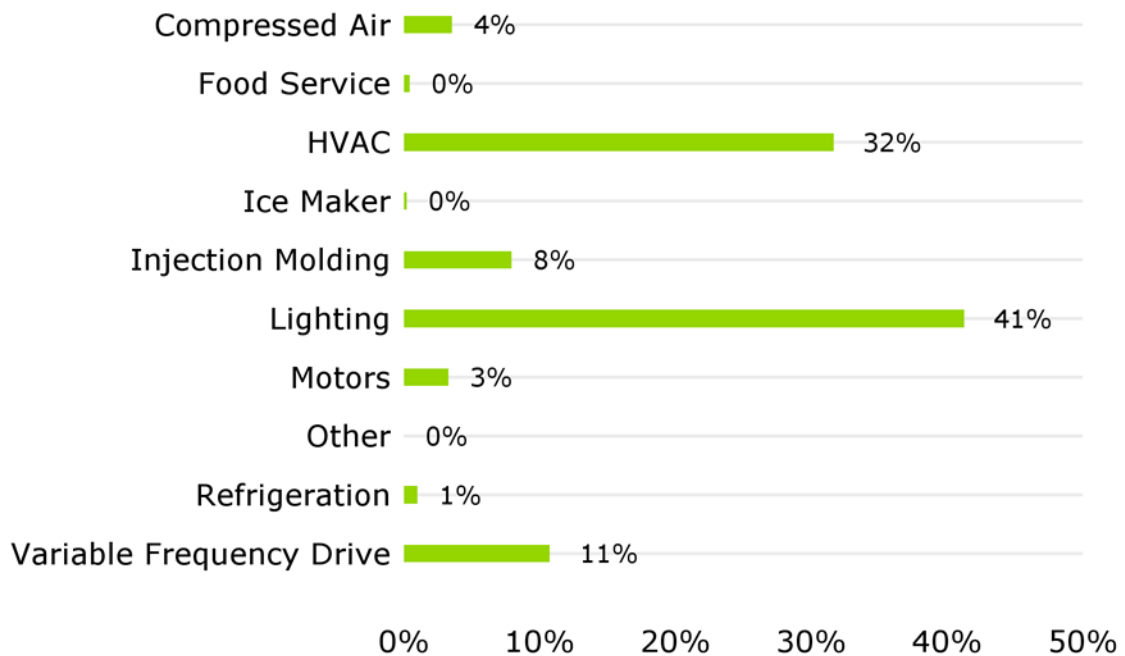


Table 3-2 and Figure 3-3 show the number of projects and savings by economic sector, based on information reported in the tracking database. In 2017, most energy savings came from industrial/manufacturing facilities (69%), which is similar to 2016 (65%).

Table 3-2. 2017 Program Activity by Economic Sector

| Economic Sector | Project Count | | Ex Ante Energy Savings (kWh/yr) | | Ex Ante Demand Savings (kWh/yr) | |
|--------------------------|---------------|-------------|---------------------------------|---------------|---------------------------------|---------------|
| Assembly | 2 | 3.2% | 27,616 | 0.4% | 5.8 | 0.7% |
| College/University | 2 | 3.2% | 76,310 | 1.2% | 12.6 | 1.5% |
| Conditioned Warehouse | 1 | 1.6% | 42,548 | 0.7% | 8.8 | 1.0% |
| Government/Municipal | 6 | 9.5% | 507,297 | 7.8% | 88.2 | 10.2% |
| Grocery | 4 | 6.3% | 169,776 | 2.6% | 4.1 | 0.5% |
| Hotel/Motel | 2 | 3.2% | 48,943 | 0.7% | 21.8 | 2.5% |
| Industrial/Manufacturing | 18 | 28.6% | 4,484,691 | 68.6% | 424.1 | 48.9% |
| Large Retail/Service | 2 | 3.2% | 63,319 | 1.0% | 8.7 | 1.0% |
| Medical/Hospital | 1 | 1.6% | 259,687 | 4.0% | 176.0 | 20.3% |
| Miscellaneous | 2 | 3.2% | 382,717 | 5.9% | 62.9 | 7.3% |
| Restaurant | 2 | 3.2% | 104,661 | 1.6% | 17.9 | 2.1% |
| School | 7 | 11.1% | 53,770 | 0.8% | 6.6 | 0.8% |
| Small Retail/Service | 13 | 20.6% | 291,069 | 4.5% | 26.0 | 3.0% |
| Unconditioned Warehouse | 1 | 1.6% | 21,089 | 0.3% | 3.0 | 0.3% |
| Total | 63 | 100% | 6,533,494 | 100.0% | 866.5 | 100.0% |

Note: Totals may not sum due to rounding

Figure 3-3. 2017 *Ex Ante* Electricity Savings – Percent by Building Type (n=63)

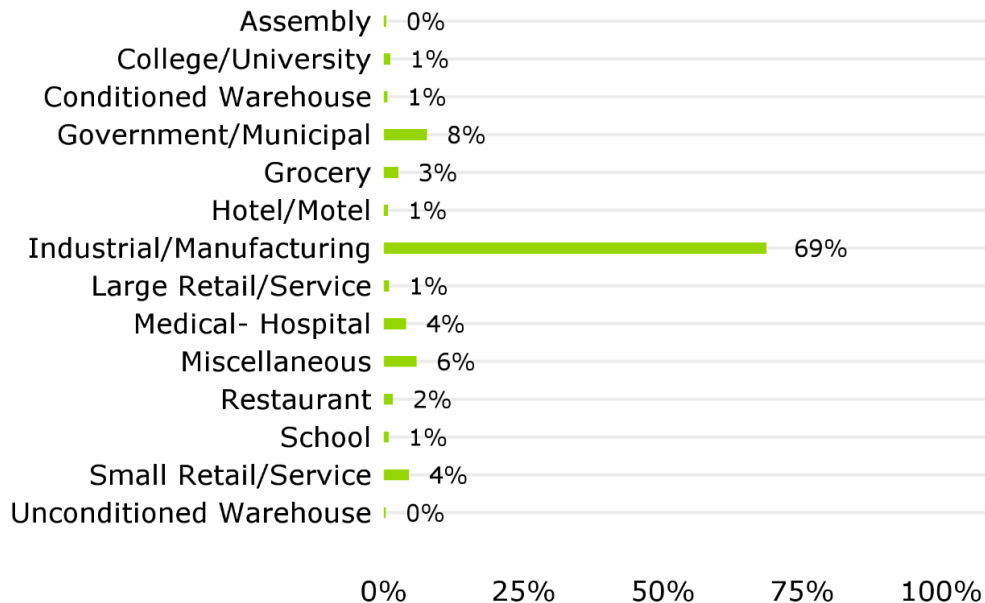
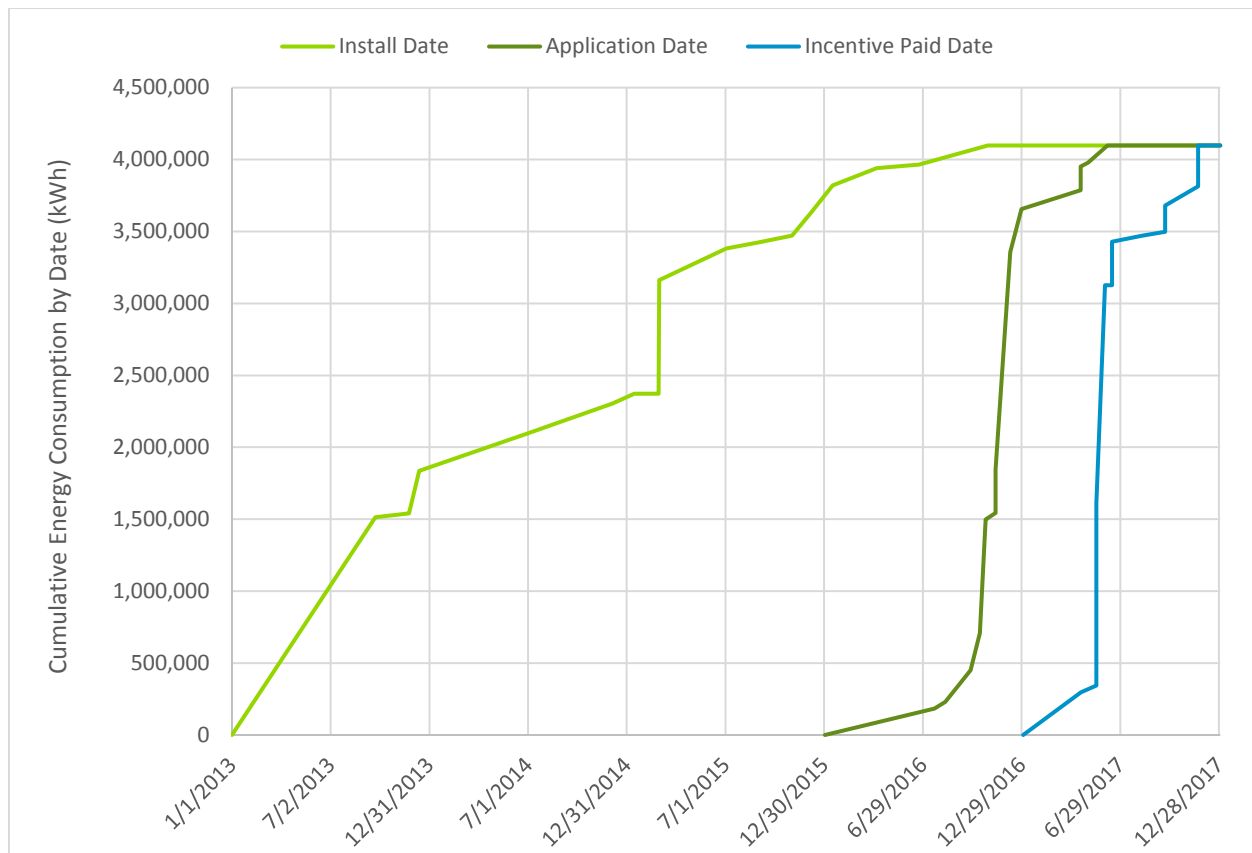


Figure 3-4 depicts a cumulative sum total of installed energy (kWh) within the program sample with respect to three different dates for each of the sampled projects: 1) when the energy efficiency measure occurred (Install Date), 2) when the project was enrolled in the program (Application Date), and 3) when the Self Direct projects were finalized (Incentive Paid Date). This timeline shows the delay from initial projects completion through involvement with the Self Direct Program. The time delay spanning the initial submission of the application to the payment of the program incentive follows a relatively stable trend of approximately six months. This duration is not overly excessive in terms of turnaround time within the program, however it could prove beneficial to analyze the elapsed time from when the documentation was in hand to when the project was paid to further determine how long projects take to process for this program.

Figure 3-4. Cumulative Sum of Installed Energy Timeline



3.2 Impact Evaluation Findings

This section includes a summary and discussion of the evaluation-calculated electrical energy and peak demand savings for the 2017 Self Direct Program. Annual electricity savings were calculated using the data collected through document reviews and field visits for the sample of sites.

3.2.1 Summary of Impact Findings

The *ex post* energy and coincident summer demand annual savings for 2017 are 6,362 MWh and 0.85 MW respectively. This result is significantly smaller than the historical *ex post* program savings and falls short the 2017 goal of 13,227 MWh savings and 1.86 MW coincident demand reduction. The realization rate for energy savings was 0.97, while the demand savings realization rate was 0.98. These results are shown in Table 3-3 and represent decreased program savings relative to 2016.

Table 3-3. Impact Savings, Realization Rate and Precision of Sample

| Metric | 2017 Program Goals* (a) | Ex Ante (b) | Ex Post (c) | Realization Rate RR = (c) / (b) | Percent of Goal = (c) / (a) | Relative Precision |
|--|----------------------------------|-------------------|-------------------|---------------------------------------|-----------------------------------|-----------------------|
| Annual Energy Savings (MWh) | 13,227 | 6,533 | 6,362 | 0.97 | 48% | 10.16% |
| Coincident Summer Peak Reduction (MW) | 1.86 | 0.87 | 0.85 | 0.98 | 46% | 12.22% |

Overall, there were fewer occurrences of issues in 2017 than in 2016 regarding project documentation, *ex ante* calculations, and onsite verifications. Most of the issues pertain to either verified conditions on site that did not match claimed assumptions within the *ex ante* calculations. Care should be taken to verify all *ex ante* calculations match current operating conditions. Additionally, *ex ante* calculations should be checked for clarity to ensure the way claimed savings values are computed are being shared in a clear and concise manner.

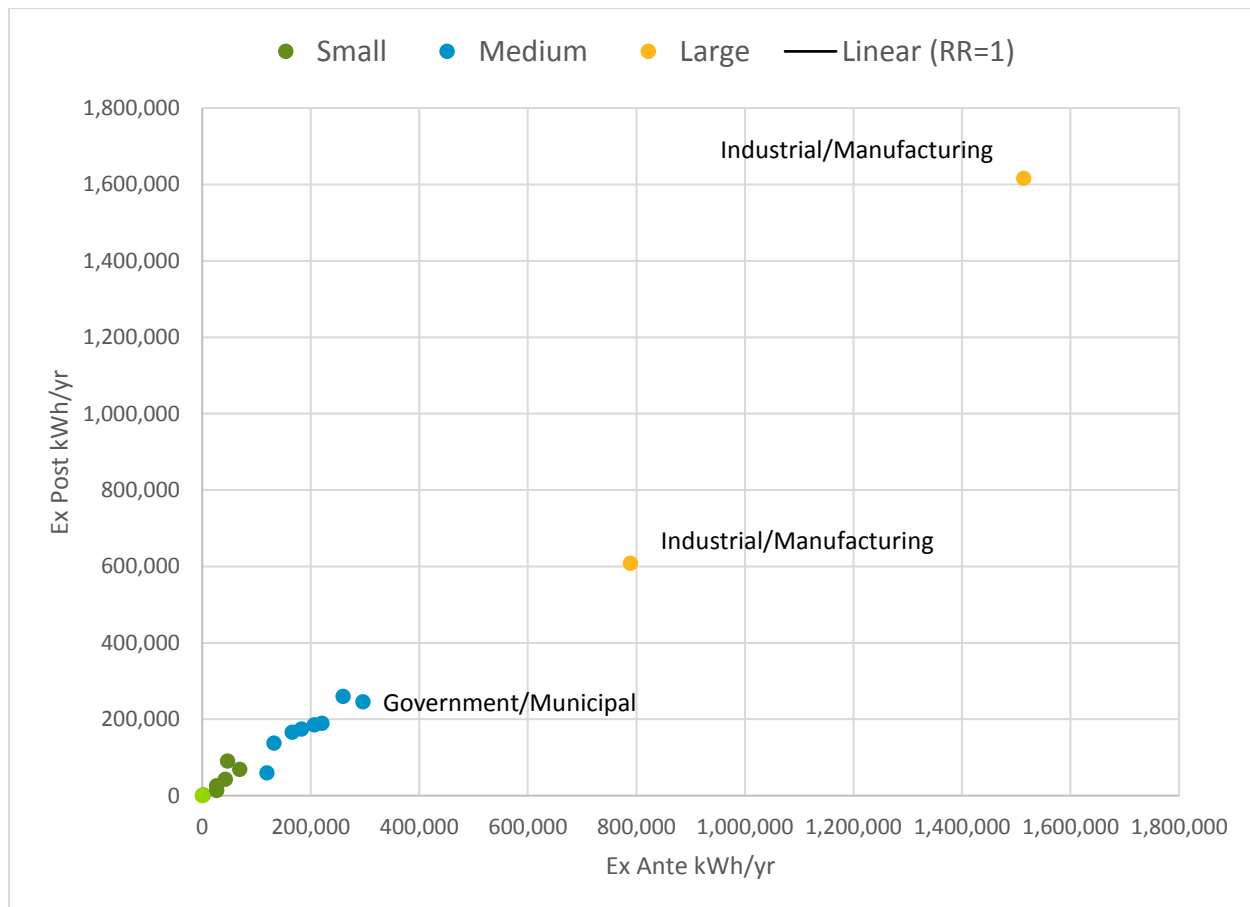
3.2.2 Driving Factors of Realization Rate

Data analysis revealed certain factors are driving the realization rate between claimed savings and verified savings.

3.2.2.1 Energy Considerations

Figure 3-5 is a graphical representation of the building level *ex ante* versus *ex post* energy savings grouped by sample strata. The diagonal line represents the goal of a realization rate of one. Points above and to the left of the RR=1 line represent buildings with energy realization rates above one, while those points below and to the right are building with realization rates less than one. The most significant outliers, though outliers are relatively non-significant in the 2017 program analysis, are labeled with their respective building types.

Figure 3-5. *Ex Ante* vs. *Ex Post* Energy Savings



The largest project in terms of energy savings was an industrial/manufacturing facility, which is called out in Figure 3-5 and involved process efficiency improvements and a new cooling tower. While the *ex ante* calculations for this project were acceptable, two small adjustments were made for the *ex post* calculations. Firstly, the *ex ante* formulae rounded EUI, which was unnecessary, so this rounding was removed. Secondly, the EUI calculation “pre” case included both 2012 and 2013 data, but since the project was conducted towards the beginning of 2013, only 2012 was used for the “pre” case of the *ex post* calculations.

The second largest project in terms of energy savings was another industrial/manufacturing facility, which is called out in Figure 3-5 and involved a lighting efficiency upgrade with a few thousand bulbs. The main driver behind the low energy realization rate for this project was that the *ex ante* calculations did not use the correct TRM, EISA-adjusted baseline. The *ex post* calculations used a binned baseline in lieu of a single baseline for the given bulb wattage.

The third largest notable energy realization rate difference was a government/municipal facility, which is called out in Figure 3-5 and involved a data center efficiency upgrade with multiple computer room air conditioner units (CRACs). There were three air-cooled CRACs cooling the uninterruptible power supply (UPS) units and three glycol-cooled CRACs cooling servers along with other existing CRAC units in the IT room. The realization rate is 0.83 on energy. Despite the realization rates being reasonably close to unity,

there were several counteracting corrections made to the savings calculations and it is fortunate the realization rate is not further degraded.

- Both the air cooled CRACs and the Glycol cooled CRACs were supposed to be operating with water-side economizers. The air cooled CRACs did not have economizers installed and the water cooled CRACs, while equipped with water-side economizers, were not operating in economizer mode even when the outside temperature was well below opportunities for economization. This resulted in dramatic cuts to the savings calculations for the compressor energy.
- The *ex ante* project files correctly noted only one of the air-cooled CRACs was running to cool the UPS room. For the three glycol-cooled CRACs, two were supposed to be running while Navigant found only one running with the other two simply circulating air and consuming fan power. This effect was essentially negated with the metered results of the one operational glycol-cooled CRAC loaded twice as much as the spot readings used in the project files.
- The Navigant metered air-cooled CRAC was found to be loaded more than twice as much as the project files indicated, which resulted in increased savings since the baseline load was also adjusted upwards.
- The fan power baseline on all CRAC units relied on an ASHRAE 90.1 baseline that was not intended for CRAC units, and did not apply an appropriate load factor to the fan motor. Navigant utilized the same California data center baseline that it uses for projects in the AEP Ohio Data Center program. This eroded approximately a quarter of the fan savings.
- The project files treated the ASHRAE 90.1 CRAC sensible coefficient of performance (SCOP) as if it only applies to the CRAC compressor, while in fact the 90.1 SCOP applies to all energy consuming equipment including outdoor compressors and glycol pumps. By adjusting for these factors, the compressor savings was increased approximately 20 percent.

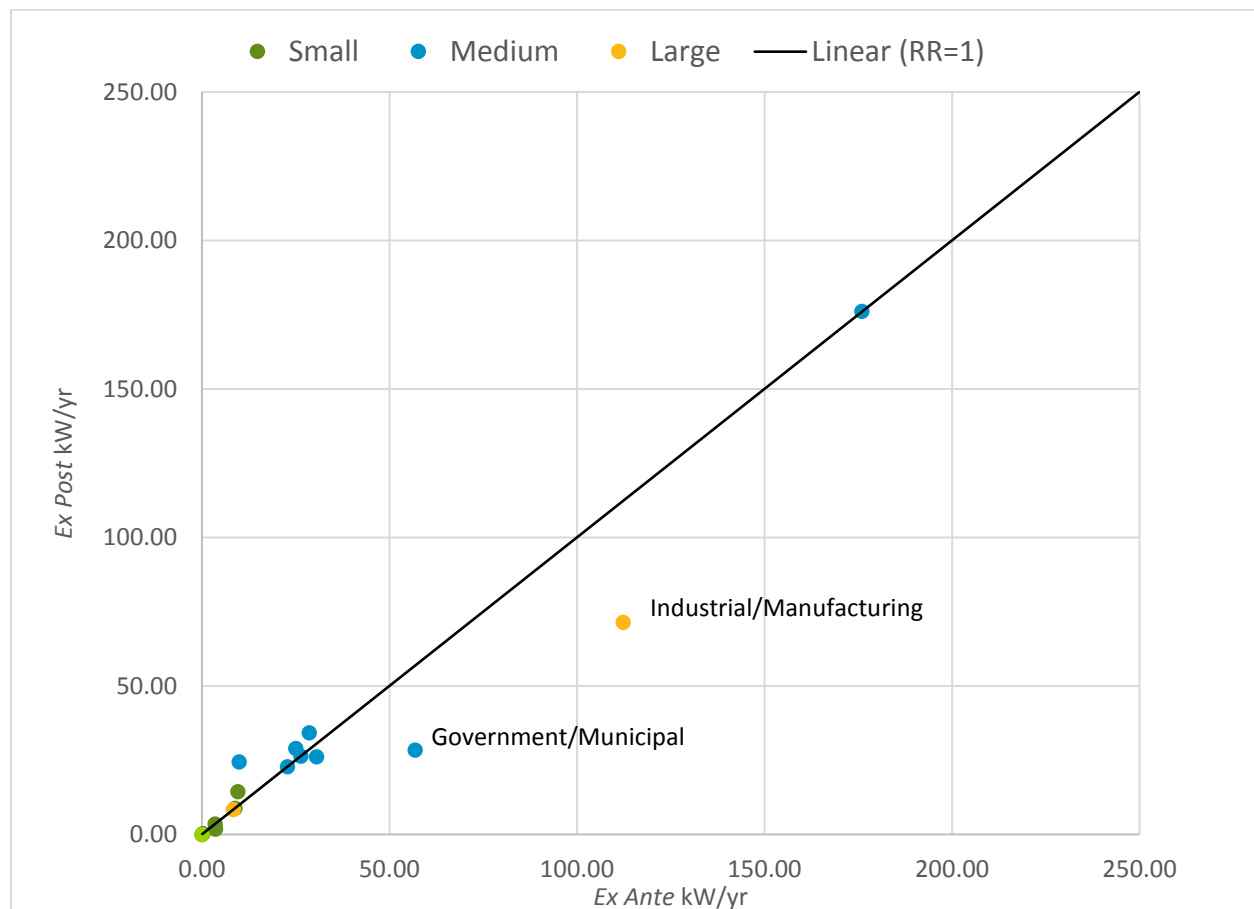
Other energy realization rate discrepancies, while smaller in magnitude, were found in the program evaluation. These discrepancies included the following list:

- A lighting project was initially evaluated based on deemed values instead of utilizing known energy parameters for a more rigorous analysis. This more rigorous analysis yielded a higher energy realization rate of 1.94.
- Two variable frequency drive projects that were found to have differing equipment capacities than in the project documentation, and metered data found the hours of use to be much higher than the deemed HOU. These factors resulted in energy realization rates of 0.50 and 0.90.
- A compressed air project that used the equipment's maximum flow rate for the savings calculations in lieu of the system's actual flow rate resulting in a slightly lower realization rate of 0.86.
- A continuously operating custom VFD project that utilized 1 week of metered data extrapolated to 50 weeks for annual consumption in lieu of 52 weeks resulting in a slightly higher realization rate of 1.04.
- An injection molding machine project was adjusted based on metered data resulting in a slight decrease in energy savings and yielded an energy realization rate of 0.95.
- An HVAC project claiming to replace a single chiller with two of similar capacity without reasoning in the documentation, which resulted in a low energy realization rate of 0.50.

3.2.2.2 Demand Considerations

Similar to the energy savings analysis, the discussion of coincident summer peak demand reduction starts by analyzing Figure 3-6, which is a graphical representation of the building level *ex ante* versus *ex post* coincident demand findings. The diagonal line represents the goal of a realization rate of one. Points above and to the left of the RR=1 line represent buildings with demand realization rates above one, while those points below and to the right are buildings with realization rates less than one. The most significant outliers, though outliers are relatively non-significant in the 2017 program analysis, are labeled with their respective building types.

Figure 3-6. Ex Ante vs. Ex Post Coincident Demand Reduction



The second largest project in terms of demand savings was an industrial/manufacturing facility, which is called out in Figure 3-6 and involved a lighting efficiency upgrade with a few thousand bulbs. The main driver behind the low energy realization rate for this project was that the *ex ante* calculations did not use the correct TRM, EISA-adjusted baseline. The *ex post* calculations used a binned baseline in lieu of a single baseline for the given bulb wattage. The resulting demand realization rate for this project is 0.64, which pulls down the realization rate for the entire program because it was the second largest project in terms of coincident summer peak demand.

The third largest project in terms of demand savings was a government/municipal facility, which is called out in Figure 3-6 and involved a chiller replacement. This project identified two chillers replacing a singular chiller of similar capacity. The lack of project documentation and the lack of responsiveness from the customer through the process of reaching out for a phone interview warranted an assumption that the two chillers were installed in a lead/lag configuration, leading to an overall realization rate of 50 percent.

Other demand realization rate discrepancies, while smaller in magnitude, were found in the program evaluation. These discrepancies included the following list:

- *Ex ante* demand savings for a data center were not calculated at the utility peak period. Savings was only calculated at 92.5 F outside temperature while the peak period spans 60 to 89 F in TMY3 data for Columbus, OH. Navigant adjusted using percent of utility peak time spent at each temperature.
- A lighting project was initially evaluated based on deemed values instead of utilizing known energy parameters for a more rigorous analysis. This more rigorous analysis yielded a higher demand realization rate of 1.51.
- Two variable frequency drive projects that were found to have differing equipment capacities than in the project documentation, and metered data found that demand usage varied on multiple cases from the project documentation, resulting in demand realization rates of 0.50 and 1.21.
- A compressed air project that used the equipment's maximum flow rate for the savings calculations in lieu of the system's actual flow rate resulting in a slightly lower realization rate of 0.86.
- An injection molding machine project was adjusted based on metered data resulting in a large increase in demand savings and yielded a demand realization rate of 2.46.

3.3 Process Evaluation Findings

The Self Direct Program did not meet the 2017 energy savings goals. The program is not marketed aggressively and serves as an introduction to customers who implement energy efficiency measures on their own and find out about AEP Ohio's EE programs after project implementation. The purpose of the Self Direct incentive is to encourage the customer to continue their efficiency efforts through participation in other AEP Ohio energy efficiency programs. In 2017, 33 participants had previously participated in other AEP Ohio programs. As in previous years, the primary participating building type was industrial/manufacturing, driven primarily by one Solution Provider.

The program implementer modified application processing in 2017. Prior to 2017, customers could submit applications to two different implementers. In 2017, the application submission process was streamlined to go through a single implementer. According to program staff, this change has significantly reduced the time to have a complete application ready for review. Due to this change in the process flow, key dates which are tracked by the implementer need to flow through to the AEP Ohio tracking data to properly quantify the participant incentive application time.

The 2017 Self Direct Program process evaluation included detailed interviews with AEP Ohio program and marketing coordinators and the implementation contractor. Additionally, Navigant interviewed implementer staff, in their role as overall outreach coordinator and manager of the central application inbox for the majority of AEP Ohio's C&I programs. Program tracking databases were analyzed to identify

implementation trends and data quality. No participant surveys were conducted for the 2017 process evaluation.

The remainder of this section presents these findings from the 2017 process evaluation in more detail, including:

- Marketing Efforts and Program Awareness
- Program Requirements
- Barriers to Participation
- Customers Enrollment Process
- Incentive Payment Process
- Program Tracking Data Review
- Verification and Due Diligence

3.3.1 Marketing Efforts and Program Awareness

Customers can learn about the Self Direct Program from the AEP Ohio website. The website layout changed in 2016, offering consolidation with navigation and an Energy Advisor page to help customers find contact information. The implementer reported customers are more satisfied with the changes made to the website layout. However, program staff reported not knowing how many customers learn of the program from the website. All customers are assigned an Energy Advisor. Typically, the Energy Advisors try to arrange a face-to-face meeting introducing all the programs available to the customer. The Energy Advisor walks the customer through the types of rebates available for their business type and steps them through the application process. The Energy Advisor asks to see the facility and, in many cases, do a walk-through which helps to identify additional energy saving opportunities. In addition to one-on-one outreach efforts, the implementation contractor is participating in trade shows to connect with customers.

3.3.1.1 Program Material

Navigant reviewed program materials provided by AEP Ohio including program management documentation, such as procedure manuals and customer facing documents including the application forms and promotional materials. A summary of documents reviewed is provided in Table 3-4.

Table 3-4. Summary of 2017 Self Direct Program Materials

| Document | Description |
|--|--|
| 2017 Application Specifications | 20-page pdf |
| Efficient Products for Business, Process Efficiency and Self-Direct program application 2018 | 22-page program application for 3 programs |
| 2017 Self Direct Fact Sheet | Single page customer facing messaging |
| Self Direct Program Terms & Conditions and Final Payment Agreement | 5-page T&C document available through electronic link on application |
| Implementer 2017 AEP Ohio Quality Plan | 64-page Word document |
| Website | Self Direct page |

AEP Ohio offers extensive customer- facing program materials. In its review, Navigant found some of the materials instructed participants to read and complete voluminous forms designed more for a contractor. For a customer new to AEP Ohio's offerings, these marketing materials, specifically documents related to the application for the Self Direct program may be confusing. The following provides insight to this finding:

- **2017 Application Specifications:** Navigant is not clear how the Application Specifications document relates to the actual Application. The Application includes tables with size categories and efficiency requirements that are not included in the Application Specifications (e.g., HVAC, Motors and Drives). While the document title references three programs, the document does not clearly articulate how measure specifications relate to each program.
 - For example, the measure specifications can be assumed to be for all three programs, until the reader gets to the Process Efficiency specifications on page 18 and finds that "Projects that are NOT eligible for a Process Efficiency incentive include: Projects eligible for Efficient Products for Business". Only by way of deduction can one assume that measures on pages 3-16 are for Efficient Products.
- **Efficient Products for Business, Process Efficiency, and Self Direct program application 2018:**
 - The application does not differentiate between the programs, explain which is which, or why a customer would choose one over another anywhere in the documentation. It is not clear to the uninitiated reader what part of the form is applicable to which of the three programs.
 - There is a link to the Application Specifications document on the technology pages. The application does not indicate what information is there, why a customer should go there, or indicate in the guidelines that they should.
 - Submission due date on the Application (11/16/2018) is inconsistent with the Terms and Conditions document (12/31/2018).
 - Self Direct incentive tiering is not explained, other than a footnote (page 5), "*Self Direct incentives are 75% of Total Requested Incentive, after 50% of the project cost threshold and tiering is applied.*" Footnote (page 5) does not explicitly tell the reader how incentives are calculated, references a program not described in the application, and are not

consistent with the Self Direct tiering incentive maximums, *“Incentives have a threshold of 50% of the project cost and total incentives paid to a threshold of \$25,000 and Bid4Efficiency above that.”*

- **Self Direct Fact Sheet:** Primary messaging is designed to encourage project completion, rather than acknowledge that Self Direct projects are already completed. “We can help you set up your project, which should provide verifiable, persistent savings and peak demand reduction for at least five years from installation date.” The term ‘set up’ implies the start of a project, when the program is designed to capture completed projects. The fact sheet mixes messaging for technical application support with program energy reduction requirements.
- **Implementer 2017 AEP Ohio Quality Plan:** While this document is not a customer facing piece, it clearly provides detailed specifications, calculations, application processing procedures, eligibility requirements and incentives for eligible technologies and measures in addition to application policies and procedures for Efficient Products, Process Efficiency, and Self Direct that guides implementation efforts. The document is well written and there are no improvements recommended at this time.
- **Website³:** The evaluation team understands the implementation team provides significant technical assistance to clarify the project. This is contradicted by the website, which directs customers to first complete a complicated 22-page form referencing a 20-page specifications document and 5-page terms and conditions. Site visits and technical assistance are not referenced on the web page.

The key message is confusing and does not accurately represent the program benefits:

“The Self Direct Program rewards qualifying customers who submit previous projects through one of two energy efficiency credit options

1. *An energy efficiency credit payment of 75% of the calculated incentive amount for energy savings under the Prescriptive or Custom Program; or*
2. *An exemption from the Energy Efficiency/Peak Demand Reduction (EE/PDR) rider for a specified number of months.”*

The evaluation team understands the program intent as: ‘recognize customers who have made energy efficiency improvements over the last 3 years by providing retroactive incentives.’

The energy efficiency program options referenced are not explained in the Self Direct documentation:

- Program names (Prescriptive and Custom) are not consistent with current program names (Efficient Products for Business and Process Efficiency)
- Neither the Commercial New Construction or Data Center program are referenced as applicable options for the Self Direct program

The website does not include key program documents, for example the Application Specification and Self Direct Fact Sheet are not provided. Additionally, the project eligibility date is incorrect: *“Submitted projects must be installed between January 1, 2013 and the date of acceptance into*

³ <https://aepohio.com/save/business/programs/SelfDirectProgram.aspx>

the program.” In 2017, it should have read January 1, 2014, in 2018 (when the website was reviewed) it should read January 1, 2015.

Overall, customer facing documentation does not promote the benefits of customer participation (either financial due to energy savings nor technical assistance from AEP Ohio). Additionally, the Self Direct program could not be easily located through the AEP Ohio website with clicks from the AEP Ohio homepage. Customers need to know what they are looking for to locate the program web page. The site does not provide customers with a matrix or map of the available programs, or which one might best meet their needs. Navigating the website, after 5 clicks customers must choose from a combined list of 17 technologies or programs (Table 3-5).

Table 3-5. Website Clicks

| Action | Landing Page |
|---|--|
| Go to AEP Home Page | https://www.aepohio.com/ |
| Click “Save Energy” | https://www.aepohio.com/save/residential/ “Rebates & Savings Programs” (NOTE: This is a residential page) |
| Click “Rebates and Savings Programs” | https://www.aepohio.com/save/residential/programs/ “Incentive Programs For Residents” |
| Click “Business” | https://www.aepohio.com/save/business/ Business Savings Incentive Programs |
| Click “Energy Savings Programs” | https://www.aepohio.com/save/business/programs/ Energy Saving Programs |
| Click “Program List” | https://www.aepohio.com/save/business/programs/PrescriptiveProgram.aspx Efficient Products for Business |
| Click “Self-Direct Program” (from list of 17 programs) | https://www.aepohio.com/save/business/programs/SelfDirectProgram.aspx Self-Direct Incentive Program |

3.3.2 Program Requirements

No program requirements were changed in 2017.

3.3.3 Barriers to Participation

According to AEP Ohio program staff, from a customer’s standpoint, the barrier to installing energy efficient equipment is the ability to make a good argument at the correct time to get it into the customer’s budgeting process. Also, some customers need help and resources to write a detailed Request for Bid and then call for bids so they can get a decent price. The implementation contractor reported hearing

customers say, “I am too busy.” The Energy Advisor is designed to take the work off the customer’s plate and mitigate the time constraint barrier.

3.3.4 Customer Enrollment Process

Navigant reviewed the customer enrollment process, including the application forms; processes followed by the implementation contractor in reviewing and approving applications; the time required for review and approval of applications; and the approval review processes. The evaluation team found there is a streamlined enrollment process requiring all applications to flow through one point of contact. According to program staff, this change has improved application processing time.

The program staff now spot checks the supporting documentation to ensure required information is included in the application to prevent back and forth revisions and to speed up the process. According to program staff, this has improved and expedited the customer experience because there is not as many required revisions to complete the application. The program staff offers a concierge service (engineers) which aids the customer in identifying the estimated energy and financial savings of proposed measures. In addition, the concierge engineers are available to answer energy efficiency technical questions. This offering is typically useful for large manufacturing customers who have not done much energy efficiency in the past or when they need help identifying projects.

3.3.5 Incentive Payment Process

Funds for each program year are reserved on a project-by-project basis as applications are received. Applications are then monitored as these proceed through the application steps to verify these are progressing as expected. If projects are delayed, particularly between program years, monies reserved for a particular project may be freed up. In 2017, Solution Providers mentioned they have regular meetings with program staff to discuss the progress of projects enrolled in the program.

The average amount of time between Final Application Date Received and Payment Mailed Date was 206 days (the minimum at 110 days and maximum at 552 days). The average difference between Payment Approved Date and Payment Mailed Date was 130 days (the minimum is 77 days and maximum is 263 days).

3.3.6 Program Tracking Data Review

The program tracking database is used to record all information from program applications and to track the progress of applications through the process.

Customer information is populated for all projects. Only one customer phone number was left blank. For Contractors, however, there is more information missing. Twenty-nine percent of contractor business names are “not provided” and 37 percent of contractor emails are left blank.

Key measure level details are filled in 100 percent. Important dates, such as final application date received, actual project completion date, payment approved date is all filled in completely. Where a post-inspection was required, a date was filled in.

While the evaluation team notes some fields were not fully populated for all applications, our overall assessment is the tracking database is reasonable and accurately reflects the status of program applications. However, the evaluator did not address whether the tracking system is adequate for regulatory prudency reviews or corporate requirements.

3.3.7 Verification and Due Diligence

There are two levels of due diligence carried out as part of the program. The first level is the administrative element, ensuring information submitted to the program is processed accurately and recorded in the project tracking database as previously discussed. The second process is the engineering review of applications to ensure savings for a project are calculated correctly and result in the appropriate level of incentive for the customer, and verification inspections carried out by the implementation contractor to confirm measures have been implemented.

No significant disputes were reported to have occurred during 2017. While the evaluation may determine a level of savings that differs from the applicant's initial estimate, these differences have generally represented differences in engineering judgement and have been resolved without issue. In most instances, program staff and solution providers indicated differences arose from legitimate differences in engineering opinion on how to estimate savings or represent an efficiency change in the building energy model. While such disputes have not been significant to-date, Navigant continues to recommend consideration be given to developing a formal process to provide a framework in case such disputes arise in future.

Navigant has met regularly with the implementation contractor to discuss issues relating to how projects will be evaluated in terms of their energy and demand savings. Feedback from the implementation contractor has indicated this communication has been helpful in avoiding misunderstandings related to the approach used in the impact evaluation, particularly with respect to more complex or unusual projects under the custom stream.

3.4 Cost Effectiveness Review

This section addresses the cost effectiveness of the Self Direct Program. Cost effectiveness is assessed using the Total Resource Cost (TRC) test. Table 3-6 summarizes the unique inputs used in the TRC test.

Table 3-6. Inputs to Cost-Effectiveness Model for the AEP Ohio Self Direct Program

| Item | Input |
|--------------------------------------|-----------|
| Measure Life | 14 |
| Projects | 63 |
| Ex Post Annual Energy Savings (kWh) | 6,362,391 |
| Ex Post Coincident Peak Savings (kW) | 849 |
| Third Party Implementation Costs | \$447,979 |
| Utility Administration Costs | \$56,704 |
| Utility Incentive Costs | \$302,538 |

| | |
|------------------------------|-------------|
| Incremental Participant Cost | \$3,308,868 |
|------------------------------|-------------|

Based on these inputs, the TRC ratio is 0.8 and does not pass the TRC test. Table 3-7 summarizes the results of the cost-effectiveness tests. Results are presented for the Total Resource Cost test, the Participant Cost Test, the Ratepayer Impact Measure Test, and the Utility Cost Test.

Table 3-7. Cost Effectiveness Results for the Self Direct Program

| Benefit-Cost Tests | Benefit/Cost Ratio |
|--------------------------|--------------------|
| Total Resource Cost | 0.8 |
| Participant Cost Test | 1.3 |
| Ratepayer Impact Measure | 0.6 |
| Utility Cost Test | 3.7 |

At this time, additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

4. KEY FINDINGS AND RECOMMENDATIONS

This section presents the key findings and recommendations from the 2017 Self Direct program impact and process evaluations.

4.1 Key Impact Findings and Recommendations

These recommendations from the evaluation team are specific to decreasing variability between the *ex ante* and *ex post* calculations and streamlining the impact verification.

Impact Finding 1: Multiple mistakes were found in the *ex ante* calculations pertaining to the onsite post claimed hours of use.

Impact Recommendation 1a: Incorporate a means of project quality control (QC) that addresses operational schedule that can be verified with the project site prior to submitting calculations. This will avoid submitting documents with potential HOU inconsistencies. For instance, lighting measures with large savings should be verified with a light logger. Less critical operational schedules should be verified with a walk through and asking questions about each space type. Where schedules cannot be better verified, use a consistent deemed hours approach that addresses building type and space type.

Impact Finding 2: Multiple mistakes were found in the *ex ante* calculations pertaining to the onsite post equipment quantities and sizes.

Impact Recommendation 2a: Incorporate a means of project quality control (QC) that addresses equipment quantities and sizes, specifically for HVAC equipment such as VFDs or motors, which can be verified with the project site prior to submitting calculations. This will avoid submitting documents with potential equipment inconsistencies. Use invoices and visual inspections as tools to verify quantity and sizes. Do a desk review of model numbers to verify sizes.

Impact Recommendation 2b: For projects that include onsite verification include a clear onsite report that highlights any equipment visually verified that contradicts other project file documents.

Impact Finding 3: The level of detail pertaining to *ex ante* calculations was ambiguous and unclear as to what was driving savings values. Multiple projects lacked key details regarding either the baseline or the efficiency measure.

Impact Recommendation 3a: Ensure submitted calculations are presented in a clear and concise manner that plainly identify all calculations steps, highlighting the main drivers for savings.

Impact Recommendation 3b: Consider requiring a project calculations summary where calculation steps are summarized in words. This step would offer dual benefits as calculations would be more easily presented, and any issues or oddities within the *ex ante* calculations would be captured and communicated.

4.2 Key Process Findings and Recommendations

The following process recommendations are offered to help improve program effectiveness and efficiency and further improve participant's experience of the program.

Process Finding 1: Program tracking data analysis suggests there is room for improvement in the role the Self Direct Program plays as a feeder for other business efficiency programs. Of the 63 completed projects, 33, or 52 percent had previously participated in other AEP Ohio projects.

Process Recommendation 1a: Survey customers who have participated in Self Direct and other programs to understand why they are continuing to participate in Self Direct.

Process Recommendation 1b: Further facilitate participation by doing a full audit of large participants scoping out potential projects. Assist with the application and follow up on leads periodically (once per quarter).

Process Finding 2: Most program savings continue to come from the industrial/manufacturing market.

Process Recommendation 2a: Consider offering an audit service to large customers in business sectors AEP Ohio would like to strategically enroll. Targeted customers should have not participated in any of the business program offerings for the last few years. The audit can be seeking projects for both Self Direct and other programs. By enrolling them in Self Direct it may encourage further participation in other programs.

Process Recommendation 2b: Encourage Energy Advisors from other programs to be looking for Self Direct projects when visiting a large customer, especially if the customer has not participated in one of the efficiency programs for several years.

Process Finding 3: Many projects were submitted by one Solution Provider.

Process Recommendation 3: Consider engaging solution providers from markets that are underserved.

Process Finding 4: The intake contractor and the implementation contractor maintain separate databases and not all information is passed from one tracking database to the other.

Process Recommendation 4: Require all dates from both contractors' flow through to the final tracking database that is maintained by the implementation contractor.

Process Finding 5: Program staff do not fully monitor the effectiveness of the website. The number of participants who learn of the program from the website versus a Solution Provider or Energy Advisor is not known.

Process Recommendation 5: Solutions include conducting a participant survey or reviewing web traffic to each of the tiered home pages for AEP Ohio, Business offerings, and the Self Direct home pages.

Process Finding 6: The average amount of time between Final Application Date Received and Payment Mailed Date was 206 days (the minimum at 110 days and maximum at 552 days). The average difference between Payment Approved Date and Payment Mailed Date was 130 days (the minimum is 77 days and maximum is 263 days).

Process Recommendation 6: Develop a system to track time elapsed between when all needed information is 1) received 2) processed and 3) payment made to ensure the timeframe is reasonable.

4.3 Key Tracking System and Project File Findings and Recommendations

With respect to the Project Tracking Database and Project Files, Navigant offers the following observations and recommendations for improved clarity and tracking.

Tracking System Finding 1: In reviewing the tracking database, Navigant found some fields were not completed for all applicants. About a third of contractor business names and contractor emails are missing, as well as square footage.

Tracking System Recommendation 1: As part of the administrative review of applications, add a check to ensure information for fields, such as incentive payment amount, contractor business name and contractor email, are complete and are entered into the database.

APPENDIX A. PROGRAM MANAGER INTERVIEW GUIDE

AEP Ohio Program Manager Interview Guide

Name of Interviewee:

Date:

Title:

Company:

Contact Information:

[Note to Interviewer] The Interview Guide is a tool to guide process evaluation interviews with utility staff and implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program's design and operation, i.e., where they have significant experiences for meaningful responses. The interviews will be audio taped and transcribed. Interviews in every case will be conducted by Navigant's process evaluation lead for the program to ensure full context and understanding for the interview, and to enable the interviewer to probe for the most meaningful questions and responses.

Roles and Responsibilities

1. Can you describe your roles and responsibilities and how they've changed over the last year for the Self Direct Program?
2. When considering the implementation contractor and AEP Ohio staff job functions, have there have been any substantial changes in the roles or people assigned to these programs in the past year compared to previous program years? If so, what were they?
3. How often do you meet with the implementation contractor(s) for the program, and in what manner? How does the implementation contractor share program progress? Are there times when it would have been helpful to have earlier updates?
4. How often are you in contact with the program Solution Providers (or Contractors)? What are you hearing from the SPs (Contractors)? And how do they provide feedback? (emails, calls, in person...)?
5. How would you describe your interaction with the Business Programs Manager, Andy McCabe?

Program Design

6. Have the program materials, your procedural documentation or outreach documents for any of the three programs changed since last year? If so, can you send me the most current version?
7. What have been the key challenges in implementing the program in the past year? What steps have you taken to overcome these challenges?
8. Is the program on track to meet the filed savings goals? What about internal savings goals?

9. What other key performance indicators do you use to measure the performance of the program? Are you on track to meet those goals?
10. Regarding Navigant's Conclusions and Recommendations from last year's evaluation report, where are you in the process of implementing Navigant's recommendations? Please note any recommendations that will not be implemented and the corresponding reasoning.
11. Have there been any significant changes to the program (delivery, components, etc.) in 2017, and do you have any significant changes planned for 2018? Why were/are these changes made, and how do they affect program performance?
12. Have there been any changes to measures offered in 2017? Are there any planned changes on the horizon? From your perspective, does the program rely on a particular measure or end use to meet its goals? Do you have suggestions for measures that should be added?
13. Have you made any changes to incentive levels in 2017, and do you plan to make any in 2018?
14. How active are account managers in the program? In what ways do account managers improve the customer experience? Are any improvements needed in the role account managers play?

Customer Experience

15. Please describe your interactions with Program participants. (Have any issues or areas for improvement been identified?)
16. Describe a typical first engagement with a new participant.
 - a. How is the first connection typically made?
 - b. Who is engaged from the participant side?
 - c. How is the program introduced to someone not wholly familiar?
 - d. What technical assistance is offered?
17. How often and at what points do you visit participant project sites in person? How do you select the sites to be visited? Which staff are responsible for visiting sites? How often does the site visit identify energy efficiency measures or future energy efficiency projects not already under consideration? Are those recommendations ever put in writing, and if so would you send some examples?
18. How do you decide if you should meter baseline conditions? What thresholds trigger metering?

Customer Satisfaction

19. From your perspective, how satisfied are Business customers with the range of programs offered by AEP Ohio? What are some common complaints you hear, and what are some common positive comments you hear from customers?
20. Do you have a sense of how satisfied customers are with various aspects of this specific program (application process, time to process incentives, interaction with implementation contractor, AEP Ohio staff, or SP (contractor), etc.)?
 - a. Are you taking any steps to promote greater participant satisfaction?

- b. Are you tracking the results from those steps? If so how and what are the results?
- 21. Have customers indicated any issues with, or are confused by, any program requirements or documentation?
- 22. How are customer problems, concerns, issues handled post-installation? Is there a call center? Who is it staffed by? Do the implementation contractors talk to customer directly and fix any issues?
- 23. Have some customers who could be eligible for the program declined to participate? If so, why?
- 24. From the customer's perspective, what are the perceived barriers to participation?
- 25. How is the program overcoming these barriers? Have Solution Providers (Contractors) and Implementation Contractors been successful at removing these barriers to participation? If so, how, if not, why?
- 26. Are there any program requirements that have caused projects to be ineligible or unfeasible?
8)
- 27. Have you seen any change in the value placed on "non-energy" benefits to program participants? Please describe.
- 28. How has customer opt-out affected participation?

Marketing

- 29. Please describe the program marketing approach in your own words. Include all relevant components, and describe how effective you think they are.

Have you seen any changes in the key motivations and perceived barriers for program participants?
- 30. Is the current level of marketing sufficient and does it address all measure end-use categories equally well, or are some over or under represented?

Please describe customer recruitment/marketing strategy used in the last year.
 - a. Have you targeted specific market segments?
 - b. How have you identified potential participants?
 - c. What outreach and marketing activities have you conducted in the past year?
 - d. How are efforts carried out consistently across the AEP Ohio service territory?
- 31. Are there additional customer segments you think the program could market to in order to increase participation?
- 32. What marketing/outreach activities worked well? Which didn't work as well as expected?
- 33. How could marketing for the program be improved?
- 34. Have you conducted outreach / recruitment / education / marketing activities for Solution Providers (Contractors)? Have you considered creating a qualified Solution Provider (contractor) network? Was there a Solution Provider (contractor) bonus in 2017?

35. Does the program provide any recognition or acknowledgement (i.e. a certificate or plaque) to program participants or Solution Providers (contractors)? If yes, please describe.
36. Does the program follow-up with past participants (whom may not have been contacted in a year or more) to see if other opportunities exist for new projects?
37. What role does the Website play in generating interest and participation by customers, and how has this changed over time? Are there improvements still needed?
38. Based on your experience, do you believe an increase in the level of resources available for marketing and outreach could increase program participation and savings?
 - a. IF YES – ASK - Would that hold true if the resources were made available by reducing the level of incentives available?

Implementation

39. What processes work really well in the program, and what processes need improvement? (e.g., communication, time processing applications, customer interaction, marketing, relationship between utility and implementation contractor, etc.)
40. Can you explain the application intake procedures, and any changes that have been made over the last year? (I.e. new on-line application form). How have these been accepted by participants?
41. Does this program offer or require pre-applications or application pre-approval? If yes, please explain.
42. When do you advise the participant of incentive amounts available?
43. What are the follow-up procedures with “stale” applications?
 - a. How are projects reviewed to see if they are stalled? What options are available to move them forward?
 - b. How does the implementer track “drop outs” (participants who have chosen not to proceed under the program)?
 - c. What proportion of customers “drop out”?
 - i. What causes customers to “drop out”?
44. Is the implementation contractor meeting your expectations for the Program? If not, what could be improved?
45. Please describe your interactions with Solution Providers (contractors) involved in the program. (Have any issues or areas for improvement been identified?)
46. Has the involvement of Solution Providers (contractors) in the program changed in the last year?
47. Do you know how many Solution Providers (contractors) were active in 2017, and is this number increasing or decreasing, and why?

48. Do you have a sense of Solution Providers' (contractors) overall satisfaction with their participation in the program in 2017 and in working with the implementation contractors? Have you noticed or heard any changes from past years?
49. Overall do you feel that Business programs have adequate networks of Solutions Providers, or are there some Programs, end uses, or geographic areas that are not well covered?
50. Are the Solution Providers (contractors) meeting your expectations for the Program? If not, what could be improved?

Data Tracking and Quality Control

51. Can you walk us through the QA/QC procedures?
52. Can you describe the quality control procedures in place to ensure complete information is obtained, and accurate information is entered into the database?
53. How do you verify customer and equipment eligibility? How do you determine whether equipment being replaced is functional, being replaced on burn-out, obsolescence or need for new capacity? (To determine baseline and calculate savings eligible for incentive).
54. At what point do you visit participant project sites to conduct final inspections or verifications? (For programs with multiple paths such as NRNC, ask for specific results for each pathway.)
 - a. How are sites selected?
 - b. Who is responsible for conducting verification?
 - c. How are the results documented?
 - d. What is the process, and who is responsible for resolving disparities?
55. Have there been any changes to how the program verifies participant savings estimates?
56. Have there been any changes to the structure of the program database or how it is maintained? (For programs with multiple implementation contractors; how is consistent data quality assured?)
57. Have you encountered any projects where it was unclear whether the project was eligible?

Summary Questions

58. Do you have any other comments, concerns or suggestions about the program that we did not discuss that you would like to make sure I know about?
59. Are there any areas that you would particularly like to see us delve into deeper in the process evaluation this year or questions you really want answered?

Specific Self Direct Program Manager Questions

1. In what ways have the recommendations from the last evaluation been implemented?

If needed, reference:

- a. Were changes made to QA/QC policies or to terms and conditions in order to discourage multiple submissions of the same project?
- b. Does the IC check whether customers have participated in the SD program or other programs?
- c. Does AEP Ohio check for customer participation across programs?
- d. Has AEP Ohio checked the number of SD customers who have gone on to participate in other programs?
- e. After customers have participated in SD is this information shared with the PMs of other business programs so they can target these customers?

APPENDIX B. IMPLEMENTATION CONTRACTOR INTERVIEW GUIDE

AEP Ohio Implementing Contractor Interview Guide

AEP Ohio Evaluation for the Energy Efficiency Program for Business Programs 2017 Implementation Contractor In-Depth Interview Guide

Name of Interviewee:

Date:

Title:

Company:

Contact Information:

Interviewer:

[Note to Interviewer] The Interview Guide is a tool to guide process evaluation interviews with implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program's design and operation, i.e., where they have significant experiences for meaningful responses. The interviews will be audio taped and transcribed. Interviews in every case will be conducted by a member of Navigant's process evaluation team to ensure full context and understanding for the interview, and to enable the interviewer to probe for the most meaningful questions and responses.

Roles and Responsibilities

1. Can you describe your roles and responsibilities, and how they've changed over the last year for the Self Direct Program?
2. When considering the implementation contractor and AEP Ohio staff job functions, have there have been any substantial changes in the roles or people assigned to these programs in the past year compared to previous program years? If so, what were they?
3. How often do you meet with the AEP Ohio staff for the program, and in what manner? How does your firm share the program's progress with AEP?
4. How often are you in contact with the program Solution Providers? What are you hearing from the SPs? And how do they provide feedback? (emails, calls, in person...)?

Program Design

5. Have the program materials, your procedural documentation or outreach documents for any of the three programs changed since last year? If so, can you send me the most current version?
6. What have been the key challenges in implementing the program in the past year? What steps have you taken to overcome these challenges?
7. Is the program on track to meet the filed savings goals? What about your contracted savings goals?

8. What other key performance indicators do you use to measure the performance of the program? Are you on track to meet those goals?
9. Next, I'd like to ask about significant changes to the program in 2017, and whether you have any significant changes planned for 2018? Changes would include:
 - a. Program Delivery
 - b. Measures (added, removed, or changes)
 - c. Incentives
 - d. Application forms or processes

Can you describe the reasoning for the changes, and how they affect program performance?

10. From your perspective, does the program rely on a particular measure or end use to meet its goals? Do you have suggestions for measures that should be added?
11. How active are account managers in the program? In what ways do account managers improve the customer experience? Are any improvements needed in the role account managers play?

Customer Experience

12. Please describe your interactions with Program participants. (Have any issues (e.g., customer service, measure offerings, program design, application, etc.) or areas for improvement been identified?)
13. Next, we'd like to discuss the experience of new participants.
 - a. What percentage of your program's customers are first time customers?
 - b. How is the first connection typically made?
 - c. Who is engaged from the participant side?
 - d. How is the program introduced to someone not wholly familiar?
 - e. What technical assistance is offered?
14. How often and at what points do you visit participant project sites in person? How do you select the sites to be visited? Which staff are responsible for visiting sites? How often does the site visit identify energy efficiency measures or future energy efficiency projects not already under consideration? Are those recommendations ever put in writing, and if so would you send some examples?
15. How do you decide if you should meter baseline conditions? What thresholds trigger metering?

Customer Satisfaction

16. From your perspective, how satisfied are Business customers with the range of programs offered by AEP Ohio? What are some common complaints you hear, and what are some common positive comments you hear from customers?
17. Do you have a sense of how satisfied customers are with various aspects of this specific program (application process, time to process incentives, interaction with implementation contractor, AEP Ohio staff, or SP, etc.)?
 - a. Are you taking any steps to promote greater participant satisfaction?

- b. Are you tracking the results from those steps? If so how and what are the results?
- 18. Have customers indicated any issues with, or are confused by, any program requirements or documentation?
- 19. How are customer problems, concerns, issues handled post-installation? Is there a call center? Who is it staffed by?
- 20. Have some customers who could be eligible for the program declined to participate? If so, why?
- 21. From the customer's perspective, what are the perceived barriers to participation?
- 22. How is the program overcoming these barriers? Have you as the Implementation Contractor or the Solution Providers been successful at removing these barriers to participation? If so, how, if not, why?
- 23. Are there any program requirements that have caused projects to be ineligible or unfeasible?
- 24. Have you seen any changes in the key motivations and perceived barriers for program participants?
 - a. Have you seen any change in the value placed on "non-energy" benefits to program participants? Please describe.
- 25. How has customer opt-out affected participation?

Marketing

- 26. Please describe the program marketing approach in your own words. Include all relevant components, and describe how effective you think they are.
 - a. Have you seen any changes in the key motivations and perceived barriers for program participants?
- 27. Is the current level of marketing sufficient and does it address all measure end-use categories equally well, or are some over or under represented?
- 28. Please describe customer recruitment/marketing strategy used in the last year.
 - a. Are specific market segments targeted?
 - b. Have potential participants been identified?
 - c. What outreach and marketing activities have you conducted in the past year?
 - d. How are efforts carried out consistently across the AEP Ohio service territory?
- 29. Are there additional customer segments you think the program could market to in order to increase participation?
- 30. What marketing/outreach activities worked well?
 - a. Which didn't work as well as expected?
 - b. How could marketing for the program be improved?

31. Have you conducted outreach / recruitment / education / marketing activities for Solution Providers (trade allies)? Have you considered creating a qualified Solution Provider network? (SP Qs N/A to Express, NRNC, CEI, ???) Was there a Solution Provider bonus in 2017?
32. Does the program provide any recognition or acknowledgement (i.e. a certificate or plaque) to program participants or Solution Providers? If yes, please describe.
33. Does the program follow-up with past participants (whom may not have been contacted in a year or more) to see if other opportunities exist for new projects?
34. What role does the Website play in generating interest and participation by customers, and how has this changed over time? Are there improvements still needed?
35. Based on your experience, do you believe an increase in the level of resources available for marketing and outreach could increase program participation and savings?
 - a. IF YES – ASK - Would that hold true if the resources were made available by reducing the level of incentives available?

Implementation

36. What processes work well in the program, and what processes need improvement? (e.g., communication, time processing applications, customer interaction, marketing, relationship between utility and implementation contractor, etc.)
37. Can you explain the application intake procedures, and any changes that have been made over the last year? (I.e. new on-line application form). How have these been accepted by participants?
38. Does this program offer or require pre-applications or application pre-approval? If yes, please explain.
39. When do you advise the participant of incentive amounts available?
40. What are the follow-up procedures with “stale” applications?
 - a. How are projects reviewed to see if they are stalled? What options are available to move them forward?
 - b. How do you track “drop outs” (participants who have chosen not to proceed under the program)?
 - c. What proportion of customers “drop out”?
 - d. What causes customers to drop out?
41. Please describe your interactions with Solution Providers involved in the program. (Have any issues or areas for improvement been identified?)
42. Has the role of Solution Providers in the program changed in the last year?

43. Do you know how many Solution Providers were active in 2017, and is this number increasing or decreasing, and why?
44. Are the Solution Providers meeting your expectations for the Program? If not, what could be improved?
45. Do you have a sense of Solution Providers' overall satisfaction with their participation in the program in 2017 and in working with the implementation contractors? Have you noticed or heard any changes from past years?
46. Overall do you feel that Business programs have adequate networks of Solutions Providers, or are there some Programs, end uses, or geographic areas that are not well covered?

Data Tracking and Quality Control

47. Can you describe the quality control procedures in place to ensure complete information is obtained, and accurate information is entered into the database?
48. Have there been any changes to the structure of the program database or how it is maintained? (For programs with multiple implementation contractors; how is consistent data quality assured?)
49. How do you verify customer and equipment eligibility? How do you determine whether equipment being replaced is functional, being replaced on burn-out, obsolescence or need for new capacity? (To determine baseline and calculate savings eligible for incentive).
50. Have you encountered any projects where it was unclear whether the project was eligible?
51. Have there been any changes to how the program verifies participant savings estimates?
52. In your role of Implementation Contractor, how often and at what points do you visit participant project sites in person, including any final inspection or verification? (For programs with multiple paths such as NRNC, ask for specific results for each pathway.)
 - a. How are sites selected?
 - b. Who is responsible for conducting verification?
 - c. How are the results documented?
 - d.
 - e. What is the process, and who is responsible for resolving disparities?

Summary Questions

53. Do you have any other comments, concerns or suggestions about the program that we did not discuss that you would like to make sure I know about?
54. Are there any areas that you would particularly like to see us delve into deeper in the process evaluation this year or questions you really want answered?

Specific Self Direct Implementation Contractor Questions

1. In what ways have the recommendations from the last evaluation been implemented?

If needed, reference:

- a. Were changes made to QA/QC policies or to terms and conditions in order to discourage multiple submissions of the same project?
- b. Do you check whether customers have participated in the SD program previously or other programs?

APPENDIX K



NON-RESIDENTIAL NEW CONSTRUCTION PROGRAM

2017 Evaluation Report

Prepared for:

AEP OHIO



A unit of American Electric Power

April 27, 2018

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TABLE OF CONTENTS

| | |
|---|-----------|
| Executive Summary | 1 |
| ES.1 Program Participation | 1 |
| ES.2 Data Collection Activities | 3 |
| ES.3 Key Impact Findings and Recommendations | 4 |
| ES.4 Key Process Findings and Recommendations | 5 |
| 1. Introduction and Purpose of Study | 7 |
| 1.1 Evaluation Objectives | 7 |
| 1.2 Evaluation Methods | 7 |
| 2. Methodology | 9 |
| 2.1 Overview of Approach | 9 |
| 2.2 Key Evaluation Questions | 10 |
| 2.2.1 Impact Questions | 10 |
| 2.2.2 Process Questions | 10 |
| 2.2.3 NRNC Specific Questions | 11 |
| 2.3 Tracking Data Review | 11 |
| 2.4 Review of Marketing Activities | 12 |
| 2.5 Review of Participation | 12 |
| 2.6 Interviews with Program and Implementation Contractor Staff | 12 |
| 2.7 Interviews with Program Participants | 12 |
| 2.8 Methods Used to Analyze Impact Data | 12 |
| 2.8.1 Impact Sample of Project Files | 13 |
| 2.8.2 Ex Post Energy Savings Calculation | 14 |
| 2.8.3 Realization Rates Calculation Method | 14 |
| 3. Detailed Evaluation Findings | 16 |
| 3.1 Program Activity | 16 |
| 3.1.1 Prescriptive / Custom Program Path Activity | 20 |
| 3.1.2 Whole Building Program Activity | 23 |
| 3.2 Impact Evaluation Findings | 23 |
| 3.2.1 Summary of Impact Findings | 23 |
| 3.2.2 Driving Factors of Realization Rate | 24 |
| 3.2.3 Lifetime Energy Considerations | 27 |
| 3.3 Process Evaluation Findings | 29 |
| 3.3.1 Participant Satisfaction | 30 |
| 3.3.2 Marketing Efforts and Program Awareness | 30 |
| 3.3.3 Program Requirements | 32 |
| 3.3.4 Barriers to Participation | 34 |
| 3.3.5 Customer Enrollment and Engagement Process | 35 |
| 3.3.6 Incentive Payment Process | 36 |
| 3.3.7 Program Tracking Data Review | 38 |
| 3.3.8 Verification and Due Diligence | 38 |
| 3.4 Cost Effectiveness Review | 40 |

| | |
|---|------------|
| 4. Key Findings and Recommendations | 41 |
| 4.1 Key Impact Findings and Recommendations..... | 41 |
| 4.2 Key Process Findings and Recommendations | 42 |
| 4.3 Key Tracking System and Project File Findings and Recommendations | 43 |
| APPENDIX A. Other Issues Found During the Impact Analysis..... | A-1 |
| APPENDIX B. Program Participant Survey, Full Results | B-1 |
| APPENDIX C. Program Manager Interview Guide | C-1 |
| APPENDIX D. Implementation Contractor Interview Guide | D-1 |
| APPENDIX E. Program Participant Interview Guide..... | E-1 |

LIST OF TABLES

| | |
|--|-----|
| Table ES-1. NRNC Summary, 2016 and 2017 Program Years | 2 |
| Table ES-2. NRNC 2017 Program Summary | 2 |
| Table ES-3. 2017 Activity by Program Option | 2 |
| Table ES-4. Impact Sampling Strata and Achieved Sampling..... | 4 |
| Table ES-5. Impact Savings, Realization Rate and Sample Precision..... | 4 |
| Table 1-1. Summary of Data Collection Activities | 8 |
| Table 2-1. Impact Sampling Strata and Achieved Sampling | 13 |
| Table 3-1. Program Ex Ante Summary, 2016 and 2017 Program Years | 17 |
| Table 3-2. 2017 Program Activity by Business Type | 19 |
| Table 3-3. 2017 Activity by Program Option | 20 |
| Table 3-4. Prescriptive / Custom Measure Ex Ante Savings, 2017 Program | 22 |
| Table 3-5. Prescriptive Lighting Measures by Category, 2017 Program | 22 |
| Table 3-6. Whole Building Measure Ex Ante Savings, 2017 Program | 23 |
| Table 3-7. Impact Savings, Realization Rate and Precision of Sample | 24 |
| Table 3-8. Comparison of 2016 – 2017 NRNC Applications. | 33 |
| Table 3-9. Inputs to Cost-Effectiveness Model for the AEP Ohio NRNC Program..... | 40 |
| Table 3-10. Cost Effectiveness Results for the NRNC Program | 40 |
| Table A-1. Lighting Power Density (LPD) Impact Issues Found in Ex Post Analysis..... | A-1 |
| Table A-2. Non-Lighting Measure Impact Issues Found in Ex Post Analysis..... | A-2 |

LIST OF FIGURES

| | |
|--|----|
| Figure ES-1. Ex Ante Electricity Savings by Type of Business, 2017 Program | 3 |
| Figure 2-1. Impact Sampling as a Percent of Ex Ante Savings | 14 |
| Figure 3-1. Distribution of Project Count by Business Type, 2017 Program | 17 |
| Figure 3-2. Energy Savings by Business Type, 2017 Program | 18 |
| Figure 3-4. Ex Ante vs. Ex Post Energy Savings..... | 25 |
| Figure 3-5. Ex Ante vs. Ex Post Coincident Demand Reduction | 27 |
| Figure 3-6. Ex Ante vs. Ex Post Lifetime Energy Savings | 28 |
| Figure 3-7. Ex Ante vs. Ex Post Lifetime for Whole Building Projects | 29 |
| Figure 3-8. Program Satisfaction Summary (n=18) | 30 |
| Figure 3-9. How Participants Learned About the NRNC Program (n=18) | 31 |
| Figure 3-10. Number of Projects Submitted to the NRNC Program in the Past 5 Years (n=11) | 32 |
| Figure 3-11. Was the Building Offered for Sale or Lease (n=18) | 35 |
| Figure 3-12. Customers Reporting that a Kick-off was Held with AEP Ohio | 36 |
| Figure 3-14. Average Days Between Final Application Received and Incentive Paid..... | 37 |

LIST OF EQUATIONS

| | |
|--|----|
| Equation 1. Realization Rates for Each Stratum..... | 14 |
| Equation 2. Realization Rates for Each Stratum Applied to Project Population | 15 |

EXECUTIVE SUMMARY

AEP Ohio's Non-Residential New Construction (NRNC) Program targets all non-residential new construction and major renovation projects within AEP Ohio's service territory. The objective of the program is to capture the multiple energy efficiency opportunities available during the design and construction of non-residential buildings and provide an example of best practices to the engineering and building community. There are two tracks within the NRNC program:

1. Whole Building Performance including the My Solutions¹ option: which relies on building energy modeling to confirm savings.
2. Custom/Prescriptive: which includes projects focused on individual measures and not whole building modeling. Prescriptive measures are treated the same as the Prescriptive program, except lighting savings are based on lighting power density calculations relative to LPD allowances in the Ohio Energy Code. Custom measures are treated the same as the Custom program and utilize energy calculations on a measure-by-measure basis to determine savings.

The NRNC Program was launched in 2011. The entire program is currently implemented by CLEARResult after a staged transition from DNV GL, which started in 2015.

ES.1 Program Participation

The 2017 program year represents the seventh year of operation for the NRNC Program and the seventh year in which Navigant has evaluated its operation. In 2017, 129 projects were completed at 128 unique buildings. The projects involved approximately 12.3 million square feet of new and renovated buildings.² In 2017, the evaluation team identified 87 unique program participants.^{3,4} In 2017, 13 participants completed multiple projects, accounting for 39 of the 129 projects completed. Overall, the number of projects and buildings participating in the program and the floor area affected by the program decreased significantly from the prior year's program.⁵ In 2017, *ex ante* electricity savings increased by six percent compared to 2016 (Table ES-1), additionally the program saved approximately 60 percent more than the electric savings target (Table ES-2).

¹ The My Solutions offering was a new addition to the AEP Ohio NRNC program in 2016. This program path offers a somewhat prescriptive approach to the Whole Building Performance path for relatively small (<70,000 sq. ft.) office, retail, and (new for 2017) restaurant participants. My Solutions offers smaller building owners, who are not planning to complete a whole building model, an option to receive the benefits of participating in the Whole Building Performance path.

² Floor area was reported for 118 of the 128 unique buildings participating in the program in 2017. For those with unreported square footage, Navigant estimated the floor area from the average floor area of similar buildings from the tracking database.

³ Navigant notes the tracking database contained several variations on some organization names. Navigant exercised judgment in identifying "unique" participants.

⁴ Full participant data was not available in the tracking data for 18 projects. Two of the 18 projects were Whole Building projects, were selected for evaluation, and were subsequently identified. The remaining 16 projects only received incentives for early design review and, as such, contributed no savings to the NRNC program in 2017.

⁵ In previous years, it was common for multiple projects to be associated with the same building, leading Navigant to aggregate the project data at the building level. The 2017 tracking data combined all the measures completed at an individual building at the project level. This change in program tracking resulted in Navigant evaluating the 2017 program at the project -level, which is virtually the same as the building level aggregation used in prior evaluations.

Table ES-1. NRNC Summary, 2016 and 2017 Program Years

| | 2017 Program | 2016 Program |
|---------------------------------------|--------------|--------------|
| Total Incremental Participant Cost | \$11,645,988 | \$14,940,573 |
| Amount of Incentives Paid by AEP Ohio | \$2,539,374 | \$3,519,527 |
| Floor Area (reported sq.ft.) | 11,074,455 | 20,007,146 |
| Floor Area (total estimated sq.ft.) | 12,362,337 | 23,067,462 |
| Ex Ante Energy Savings (MWh) | 44,687 | 42,015 |
| Ex Ante Demand Savings (MW) | 7.2 | 8.4 |

NOTE: Total floor area is calculated from unique buildings in each year.

Source: Navigant analysis of 2017 NRNC tracking data

Table ES-2. NRNC 2017 Program Summary

| | 2017 Program Goals | 2017 Program, Reported |
|------------------------------|--------------------|------------------------|
| Program Budget | \$5,900,000 | \$4,162,824 |
| Ex Ante Energy Savings (MWh) | 27,626 | 44,687 |
| Ex Ante Demand Savings (MW) | 6.2 | 7.2 |

Source: Navigant analysis of 2017 NRNC tracking data

As in past years, the majority of the NRNC projects completed in 2017 applied under the Custom or Prescriptive path (Table ES-3). One Whole Building project also utilized the Prescriptive path for some measures, and 13 Whole Building projects received a Design Incentive. The number of Whole Building projects decreased by almost 60 percent compared to the prior year (48 in 2016), though the associated total *ex ante* savings slightly increased (2%, relative to 11,746,597 kWh in 2016).

Table ES-3. 2017 Activity by Program Option

| Option | Number of Projects | | Estimated Floor Area (Sq Ft) | Ex Ante Savings (kWh/year) | |
|-----------------------|--------------------|-------------|---------------------------------|-------------------------------|-------------|
| Custom/Prescriptive | 92 | 71% | 8,308,781 | 32,710,310 | 73% |
| Whole Building | 20 | 16% | 2,091,296 | 11,976,757 | 27% |
| Design Incentive Only | 17 | 13% | 1,962,250 | 0 | 0% |
| Total | 129 | 100% | 12,362,337 | 44,687,067 | 100% |

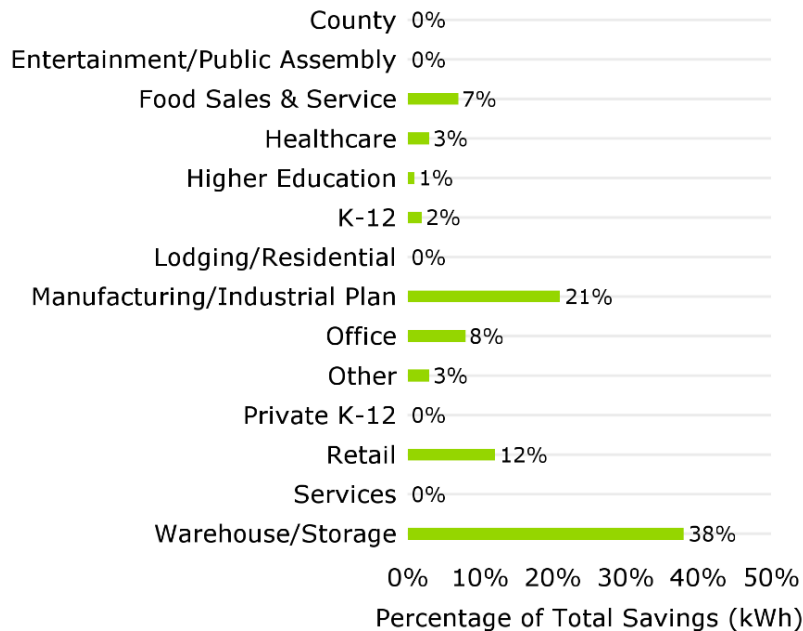
NOTE: Buildings including Whole Building and Prescriptive/Custom projects or Design Incentives are included under the Whole Building category.

Source: Navigant analysis of 2017 NRNC tracking data

Figure ES-1 shows the *ex ante* energy savings by business type. In 2017, five business segments (Warehouse / Storage, Manufacturing / Industrial, Retail, Office, and Food Sales and Service) accounted for approximately 86 percent of the reported electrical energy savings. These five business segments which account for the large majority of program savings, encompass 70 projects. The balance of the

program savings was distributed in small amounts, 5 percent or less, across nine other business segments. These nine other business segments included 59 projects, were generally smaller in nature.

Figure ES-1. Ex Ante Electricity Savings by Type of Business, 2017 Program



Source: Navigant analysis of 2017 NRNC tracking data

ES.2 Data Collection Activities

As part of the impact study, the evaluation team completed an engineering review of project files accounting for 77 percent of the claimed *ex ante* energy savings. Projects accounting for 43 percent of the *ex ante* energy savings also underwent an onsite review. Table ES-4 provides an illustration of the impact measurement and verification (M&V) sample stratification and the level of review completed by the evaluation team within each stratum.

Table ES-4. Impact Sampling Strata and Achieved Sampling

| Stratum by Approach and Energy Savings | Number of Projects | Strata weight by Energy | Number of Desk Reviews | Number of Onsite Reviews ⁶ |
|--|--------------------|-------------------------|------------------------|---------------------------------------|
| X-Large (>10,000 MWh/yr) | 1 | 28.0% | 1 | 1 |
| Large (>750 MWh/yr) | 10 | 44.0% | 10 | 3 |
| Medium (>300 MWh/yr, <750 MWh/yr) | 16 | 13.9% | 3 | 0 |
| Small (>50 MWh, < 300 MWh) | 48 | 12.5% | 5 | 0 |
| Very Small (<50 MWh) | 54 | 1.6% | 3 | 0 |
| Design Review (No Savings) | 18 | 0.0% | 0 | 0 |
| Total | 129 | 100% | 22 | 4 |
| Percent of Ex Ante Savings | | | 77% | 43% |

Source: Navigant analysis of 2017 NRNC tracking data

ES.3 Key Impact Findings and Recommendations

As summarized in Table ES-5, the *ex post* electricity savings exceeded the 2017 targets of 27,626 MWh and 6.2 MW coincident demand reduction. The *ex post* energy and coincident summer peak demand savings are 42,844 MWh/year and 7.57 MW respectively. The realization rate for energy is 0.96, while the demand realization rate is 1.05. These results represent decreased program savings compared to 2016. The demand realization rate increased from 2016, while the energy realization rate decreased.

Table ES-5. Impact Savings, Realization Rate and Sample Precision

| Metric | 2017 Program Goals (a) | Ex Ante (b) | Ex Post (c) | Realization Rate RR = (c) / (b) | Overall Relative Precision at 90% Confidence | Percent of Goal = (c) / (a) |
|--|------------------------|-------------|-------------|------------------------------------|--|-----------------------------|
| Annual Energy Savings (MWh) | 27,626 | 44,687 | 42,844 | 0.96 | 1.84% | 155% |
| Coincident Peak Demand Reduction (MW) | 6.2 | 7.2 | 7.6 | 1.05 | 12.6% | 123% |

Source: Navigant analysis of 2017 NRNC tracking data

Other key impact findings and recommendations include the following. Additional impact recommendations are included in Section 4.1 (Key Impact Findings and Recommendations).

Impact Finding 1: Detailed verification of *ex ante* lighting power density (LPD) calculations reveals several errors, including inaccurate fixture counts, missing ballast specifications, omission of lighting

⁶ Onsite reviews are a sub-set of desk reviews. All buildings in the sample at least received a desk review, while some received an onsite review in addition to the desk review. If a building received both an onsite and a desk review, it is counted in both the onsite and desk review totals.

controls in both the baseline and as-built calculations, and ignoring the longer run hours of 24/7 security lighting.

Impact Recommendation 1a: Consider training LPD specialists to thoroughly check that all LPD submittals are consistent with the lighting layout drawings, or noting where the actual building differs from the drawings. Onsite inspections should include double checking that the actual building lighting equipment matches the drawings.

Impact Recommendation 1b: Include an analysis of both the baseline and as-built lighting controls. Specify which baseline code of what vintage is being followed, IECC or ASHRAE 90.1 and the year, and calculate lighting control savings from the actual building.

Impact Finding 2: Two projects mislabeled building and/or space types in their lighting calculations, including some exterior building façade lighting that was labeled as "Warehouse," resulting in significantly different baseline LPDs.

Impact Recommendation 2: Ensure that verification of building and space types is a stand-alone step in the quality control process for every project.

Impact Finding 3: All NRNC projects are universally assigned a 14-year lifetime as a conservative estimate, which comes from the calculated average lifetime from the 2016 evaluation. The evaluation team found that, for Whole Building buildings reviewed, two *ex post* lifetimes were calculated to be 14 years, and three were less. The *ex post* lifetime, which is calculated as a weighted average (by *ex post* energy savings) of each documented end use, is pulled down by the 11-year lifetime assumption for lighting.

Impact Recommendation 3: Calculate project lifetimes through a weighted average, based on energy savings, for each end use documented.

ES.4 Key Process Findings and Recommendations

The following process recommendations are offered to help improve program effectiveness and efficiency, and further improve the overall experience of program participants. Additional process recommendations are included in Section 4.2.

Process Finding 1: The program is implementing strategies resulting in early involvement in the project design and development phase. Earlier engagement typically leads to increased savings and a clear connection between program promoted activity and project savings.

Process Recommendation 1: Continue to encourage participants to apply early, and require pre-application with the Whole Building and My Solutions paths. Continue to facilitate pre-design meetings to increase per project savings and clearly correlate project results to program activity.

Process Finding 2: Because marketing has not been a priority of the NRNC program, the marketing materials are both limited and outdated. This includes print materials and the program website. The implementation contractor reports interest in having printed program materials to support conversations with potential program participants.

Process Recommendation 2a: Build NRNC specific print marketing material – this could be a one or two-page handout that could be used as a program introduction.

Process Recommendation 2b: Update the NRNC program website for clarity and ease of use, so it can be of use to more program participants than just rebate processing companies.

1. INTRODUCTION AND PURPOSE OF STUDY

AEP Ohio's Non-Residential New Construction (NRNC) Program provides support to customers building a new facility or undertaking a major renovation to incorporate higher levels of energy efficiency in their building design. The program is divided into two tracks which are intended to meet the needs of buildings of varying size and complexity. The two program tracks include:

- 1) Whole Building Performance including the My Solutions⁷ option; which relies on building energy modeling to confirm savings.
- 2) Custom/Prescriptive: which includes projects focused on individual measures and not whole building/modeling. Prescriptive measures are treated the same as they would through the Prescriptive program, except lighting savings are based on a lighting power density calculation. Custom measures are treated the same as the Custom Program and utilize engineering calculations on a measure-by-measure basis to determine savings.

The 2017 program year represents the seventh year of operation for this program. The program is delivered by CLEAResult on behalf of AEP Ohio. The program implementation transitioned from DNV GL to CLEAResult in 2016 and record of this transition was still apparent in the first months of 2017.

1.1 Evaluation Objectives

This report presents the findings from the impact and process evaluations of the AEP Ohio NRNC Program for 2017. The three major objectives of the evaluation were to:

- 1) Quantify energy and summer peak demand savings impacts at the meter from the program during 2017.
- 2) Determine program cost-effectiveness.
- 3) Determine key process-related program strengths and weaknesses and identify ways in which the program can be improved.

Specific process evaluation questions are summarized in Section 2.2 (Key Evaluation Questions) and Section 3.3 (Process Evaluation Findings).

1.2 Evaluation Methods

Program impacts for the 2017 NRNC Program were evaluated in terms of electric energy and peak demand savings. A portion of the completed project population was sampled with the intention of achieving 90 percent confidence and a +/- 10 percent precision for both the program energy and demand savings.

⁷ The My Solutions offering was a new addition to the AEP Ohio NRNC program in 2016. This program path offers a somewhat prescriptive approach to the Whole Building Performance path for relatively small (<70,000 sq. ft.) office, retail, and (new for 2017) restaurant participants. This solution offers smaller building owners, who are not planning to complete a whole building model as part of their process, an option to receive the benefits of participating in the Whole Building Performance path.

The *ex post* energy and demand savings of the sampled projects were determined by engineering review of the project files, engineering review of the *ex ante* savings analysis, inspection of the building energy models and/or site verification of the installed components of the energy efficiency measures designed for the subject buildings. Coincident summer peak demand savings are determined by engineering analysis of the savings potential during the peak period or by adjusting demand savings with a published coincidence factor for summer peak demand.

Data collection activities are summarized in Table 1-1. During the 2017 program evaluation, Navigant interviewed staff from AEP Ohio and the implementation contractors, interviewed program participants, reviewed program materials, and reviewed strategy documents to gain an understanding of program logic, expected inputs, outputs, and outcomes for the program.

Table 1-1. Summary of Data Collection Activities

| Data Collection Type | Targeted Population | Supported Evaluation Activities |
|---------------------------------|---|---------------------------------|
| Review of Program Documentation | Program documentation and marketing materials for 2017 program. | Process Evaluation |
| In-depth Telephone Interviews | AEP Ohio Program staff | Process Evaluation |
| | Implementer staff | Process Evaluation |
| | Program participants | Process Evaluation |
| Project File Review | Sample of completed projects | Impact Evaluation |
| Telephone Verification | Where project files were incomplete | Impact Evaluation |
| Onsite Verification | Where uncertainties in the savings calculations existed | Impact Evaluation |
| Tracking Data Review | All program participants | Impact and Process Evaluation |

2. METHODOLOGY

This section describes the methodology used to conduct the process and impact evaluations. A high-level overview of the steps taken to collect and analyze the data for this evaluation is described in Section 2.1. This is followed by a discussion of the research questions that guided the evaluation and the tasks completed as part of the process evaluation; including the review of tracking data, marketing activities, and participation; interviews with program and implementation staff; and interviews with program participants. Finally, the methods used for primary data collection tasks and in analyzing the impact and process data are discussed.

2.1 Overview of Approach

The evaluation was driven by three overarching objectives: 1) quantify electric energy and coincident summer peak demand savings impacts from the 2017 program year, 2) determine program cost effectiveness, and 3) determine key process-related program strengths and weaknesses and identify ways in which the program can be improved. To meet these objectives, the evaluation team undertook the following activities.

- 1) **Evaluation Questions.** Navigant established key evaluation questions as part of developing the 2017 Evaluation Plan with AEP Ohio staff.
- 2) **Tracking Data Review.** Navigant reviewed the program tracking data collected by the implementation contractor and provided to the evaluation team by AEP Ohio.
- 3) **Review of Marketing Activities.** Navigant reviewed the overall marketing activities and approach as implemented by the implementation contractor.
- 4) **Review of Participation.** Navigant reviewed program participation by building type, program path, completion date, and geographic location.
- 5) **Primary Data Collection.** Navigant performed primary data collection, including in-depth interviews with program staff and the implementation team, interviews with program participants, file reviews of a randomly-selected sample of projects, and onsite verification for a subset of the sampled projects.
- 6) **Methods Used to Analyze Impact Data.** Navigant quantified energy and coincident peak demand reduction savings by reviewing project files. File reviews included verifying engineering calculations and building model simulations. Where uncertainties existed in the savings calculations, onsite visits were conducted. Onsite visits included verification of equipment specifications and quantities, collection of energy management system data, and metering of equipment.
- 7) **Methods Used to Analyze Process Data.** Navigant assessed the effectiveness of the program processes by analyzing program documents; the results of interviews with AEP Ohio program staff, implementation contractors, and program participants; and program tracking data.

2.2 Key Evaluation Questions

Navigant collaborated with AEP Ohio to identify program-wide key evaluation questions to guide the impact and process evaluation tasks. In addition, the evaluation team identified a few research questions specific to the NRNC program. The key evaluation questions for each of these categories are defined in the following subsections.

2.2.1 Impact Questions

- 1) What were the realization rates and what were primary factors driving the realization rates? (Defined as evaluation-verified (*ex post*) savings divided by program-reported (*ex ante*) savings.)
- 2) What are the verified (*ex post*) gross energy and peak demand savings from the program?
- 3) Did the program meet the energy and peak demand savings goals? If not, why not?
- 4) What are the benefits, costs, and cost-effectiveness of the program?

2.2.2 Process Questions

Marketing and Participation

- 1) Does the marketing effort appropriately meet current and future program participation goals?
- 2) Does the program outreach effectively increase awareness of program opportunities?
- 3) How often does program outreach occur?
- 4) Are the messages included within program outreach clear and actionable?
- 5) What are the key interests and motivations for potential and actual participants beyond the financial incentive offered?
- 6) What are the key barriers to participation in the program?

Program Effectiveness and Satisfaction

- 1) What improvements could be made to create a more effective program and to help increase energy and demand impacts?
- 2) What is the status of implementing recommendations/issues identified in previous evaluations?
- 3) How do the findings in the current year's evaluation compare to previous evaluations?
- 4) Are participants and providers satisfied with the programs?
- 5) Have implementation changes effectively increased satisfaction and/or participation?

Administration and Delivery

- 1) Is program administration functioning effectively?
- 2) Are there any problems with program delivery?

- 3) Are program tracking systems adequate? Are program tracking systems consistently maintained? Do program tracking systems contain all data required to support AEP Ohio supervision, program tracking, and evaluation?
- 4) Are program procedures documented and followed?
- 5) Are verification procedures implemented in a manner consistent with program design?
- 6) Is the implementation contractor meeting a key performance indicator?

2.2.3 NRNC Specific Questions

- 1) How are program savings and project level realization rates affected by the change to a new commercial building code: 2012 IECC and ASHRAE 90.1-2010 with amendments?
- 2) What customer market segments or types of projects participate in the program? Are any barriers specific to certain customer market segments?
- 3) How successful has the program been in obtaining repeat participation from customers?
- 4) How successful has the program been in obtaining broad participation from design teams that have participated in the program?
- 5) Do participants and trade allies understand the available program tracks and their differences?
- 6) How could the program encourage deeper comprehensive savings, beyond lighting power density and HVAC mechanical efficiencies, for projects participating in the Custom or Prescriptive tracks?
- 7) For completed projects, does AEP Ohio award public recognition or acknowledgement (certificate, plaque, occupant communications, etc.) to publicize their achievements to their community?
- 8) What types of recognition does AEP Ohio provide to the design teams? How is this recognition perceived by design teams? Is it effective in encouraging participation or encouraging more efficient design?

2.3 Tracking Data Review

Program tracking data is critical for determining the impacts of the NRNC Program. A copy of the program tracking data collected by the implementation contractors was provided by AEP Ohio to the evaluation team. The tracking data was received after the end of the program year and included all projects which received an incentive by December 31, 2017.

The evaluation team reviewed all fields recorded on the application forms and key data fields in the database were reviewed to identify missing, incomplete, or inconsistent data. The data collected was also reviewed to identify any additional information that would be helpful in evaluating program performance. The evaluation team did not assess whether the tracking system was adequate for regulatory prudence reviews or corporate requirements.

2.4 Review of Marketing Activities

Marketing collateral, application forms and other materials available from the AEP Ohio website were reviewed by the evaluation team. Additional marketing materials were requested from AEP Ohio and the implementation contractors. Information on marketing, communications and outreach efforts was also obtained from both AEP Ohio and the implementation contractors.

2.5 Review of Participation

The evaluation team used the program tracking data to analyze program participation through several key factors including building type, completion date, program path (Whole Building or Prescriptive/Custom), and geographic location. The analysis focused on metrics such as number of participants and impact results. The results of this analysis are presented in the discussion of program activity in Section 3.

2.6 Interviews with Program and Implementation Contractor Staff

In-depth qualitative interviews were completed with AEP Ohio and the implementation contractor staff. The purpose of these interviews was to understand how the program worked and how it was marketed for 2017. Discussion guides were developed allowing a structured but open-ended interview and provided to AEP Ohio for review. A free-flowing discussion resulted between interviewer and respondent. Staff experienced in new building programs and program evaluations were used to perform the interviews. Interviews were conducted by telephone to provide flexibility to the respondents' schedules.

2.7 Interviews with Program Participants

Navigant designed the customer surveys within a best practice research framework and worked with the Blackstone Group to field participant telephone surveys. The evaluation team developed the survey sample to achieve appropriate program level confidence and precision. To meet the targets and provide the most representative data, the sample design controlled for confounding factors specific to the program and employed randomized selection to mitigate any possible biases. The evaluation team defined the survey population based on tracking data provided by AEP Ohio. Participants who received an onsite for the impact evaluation were not included in the participant telephone sample. Instruments were sent to the AEP Ohio compliance team for review. Navigant limited duplication of survey questions already asked by AEP Ohio and considered timing of surveys to limit customer confusion and fatigue.

2.8 Methods Used to Analyze Impact Data

Through a review of the tracking data, the evaluation team divided the completed projects into six strata based on *ex ante* energy savings. A random sample was selected from each stratum except the design review stratum to be reviewed by the evaluation team. Desk reviews were conducted on all sampled projects, including engineering calculations of energy savings claims and verification of baseline and as-built assumptions. Energy modeled projects were reviewed for model inputs on the baseline and as-built models. If uncertainties in the savings calculation existed, a site visit was conducted. Site visits inspected equipment specifications and quantities, verified hours of operation, collected energy management system data and/or metered systems where required, and answered any outstanding questions. The

results of the verification of the sampled projects were statistically applied to the entire population of projects to determine *ex post* savings.

2.8.1 Impact Sample of Project Files

The impact sample for 2017 was chosen to achieve a 90% level of confidence and +/- 10% relative precision for the engineering review. The program was evaluated at the project level and the completed projects were divided into six strata based on *ex ante* energy savings.

The evaluation team sorted the projects from largest to smallest *ex ante* kWh savings and placed them into strata, attempting to achieve a relatively even distribution of cumulative standard deviation in electric energy savings between strata and minimize overall sample size. This approach resulted in a total sample of 22 projects to be selected for engineering review. In the end, Navigant completed desk reviews on a sample comprising 77 percent of the reported program MWh savings. Table 2-1 provides an illustration of the impact measurement and verification (M&V) sample stratification and the level of review complete by the evaluation team within each stratum. Figure 2-1 illustrates the total *ex ante* energy savings claim for the program and the proportion on which the evaluation team completed either a desk or onsite level review.

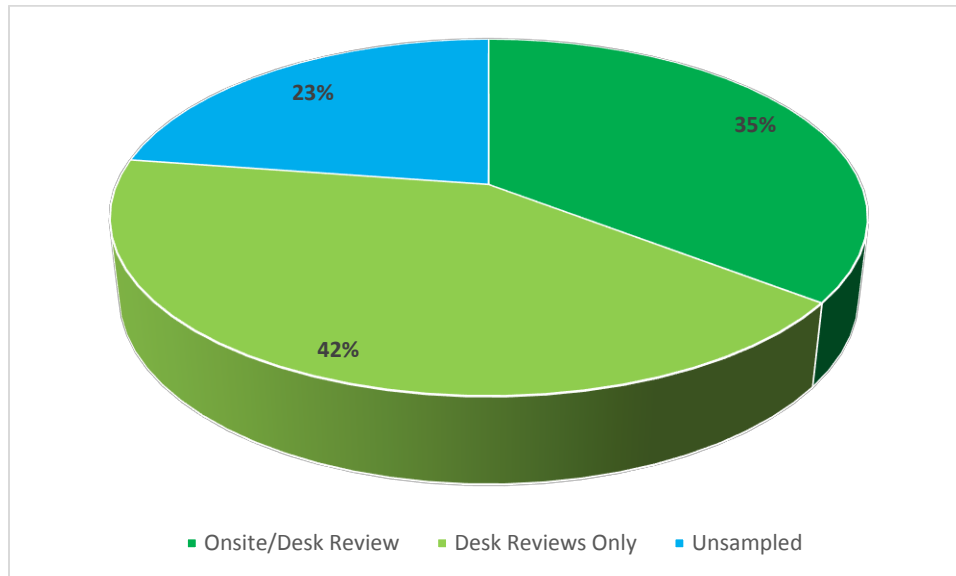
Table 2-1. Impact Sampling Strata and Achieved Sampling

| Stratum by Approach and Energy Savings | Number of Projects | Strata Weight by Energy | Number of Desk Reviews | Number of Onsite Reviews ⁸ |
|--|--------------------|-------------------------|------------------------|---------------------------------------|
| X-Large (>10,000 MWh/yr) | 1 | 28.0% | 1 | 1 |
| Large (>750 MWh/yr) | 10 | 44.0% | 10 | 3 |
| Medium (>300 MWh/yr, <750 MWh/yr) | 16 | 13.9% | 3 | 0 |
| Small (>50 MWh, < 300 MWh) | 48 | 12.5% | 5 | 0 |
| Very Small (<50 MWh) | 54 | 1.6% | 3 | 0 |
| Design Review (No Savings) | 18 | 0.0% | 0 | 0 |
| Total | 129 | 100% | 22 | 4 |
| Percent of Ex Ante Savings | | | 77% | 43% |

Source: Navigant Analysis

⁸ Onsite reviews are a subset of desk reviews. All buildings in the sample at least received a desk review, while some received an onsite review in addition to the desk review. If a building received both an onsite and a desk review, it is counted in both the onsite and desk review totals.

Figure 2-1. Impact Sampling as a Percent of *Ex Ante* Savings



Source: Navigant analysis of 2017 NRNC tracking data

2.8.2 Ex Post Energy Savings Calculation

Energy savings calculations were conducted in accordance with the 2017 Appendix A - AEP Ohio Prescriptive Measures Protocols, the Draft 2010 Ohio Technical Reference Manual, or other published methodologies, such as regional TRM's and accepted engineering approaches, as appropriate. Building energy code, which is referenced as the baseline in many NRNC projects, is defined by the State of Ohio. The default reference code for non-residential new construction in Ohio is IECC 2009, though an option is provided to use ASHRAE 90.1-2007. The evaluation team followed this protocol and used IECC 2009 as the referenced baseline code, except for projects where ASHRAE 90.1-2007 was explicitly referenced in the implementation contractor files as the baseline code, and for whole building projects, which were evaluated in accordance to ASHRAE 90.1 – Appendix G. Lighting was analyzed via lighting power density calculations using the building area method unless the space-by-space method was specified or indicated by the project specifications. Standard approaches were taken with HVAC, shell, appliances, and other equipment. When executable building energy models were available, the models were analyzed for run hours during the actual peak period to determine coincident peak demand reduction.

2.8.3 Realization Rates Calculation Method

Realization rates for each stratum were calculated with the following Equation 1:

Equation 1. Realization Rates for Each Stratum

$$RR = \frac{\sum_{sampled} E_{ex-post}}{\sum_{sampled} E_{ex-ante}}$$

Where: E = the electric energy savings or peak demand reduction for each project in the stratum

Realization rates in each stratum were applied to the project population of that stratum with the following Equation 2:

Equation 2. Realization Rates for Each Stratum Applied to Project Population

$$E_{i,ex-post} = RR_{stratum} * E_{i,ex-ante}$$

3. DETAILED EVALUATION FINDINGS

The following section includes evaluation findings from both the process and impact evaluation of the NRNC Program.

3.1 Program Activity

The 2017 program year represents the seventh year of operation for the NRNC Program and the seventh year in which Navigant has evaluated its operation. In 2017, 129 projects were completed at 128 unique buildings. In 2017, 87 unique identified participants⁹ and 16 early design reviews participated in the program,¹⁰ fewer than the 143 unique participants from 2016. Thirteen participants, completed multiple projects, accounting for 38 of the 129 projects. This means 13 percent of participants were responsible for 29 percent of projects, a significant change from 2016 when 20 percent of participants were responsible for 47 percent of projects.

In previous years, it was common for multiple separate projects to be associated with the same building, leading Navigant to aggregate and evaluate at the building level. The 2017 tracking data combined measures at individual buildings to the project level. One building received two or more distinct project codes. This change led Navigant to evaluate at the project level, which is now nearly identical to the building level aggregation and evaluation done in prior years.

The 2017 NRNC projects involved approximately 123 million square feet of new and renovated buildings.¹¹ Overall, the number of projects participating in the program decreased significantly from the prior year's program (though this isn't a great comparison as the definition of project has changed). The floor area affected by the program also decreased significantly. Nearly twenty percent of the floor area touched by the program in 2017 was attributable to a single warehouse facility claiming 2.3 million square feet and over 12 million kWh of savings, nearly thirty percent of total program savings.

Total *ex ante* electricity savings reported for the program in 2017 amounted to 44,687 MWh (Table 3-1), an increase of six percent over 2016 (Table 3-1). These *ex ante* savings reveal the program exceeded its energy savings goals by approximately 60 percent. The *ex ante* demand reduction for the NRNC program totaled 7.2 MW, 14 percent lower than 2016. The total amount of incentives issued in 2017 was \$2,539,374 28 percent less than the program paid in 2016.

⁹ Navigant notes the tracking database contained a number of variations on some organization names. Navigant exercised judgment in identifying "unique" participants.

¹⁰ Full participant data was not available in the tracking data for 18 projects. Two of these 18 projects were Whole Building projects, were selected for evaluation, and were subsequently identified. The remaining 16 projects only received incentives for early design review and as such contributed no savings to the NRNC program in 2017.

¹¹ Floor areas were reported for 118 of the 128 unique buildings participating in the program in 2017. For those with unreported square footage, Navigant estimated the floor area from the average floor area of similar buildings from the tracking database.

Table 3-1. Program *Ex Ante* Summary, 2016 and 2017 Program Years

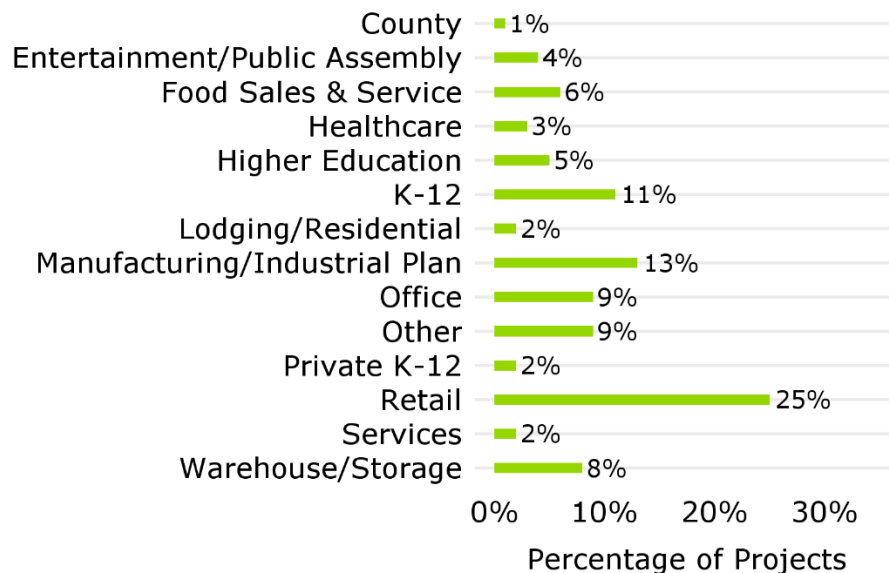
| | 2017 Program | 2016 Program |
|---|--------------|--------------|
| Total Incremental Participant Cost | \$11,645,988 | \$14,940,573 |
| Amount of Incentives | \$2,539,374 | \$3,519,527 |
| Floor Area (reported sq.ft.) | 11,074,455 | 20,007,146 |
| Floor Area (total estimated sq.ft.) | 12,362,337 | 23,067,462 |
| <i>Ex Ante</i> Energy Savings Reported to Program (MWh) | 44,687 | 42,015 |
| <i>Ex Ante</i> Demand Savings Reported to Program (MW) | 7.2 | 8.4 |

NOTE: Total floor area is calculated from unique buildings in each year.

Source: Navigant analysis of 2017 NRNC tracking data

Retail, manufacturing/industrial, and K-12 schools represent the three largest business type categories when considering the total number of projects completed, contributing approximately half of the total projects completed by the program in 2017 (Figure 3-1).

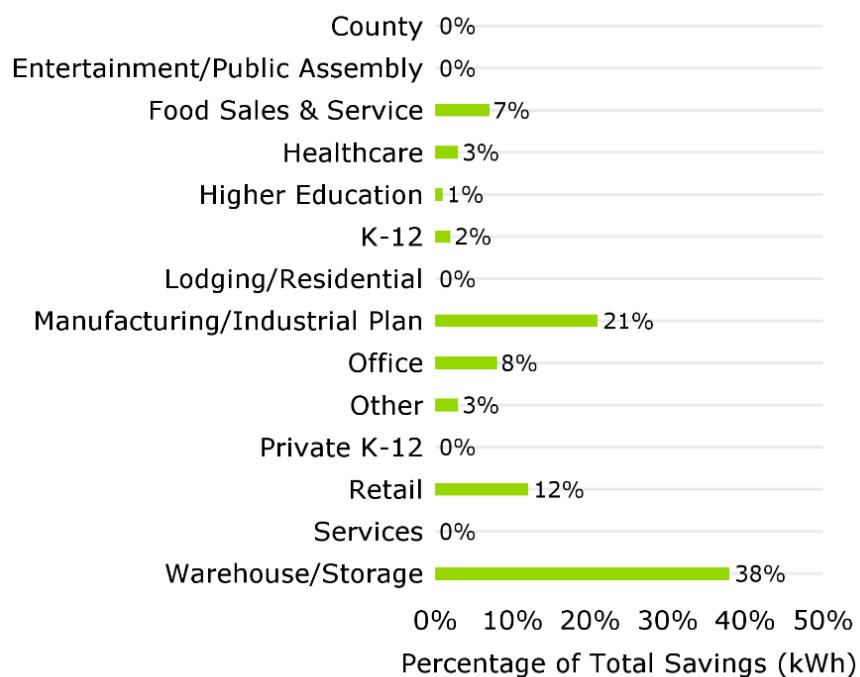
Figure 3-1. Distribution of Project Count by Business Type, 2017 Program



Source: Navigant analysis of 2017 NRNC tracking data

In terms of energy savings, Figure 3-2 shows the distribution of *ex ante* energy savings by business type. Savings from warehouse/storage, retail, and food service facilities saw significant increases in 2017 from 2016, up to 38 percent from 13 percent, 12 percent from less than one percent, and seven percent from approximately one percent, respectively. K-12 schools, higher education, and offices saw significant decreases from 2016 to 2017, from 15 percent to two percent, nine percent to one percent, and 15 percent to eight percent, respectively. A significant portion of the savings for this program year were attributable to a single warehouse facility claiming nearly 30 percent of the entire program's energy savings, and inflating the portion of savings attributed to the warehouse/storage business type.

Figure 3-2. Energy Savings by Business Type, 2017 Program



Source: Navigant analysis of 2017 NRNC tracking data

Table 3-2 shows the number of projects that participated in the program by business type, along with the level of savings, based on information reported in the tracking database.

Table 3-2. 2017 Program Activity by Business Type

| Business Type | Project Count | | Ex Ante Energy Savings (kW/year) | | Ex Ante Demand Savings (kW/year) | |
|---------------------------------|---------------|-------------|----------------------------------|-------------|----------------------------------|-------------|
| Warehouse / Storage | 10 | 7.8% | 16,888,267 | 37.8% | 1,778 | 24.7% |
| Manufacturing / Industrial | 14 | 10.9% | 9,562,684 | 21.4% | 1,370 | 19.1% |
| Retail | 24 | 18.6% | 5,455,123 | 12.2% | 802 | 11.2% |
| Office | 13 | 10.1% | 3,550,560 | 7.9% | 1,076 | 15.0% |
| Food Sales & Service | 9 | 7.0% | 2,964,599 | 6.6% | 480 | 6.7% |
| Unassigned | 18 | 14.0% | 2,389,067 | 5.3% | 601 | 8.4% |
| Healthcare | 5 | 3.9% | 1,178,919 | 2.6% | 436 | 6.1% |
| Other | 6 | 4.7% | 1,002,389 | 2.2% | 165 | 2.3% |
| K-12 | 13 | 10.1% | 831,845 | 1.9% | 271 | 3.8% |
| Higher Education | 5 | 3.9% | 353,712 | 0.8% | 109 | 1.5% |
| Private K-12 | 1 | 0.8% | 183,251 | 0.4% | 30 | 0.4% |
| Lodging / Residential | 2 | 1.6% | 126,633 | 0.3% | 35 | 0.5% |
| Services | 3 | 2.3% | 83,301 | 0.2% | 16 | 0.2% |
| Entertainment / Public Assembly | 4 | 3.1% | 116,717 | 0.3% | 17 | 0.2% |
| County | 2 | 1.6% | 0 | 0.0% | 0 | 0.0% |
| Total | 129 | 100% | 44,687,067 | 100% | 7,188 | 100% |

Source: Navigant analysis of 2017 NRNC tracking data

Table 3-3 shows the distribution of projects by program option. Seventy-four percent of the projects in the 2017 program applied under the custom/prescriptive path. The custom/prescriptive path projects account for 74 percent of total program savings, while the other 26 percent of program savings are attributable to whole building projects. The proportional distribution of savings is relatively consistent to what was seen in 2016. (In 2016, 72 percent of program savings were contributable to the custom/prescriptive path while 28 percent were contributable to the whole building path.)

Table 3-3. 2017 Activity by Program Option

| Option | Number of Projects | | Estimated Floor Area (Sq Ft) | Ex Ante Savings (kWh/year) | |
|-----------------------|--------------------|-------------|------------------------------|----------------------------|-------------|
| Custom/Prescriptive | 92 | 71% | 8,308,781 | 32,710,310 | 73% |
| Whole Building | 20 | 16% | 2,091,296 | 11,976,757 | 27% |
| Design Incentive Only | 17 | 13% | 1,962,250 | 0 | 0% |
| Total | 129 | 100% | 12,362,337 | 44,687,067 | 100% |

NOTE: Buildings that include Whole Building and Prescriptive/Custom projects or Design Incentives are counted under the Whole Building category for project and building counts, but measure savings are placed under their respective category.

Source: Navigant analysis of 2017 NRNC tracking data

3.1.1 Prescriptive / Custom Program Path Activity

A total of 399 prescriptive/custom measures were completed within the NRNC program in 2017. The breakdown of the prescriptive/custom energy savings by measure category is shown in

Table 3-4. The prescriptive approach is mostly driven by Solution Providers and, as such, is an indication of the Solution Provider's activity. The percent of savings attributable to lighting showed a notable increase from 2016, but closely resembles the savings breakdown from the year before, 79 percent in 2017 compared to 54.8 percent in 2016 and 73.1 percent in 2015. The fact that lighting savings showed a significant increase in contribution over the 2016 program is more indicative of 2016 being different than other years than a notable change in the 2017 program.

Table 3-4. Prescriptive / Custom Measure *Ex Ante* Savings, 2017 Program

| Measure Category | Measure Count | <i>Ex Ante</i> Energy Savings (kWh) | |
|----------------------------|---------------|--|-------------|
| Agriculture | 6 | 503,681 | 1.5% |
| Commercial Clothes Washers | 1 | 587 | 0.0% |
| Compressed Air | 2 | 148,500 | 0.5% |
| Food Service | 13 | 40,032 | 0.1% |
| HVAC | 207 | 1,725,843 | 5.2% |
| Hot Water | 2 | 41,184 | 0.1% |
| Lighting | 118 | 25,919,809 | 78.8% |
| Process Equipment and VFDs | 17 | 1,870,949 | 5.7% |
| Transformers | 3 | 6,269 | 0.0% |
| Refrigeration | 26 | 2,468,270 | 7.5% |
| Shell Improvements | 4 | 161,603 | 0.5% |
| Total | 399 | 32,886,727 | 100% |

NOTE: Totals may not sum due to rounding.

Source: Navigant analysis of 2017 NRNC tracking data

Lighting measures completed under the NRNC Program are divided into two broad categories, 1) lighting power density (LPD) and 2) interior lighting controls, and are further subdivided within the categories, as shown in Table 3-5. The division of energy savings within the prescriptive lighting measures are very similar to the prior program year, with lighting power density savings accounting for almost 98 percent of the reported lighting energy savings. Lighting controls accounted for 2.2 percent of lighting savings and six total installations within the NRNC Program during 2017.

Table 3-5. Prescriptive Lighting Measures by Category, 2017 Program

| Prescriptive Lighting Measures | Number of Measures | <i>Ex Ante Lighting</i> Energy Savings (kWh) | | <i>Ex Ante Lighting</i> Demand Savings (kW) | |
|--------------------------------|--------------------|---|-------------|--|-------------|
| Interior LPD | 70 | 22,458,688 | 86.6% | 3025.47 | 97.7% |
| Exterior LPD | 42 | 3,279,046 | 12.7% | 5.3664 | 0.2% |
| Interior Daylighting Controls | 6 | 182,074 | 0.7% | 66.953 | 2.2% |
| TOTAL | 118 | 25,919,809 | 100% | 3,097.79 | 100% |

NOTE: Totals may not sum due to rounding.

Source: Navigant analysis of 2017 NRNC tracking data

3.1.2 Whole Building Program Activity

There were a total of 50 whole building measures completed across 37 projects within the 2017 NRNC Program. The whole building measures fell into three categories, standard whole building measures, design/modeling incentives, and My Solutions, as shown in Table 3-6.

Table 3-6. Whole Building Measure *Ex Ante* Savings, 2017 Program

| Measure Category | Measure Count | <i>Ex Ante</i> Energy Savings (kWh) | |
|---------------------------|---------------|--|-------------|
| Whole Building | 18 | 11,665,923 | 99% |
| Design/Modeling Incentive | 30 | - | 0% |
| My Solutions | 2 | 134,417 | 1% |
| Total | 50 | 11,800,340 | 100% |

Source: Navigant analysis of 2017 NRNC tracking data

The design and modeling incentives have no associated savings, as these measures are associated with incentives provided to the design team for early design assistance or support over the course of the building project. Some of the design and modeling incentives provided in 2017 are associated with projects completed in 2017, but because of the length of time required to complete most NRNC projects, some of the design and modeling incentives are related to projects that will likely be completed, and potentially contribute energy savings in future program years.

Ninety-nine percent of the *ex ante* energy savings associated with the whole building measures are associated with the standard whole building measures. The My Solutions option, which was introduced in 2016, only accounts for one percent of the *ex ante* energy savings associated with the Whole Building measures. The two My Solutions measures identified in Table 3-6 are associated with two separate projects, meaning the average savings for a My Solutions project in 2017 is approximately 67,000 kWh, significantly less than the average savings from a standard whole building project of approximately 650,000 kWh.

3.2 Impact Evaluation Findings

This section includes a summary and discussion of the evaluation-calculated electrical energy and peak demand savings for the 2017 NRNC program. Annual electricity savings were calculated using the data collected through document reviews and field visits for the sample of sites.

3.2.1 Summary of Impact Findings

The *ex post* energy and coincident summer peak demand annual savings for 2017 are 42,844 MWh and 7.57 MW respectively. This result is slightly lower than the historical *ex post* program savings (a decrease of three percent for energy savings and eight percent for coincident peak demand savings from 2016) and greatly exceeded the 2017 goal of 27,626 MWh savings and 6.2 MW coincident demand reduction. The realization rate for energy savings was found to be 0.96, while the demand savings realization rate was found to be 1.05. These detailed results are shown in Table 3-7.

Table 3-7. Impact Savings, Realization Rate and Precision of Sample

| Metric | 2017 Program Goals (a) | <i>Ex Ante</i> (b) | <i>Ex Post</i> (c) | Realization Rate RR = (c) / (b) | Overall Relative Precision at 90% Confidence | Percent of Goal = (c) / (a) |
|---------------------------------------|---------------------------|-----------------------|-----------------------|------------------------------------|--|--------------------------------|
| Annual Energy Savings (MWh) | 27,626 | 44,687 | 42,844 | 0.96 | 1.84% | 155% |
| Coincident Peak Reduction (MW) | 6.2 | 7.22 | 7.57 | 1.05 | 12.6% | 123% |

Source: Navigant analysis of 2017 NRNC tracking data

One factor that may have contributed to the reduction in energy savings from the 2016 program year to the 2017 program year may have been the advancement of the commercial building energy code. On January 1, 2017, the minimum building code was updated from ASHRAE 90.1 2007 to ASHRAE 90.1 2010. This code change improved the minimum efficiency, or baseline, required by code for HVAC systems and most LPD calculations, among many smaller adjustments. Increasing the efficiency of code minimum decreases the baseline energy consumption and savings for any given efficiency measure.

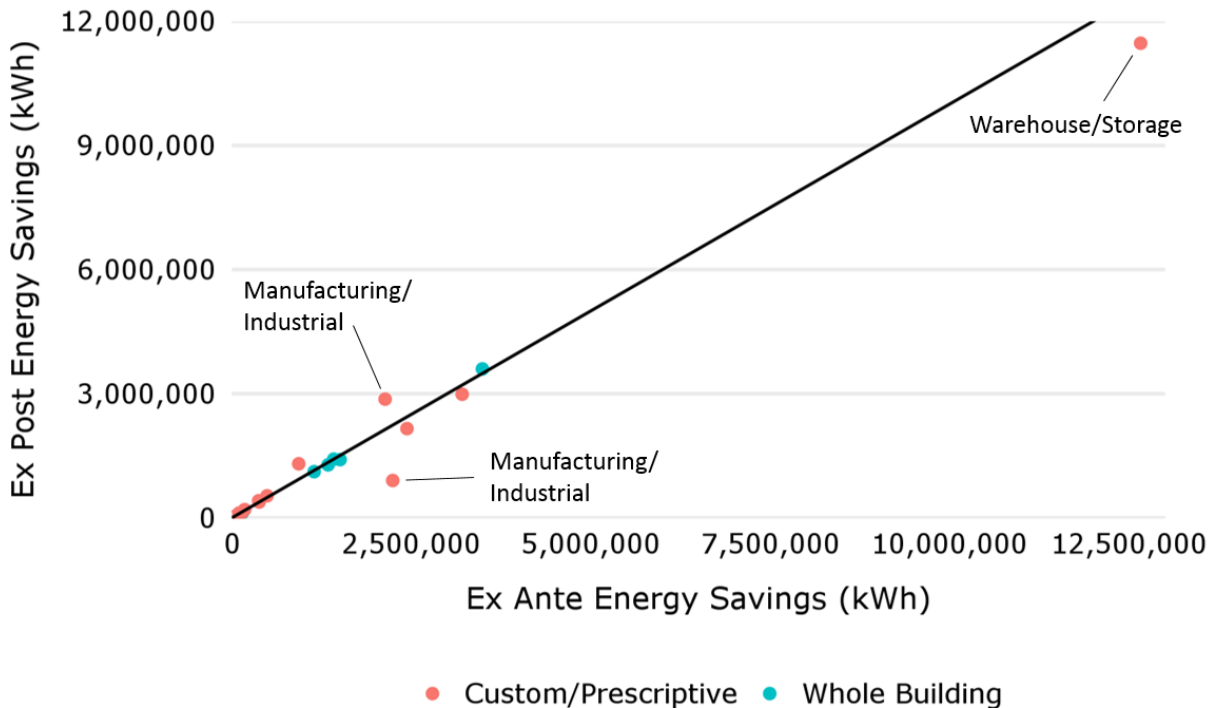
For new construction projects, the code used by a facility is dictated by the permit dates acquired before construction. Navigant gathered these permit dates from applications included in project files to apply the appropriate code minimum for evaluation. Within the 2017 program, there were a handful of projects to which the new baseline applied, so the impact is likely minor, which is why Navigant did not explore a comparison in detail. The 2018 program will likely see a larger number of projects evaluated under the new code, the effect of which will be explored in greater detail in the 2018 evaluation.

3.2.2 Driving Factors of Realization Rate

Data analysis revealed certain factors are driving the realization rate between claimed savings and verified savings.

3.2.2.1 Energy Considerations

Figure 3-3 is a graphical representation of the building level *ex ante* versus *ex post* energy savings grouped by program approach. The diagonal line represents the goal of a realization rate of one. Points above and to the left of the RR=1 line represent buildings with energy realization rates above one, while those points below and to the right are buildings with realization rates less than one. The most significant outliers are labeled with their respective business types.

Figure 3-3. *Ex Ante* vs. *Ex Post* Energy Savings


Source: Navigant analysis

The project most influential on the program energy realization rate was a Manufacturing/Industrial building with *ex ante* energy savings of approximately 2.2 million kWh and *ex post* savings of 900,000 kWh. *Ex ante* calculations indicated 6,240 annual hours of use throughout the building. The onsite verification determined multiple lighting schedules were being utilized. Lighting schedules included 2,134 annual hours for most areas, 1,102 hours for conference rooms, and 502 hours for unoccupied and seldom used offices. Air compressor hours of use were also found to be lower than claimed, averaging at 3,600 annual hours instead of the claimed 6,240. Finally, two claimed variable speed drives on pump motors were found to have been removed.

The second most influential site was the largest project, near 12 million kWh in savings. Its significance and influence come largely from its size, as it represents 28 percent of total program savings for 2017. The issue driving the low realization rate for this Warehouse/Storage building was the hours of use of the lighting. *Ex ante* calculations indicated most lights were on 24 hours per day, 365 days a year, yielding 8,760 hours of annual usage. Actual hours of use were verified onsite to be approximately 3,420 hours per year for a portion of the lighting, resulting in a significant decrease in energy savings from lighting, and an overall project realization rate of 91 percent.

One smaller site, with *ex ante* savings near 900,000 kWh, had the opposite problem, and a resulting overall realization rate of 140 percent. *Ex ante* calculations indicated 3,420 annual hours of use for all lights, while the onsite verification revealed a significant portion (25-30 percent) of fixtures were nightlight fixtures, operating 8,760 hours per year.

The final site with a significant impact on the energy realization rate was another Manufacturing/Industrial facility with *ex ante* energy savings of 2.1 million kWh and *ex post* savings of 2.9 million kWh. *Ex ante* calculations were based on lighting diagrams and schedules included with the original application, which consisted mostly of T8 and T5 linear fluorescent fixtures. However, the installed fixtures, determined from purchase receipts, were mostly more efficient LED fixtures, with lower wattages than the linear fluorescent fixtures, resulting in significantly higher energy savings.

At the program level, the findings from the 2017 evaluation point to rather strong agreement between the *ex ante* and *ex post* findings, but there is wide variance at the project level. This variance is driven primarily by issues in calculating the savings from lighting through lighting power density (LPD) calculations. These issues are identified in greater detail in Section 3.2.4, but the most important issues related to lighting include the following.

- For a handful of projects, the *ex ante* calculations did not correctly classify the building type and therefore the baseline for the LPD calculation.
- In some cases, the *ex ante* calculations were found to not use the correct HOU for the as-built conditions.
- For a few projects, *ex ante* calculations do not include the exterior base allowance in exterior lighting.

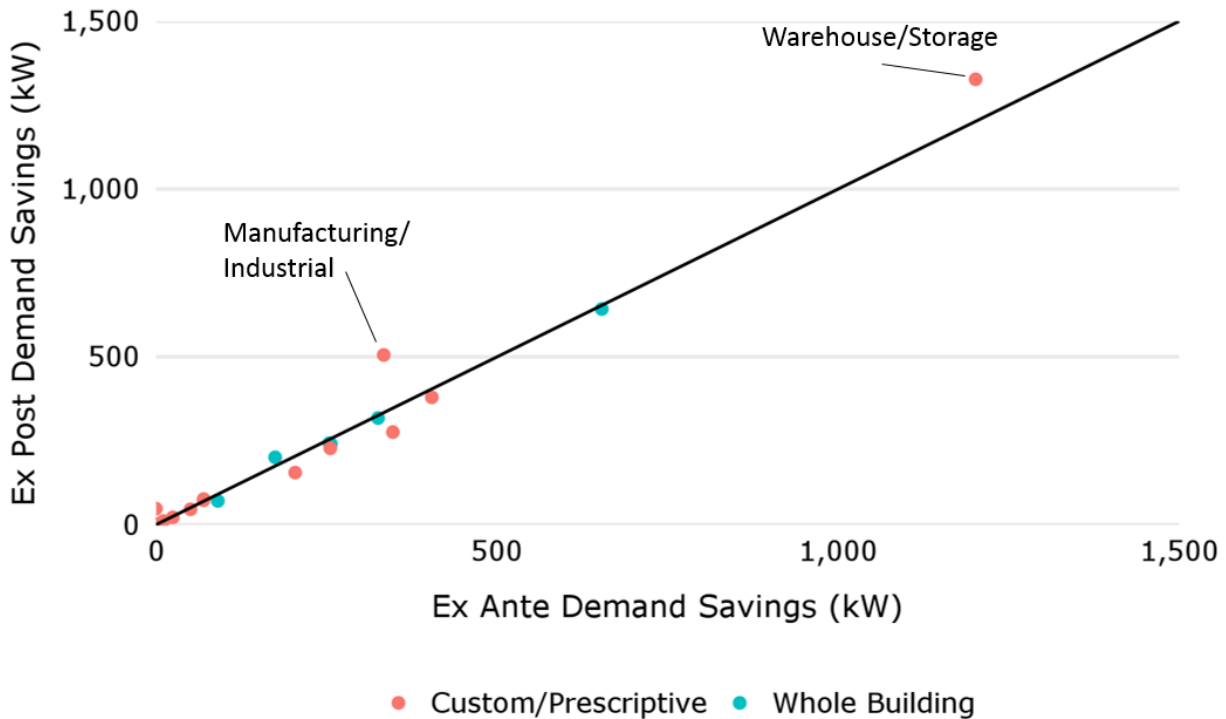
The issues around lighting savings did result in significant adjustments to savings including adjustments of more than 1 GWh of savings for at least one project. Improving the quality of LPD savings calculations should be a critical focus of the 2018 program and is discussed in the recommendations of this report.

Figure 3-3 illustrates the difference in *ex ante* and *ex post* energy savings by application type. The differences between the *ex ante* and *ex post* savings were very small for the Whole Building projects. The realization rate adjustments are mostly attributable to Prescriptive and Custom projects.

3.2.2.2 Demand Considerations

Similar to the energy savings analysis, the discussion of coincident demand reduction starts by analyzing Figure 3-4, which is a graphical representation of the building level *ex ante* versus *ex post* coincident demand findings. The diagonal line represents the goal of a realization rate of one. Points above and to the left of the $RR=1$ line represent buildings with demand realization rates above one, while those points below and to the right are buildings with realization rates less than one. The most significant outliers, though outliers are relatively non-significant in the 2017 program analysis, are labeled with their respective business types.

Figure 3-4. *Ex Ante* vs. *Ex Post* Coincident Demand Reduction



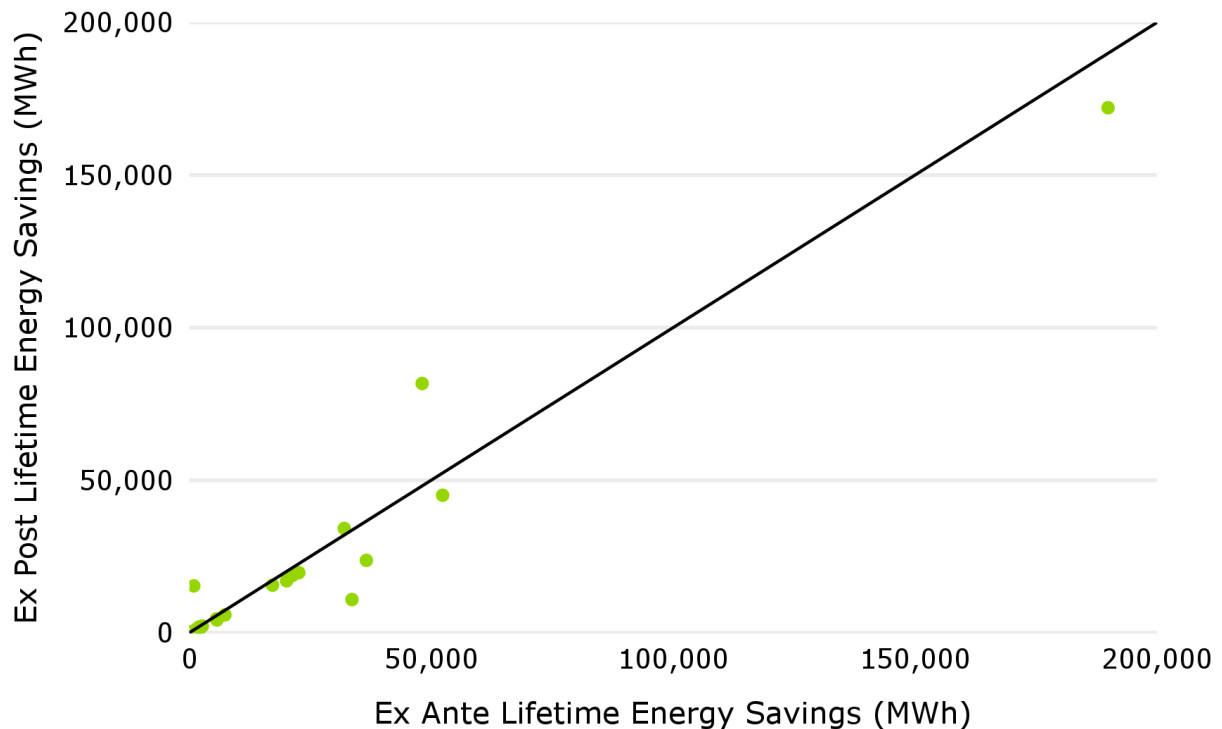
Source: Navigant analysis

There are two projects that stand out slightly from this analysis. The first is the large Warehouse/Storage facility previously discussed. The hours of use issue discussed above does not affect the demand. The greater than one demand realization rate results from the onsite providing an updated building type for *ex post* calculations, which slightly increased allowed baseline lighting power density in *ex post* calculations.

The second project that significantly impacts the program-level demand realization rate is one of the Manufacturing/Industrial projects previously discussed. As noted above, *ex ante* calculations used outdated lighting diagrams and schedules claimed mostly linear fluorescent fixtures, but most of the fixtures actually installed were more efficient LED fixtures, resulting in further reduced installed wattage and increased savings. This was true for the coincident demand savings as well as the energy savings.

3.2.3 Lifetime Energy Considerations

Figure 3-5 is a scatter plot of the *ex ante* and *ex post* lifetime energy savings by project type. As before, the diagonal line represents the goal of a realization rate of one. Points above and to the left of the RR=1 line represent buildings with demand realization rates above one, while those points below and to the right are buildings with realization rates less than one. This illustrates the significant variance off the RR=1 line for the Lifetime Energy Savings, indicating project lifetimes varied widely between *ex ante* and *ex post*.

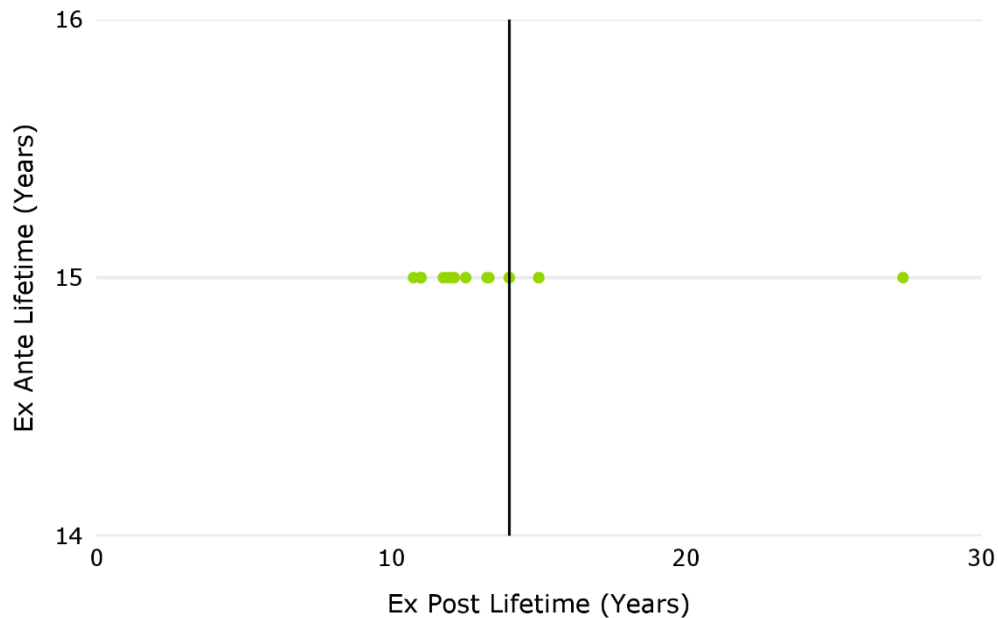
Figure 3-5. *Ex Ante* vs. *Ex Post* Lifetime Energy Savings


Source: Navigant analysis

Ex ante lifetimes are uniformly assigned at 14 years for all projects, including all measures. *Ex post* calculations separate energy savings given by the building models into lighting LPD savings and various HVAC measures, apply specific lifetimes for each savings category, and calculate a weighted average lifetime for the entire project.

The *ex ante* estimate of 14 years is a conservative guess at a typical life. However, the *ex post* results indicate this value may not be that conservative. Figure 3-6 illustrates the average expected project lifetimes for each evaluated project. Sixteen of the 22 evaluated projects received an *ex post* lifetime of less than 14 years, two projects had lifetimes of 15 years, and one project was found to have a lifetime significantly over 15 years. Only three of the 22 evaluated projects had a lifetime matching the *ex ante* estimated lifetime. Projects that were verified to have lifetimes less than 14 years were usually dominated by lighting measures with standard lifetimes of 11 years. The one project with a lifetime significantly greater than 14 years included building shell (insulation) and refrigeration measures integral to the buildings structure, which were considered to have a 30-year lifetime. The average verified lifetime was found to be approximately 14 years, matching the *ex ante* estimate, but there was large variance within individual projects.

Figure 3-6. *Ex Ante* vs. *Ex Post* Lifetime for Whole Building Projects



Source: Navigant analysis

Additional findings from the impact analysis, including details of less significant issues identified through the impact analysis are included in APPENDIX A.

3.3 Process Evaluation Findings

In 2017, the NRNC program saw the conclusion of the implementation contractor transition, where all program activities were shifted between two implementers. This transition began in 2015 and was expected to be completed in 2016, but extended into the first half of 2017 with a handful of projects still needing to be closed out by the original implementer. The most significant 2017 program process change was a simplification of application verification process, which was enacted across AEP Ohio's portfolio of business programs. In prior years applications for the AEP Ohio programs were directed to multiple implementation contractors. In 2017, an Outreach Coordinator was added to the implementation team; applications for all AEP Ohio business programs were directed to this Outreach Coordinator who reviewed everything for missing documentation before forwarding the complete application to the correct implementation contractor for engineering review.

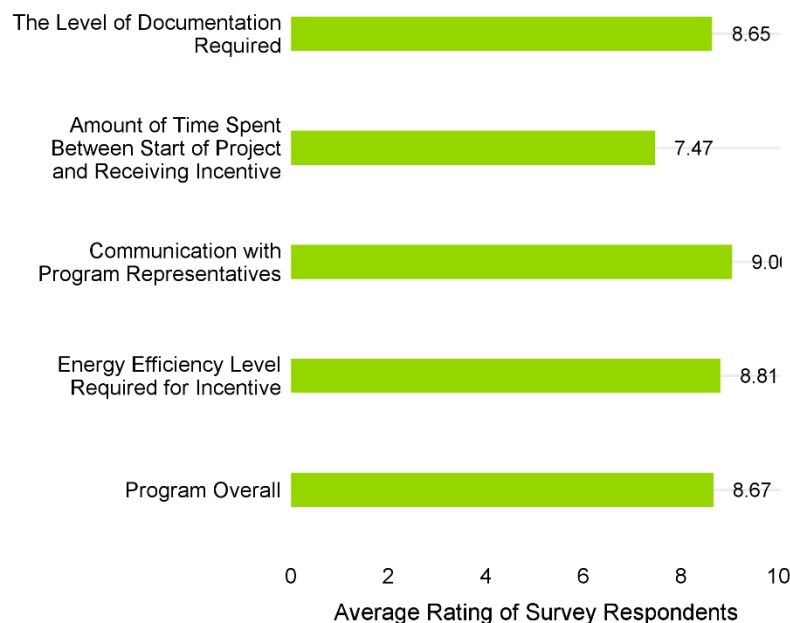
The 2017 process evaluation activities included detailed interviews with AEP Ohio's Program Administrators and the implementer and telephone surveys with program participants. The phone surveys targeted a census of 2017 NRNC program participants, except for those who were selected for an onsite as part of the impact sample. Of the 74 unique participant records that made up the potential survey population, the evaluation team completed 18 surveys, a response rate of 24 percent. However, 28 of the customer records were determined to be "bad" records, i.e. turned out to be fax numbers, wrong numbers, disconnected numbers, etc., so of the 46 "good" records, the adjusted response rate turned out to be 39 percent. Significant findings from the detailed interviews with the Program Managers and

implementation contractor as well as the participant survey are detailed in this section. Full responses to the participant survey are included in APPENDIX B.

3.3.1 Participant Satisfaction

NRNC program participants continue to show a high level of satisfaction with the program. On a scale of 0 to 10 participants gave the program an average overall score of 8.67 (Figure 3-7), which is comparable to the 8.8 score found during the 2015 evaluation, which is the last time a participant survey was completed. As illustrated in Figure 3-7, program participants not only gave the program a high overall rating, they also rated the program well in terms of the documentation required and communication with program staff.

Figure 3-7. Program Satisfaction Summary (n=18)



Source: Navigant analysis of customer survey

The AEP Ohio program manager's and the implementation contractor's perceptions of program satisfaction match those of the customer survey. Both indicate that they believe the NRNC program is well received by customers and that customer satisfaction is an important metric of success, although in both cases this perception seems to be mostly due to a lack of complaints than any active monitoring process.

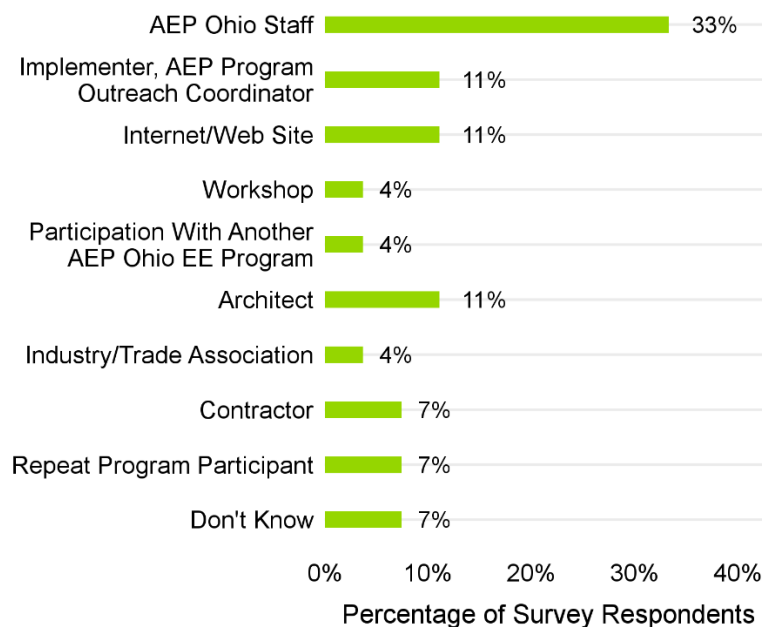
3.3.2 Marketing Efforts and Program Awareness

AEP Ohio does not prioritize marketing for the NRNC program to the general public, as this program has always exceeded its savings goals. Participation in the NRNC program is limited more by the availability of funds and the time needed from the implementation contractor to engage with customers and design firms, than being able to find participants. In general, AEP Ohio spends very little on marketing efforts related to the NRNC program, which is consistent with the other Business programs.

Past NRNC program evaluation reports have indicated potential missed opportunities in some segments of the NRNC market as well as within specific design pathways, i.e. design-build, or build-to-lease. It was clear from the 2017 process evaluation that AEP Ohio and the implementation contractor did not focus efforts on potential underserved markets. Even if the program continues to exceed its targets, there is still a need to reassess pathways to encourage participation of harder-to-reach market segments such as build-to-lease projects or those in less populated areas of the jurisdiction.

Current NRNC program outreach activities are driven by people-to-people connections between implementation contractor Energy Advisors and design teams, including architects and engineers. As indicated in Figure 3-8, approximately half of NRNC program participants (44 percent) indicate they learned about the program through AEP Ohio or implementer program staff. Implementation Contractor staff also maintain close connections with local trade associations and design teams. In many cases the implementation contractor works behind the scenes with the design team, providing the support necessary for the design team to promote the NRNC program to their client. Figure 3-8 supports this point, with 22 percent of participants reporting they learned about the NRNC program through an architect, contractor, or industry/trade association. The implementation contractor reports that occasionally they make cold calls or stop in at job sites to chase after projects that they hear about, but this is very rare.

Figure 3-8. How Participants Learned About the NRNC Program (n=18)

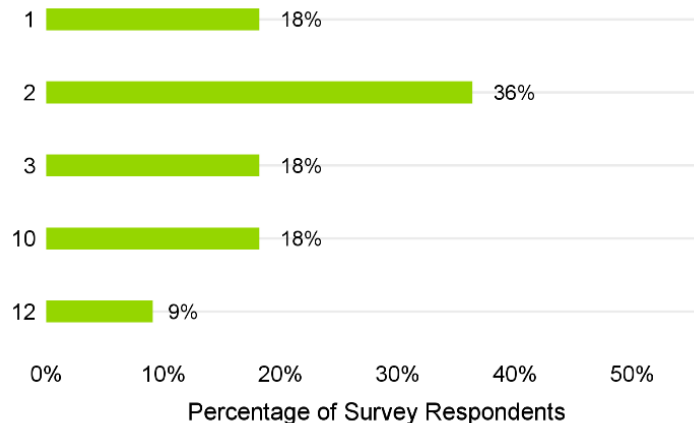


Source: Navigant analysis of customer survey

AEP Ohio reports the current NRNC program Technical Advisors are very strong; they are so good at working with the Architects and Engineers that they have reduced the burden on the Energy Advisors. The program benefits from the relationships established by the Technical Advisors. The result is greater program penetration within design companies, because these companies are now relying on the expertise and input of the Technical Advisors. It is expected that the program will see more repeat

customers because of this relationship. It should be noted, repeat customers are not currently lacking in the NRNC program, as illustrated in Figure 3-9, but this is expected to grow.

Figure 3-9. Number of Projects Submitted to the NRNC Program in the Past 5 Years (n=11)¹²



Source: Navigant analysis of customer survey

Because marketing has not been a priority of the NRNC program, there are very limited program materials for the implementation contractor to use. The current program materials only include the program applications and the website. In the fourth quarter of 2016, the implementation contractor started a NRNC newsletter to share program news with Solution Providers, i.e. developers, architects, and engineers. The implementation contractor reports interest in having some additional printed program materials to support conversations with potential participants and an update to the website, which the implementation contractor reports is only used by rebate processing companies.

3.3.3 Program Requirements

Overall, the NRNC program has remained relatively consistent between 2016 and 2017, but a few minor changes are worth noting and are listed below in

Table 3-8. A portion of the 2017 program changes have been driven by the market, while other changes result from the completion of the IC program transition.

1. **Process:** The new implementer brought all NRNC program engineering review in-house. This move has reduced complexity for the customers as they now only have one application number, where they used to have two (Each implementer had their own application numbers).

Applications: The program applications have been updated to reflect the energy code change that went into effect on January 1, 2017, when ASHRAE 90.1-2007 was replaced by ASHRAE 90.1-2010. The program is currently operating with two versions of each application, as illustrated in

2. Table 3-8 because the baseline code for a project is the code under which the building was permitted. This means any building permitted prior to January 1, 2017 will be built under ASHRAE 90.1-2007 and as such, will still use the ASHRAE 90.1-2007 application. The differences in these

¹² This question was asked of NRNC participants who reported that their firm had completed more than one project in AEP Ohio service territory in the last five years.

applications is relatively minor and completely code driven, for example ASHRAE 90.1-2010 is more stringent for lighting which means lower minimum watts per square foot for LPD inputs.

Table 3-8. Comparison of 2016 – 2017 NRNC Applications.

| Program Track | 2016 Program Year Applications | 2017 Program Year Applications |
|---------------------------------------|---|---|
| Standard New Construction Application | ASHRAE 90.1-2007: Single application for Whole Building, Efficient Products for Business and Process Efficiency | ASHRAE 90.1-2007: Single application for Whole Building, Efficient Products for Business and Process Efficiency |
| | | ASHRAE 90.1-2010: Single application for Whole Building, Efficient Products for Business and Process Efficiency |
| My Solutions | 2007 code baseline: Office | ASHRAE 90.1-2007: Office |
| | | ASHRAE 90.1-2010: Office |
| | 2007 code baseline: Retail | ASHRAE 90.1-2007: Retail |
| | | ASHRAE 90.1-2010: Retail |
| | | ASHRAE 90.1-2007: Restaurants |
| | | ASHRAE 90.1-2007: Multifamily (expected 2018) |

Source: Navigant review of NRNC program materials and interviews with Program Managers and ICs

3. **Measures:** There were two relatively significant changes to NRNC program measures in 2017:
 - a. With the updated application, the program has added some new lighting measures which are based on the baseline code change. The updated application includes incentives for:
 - i. High bay occupancy sensors
 - ii. Networked lighting controls
 - b. A My Solutions offering for Restaurants was added in 2017¹³. My Solutions provides a prescriptive path towards whole building modeling for buildings smaller than 70,000 sq. ft. and is currently offered for Office, Retail, and the newly added Restaurants. The My Solutions Restaurant offering includes a few refrigeration and lighting measures that are not part of the Office and Retail offerings because these are more specific to the restaurant building type.
4. **Incentive Adjustments:** The program made a few small adjustments to incentives in 2017, including the following.
 - a. The incentive was slightly increased for smaller HVAC Units (AC and heat pumps <5.4 tons) because the minimum qualifying efficiency increased with the code change. Chiller incentives did not change.
 - b. The NRNC program is now claiming heating savings for heat pumps, which allowed the incentives for all heat pumps to increase slightly.

¹³ A My Solutions offering for Multifamily will be added in 2018.

- c. Incentives for exterior lights were decreased which makes the exterior lighting incentives different from the interior lighting incentives. This change was made because AEP Ohio cannot claim kW savings on exterior lighting which limits the value of these savings and because LED parking lot lighting is becoming industry standard.
 - d. Reach in refrigerator and freezer equipment is now being incentivized based on volume.
5. **Pre-Approval:** In 2017, every application included a pre-approval requirement. This requirement was not enforced in 2017, but will be in 2018. The pre-approval can cause some challenges both for the implementation contractor and the project teams, but the goal is to ensure that the program is only incentivizing projects that they have influenced, which is expected to drive deeper energy savings for participating projects. The implementation contractor does have some concerns about this requirement in that it will make it harder for the program to continue to exceed its program savings goal, because they may lose out on some customers that may have otherwise participated in the program. However, the IC is working on educating customers in hopes of limiting this impact. Requiring this pre-approval has been a recommendation of previous program evaluations.

3.3.4 Barriers to Participation

No significant barriers to participation in the NRNC program were identified through the project review. Program staff indicated that they have not heard customers expressing concerns over program requirements and very few customers drop out of the program once they have applied. The implementer indicates there is a significant portion of the NRNC market that won't participate in the program, but in most cases, they don't have a clear indication why. There are a small number of customers that don't think that the incentive is worth their time. This is specifically true for smaller customers, where the incentive is relatively small.

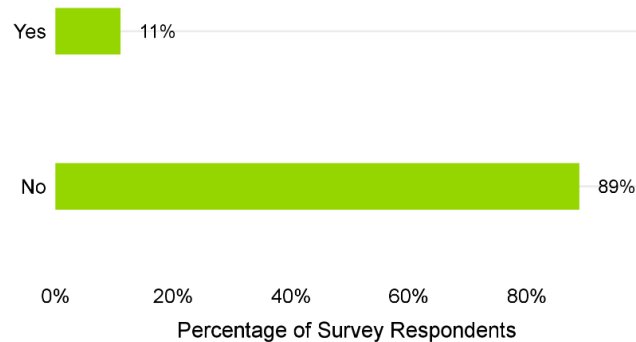
Past evaluation reports indicate the complexity of the program incentive may be a barrier. Navigant's review of the program documentation indicated complexity and clarity of program documentation remains an issue. The evaluation team's perspective is program documents are confusing, duplicative, and do not promote non-energy benefits to the consumer. This concern around the complexity of program documentation is not reflected in the customer experience. The customer interview included questions around the difficulty of finding program documentation and completing the application. For both questions, program participants reported an average score of eight, rated on a 10-point scale where zero represents difficult and 10 represents easy. This finding may be reflective of the fact the implementation contractor reports its staff often complete applications for customers and applications improve when the program staff support this process.

The 2017 evaluation did not research NRNC market segments which may be underserved by the program. Build-to-lease projects are the clear example as these projects suffer from the split incentive¹⁴ issue. The customer survey indicated a very small number of NRNC participating projects, eleven percent, were offered for sale or lease to other businesses (Figure 3-10. Was the Building Offered for Sale or Lease (n=18)). This result is likely indicative of the program's inability to serve the build-to-lease

¹⁴ Split incentives occur when the party responsible for paying energy bills is not the same party who makes the capital incentive in energy efficiency measures. Split incentives mark a barrier to the employment of energy efficiency measures that is most common in multifamily or leased buildings.

market very well. The NRNC Program continues to exceed its savings targets and as such has not focused efforts on meeting the needs of hard-to-reach markets.

Figure 3-10. Was the Building Offered for Sale or Lease (n=18)



Source: Navigant analysis of customer survey

The implementation contractor also indicated that stale, stand-alone projects may be slipping through the cracks. Stale projects are defined as projects where the design or construction project has slowed or stalled, which means that they miss their planned completion date by a significant amount. These projects do not likely represent a significant amount of program savings, as the implementation contractor notes a handful of projects submit a pre-application and not a final application. However, the implementation contractor reports that keeping better track of these projects to reengage in an effective manner is something that they want to do a better job of moving forward.

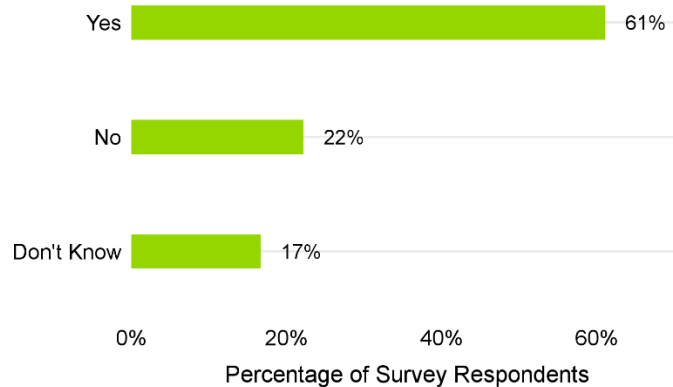
3.3.5 Customer Enrollment and Engagement Process

Navigant reviewed the customer enrollment and engagement process, including reviewing the application forms; processes followed by the implementation contractor in reviewing and approving applications; the time required for review and approval of applications; and the approval review processes. The evaluation team found no significant issues with respect to the enrollment and engagement process.

In most cases, customer interaction with the NRNC Program is marked by a kick-off meeting, or conversely an early design meeting for whole building projects. The kick-off meeting is currently not a required step, but the program is working to encourage/require the meeting, especially since projects with earlier program involvement tend to include a more diverse measure mix, i.e. not just lighting.

The project kick-off meeting helps to ensure that all team members are on the same page, referring to the correct application, and working towards the same goals. Sixty-one percent of the NRNC customers interviewed as part of this evaluation report indicated that there was a kick-off meeting held for their project (Figure 3-11). For customers reporting that no kick-off meeting was held, they further indicate there might have been one but they weren't aware, that it was determined to not be a good use of time, or they were already too far along in the design process for it to provide benefit.

Figure 3-11. Customers Reporting that a Kick-off was Held with AEP Ohio



Source: Navigant analysis of customer survey

Specifically, for larger or more complex projects AEP Ohio specifically focuses on engaging with the design team through an early design meeting (in some cases this early design and kickoff meeting may be considered one and the same). The goal of the early design meetings is to include the AEP Ohio team at the start of the design process so they will not miss opportunities to encourage energy efficiency and to drive deeper savings in each project. The customer receives a \$2,500 incentive if the NRNC program team can join an early design meeting; an extra \$500 incentive is provided if the commissioning agent is included in this meeting. Overall, this early design meeting has been well received.

AEP Ohio's Technical Account Managers (TAMs) engage with customers throughout the project lifecycle. The TAMs are typically involved in all steps of the process from initiation to payment. They complete inspections to ensure that items are installed correctly, follow the progress of the project, and step in with support at critical junctures. For NRNC projects, implementation contractor engineering staff are often also closely involved with project processes and may visit the project while it is under construction to review progress. This is specifically true for complex and whole building projects.

3.3.6 Incentive Payment Process

Funds for each program year are reserved on a project-by-project basis, ideally through an incentive pre-approval process, or as applications are received. Applications are monitored as they proceed through the application steps to verify that they are progressing as expected. If projects are delayed, particularly between program years, money reserved for a particular project may be freed up. In 2017, the implementer mentioned they have regular meetings with AEP Ohio program staff to discuss the progress of projects enrolled in the program.

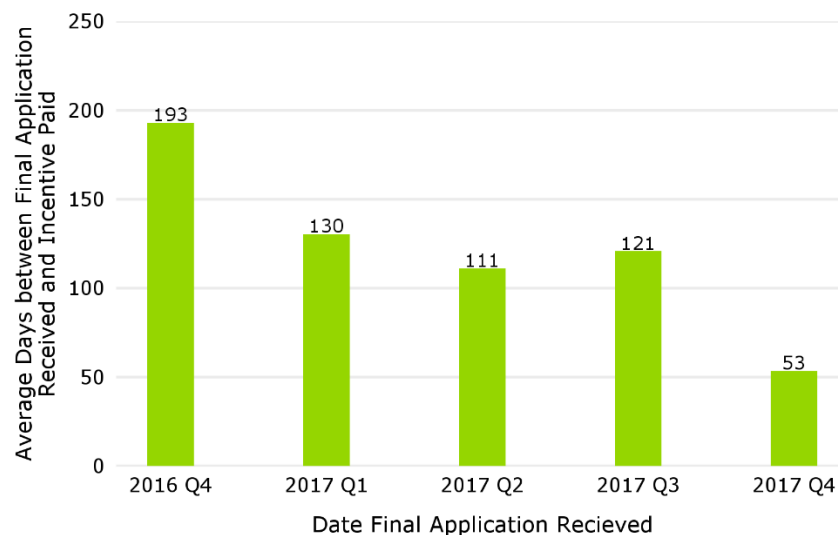
Project pre-approval is the process by which the implementation contractor works with the design team ahead of the application process to understand potential efficiency opportunities and reserve incentive funds. Pre-approval of funds was added to the applications as a requirement in 2017, but the requirement was not enforced explicitly. Of the 129 projects completed in 2017, there were pre-approved incentive amounts recorded in the tracking data for 87.

It is important to note in relation to the pre-approval process is the challenge the NRNC Program has in carrying projects, especially large projects from one year to the next if the project is delayed. Program budgets are assigned for a specific fiscal year, so if a project is pre-approved at a certain incentive for one program year and the project is delayed, it may be difficult to reserve those same funds in the next program year. This challenge makes managing the program more difficult, but there are no reports or significant issues or disputes arising because of this challenge.

Navigant reviewed the elapsed time from the date when the final application was received (field = *FinalApplicationDateReceived*) and the date on which the incentive check was mailed (field = *IncentivePaidDate*). This review was completed for the 94 projects where both fields were populated, though it should be noted these fields should not be completed for the 18 projects that only received early design incentives in 2017.

The average elapsed time from the date when the final application was received and the check was mailed was 131 days. This is compared to 141 days in 2015, and 69 days in 2014.¹⁵ Navigant does not view this as a measure of program performance, but rather as an indication of the time required to complete projects under the program. It is however, interesting to note the length of time between the application completion date and the incentive payment date decreased over the course of the year (Figure 3-12). This is likely a result of the completion of the transfer of the entire process to one implementation contractor and the push to wrap up projects within the 2017 program year.¹⁶

Figure 3-12. Average Days Between Final Application Received and Incentive Paid



Source: Navigant analysis of 2017 NRNC tracking data

The implementation contractor reports that customer dissatisfaction is more closely linked to incentive payments than anything else. The implementation contractor sees customer satisfaction related to a lack

¹⁵ This analysis was not completed in 2016 because the program tracking data did not include the date the final application was received.

¹⁶ It is important to note that the time period between receiving the final application and the payment of the incentive will never be less than 15 days, as there is a 15 day window between AEP Ohio and the current implementer for clearing the check.

of clarity around process efficiency incentive amounts or delayed incentive payments. In some cases, the program has to let customers know they cannot incentivize certain process efficiency measures, because what was installed is the minimum efficiency required by code. In the customer survey, participants indicated their lowest levels of satisfaction with the time required to receive the incentive, but it was not that low and averaged a score of 7.5 on a range from 0 to 10 where 0 represented low satisfaction and 10 represented high satisfaction.

3.3.7 Program Tracking Data Review

The program tracking database is used to record all information from program applications and to track the progress of applications through the process. Navigant's overall assessment of the tracking database is that it is reasonable and accurately reflects the status of program applications. Navigant's review did not address whether the tracking system is adequate for regulatory prudency reviews or corporate requirements.

As in past years, Navigant provides suggestions for improving the usability of the tracking database and making the data clearer for those reviewing the data.

1. Some fields in the tracking database were not completed for all applicants. While all the critical information including savings claimed and incentives paid was complete, other information such as building floor area that is useful in comparing program results as part of the evaluation was missing. For example, floor area was not reported for 10 projects and business type was not reported for 18 projects, 16 of which were early design projects. Navigant recommends a check be added as part of the administrative review of applications to ensure complete information on the project has been received and entered into the database.

3.3.8 Verification and Due Diligence

There are two levels of due diligence carried out as part of the program. The first level is the administrative element, ensuring information submitted to the program is processed accurately and recorded in the project tracking database as previously discussed. The second process is the engineering review of applications to ensure savings for a project are calculated correctly and result in the appropriate level of incentive for the customer, and verification inspections carried out by the implementation contractor to confirm measures have been implemented.

The application completeness verification process was updated in 2017. In prior years applications for the AEP Ohio programs were directed to multiple implementation contractors. In 2017, an Outreach Coordinator was added to the implementation contractor's team; applications to all AEP Ohio business programs were directed to this Outreach Coordinator who reviewed everything for missing documentation before forwarding the complete application to the correct implementation contractor for engineering review. This change has dramatically reduced the time required for an application to be ready for engineering review.

In terms of information tracking, all projects are subject to an administrative review after the application has been received and entered into the program tracking database. This administrative review is then confirmed through a management review before information is provided to AEP Ohio. AEP Ohio then reviews all program application data provided by the implementation contractor and approves program incentives.

The engineering review process differs depending on the type of project (Prescriptive/Custom or Whole Building) and the level of verification carried out differs depending on the type and size of the project. All projects are reviewed by an engineer and most projects also go through a peer review process. Projects may also be subject to a site visit for verification. The proportion of projects subject to a site visit is based on the level of incentive payment, with a higher sampling rate applied to projects with a higher level of incentive. All Whole Building projects are subject to a site inspection.

Reviews for the Prescriptive approach are relatively simple. Staff review the application and supporting documentation to determine compliance with program rules and determines the level of incentives. For the Custom approach, engineering calculations are also reviewed and metering may be installed or other approaches taken to establish customized savings.

Building energy simulation modeling is required for all projects participating in the Whole Building approach, but may also be used for some other projects. Starting in 2013, all applicants to the Whole Building approach are required to provide executable versions of their models. This allows program staff to review the model, project documentation, and drawings to determine whether the energy simulation model properly represents the building design. Engineers from the implementation contractor team work with modelers from the design team to ensure the model accurately reflects expected energy use, which is then used to determine the level of incentives available under the program. Given modeling results can be subject to assumptions made in the modeling process and even to the version of model used, these executable files are important parts of the review process.

No significant disputes were reported to have occurred during 2017. While the evaluation may determine a level of savings that differs from the applicant's initial estimate, these differences have generally represented differences in engineering judgement and have been resolved without issue. In most instances, program staff and solution providers indicated the differences arose from legitimate differences in engineering opinion on how to estimate savings or represent an efficiency change in the building energy model. While such disputes have not been significant to-date, Navigant continues to recommend consideration be given to developing a formal process to provide a framework in case such disputes arise in future.

Navigant has met regularly with the implementation contractor to discuss issues relating to how projects will be evaluated in terms of their energy and demand savings. Feedback from the implementation contractor has indicated this communication has been helpful in avoiding misunderstandings related to the approach used in the impact evaluation, particularly with respect to more complex whole building or custom projects.

3.4 Cost Effectiveness Review

This section addresses the cost effectiveness of the NRNC Program. Cost effectiveness is assessed using the Total Resource Cost (TRC) test. Table 3-9 summarizes the unique inputs used in the TRC test.

Table 3-9. Inputs to Cost-Effectiveness Model for the AEP Ohio NRNC Program

| Item | Input |
|--------------------------------------|--------------|
| Measure Life | 14 |
| Projects | 129 |
| Ex Post Annual Energy Savings (kWh) | 42,844,159 |
| Ex Post Coincident Peak Savings (kW) | 7,566 |
| Third Party Implementation Costs | \$1,158,703 |
| Utility Administration Costs | \$464,747 |
| Utility Incentive Costs | \$2,539,374 |
| Incremental Participant Cost | \$11,645,988 |

Source: Navigant review of AEP Ohio cost effectiveness model

Based on these inputs, the TRC ratio is 2.0 and the NRNC Program the TRC test. Table 3-10 summarizes the results of the cost-effectiveness tests. Results are presented for the Total Resource Cost test, the Participant Cost Test, the Ratepayer Impact Measure Test, and the Utility Cost Test.

Table 3-10. Cost Effectiveness Results for the NRNC Program

| Benefit-Cost Test | Benefit/Cost Test Ratio |
|--------------------------|-------------------------|
| Total Resource Cost | 2.0 |
| Participant Cost Test | 3.1 |
| Ratepayer Impact Measure | 0.7 |
| Utility Cost Test | 6.4 |

Source: Navigant review of AEP Ohio cost effectiveness model

Additional benefits related to reduction of greenhouse gas emissions have not been quantified in the calculation of the TRC. These additional benefits would increase the given TRC benefit/cost ratio.

4. KEY FINDINGS AND RECOMMENDATIONS

This section presents the key findings and recommendations from the 2017 NRNC program impact and process evaluations.

4.1 Key Impact Findings and Recommendations

Impact Finding 1: Detailed verification of *ex ante* lighting power density (LPD) calculations reveals several errors, including inaccurate fixture counts, missing ballast specifications, omission of lighting controls in both the baseline and as-built calculations, and ignoring the longer run hours of 24/7 security lighting.

Impact Recommendation 1a: Consider training LPD specialists to thoroughly check that all LPD submittals are consistent with the lighting layout drawings, or noting where the actual building differs from the drawings. Onsite inspections should include double checking the actual building lighting equipment matches the drawings.

Impact Recommendation 1b: Include an analysis of both the baseline and as-built lighting controls. Specify which baseline code of what vintage is being followed, IECC or ASHRAE 90.1 and the year, and calculate lighting control savings from the actual building.

Impact Finding 2: Two projects mislabeled building and/or space types in their lighting calculations, including some exterior building façade lighting that was labeled as "Warehouse," resulting in significantly different baseline LPDs.

Impact Recommendation 2: Ensure that verification of building and space types is a stand-alone step in the quality control process for every project.

Impact Finding 3: All NRNC projects are universally assigned a 14-year lifetime as a conservative estimate, calculated as the average lifetime during the 2016 evaluation. The evaluation team found that, for Whole Building buildings reviewed, two *ex post* lifetimes were calculated to be 14 years, and three were less. The *ex post* lifetime, which is calculated as a weighted average (by *ex post* energy savings) of each documented end use, is pulled down by the 11-year lifetime assumption for lighting.

Impact Recommendation 3: Calculate project lifetimes through a weighted average, based on energy savings, for each end use documented.

Impact Finding 4: Multiple mistakes were found in the *ex ante* calculations including discrepancies in fixture quantities, wattages, and area LPDs; mistaken eligibility of a measure; discrepancies in savings values and calculations in project files; and savings claimed in project files differing from the tracking database.

Impact Recommendation 4: Develop a project quality control (QC) checklist identifying the most common errors (including those mentioned above) to ensure peer reviews pick up simple errors and typos in the project files.

Impact Finding 5: Three separate lighting projects did not include the ASHRAE / IECC allowed "exterior base allowance" when calculating the baseline wattage.

Impact Recommendation 5: Include the "base allowance" in exterior baseline lighting calculations.

Impact Finding 6: Three separate projects had significant differences between *ex ante* claimed hours of use and those verified.

Impact Recommendation 6: Verify hours of use with the customer and / or deemed values based on building and space types. This needs to be a detailed interview with the customer. If the customer indicates their lights are on 100 percent of the time, 8,760 hours of use should not be assumed. Scheduling documentation should be requested to confirm these claims, or use a light logger if the project is large or uncertain enough.

Impact Finding 7: One whole building project included a model that, when run, produced savings values significantly different from those claimed in project files and the tracking data. Other sets of project files included multiple *ex ante* savings calculation workbooks or methods, each producing different calculated savings.

Impact Recommendation 7: Provide the evaluator with the most up-to-date and complete project files and models available, and identify "final" documents.

Impact Finding 8: Two projects in the 2017 NRNC Program were My Solutions projects. These projects contributed significantly less than one percent of the NRNC program savings.

Impact Recommendation 8: Continue to search out opportunities to highlight the My Solutions program path to increase participation of small, comprehensive projects.

4.2 Key Process Findings and Recommendations

The following process recommendations are offered to help improve program effectiveness and efficiency and further improve participant's experience of the program.

Process Finding 1: The program is implementing strategies resulting in early involvement in the project design and development phase. Earlier engagement typically leads to increased savings and a clear connection between program promoted activity and project savings.

Process Recommendation 1: Continue to encourage participants to apply early, and require pre-application with the Whole Building and My Solutions paths. Continue to facilitate pre-design meetings to increase per project savings and clearly correlate project results to program activity.

Process Finding 2: Because marketing has not been a priority of the NRNC program, the marketing materials are both limited and outdated. This includes print materials and the program website. The implementation contractor reports interest in having printed program materials to support conversations with potential program participants.

Process Recommendation 2a: Build NRNC specific print marketing material – this could be a one or two-page handout that could be used as a program introduction.

Process Recommendation 2b: Update the NRNC program website for clarity and ease of use, so it can be of use to more program participants than just rebate processing companies.

Process Finding 3: Program staff are aligning program services with customer needs through adjustments to the Whole Building path and creation of the My Solutions path.

Process Recommendation 3: Continue to identify opportunities that reduce customer participation barriers, including (a) supporting LEED applicants through aligning NRNC requirements with the LEED modeling requirements, and (b) streamlining smaller project participation through paths, such as My Solutions that reduce the burden of customer participation.

Process Finding 4: Stale, stand-alone projects may be slipping through the cracks. Stale projects are defined as projects where the design or construction project has slowed or stalled, which means these miss the planned completion date by a significant amount.

Process Recommendation 4: Develop a procedure for tracking and ensuring projects that slow or stall are not forgotten.

Process Finding 5: There may be missed opportunities in some segments of the NRNC market that could be leveraged for additional participation. This could include smaller projects, those outside of urban centers, and specific project types such as build-to-lease projects. These pathways have not been actively pursued by the NRNC Program because the program continues to meet, and exceed, its savings targets.

Process Recommendation 5: AEP Ohio should explore the opportunities to capture these additional market savings in case other programs in the business portfolio encounter challenges in meeting the savings goals, which could occur as federal lighting standards and code updates increase the baseline. In addition, these currently missed NRNC savings could be captured more cost effectively than savings currently captured through other program offerings.

4.3 Key Tracking System and Project File Findings and Recommendations

With respect to the Project Tracking Database and Project Files, Navigant offers the following observations and recommendations for improved clarity and tracking.

Tracking System Finding 1: In reviewing the tracking database, Navigant found some fields were not completed for all applicants. Most critically, the square footage and final application received date was missing for a small portion of the projects.

Tracking System Recommendation 1: As part of the administrative review of applications, add a check to ensure information for all fields are complete and are entered into the database. The database should have no blank fields; if a field is not used, i.e. an inspection was not completed for a site, this should be noted with a standard acronym (N/A, 999) instead of leaving the space blank.

APPENDIX A. OTHER ISSUES FOUND DURING THE IMPACT ANALYSIS

The tables in this section, Table A-1 and Table A-2, identify the impact issues corrected in the *ex post* analysis, and the number of buildings where the issue is noted. The impact issues identified during the *ex post* analysis have been broken into two categories. Table A-1 identifies issues related to lighting power density calculations, Table A-2 includes the remainder of issues found by the evaluation team during the *ex post* analysis.

Table A-1. Lighting Power Density (LPD) Impact Issues Found in *Ex Post* Analysis

| Number of Projects with Impact Issue | Impact Issue Description |
|--------------------------------------|--|
| 5 | Claimed fixture quantities and/or wattages did not match those verified during evaluation. |
| 3 | Claimed hours of use varied significantly from those verified during evaluation. |
| 3 | <i>Ex ante</i> calculations omitted the additional “baseline allowance” for exterior lighting. |
| 3 | No savings were claimed by occupancy sensors not required by code. |
| 2 | Incorrect or inaccurate building or space types were used in <i>ex ante</i> calculations. |
| 2 | Calculated “efficient” LPDs were inaccurate. QC LPD calculations. |
| 1 | Using the “Whole Building” LPD method when a “Space Type” evaluation would be more appropriate. |
| 1 | <i>Ex ante</i> calculations rounded the building area up to the nearest 10,000 sf, resulting in overstated allowed wattage and overstated savings. |
| 1 | Project documents disagreed with each other, resulting in ambiguities and discrepancies in area, fixture quantities, and fixture types. |

As Table A-1 indicates, three buildings in the impact sample had occupancy sensors in spaces where the baseline code did not require lighting controls, yet the *ex ante* analysis did not consider these lighting controls. Where installed occupancy sensors are ignored, savings are underestimated and the participant does not receive the full incentive that it should. ASHRAE 90.1-2007 does not require light reduction controls, but does require occupancy sensors in classrooms, conference and meeting rooms, and employee lunch and break rooms. ASHRAE 90.1-2010 expanded that list to include storage rooms between 50 and 1,000 ft², copy and printer rooms, office spaces less than 250 ft², restrooms, and dressing rooms, locker rooms, and fitting rooms. ASHRAE 90.1 occupancy sensor requirements are detailed in Section 9.4.1.2 Space Control of both ASHRAE 90.1-2007 and ASHRAE 90.1-2010.

More careful *ex ante* analysis would eliminate some of the LPD issues noted. Installed fixture counts and fixture wattage should be doubled checked with the drawings, invoices, and fixture specifications, and field verified for major projects. Detailed analysis of the lighting layout drawings would indicate if any

fixtures are running 8,760 hours per year. In these cases, Navigant recommends using 8,760 hours of use (HOU).

Table A-2. Non-Lighting Measure Impact Issues Found in *Ex Post* Analysis

| Measure Category | Impact Issue Description |
|-----------------------|--|
| Whole Building | One project's savings from the model provided did not match those claimed in the project files or tracking data. |
| Whole Building | The savings documented in <i>ex ante</i> calculations did not match the savings from the tracking database for one Whole Building project. |
| Custom / Prescriptive | One claimed measure for one project did not actually qualify based on program requirements. |
| Custom / Prescriptive | One project claimed savings for measures that were removed between installation and evaluation. |

As indicated in Table A-2, the evaluation team identified one instance where the methodology outlined in the implementer's 2017 Appendix A was not applied correctly.

- One building was found to have savings claimed for a VFD which was in fact ineligible for program savings because it was placed on a backup motor running about 500 hours per year, significantly lower than the program minimum of 1,200 hours. It is important the NRNC Program applies the same methodology for claiming savings from prescriptive measures as other AEP Ohio programs, and to consistently apply the methodology outlined in the implementer's 2017 Appendix A.
- One project claimed savings for VFDs that facility personnel indicated were removed.

In the case of Whole Building projects, care should be taken to make sure the submitted models are run and agree with the *ex ante* summary results. The evaluation team found building models where the results from the provided model were different from the results used in the *ex ante* model, though the differences were relatively small. Care should be taken to verify all model inputs, including through onsite visits for larger projects. Additionally, the model should be used in all cases to determine the coincident peak savings by producing hourly outputs and calculating savings during the peak hours.

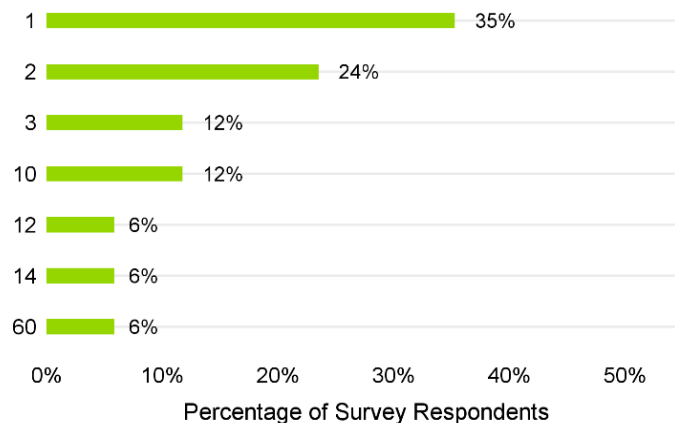
APPENDIX B. PROGRAM PARTICIPANT SURVEY, FULL RESULTS

B.1 Firmographics

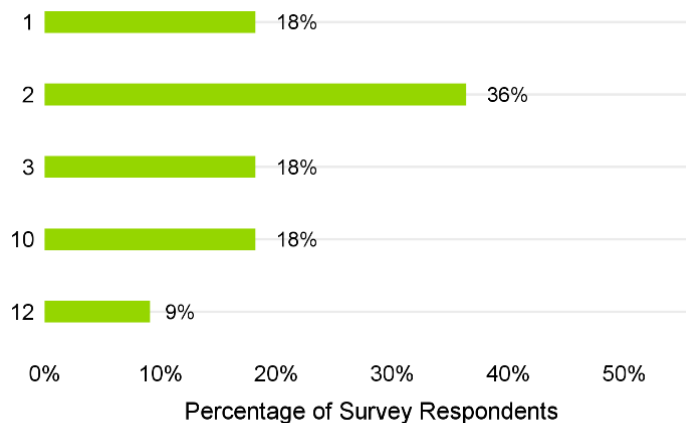
Question F1. What is your job title or role?

[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

Question F2. Approximately how many new building projects has your firm completed in Ohio in the last 5 years? (n=17)



Question F2a. [If F2 > 1] Do you know how many of those have participated in AEP Ohio's New Construction program? (n=11)



Question F2b. [If F2 > F2a] How do you determine which projects are enrolled in the AEP Ohio New Construction program?

[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

Question F3. How would you categorize the business conducted at this site?

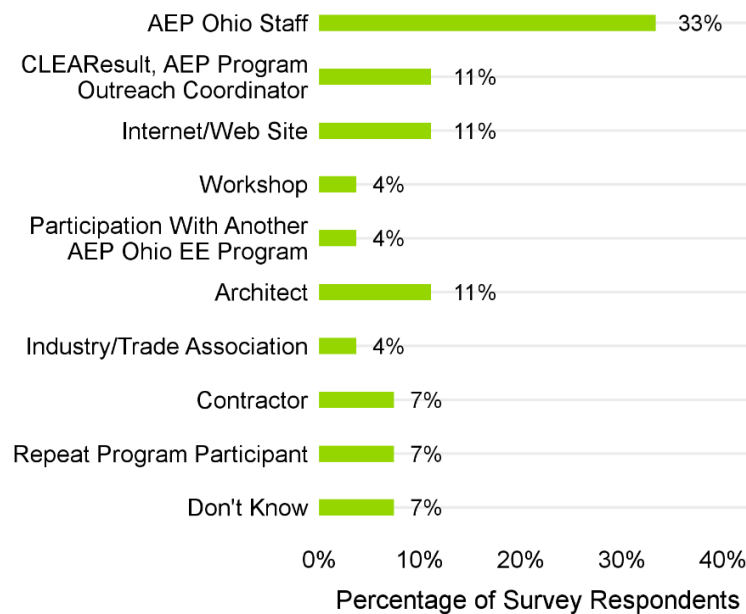
[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

Questions F4. What is the approximate floor area of the project for which the incentive was provided? Your best estimate will be fine.

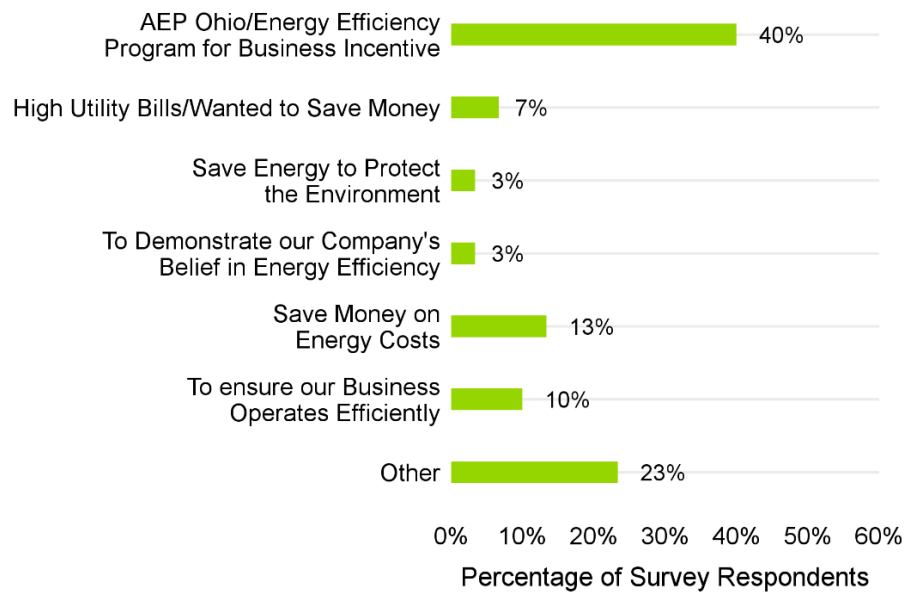
[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

B.2 Awareness & Motivation

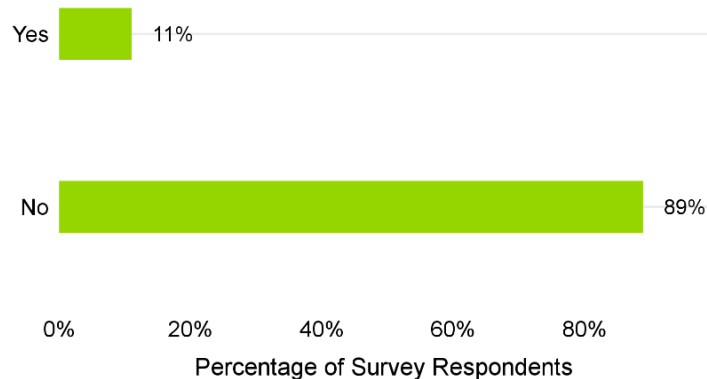
Question 1. How did you first learn of the AEP Ohio New Construction Program? (n=18)



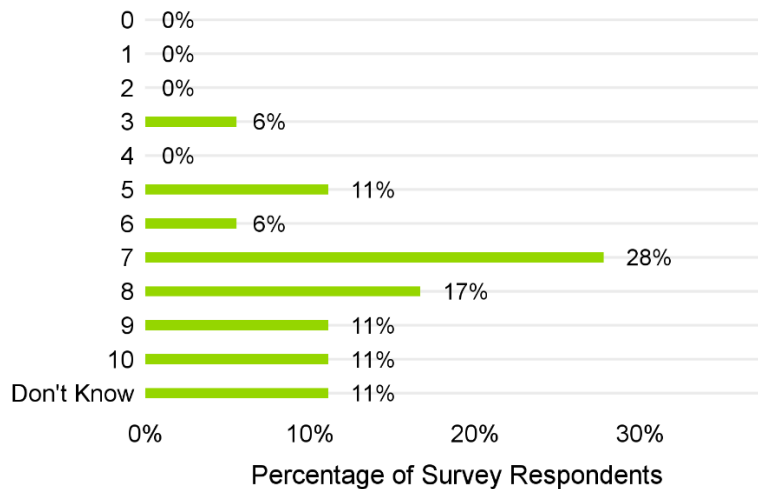
Question 2. What were the main reasons your company decided to participate in the program?
(n=18)



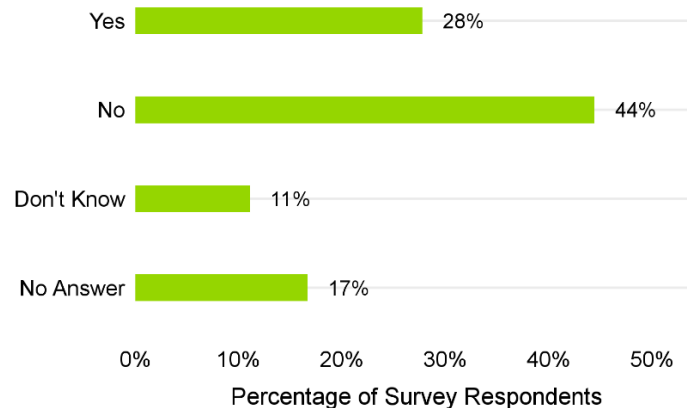
Question 3. Was any of the new building space offered for sale or leased to other businesses?
(n=18)



Question 4. Using a scale of 0-10 where 0 represents little value and 10 represents a great deal of value, how much value do you feel is placed on energy efficiency by potential buyers or lessees in your market? (n=18)



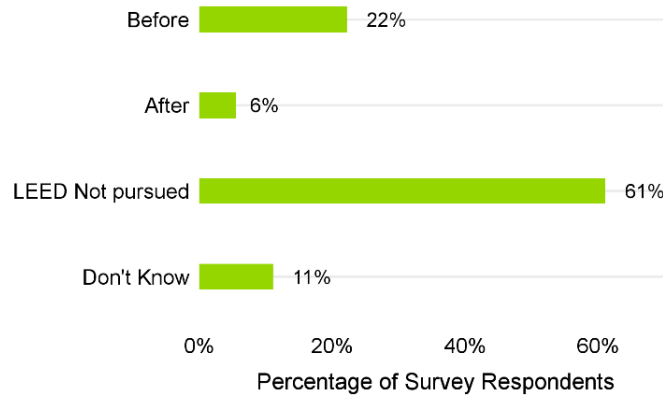
Question 5. Did you consider participation in the Whole Building Path, which uses a performance-based approach through building modeling? (n=18)



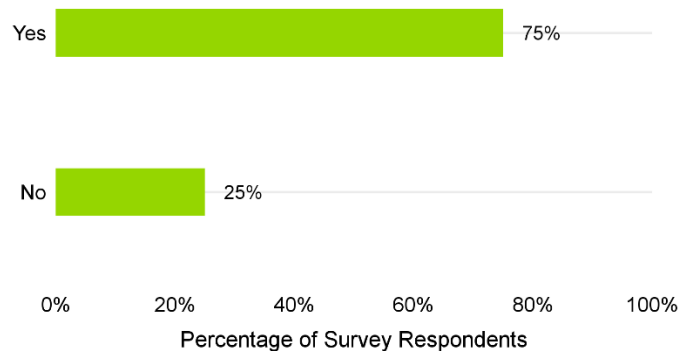
Question 6. Why did you choose the Prescriptive or Custom Path?

[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

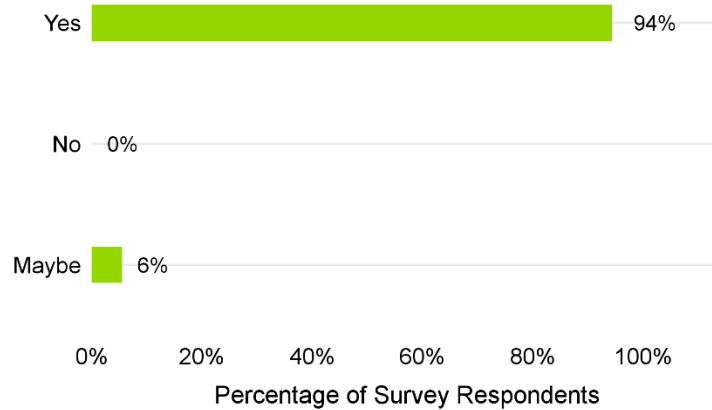
Question 7. If your building pursued LEED accreditation, did you decide to pursue LEED before or after applying to the AEP Ohio program? (n=18)



Question 8. [If Q7 = "Before"] Did you make design changes to meet LEED requirements that increased the amount of electrical energy savings and achieve LEED Energy and Atmosphere points due to the AEP Ohio program? (n=4)



Question 9. If you build/renovate another building, would you participate in the program again? (n=18)

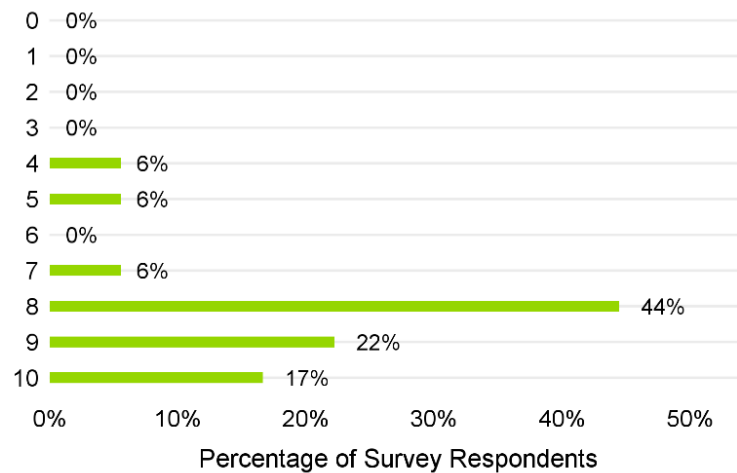


Question 10. [ASK IF Q9 = "No"] Why wouldn't you plan to participate in the program again?

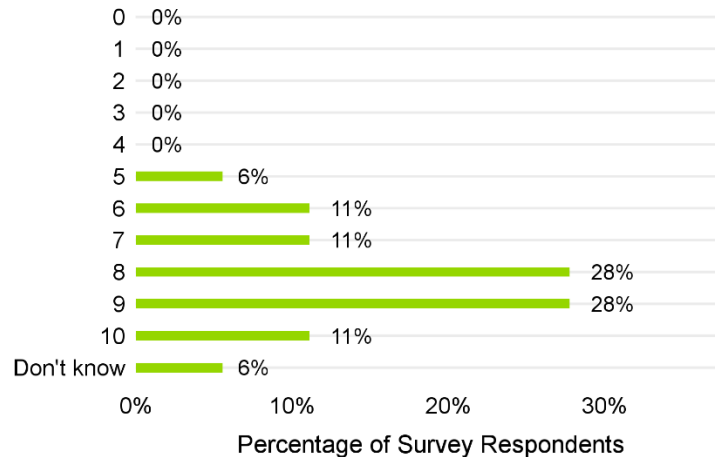
[No participants were selected for this question – so no responses are presented]

B.3 Experience with Program

Question 11. How would you rate the ease of finding information about the program using a scale of 0-10 where 0 represents very challenging and 10 represents very easy? (n=18)

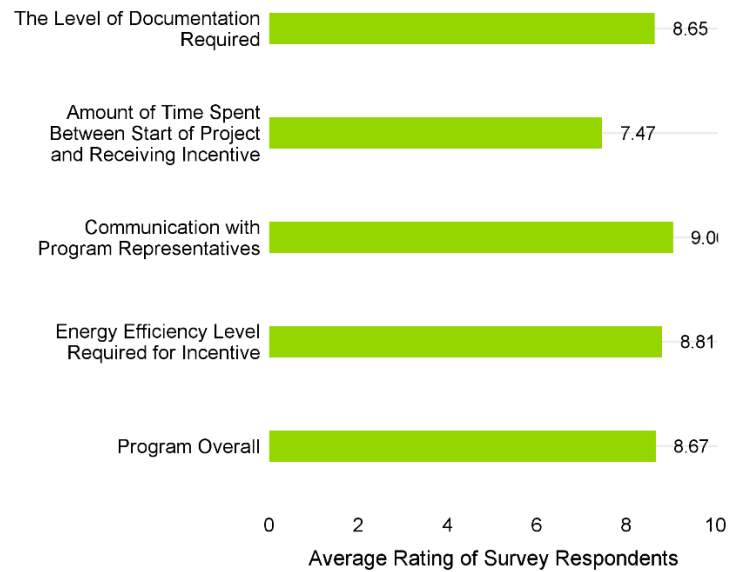


Question 12. How difficult or easy did you find the application process using a scale of 0-10 where 0 represents difficult and 10 represents easy? (n=18)

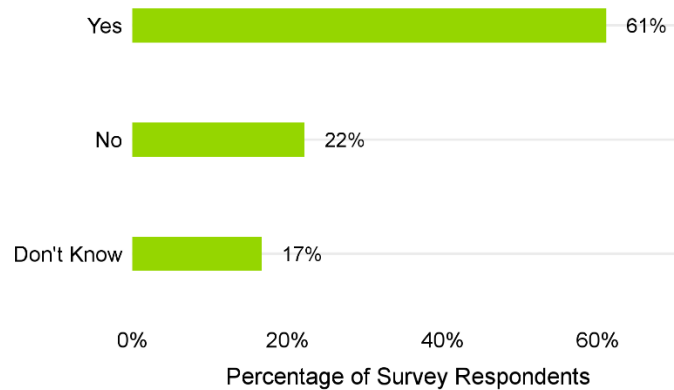


Question 13. Again, using a scale of 0-10 where 0 represents not satisfied and 10 represents very satisfied, how satisfied were you with: (n=18)

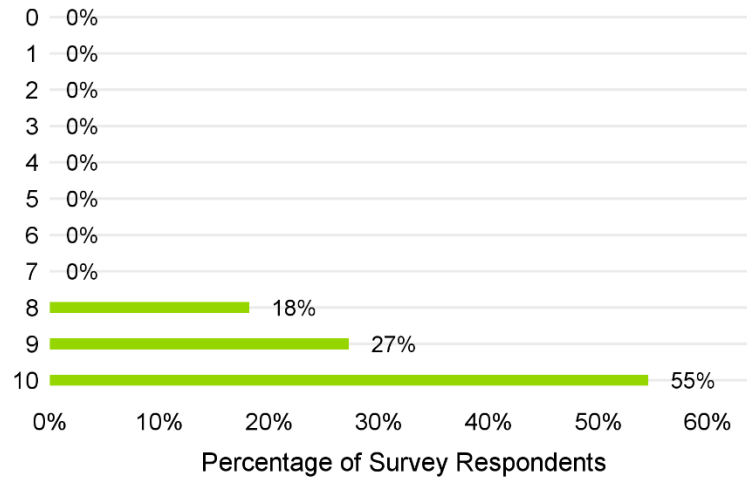
- a) The level of documentation required?
- b) The amount of time spent from the beginning of the project to the time you received your incentive
- c) Communication you had with the program staff (including CLEAResult staff)?
- d) Energy efficiency level required to qualify for an incentive?
- e) The program overall?



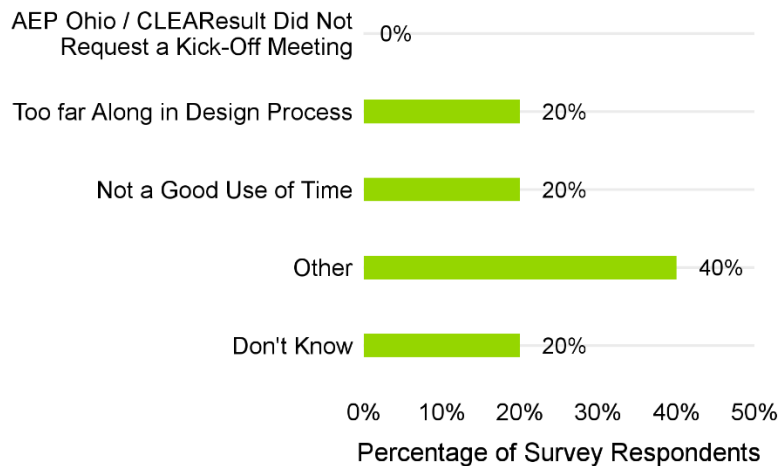
Question 14. When you first applied to the program, was there a kickoff meeting with the AEP Ohio team to discuss project goals? (n=18)



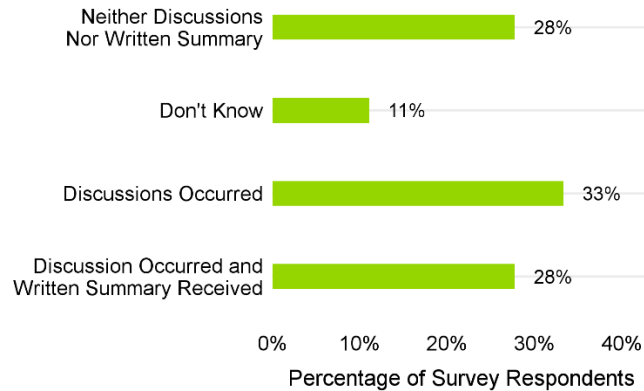
Question 15. *[If Q14 = 1]* On a scale of 0-10, with 0 being not at all pleased and 10 being very pleased, have you been pleased with the way the program has addressed the goals you set in the kickoff meeting? (n=11)



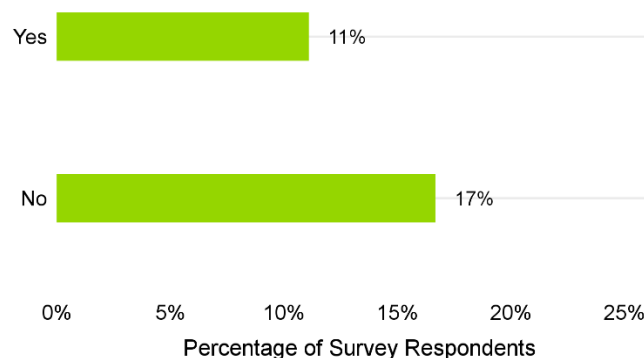
Question 16. *[If Q14=2]* Do you know why there was not a kick off meeting? (n=5)



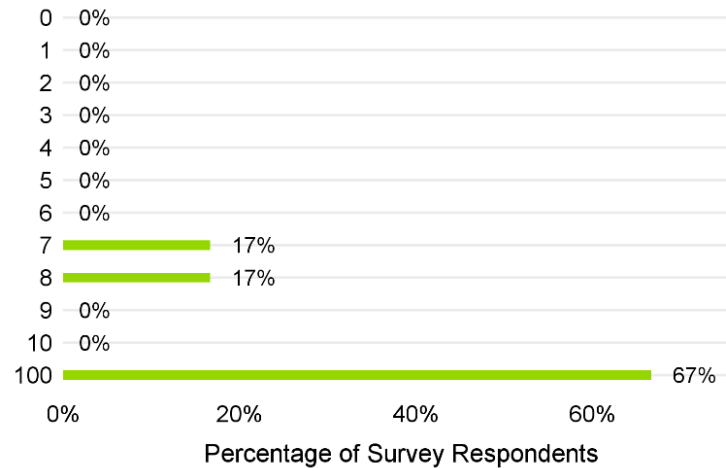
Question 17. Were there discussions with AEP Ohio / CLEAResult staff or a written review of the preliminary design with suggestions to make the building more efficient or identify additional incentives? (n=18)



a) **[Q17=2, 4] You stated you received a written summary, are you willing to share a copy? [If yes, "Thank you, Navigant may follow up with you to collect this information."]** (n=5)



Question 18. On a scale of 0-10, with 0 being not much improved and 10 being significantly improved, how well do you feel that the suggestions the program has made have improved the efficiency of your building? (n=18)



Question 19. Using a ranking from 1-3, where 1 = main concern and 3 = low concern, please rank the following on their influence to you NOT being able to implement energy efficient measures.

1. Management priority
2. Staff time
3. Project funding

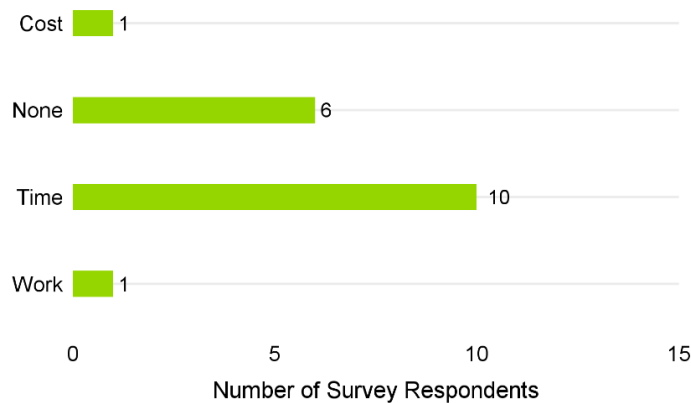


Question 20. What do you see as the main benefit(s) to participating in the AEP Ohio New Construction program?

[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

Question 21. What do you see as the drawbacks to participating in the New Construction program? (n=18)

[Verbatim responses, which were recorded for this question, are not presented in this Appendix. However, a summary of those responses is presented.]



Question 22. Do you have any other feedback on the New Construction program?

[Verbatim responses, which were recorded for this question, are not presented in this Appendix]

APPENDIX C. PROGRAM MANAGER INTERVIEW GUIDE

Name of Interviewee:

Date:

Title:

Company:

Contact Information:

[Note to Interviewer] The Interview Guide is a tool to guide process evaluation interviews with utility staff and implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program's design and operation, i.e., where they have significant experiences for meaningful responses. The interviews will be audio taped and transcribed. Interviews in every case will be conducted by Navigant's process evaluation lead for the program to ensure full context and understanding for the interview, and to enable the interviewer to probe for the most meaningful questions and responses.

1. In what ways have program recommendations from the last evaluation been implemented?
If necessary, reference:
 - a. Engage Build-to-Lease projects?
 - b. Identify the portion of the NC market served by the NRNC program?
 - c. Institute / update QC process to improve project / data accuracy
 - d. Develop database documentation describing the purpose and use of each field
2. How has the change in implementation contractors affected program implementation?
 - a. Were customers aware of the change?
 - b. Did it effect the timing or accuracy of project processing?
3. How do participants determine whether to pursue whole building vs prescriptive paths? (Do program staff or trade allies provide guidance? How do they share project leads?)
4. How do participant needs vary by sector or design method? (Design-build, design-bid-build, build to lease, build to own).
5. Can you explain the review process used to suggest efficiency measures the design team was not considering? How is this received by design teams? Customers?
 - a. (How could the program achieve deeper comprehensive savings, beyond lighting power density and HVAC mechanical efficiencies?)
6. What proportion of LEED projects changed their design to increase energy efficiency relative to their original design as a result of participating in the AEP Ohio program?
7. Is there an opportunity for a future tenant in a new construction design project to provide input into the energy efficiency measures being considered?

8. How is the AEP Ohio recognition received by design teams? How does it encourage participation or more efficient design?

APPENDIX D. IMPLEMENTATION CONTRACTOR INTERVIEW GUIDE

Name of Interviewee:

Date:

Title:

Company:

Contact Information:

[Note to Interviewer] The Interview Guide is a tool to guide process evaluation interviews with utility staff and implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The depth of the exploration with any particular respondent will be guided by the role that individual played in the program's design and operation, i.e., where they have significant experiences for meaningful responses. The interviews will be audio taped and transcribed. Interviews in every case will be conducted by Navigant's process evaluation lead for the program to ensure full context and understanding for the interview, and to enable the interviewer to probe for the most meaningful questions and responses.

1. In what ways have program recommendations from the last evaluation been implemented?
If necessary, reference:
 - a. Engage Build-to-Lease projects?
 - b. Identify the portion of the NC market served by the NRNC program?
 - c. Institute / update QC process to improve project / data accuracy
 - d. Develop database documentation describing the purpose and use of each field
2. How has the change in implementation contractors affected program implementation?
 - a. Were customers aware of the change?
 - b. Did it effect the timing or accuracy of project processing?
3. How do participants determine whether to pursue whole building vs prescriptive paths? (Do program staff or trade allies provide guidance? How do they share project leads?)
4. Have projects which applied under the prescriptive/custom path transferred to the whole-building path? How was this transfer handled?
5. How do participant needs vary by sector or design method? (Design-build, design-bid-build, build to lease, build to own).
6. Have you seen any changes in the roles of key decision-makers/influencers in the process – specifically with respect to energy efficiency decisions? (I.e. owner/developer, architect, engineers?) from past years?
7. Have you seen any increase in the use of “Integrated Design” as part of the Whole Building Design projects? How successful do you think this approach has been in improving building energy efficiency? Are these program aspects being tracked?

8. Can you explain the review process used to suggest efficiency measures the design team was not considering? How is this received by design teams? Customers?
 - a. (How could the program achieve deeper comprehensive savings, beyond lighting power density and HVAC mechanical efficiencies?)
9. What proportion of LEED projects changed their design to increase energy efficiency relative to their original design as a result of participating in the AEP Ohio program?
10. Is there an opportunity for a future tenant in a new construction design project to provide input into the energy efficiency measures being considered?
11. How is the AEP Ohio recognition received by design teams? How does it encourage participation or more efficient design?

APPENDIX E. PROGRAM PARTICIPANT INTERVIEW GUIDE

| | |
|--|--|
| From Tracking Data: | |
| Date | |
| Name of Interviewee | |
| Title | |
| Company | |
| Contact Information | |
| Interviewer | |
| New Construction Program Path [Multiple paths allowed] | <input type="checkbox"/> Prescriptive <input type="checkbox"/> Custom <input type="checkbox"/> Whole Building <input type="checkbox"/> My Solutions |
| Project Reference (name) | |
| Brief Project Description (Location / type of measures) | |

The survey is designed to address the following research questions:

| Cross Cutting Research Questions: | Survey Questions |
|--|------------------|
| 1. Does the program outreach effectively increase awareness of program opportunities? | 1 |
| 2. Are the messages included within program outreach clear and actionable? | 1, 15, 16 |
| 3. What are the key interests and motivations for potential and actual participants beyond the financial incentive offered? | 2, 20 |
| 4. What are the key barriers to participation in the program? | 10, 19 |
| 5. What improvements could be made to create a more effective program and to help increase energy and demand impacts? | 21 |
| 6. Are participants and providers satisfied with the programs? | 11, 12, 13 |
| Non-Residential New Construction Program Specific Research Questions: | |
| 7. What customer market segments or types of projects participate in the program? Are any barriers specific to certain customer market segments? | F3, F4, 3, 4 |
| 8. How successful has the program been in obtaining repeat participation from customers? | F2, F2a, F2b, 9 |
| 9. How successful has the program been in obtaining broad participation from design teams that have participated in the program? | F1 |
| 10. Do participants and trade allies understand the available program tracks and their differences? | 5, 6 |
| 11. How could the program encourage deeper comprehensive savings, beyond lighting power density and HVAC mechanical efficiencies, for projects participating in the Custom or Prescriptive tracks? | 7, 8, 14, 17, 18 |

E.1 Introduction:

[ASK FOR NAMED CONTACT]

Good afternoon. Hello, my name is _____, from Blackstone and I'm calling on behalf of AEP Ohio's energy efficiency programs. We are conducting a review of AEP Ohio's New Construction energy efficiency program. The reason for calling you today is to ask about your experience with the program. Our objective in conducting this survey is to better understand how effective the program has been, and how it might be improved in future years.

You will receive a \$15 a gift card in appreciation of your time spent with us. (Delete this sentence and move it down)

[If they express hesitation, use an appropriate combination of the following.]

[Overcoming objections:]

- *[Confidentiality]* We are an independent firm and your responses will remain confidential and only presented in aggregate along with responses from other survey participants.
- *[Not the right person]* – That's fine, do you know who would be more appropriate to talk to? Do you have their contact details? *[RECORD NEW CONTACT]*
- *[Security]* Your responses will not affect your ability to participate in the program in the future.
- *[Sales concern]* I am not selling anything. On behalf of AEP Ohio, I simply want to understand what factors were important to your company's decision to participate in the program.
- *[Contact]* If you would like to talk with someone from AEP Ohio about this survey, the contact is: **AEP Ohio –Brian Billing**– available by phone at (614) 883 7806 or e-mail at: bfbilling@aep.com

QS1. We understand your firm participated in the AEP Ohio program for a new building/renovation project located at _____, is this correct?

QS2. [If they say no] Did you participate in the _____ program in 2017? [If no, thank them for their time, hang up].

[If yes] Can you tell the address of the facility that did participate in the program:

_____.

QS3. [If the address is correct] Great, the survey will take approximately 10-15 minutes and you will receive a \$15 a gift card in appreciation of your time spent with us. Is now a good time to talk?

(If they say no:)

QS4. May I schedule another time?

E.2 Firmographics

I'd like to ask you few general questions about your company, specifically at *[SITE_ADDRESS]*.

F1. What is your job title or role?

[Record verbatim]

98. DON'T KNOW

99. REFUSED

F2. Approximately how many new building projects has your firm completed in Ohio in the last 5 years?

[RECORD NUMBER 0-999]

98. DON'T KNOW

99. REFUSED

F2a. *[If F2 > 1]*

Do you know how many of those have participated in AEP Ohio's New Construction program?

[RECORD NUMBER 0-999]

98. DON'T KNOW

99. REFUSED

F2b. *[If F2 > F2a]*

How do you determine which projects are enrolled in the AEP Ohio New Construction program?

[Record verbatim]

98. DON'T KNOW

99. REFUSED

F3. How would you categorize the business conducted at this site?

[Record verbatim]

98. DON'T KNOW

99. REFUSED

[Elaborate if needed. This should be the main business activity that occurs at this location. For example, is it an office, a warehouse, a store?]

F4. What is the approximate floor area of the project for which the incentive was provided? Your best estimate will be fine.

[RECORD NUMBER 100-1,000,000]

98.. DON'T KNOW

99.. REFUSED

E.3 Awareness & Motivation

Now I am going to ask you questions about AEP Ohio's Energy Efficiency programs.

1. How did you first learn of the AEP Ohio New Construction program? Multi response

[DO NOT READ; PROBE IF NEEDED]

1. AEP Ohio staff
2. CLEAResult, AEP program Outreach coordinator
3. Internet / Web site
4. Workshop
5. Participation with another AEP Ohio EE program *[specify]*
6. Architect
7. Engineering firm
8. Energy Modeler
9. Industry/Trade Association
10. Advertising/Trade Publication

11. Commissioning Agent
12. Associate or Co-Worker
13. Contractor
14. Repeat program participant
15. Retailer / Supplier / Wholesaler

97. Other: _____
98. DON'T KNOW
99. REFUSED

The following questions all relate to the building which participated in the New Construction program in 2017.

2. What were the main reasons your company decided to participate in the program?

[DO NOT READ; RECORD ALL, PROBE IF NEEDED]

1. AEP Ohio/ Energy Efficiency Program for Business incentive
2. Special deal from contractor
3. Recommended by contractor
4. Product was on sale at store
5. Old equipment was malfunctioning
6. Old equipment was no longer functioning, replacement was necessary
7. High utility bills/wanted to save money
8. Save energy to protect the environment
9. Program technical assistance
10. Required by company headquarters or owner
11. To demonstrate our company's belief in energy efficiency.
12. Save money on energy costs
13. To insure our business operates efficiently
14. CLEARResult, AEP program Outreach coordinator
15. The Design review assistance provided by AEP/CLEARResult
16. Other: _____
17. DON'T KNOW
18. REFUSED

3. Was any of the new building space offered for sale or leased to other businesses?

1. Yes
2. No
98. DON'T KNOW
99. REFUSED

4. Using a scale of 0-10 where 0 represents little value and 10 represents a great deal of value, how much value do you feel is placed on energy efficiency by potential buyers or lessees in your market?

[RECORD NUMBER 0-10]

98. DON'T KNOW
99. REFUSED

[Participants in NRNC Custom or Prescriptive Path proceed – Others proceed to Q7.]

5. Did you consider participation in the Whole Building Path, which uses a performance-based approach through building modelling?

1. Yes

- 2. No
- 98. DON'T KNOW
- 99. REFUSED
- 6. *[If Q5 = 1 or 2]* Why did you choose the Prescriptive or Custom Path?
[Record verbatim]
98. DON'T KNOW
99. REFUSED
- [All NRNC participants]*
- 7. If your building pursued LEED accreditation, did you decide to pursue LEED before or after applying to the AEP Ohio program?
1. Before
2. After
3. LEED, not pursued
98. DON'T KNOW
99. REFUSED
- 8. *[If Q7 = 1]* Did you make design changes to meet LEED requirements that increased the amount of electrical energy savings and achieve LEED Energy and Atmosphere points due to the AEP Ohio program?
1. Yes
2. No
98. DON'T KNOW
99. REFUSED
- 9. If you build/renovate another building, would you participate in the program again?
1. YES
2. NO *[ASK Q10.]*
3. MAYBE
98. DON'T KNOW
99. REFUSED
- 10. *[ASK IF Q9 = 2]* Why wouldn't you plan to participate in the program again?
[DO NOT READ; SELECT ALL THAT APPLY]
1. PROGRAM INCENTIVES ARE NOT SUFFICIENT
2. DESIGN ASSISTANCE ISSUES
3. PROGRAM ADMINISTRATIVE REQUIREMENTS TOO BURDENSOME
4. PROGRAM STAFF RELATIONSHIP ISSUES
5. NO BUILDINGS PLANNED IN THE FORESEEABLE FUTURE
6. CHANGE IN BUSINESS STRATEGY IN RELATION TO BUILDING DESIGN NEEDS
7. EFFICIENT EQUIPMENT REQUIRED FOR INCENTIVES DID NOT MEET OUR NEEDS
97. OTHER (SPECIFY) _____
98. DON'T KNOW
99. REFUSED

E.4 Experience with Program

I am now going to ask a few questions about your experience with the program.

11. How would you rate the ease of finding information about the program using a scale of 0-10 where 0 represents very challenging and 10 represents very easy?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
12. How difficult or easy did you find the application process using a scale of 0-10 where 0 represents difficult and 10 represents easy?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
13. Again, using a scale of 0-10 where 0 represents not satisfied and 10 represents very satisfied, how satisfied were you with:
 - a) The level of documentation required?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
 - b) The amount of time spent from the beginning of the project to the time you received your incentive
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
 - c) Communication you had with the program staff (including CLEAResult staff)?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
 - d) Energy efficiency level required to qualify for an incentive?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
 - e) The program overall?
[RECORD NUMBER 0-10]
 98. DON'T KNOW
 99. REFUSED
14. When you first applied to the program, was there a kickoff meeting with the AEP Ohio team to discuss project goals?
 1. Yes *[Ask Q15]*
 2. No *[Ask Q16]*
 98. Don't know
 99. Refused
15. *[IF Q14 = 1]* On a scale of 0-10, with 0 being not at all pleased and 10 being very pleased, have you been pleased with the way the program has addressed the goals you set in the kickoff meeting?

[NUMERIC OPEN-END, RANGE 0-10]

- 98. DON'T KNOW
- 99. REFUSED

16. *[If Q14=2]* Do you know why there was not a kick off meeting?

[Do not read. Accept multiple responses. Probe if necessary.]

- 1. AEP Ohio / CLEAResult did not request a kick-off meeting
- 2. We were too far along on the design process
- 3. We didn't think a kick off meeting would be a good use of our time.

97. Other: _____

98. DON'T KNOW

99. REFUSED

[All Respondents]

17. Were there discussions with AEP Ohio / CLEAResult staff or a written review of the preliminary design with suggestions to make the building more efficient or identify additional incentives?

- 1. Discussions occurred
- 2. Written summary was received *[Ask if they would be willing to share a copy]*
- 3. Neither discussions nor written summary
- 4. Both discussion occurred and written summary was received

98. DON'T KNOW

99. REFUSED

[Q17=2, 4]

Q17A. You stated you received a written summary, are you willing to share a copy? [If yes, "Thank you, Navigant may follow up with you to collect this information."]

1. YES

2. NO

98. DON'T KNOW

99. REFUSED

[Ask if Q17 =1 or 2]

18. On a scale of 0-10, with 0 being not much improved and 10 being significantly improved, how well do you feel that the suggestions the program has made have improved the efficiency of your building?

[NUMERIC OPEN-END, RANGE 0-10]

98. DON'T KNOW

99. REFUSED

19. Using a ranking from 1-3, where 1 = main concern and 3 = low concern, please rank the following on their influence to you NOT being able to implement energy efficient measures.

[Rank 1, 2, 3, 4 (if applicable)]

Programming: We will use #4 for "Other" – this should not be a forced response. If only 3 is ranked by respondent, please allow them to continue if "Other" is not ranked.

1. Management priority

2. Staff time

3. Project funding

97. Other: _____

98. DON'T KNOW
99. REFUSED

20. What do you see as the main benefit(s) to participating in the AEP Ohio New Construction program?

[Record verbatim]

98. DON'T KNOW
99. REFUSED

21. What do you see as the drawbacks to participating in the New Construction program?

[Record verbatim]

98. DON'T KNOW
99. REFUSED

22. Do you have any other feedback on the New Construction program?

[Record verbatim]

98. DON'T KNOW
99. REFUSED

Thank you for your time and feedback! We will send you your \$15 gift card within 2 weeks. Can you confirm the email we have on file is correct: [Insert Email_Address from sample file]?

If email address is incorrect from the sample, please include an option for our interviewers to correct and collect email address

This foregoing document was electronically filed with the Public Utilities

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Case No(s). 18-0835-EL-EEC

Summary: Annual Report - Ohio Power Company submits the 2017 Portfolio Status Report pursuant to Rule 4901:1-39-05(C), Ohio Administrative Code
(Part 4 of 6) electronically filed by Mr. Steven T Nourse on behalf of Ohio Power Company