ATTACHMENT 6-
Smart$aver NR Custom Evaluation

FINAL REPORT

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Smart $aver® Non-Residential Custom Program Years 2015-2017 Evaluation Report

Submitted to Duke Energy Ohio
in partnership with Tetra Tech

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Principal Authors:
Patrick Burns, Senior Vice President
Nathanael Benton, Senior Consultant
Carrie Koenig, Dan Belknap, Tetra Tech

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1 Executive Summary

1.1 Program Summary

Duke Energy's Non-Residential Smart $aver® Custom Incentive Program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers in the Duke Energy Ohio (DEO) service territory to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The program is designed to meet the needs of the Company's non-residential customers with electrical energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance.

1.2 Evaluation Objectives and High Level Findings

This report presents the results and findings of evaluation activities for Duke Energy Ohio's NR Custom program conducted by the evaluation team, collectively Nexant Inc. and our subcontracting partner, Tetra Tech, for the period of August 2015 through December 2017.

1.2.1 Impact Evaluation

The overarching goals for the NR Custom impact evaluation were to:

- Quantify accurate and supportable energy impacts (kWh) and summer and winter demand (kW) savings for energy efficient measures and equipment implemented in participants' facilities.
- Assess the rate of free riders from customer and contractor perspective.
- Determine spillover effects
- Consider and verify measure installation-vintage aligned with measure baseline definitions, i.e. early replacement, burnout on failure, etc.

Evaluation activities included in-depth reviews and on-site verification of a representative sample of projects, in-person or phone interviews with program participants, deploying metering equipment, collecting building automation system/energy management system (BAS/EMS) data, and engineering analyses to estimate gross and net savings for all implemented measures attributed to the NR Custom Program.

1.2.2 Process Evaluation Objectives

Process evaluations are designed to support continuous program improvement by identifying successful program elements that can be expanded upon as well as underperforming/inefficient processes that could be holding back program performance. The process evaluation for the NR Custom Program sought to:

- Assess how participant characteristics compare to segments targeted for the program
- Assess the sources of customer engagement and most effective marketing source
- Assess influence the program has on customers' decisions to install EE measures
- Assess whether sufficient documentation and information are provided to customers
- Assess persistence of program engagement with participants
- Assess satisfaction with the program and its components including suggestions for program changes

To meet these objectives, the evaluation team conducted interviews with key program staff, reviewed program documentation, and utilized telephone surveys to ask program participants and trade allies about their experiences with the program.

1.2.3 High Level Findings

1.2.3.1 Gross Impact Evaluation Key Findings

The impact evaluation results indicate that program internal processes for project review, savings estimation, and installation verification are producing quality estimates of project impacts. Energy realization rates exceed 86% for three of the four strata (Lighting - Large, Lighting - Small, and Non-lighting - Small). The realization rate for the Non-lighting-Large strata was 74.8%. Realization rates for Summer and Winter demand at the program level were 91.6% and 88.1%, respectively. Findings from the gross impact evaluation are summarized in Table 1-1,

Table 1-2, and Table 1-3.

Table 1-1 DEO Program Reported and Verified Gross Energy Impacts for Projects Completed August 2015 – December 2017

Measure Category	Strata	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	RR (%)
Lighting	Large (>400 MWh)	24,502,606	27,247,510	111.2%
	Small (<400 MWh)	11,301,697	10,896,832	96.4%
Non-lighting	Large (>1,000 MWh)	38,284,556	28,618,948	74.8%
	Small (<1,000 MWh)	12,831,537	11,150,566	86.9%
Total		**86,920,395**	**77,913,856**	**89.6%**

Table 1-2 DEO Program Reported and Verified Gross Summer Demand Impacts for Projects Completed August 2015 – December 2017

Measure Category	Strata	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	RR (%)
Lighting	Large (>400 MWh)	3,513	3,883	110.5%
	Small (<400 MWh)	1,901	1,887	99.2%
Non-lighting	Large (>1,000 MWh)	3,800	2,385	62.8%
	Small (<1,000 MWh)	1,934	2,058	106.4%
Total		**11,148**	**10,213**	**91.6%**

Table 1-3 DEO Program Reported and Verified Gross Winter Demand Impacts for Projects Completed August 2015 – December 2017

Measure Category	Strata	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	RR (%)
Lighting	Large (>400 MWh)	3,126	3,205	102.5%
	Small (<400 MWh)	1,664	1,482	89.1%
Non-lighting	Large (>1,000 MWh)	3,304	2,143	64.9%
	Small (<1,000 MWh)	1,685	1,789	106.2%
Total		**9,779**	**8,619**	**88.1%**

Additionally, consistent with Ohio SB310, the higher of the evaluated estimates of energy efficiency impacts or the deemed values are applied prospectively to adjust subsequent impact assumptions until superseded by new EM&V results[1]. The deemed impacts reported for the Smart $aver NR Custom program were found to be greater than the verified savings and therefore the deemed results shall be applied to the rider in the month following the completion of this EM&V report. These results will also be used to estimate future target achievement levels for development of estimated incentives and in future cost-effectiveness evaluations. Table 1-4 below summarizes the program claimed, deemed, and evaluated values.

[1] Per Section 4928.66(B) of the Revised Code from Senate Bill 310, energy efficiency savings and peak demand reduction achieved on and after the effective date of S.B. 310 of the 130th general assembly shall be measured on the higher of an as found or deemed basis, except that, solely at the option of the electric distribution utility, such savings and reduction achieved since 2006 may also be measured using this method.

Table 1-4 DEO Program Impact Summary

	Energy kWh	Summer Demand (kW)	Winter Demand (kW)
Gross Claimed Impacts	86,920,395	**11,148**	**9,779**
Deemed Realization Rate	95.0%	95.0%	95.0%
Deemed Savings	**82,574,375**	**10,591**	**9,290**
Evaluated Realization Rate	89.6%	91.6%	88.1%
Evaluated Savings	**77,913,856**	**10,212**	**8,615**

1.2.3.2 Net Impact Evaluation Key Findings

The results of the net impact evaluation show that the gross energy savings are largely attributable to the program's activities. Customers did not report implementing efficient projects outside of the program, which suggests that the program is effective at getting customers to participate when they are considering efficiency projects. The freeridership identified through this evaluation primarily stemmed from customers who reported they planned to complete the same project prior to learning about the program, and would have paid the additional incentive amount to complete the efficient version of the project. Findings from the net impact evaluation are summarized in

Table 1-5.

Table 1-5 Net-to-Gross Evaluation Results

Net-to-Gross Component	Rate
Net of Free-ridership	82.8%
Program-influenced Spillover	0.1%
Net-to-Gross	**82.9%**

1.2.3.3 Process Evaluation Key Findings

Overall, the program is operating as intended, and customers and trade allies are satisfied with their experiences with the program as well as with Duke Energy. Contractors play a key role in the program by making customers aware of the program offerings, and contractors have utilized the program to encourage customers to purchase high efficient equipment. Contractors felt the program was influential in customers moving forward with projects where they would not have otherwise. Participants provide similar feedback, stating they have appreciated the support they received from trade allies and Duke Energy.

Additional high-level findings include the following:

- The primary source of participants' program awareness is Duke Energy. This was followed by their contractor.
- Satisfaction with the program overall and its components is high among participants and trade allies
- The contractor assistance was the most valuable program component as rated by participant respondents
- The program-provided calculators were used by participant and contractor respondents with contractors indicating that the calculators were useful[2].
- Contractors value the program and use the incentives to encourage customers to purchase high efficient equipment
- The tracking database was missing some key information for evaluation activities and program/project tracking

[2] Participant respondents were not asked to rate the usefulness of the calculators (only contractors were).

1.3 Evaluation Conclusions and Recommendations

Based on evaluation activities and findings, the evaluation team concluded the following and provides several recommendations for program improvement.

1.3.1 Impact

Conclusion 1: The evaluation team's analysis resulted in a 89.6% realization rate (energy) for the DEO NR Custom Program. The strong realization rate indicates that Duke Energy's internal processes for project review, savings estimation, and installation verification are working to produce high quality estimates of project impacts. Reported energy and demand savings could be increased by incorporating interactive factors into ex-ante impact estimates for lighting measures.

Recommendation 1: The evaluation team recommends that Duke continue to operate this program with the current level of rigor. For interior lighting projects, Duke should consider developing and applying deemed interactive factors to quantify the interactive effects between lighting retrofits and their associated HVAC systems.

Conclusion 2: Assumptions used in ex ante energy savings estimates are well-documented, but there are opportunities for improvement on new construction lighting projects and some non-lighting projects.

Recommendation 2: The evaluation team recommends that any adjustments made to baseline assumptions on new construction projects be well-documented within the incentive calculation spreadsheet developed by the program. This will provide better transparency when deviations from a lighting power density approach are used in ex-ante energy savings estimates.

Conclusion 3: The NR Custom Program uses T12 baseline fixture wattages in ex-ante energy savings estimates for applicable linear fluorescent to LED tube retrofit measures. This practice is defensible given the availability of high color rendering index (CRI) replacement lamps; however, peer Demand Side Management (DSM) programs no longer credit energy or demand savings beyond a T8 baseline.

Recommendation 3: It is recommended that the Duke NR Custom Program consider using a T8 equivalent when developing ex-ante energy and demand savings estimates for T12 to LED tube retrofit measures.

1.3.2 Process

Conclusion 1: The program is operating as intended and has resulted in high satisfaction across participant and contractor respondents. The most common source of program awareness from customers was from Duke Energy followed by their contractor, which is consistent with how the program is marketed.

Technical assistance from the contractor was the highest rated aspect of the program which highlights the contractors' technical competence and the significant role contractors play in the program. Many customer respondents also commented on how their contractors are knowledgeable which made the entire process easy.

Recommendation 1: Continue program outreach efforts and continue to engage contractors in the program and keep them informed of the program and any future changes to increase awareness among customers and encourage the installation of program-qualifying equipment.

Conclusion 2: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. Over half of contractor and one-third of participant respondents indicated they have used Duke's tools to calculate savings. Contractors who used Duke's provided tools rated their usefulness high. Additionally, participant respondents rated the worksheets and calculators as the second best aspect of the program.

Recommendation 2: Continue to keep the Custom-to-Go and Classic Custom calculators updated and available to customers and contractors who need a tool to estimate savings.

Conclusion 3: Interviews with program staff indicated the pre-approval review process could take as much as six weeks for review. While Duke staff felt the review process could be improved, program participants were generally satisfied with the review process. Contractor respondents were slightly less satisfied than participant respondents in the pre-approval process although they still provided high satisfaction scores. While no respondents reported being dissatisfied with the application process, it is something to watch to make sure the length of time to review applications is not taking too long.

Recommendation 3: Monitor the time it takes to review applications to ensure the time does not exceed six weeks.

Conclusion 4: Most customer respondents reported high satisfaction with the application progress although two respondents indicated low satisfaction due to the complexity of the application. One of these respondents indicated that the application is hard to fill out when involving the supplier and vendor, while the other respondent explained that the application requires "*so much information and justification*." When asked if there were any improvement suggestions, five customer respondents felt the paperwork was too complex and felt it could be improved.

Recommendation 4: Maintain streamlined application paperwork to minimize customer burden.

2 Introduction and Program Description

2.1 Program Description

Duke Energy's Non-Residential Smart $aver® Custom Incentives program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers (that have not opted-out) in the Duke Energy Ohio (DEO) service territory to enhance their ability to adopt and install cost-effective energy efficiency projects.

The program is designed to meet the needs of the Company's non-residential customers with electrical energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance. The program requires pre-approval prior to the project implementation. Proposed energy efficiency measures may be eligible for customer incentives if they clearly reduce electrical consumption and/or demand.

The two approaches for applying for incentives for this program are Classic Custom and Custom-to-Go. The difference between the two approaches focuses on the method by which energy savings are calculated. The documents required as part of the application process vary slightly.

The custom application forms are located on the company's website under the Smart $aver® Incentives (Business and Large Business tabs). The application forms are offered in Word (doc) and Adobe (pdf) format with the designated worksheet in Excel format for projects saving more than 700,000 kWh annually. Customers can utilize provided calculation tools (Custom-to-Go) for energy management system (EMS) projects savings less than 700,000 kWh annually or request worksheets in another format if preferred. Customers or their vendors submit the forms with supporting documentation. Forms are designed for multiple projects and multiple locations. Custom incentive applications (doc or pdf) are submitted with one or more of the following worksheets:

- Classic Custom approach (> 700,000 kWh or no applicable Custom-to-Go calculator)
  - Lighting worksheet (Excel)
  - Variable Speed Drive (VFD) worksheet (Excel)
  - Compressed Air worksheet (Excel)
  - Energy Management System (EMS) worksheet (Excel)
  - General worksheet (Excel), to be used for projects not addressed by or not easily submitted using one of the other worksheets

- Custom-to-Go Calculators (< 700,000 kWh and applicable Custom-to-Go calculator)
  - Energy Management Systems
  - Lighting
  - Process VFDs
  - Compressed Air

The Company contracts with Alternative Energy Systems Consulting (AESC) to perform technical review of applications. All other analysis is performed internally at Duke Energy, including DSMore runs for every custom measure that is recorded by the program.

2.1.1 Participation Summary

Table 2-1 summarizes program participation and reported energy savings for the full evaluation period of August 2015 through December 2017. There were a total of 195 projects completed during the evaluation period. For the purposes of this report a project is defined as a unique enrollment ID. These 195 projects collectively accounted for a total of 527 unique database line items. Database line items typically represent single-measure projects or an individual measure implemented as part of a multi-measure project. There are also a few instances where a line item in the tracking database represents a unique project site where a common scope of work was completed as part of a larger portfolio of sites (i.e. United Dairy Farmers). Table 2-2 outlines the reported summer and winter demand (kW) for the evaluation period.

Table 2-1 DEO NR Custom Program Participation and Reported Energy Summary

Category & Strata		Database Line Items		Enrollment IDs		Reported Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go Gross kWh	Classic Custom Gross kWh
Lighting	Large (>400 MWh)	11	42	2	14	2,036,415	22,466,191
	Small (<400 MWh)	109	263	54	56	4,375,034	6,926,663
Non-lighting	Large (>1,000 MWh)	-	20	-	17	-	38,284,556
	Small (<1,000 MWh)	2	80	2	50	31,898	12,799,639
Total		**122**	**405**	**58**	**137**	**6,443,347**	**80,477,048**
Grand Total		**527**		**195**		**86,920,395**	

Table 2-2 DEO NR Custom Program Reported Demand Savings Summary

Category & Strata		Enrollment IDs		Reported Summer Demand (kW) Savings		Reported Winter Demand (kW) Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go	Classic
Lighting	Large (>400 MWh)	2	14	478	3,035	146	2,980
	Small (<400 MWh)	54	56	931	971	611	1,054
Non-lighting	Large (>1,000 MWh)	-	17	-	3,800	-	3,304
	Small (<1,000 MWh)	2	50	6	1,928	2	1,682
Total		**58**	**137**	**1,415**	**9,733**	**759**	**9,020**
Grand Total		**195**		**11,148**		**9,779**	

Figure 2-1, Figure 2-2, and Figure 2-3 summarize the distribution of reported energy (kWh) and demand (kW) savings at the program level by technology category.

Figure 2-1 Distribution of Reported Energy Savings from NR Custom Program Projects by Technology

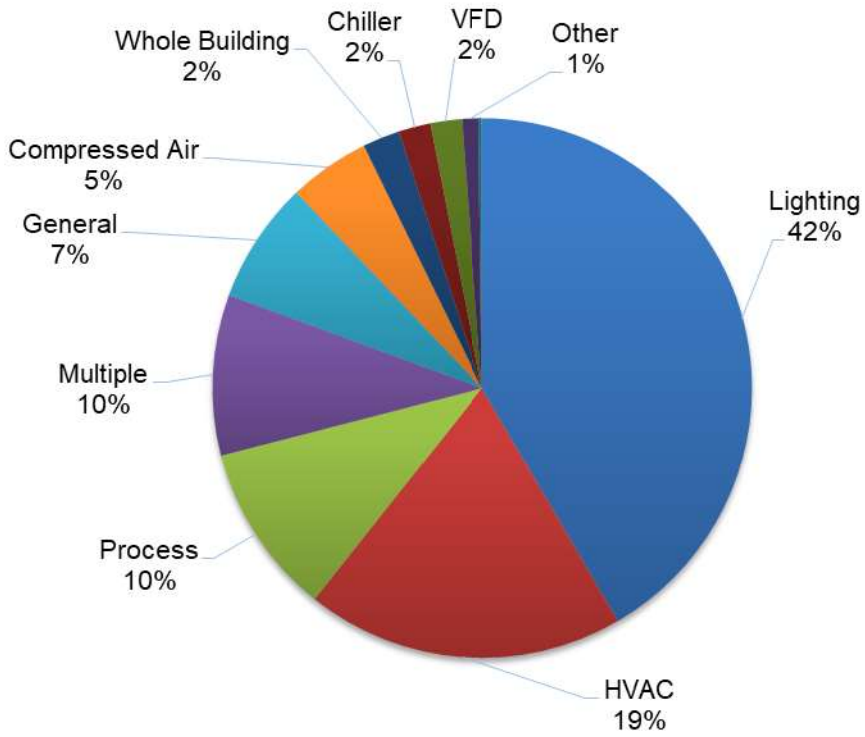


Figure 2-2 Distribution of Reported Summer Demand Savings from NR Custom Projects by Technology

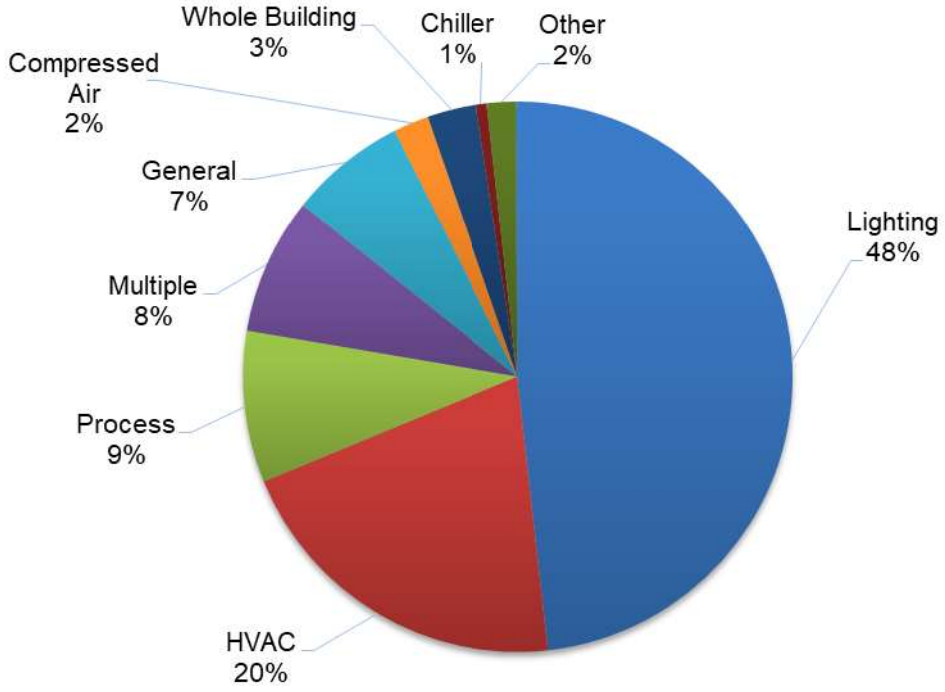
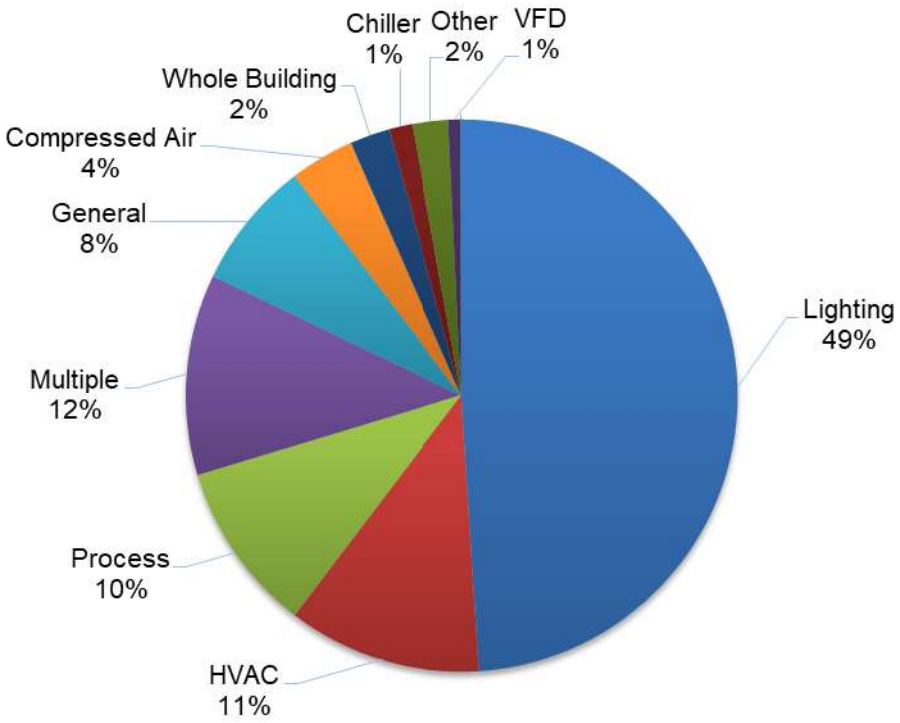


Figure 2-3 Distribution of Reported Winter Demand Savings (kW) from NR Custom Projects by Technology



3 Key Research Objectives

3.1 Gross Impact

The impact evaluation processes followed standard industry protocols and definitions, where applicable, and include the Department of Energy Uniform Methods Protocol[3], as an example. As part of evaluation planning, the evaluation team outlined the following activities for this program evaluation:

- Quantify accurate and supportable energy (kWh) and demand (kW) savings for measures and equipment being implemented in customer facilities attributed to the NR Custom Program;
- Assess the rate of free riders from customer and contractor perspectives and determine spillover effects; and,
- Consider and verify measure installation vintage aligns with measure baseline definitions, i.e. early replacement, burnout on failure, new construction etc.

3.2 Net Impact

The goal of the net impact evaluation was to estimate the overall energy impacts that are attributable to the program. This estimate comprises two components: free-ridership and spillover.

Free-ridership is the estimate of what proportion of the program's savings would have happened in the absence of the program. Free-ridership takes into account the customers' plans prior to engaging in the program and the various influences the program can have on the customer such as incentives and other interactions with the program staff, contractors, and marketing materials.

Spillover estimates additional energy savings for efficiency projects that were completed without receiving a program incentive, but were influenced by the program in some other way.

Net program results are calculated through a net-to-gross ratio, as follows:

$$\text{Net-to-gross} = (1 - \text{Free-ridership \%}) + \text{Spillover \%}$$

$$\text{Net Savings} = \text{Net-to-gross (\%)} * \text{Gross Verified Savings}$$

[3] The DOE's Uniform Methods Project for Determining Energy Efficiency Program Savings can be found at http://www1.eere.energy.gov/office_eere/de_ump.html.

3.3 Process

The evaluation team collected data from a variety of sources to address the researchable questions identified at the beginning of the study. Table 3-1 contains the list of research objectives and the data sources used to investigate each one.

Table 3-1 Process Evaluation Research Questions and Activities

Preliminary Research Questions	Document Review	Interviews with Key Contacts	Participant Survey	Trade Ally Survey
How is the program promoted? How important are account representatives? Are contractors or vendors identifying potential projects?	✓	✓	✓	✓
Understand participant experience. What steps are involved in identifying and scoping projects and obtaining pre-approval? What issues emerge during the process? How are these addressed?		✓	✓	✓
Why do potential projects drop out? Are there opportunities to make the process simpler or more streamlined while maintaining robust quality control (QC)?		✓		✓
Is the uptake of custom vs. custom-to-go projects as expected? How do the projects and/or the customer experience differ between the two participation paths?	✓	✓	✓	✓
What is the customer's decision-making process regarding energy efficiency upgrades or equipment? How influential were various aspects of the program in their decision? How influential was the contractor they worked with?	✓		✓	✓

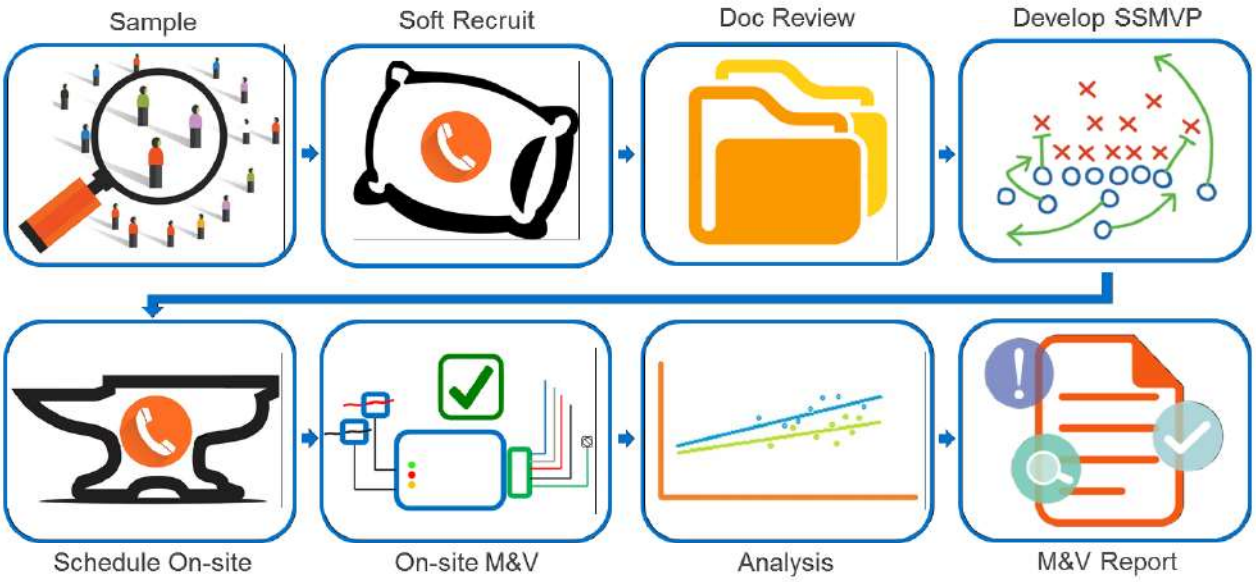
4 Impact Evaluation

4.1 Approach

The primary determinants of impact evaluation costs are the sample size and the level of rigor employed in collecting the data used in the impact analysis. The accuracy of the study findings is in turn dependent on these parameters. Techniques that we used to conduct the evaluation, measurement, and verification (EM&V) activities, and to meet the goals for this evaluation, include on-site inspections and measurements, utility billing analysis, telephone surveys, documentation review, best practice review, and interviews with implementation staff, trade allies, program participants, and general business customers.

The evaluation team's impact analysis focused on the energy and demand savings attributable to the NR Custom Program for the period of August 2015 through December 2017. A variety of techniques were used to develop independent assessments of gross and net energy savings for each sampled project. All sampled custom projects received both a desk review and on-site verification. Figure 4-1 provides a high-level process flow diagram of all impact evaluation activities and brief summary of each step in the process is provided below.

Figure 4-1 Process Flow Diagram of Impact Evaluation Activities



The evaluation team verified energy and demand savings attributable to the program by conducting the following impact evaluation activities:

- **Sample:** Conduct review of NR Custom Program participant database on a quarterly basis, identify all new projects, and draw representative sample of projects for on-site M&V.
- **Soft Recruit:** Attempt to reach all sampled participants by phone or email, prior to conducting an in-depth review of project documentation or developing a site specific

measurement and verification plan (SSMVP), to inform participants of the ongoing evaluation and request permission to conduct an on-site inspection. Nothing would be formally scheduled during this call.

- **Document (Doc) Review:** Request, receive, and review all project documentation available for those sites successfully recruited.
- **Develop SSMVP:** Develop document providing general overview of the project, reported benefits and costs, proposed level of rigor, M&V equipment, and key data to be gathered in the field.
- **Schedule On-site:** Schedule on-site inspection with participant after Duke team provides comments and approves SSMVP. The purpose of the Duke team reviews were to verify that all measures were included in the plan, reported energy and demand savings were accurate, and proposed M&V approaches were appropriate.
- **On-site M&V:** Verify measure implementation, deploy metering equipment, interview key project personnel, and obtain trend data from existing BAS/EMS systems.
- **Analysis:** Estimate gross verified energy and demand savings for sampled measures and projects using data collected from on-site measurement and verification.
- **M&V Report:** Compare gross-verified energy and demand savings to program-reported values to determine project-level realization rates and summarize findings for each sampled site in M&V report.
- **Gross Verified Savings:** Summarize project-level results to stratum-level for determining program-level realization rates and verified gross energy and demand savings.
- **Net Verified Savings:** Apply attribution survey data to estimate net-to-gross ratios and net-verified savings at the program level.

4.2 Database Review

The program participation database informed many of the evaluation activities including sample design, project-level savings review, and estimating program-level gross verified energy and demand savings. Participation database extracts were requested and received quarterly in real time with the program implementation. After the first round of participation recruitment in 2016, it became evident that a census of participants would need to be incorporated into the "soft-recruiting" effort in order to achieve sample targets from the Evaluation Plan (discussed further in Section 4.3).

Once all newly completed projects were identified, the evaluation team would receive site contact information and sufficient project details so as to initiate preliminary "soft-recruiting" effort by the evaluation team. Once a participant was successfully recruited into the evaluation, the impact team requested detailed project documentation for each project and conducted an in-depth review of all information. While reviewing project documentation, the evaluation team would verify whether parameters such as reported energy and demand savings, energy conservation measure (ECM) quantities, and measure descriptions matched those indicated in the tracking database. Any identified discrepancies between the two sources were then

identified in the SSMVP and later resolved based on feedback provided by the Duke program team.

At the conclusion of the project, the evaluation team requested a full database extract for the entire evaluation period (August 2015 through December 2017) for comparison to the compiled database maintained by the evaluation team throughout the course of the evaluation for reconciliation. There were a number of inconsistencies in the database revealed through the reconciliation. Common inconsistencies included:

- Lighting projects where ECM Quantity was indicated as "1" in the tracking database for non one-for-one retrofit measures or measures involving multiple post installation fixture types, but a common baseline fixture type. The actual quantity was usually determined from project documents or the "Measure Name" field within the tracking database itself. [4]
- Inaccurate phone numbers or phone numbers listed as 999-9999, as a generic default. This issue was generally resolved through follow-up information requests.
- No email address for site contact. Also generally resolved through follow-up information requests if participant could not be reached by phone.

The inconsistencies identified do not have a direct impact on overall program performance, but it is recommended that these issues be addressed by the Duke Team internally, when feasible, so as to improve the overall evaluability of the program and eliminate lost effort chasing and correcting them.

4.3 Sampling and Estimation

The gross and net verified energy and demand savings estimates presented in this report from the Duke Energy Ohio Smart $aver Non-residential Custom Program were generally determined through the observation of key measure parameters among a sample of program participants. A census evaluation would involve surveying, measuring, or otherwise evaluating the entire population of projects within a population. Although a census approach would eliminate the sampling uncertainty for an entire program, the reality is that M&V takes many resources both on the part of the evaluation team and the program participants who agree to be surveyed or have site inspections conducted in their business. When a sample of projects is selected and analyzed, the sample statistics can be extrapolated to provide a reasonable estimate of the population parameters. Therefore, when used effectively, sampling can improve the overall quality of an evaluation study. By limiting resource-intensive data collection and analysis to a random sample of all projects, more attention can be devoted to each project surveyed. Sampling also reduces the overall cost of an evaluation compared to a census approach while still maintaining representativeness.

For the NR Custom impact evaluation the most important sampling objective was representativeness – that is that the projects selected in the evaluation were representative of

[4] It should be noted that the baseline and post-retrofit quantities are well-documented elsewhere by the program team outside of the participation tracking database. In fact standard policy is to verify installed equipment quantities prior to issuing payment. The pre- and post-retrofit quantity information isn't considered by the program to be critical to include in the participation database.

the population they were selected from and would produce unbiased estimates of population parameters. The evaluation team used a ratio estimation technique for this evaluation. This technique assumes that the ratio of the sum of the verified savings estimates to the sum of the reported savings estimates within the sample is representative of the program as a whole. This ratio is referred to as the realization rate, or ratio estimator, and is calculated in Equation 1:

Equation 1: Realization Rate

$$Realization\ Rate = \frac{\sum_i^n Verified\ Savings}{\sum_i^n Reported\ Savings}$$

Where *n* is the number of projects in the evaluation sample. The realization rate is then applied to the claimed savings of each project in the population to calculate gross verified savings.

Stratification

The evaluation team used sample stratification with ratio estimation techniques for the NR Custom Program. Stratification is a departure from simple random sampling (SRS), where each sampling unit (customer/project/rebate/measure) has an identical likelihood of being selected in the sample. Stratified random sampling refers to the designation of two or more sub-groups (strata) from within a program population prior to the selection process.

The evaluation team took great care to ensure that each sampling unit within the population belonged to one (and only one) stratum. In a stratified sample design, the probability of selection is different between strata and this difference must be accounted for when calculating results. The inverse of the selection probability is referred to as the *case weight* and is used in estimation of impacts when stratified random samples are utilized. Consider the following simplified example in Table 4-1 based on a fictional program with two measures; LED lighting and variable frequency drives (VFDs).

Table 4-1 Case Weights Example

Measure	Population Size	Sample Size	Case Weight
LED lamps	15,000	30	500
VFDs	6,000	30	200

Because LED lighting measures are sampled at a higher rate (1-in-200) than VFDs (1-in-500), each sample point carries less weight in the program results than an individual VFD sample point. In general, the evaluation team designed samples so that low case weights were reserved for large and complex measures such as the L-Large and NL-Large strata.

The evaluation team felt that stratification was advantageous and utilized it in the sample design for a variety of reasons:

- Increased precision of the within-stratum variability was expected to be small compared to the variability of the population as a whole. Stratification in this case allows for increased precision and smaller total sample sizes.

- It enabled the evaluation team to ensure that a minimum number of units within a particular stratum were verified.

Presentation of Uncertainty

There is an inherent risk, or uncertainty, that accompanies sampling, because the projects selected in the evaluation sample may not be representative of the program population as a whole with respect to the parameters of interest. As the proportion of projects in the program population that are sampled increases, the amount of sampling uncertainty in the findings decreases. The amount of variability in the sample also affects the amount of uncertainty introduced by sampling. A small sample drawn from a homogeneous population will provide a more reliable estimate of the true population characteristics than a small sample drawn from a heterogeneous population. Variability is expressed using an error ratio for programs that use ratio estimation.

When ratio estimation is utilized, standard deviations will vary for each project in the population. The error ratio is an expression of this variability and is analogous to the coefficient of variation, C_v, for simple random sampling.

Equation 2 provides the formula for estimating error ratio.

Equation 2: Error Ratio

$$Error\ Ratio = \frac{\sum_{i=1}^{N} \sigma_i}{\sum_{i=1}^{N} \mu_i}$$

Equation 3 shows the formula used to calculate the required sample size for each evaluation sample, based on the desired level of confidence and precision. Notice that the *Error Ratio* term is in the numerator, so required sample size will increase as the level of variability increases.

Equation 3: Required Sample Size

$$n_0 = \left(\frac{z * Error\ Ratio}{D}\right)^2$$

Where:

n_0 = *The required sample size before adjusting for the size of the population*

Z = *A constant based on the desired level of confidence (equal to 1.645 for 90% confidence two-tailed test)*

D = *Desired relative precision*

The sample size formula shown in Equation 3 assumes that the population of the program is infinite and that the sample being drawn is reasonably large. In practice, this assumption is not always met. For sampling purposes, any population greater than approximately 7,000 may be considered infinite for the purposes of sampling. For smaller, or finite, populations, (such as the Duke Energy Ohio NR Custom participant population) the use of a finite population correction factor (FPC) is warranted. This adjustment accounts for the extra precision that is gained when the sampled projects make up more than about 5% of the program savings. Multiplying the

results of Equation 3 by the FPC formula shown in Equation 4 will produce the required sample size for a finite population.

Equation 4: Finite Population Correction Factor

$$fpc = \sqrt{\frac{N - n_0}{N - 1}}$$

Where:

N = *Size of the population*

n_0 = *The required sample size before adjusting for the size of the population*

The required sample size (n) after adjusting for the size of the population is given by Equation 5.

Equation 5: Application of the Finite Population Correction Factor

$$n = n_0 * fpc$$

Verified savings estimates always represent the point estimate of total savings, or the midpoint of the confidence interval around the verified savings estimate for the program. Equation 6 shows the formula used to calculate the margin of error for a parameter estimate.

Equation 6: Error Bound of the Savings Estimate

$$Error\ Bound = se * (z - statistic)$$

Where:

se = *The standard error of the population parameter of interest (proportion of realization rate, total energy savings, etc.) This formula will differ according to the sampling technique utilized.*

$z - statistic$ = *Calculated based on the desired confidence level and the standard normal distribution.*

The 90% confidence level is a widely accepted industry standard for reporting uncertainty in evaluation findings. The confidence levels and precision values presented in this report are at the 90% confidence level. The z-statistic associated with 90% confidence is 1.645.

When evaluators or regulators use the term "90/10", the 10 refers to the relative precision of the estimate. The formula for relative precision shown in Equation 7:

Equation 7: Relative Precision of the Savings Estimate

$$Relative\ Precision_{Verified\ Savings} = \frac{Error\ Bound_{(kWh\ or\ kW)}}{Verified\ Impact_{(kWh\ or\ kW)}}$$

An important attribute of relative precision to consider when reviewing achieved precision values is that it is "relative" to the impact estimate. Therefore programs with low realization rates are likely to have larger relative precision values because the error bound (in kWh or kW) is being

divided by a smaller number. This means two programs with exactly the same reported savings and sampling error in absolute terms, will have very different relative precision values, as shown in Table 4-2.

Table 4-2 Relative Precision Example

Program	Reported kWh	Realization Rate	Error Bound (kWh)	Verified kWh	Relative Precision (90%)
Program #1	4,000,000	0.5	400,000	2,000,000	± 20%
Program #2	4,000,000	1.0	400,000	4,000,000	± 10%

In many cases a program-level savings estimate requires summation of the verified savings estimates from several strata. In order to calculate the relative precision for these program-level savings estimates, the evaluation team used Equation 8 to estimate the error bound for the program as a whole from the stratum-level error bounds.

Equation 8: Combining Error Bounds across Strata

$$Error\ Bound_{Program} = \sqrt{Error\ Bound^2_{Stratum1} + Error\ Bound^2_{Stratum2} + Error\ Bound^2_{Stratum3}}$$

Using this methodology, the evaluation team developed verified savings estimates for the program and an error bound for that estimate. The relative precision of the verified savings for the program is then calculated by dividing the error bound by the verified savings estimate.

4.4 Targeted and Achieved Sampling

Table 4-3 presents the final achieved sample size for Duke's Ohio service territory based on data collection activity (verification and M&V) and the program delivery stream method (Classic versus Custom-to-Go). Impact sample sizes targeted a 90/10 confidence precision based on the expected participation counts for the evaluation period. Samples were selected on an on-going basis across the evaluation period (August 2015 - December 2017) to help ensure proper representation of measure types and program approaches as the program progressed.

Table 4-3 NR Custom Sampling Plan Custom-to-Go vs. Custom Classic - Achieved

Utility	Data Collection Activity	Custom to Go	Classic	Total
Duke Energy Ohio	Share of Participation	42%*	58%*	100%
	Site Visits – On-site Measurement	16	20	36
	Site Visits – On-site Verification	6	11	17
	Total	**22**	**31**	**53**

* Percentages are representative of project counts (58 of 137 enrollment IDs went through Custom-to-Go track). Distribution of program-level savings was 7% Custom-to-Go / 93% Custom Classic.

The evaluation team stratified the participant population by technology category (lighting vs. non-lighting) and relative magnitude of savings (kWh) to ensure that the evaluated sample

represented the population make-up of the total program-level savings and in order to achieve higher statistical precision by reducing the variability within the sample. Our stratification approach and achieved sample sizes are summarized in Table 4-4.

Table 4-4 NR Custom Stratified Sampling - Achieved

Strata	Population	Pop Reported Savings (kWh)	Achieved Sample Size
L-Large (>400 MWh)	16	24,502,606	2
L-Small (<400 MWh)	110	11,301,697	36
NL-Large (>1,000 MWh)	17	38,284,556	3
NL-Small (<1,000 MWh)	52	12,831,537	12
Total	**195**	**86,920,395**	**53**

4.5 Data Collection

As outlined in prior sections, the gross impact evaluation process began with a thorough review of project documentation. This information was provided upon formal request. Documents commonly provided by the program team include:

- Smart $aver Incentive Calculation workbooks
- DSMore Summary workbooks
- Custom Incentive Application Forms
- Contractor Proposals
- Detailed project narratives
- Product specifications and invoices
- Customer utility data (billing history)
- Incentive payment request forms
- Email correspondence between members of the program management team and participants
- Other documents commonly provided on lighting project include:
  - Smart $aver Custom Incentive Program Lighting Calculators
  - Specification sheets for retrofit lighting systems
- Other documents commonly provided for non-lighting projects include:
  - Customer submitted energy and demand savings calculations
  - Detailed reports developed by third-party engineering consultants
  - Building energy simulation model output files

After reviewing all program-supplied project documentation the evaluation team engineer assigned to each project then developed a site-specific measurement and verification plan (SSMVP) for each unique premise. These were developed in order to create a standardized, rigorous process for the verification of project claims while on-site. Each SSMVP was specifically tailored to verify the equipment that was installed and measures that were implemented per the provided project documentation. The SSMVP also identified baseline assumptions for verification with on-site personnel in order to validate ex-ante, forecasted savings estimates.

Each SSMVP also identified the specific parameters to be gathered in the field for each measure. These plans followed guidelines set forth in multiple Department of Energy Uniform Methods Project (DOE UMP) protocols including:

- Chapter 2: Commercial and Industrial Lighting Evaluation Protocol
- Chapter 14: Chiller Evaluation Protocol
- Chapter 18: Variable Frequency Drive Evaluation Protocol
- Chapter 19: HVAC Controls (DDC/EMS/BAS) Evaluation Protocol
- Chapter 22: Compressed Air Evaluation Protocol
- Chapter 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol

The plans also identify a preferred and one or two alternate analysis approaches (level of rigor) along with the critical data to be gathered for each. Regardless of the method ultimately selected for the savings analysis, field engineers were instructed to gather the data necessary for all methods identified in the SSMVP. Table 4-5 provides a few examples of the data points typically gathered for several of the more commonly-encountered energy conservation measures (ECMs).

Once completed each SSMVP was then submitted to the Duke EM&V Team for review and approval. Upon approval from Duke an on-site inspection was then scheduled with the participant.

4.5.1 On-site Verification Activities

During on-site verification, field engineers would verify that measures were appropriately implemented in accordance with the SSMVP developed for the site. Field engineers would also deploy metering equipment for short-term monitoring of parameters such as lighting hours of use, energy consumption (amps or kW), and loads. They also requested copies of equipment specifications and sequences of operation, as appropriate. Any available historic trend data (when available) was also obtained from existing HVAC control and central plant sequencing control systems.

Table 4-5 Key Data Points Gathered for Commonly Encountered ECMs

Measure Name	Baseline or Retrofit
Interior Lighting Retrofits	Quantity of existing and retrofit fixtures Fixture type of existing and retrofit fixtures Existing fixture controls, if any New fixture controls, if any Typical schedule and hours of operation Space temperature Type of heating and cooling equipment/specifications
HVAC Control/EMS	Determine baseline setpoints and schedules through customer interviews Determine post-retrofit setpoints and schedules through central BAS Obtain any available trend data Verify occupancy and equipment schedules Gather nameplate information from primary heating and cooling systems
Variable Speed Drive on Pump	Determine baseline method of pump control Determine conditions that dictate the speed of the VSD Determine whether loads modulate or are fairly constant If loads modulate, determine load profile (% load bins) Nameplate information from pump Nameplate information from VSD Gather any available trend data Deploy metering equipment capable of measuring true polyphase RMS power Perform spot power measurements (kW) of pump while running under normal operating conditions
VSD Air Compressor	Determine baseline method of control Gather information on baseline air compressor system (kW/CFM, hp, CFM output, system type, etc.) Determine how loads vary daily, weekly, seasonally, annually for VSD compressor Nameplate information from new air compressor Gather any operational parameters displayed on control panels Gather any available trend data from central controls system Determine whether compressor serves central plant with multiple compressors or is stand-alone. If part of multi-compressor plant determine role and sequences of operation (primary, secondary, trim, etc.) Deploy metering equipment capable of measure true polyphase RMS power

4.6 Level of Rigor

A variety of analysis approaches were utilized for the impact evaluation. The approach applied was decided based upon the methods used by the participant, trade ally, or program in generating the ex-ante[5] savings estimates, the availability of information, and the extent of interactive effects. An overview of each analysis approach applied is provided in Sections 4.6.1 through 4.6.3.

4.6.1 Basic Rigor: Simple Engineer Model (SEM) with On-Site Measurement

Consistent with IPMVP Option A (Partially Measured Retrofit Isolation), this approach was used for the majority of lighting, custom process, and compressed air measures. This method uses engineering calculations, along with site measurements of a limited number of important parameters, to verify the savings resulting from specific measures. This was the most prevalent level of rigor applied for this evaluation.

An overview of the key inputs and algorithms used to develop energy and demand savings estimates for lighting measures and compressed air measures is provided in Section 4.6.1.1 and 4.6.1.2.

4.6.1.1 Lighting Measures

Equation 9 and Equation 10 were used to calculate energy and demand savings for all lighting retrofit measures.

Equation 9: Lighting Demand Savings

$$\Delta kW = (Qty_{BASE} \times Watts_{BASE} - Qty_{EE} \times Watts_{EE}) / 1000 \times WHF_d$$

Equation 10: Lighting Annual Energy Savings

$$\Delta kWh/yr = (Qty_{BASE} \times Watts_{BASE} - Qty_{EE} \times Watts_{EE}) / 1000 \times HoursWk \times Weeks \times WHF_e$$

Where:

Qty_{BASE} = *Quantity of baseline fixtures*

$Watts_{BASE}$ = *Watts of baseline fixture (based on the specified existing fixture type) (Watts)*

Qty_{EE} = *Quantity of energy efficient fixtures*

$Watts_{EE}$ = *Watts of energy efficient fixture (based on the specified installed fixture type) (Watts)*

HoursWk = *Weekly hours of equipment operation (hrs/week)*

Weeks = *Weeks per year of equipment operation (weeks/year)*

[5] The term "ex ante" represents the forecasted energy and demand savings rather than the actual results.

WHF_d lighting* = *Waste heat factor for demand to account for cooling savings from efficient*

WHF_e lighting* = *Waste heat factor for energy to account for cooling savings from efficient*

1000 = *Conversion: 1000 Watts per kW*

Fixture Wattages

The pre-existing fixture wattages were quoted from industry standards and commercial literature for the applicable type of fixtures.

The installed light fixture wattages were taken from the manufacturer's cut sheets.

Hours of Use

Nexant verified hours of use assumptions by deploying lighting loggers. The lighting operating hours may exceed the facility's posted hours of business.

4.6.1.2 Compressed Air Measures

Energy use reduction for all compressor projects can be calculated by the difference between the energy consumed in the baseline operation minus the energy consumed in the post-retrofit operation. Generally, information is required for compressor capacity in both the baseline and post-retrofit scenarios. Appropriate adjustments are made to ensure the flow profile is equivalent between pre- and post-retrofit conditions unless demand improvements have been made that result in a change in the flow profile. Compressor power at full load can be calculated using Equation 11 and Equation 12.

Equation 11: Compressor Power at Full Load (No VSD)

$$Full\ Load\ kW_{rated} = \frac{(Compressor\ hp) \times LF_{rated} \times (0.746\ kW/hp)}{(\eta_{motor})}$$

Equation 12: Compressor Power at Full Load (w/ VSD)

$$Full\ Load\ kW_{rated} = \frac{(Comp\ hp) \times LF_{rated} \times (0.746\ kW/hp)}{(\eta_{motor}) \times (\eta_{VSD})}$$

Where:

Comp hp = *compressor horsepower, nominal rating of the prime mover (motor)*

0.746 = *horsepower to kW conversion factor*

η_{moto} = *motor efficiency (%)*

η_{VSD} = *variable-speed drive efficiency (%)*

LF_{rated} = *load factor of compressor at full load (typically 1.0 to 1.2)*

The above methods for determining the instantaneous demand of an air compressor at a given load is then repeated for many bins of hour-CFM operation. This is commonly referred to as a CFM demand profile. A demand profile is developed to provide accurate estimates of annual energy consumption. A demand profile typically consists of a CFM-bin hour table summarizing hours of usage under all common loading conditions throughout a given year.

The annual CFM profile is used to determine base case and proposed case energy use. For both, compressor electricity demand for each CFM-bin is determined from actual metering data, spot power measurements, historical trend data or CFM-to-kW lookup tables.

The difference in energy consumption between an air compressor operating in idling mode and being physically shut down can be significant depending on the base case and post-retrofit case methods of system control. For example, a rotary screw compressor with inlet valve modulation (w/blowdown) controls will draw 26% of full-load power (kW) when operating in idling mode; whereas a VSD-controlled system (w/stopping) has zero load for the same bin-hours. Table 4-6 shows the average percent power versus percent capacity for rotary screw compressors with various control methods[6].

Table 4-6 Average Percent Power versus Percent Capacity for Rotary Screw Compressors with Various Control Methods

	% Power							
% Capacity	On/Off Control	Load/Unload (1 gal/CFM)	Load/Unload (10 gal/CFM)	Inlet Valve Modulation (w/o Blowdown)	Inlet Valve Modulation (w/Blowdown)	Variable Displacement	VSD w/Unloading	VSD w/Stopping
0%	0%	27%	27%	71%	26%	25%	12%	0%
10%	10%	32%	35%	74%	40%	34%	20%	12%
20%	20%	63%	42%	76%	54%	44%	28%	24%
30%	30%	74%	52%	79%	62%	52%	36%	33%
40%	40%	81%	60%	82%	82%	61%	45%	41%
50%	50%	87%	68%	86%	86%	63%	53%	53%
60%	60%	92%	76%	88%	88%	69%	60%	60%
70%	70%	95%	83%	92%	92%	77%	71%	71%
80%	80%	98%	89%	94%	94%	85%	80%	80%
90%	90%	100%	96%	97%	97%	91%	89%	89%
100%	100%	100%	100%	100%	100%	100%	100%	100%

[6] Source: Department of Energy Uniform Methods Project: Chapter 22: Compressed Air Evaluation Protocol

The energy consumption for each CFM-bin is determined from the product of the average compressor demand and the number of hours in each bin (Equation 13). The sum of the kWh bin values gives the annual consumption (Equation 14).

Equation 13: Energy Consumption of CFM-bin

$$\Delta kWh_{bin1} = (Base\ kW_{operating\_bin1} - Post\ kW_{operating\_bin1}) \times CFM\text{-}bin\ 1\ Hours$$

$$\Delta kWh_{binN} = (Base\ kW_{operating\_binN} - Post\ kW_{operating\_binN}) \times CFM\text{-}bin\ N\ Hours$$

Where:

$Base\ kW_{operating\_bin1}$ = *baseline demand at part-load associated with CFM-bin 1*

$Post\ kW_{operating\_bin1}$ = *post demand at part-load associated with CFM-bin 1*

$Base\ kW_{operating\_binN}$ = *baseline demand at part-load associated with CFM-bin N*

$Post\ kW_{operating\_binN}$ = *post demand at part-load associated with CFM-bin N*

Equation 14: Total Energy Consumption of All CFM-bins

$$Total\ Energy\ Reduction\ (kWh/yr) = \sum_{o\text{-}n} [\ \Delta kWh_{bin1} + \Delta kWh_{bin2} + \ldots + \Delta kWh_{binN}\ ]$$

Where:

ΔkWh_{bin1} = *energy reduction for CFM-bin 1*

ΔkWh_{binN} = *energy reduction for CFM-bin N*

4.6.2 Basic Rigor: Simple Engineer Model (SEM) with On-Site Verification Only

This approach is very similar to SEM with On-site Measurement, but without direct measurement of key parameters. This approach was generally applied to measures that are not conducive to direct measurement such as outdoor lighting or building envelope improvements. This approach was also used in instances where process equipment could not be de-energized for the purposes of deploying metering equipment. The algorithms and inputs described in Section 4.6.1 are still applicable to this approach.

4.6.3 Enhanced Rigor: Billing Analysis with On-Site Verification Only

Consistent with IPMVP Option C (Whole Building), this approach was used for projects involving multiple HVAC control measures with interactive effects, when final ex ante building simulation models could not be obtained from the trade ally. It was also used for large industrial custom process measures involving equipment that could not be de-energized to accommodate installation of data logging equipment. This approach was only applied on projects where the reported gross energy savings exceeded 10% of annual energy consumption. This approach entailed a pre- and post-retrofit comparison of weather-normalized whole facility energy consumption. This approach adhered to guidelines set forth in the Department of Energy Uniform Methods Project Protocols for HVAC Controls (Chapter 19) and Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol (Chapter 8).

Our general approach consisted of the following:

1. Fit a premise-level degree-day regression model separately for the pre- and post-periods.

2. For each period (pre- and post-) use the coefficients of the fitted model with normal year degree days to calculate weather-normalized annual consumption (NAC) for that period.

3. Calculate the difference between the pre- and post-period NAC for the site.

This approach was used for four of the Custom Incentive Participant projects. Outlined below is the step-by-step process for this analysis:

Step 1. Fit the Regression Model: The degree-day regression for the site and year (pre or post) are modeled as:

Equation 15: Average Consumption per Day

$$E_m = \mu + \beta_H H_m + \beta_C C_m + \varepsilon_m$$

Where:

E_m = *Average consumption per day during interval m*

H_m = *Specifically, $H_m(T_H)$, average daily heating degree days at the base temperature (T_H) during meter read interval m, based on daily average temperatures on those dates*

C_m = *Specifically, $C_m(T_C)$, average daily cooling degree days at the base temperature (T_C) during meter read interval m, based on daily average temperatures on those dates*

μ = *Average daily baseload consumption estimated by the regression*

β_H, β_C = *Heating and cooling coefficients estimated by the regression*

ε_m = *Regression residual*

Step 2. Applying the Model: To calculate NAC for the pre- and post-installation periods for the given site and timeframe, combine the estimated coefficients μ, β_H, and β_C with the annual normal-year or typical meteorological year (TMY) degree days H_0 and C_0 calculated at the site-specific degree-day base, T_H and T_C. The example shown below puts all premises and periods on an annual and normalized basis.

Equation 16: Weather-Normalized Annual Consumption

$$NAC = \mu * 365.25 + \beta_H H_0 + \beta_C C_0$$

Step 3. Calculate the Change in NAC: The difference between pre- and post-program NAC values (ΔNAC) represents the change in consumption under normal weather conditions.

4.6.4 Peak Period Definition

Demand savings were evaluated based on the definition of the peak period provided by Duke Energy, as summarized Table 4-7.

Table 4-7 Definition of Peak Demand Periods

	Summer	Winter
Month	July	January
Hour	3pm – 4pm	7pm – 8pm

4.7 Measurement & Verification Reports

Once a savings analysis was complete all findings from on-site verification and each project-level savings analysis was summarized in a standalone Measurement and Verification Report. Each report contained the full contents of the original SSMVP (Sections 1 through 3) prepared in advance of the on-site inspection as well as a new section (Section 4) summarizing all site visit findings, the chosen approach for quantifying energy savings, the verified energy and demand savings, and commentary on reasons for differences between the reported and verified savings values. Each individual M&V Report was then submitted to the Duke EM&V Team for review, comment, and approval. The 55 individual M&V Reports developed as part of this evaluation were provided under separate cover.

4.8 Impact Evaluation Analysis and Findings

4.8.1 High Level Findings

4.8.1.1 Continue with Current Work

Based upon the results of the gross impact evaluation it is evident that the level of rigor being applied to each project as it goes through the application process of the NR Custom Program is resulting in accurate estimates of energy and demand savings. The practice of subjecting each project to a thorough engineering review by AESC followed by a high-level review by the program team seems to be providing a level of quality control that minimizes calculation errors or instances of over-claimed energy or demand savings. The strata-level realization rates also indicate that an appropriate level of rigor is being applied to every project regardless of its size (magnitude of energy /demand savings) or measure category (lighting vs. non-lighting).

4.8.1.2 Interactive Energy Changes for Lighting Retrofits

How energy-efficiency projects change the energy use of other equipment, not associated directly with the projects themselves, should be a consideration in estimating the energy efficiency program benefits. These interactive energy changes can be challenging to quantify, but should be accounted for whenever possible.

Interactive energy changes come in a number of forms and affect different fuel types. A measure that directly saves electricity may cause another building system to consume less energy. Alternatively, a measure that directly saves electricity could cause another building system to consume more energy. Sometimes, a single project can have both positive and

negative interactive effects on other systems. For example, upgrading to energy efficient lighting reduces the electricity that a participant uses on lighting; the associated reduction in waste heat reduces the burden on the cooling system in the summer – but increases the burden on the heating system in the winter.

Lighting projects produce relatively predictable interactive energy changes enabling the development of stipulated factors through building energy simulation modeling. For this evaluation building energy simulation models were developed for 18 facility types using DOE-2 based modeling software and Database of Energy Efficiency Resources (DEER) building prototypes. A single set of models was developed for the DEO service territory using TMY3 weather data from the Cincinnati/Northern Kentucky International Airport (CVG) weather station. Table 4-8 presents the interactive factors developed by the evaluation team for each building type and weather station. The CVG weather station aligns with Duke Energy Ohio's service territory.

Table 4-8 Interactive Factors by Facility Type and Weather Station

Building Type	CVG Interactive Factors (IF)
Assembly	106.3%
Bio Tech Manufacturing	109.6%
Community College	104.8%
Hospital	107.7%
Hotel	110.2%
Light Industrial Manufacturing	102.6%
Motel	119.9%
Nursing Home	126.6%
Office Large	103.2%
Office Small	102.8%
Primary School	101.8%
Restaurant Fast Food	102.6%
Restaurant Sit Down	98.5%
Retail Large	104.0%
Retail Small	102.2%
Secondary School	102.6%
University	109.9%
Warehouse Conditioned	107.0%

Interactive effects were estimated for each facility type by simulating a reduction in annual lighting end use energy consumption of approximately 4%. This value was chosen based upon Nexant's experience with evaluating other custom and prescriptive lighting programs across the country.

Table 4-9 provides an overview of the verified energy savings attributed to interior lighting measures within conditioned spaces and the relative contribution to savings by interactive effects estimated by the evaluation team. Total savings attributable to interactive effects within the evaluated sample is estimated to be approximately 115,431 kWh or 2.5% of total verified energy savings for all lighting projects. Interactive effects account for approximately 6.4% of verified energy savings for projects with space cooling.

Table 4-9 Verified Energy Savings (kWh) and Relative Contribution of Interactive Effect Savings by Facility Type from Evaluated Sample for Facilities with Space Cooling

Building Type	Verified Energy Savings (kWh)	Interactive Effects Savings (kWh)	% Savings Attributable to Interactive Effects
Assembly	358,745	7,034	2.0%
Hospital	1,000	72	7.1%
Light Industrial Manufacturing	679,221	17,110	2.5%
Nursing Home	332,993	69,965	21.0%
Office Large	8,234	257	3.1%
Restaurant Fast Food	39,489	2,116	5.4%
Retail Large	65,302	2,511	3.8%
Retail Small	42,388	919	2.2%
Secondary School	47,534	1,198	2.5%
Warehouse Conditioned	234,344	14,250	6.1%
Total	**1,809,250**	**115,431**	**6.4%**

4.8.1.3 Documentation of Baseline Assumptions on New Construction Lighting Projects

Assumptions used in ex ante energy savings estimates are fairly well-documented, but there are opportunities for improvement on new construction lighting projects as well as some non-lighting projects. Through the course of the evaluation and in correspondence with the Duke EM&V Team it was discovered that the approach to baseline assumptions on new construction lighting projects is not necessarily uniform.

Baseline lighting demand (kW) is either estimated using the area (ft^2) and the maximum allowable lighting power density (Watts/ft^2) for the applicable space type, or an assumed baseline fixture type specified by the participant in the Custom Lighting Worksheet. As a general practice the EM&V Team uses whichever approach results in the most conservative estimate of project-level savings.

The evaluation team agrees with this practice, but it is recommended that any adjustments made to baseline assumptions on new construction projects be well-documented within the incentive calculation spreadsheet. This will provide better transparency to the evaluator when assessing project-level savings.

Figure 4-2 provides a hypothetical example of how baseline assumptions on a new construction lighting project could be documented within the incentive calculation spreadsheet utilized by the Duke program team.

Figure 4-2 Example of Documenting Baseline Assumption in Smart $aver Custom Incentive Calculation Workbook

Notes:
FINAL: ECM#1 removed because it was not installed. Project cost adjusted for ECM#4 based on invoice. Corrected standard nighttime hours form 4368 to 4380
Rev2: Incentive amounts updated
NOTE: Elected to use customer-specified baseline fixture types in lieu of space-by-space Lighting Power Density approach as this results in more conservative estimate of savings.

						Applicant			Before Implementation			
	EI	Technology	Sub-Technology	Monthly Data Provided	Unit of Measure	estimated annual kWh savings	Perf. Incentive Weight %	ECM Quantity	Summer Peak kW per Unit	Winter Peak kW per Unit	Customer Peak kW per Unit	Annual hours use
6		Lighting	LED	NO	Per Lamp/Fix	#DIV/0!		0				
6		Lighting	LED	NO	Per Lamp/Fix	46		27	0.120	0.120	0.120	3,796
6		Lighting	LED	NO	Per Lamp/Fix	822		4	0.000	0.291	0.291	4,380
6		Lighting	LED	NO	Per Lamp/Fix	563		50	0.000	0.452	0.452	4,380
6		Lighting	LED	NO	Per Lamp/Fix	987		30	0.452	0.452	0.452	3,796

4.8.2 Gross Impacts

Table 4-10, Table 4-11, and Table 4-12 summarize gross impact results for energy (kWh), Summer demand (kW), and Winter demand (kW). Detailed results for each sampled project are provided in the standalone M&V Reports.

The realization rates for the Non-Lighting – Large stratum were lower than the other three strata primarily due to two large projects that had realization rates below 70%. On one of the projects the low realization rate was ultimately attributed to the customer and program using a top-down approach to estimating project-level savings based upon results from a similar scope of work implemented at a similar manufacturing facility. The evaluation team used a bottom-up approach based upon historic production data and trend data available from the central control system.

The other Non-Lighting – Large project that had a lower realization rate was an HVAC-EMS project where a weather-normalized analysis of pre- and post-retrofit billing data (IPMVP Option C) showed that achieved energy savings were approximately 34% lower than claimed savings.

Table 4-10 Gross Verified Energy Savings (kWh) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>400 MWh)	16	2	24,502,606	27,247,510	111.2%	3.8%
L-Small (<400 MWh)	110	36	11,301,697	10,896,832	96.4%	32.7%
NL-Large (>1,000 MWh)	17	3	38,284,556	26,618,948	74.8%	20.4%
NL-Small (<1,000 MWh)	52	12	12,831,537	11,150,566	86.9%	22.1%
Total	**195**	**53**	**86,920,395**	**77,913,856**	**89.6%**	**9.4%**

Table 4-11 Gross Verified Summer Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>400 MWh)	16	2	3,513	3,883	110.5%	2.8%
L-Small (<400 MWh)	110	36	1,901	1,887	99.2%	39.2%
NL-Large (>1,000 MWh)	17	3	3,800	2,385	62.8%	10.0%
NL-Small (<1,000 MWh)	52	12	1,934	2,058	106.4%	20.8%
Total	**195**	**53**	**11,148**	**10,213**	**91.6%**	**8.8%**

Table 4-12 Gross Verified Winter Demand Savings (kW) by Stratum

Stratum	Population (N)	Sample Count (n)	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Large (>400 MWh)	16	2	3,126	3,205	102.5%	13.3%
L-Small (<400 MWh)	110	36	1,664	1,482	89.1%	59.8%
NL-Large (>1,000 MWh)	17	3	3,304	2,143	64.9%	5.4%
NL-Small (<1,000 MWh)	52	12	1,685	1,789	106.2%	18.7%
Total	**195**	**53**	**9,779**	**8,619**	**88.1%**	**12.1%**

Additionally, consistent with Ohio SB310, the higher of the evaluated estimates of energy efficiency impacts or the deemed values are applied prospectively to adjust subsequent impact assumptions until superseded by new EM&V results[7]. The deemed impacts reported for the Smart $aver NR Custom program were found to be greater than the verified savings and therefore the deemed results shall be applied to the rider in the month following the completion of this EM&V report. These results will also be used to estimate future target achievement levels for development of estimated incentives and in future cost-effectiveness evaluations. Table 4-13 below summarizes the program claimed, deemed, and evaluated values.

Table 4-13 DEO Program Impact Summary

	Energy kWh	Summer Demand (kW)	Winter Demand (kW)
Gross Claimed Impacts	86,920,395	**11,148**	**9,779**
Deemed Realization Rate	95.0%	95.0%	95.0%
Deemed Savings	**82,574,375**	**10,591**	**9,290**
Evaluated Realization Rate	89.6%	91.6%	88.1%
Evaluated Savings	**77,913,856**	**10,212**	**8,615**

[7] Per Section 4928.66(B) of the Revised Code from Senate Bill 310, energy efficiency savings and peak demand reduction achieved on and after the effective date of S.B. 310 of the 130th general assembly shall be measured on the higher of an as found or deemed basis, except that, solely at the option of the electric distribution utility, such savings and reduction achieved since 2006 may also be measured using this method.

4.8.2.1 Custom-to-Go vs. Custom Classic

Custom-to-Go realization rates were higher primarily based upon the fact that the majority of savings come from lighting measures. Lighting measures represent 99.5% of total Custom-to-Go project reported energy savings, whereas for Classic Custom projects lighting measures account for only 37% of gross reported energy savings. Figure 4-3 shows the distribution of reported energy savings for classic custom projects broken down by technology category.

Figure 4-3 Distribution of Reported Energy Savings for Classic Custom Projects by Technology Category

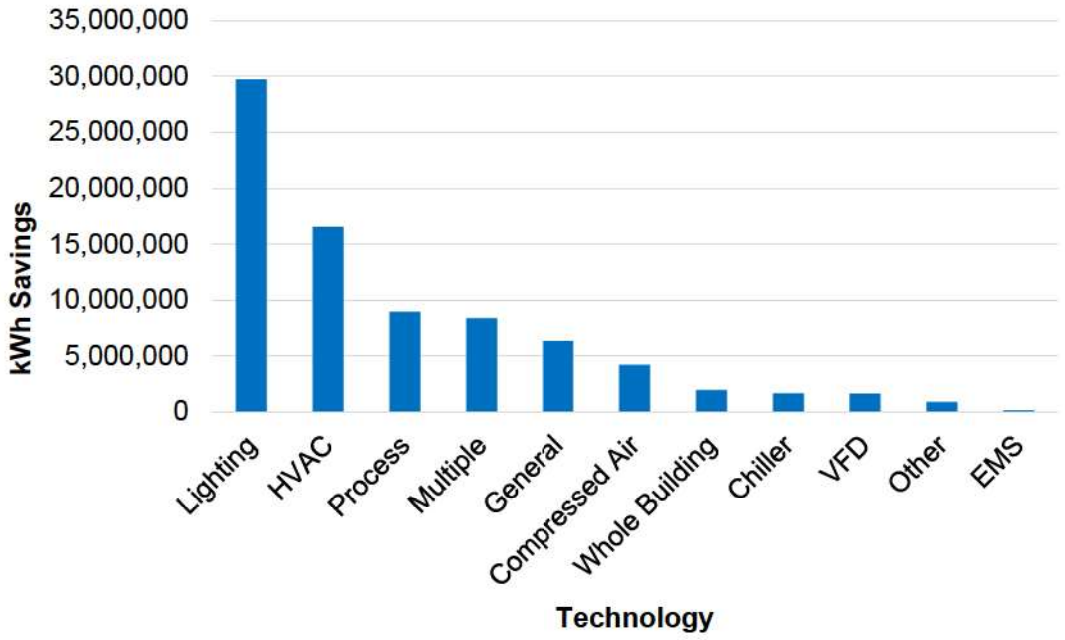


Table 4-14 indicates the reported and verified energy (kWh) savings stratified by technology category (lighting vs. non-lighting) and participation track (Custom Classic vs. Custom-to-Go) for the evaluated sample. Realization rates were generally higher for Custom-to-Go projects since the majority of the energy savings comes from lighting retrofits.

Table 4-14 Comparison of Strata-Level Realization Rates - Classic vs. Custom-to-Go[8]

Track	Measure Category	Sample	Sample Reported (kWh)	Sample Verified (kWh)	Realization Rate (%)
Classic	Lighting	17	3,036,838	3,244,886	106.9%
	Non-lighting	14	7,429,531	5,842,836	78.6%
	Total	**31**	**10,466,369**	**9,087,722**	**86.8%**
Custom-to-Go	Lighting	21	1,490,314	1,400,378	94.0%
	Non-lighting	1	11,247	12,656	112.5%
	Total	**22**	**1,501,560**	**1,413,034**	**94.1%**

4.8.2.2 Baseline Assumptions for Linear Fluorescent T12 Fixture Retrofits

Starting in 2017, the evaluation team agreed to ask participants and trade allies about the continued use of linear fluorescent T12 lamps. The evaluation team sought to understand how claimed energy savings for linear fluorescent to LED retrofit measures would be estimated with a T8 baseline as opposed to a T12 baseline, even if the pre-existing fixture was a T12. Additionally, the research sought to understand how high Color Rending Index (CRI) T12s are still readily available in the marketplace enabling participants to continue using T12 lighting systems. This research was completed in a cross-cutting manner for NR Custom evaluations for multiple Duke jurisdictions including Ohio, Ohio, North Carolina, and South Carolina.

In an effort to gain direct insights on this issue from participants and trade allies, the evaluation team developed a battery of survey questions for each program participant and incorporated them into the survey instruments developed for this evaluation. The set of survey questions developed for participants was only fielded by those who implemented lighting retrofits involving linear fluorescent T12s, which was very limited (total of four participants across all jurisdictions being evaluated and only one from DEO). The questions asked and a summary of the responses received are summarized below.

Participant Surveys

Sampled participants with projects involving T12 retrofits (4) were asked:

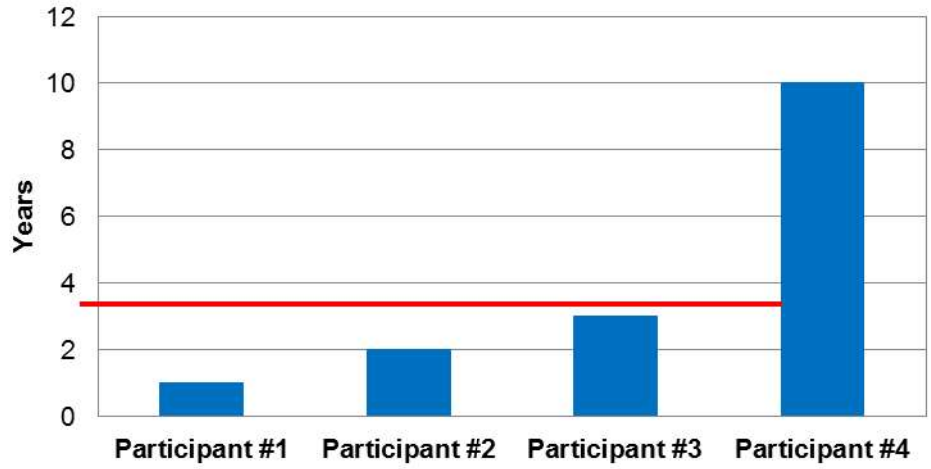
- **Question #1:** *"Would you have continued using linear fluorescent T12 fixtures if you had not received a financial incentive to upgrade to LED?"*
  - Two respondents said *"Yes"*
  - Two respondents said *"No"*
- **Question #2:** *"Were you previously purchasing high Color Rendering Index (CRI) T12 replacement lamps as a means of postponing full fixture replacements?"*

[8] Note that all savings presented in Table 4-13 reflect sampled projects only.

- Two respondents said *"Yes"*
- Two respondents said *"No"*

- **Question #3:** "How long could replacement lamps have allowed you to continue to use T12 fixtures?" (Responses in Figure 4-4)

Figure 4-4 How Long Participant Could Have Continued Using T12 Fixtures

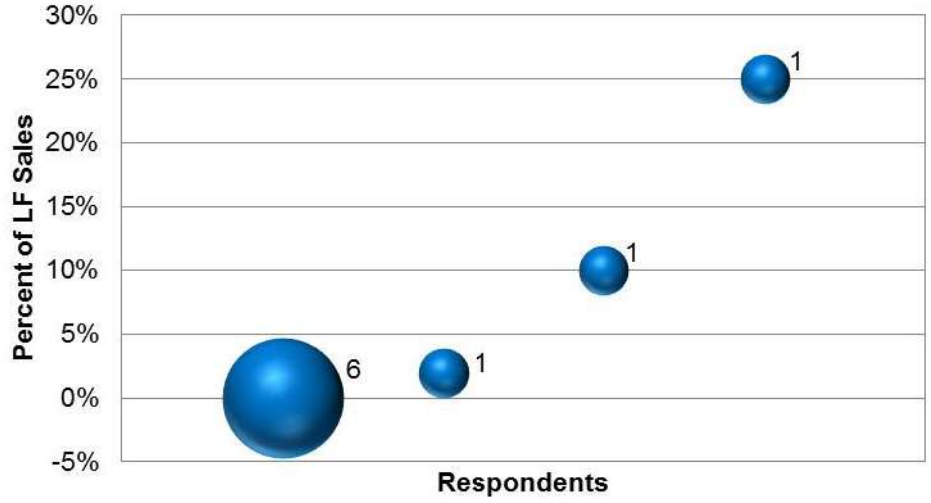


Trade Ally Surveys

Trade allies were asked the following questions regarding historic 2017 sales and forecasted 2018 sales for linear fluorescent T12 lamps and fixtures:

- **Trade Ally Question #1:** "Of your linear fluorescent lighting system sales in 2017, what percent were T12s?" (Responses in Figure 4-5)

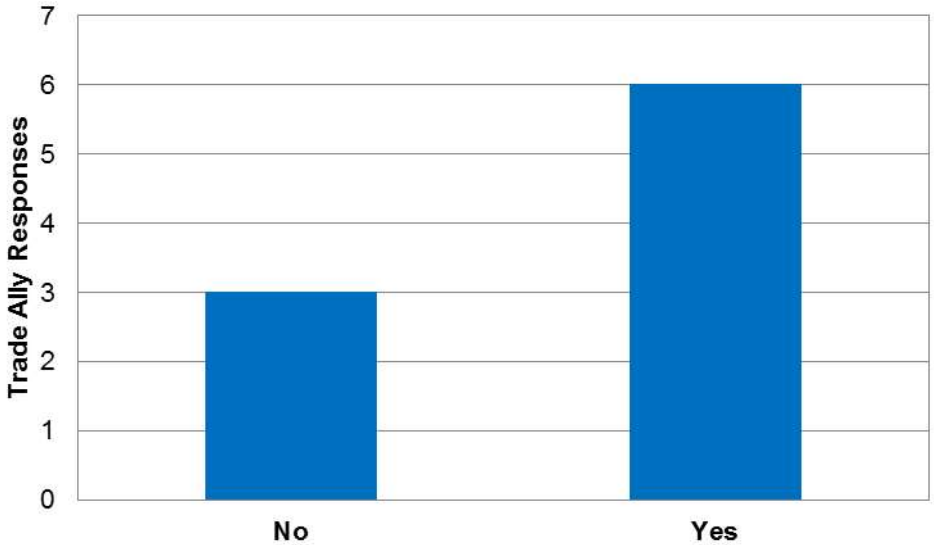
Figure 4-5 Percentage of 2017 Linear Fluorescent Lighting Sales that were T12 According to Surveyed Trade Allies



Trade ally responses to Question #1 suggest that the majority of the market has already shifted away from linear fluorescent T12s. Six of the nine trade allies surveyed reported that 0% of 2017 linear fluorescent sales were of the T12 variety.

- **Trade Ally Question #2:** "Are you still stocking and selling linear fluorescent T12 lighting systems and replacement lamps?" (Responses in Figure 4-6)

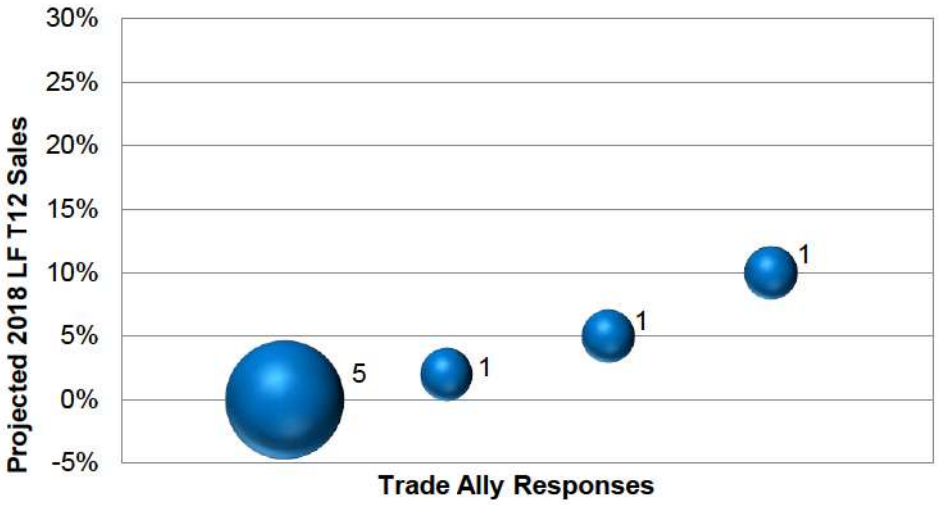
Figure 4-6 Are Trade Allies Still Stocking Linear Fluorescent T12 Replacement Lamps



Responses to Trade Ally Question #2 were also mixed. Six of the surveyed trade allies reported that they are still stocking linear fluorescent T12 lamps; however, only three of the trade allies surveyed reported to have sold T12s in 2017. This indicates that T12 lamps are being stocked, but not sold.

- **Trade Ally Question #3**: "Thinking of your 2018 sales of linear fluorescent lighting system sales, what percent will be T12s?" (Responses in Figure 4-7)

Figure 4-7 Estimated Percentage of 2018 Linear Fluorescent Lamps Sales That Will Be T12



Responses to Trade Ally Question #3 suggest that linear fluorescent T12 sales are expected to decline even further in 2018. Five of the nine trade allies surveyed indicated that 0% of 2018 linear fluorescent sales would be T12s.

In addition to asking participants and trade allies about linear fluorescent T12 lamps and fixtures, the evaluation team also quantified the difference in verified energy savings for all T12 measures sampled. For this analysis the evaluation team calculated the measure level savings using two scenarios. The first approach used a T12 baseline which is consistent with what the program uses in ex-ante energy savings estimates. The second approach used a reduced baseline fixture wattage consistent with a linear fluorescent T8 equivalent. The results of this analysis are summarized in Figure 4-8.

Figure 4-8 Comparison of Verified Energy Savings (kWh) and Realization Rates when Using T12 vs. T8 Baseline for Linear Fluorescent Retrofits

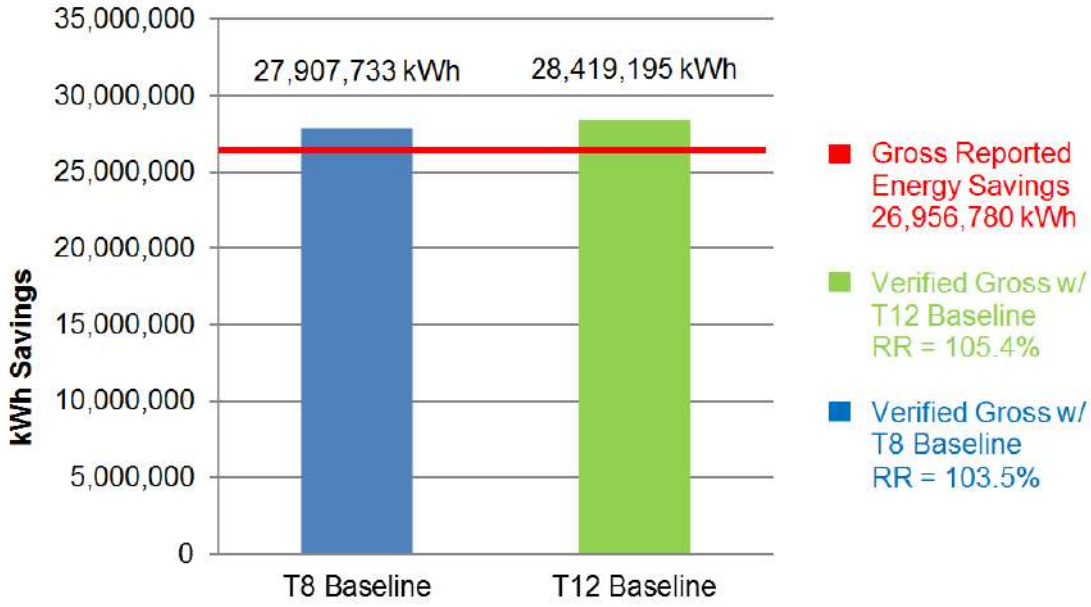


Figure 4-8 indicated that the overall impact on verified energy savings at the program level is very small regardless of whether a T12 or a T8 baseline is used for linear fluorescent fixture retrofits. Verified energy savings would reduce by approximately 511,462 kWh or 1.8%. Due to the relative minimal impact and in keeping with current industry standards, it is recommended that the NR Custom Program adopt a T8 baseline standard.

5 Net-to-Gross

5.1 Methodology

The evaluation team based the net-to-gross evaluation on customer self-report surveys, as described in the Uniform Methods Project, Chapter 23: Estimating Net Savings: Common Practices.[9] The survey was designed based on established methodologies outlined in the Pennsylvania Evaluation Framework.[10]

Net-to-gross analysis for this program involved two calculations: free-ridership and spillover. The results of these calculations are combined to produce the program-level net-to-gross ratio as follows:

Equation 17: Net-to-Gross Equation

$$NTG_p = (1 - FR_p) + SO_p$$

Where:

NTG_p = *the program-level net-to-gross ratio*

FR_p = *the program-level free-ridership ratio*

SO_p = *the program-level spillover ratio.*

The program net verified energy savings are calculated by multiplying the program net-to-gross ratio by the gross verified energy savings resulting from the impact evaluation activities as described in Section 4.

Equation 18: Net Verified Energy Savings

$$kWh_{nv} = kWh_{gv} \times NTG_p$$

The calculations of the program-level free-ridership and spillover ratios are detailed in the following sections.

5.1.1 Free-Ridership

The evaluation calculated free-ridership for each survey respondent based on their answers to a series of questions. These questions collected information on the customers' *intention* prior to interacting with the program and the *influence* of the program on changing those intentions.

Survey respondents were asked how the project would have changed if the incentive were not available. Responses were scored on a scale from 0 to 50 as shown in Table 5-1. If the respondent indicated they would do a smaller or less efficient project, they are prompted to categorize it as a small, moderate, or large reduction in scope.

[9] https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf, Section 3.2.

[10] http://www.puc.state.pa.us/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework082516.pdf, Appendix B.

Table 5-1 Net-to-Gross Intention Score Methodology

Response	Intention Score
Done nothing	0
Canceled or postponed the project	0
Done a smaller or less efficient project	Small = 37.5 Moderate = 25 Large = 12.5 Don't know = 25
Done exactly the same project	Would have paid = 50 Would not have paid = 25 Don't know = 37.5

To recognize the direct points of influence that the program has on customers' decisions, the survey asked respondents to rate the influence of several program aspects (where 10 is extremely influential and 0 is not at all influential). The highest rating for each customer was scored, again on a scale of 0 to 50. The rationale is that if any aspect of the program is highly influential on a customer's decision, then the program overall was equally influential (see Table 5-2).

Table 5-2 Net-to-Gross Influence Score Methodology

Program Aspect	Max Rating → Influence Score
Incentive provided by Duke Energy	0-1 → 50 2 → 43.75
Interactions with Duke Energy	3 → 37.5
Duke Energy marketing materials	4 → 31.25 5 → 25
Previous experience with Duke Energy programs	6 → 18.75
Contractor or vendor recommendation	7 → 12.5 8 → 6.25 9-10 → 0

The intention and influence scores are added together to produce each respondent's free-ridership ratio using Equation 19.

Equation 19: Respondent Free-ridership Ratio

$$FR_i = \frac{Intention + Influence}{100}$$

The ratio is multiplied by that respondent's verified gross savings to result in free rider savings, or savings that would have occurred without the program. The program free-ridership ratio is the sum of free rider savings divided by the sum of verified gross savings as shown in Equation 20.

Equation 20: Program Free-ridership Ratio

$$FR_p = \frac{\sum(FR_i \times kWh_{gv})}{\sum kWh_{gv}}$$

5.1.2 Spillover

Spillover is an estimate of savings resulting from the installation of energy efficient projects that were completed without a program incentive but that still were influenced by the program. There are two components to arriving at these program-attributable savings.

First, the survey collects information on the type of energy-efficiency equipment that was installed but for which an incentive was not received. This is used to estimate energy savings through the application of established calculation methodologies, often a technical reference manual.

Second, the survey asks the respondent to rate the influence of the program on their decision to implement the project despite not receiving an incentive. That score is used to prorate the total project savings, recognizing that the program may not have been the only influence in the completion of the project. The result of this calculation is program-attributable spillover, shown in Equation 21:

Equation 21: Program-Attributable Spillover

$$kWh_{aso} = kWh_{gso} \times Influence$$

Where:

kWh_{aso} *is the program-attributable spillover savings*

kWh_{gso} *is the gross spillover savings*

Influence is the value based on the respondent's rating of the program influence, as shown in Table 5-3.

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Table 5-3 Participant Spillover Program Influence Values

Reported SmartSaver Program Influence	Influence Value
0	0.0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9
10	1.0
Don't know / Refused	Sector-level measure average

This number is divided by the total verified gross energy savings for the program to produce a program spillover ratio (Equation 22):

Equation 22: Program Spillover Ratio

$$Program\ SO\ Ratio = \frac{\sum kWh_{aso}}{kWh_{gv}}$$

5.2 Net-to-Gross Analysis and Findings

The evaluation team conducted interviews with 31 customers who completed projects at 49 different locations in Ohio. Customers reported that for most projects (38 of 49 surveyed projects) they would have put off the work, canceled it entirely, or reduced the scope or efficiency of the project. The remaining customers said they planned to do the same project prior to learning about the Smart $aver Custom Program, and most of those customers said they would have paid the cost of the upgrade if the incentive were not available. The full distribution of responses is shown in Table 5-4.

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Table 5-4 What Would You Have Done Had You Not Received an Incentive?

Response	Respondents
Canceled or postponed the project	30
Done a smaller or less efficient project	8 Large reduction (2) Moderate reduction (4) Small reduction (1) Don't know (1)
Done exactly the same project	9 Would have paid (9)
Don't know	2

When asked to rate the influence of the program on their decision to complete the energy-efficiency project, all respondents rated at least one program aspect a 7 or higher on a 0 to 10 scale, where 0 means "not at all influential" and 10 means "extremely influential." The program incentive and contractors' recommendations were the program aspects most commonly given a high rating.

The resulting free-ridership, spillover, and net savings are shown in Table 5-5 below. These results indicate that the program is extremely effective in encouraging customers to complete projects they would not otherwise do.

Table 5-5 Net-to-Gross Evaluation Results

Measurement	Gross Verified Energy Savings (MWh)	Ratio	Net Verified Energy Savings (MWh)
Net of Free-ridership	12,341 (surveyed)	82.8%	10,212
Program-influenced Spillover	77,914	0.1%	73
Net-to-Gross	77,914	82.9%	64,620

6 Process Evaluation

6.1 Summary of Data Collection Activities

Process evaluation activities are designed to support continuous program improvement by identifying successful program elements that can be expanded or built upon, as well as underperforming or inefficient program processes that could be holding back program performance or participation. The data collection activities for the process evaluation of the NR Custom Program included a database review, and interviews with key contacts involved in program operations, participating customers, and contractors who assisted customers with projects.

The evaluation team developed data collection instruments designed to explore the research questions identified in Table 3-1. Table 6-1 summarizes the process evaluation data collection activities for Duke Energy Ohio.

Table 6-1 Summary of Process Evaluation Data Collection Activities

Target Group	Completes
Staff	5 In-depth interviews
Participants	49 Telephone surveys with participant projects (33 unique participant respondents)
Contractors	6 In-depth interviews 17 Telephone surveys

6.1.1 Program Staff Interviews and Database Review

Five interviews were conducted in June 2016 with Duke Energy's NR Custom program staff so that the evaluation team had a good understanding of the program and to get background information on program design and implementation practices. The program staff provided valuable feedback on intended operations, processes of the program's stated (and unstated) goals and objectives, perceived barriers to program up-take, and modifications to any program components based on the previous program cycle as well as the rationale for those modifications. The information the team gathered assisted in the design of the interview guides and surveys for customers and contractors.

In addition to the program staff interviews, the evaluation team reviewed the program tracking database to ensure necessary data and information was being collected to track program progress.

6.1.2 Contractor Interviews and Surveys

Custom programs include a variety of types of contractors and projects that require preapproval. For these programs to be successful, contractors must be able to access and use calculation tools, navigate preapproval processes, and communicate the steps involved to project

representatives. Contractors are important market actors, especially in large custom programs, and a good understanding of their experience with program processes, preapprovals, customer decision making, and persistent barriers to additional projects is crucial to the success of custom programs.

Six in-depth interviews were conducted in January and February 2017 to gain an in-depth understanding of contractors' experience with the program. The input from these interviews helped the team design the guide for the telephone survey, which was completed in November 2017. The evaluation team selected implementation contractors associated with customer projects from the tracking database provided by Duke Energy. Discussion topics in the survey included program awareness among customers, program guidelines and processes, interactions with customers, and suggestions for improving the program. Surveys were completed with 19 of 55 program contractors who participated in the program. The average survey length was 21.2 minutes and average number of telephone attempts was 8.6. Table 6-2 outlines the contractor response for the evaluation.

Table 6-2 Contractor Response Rate

Disposition	Contractor Count
Starting Sample	**52**
Does not recall participating	5
Refusal	13
Incompletes (partial surveys)	1
Language barrier	1
Wrong number	3
Not completed	12
Completes	**17**
Response Rate (Complete/Starting Sample)	**32.7%**

6.1.3 Participant Surveys

Collecting survey data from program participants provides data suitable for quantitative analyses on participant characteristics, and key aspects of the program. The evaluation team conducted a telephone survey with program participants, defined as customers who received a rebate through Duke Energy's NR Custom Program between August 2015 and July 2017.[11] Surveys were conducted with program participants in two waves; the first in November 2016 and the second in October 2017. Surveys focused on customers' experience with the program, sources of awareness, decisions to install equipment, barriers to participation, satisfaction with various aspects of the program, and any program improvement suggestions. Surveys were

[11] In order to meet the reporting deadline outlined in the evaluation plan, the participant surveys utilized all sampled received through July 2017. The team does not believe the projects received after this date were systematically different than those included in the participant survey.

completed regarding 42 of 66 projects completed through the program (33 unique respondents). Table 6-3 outlines the participant response rate for the evaluation.

Table 6-3 Participant Response Rate

Disposition	Participants
Starting Sample	**74**
Does not recall participating	1
Refusal	7
Incompletes (partial surveys)	2
Wrong number	1
Not completed	14
Completes	**49**
Response Rate (Complete/Starting Sample)	**66.2%**

Wave 1 calling started November 2, 2016 and ended November 18, 2016
Wave 2 calling started October 5, 2017 and ended October 26, 2017

6.2 Process Evaluation Findings

6.2.1 Program Staff and Database Review

The program staff interviews were extremely useful in helping the evaluation team understand how the program operates, and to design the interview guides and surveys for program participants and contractors. Information from staff interviews has been used throughout the findings section to add context around respondent answers.

An additional part of the evaluation activities included reviewing the program database to ensure the necessary information needed to track the program and conduct evaluation activities existed. Program staff use the tracking database to document customers who participated in the program, the details of the equipment being installed, and the savings associated with the project. Once the application is received, this information is passed to AESC, the vendor responsible for the technical review. AESC verifies the accuracy of the savings calculations and provides Duke Energy with verification in a systematic format. Duke Energy engineers also review the application information to verify savings calculations.

The evaluation team utilized this same database to select samples for impact and process evaluation activities. When using information for evaluation purposes, the information included in the file was accurate and thorough although some areas were not electronically documented. Specifically, some contact information was missing from the file, specifically contact phone numbers and email addresses. Additionally, the quantities of installed equipment (particularly for

lighting) and some savings values associated with projects was missing or incorrect.[12] Understanding which customers received a Custom incentive is critical in evaluating progress towards program goals and conducting an independent review of program participants.

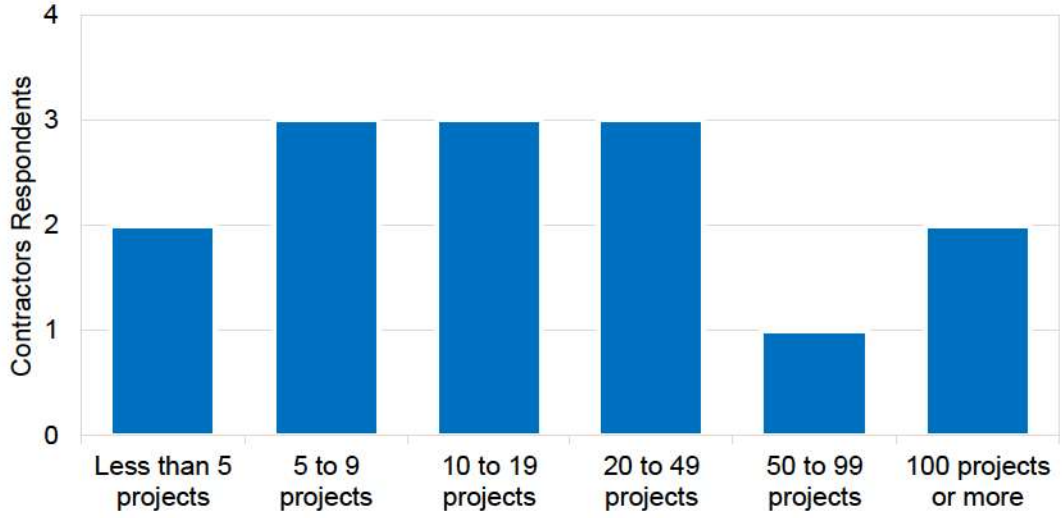
In conducting the process evaluation telephone efforts, some contact information associated with some participants was out of date. Given that evaluation activities went back to 2015, some level of personnel turnover at companies is expected, resulting in having contact information for people who no longer work for listed companies.

6.2.2 Contractors

The evaluation team surveyed 17 contractors who were involved in the installation of participating customer's projects during the evaluation period. The amount of time these contractors have been involved in the program varied with five contractors indicating they have participated in Duke Energy's programs for one to two years, seven contractors indicating they have been involved between three to five years and five have been involved for more than five years. Two contractors could not recall how long they have been participating in Duke's NR Custom program.

Responses regarding the number of projects contractors have completed during their time with the program varied from less than 5 projects to more than 100. Figure 6-1 shows the number of contractors and an estimate of the number of projects they recall completing through the program since they began. As expected, contractors involved in the program longer completed more projects while those only involved in the program a few years completed fewer.

Figure 6-1 Number of Total Completed Projects



When asked about their 2018 project plans, 5 of 17 contractors felt their program participation would be higher compared to their 2017 participation. The most mentioned reason was an

[12] It should be noted that the baseline and post-retrofit quantities are well-documented elsewhere by the program team outside of the participation tracking database. In fact standard policy is to verify installed equipment quantities prior to issuing payment. The pre- and post-retrofit quantity information isn't considered by the program to be critical to include in the participation database.

expected increase in projects (3 respondents), e.g. as a result of increased interest in energy efficiency projects by building owners. Two respondents added that "*the program is good and fits well*" or that "*the business is better*." The other two respondents described financial reasons related to the program and its benefits: "*will add to the bottom line and profitability*," and "*is another sales tool that offers incentives*."

Six contractors felt that their program participation in 2018 would be about the same because they do not anticipate a change in the number of projects (based on their customers interests and needs), especially if there are no major changes in the prescriptive program. Five contractor respondents thought the participation would be lower in 2018 due to potential changes in the program (program not being offered, change in the incentives, or moving equipment currently offered through custom to the prescriptive program), or anticipated reduction in number of projects based on the needs of major clients.

When asked if they were registered with Duke Energy's contractor network and appear on Duke's website, 11 of 17 contractors indicated they were. The remaining six contractor respondents were not sure.

6.2.2.1 Communication

Most contractors reported that communication with Duke Energy program staff was effective (7 very effective and 6 somewhat effective). Almost two-thirds of respondents (10 of 17) indicated they have received trainings and information from Duke Energy about the Smart $aver Custom Incentive program. One of the 10 contractors indicated additional trainings/information could be provided, in this case "*more in-depth process training from start to end*."

6.2.2.2 Customer Interaction

On average, contractor respondents felt about 40 percent of their customers were aware of the Custom program prior to them telling them about it. Most contractors (12 respondents) felt they were at least partially responsible for the awareness. Other sources of awareness mentioned by contractors included other contractors or vendors (4 respondents), Duke Energy website (3 respondents), Duke Energy advertisements (3 respondents), Duke Energy staff (2 respondents). When talking with contractors, 4 of 17 respondents indicated that customers do not have any concerns about the program. The remaining 13 contractors had a variety of customer concerns about participating, as outlined in Table 6-4.

Table 6-4 Contractor Reported Customer Concerns About the Program

Concern	Respondents
If they will get the rebate and how long it will take	5
Unsure if the savings will be achieved	3
Unsure if the incentive will be as high as estimated	3
Uncertainty around the approval	2
Unsure who is getting the incentive	2
Unsure if the program will continue to be funded	2
Unsure if the equipment qualifies	1
Unsure about electricity cost reduction	1
Program not keeping up with the industry	1
Skeptic	1
Respondents	**17**

Source: Question PI5
Don't know responses are excluded.

Thirteen of the 17 contractor respondents indicated that they use the program as a sales tool and that the program is helpful in selling energy efficient equipment (10 very helpful and 3 somewhat helpful)[13].

When asked about the factors that influence the type of equipment nonresidential customers purchase, the most common response from respondents was equipment cost (7 respondents), and payback period (5 respondents), as outlined in Table 6-5.

Table 6-5 Factors on NR Customer's Purchase

Factor	Respondents
Equipment costs	7
Payback or return on investment (ROI)	5
Efficiency and reliability of equipment	3
Warranty, quality, and design of equipment	3
General need	2
Interest in new technology	1
Equipment specifications	1

[13] Response options where very helpful, somewhat helpful, neither helpful nor unhelpful, not very helpful and not at all helpful.

Factor	Respondents
Rebate and incentive availability	1
Desire to reduce energy bills	1
Availability of equipment for emergency replacement	1
Respondents	**15**

Source: Question CI1
Don't know responses are excluded.

Some contractor respondents felt manufacturing, industrial, and commercial (4 respondents) customers were more receptive to high efficiency equipment. Other contractors, however, felt it was not about the sector but rather if the customer owned the building (2 respondents), if they have longer operation hours such as warehouses (2 respondents), if customers are concerned about reducing their costs (3 respondents), or if they are educated and value saving energy (3 respondents).

Based on the contractor respondents, the main reason some customers do not move forward with projects is financing or equipment cost (11 respondents). This was followed by project not meeting payback or ROI criteria (5 respondents), urgency of the project combined with the burden of completing incentive forms (1 respondent), facility operation constraints (1 respondent), and lack of knowledge (1 respondents).

6.2.2.3 Application Process

Most contractor respondents (14 of 17) indicated that they received a request for additional information after submitting their initial application for preapproval. Typical requests were related to providing additional documentation about the equipment or its use (10 respondents), examples include specification sheet, fixture wattage, size of the facility, and confirmation that the equipment is on the Design Lights Consortium (DLC) list. Other requests were regarding calculations or audit information.

When asked if there were any enrollment paperwork or rebate submission processes that could be simplified to encourage customers to complete projects, most contractor respondents did not think so (9 respondents). Of the seven contractor respondents who thought processes could be simplified, responses varied by contractor. Examples of improvement included the following: more existing lighting could be added to prescriptive rebates so they would not have to be custom (e.g. T8 and T12), the ability to use external calculators for smart control systems, streamline the submittal process, and shorten the preapproval process. One contractor was not able to provide detail on what specifically he would change about the process.

Email applications have been used almost exclusively for the past three years. Although starting in 2016, an online application portal was launched. All but two contractors were aware of the online application portal to submit the application online. Of the 15 contractor respondents who were aware of the online application portal, 14 indicated they have used the portal and rated its usefulness high (average 7.64 on a 0 to 10 scale where 0 was 'not at all useful' and 10 was 'very useful'). The one contractor respondent who was aware of the online portal but has not used it, did not indicate any reasons preventing him from using the portal.

6.2.2.4 Calculators

As part of the application process, and to receive incentives through the Smart $aver Custom program, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. Classic Custom calculators are Excel-based worksheets available for five different technologies. One Custom-to-go Windows-based calculation tool is also available.

Contractors were asked how they typically estimate savings for projects that were submitted through the program. Ten respondents mentioned using Duke Energy provided tools while eight mentioned they only use their own/other tools (Table 6-6).

Table 6-6 Tools Used by Contractors to Estimate Savings

Calculators Used	Respondents
Own calculators only	5
Custom-to-go, Classic Custom, and own calculators	8
Own calculators and other calculators	1
Custom-to-go and own calculators	2
Custom-to-go and Classic Custom	1
Respondents	**17**

Source: Question PP1

Contractor respondents who used Duke provided calculators were asked to rate their usefulness on a 0 to 10 scale where 0 was 'not at all useful' and 10 was 'very useful.' Both calculators were rated as being useful with mean scores of 7.8 and 7.3 for Custom-to-go and Classic Custom, respectively.

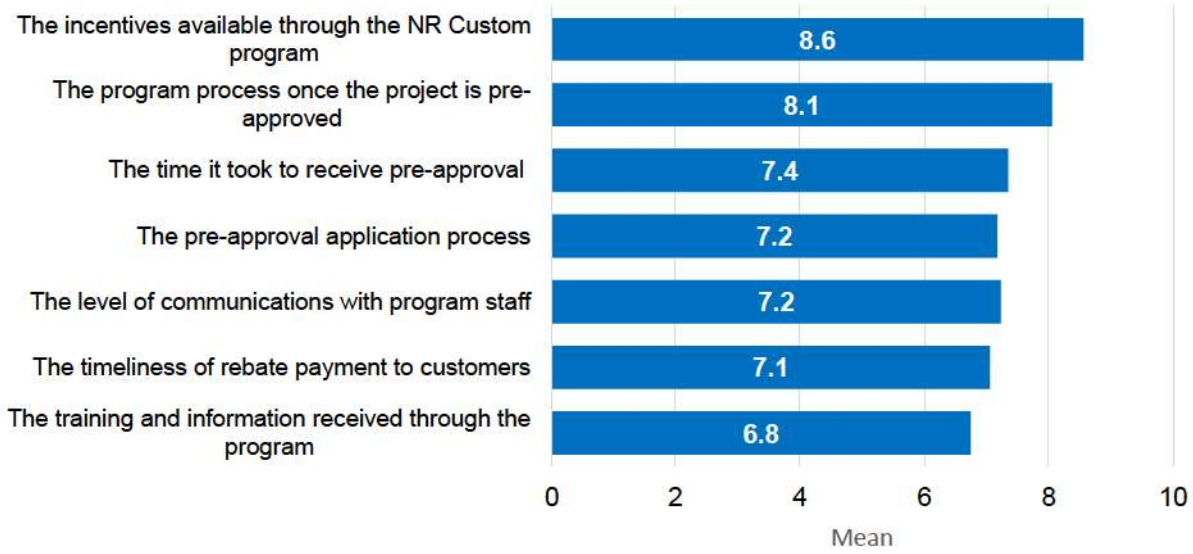
Respondents who did not use the calculators provided by Duke reported not being aware of the calculators (1 respondents) and using their own calculators which they are familiar with or customized to their company (2 respondents) as reasons for not using the Custom-to-go and Classic Custom calculators. Two contractors indicated Duke's calculators did not fit their specific project or equipment category, and another contractor mentioned that the Duke's calculators are not complex enough. Two contractors were not able to provide detail on why they have not used Duke calculators.

6.2.2.5 Satisfaction

Overall, contractor respondents were satisfied with the NR Custom program and with Duke Energy. Respondents were asked to rate their satisfaction on a 0 to 10 scale where 0 was 'not at all satisfied' and 10 was 'very satisfied'. On average, contractor respondents rated their satisfaction with the program 7.6 and their satisfaction with Duke Energy 7.2.

Using the same scale, contractors were also asked to rate their satisfaction with different program components. Contractors were generally satisfied with the program with most mean scores over 6.8. The lowest rated item was the training and information received through the program while the highest rated item was the incentives available through the program, as shown in Figure 6-2.

Figure 6-2 Contractor Satisfaction with Program Components



Source: Question SA1
Don't know responses are excluded.

Most contractor respondents felt the program aspect that was most influential in customers' decision to move forward with projects was the incentive (12 of 16 respondents). Additionally, contractor respondents felt the program incentive was the most valuable part of the NR Custom program (10 of 17 respondents).

As far as improvements with the program, four contractor respondents indicated no changes were needed. For the remaining 13 respondents: 6 contractors proposed increased communications, especially related to future changes in rebates (4 respondents), clarity about initial stages, initial M&V requirements, and incentives (2 respondents); 5 contractors indicated shortening the application review or the time it takes to receive the incentives; 1 contractor suggested increasing the incentives; 1 contractor proposed updating the application instructions in relation to smart control systems; and 1 contactor suggested moving more equipment to prescriptive.

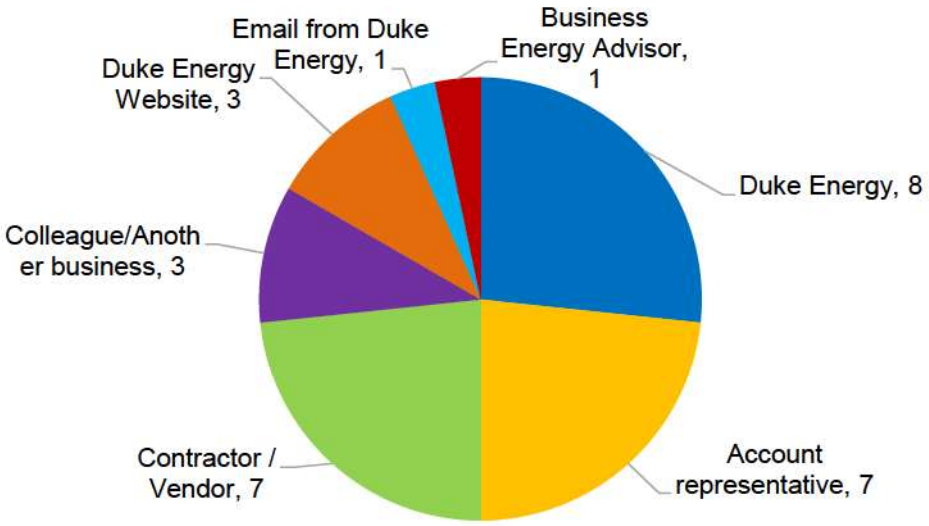
6.2.3 Participants

Surveys were conducted with program participants, or customers who received a rebate through the NR Custom Program. This section provides detailed findings from 31 customer respondents who completed the surveys.

6.2.3.1 Marketing Practices

Prior to 2016, the program largely focused on account managers as the primary source of program promotion. In 2016, traditional marketing channels were used such as direct mail, ads on social media or other websites and emails to a subset of customers by segment. Contractor outreach representatives market the program directly to contractors, which Duke staff indicates accounts for a significant percentage of projects. When asked how they heard about the program, the three primary sources of awareness of the NR Custom Program reported by participant respondents were Duke energy (8 respondents), their contractor or vendor (7 respondents) or their account representative (7 respondents) as the primary, which is consistent with how the program was marketed. Figure 6-3 shows breakdown of the awareness sources customer respondents.

Figure 6-3 Participant Source of Program Awareness



Source: Question Q1
Don't know responses are excluded.

For respondents who heard about the program from their contractor, account representative, or business energy advisor, all respondents indicated they were provided with enough information about the program and no additional follow-up or information was needed. This supports what was reported by the surveyed contractors and the role they play in increasing program awareness. This also shows that contractors, in addition to Duke staff, are well-versed on the program and can answer customer questions.

Program website materials note that the NR Custom incentives "can help you offset up-front costs and improve your bottom line." When respondents were asked what made them decide to apply for the NR Custom program, needing a new equipment was mentioned most. Nine participant respondents mentioned the return on investment, and several others mentioned contractor recommendation and monetary savings. Other reasons are included in Table 6-7.

Table 6-7 Reasons for Participating in Smart $aver Custom Incentive Program

Reason	Respondents
Needed new equipment	15
ROI/payback/cost-benefit	9
Contractor recommendation	7
Monetary savings	5
Energy savings	3
The rebate/incentive	2
Ability to get a better product cheaper	1
Didn't know	1
Respondents	**31**

6.2.3.2 Application Process

According to program staff, the review process takes about four to six weeks. Staff mentioned they would like to improve the turnaround and are currently tracking the timing and looking for ways to improve the internal review process. While Duke staff felt the review process could be improved, program participants were generally satisfied with the review process (Table 6-8). When asked about their satisfaction with various aspects of the application process, respondents rated their satisfaction highly, with mean scores 8.2 or higher (using a 0 to 10 scale where 0 is 'very dissatisfied' and 10 is 'very satisfied'). Over half of participant respondents (16 of 26 respondents) indicated their contractor filled out the Smart $aver Custom Incentive program application, 6 respondents indicated someone within their organization filled out the application, and 4 respondents reported someone within their company worked on the application with the contractor.

Table 6-8 Satisfaction with Application Process

Application Aspect	Mean	Respondents
Process to fill out and submit your application	8.33	30
Staff time it took to submit the application	8.21	29
Duke Energy's processing and preapproval of your application	8.36	28

Source: Questions Q8, Q9, Q10
Don't know responses are excluded.

Only two respondents rated their satisfaction low for an aspect of the application process (less than 4) due the complexity of the application: one respondent indicated that the application is hard to fill out when involving the supplier and vendor, the other respondent explained that the application requires "*so much information and justification*."

About half of participant respondents (12 of 25 respondents) indicated they received a request for additional information after submitting their initial application for preapproval. Most respondents could not recall the specifics around the request although some noted that it was additional equipment information (3 respondents), or calculation justifications (3 respondents).

6.2.3.3 Calculators

As mentioned above, as part of the application process and to receive incentives through the program, an appropriate worksheet or calculator must be submitted. In addition to the feedback contractors provided, participant respondents were also asked if they used any of the calculators provided by Duke Energy or if they used their own methods to calculate energy savings. Over one-third of respondents reported using the tools Duke provided while the remaining used their own tool or relied on their contractor to calculate savings (Table 6-9). This is similar to the feedback received from contractors where 11 of the 17 contractors indicated they used Duke tools to calculate savings.

Table 6-9 Calculators Used by Participants

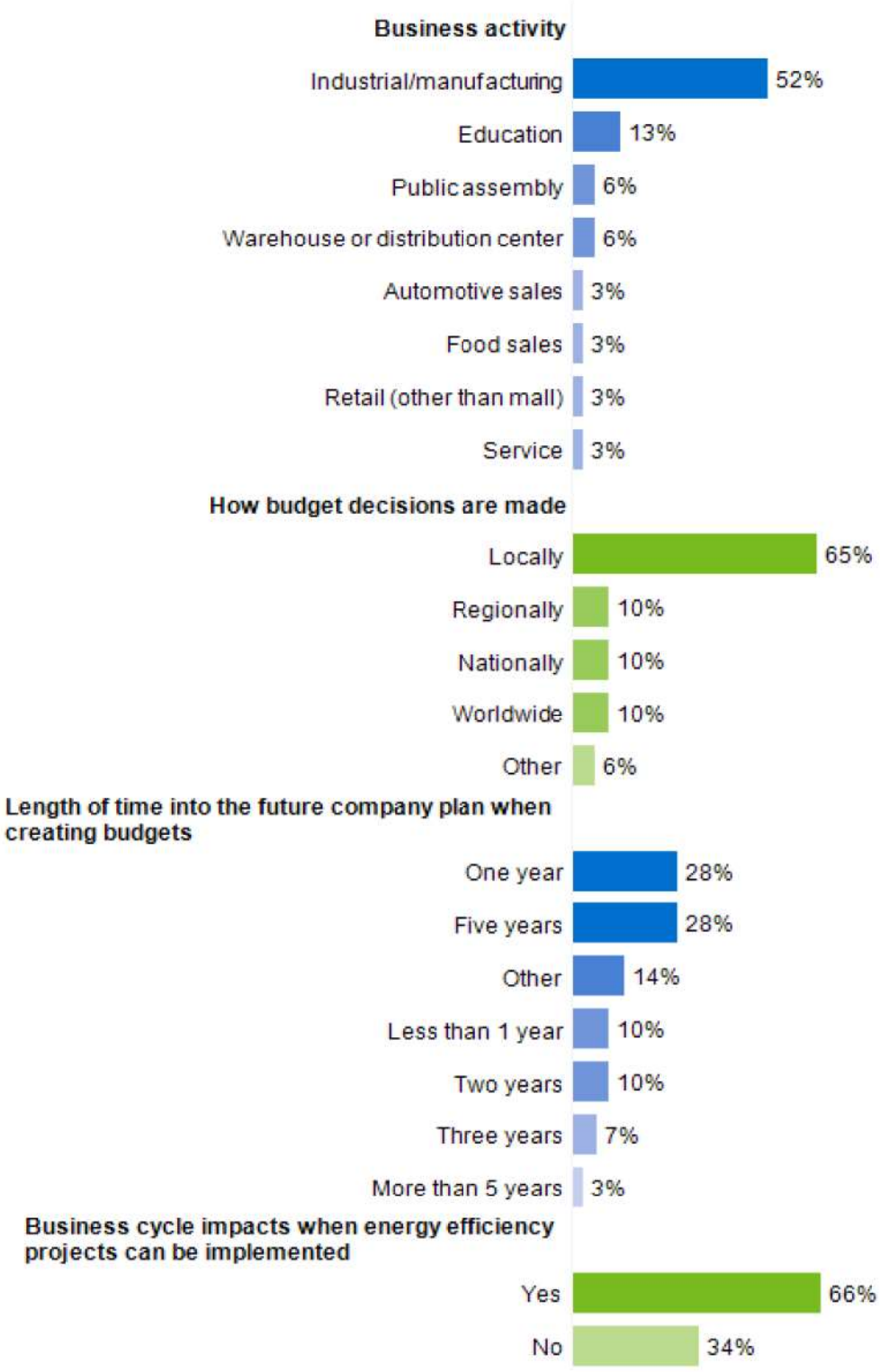
Calculators Used	Respondents	Percent
Own methods only	10	37%
Custom-to-go only	9	33%
Contractor calculated only	7	26%
Custom-to-go and own methods	1	4%
Respondents	**27**	

Source: Question Q12
Don't know responses are excluded.

6.2.3.4 Participating Customer Characteristics

Facility types varied across the 31 participant respondents' locations. The most mentioned type of businesses was Industrial/Manufacturing (16 respondents, 52 percent), followed by Education (4 respondents, 13 percent). The facility types are consistent with how the program was marketed, which initially targeted larger industrial customers. When participants were asked how their companies make budget decisions and whether they were decided locally, regionally, nationally, worldwide or something else, most respondents reported that decisions are made locally (20 respondents, 65 percent). Most respondents tended to plan one year (8 of 29 respondents) or 5 years (8 of 29 respondents) into the future when creating budget and financial plans. Figure 6-4 shows the participant business characteristics.

Figure 6-4 Smart $aver Custom Incentive Program Participant Characteristics



Source: Questions C1, C2, C3, C4
Don't know responses are excluded.

6.2.3.5 Fast Track

Duke piloted and now offers a fast track option in other jurisdictions where customers with a project under a tight timeline can pay a $550 fee to accelerate the review of their project from four to six weeks to about one week. Customers must also commit to participating in a kick off meeting and promptly responding to any requests.

While this option is not currently offered in Ohio[14], customers were asked about their awareness and interest in the offering. Before the survey, only 2 of 31 respondents were aware of the Fast Track offering, one participant found out from their account representative, and the other one from their contractor. This is likely a result of spillover from other territories. Given this option is not available in Ohio, neither respondent have utilized the Fast Track offering.

Figure 6-5 Awareness about the NR Custom Program Fast Track Option

Source: Question FT10
Don't know responses are excluded.

Respondents who have not utilized the fast track option were asked about their interest in the offering. Over half (19 of 30 respondents) indicated they would be willing to pay a fee to have an accelerated review of their application if they had a project under a tight timeline. Those who were not willing to pay the fee indicated reasons such as delaying the project or planning it better to avoid having to pay a fee (2 respondents), or not having projects large enough that would require needing an expedited process (1 respondent). Two participant respondents reported that they cannot afford to pay that money or get approval for it. Other respondents mentioned that the fee "*is a waste of tax payers' money*," or that "*the cost would outweigh the incentive*." One respondent reported that "*they would do the project regardless*."

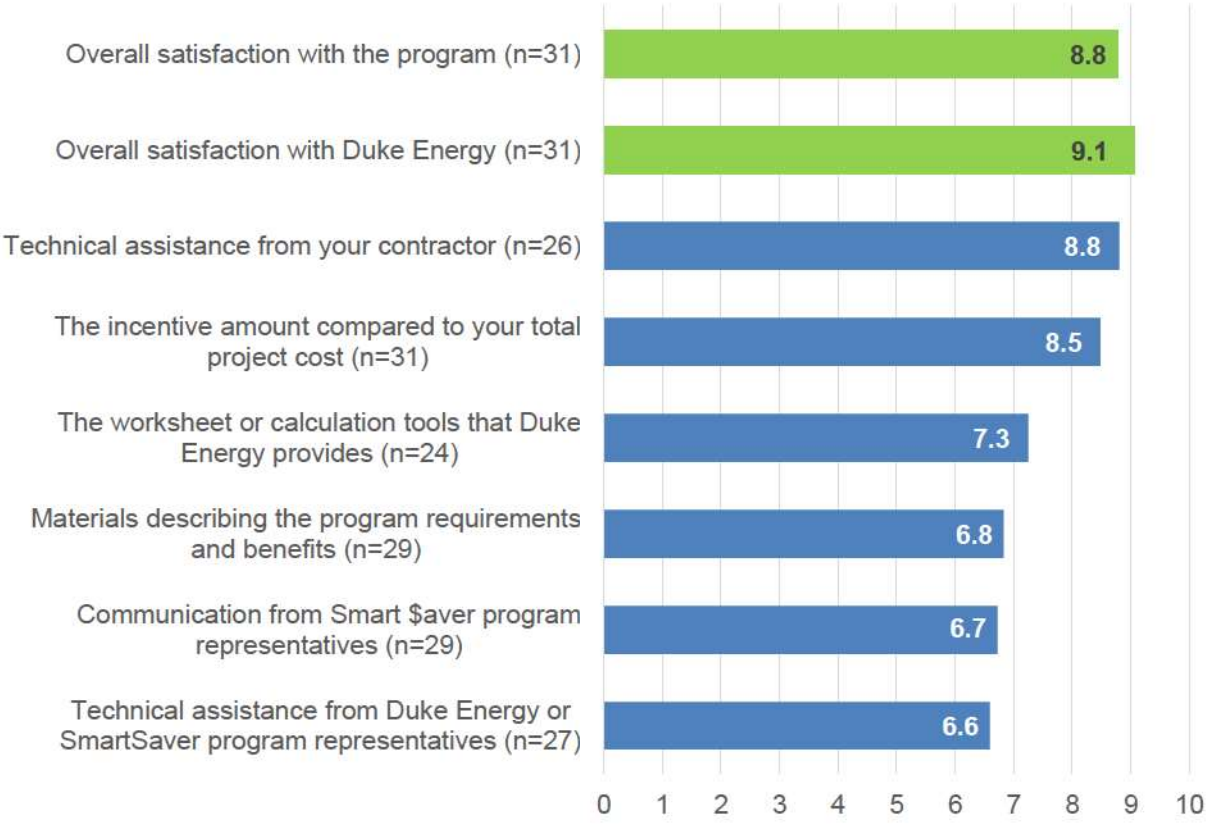
[14] The Fast Track offering was originally planned to launch in Ohio for program year 2018; however, this was put on hold as a result of the Public Utilities Commission of Ohio (PUCO) September 2017 order which limited program funding. Should additional funding become available, the program should consider adding the Fast Track option for customers who need an expedited review of their project.

While the fee may be a barrier, the meetings may not be. Over two-thirds of respondents (22 of 30) would be willing to participate in an entrance meeting and respond to requests about the project specifications in a timely manner. Five respondents indicated they would not be willing to pay the fee nor participate in the necessary meetings. Overall, when asked about the value of the Fast Track option, responses were mixed. The average response was 5.4 (on a 0 to 10 scale with 0 being 'not at all valuable' and 10 being 'very valuable').

6.2.3.6 Program Satisfaction

Overall, program participants were highly satisfied with the NR Custom program. Respondents were asked to rate their overall experience with the program and with Duke Energy on a scale of 0 to 10, where 0 is 'very dissatisfied' and 10 is 'very satisfied.' Respondents rated their overall satisfaction with the program overall highly (8.8 out of 10.0) and rated Duke Energy highly as their service provider (9.1 out of 10.0). Respondents were also asked to rate the value of different program components on a similar 0 to 10 scale. All program aspects were rated an average of 6.6 or higher (see Figure 6-6).

Figure 6-6 Program Participant Satisfaction and Value of Program Aspects



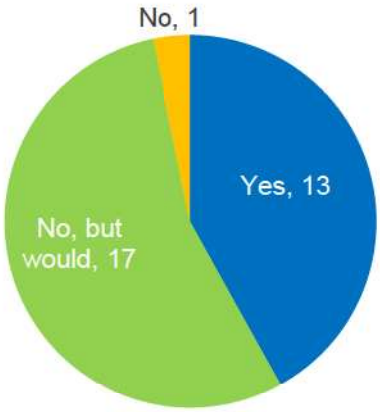
Source: Question SAT5, SAT11, SAT13
Don't know responses are excluded.

As far as the program aspect that is most valuable to their organization, 17 of the 31 participant respondents indicated the incentive compared to their total project cost (which correlates with the contractor responses). This was followed by 6 respondents indicating the technical

assistance they received from their contractor, and 6 respondents saying the worksheet or calculation tools that Duke Energy provides.

As another gauge of satisfaction, customers were asked if they have recommended the program to others. As shown in Figure 6-7, participants reported that they had already recommended the program. If provided the opportunity, 17 of the remaining 18 respondents said they would recommend the program. Furthermore, all respondents indicated they would participate in the program again. The one respondent who did not indicate he would recommend the program if given the opportunity provided no indication of dissatisfaction throughout the survey.

Figure 6-7 Have You Recommended the Program to Others?

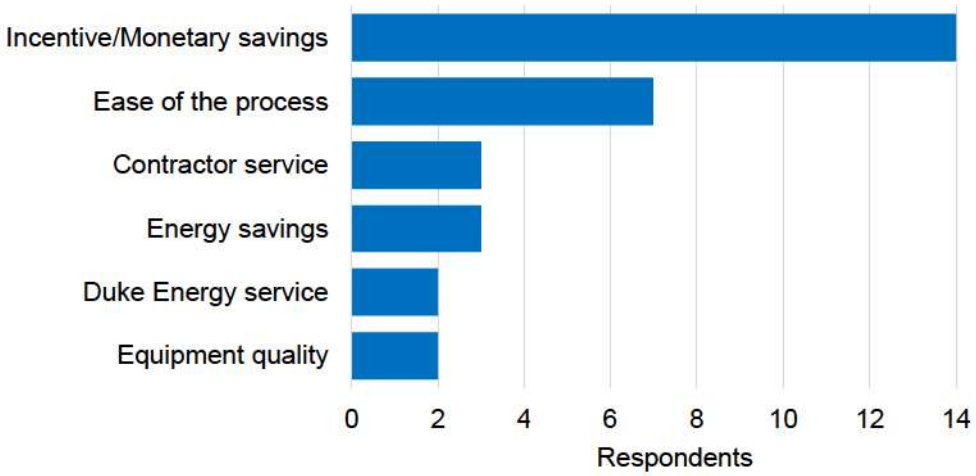


Source: Questions SAT8, SAT9

Respondents reported many reasons for rating the program highly (

Figure 6-8); those include mainly availability of the incentive and money savings (14 respondents), and ease of the process (7 respondents). Three of the 14 respondents indicated that they would have not done the projects without the incentives provided through the program.

Figure 6-8 Reasons for Rating the Program Highly



Source: Question SAT12o
Don't know responses are excluded.

When asked what they would change about the Smart $aver Custom Incentive program, 12 of 30 respondents indicated they would not change anything. Of the remaining 18 respondents, five respondents felt the paperwork was too complex and six respondents asked for improving the initial processing time. Other responses included reducing the amount of paperwork (1 respondent) and removing the preapproval requirement (1 respondent). These suggestions align with opportunities for improvement reported by the contractors.

7 Conclusions and Recommendations

7.1 Impact Evaluation

Conclusion 1: The evaluation team's analysis resulted in an 89.6% realization rate (energy) for the DEO NR Custom Program. The strong realization rate indicates that Duke Energy's internal processes for project review, savings estimation, and installation verification are working to produce high quality estimates of project impacts.

Recommendation 1: The evaluation team recommends that Duke continue to operate this program with the current level of rigor. For interior lighting projects, Duke should consider developing and applying deemed interactive factors to quantify the interactive effects between lighting retrofits and their associated HVAC systems.

Conclusion 2: Assumptions used in ex-ante energy savings estimates are well-documented, but there are opportunities for improvement on new construction lighting projects and some non-lighting projects.

Recommendation 2: The evaluation team recommends that any adjustments made to baseline assumptions on new construction projects be well-documented within the incentive calculation spreadsheet developed by the program. This will provide better transparency when deviations from a lighting power density approach are used in ex-ante energy savings estimates.

Conclusion 3: The NR Custom Program still uses T12 baseline fixture wattages in ex-ante energy savings estimates for linear fluorescent to LED tube retrofit measures. This practice is defensible given the availability of high color rendering index (CRI) replacement lamps; however, peer DSM programs no longer credit energy or demand savings beyond a T8 baseline.

Recommendation 3: It is recommended that the Duke NR Custom Program consider using a T8 equivalent when developing ex-ante energy and demand savings estimates for T12 to LED tube retrofit measures.

7.2 Process Evaluation

Conclusion 1: The program is operating as intended and has resulted in high satisfaction across participant and contractor respondents. The most common source of program awareness from customers was through their contractor, which is consistent with how the program marketed.

Recommendation 1: Continue to engage contractors in the program and keep them informed of the program to increase awareness among customers and encourage the installation of program-qualifying equipment.

Conclusion 2: The Fast Track option is available to customers with projects under a tight timeline. While few respondents have utilized the offering, the option exists for those who need it. Those who have not utilized the option indicated the associated fee may be a barrier;

although these customers indicated they were likely to reschedule the project to avoid paying the fee. While not all customers are willing to pay the fee, some are -- and may utilize the offering -- should they need an expedited review.

Recommendation 2: Continue to offer the Fast Track option to expedite the review process and encourage program participation for customers who need a quick turnaround on their project approval.

Conclusion 3: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two types of calculators: Classic Custom and Custom-to-go. About half of both contractor and participant respondents indicated they have used Duke's tools to calculate savings. Contractors who used Duke's provided tools rated their usefulness high.

Recommendation 3: Continue to keep the Custom-to-Go and Classic Custom calculators updated and available to customers and contractors who need a tool to estimate savings.

Conclusion 4: Interviews with program staff indicated the pre-approval review process could take as much as six weeks for review. While Duke staff felt the review process could be improved, program participants were generally satisfied with the review process. Contractor respondents were slightly less satisfied than participant respondents in the pre-approval process although they still provided high satisfaction scores. While no respondents reported being dissatisfied with the application process, it is something to watch to make sure the length of time to review applications is not taking too long.

Recommendation 4: Monitor the time it takes to review applications to ensure the time does not exceed six weeks.

Appendix A Summary Form

Duke Energy Ohio Smart $aver NR Custom Program

Completed EMV Fact Sheet

Description of Program

Duke Energy's Non-Residential Smart $aver® Custom Incentive Program (NR Custom) offers financial assistance to qualifying commercial, industrial and institutional customers in the Duke Energy Ohio (DEO) service territory to enhance their ability to adopt and install cost-effective electrical energy efficiency projects. The Program targets energy saving projects involving more complicated or alternative technologies, or those measures not covered by the non-residential Smart $aver Prescriptive Program. The intent of the program is to encourage the implementation of energy efficiency projects that would not otherwise be completed without the company's technical or financial assistance. The program requires pre-approval prior to the project implementation.

Summary		Strata	Verified Net Savings (kWh)
Region(s)	Ohio	Lighting	31,636,000
Evaluation Period	Aug 1, 2015 – Dec 31, 2017		
Annual kWh Net Savings	64,619,880	Non-lighting	32,983,880
Coincident kW Net Impact - Summer	8,470		
Coincident kW Net Impact - Winter	7,149		
Net-to-Gross Ratio	82.9%		
Process Evaluation	Yes		
Previous Evaluation(s)	N/A		

Evaluation Methodology

Impact Evaluation Activities

- *53 On-site Measurement & Verification*

Impact Evaluation Findings

- *Energy Realization Rate: 89.6%*
- *Summer Demand Realization Rate: 91.6%*
- *Winter Demand Realization Rate: 88.1%*
- *Net-to-gross: 82.9%*

Process Evaluation Activities

- *Program Staff; 5 interviews with program staff*
- *Trade Allies; 6 in-depth interviews with high volume contractors, telephone surveys with representative sample of 17 trade allies*
- *Participants; 49 telephone surveys*

Process Evaluation Findings

- *Primary source of program awareness is Duke Energy followed by contractors*
- *Satisfaction with program is high among participants and trade allies*
- *Contractor assistance was most valuable program component as rated by participants*
- *Program-provided calculators are being used by participants and contractors*
- *Contractors value the program and use incentives to encourage customers to purchase high efficiency equipment*

Appendix B Survey Instruments

Duke Energy Nonresidential Custom Program
Participant Survey

Sample Variables

CONTACT NAME Primary customer contact name

MEASURE Summary of project measure implemented
1 lighting
2 process
3 compressed air
4 HVAC

MEASURETYPE Type of measure sampled

LIGHTFLAG Customers who will get asked the T12 lighting questions

LIGHTINGTYPE Specific lighting type rebated through the program
QTY Number of measures installed

YEAR The year the measure was completed and paid

MAIL_ADDR, MAIL_CITY, MAIL_ST, MAIL_ZIP The address of the site where the measure was installed

INCENTIVE The amount of the incentive paid for the measure

CONTRACTOR Flag that customer worked with external contractor

1 Worked with contractor
0 Implemented within company

FASTTRACK Flag that customer went through the Custom Fast Track application process

1 Fast track customer
0 Standard process customer

STRATUM
1 Indiana
2 Kentucky
3 Ohio

TOTAL_KWH

PROGRESS

Introduction and Screening

INT01 Hello, my name is [NAME], and I am calling on behalf of Duke Energy. May I speak with [CONTACT NAME]?

01 Yes
02 No

MULTCHK [ASK IF MULTFLAG=1] [INTERVIEWER: Is this the first case of a multiple?

01 Yes, first case
02 No, subsequent case [SKIP TO Q1]

PREAMBLE I'm calling from Tetra Tech, an independent research firm. We were hired by Duke Energy to talk with some of their customers about their participation in the SmartSaver Custom Incentive Program.

Our records indicate that you participated in Duke Energy's SmartSaver Custom Incentive Program that included a [MEASURE] project in [YEAR] at [PREMISE_ADDR]. Are you able to answer questions about your company's participation in this program?

01 Yes, I'm able to answer SKIP TO SCREEN1
02 Yes, but information isn't quite right (specify) SKIP TO SCREEN1
03 No, I'm not able to answer
04 We have not participated [THANK AND TERMINATE 82]
99 Refusal [THANK AND TERMINATE 91]

OTHER_R Is it possible that someone else in your organization would be more familiar with the program or the project that was completed?

01 Yes
02 No [THANK AND TERMINATE 81]
99 Refusal [THANK AND TERMINATE 91]

AVAILABLE_R May I please speak with that person?

01 Yes
02 No (When would be a good time to call back?)
03 We have not participated [THANK AND TERMINATE 82]
99 Refusal [THANK AND TERMINATE 91]

SCREEN1 Were you involved in the decision to complete the [MEASURE] project?

01	Yes	
02	No	[SKIP TO OTHER_R]

PREAMBLE2 Great, thank you. I'd like to assure you that I'm not selling anything, I would just like to ask your opinion about this program. Your responses will be kept confidential and your name will not be revealed to anyone. For quality and training purposes, this call will be recorded.

Program Awareness and Marketing

Q1 [IF MULTCHK=2 SKIP TO MEASCHK] How did you first hear about the SmartSaver Custom Incentive Program? (Select one)

01	Account representative	
02	Business Energy Advisor	
03	Contractor or Vendor	[CONTRACTOR = 1]
04	Email from Duke Energy	
05	Mail from Duke Energy	
06	Colleague/Another business	
07	Conference/Trade Show/Expo	
08	Duke Energy website	
09	Other (specify)	
88	Don't know	

Q2 [ASK IF Q1 = 1, 2 or 3] Did the [response from Q1] provide you with enough information about the program?

01	Yes	SKIP TO Q4
02	No	

Q3 [ASK IF Q1 = 1, 2 or 3] What additional information would you have liked [response from Q1] to provide?

[RECORD VERBATIM]

Q4 [ASK IF Q1<>3] Did you work with a contractor or vendor to implement the [MEASURE] project or did you work with internal staff at your company?

01	Worked with a contractor / vendor	[CONTRACTOR = 1]
02	Internal staff at company	[CONTRACTOR = 0]
03	Both the contractor and internal staff	[CONTRACTOR = 1]
88	Don't know	[CONTRACTOR = 0]

Q5 Before your [MEASURE] project in [YEAR], had you participated in the SmartSaver Program before?

01 Yes
02 No
88 Don't know

Q6 What made you decide to apply to the SmartSaver program?

[RECORD VERBATIM]

Q7 [IF CONTRACTOR=1] Did someone at your company fill out your application for the SmartSaver Custom Incentives program or did your contractor or vendor?

01 Someone at my company
02 Contractor / Vendor
03 Both someone at our company and the contractor
88 Don't know

Q8 Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the process to fill out and submit your application?

___ [RECORD RESPONSE]
77 Does not apply
88 Don't know
99 Refused

Q9 Using the same scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the staff time it took to submit the application and necessary paperwork?

___ [RECORD RESPONSE]
77 Does not apply
88 Don't know
99 Refused

Q10 Using the same scale [OPTIONAL: "of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied"], how satisfied are you with Duke Energy's processing and preapproval of your application?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

Q11 [IF Q8<=3 OR Q9<=3 OR Q10<=3] What could the program have done differently to make the application process easier?

[RECORD VERBATIM]

Q12 Did you use the Custom-to-Go calculators provided by Duke Energy, or did you calculate energy savings using your own methods? (Select all that apply)

01 Custom-to-Go
02 Own methods
03 Other (specify)
04 Contractor/vendor calculated
88 Don't know

Q12a [ASK IF Q12 = 4] How did the contractor / vendor calculate the energy savings? (Select all that apply)

01 Custom-to-Go calculators provided by Duke Energy
02 Own methods
03 Other (specify)
88 Don't know

Q13 After submitting your initial application for preapproval, did you receive any requests for additional information while Duke Energy was processing your application?

01 Yes (What additional information was requested?)
02 No
88 Don't know

Q14 Was your project under pressure to be completed in a short amount of time?

01 Yes
02 No

Equipment Questions

E1 Was the [MEASURE] part of a newly constructed building or major renovation of an existing facility?

01 Yes [SKIP TO MeasChk]
02 No
88 Don't know
99 Refused

E2 Did the [MEASURE] you purchased replace an existing [MeasureType]?

01	Yes	
02	No	[SKIP TO MeasChk]
88	Don't know	[SKIP TO MeasChk]
99	Refused	[SKIP TO MeasChk]

E3 About how old was your existing [MEASURE]?

___	Years
888	Don't know

E4 What condition was your existing [MEASURE] unit when you decided to purchase a new one? (Read list)

01	Operating with no performance issues
02	Operating but in need of repair
03	No longer operating (broken, did not work)
88	Don't know
99	Refused

Net-to-Gross

MeasCHK [ASK IF MULTCHK = 2 ELSE SKIP TO FR1]
[INTERVIEWER QUESTION: Is this case's MEASURE variable the same as a previous case's MEASURE variable?]

1	Yes; Duplicate measure	
2	No, New measure	[SKIP TO Q4_MULT]

DecisionCHK [ASK IF MeasCHK=1]
Now, thinking about the [MEASURE] project at [PREMISE_ADDR], was the decision making process the same or different from the previous [MEASURE] project we discussed?

1	Same decision making process	[SKIP TO INT99]
2	Different decision making process	

Q4_MULT [ASK IF MULTCHK=02] Did you work with a contractor or vendor to implement the [MEASURE] project or did you work with internal staff at your company?

01	Worked with a contractor / vendor	[CONTRACTOR = 1]
02	Internal staff at company	[CONTRACTOR = 0]
03	Both the contractor and internal staff	[CONTRACTOR = 1]
88	Don't know	[CONTRACTOR = 0]

FR1 Which of the following is most likely what would have happened if you had not received the incentive from Duke Energy? (Read list)

01 Canceled or postponed the project at least one year
02 Reduced the size, scope, or efficiency of the project
03 Done exactly the same project
04 Done nothing
88 [DO NOT READ] Don't know

FR2 [ASK IF FR1=2] By how much would you have reduced the size, scope, or efficiency of the project? Would you say a small amount, a moderate amount or a large amount?

01 Small amount
02 Moderate amount
03 Large amount
88 Don't know

FR3 [ASK IF FR1=3] Would your business have paid the additional [INCENTIVE AMOUNT] to complete the project on your own?

01 Yes
02 No
88 Don't know

FR4 On a scale of 0 to 10, with 0 being "not at all influential" and 10 being "extremely influential", how would you rate the influence of the following factors on your decision to complete the [MEASURE] project? [RANDOMIZE ORDER]

FR4A The incentive provided by Duke Energy
FR4B The interaction with Duke Energy SmartSaver program representatives
FR4C SmartSaver marketing materials
FR4D [IF Q5=1] Previous experience with the SmartSaver program
FR4E [IF CONTRACTOR=1] Your contractor's or vendor's recommendation

___ Record influence [0-10]
77 Not applicable
88 Don't know
99 Refused

FR5 [ASK IF CONTRACTOR=1] Was there anything your contractor or vendor said to make you choose the equipment that you ended up installing?

01 Yes [SPECIFY: What did they say?]
02 No
88 Don't know

T12 Questions

[Ask if LightFlag = 1, Else skip to SP1]

TL1 Would you have continued using linear fluorescent T12 fixtures if you had not received a financial incentive to upgrade to [LightingType]?

01 Yes
02 No
88 Don't know

TL2 [If TL1 = 1] How long could replacement lamps have allowed you to continue to use T12 fixtures?

___ Months
___ Years

TI3 Were you previously purchasing high Color Rendering Index (CRI) T12 replacement lamps as a means of postponing full fixture replacements?

01 Yes
02 No
88 Don't know

Spillover

[IF MULTCHK=02 SKIP TO INT99]

SP1 Since your participation in the SmartSaver program, did you complete any additional energy efficiency projects at this facility or another facility served by Duke Energy that did not receive incentives through a Duke Energy program?

01	Yes	
02	No	SKIP TO SAT1
88	Don't know	SKIP TO SAT1
99	Refused	SKIP TO SAT1

SP2 What energy efficient products, equipment, or improvements did you install or implement? (Select all that apply)

01 Lighting
02 Heating / Cooling
03 Hot Water
04 Appliances / Office
05 Insulation
06 Motor / Variable Frequency drives (VFDs)
07 Compressed Air
08 Refrigeration
09 Other1 [SPECIFY]
10 Other2 [SPECIFY]
88 Don't know SKIP TO SAT1

[ASK SP3-SP4 FOR EACH MENTIONED IN SP2]

SP3 Can you describe the [SP2] equipment? For example: What was the brand or model? Efficiency rating? Dimensions? or Capacity?

[RECORD VERBATIM]

SP4 How many [SP2] units did you install?

____ [RECORD RESPONSE]

SP5 On a scale of 0 to 10, with 0 meaning "not at all influential" and 10 meaning "extremely influential", how influential was your participation in the SmartSaver program on your decision to complete the additional energy efficiency project(s)?

___ [RECORD RESPONSE]

Customer Satisfaction

SAT1 What would you change about the SmartSaver Custom Incentive Program, if anything? (DO NOT READ, Select all that apply)

01 Would not change anything
02 Remove pre-approval requirement
03 Improve initial processing time
04 Increase rebate amount
05 Other (specify)
88 Don't know

SAT2 [ASK IF SAT1=3] What would you consider to be a reasonable amount of time for processing the initial application?

___ [RECORD VERBATIM]

SAT3 [ASK IF SAT1=4] What percent of the project's cost do you think would be reasonable for the SmartSaver program to pay?

___ [RECORD PERCENT]
888 Don't know
999 Refused

SAT4 Was the incentive you received close to the amount you originally calculated when completing your application?

01 Yes
02 No
88 Don't know

Fast Track Feedback

FT1 [IF FastTrack=1 ELSE SKIP TO SAT5] Our records indicate that your project was reviewed under the SmartSaver program's Custom Fast Track option, where you paid for an accelerated review of your project's application. Is this correct?
[IF NEEDED: "There is typically a several hundred dollars fee for the accelerated review."]

01	Yes	
02	No	[FastTrack = 0] SKIP TO SAT5
88	Don't know	SKIP TO SAT5

FT2 How did you hear about the Smart $aver Custom FastTrack option?

01 Account representative
02 Business Energy Advisor
03 Contractor
04 Other (specify)
88 Don't know

FT3 Why did you choose the Custom Fast Track option?

[RECORD VERBATIM]

FT4 Did you have any difficulty responding to the Custom Fast Track questions or requests?

01 Yes
02 No
03 No follow-up questions were asked
88 Don't know

FT5 [ASK IF FT4=1] What was challenging about responding to the SmartSaver program's requests?

[RECORD VERBATIM]

FT6a Were you involved in the kickoff phone call to discuss the scope of the project or to answer any questions Duke Energy had about your project or the building?

01 Yes
02 No SKIP TO FT8
88 Don't know SKIP TO FT8

FT6b Were you notified in advance of the kickoff phone call what would be discussed or any information you would need available?

01 Yes
02 No
88 Don't know

FT7 [ASK IF FT6b=1] What was discussed during the kickoff call?

[RECORD VERBATIM]

FT8 Did your participation in the Fast Track option allow you to complete your project on schedule?

01 Yes
02 No
88 Don't know

FT9 [ASK IF FT8 = 2] What drove the delay in your project being completed as planned?

[RECORD VERBATIM]

FT9a Will you use the Fast Track option again if you have a project under a tight timeline?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know

SAT5 Using a scale of 0 to 10, where 0 is "not at all valuable" and 10 is "very valuable", how valuable are the following SmartSaver program components to your organization? [RANDOMIZE LIST]

FOR SAT5A through SAT5G

__ Record value [1-10]
NA Not applicable
DK Don't know
RE Refused

SAT5A Materials describing the program requirements and benefits
SAT5B Communication from SmartSaver program representatives
SAT5C Technical assistance from Duke Energy or SmartSaver program representatives
SAT5D [IF CONTRACTOR=1] Technical assistance from your contractor or vendor
SAT5E The incentive amount compared to your total project cost
SAT5F The worksheet or calculation tools that Duke Energy provides
SAT5G [IF FastTrack=1] The Custom Fast Track application option

[ASK IF MULTIPLE SAT5 COMPONENTS RATED EQUALLY VALUABLE]
[SKIP IF ONE SINGLE COMPONENT IS RATED HIGHEST]
[SKIP IF ALL SAT5 COMPONENTS ARE EQUAL TO ZERO]
SAT7 Which of the following SmartSaver program components is most valuable to your organization? [READ LIST, SELECT ONE] [RANDOMIZE CHOICES]

01 Materials describing the program requirements and benefits
02 Communication from SmartSaver program representatives
03 Technical assistance from Duke Energy or SmartSaver program representatives
04 Technical assistance from your contractor or vendor
05 The incentive amount compared to your total project cost
06 The worksheet or calculation tools that Duke Energy provides
07 The Custom Fast Track application option
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

SAT8 Have you recommended the SmartSaver Custom Incentive Program to anyone?

01 Yes SKIP TO SAT10
02 No
88 Don't know

SAT9 If provided the opportunity, would you recommend the SmartSaver Custom Incentive Program to anyone?

01 Yes
02 No
88 Don't know

SAT10 Would you consider participating in the SmartSaver Custom Incentive Program again in the future?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know [SPECIFY: Please explain.]

SAT11 Considering all aspects of the program, using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how would you rate your overall satisfaction with the SmartSaver Custom Incentive program?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

SAT12 Why do you say that?

[RECORD VERBATIM]

SAT13 Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how would you rate your overall satisfaction with Duke Energy?

___ [RECORD RESPONSE]

SAT14 [ASK IF SAT13<=3] Why do you say that?

[RECORD VERBATIM]

FT10 [ASK IF FastTrack = 0 ELSE SKIP TO C1] Duke Energy offers a fast track option where customers can pay a fee to accelerate the review of a project from 4 to 6 weeks to about one week. Before today, were you aware this is now offered?

01 Yes
02 No SKIP TO FT13
88 Don't know SKIP TO FT13

FT11 How did you become aware of the offering?

01 Account representative
02 Business Energy Advisor
03 Contractor / Vendor
04 Other (specify)
88 Don't know

FT12 Why did you choose not to participate in the offering?

[RECORD VERBATIM]

FT13 If you have a project under a tight timeline, would you be willing to pay several hundred dollars for an accelerated review of your SmartSaver application?

01 Yes
02 No [SPECIFY: Why not?]
88 Don't know

FT14 Would you be willing to participate in a meeting or teleconference and respond to requests about the project specifications in a timely manner?

01 Yes
02 No
88 Don't know

FT15 Using a scale of 0 to 10, where 0 is "not at all valuable" and 10 is "very valuable", how valuable would the fast track application option be for future projects?

___ [RECORD RESPONSE]
88 Don't know
99 Refused

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Case No(s). 19-0622-EL-RDR

Summary: Application APPLICATION OF DUKE ENERGY OHIO, INC., PART 2 electronically filed by Carys Cochern on behalf of Duke Energy

Customer Characteristics

C1 What is the main business activity at [PREMISE_ADDR]?

01 Office/Professional
02 Warehouse or distribution center
03 Food sales
04 Food service
05 Retail (other than mall)
06 Mercantile (enclosed or strip malls)
07 Education
08 Religious worship
09 Public assembly
10 Health care
11 Lodging
12 Public order and safety
13 Industrial/manufacturing [SPECIFY]
14 Agricultural [SPECIFY]
15 Vacant (majority of floor space is unused)
16 Other [SPECIFY]
88 Don't know

C2 Are your company's budget decisions made locally, regionally, nationally, worldwide, or something else?

01 Locally
02 Regionally
03 Nationally
04 Worldwide
05 Other (specify)
88 Don't know

C3 When creating budgets and financial plans, how far into the future does your company plan?

00 Less than 1 year
01 One year
02 Two years
03 Three years
04 Four years
05 Five years
06 More than 5 years
07 Other (specify)
88 Don't know

C4 Does your business' production schedule or business cycle affect when you can implement energy efficiency projects?

[PROBE: A business cycle refers to time periods when your business' activities might be significantly different. For example, a school might have to wait until summer to implement projects, while a manufacturing facility might wait until production is lower."]

01 Yes (Please describe that schedule or cycle)
02 No
03 Don't know

C7 Would you like someone from Duke Energy to contact you directly to provide more information or answer any questions you might have about their energy efficiency programs?

[PROBE: We will not share your responses to this survey, only pass along your contact information]

01 Yes
02 No [SKIP TO C9]

C8_phone To confirm, what's the best number to reach you at?

[RECORD VERBATIM]

C8_name And who should they get in touch with? [Can you spell your name?]

[RECORD VERBATIM]

C9 [IF MULTFLAG=1 SHOW: "[INTERVIEWER, If R has more surveys to complete read: Now I'd like to ask you a smaller selection of questions about another location we have on record for your firm." OTHERWISE READ: "Those are all the questions I have. I'd like to thank you for your help with this survey."]
Do you have any comments you would like to share with Duke Energy?

01 Yes [SPECIFY]
02 No

INT99 That completes the survey, thank you very much for your time.

Duke Energy Midwest SmartSaver Custom Incentive Program
Participating Trade Ally Survey

Sample Variables

CONTACT Primary customer contact name

Company Customer company name

Territory Territory state

Introduction and Screening

INT01 Hello, my name is <NAME> and I am calling on behalf of Duke Energy. May I speak with <CONTACT_NAME, or> the person most familiar with your company's participation in <PROGRAM>?

01 Yes
02 No

PREAMBLE I'm calling from Tetra Tech, an independent research firm. We were hired by Duke Energy to talk with contractors such as yourself about their participation in the SmartSaver Custom Incentive program.

[If needed: We are working with Duke Energy to evaluate their SmartSaver Custom Incentive program. As part of this evaluation, we are speaking to contractors such as yourself. We will be asking about your experience with the program in the past and improvements you would suggest for the future.]

I'd like to assure you that I'm not selling anything, I would just like to ask your opinion about this program. Your responses will be kept confidential and your name will not be revealed to anyone. For quality and training purposes, this call will be recorded.

01 Continue

I1 Are you familiar with the Duke Energy SmartSaver Custom Incentive Program?

01	Yes, I'm able to answer	[SKIP TO C_QAL]
02	Yes, but information isn't quite right (specify)	[SKIP TO C_QAL]
03	No, I'm not able to answer	
04	We have not participated	[THANK AND TERMINATE]
99	Refused	[THANK AND TERMINATE]

OTHER_R Is it possible that someone else in your organization would be more familiar with the program or the project that was completed?

01	Yes	[SKIP TO AVAILABLE_R]
02	No	[THANK AND TERMINATE]
88	Don't' know	[THANK AND TERMINATE]
99	Refused	[THANK AND TERMINATE]

AVAILABLE_R May I please speak with that person?

01	Yes	[SKIP TO INT01]
02	Yes, but R is not currently available	
03	No, we have not participated	[THANK AND TERMINATE]
88	Don't know	[THANK AND TERMINATE]
99	Refused	[THANK AND TERMINATE]

Trade Ally Background

TA1 I want to begin by asking you a few background questions about you and your company.

What is your role at <company>? (Select one)

01	Owner, partner
02	President, vice president
03	Sales
04	Incentive manager
05	Engineer
06	Other (specify)
88	Don't know
99	Refused

TA2 What equipment and services does your company provide to your customers? (Select all that apply)

01 Application completion assistance
02 Architectural and engineering firm
03 Building shell (insulation, window film, windows, doors, etc.)
04 Cool roof
05 Food service
06 HVAC (heating, ventilation, air conditioning, chillers)
07 Information technology
08 Lighting
09 Motors, pumps or drives
10 Performance
11 Plumbing
12 Process (air compressors, injection molding, etc.)
13 Other (specify)
88 Don't know
99 Refused

TA3 In what states do you provide these services? (Select all that apply)

01 Ohio
02 Indiana
03 Kentucky
04 Others (specify)
88 Don't know
99 Refused

TA4 How long has <company> been participating in the Duke Energy SmartSaver Custom Incentive program?

01 Less than 1 year
02 1 to 2 years
03 3 to 5 years
04 More than 5 years
88 Don't know
99 Refused

TA5 About how many projects would you say you have completed through the SmartSaver program since then?

01 Less than 5 projects
02 5 to 9 projects
03 10 to 19 projects
04 20 to 49 projects
05 50 to 99 projects
06 100 projects or more
88 Don't know
99 Refused

TA6 Thinking about the number of projects you did through the program in the last 12 months, do you think the number of 2018 projects will be higher, lower or about the same?

01 Higher
02 Lower
03 About the same
88 Don't know
99 Refused

TA7 Why do you think your 2018 projects will be <TA6 response>?

[RECORD VERBATIM]

TA8 Are you registered with Duke Energy's trade ally network and appear on their website?

[if needed, you would have had to complete a code of conduct and agreement form to appear on Duke Energy's website.]

01 Yes
02 No, [SPECIFY: Why not?]
88 Don't know
99 Refusal

Program Interaction

PI1 Did you receive any training or information from Duke Energy as part of the Custom program?

01 Yes
02 No [SKIP TO PI3]
88 Don't know [SKIP TO PI3]
99 Refusal [SKIP TO PI3]

PI2 Is there any additional training or information Duke Energy could provide?

01 Yes – [SPECIFY: What additional training or information would you like?]
02 No
88 Don't know
99 Refused

PI3 What percent of your customers know about the Custom program prior to you telling them about it?

___ [RECORD 0-100%]
888 Don't know
999 Refused

PI4 Based on your own interactions with customers, how do customers become aware of the SmartSaver Custom program? (Do not read; Select all that apply)

01 Direct contact from <company>
02 Contractor marketing materials such as direct mail, ad, etc.
03 Another contractor
04 Duke Energy bill insert
05 Duke Energy website
06 Duke Energy employee, account representative, customer service representative
07 Colleague, family or friends
08 Program brochure
09 Other (specify)
88 Don't know
99 Refused

PI5 What types of concerns do customers have about the program, if any? (Select all that apply)

01 No concerns
02 Unsure if the equipment qualifies
03 Unsure if the savings will be achieved
04 Unsure if the incentive will be as high as estimated
05 Uncertainty around the preapproval
06 Other (specify)
88 Don't know
99 Refused

PI6 Do you use the program as a sales tool?

01 Yes
02 No SKIP TO AT1
88 Don't know SKIP TO AT1
99 Refusal SKIP TO AT1

PI7 How helpful is the Duke Energy program in selling energy efficient equipment? Do you think it is. . .? [READ LIST]

01 Very helpful
02 Somewhat helpful
03 Neither helpful nor unhelpful
04 Not very helpful
05 Not at all helpful
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

Attribution

AT1 Approximately how many projects did you complete through the SmartSaver Custom Incentive program in the past 12 months?

__ [RECORD # OF PROJECTS 0-50]
888 Don't know
999 Refused

AT2 In what percent of your sales situations did you recommend high-efficiency equipment *before* you learned about the SmartSaver Custom Incentive program?

___ [RECORD 0-100%]
888 Don't know
999 Refused

AT3 And in what percent of your sales situations do you recommend high-efficiency equipment now that you have worked with the SmartSaver Custom Incentive program?

___ [RECORD 0-100%]
888 Don't know
999 Refused

AT4 Using a scale from 0 to 10 where 0 is "not at all important" and 10 is "very important", how important was the SmartSaver Custom Incentive program in influencing your decision to recommend high-efficiency equipment to your customers?

__ [RECORD 0-10]
88 Don't know
99 Refused

AT5 And using a scale from 0 to 10 where 0 is "not at all likely" and 10 is "very likely", how likely is it that you would have recommended the high efficiency equipment to your customers if the SmartSaver Custom Incentive Program had not been available?

__ [RECORD 0-10]
88 Don't know
99 Refused

AT6 And in what percent of your sales situations did the customer choose to go with higher efficiency equipment based on the availability of a Duke Energy rebate?

___ [RECORD 0-100%]
888 Don't know
999 Refused

AT7 What percent of the projects in the last 12 months where you sold or installed high-efficiency equipment were eligible but DID NOT receive an incentive through a Duke Energy energy-efficiency program?

___ [RECORD 0-100%]
888 Don't know
999 Refused

AT8 [if AT7 > 0] Did you request an incentive for any of those projects?

01 Yes
02 No [SKIP TO AT10]
88 Don't know [SKIP TO AT11]
99 Refused [SKIP TO AT11]

AT9 [if AT8 = 1] If you requested an incentive but did not receive one, why was that?

[RECORD VERBATIM RESPONSE]

AT10 [if AT8 = 2] Why did you or your customers not request an incentive for these energy efficiency projects?

[RECORD VERBATIM RESPONSE]

AT11 What percent of your sales in the last 12 months were for each of the following five categories?

a. planned replacement of working equipment?
b. equipment for new facilities?
c. new equipment for existing facilities?
d. failed or emergency equipment replacement?
e. other?

AT11_OTR [if AT11E>0 and AT11E<>888] You mentioned that [from AT11E] percent of your sales were because of some other reason. What were these reasons?

01 Other (Specify)

AT12 [if AT11a > 0 and AT11<>888] Would you say the working equipment you replaced was typically in good, fair, or poor condition?

01 Good
02 Fair
03 Poor
04 Other (specify)
88 Don't know
99 Refused

T12 Lamp Questions

[if TA2 = 8, ask this section, else skip to SA1_INT]

TL1 Next I have a few questions about lighting systems.
Of your linear fluorescent lighting system sales in 2017, what percent were T12s?

___ [RECORD 0-100%]
888 Don't know
999 Refused

TL2 Are you still stocking and selling linear fluorescent T12 lighting systems and replacement lamps?

01 Yes
02 Yes [SPECIFY: Capture any additional contractors comments in TL2 (e.g., yes, but…]
03 No
04 No [SPECIFY: Capture any additional contractors comments in TL2 (e.g., no, but…]
88 Don't know
99 Refused

TL3 [if TL2 = 1 or 2] Thinking of your 2018 sales of linear fluorescent lighting system sales, what percent will be T12s?

___ [RECORD 0-100%]
888 Don't know
999 Refused

Satisfaction

SA1_INT Next I'm going to read a list of aspects related to your experience with the SmartSaver Custom Incentive Program. Using a scale where 0 is "not at all satisfied" and 10 is "very satisfied," how satisfied are you with the following program aspects…

[RANDOMIZE A THROUGH G]

For SA1A THROUGH SA1G
__ [RECORD 0-10]
88 Don't know
99 Refused

a. The time it took to receive pre-approval
b. The pre-approval application process
c. The program process once the project is pre-approved
d. The incentives available through the SmartSaver Custom program
e. The timeliness of rebate payment to customers
f. The training and information received through the program
g. The level of communications with program staff

SA2 Using this same scale (0 being "not at all satisfied" and 10 being "very satisfied"), how satisfied are you with the SmartSaver Custom Incentive program overall?

__ [RECORD 0-10]
88 Don't know
99 Refused

SA3 And how satisfied are you with Duke Energy (if needed: using the same scale where 0 is "not at all satisfied" and 10 is "very satisfied")?

__ [RECORD 0-10]
88 Don't know
99 Refused

SA4 Would you say your communication with Duke Energy program staff was very effective, somewhat effective, neither effective nor ineffective, not too effective, or not at all effective?

01 Very effective
02 Somewhat effective
03 Neither effective nor ineffective
04 Not too effective
05 Not at all effective
88 Don't know
99 Refused

Customer Interaction

CI1 Now I'd like to ask a few questions about your customers.
Based on your experiences, what factors most influence the type of equipment nonresidential customers purchase? (Do not read; Select all that apply)

01 Equipment cost
02 Rebate and incentive availability
03 Contractor recommendation
04 Desire to reduce energy bills
05 Availability of equipment for emergency replacement
06 Equipment specifications
07 Other (specify)
88 Don't know
99 Refused

CI2 Are some nonresidential customers more receptive than others to high efficiency equipment?

01 Yes [PROBE: "What types of customers are more receptive? What types are less receptive?"]
02 No
88 Don't know
99 Refused

CI3 Why do some projects drop out or why do some customers not move forward with projects?

[RECORD VERBATIM RESPONSE]

Program Participation

***Added option of (specify) to choice 03 on 11/08/2017

PP1 How do you typically estimate savings for projects submitted through the SmartSaver Custom program? (Read list; Select all that apply)

[note: the "classic custom calculator" is an Excel sheet (workbook) and the "custom-to-go calculator" is an actual non-Excel based calculator.]

01 Using Duke's custom-to-go calculator
02 Using Duke's classic custom calculator
03 Using your own calculators (specify)
04 Other (specify)
88 Don't know
99 Refused

PP2 [if PP1 = 1] Using a scale from 0 to 10 where 0 is "not at all useful" and 10 is "very useful", how useful is the custom-to-go calculator in estimating energy savings?

[note: the "classic custom calculator" is an Excel sheet (workbook) and the "custom-to-go calculator" is an actual non-Excel based calculator.]

__ [RECORD 0-10]

PP3 [if PP1 = 2] Using a scale from 0 to 10 where 0 is "not at all useful" and 10 is "very useful", how useful is the classic custom calculator in estimating energy savings?

[note: the "classic custom calculator" is an Excel sheet (workbook) and the "custom-to-go calculator" is an actual non-Excel based calculator.]

__ [RECORD 0-10]

PP4 [PP1<>1 OR PP1 <>2, if do not use Duke's custom-to-go or classic custom calculator] Why haven't you used Duke's <fill from PP1: custom-to-go and/or classic custom> calculators?

[RECORD VERBATIM]

PP5 After submitting an application, have you ever received requests for more information?

01	Yes	
02	No	SKIP TO PP7
88	Don't know	SKIP TO PP7
99	Refused	SKIP TO PP7

PP6 [if PP5 = 1] What was the request for?

[RECORD VERBATIM RESPONSE]

PP7 Are there any enrollment paperwork or rebate submission processes that could be simplified to encourage customers to complete projects?

01	Yes	What process could be simplified?
02	No	
88	Don't know	
99	Refused	

PP8 Were you aware there was an online application portal to submit the application online?

01	Yes
02	No
88	Don't know
99	Refused

PP9 [If PP8 = 1] Have you used the online portal?

01	Yes
02	No
88	Don't know
99	Refused

PP10 [if PP9 = 1] Using a scale from 0 to 10 where 0 is "not at all useful" and 10 is "very useful", how useful is the online portal?

__ [RECORD 0-10]

PP11 [if PP9 =02,88,99] Is there anything preventing you from using this portal?

01 Yes What is preventing you from using the portal?
02 No
88 Don't know
99 Refused

PP12 What program aspect is most influential in customers' decision to move forward with the project?

01 The incentive
02 The energy savings
03 The engineering support provided by Duke
04 Other (specify)
88 Don't know
99 Refused

PP13 From your perspective, what is the most valuable part of the SmartSaver Custom Incentive program? (DO NOT READ)

01 The incentive
02 The energy savings
03 The engineering support provided by Duke
04 Other (specify)
88 Don't know
99 Refused

PP14 From your perspective, what part of the SmartSaver Custom Incentive program could be improved?

[RECORD VERBATIM RESPONSE]
77 Nothing

Wrap up

WU1 Do you have any other feedback that you would like to share with Duke Energy about this program?

01 Yes [record comments]
02 No
88 Don't know
99 Refused

INT99 Those are all the questions I have. Thank you for your time.

Nexant

Headquarters

101 2nd Street, Suite 1000

San Francisco CA 94105-3651

Tel: (415) 369-1000

Fax: (415) 369-9700

www.nexant.com

Summary: Exhibit Attachment A Part 6 of 8 to the Amended Application electronically filed by Mrs. Tammy M. Meyer on behalf of Duke Energy Ohio Inc. and D'Ascenzo, Rocco and Vaysman, Larisa and Kingery, Jeanne W.