Nexant
Reimagine tomorrow.

OFFICIAL COPY
Mar 07 2023

Smart $aver® Non-Residential Custom Program Years 2018-2019 Evaluation Report

Submitted to Duke Energy Carolinas and Duke Energy Progress
in partnership with Tetra Tech

July 14, 2022

Principal Authors:
Jim Herndon, Vice President
Ron Shaw, Principal
Carrie Koenig, Director - Tetra Tech
Kimberly Bakalars, Manager - Tetra Tech

OFFICIAL COPY
Mar 07 2023

Contents

1 Executive Summary 1
1.1 Program Summary 1
1.2 Evaluation Objectives and High-Level Findings 1
1.2.1 Impact Evaluation Objectives 1
1.2.2 Process Evaluation Objectives 2
1.2.3 High Level Findings 2
1.2.3.1 Gross Impact Evaluation Key Findings – DEC 2
1.2.3.2 Gross Impact Evaluation Key Findings – DEP 3
1.2.3.3 Net Impact Evaluation Key Findings 4
1.2.3.4 Process Evaluation Key Findings 5
1.3 Evaluation Conclusions and Recommendations 6
1.3.1 Impact Recommendations 6
1.3.2 Process Recommendations 7

2 Introduction and Program Description 11
2.1 Program Description 11
2.1.1 Participation Summary – DEC 12
2.1.2 Participation Summary – DEP 15

3 Key Research Objectives 19
3.1 Gross Impact 19
3.2 Net Impact 19
3.3 Process 20

4 Impact Evaluation 21
4.1 Impact Methodology 21
4.1.1 Sampling 22
4.1.1.1 Stratification 23
4.1.1.2 Targeted Sample Size – DEC 24
4.1.1.3 Targeted Sample Size – DEP 25

OFFICIAL COPY
Mar 07 2023

4.1.2 Data Collection 25
4.1.2.1 Tier 1 – In-person Site Visits *29*
4.1.2.2 Tier 2 – Virtual Site Visits *29*
4.1.2.3 Tier 3 – Enhanced Desk Reviews *29*
4.1.3 Project Level Analyses 29
4.1.3.1 Basic Rigor: Simple Engineer Model (SEM) with On-site Measurement *30*
4.1.3.2 Basic Rigor: Simple Engineer Model (SEM) with Verification Only *30*
4.1.3.3 Enhanced Rigor: Billing Analysis *30*
4.1.3.4 Enhanced Rigor: Whole Building Simulation *30*
4.1.3.5 Peak Period Definition *31*
4.1.3.6 Interactive Effects *31*
4.1.4 Measurement & Verification Reports 32
4.1.5 Program Level Gross Verified Estimation 32
4.1.5.1 Presentation of Uncertainty *33*
4.2 Impact Evaluation Analysis and Findings – DEC 35
4.2.1 DEC Achieved Sample Size 35
4.2.2 DEC Gross Verified Impacts 35
4.2.2.1 DEC Small Lighting Projects *37*
4.2.2.2 DEC Large Lighting Projects *37*
4.2.2.3 DEC Small Non-lighting Projects *37*
4.2.2.4 DEC Large Non-lighting Projects *38*
4.2.3 DEC Custom-to-Go vs. Custom Classic 38
4.3 Impact Evaluation Analysis and Findings – DEP 41
4.3.1 DEP Achieved Sample Size 41
4.3.2 DEP Gross Verified Impacts 41
4.3.2.1 DEP Small Lighting Projects *43*
4.3.2.2 DEP Large Lighting Projects *43*
4.3.2.3 DEP Small Non-lighting Projects *43*
4.3.2.4 DEP Large Non-lighting Projects *44*
4.3.3 DEP Custom-to-Go vs. Custom Classic 44
4.4 High Level Findings 47
4.4.1 Continue High Quality Reviews 47
4.4.2 Lighting Schedules 47
4.4.3 Documentation of Assumptions and Trend data 48
4.4.4 Measurement and Verification Requirements 48

OFFICIAL COPY
Mar 07 2023

4.4.5 Calibration of New Construction models 48

5 Net-to-Gross 50

5.1 Methodology 50

5.1.1 Free-Ridership 51

5.1.1.1 Intention 51

5.1.1.2 Influence 53

5.1.1.3 Calculation Steps 56

5.1.2 Spillover 57

5.1.2.1 Participant spillover 57

5.1.2.2 Nonparticipant Spillover 58

5.2 Sampling 59

5.3 Net-to-Gross Analysis and Findings 60

5.3.1 Intention 60

5.3.2 Influence 61

5.3.3 Adjustments 63

5.3.4 Net-to-Gross Results 63

5.3.5 Benchmarking 67

6 Process Evaluation 69

6.1 Summary of Data Collection Activities 69

6.1.1 Program Staff Interviews and Application Data Review 69

6.1.2 Contractor Interviews and Surveys 70

6.1.3 Participant Surveys 71

6.2 Process Evaluation Findings 71

6.2.1 Program Staff 71

6.2.1.1 Roles and Relationships 72

6.2.1.2 Marketing and Outreach 73

6.2.1.3 Application Process 74

6.2.1.4 New Construction - NCEEDA 74

6.2.1.5 Staff Influence 75

6.2.2 Data Review 75

6.2.3 Completed Project Review 75

6.2.4 Contractors 80

6.2.4.1 Contractor Characteristics 80

6.2.4.2 Customer Interaction 80

OFFICIAL COPY
Mar 07 2023

6.2.4.3 Application Process 81
6.2.4.4 Satisfaction 82
6.2.4.5 Effects of the COVID-19 Pandemic 84
6.2.5 Participants 85
6.2.5.1 Marketing Practices 85
6.2.5.2 Application Process 87
6.2.5.3 Calculators 88
6.2.5.4 Program Satisfaction 88
6.2.5.5 Participating Customer Characteristics 94
6.2.5.6 COVID Impacts 96

7 Conclusions and Recommendations 97
7.1 Impact Evaluation 97
7.2 Process Evaluation 98

Appendix A Summary Forms A-1

Appendix B DSMore Input Summary B-1

Appendix C Free-ridership Scores Across Categories C-1

Appendix D Survey Instruments D-1

Appendix E Algorithms E-1

Appendix F Benchmarking Bibliography F-1

OFFICIAL COPY
Mar 07 2023

List of Figures

Figure 2-1 Distribution of DEC Reported Energy Savings from NR Custom Program Projects by Technology 14
Figure 2-2 Distribution of DEC Reported Summer Demand Savings from NR Custom Projects by Technology....14
Figure 2-3 Distribution of DEC Reported Winter Demand Savings (kW) from NR Custom Projects by Technology....15
Figure 2-4 Distribution of DEP Reported Energy Savings from NR Custom Program Projects by Technology 17
Figure 2-5 Distribution of DEP Reported Summer Demand Savings from NR Custom Projects by Technology....17
Figure 2-6 Distribution of DEP Reported Winter Demand Savings (kW) from NR Custom Projects by Technology....18
Figure 4-1 Flow Diagram of Impact Evaluation Activities....21
Figure 4-2: Dalenius-Hodges Boundary Design for DEC 2018-2019 Lighting Projects....24
Figure 4-3 Distribution of DEC Reported Energy Savings for Classic Custom Projects by Technology Category....39
Figure 4-4 Distribution of DEC Reported Energy Savings for Custom-to-Go Projects by Technology Category....40
Figure 4-5 DEP Distribution of Reported Energy Savings for Classic Custom Projects by Technology Category....45
Figure 4-6 DEP Distribution of Reported Energy Savings for Custom-to-Go Projects by Technology Category....46
Figure 5-1 Preliminary Free-ridership Calculation 51
Figure 5-2 Intention Score Flowchart 52
Figure 5-3 Net Verified Program Savings Calculation....65
Figure 6-1 Smart $aver Custom Program Delivery Support....72
Figure 6-2 Smart $aver Customer Program Application Process 76
Figure 6-3 Influence of Program Components....80
Figure 6-4 Number of Similar Projects Completed in Last 12 Months (n=59) 81
Figure 6-5 Contractor Satisfaction with Program Components....83
Figure 6-6 Participant Source of Program Awareness (n=91) 86
Figure 6-7 Program Participant Satisfaction and Value of Program Aspects in Carolina 89
Figure 6-8 Program Participant Satisfaction and Value of Program Aspects 89
Figure 6-9 Reasons for Rating the Program Highly (n=88)....91
Figure 6-10 Have You Recommended the Program to Others? 92
Figure 6-11 Smart $aver Custom Incentive Program Business Activities (n=92) 95
Figure 6-12 Smart $aver Custom Incentive Program Participant Characteristics....95

List of Tables

Table 1-1 DEC Program Reported and Verified Gross Energy Impacts 2
Table 1-2 DEC Program Reported and Verified Gross Summer Demand Impacts 3
Table 1-3 DEC Program Reported and Verified Gross Winter Demand Impacts 3
Table 1-4 DEP Program Reported and Verified Gross Energy Impacts.... 4
Table 1-5 DEP Program Reported and Verified Gross Summer Demand Impacts 4

OFFICIAL COPY
Mar 07 2023

Table 1-6 DEP Program Reported and Verified Gross Winter Demand Impacts 4
Table 1-7 Net-to-Gross Evaluation Results 5
Table 2-1 DEC NR Custom Program Participation and Reported Energy Summary.....13
Table 2-2 DEC NR Custom Program Reported Demand Savings Summary 13
Table 2-3 DEP NR Custom Program Participation and Reported Energy Summary.....16
Table 2-4 DEP NR Custom Program Reported Demand Savings Summary 16
Table 3-1 Process Evaluation Research Questions and Activities.....20
Table 4-1 NR Custom Stratified Sampling Plan - Targeted 25
Table 4-2 NR Custom Stratified Sampling Plan - Targeted 25
Table 4-3 Key Data Points Gathered for Commonly Encountered ECMs 28
Table 4-4 Definition of Peak Demand Periods.....31
Table 4-5 DEC NR Custom Stratified Sampling - Achieved.....35
Table 4-6 DEC Gross Verified Energy Savings (kWh) by Stratum.....36
Table 4-7 DEC Gross Verified Summer Peak Demand Savings (kW) by Stratum 36
Table 4-8 DEC Gross Verified Winter Peak Demand Savings (kW) by Stratum 36
Table 4-9 DEC Gross Reported Energy Savings by Worksheet Type 39
Table 4-11 DEP NR Custom Stratified Sampling - Achieved.....41
Table 4-12 DEP Gross Verified Energy Savings (kWh) by Stratum.....42
Table 4-13 DEP Gross Verified Summer Peak Demand Savings (kW) by Stratum 42
Table 4-14 DEP Gross Verified Winter Peak Demand Savings (kW) by Stratum.....42
Table 4-15 DEP Gross Reported Energy Savings by Worksheet Type 45
Table 4-16 Comparison of Strata-Level Realization Rates – DEP Classic vs. Custom-to-Go ...46
Table 5-1 Net-to-Gross Intention Score Methodology – Retrofit Projects.....53
Table 5-2 Net-to-Gross Intention Score Methodology – New Construction Projects 53
Table 5-3 Net-to-Gross Program Influence Aspects 54
Table 5-4 Net-to-Gross Influence Score Methodology.....55
Table 5-5 Net-to-Gross Influence Score Methodology – Influential Vendor 55
Table 5-6 Participant Spillover Program Influence Values.....58
Table 5-7 Nonparticipant Spillover Influence Values 59
Table 5-8 Survey Sample Design by Initiative 60
Table 5-9 What Would You Have Done Had You Not Received an Incentive (Intention).....61
Table 5-10 Influence of the Highest Rated Program Factor.....62
Table 5-11 Program Factor with the Highest Influence Rating.....62
Table 5-12 Progression of Free-ridership Adjustments (weighted results).....63
Table 5-13 Net-to-Gross Evaluation Results 64
Table 5-14 Free-ridership Comparison across Evaluations 65
Table 5-15 Free-ridership Results by Measure Type.....66
Table 6-1 Summary of Process Evaluation Data Collection Activities.....69
Table 6-2 Contractor Response Rate.....70
Table 6-3 Participant Response Rate.....71
Table 6-4 Influence of Duke Staff.....75
Table 6-5 Analysis of Incomplete Projects.....78
Table 6-6 Analysis of Application and Free-ridership Responses.....79
Table 6-7 Contractor Suggestions for Program Improvements.....83
Table 6-8 Effect of Pandemic.....84
Table 6-9 Reasons for Participating in Smart $aver Custom Incentive Program.....87
Table 6-10 Satisfaction with Application Process 87

OFFICIAL COPY

Mar 07 2023

Table 6-11 Calculators Used by Participants....88
Table 6-12 Value of Program Aspects by Calculator Use....90
Table 6-13 Reasons for Rating the Program Highly....92
Table 6-14: Recommended Program Changes....93
Table B-1 Verified Impacts per Project by Technology and Project Size- DEC....B-1
Table B-2 Verified Impacts per Project by Technology and Project Size- DEP....B-1

Equations

Equation 1 Net Program Savings....19
Equation 2 Interactive Cooling Energy Savings for Interior Lighting....31
Equation 3 Interactive Cooling Factor....32
Equation 4 Realization Rate....33
Equation 5 Error Ratio....33
Equation 6 Required Sample Size....33
Equation 7 Finite Population Correction....34
Equation 8 Error Bound of the Savings Estimate....34
Equation 9 Relative Precision of the Savings Estimate....34
Equation 10 Net-to-Gross Equation....50
Equation 11 Net Verified Energy Savings....50
Equation 12 Respondent Preliminary Free-ridership Ratio....56
Equation 13 Consistency Checks Adjustment Supporting Higher Free-ridership....56
Equation 14 Consistency Checks Adjustment Supporting Lower Free-ridership....56
Equation 15 Respondent Final Free-ridership Ratio....57
Equation 16 Respondent Final Free-ridership Ratio....57
Equation 17 Program Free-ridership Ratio....57
Equation 18 Program-Attributable Participant Spillover....58
Equation 19 Program Participant Spillover Ratio....58
Equation 20 Program-Attributable Nonparticipant Spillover....59

OFFICIAL COPY
Mar 07 2023

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 Carolinas (DEC) and Duke Energy Progress (DEP) service territories to enhance their ability to adopt and install cost-effective electrical energy efficiency projects.

The program is designed to meet the needs of the Duke Energy's (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 engages numerous Duke Energy team members to support the program, including large account managers, business energy advisors (BEAs), energy efficiency engineers, and trade ally outreach representatives. Willdan is Duke Energy's authorized vendor for the New Construction Energy Efficiency Design Assistance (NCEEDA) portion of the Smart $aver program. Willdan acts as a client liaison with Duke Energy and discusses project technical issues with Duke Energy's energy efficiency engineers.

1.2 Evaluation Objectives and High-Level Findings

This report presents the results and findings of evaluation activities for Duke Energy Carolina's and Duke Energy Progress NR Custom program, conducted by the evaluation team, collectively Nexant Inc. and their subcontracting partner, Tetra Tech, for the period of January 2018 through December 2019.

1.2.1 Impact Evaluation Objectives

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 the participants' facilities.
- Assess the rate of free riders from the customer and contractor perspective.
- Determine spillover effects from customer and contractor perspective.
- 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 verification of a representative sample of projects including virtual or phone interviews with program participants; collecting trend, utility consumption data, and building automation system/energy management system (BAS/EMS)

OFFICIAL COPY
Mar 07 2023

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 and 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 the influence the program has on customers' decisions to install energy-efficient (EE) measures
- Assess Duke staff involvement in setting any organization policies
- 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, interviewed third-party vendors, 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 – DEC

The DEC impact evaluation results indicate that program's internal processes for project review, savings estimation, and installation verification are producing quality estimates of project impacts. Energy realization rate exceed 100% for the Lighting-Small strata. The energy realization rate for the Non-lighting-Small strata was 92.85% and Non-lighting Large was 96.42%. Realization rate for summer demand was just below 100% at 99.26%, whereas winter demand was 110.53% at the program level. Findings from the gross impact evaluation are summarized in Table 1-1 Table 1-2, and Table 1-3.

Table 1-1 DEC Program Reported and Verified Gross Energy Impacts

Measure Category	Strata	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	RR (%)
Lighting	Small (<360 MWh)	25,107,218	26,104,266	103.97%
	Large (≥360 MWh)	41,747,348	41,723,000	99.94%
Non-lighting	Small (<537 MWh)	12,433,255	11,544,202	92.85%
	Large (≥537 MWh)	21,106,809	20,350,706	96.42%
Total		**100,394,630**	**99,722,174**	**97.62%**

OFFICIAL COPY
Mar 07 2023

Table 1-2 DEC Program Reported and Verified Gross Summer Demand Impacts

Measure Category	Strata	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	RR (%)
Lighting	Small (<360 MWh)	4,112	3,497	85.04%
	Large (≥360 MWh)	7,109	6,806	95.74%
Non-lighting	Small (<537 MWh)	2,081	1,610	77.37%
	Large (≥537 MWh)	3,629	3,706	102.13%
Total		**16,931**	**15,620**	**99.26%**

Table 1-3 DEC Program Reported and Verified Gross Winter Demand Impacts

Measure Category	Strata	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	RR (%)
Lighting	Small (<360 MWh)	3,628	3,051	84.08%
	Large (≥360 MWh)	5,899	5,735	97.22%
Non-lighting	Small (<537 MWh)	1,757	2,211	125.81%
	Large (≥537 MWh)	2,973	3,481	117.10%
Total		**14,257**	**14,478**	**110.53%**

1.2.3.2 Gross Impact Evaluation Key Findings – DEP

The DEP impact evaluation results indicate that program's internal processes for project review, savings estimation, and installation verification are producing quality estimates of project impacts. Energy realization rates exceed 100% for the two lighting strata (Lighting – Large and Lighting - Small). The energy realization rate for the Non-lighting-Small strata was 94.06% and Non-lighting Large was 93.04%. Realization rate for summer demand was below 100% at 91.76%, whereas winter demand was 105.07% at the program level. Findings from the gross impact evaluation are summarized in Table 1-4, Table 1-5, and Table 1-6.

OFFICIAL COPY
Mar 07 2023

Table 1-4 DEP Program Reported and Verified Gross Energy Impacts

Measure Category	Strata	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	RR (%)
Lighting	Small (<123 MWh)	6,301,713	6,803,085	107.96%
	Large (≥123 MWh)	10,478,150	11,978,543	114.32%
Non-lighting	Small (<258 MWh)	3,617,228	3,402,256	94.06%
	Large (≥258 MWh)	6,371,065	5,927,597	93.04%
Total		**26,768,156**	**28,111,481**	**102.08%**

Table 1-5 DEP Program Reported and Verified Gross Summer Demand Impacts

Measure Category	Strata	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	RR (%)
Lighting	Small (<123 MWh)	1,219	1,214	99.53%
	Large (≥123 MWh)	1,448	1,523	105.14%
Non-lighting	Small (<258 MWh)	884	634	71.76%
	Large (≥258 MWh)	1,728	1,583	91.61%
Total		**5,279**	**4,954**	**91.76%**

Table 1-6 DEP Program Reported and Verified Gross Winter Demand Impacts

Measure Category	Strata	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	RR (%)
Lighting	Small (<123 MWh)	703	1,012	143.96%
	Large (≥123 MWh)	1,682	1,776	105.63%
Non-lighting	Small (<258 MWh)	546	772	141.39%
	Large (≥258 MWh)	1,281	1,193	93.19%
Total		**4,211**	**4,753**	**105.07%**

1.2.3.3 Net Impact Evaluation Key Findings

Duke Energy staff have a thorough process for evaluating applications. This process includes denying projects if customers already purchased equipment or, in the case of new construction, started the building process. The net impact evaluation results show that over 80% of the

OFFICIAL COPY
Mar 07 2023

program's energy savings are attributable to the program's activities. A large portion of the free-ridership stemmed from the Intention score. Customers reported they planned to complete the same project and would have paid the additional incentive amount to complete the efficiency project or said the project would have been largely or moderately the same without the program. Findings from the net impact evaluation are summarized in Table 1-7.

Table 1-7 Net-to-Gross Evaluation Results

Measurement	DEC	DEP	Combined[1]
Free-ridership (FR)	29.16%	32.67%	29.99%
Net of Free-ridership (1-FR)	70.84%	67.33%	70.01%
Program-influenced Participant Spillover (PSO)	0.28%	0.01%	0.22%
Program-influenced Nonparticipant Spillover (NPSO)	12.54%	24.03%	12.95%
Net-to-Gross* (1-FR) +PSO+NPSO	**83.66%**	**91.37%**	**83.18%**

1.2.3.4 Process Evaluation Key Findings

Overall, the program is operating as intended, and customers and trade allies are generally satisfied with their experiences with the program. Participant satisfaction was slightly lower than the prior evaluation but, overall, still high. Contractors continue to play a vital role in the program by making customers aware of the program offerings. Contractors have utilized the program to encourage customers to purchase high-efficient equipment and felt the program incentive was the most influential factor in customers moving forward with projects they would not have otherwise. Participants provide similar feedback, stating they have appreciated their support from trade allies and Duke Energy.

Additional high-level findings include the following:

- The primary source of participants' program awareness continues to be from contractors.
- The application processing is quicker than the four to six-week goal and customers report being satisfied with the application process.
- Satisfaction with the program overall and its components is high among participants and trade allies. The highest-rated program component for contractors was the interaction they had with Duke Energy program staff.

[1] The combined results are weighted using the same kWh-based weights used for DEC and DEP results, since this accounts for individual project sizes as well as the relative size of the programs across the two jurisdictions.

OFFICIAL COPY
Mar 07 2023

- The contractor assistance was the most valuable program component as rated by participant respondents.
- The program-provided calculators were the lowest rated program element by participant respondents. The calculation tools had a recent overhaul and most recently moved to an online platform, which may be a reason for the lower satisfaction.
- The tracking database was missing some key customer-contact information for evaluation activities and program/project tracking.
- The COVID pandemic had a moderately negative impact on contractors' business operations, with businesses implementing social distancing procedures. Furthermore, one-third had a reduction in sales due to the pandemic. The pandemic also impacted customers, where one-third said they had plans to upgrade equipment before the pandemic. The majority of these customers indicated they had delayed those planned projects.

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 Recommendations

Conclusion 1: The evaluation team saw strong evidence the Duke Program team conducts detailed reviews of the project applications, has quality control checks and revises measure parameters to refine savings estimates. Engineering reviews by AESC provides an additional level of quality control that helps to minimize most calculation errors or instances of over-claimed energy or demand savings. The strata-level realization rates indicate that an appropriate level of rigor is being applied to lighting projects and most non-lighting projects.

Recommendation 1: Continue the level of rigor being applied to projects as it goes through the NR Custom application process while considering the following recommendations to improve the program in specific areas.

Conclusion 2: Of the parameters needed to calculate lighting project savings, verified lighting operating schedules, or annual hours of use, were more often found to be different than the hours used to calculate reported savings. Applicants are asked to provide the operating schedules as part of the application process and participants, not trade allies, may have the best insights into what the schedule will be for each installed fixture.

Recommendation 2: Improve the level of detail collected in the application on the hours of operation. Weekly schedules should be defined and/or verified by the participant. Holidays and seasonal changes should also be captured in the annual hours of use.

Conclusion 3: Project reviews, both during the application process and the evaluation, benefit from documentation of all underlying assumptions and worksheets used for the calculations of savings. Photos serve as a valuable verification of the installed equipment and provide essential information regarding the condition and operating parameters of the old and new equipment. This applies to primarily small and larger non-lighting projects where trend data and

OFFICIAL COPY

Mar 07 2023

manufacturer's specification sheets would allow more detailed analyses of the proposed measures. Lighting projects are very well documented but pictures of baseline equipment prior to it being removed would be useful to refine savings calculations.

Recommendation 3: Collect and document enough information and photos of the project so the calculations of savings could be independently repeated.

Conclusion 4: Measurement and verification (M&V) plans help confirm measures are installed and resulting in the expected energy and demand savings. Differences between expected savings and measured savings can help identify measures that are not performing or have been disabled and thus lead to refined savings estimates for the project. M&V plans for large non-lighting projects can greatly assist the review of the program applications and projects being evaluated, in some cases years after the project is implemented.

Recommendation 4: Require M&V plans that are consistent with recognized protocols for large non-lighting projects involving a large portion of the program savings or measures with high uncertainty. Establish a threshold in kWh savings or incentives dollars above which an M&V plan is required.

Conclusion 5: The Duke NCEEDA protocol defines how savings from new, high performance buildings shall be modeled and estimated. Assumptions on how the building is expected to be occupied and used are also required but do not always match how the new buildings are actually used or occupied. This can lead to the modeled consumption and savings not matching the actual consumption and savings.

Recommendation 5: The NCEEDA should incorporate a tiered post construction calibration requirement that uses the ASHRAE 14 tolerances to assess the level of uncertainty in the new construction models and make adjustments to the model in order to minimize the uncertainty.

1.3.2 Process Recommendations

Conclusion 6: The program continues to operate as intended. Contractor and customer respondents reported high overall satisfaction with the program and many program aspects. The most common source of program awareness from customers was their contractor, consistent with Duke Energy's primary channel to market the program. A high proportion of customers reported the contractor recommendation as an important source of influence on their decision to install high-efficient equipment. Contractor technical assistance also saw high satisfaction, underscoring the critical role. Furthermore, contractors are generally satisfied with the program and appreciate using the incentives as a sales tool.

Recommendation 6a: 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. This engagement should include builders and architects who may be utilizing the new construction design assistance.

Recommendation 6b: Encourage contractors and architects to inform customers of the Duke Energy incentives available while considering equipment options. Early conversations may push customers to purchase program-qualifying equipment rather than standard efficiency.

Conclusion 7: The participant survey was conducted approximately 1 to 3 years after program participation. The more time passes from program participation, the more it can impact the

OFFICIAL COPY
Mar 07 2023

customer recalling the details around the decision to select the specific equipment. Additionally, turnover can occur, so decision-makers may no longer be with the organization. All of which can impact free-ridership.

Recommendation 7: Conduct the free-ridership study closer to the decision-making process. This may help ensure we can talk with the decision-maker to answer questions regarding the decision to do the project through the program. By surveying customers closer to when the decision was made, they should be more likely to remember the factors that went into the decision. Surveys could be conducted on a rolling basis (i.e., quarterly) with those projects where incentives have been paid. Web surveys could be utilized if the project team collects the email address and contact details (name, address, and phone) of the decision-maker at the organization where the equipment was installed.

While customers are more likely to recall the decision process, not enough time will have passed to allow customers to install additional equipment because of the program; therefore, the program may not see any spillover. The evaluation team may consider conducting a separate spillover study, if deemed necessary, to capture any spillover from participating customers.

Conclusion 8: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two calculators: Classic Custom and Custom-to-Go, which recently changed. The calculators were transitioned from Excel-based to an online tool. Indications are customers are having difficulty adjusting to the new format. One-third of customer respondents reported using the Custom-to-Go calculator.

Recommendation 8: Monitor how customers and contractors use the calculators and request feedback for any specific changes that users request. Ensure any instructions associated with the calculator are clear to assist customers in entering or completing the necessary information. Coordinate any instruction documents used by Duke Energy staff to compile a comprehensive document.

Conclusion 9: Duke Energy staff report it typically takes between three to four weeks to review applications, faster than the four to six weeks the program indicates, which has resulted in reduced use of the Fast Track option. Participant feedback supports this, with high satisfaction reported for the application process. Contractors felt that the amount of paperwork they needed to submit was an area that the program could improve. Four contractors mentioned how the custom application was too complicated, and they would instead apply for incentives through the prescriptive program and have more prescriptive incentive options.

Recommendation 9a: Continue to monitor the time it takes to review applications to maintain the expedient process Duke Energy has in place for custom measures.

Recommendation 9b: Monitor the equipment submitted for custom incentives and direct prescriptive measures to the prescriptive program for an easier application process.

Conclusion 10: A relatively new aspect to the program introduced in 2019 was an online application portal. The third-party vendors appreciate the online application portal, making tracking applications, preapproval, and incentive status easier. Still, a couple of the vendors said it does not reduce the complexity of the Custom application itself. Customers were only asked

OFFICIAL COPY
Mar 07 2023

about their awareness of the portal, where one-third of customer respondents indicated they were aware.

Recommendation 10: Continue to market the online application portal to customers and contractors interested in the program. The online portal may help streamline costs and improve consistent application submittal with the necessary information.

Conclusion 11: The Duke team has an efficient and effective process for reviewing applications for preapproval to focus on eligible but not already committed projects. They offer both application and calculation assistance that provides third-party aid to customers and trade allies if needed for a fee. As part of the application, questions are included to identify projects where the customer has already identified or purchased program-qualifying equipment. The questions on the application are a great tool to use in talking with customers about their projects and plans to increase the scope and efficiency of projects. As applications are flagged, the program team can encourage customers to revise the scope to implement more than otherwise.

Recommendation 11a: Continue to discuss project scope with customers who may have already committed to a project based on question E[2] of the application. This question identifies customers who have already identified, purchased, or committed to a project or building.

Recommendation 11b: Update question G on the application to 1) require customers to answer the question and 2) revise the wording to allow more response options to be presented. By requiring customers to answer the question, the project team will better understand the type of equipment customers are selecting and if the program assistance is responsible for the project. The response to this question can provide insight into the potential free-ridership of the project. The evaluation team recommends updating the question text to the following:

> G. Without the program assistance and incentive, you would…
>
> - ❑ Purchase and install the same high efficiency equipment
> - ❑ Purchase less of the high efficiency equipment
> - ❑ Purchase the high efficiency equipment at a later date
> - ❑ Purchase standard / code minimum efficiency
> - ❑ Neither purchase nor install any part of the project

The project team can then use this question to flag applications and follow-up with customers to discuss the following: a) Would they consider more efficient equipment or more fixtures? b) How did they select the efficiency of the equipment on the application? c) Does the company have policies that encourage or require purchasing higher efficiency equipment, reducing GHGs or meeting sustainability goals? Answers to these questions will allow Duke Energy staff to determine if the project is a good candidate for an incentive and help further manage free-ridership.

The program team should carefully balance the need to minimize free-ridership with maintaining participation levels and subsequent customer satisfaction. The objective of this follow-up should

[2] Question E: Have you made any commitment to your project (signed purchase order/contract, ordered equipment, started construction)

OFFICIAL COPY
Mar 07 2023

not be to eliminate free-ridership from the program but to manage how much free-ridership is in the program. Follow-up will also optimize net savings and better understand how the program can encourage customers to achieve more savings than they would achieve on their own.

Recommendation 11c: Document changes customers make to projects from discussions with Duke Energy staff. While customers may feel that they were planning on high-efficiency equipment, conversations with Duke Energy staff can cause them to adjust their plans. The evaluation team can use details from documentation of these discussions to inform how intention is calculated, affecting the NTG score for that customer. Documentation should include the date of the conversation, original technology or efficiency plans, and new technology or efficiency plans.

Conclusion 12: The environment in the Carolinas allows customers to opt into the energy-efficiency programs for one year in DEC and three years in DEP. With customers having the option when to choose to contribute to energy efficiency programs, customers may be selective in deciding when to contribute and not. This option may impact free-ridership for those customers.

Recommendation 12: Continue to check opt-in/out status with the customer applications to identify customers doing projects to get the incentive. These discussions will allow Duke Energy staff to determine better if the project is a good candidate for an incentive.

Conclusion 13: Transformation in equipment markets drives changes to what should be considered the appropriate baseline. Additionally, program influence and/or advances in technology can shift market baselines (e.g., LEDs and new construction). As the program matures and technologies change, baselines will change as well. The evaluation team found that some of the equipment incentivized through the program could be considered close to the market baseline equipment. Incentivizing LED lighting in high end new construction buildings has the potential for high free ridership since LED technology is becoming the market baseline in these applications. The program team should continue to monitor equipment baselines and adjust them accordingly.

Recommendation 13a: Consider additional application approval criteria, if feasible. These criteria could include a question on the application to identify customers' current ROI threshold for internal project approval. Another question to consider adding to the application or in discussions with customers would be if there are other benefits the company will gain (e.g., avoided O&M costs, better reliability, faster production).

Recommendation 13b: Research market baselines and adjust project baselines and measure savings as needed.

Recommendation 13c: Identify measures replacing equipment at the end of useful service life (EUSL) and assess ROI accordingly. Other questions the program team can ask customers in the discussion include the following:

- Does the company have a preventative maintenance program? If so, when is the equipment scheduled to be replaced?
- How much remaining useful life does the existing equipment have?

OFFICIAL COPY
Mar 07 2023

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 in the Duke Energy Carolinas (DEC) and Duke Energy Progress (DEP) service territories to enhance their ability to adopt and install cost-effective electrical energy efficiency projects. Customers can opt-in to the energy efficiency programs at different rates in the Carolinas territory. Historically, DEC was a one-year opt-in period for the calendar year, and customers have a window to opt-in and opt-out. DEP customers could opt-in at any time. When customers received an incentive, they were considered opted in for three years.

The Program is designed to meet the needs of Duke Energy's (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. As part of the preapproval process, the Duke Energy team conducts thorough reviews of applications, rejecting applications that do not meet the program requirements.

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 applications forms are located on the company's website under the Smart $aver® Incentives (Business and Large Business tabs). The application forms are offered in Microsoft Word (doc) and Adobe (pdf) format with the designated worksheet in Microsoft Excel format for projects saving more than 700,000 kWh annually. Customers can utilize provided calculation tools (Custom-to-Go, now Smart $aver Tools) for projects savings less than 700,000 kWh annually or submit 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. The custom incentive application (doc or pdf) is 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)

OFFICIAL COPY

Mar 07 2023

- 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, now Smart $aver Tools (<700,000 kWh and applicable Custom-to-Go calculator)

- Lighting
- HVAC
- Compressed Air
- Fan
- Pump

The Company contracts with Alternative Energy Systems Consulting (AESC) to perform the technical review of applications. Duke Energy contractors process applications as well as train and provide technical support to the Trade Ally (TA) network. All other analysis is performed internally at Duke Energy, including DSMore runs for every custom measure that is recorded by the program to ensure the project's cost effectiveness prior to implementation.

2.1.1 Participation Summary – DEC

Table 2-1 summarizes program participation and reported energy savings for the full evaluation period of January 2018 through December 2019. There was a total of 529 projects completed during the evaluation period. For the purposes of this report a project is defined as a unique enrollment ID. These 529 projects collectively accounted for a total of 780 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., Speedway / Super America).

OFFICIAL COPY
Mar 07 2023

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

Category & Strata		Database Line Items		Projects		Reported Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go Gross kWh	Classic Custom Gross kWh
Lighting	Small (<360 MWh)	157	393	95	264	8,639,906	16,467,312
	Large (≥360 MWh)	35	59	20	38	12,811,928	28,935,421
Non-lighting	Small (<537 MWh)	32	77	28	71	4,852,361	7,580,895
	Large (≥537 MWh)	3	24	3	10	1,789,327	19,317,482
Total		**227**	**553**	**146**	**383**	**28,093,521**	**72,301,110**
Grand Total		**780**		**529**		**100,394,631**	

Table 2-2 outlines the reported summer and winter demand (kW) for the evaluation period.

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

Category & Strata		Projects		Reported Summer Demand (kW) Savings		Reported Winter Demand (kW) Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go	Classic
Lighting	Small (<360 MWh)	95	264	1,650.0	2,462.0	1,315.1	2,313.4
	Large (≥360 MWh)	20	38	2,678.0	4,431.0	1,754.2	4,144.6
Non-lighting	Small (<537 MWh)	28	71	336.7	1,744.6	532.7	1,224.8
	Large (≥537 MWh)	3	10	33.9	3,595.0	52.4	2,920.1
Total		**146**	**383**	**4,698.6**	**12,232.6**	**3,654.4**	**10,602.9**
Grand Total		**529**		**16,931.2**		**14,257.3**	

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.

OFFICIAL COPY
Mar 07 2023

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

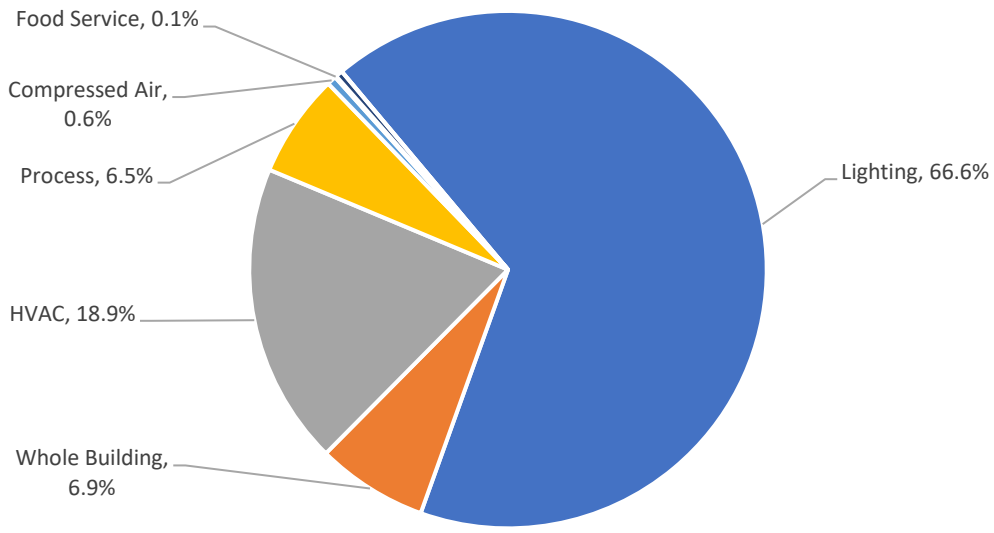
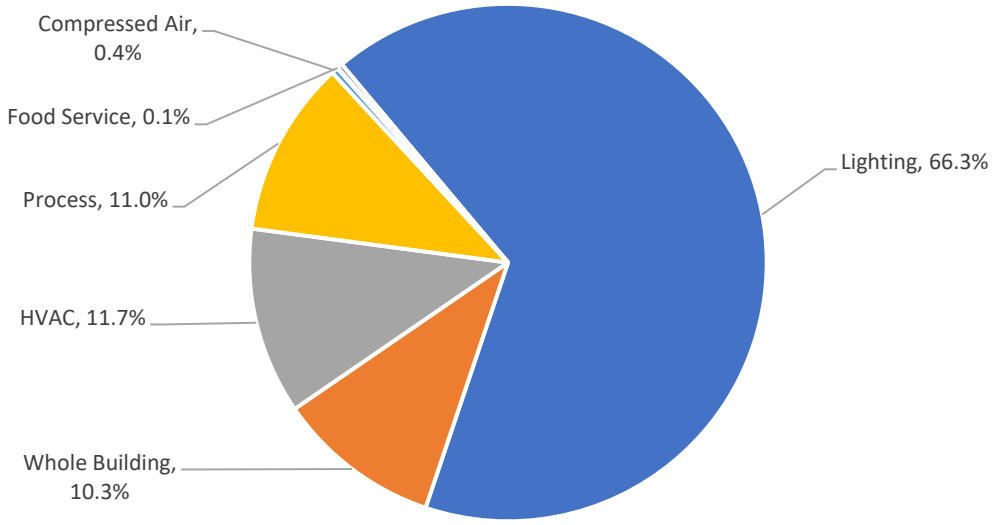
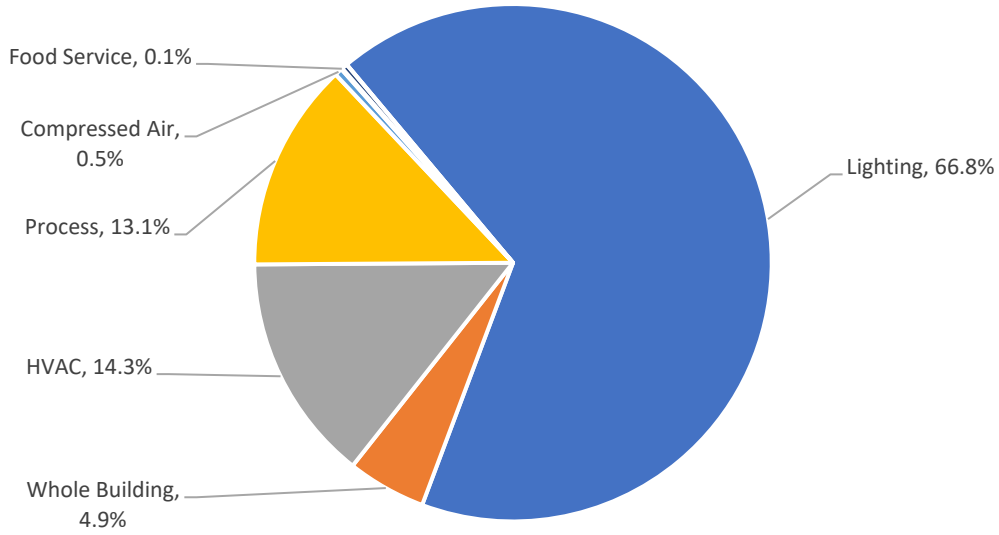


Figure 2-2 Distribution of DEC Reported Summer Demand Savings from NR Custom Projects by Technology



OFFICIAL COPY
Mar 07 2023

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



2.1.2 Participation Summary – DEP

Table 2-3 summarizes program participation and reported energy savings for the full evaluation period of January 2018 through December 2019. There was a total of 292 projects completed during the evaluation period. For the purposes of this report a project is defined as a unique enrollment ID. These 292 projects collectively accounted for a total of 407 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., Speedway / Super America).

OFFICIAL COPY
Mar 07 2023

Table 2-3 DEP NR Custom Program Participation and Reported Energy Summary

Category & Strata		Database Line Items		Projects		Reported Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go Gross kWh	Classic Custom Gross kWh
Lighting	Small (<123 MWh)	92	210	72	139	1,588,705	4,713,008
	Large (≥123 MWh)	28	26	9	24	2,811,286	7,666,864
Non-lighting	Small (<258 MWh)	5	33	5	30	589,553	3,027,675
	Large (≥258 MWh)	-	13	-	13	-	6,371,065
Total		**125**	**282**	**86**	**206**	**4,989,544**	**21,778,612**
Grand Total		**407**		**292**		**26,768,156**	

Table 2-4 outlines the reported summer and winter demand (kW) for the evaluation period.

Table 2-4 DEP NR Custom Program Reported Demand Savings Summary

Category & Strata		Projects		Reported Summer Demand (kW) Savings		Reported Winter Demand (kW) Savings	
		Custom-To-Go	Classic	Custom-To-Go	Classic	Custom-To-Go	Classic
Lighting	Small (<123 MWh)	72	139	391.0	828.4	266.1	436.6
	Large (≥123 MWh)	9	24	529.3	919.1	535.2	1,146.3
Non-lighting	Small (<258 MWh)	5	30	30.2	853.6	48.6	497.4
	Large (≥258 MWh)	0	13	-	1,727.9	-	1,280.5
Total		**86**	**206**	**950.5**	**4,329.0**	**850.0**	**3,360.8**
Grand Total		**292**		**5,279.5**		**4,210.8**	

Figure 2-4, Figure 2-5, and Figure 2-6 summarize the distribution of reported energy (kWh) and demand (kW) savings at the program level by technology category.

OFFICIAL COPY
Mar 07 2023

Figure 2-4 Distribution of DEP Reported Energy Savings from NR Custom Program Projects by Technology

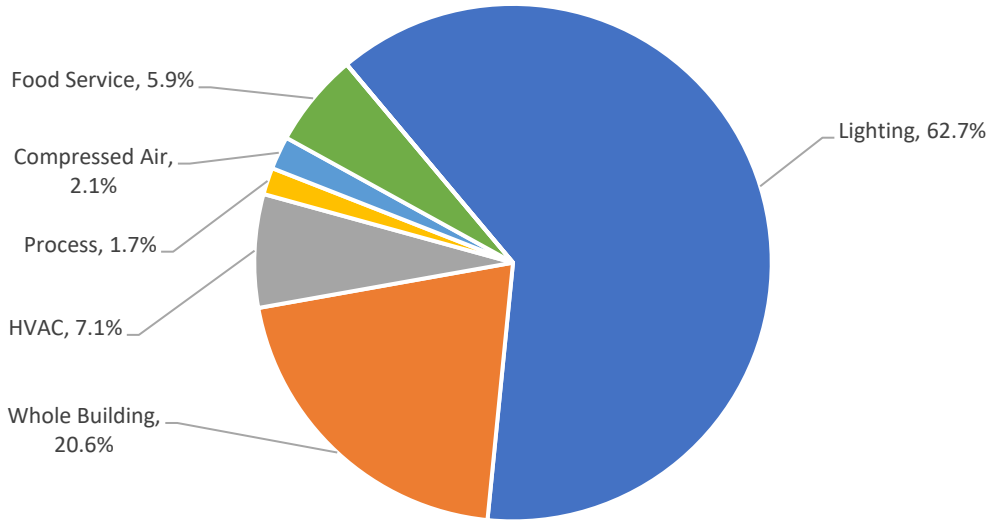
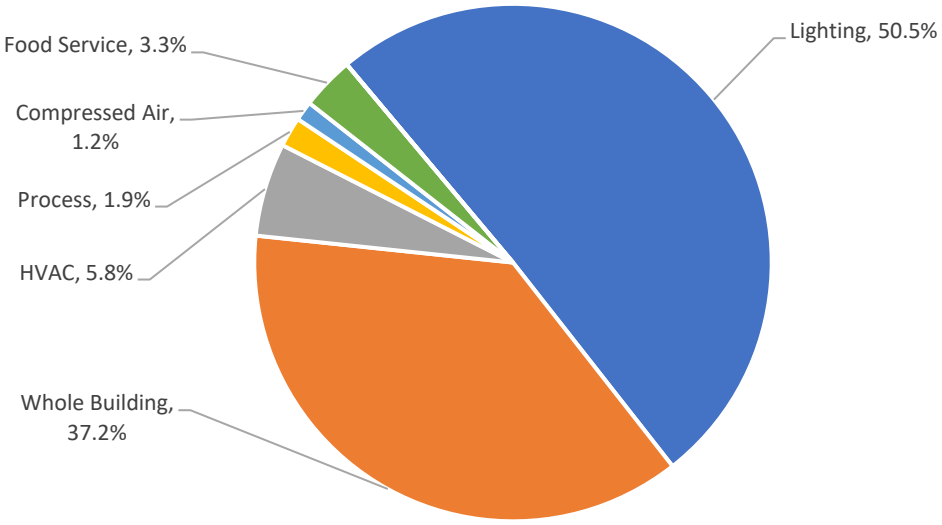
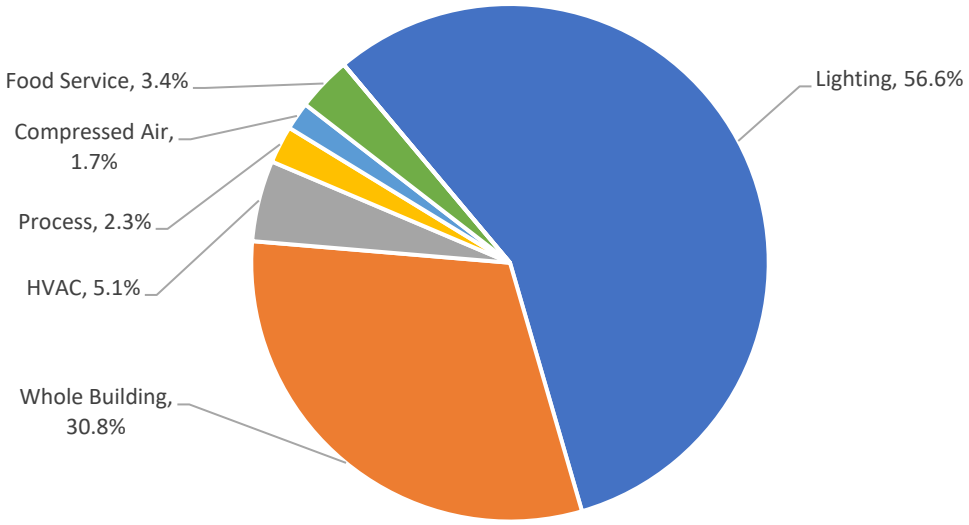


Figure 2-5 Distribution of DEP Reported Summer Demand Savings from NR Custom Projects by Technology



OFFICIAL COPY
Mar 07 2023

Figure 2-6 Distribution of DEP Reported Winter Demand Savings (kW) from NR Custom Projects by Technology



OFFICIAL COPY
Mar 07 2023

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. 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 the customer and contractor perspective.
- Determine spillover effects from the customer and contractor perspective.
- Consider and verify measure installation vintage aligned with measure baseline definitions, i.e. early replacement, burnout on failure, etc.

3.2 Net Impact

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

Free-ridership estimates what proportion of the program's savings would have happened in the absence of the program. Free-ridership considers the customers' plans before engaging in the program and the various influences the program can have on the customer, such as incentives, the application process, and other interactions with the program staff, contractors, and marketing materials.

Spillover estimates additional energy savings for efficiency projects completed without receiving a program incentive but were influenced by the program in some other way. Spillover was captured from participants (participant spillover) and contractors (for nonparticipant spillover).

Net program results are calculated through a net-to-gross ratio, as shown in Equation 1.

Equation 1 Net Program Savings

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

[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.

OFFICIAL COPY
Mar 07 2023

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? What role do Duke Energy account representatives (i.e., account executives, business energy advisors, energy efficiency engineers and trade ally outreach representatives) play in helping customers identify and complete projects? 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?[4] 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] Duke Energy determined the evaluation did not need to include data collection with drop-out customers.

OFFICIAL COPY
Mar 07 2023

4 Impact Evaluation

4.1 Impact Methodology

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 used to conduct the evaluation measurement and verification (EM&V) activities and to meet the goals for this evaluation include measure level data collection, 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 January 2018 through December 2019. A variety of techniques were used to develop independent assessments of gross and net energy savings for each sampled project. In order to estimate gross energy savings, all sampled custom projects received a desk review; project specific data collection, measurement and/or verification; and custom data analysis of savings. Data collection involved a combination of several activities, including: verifying equipment installation and operation; interviewing site contacts; and collecting building automation system/energy management system (BAS/EMS) data. The level of rigor conducted for the data analysis reflected the level of project documentation available prior to the evaluation (such as the data collected from existing metering and monitoring equipment), the uncertainty of the savings estimate, the magnitude of the project savings and the ability to collect additional data from the program participants. 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 Flow Diagram of Impact Evaluation Activities

OFFICIAL COPY
Mar 07 2023

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

Sample: Conduct review of NR Custom Program participant database and draw representative sample of projects.

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 data collection for the analysis of savings. Nothing would be formally scheduled during this call.

Document Review: Review all project documentation available for those sites successfully recruited.

Develop SSMVP: Develop a plan that provides a general overview of the implemented measures, reported benefits and costs, proposed level of rigor, measurement & verification (M&V) equipment, and key data to be gathered. The Duke team reviews and approves all 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.

Data Collection: Verify equipment installation and operation; interview site contacts; and collect building automation system/energy management system (BAS/EMS) data.

Analysis: Estimate gross verified energy and demand savings for sampled measures and projects using data collected.

Measurement & Verification 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 the M&V report. The Duke team reviews and approves all M&V reports. 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.

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.

The following sections provide more details on the specific considerations made and methods used for the major evaluation activities.

4.1.1 Sampling

The gross and net verified savings estimates presented in this report were determined through the observation of key measure parameters among a sample of projects from the program population. A census evaluation would have involved surveying, measuring, or otherwise evaluating the entire population of projects. Although a census approach would eliminate any sampling uncertainty, when used effectively, the results from a sample of projects can be extrapolated to provide a reasonable and cost-effective estimate of the population parameters.

OFFICIAL COPY
Mar 07 2023

The most important sampling objective was representativeness – that is projects selected in the evaluation sample were representative of the population and would produce unbiased estimates of population parameters. To obtain a representative sample, the characteristics of the program population must be reviewed and understood. A participation database extract was requested and received that contained only projects with a Vendor Update Timestamp between January 2018 and December 2019. This database extract represented the program population for program years 2018 and 2019. The program participation database informed many of the evaluation activities including sample design, project-level savings review, and estimating program-level gross verified savings.

4.1.1.1 Stratification

The evaluation team used sample stratification with ratio estimation techniques for the NR Custom Program. Stratification is a departure from simple random sampling, where each sampling unit (customer/project/incentive/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 sample selection process.

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

- Increased precision of the within-stratum variability was expected to be small compared to the variability of the population. 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 projects within a particular stratum were verified.

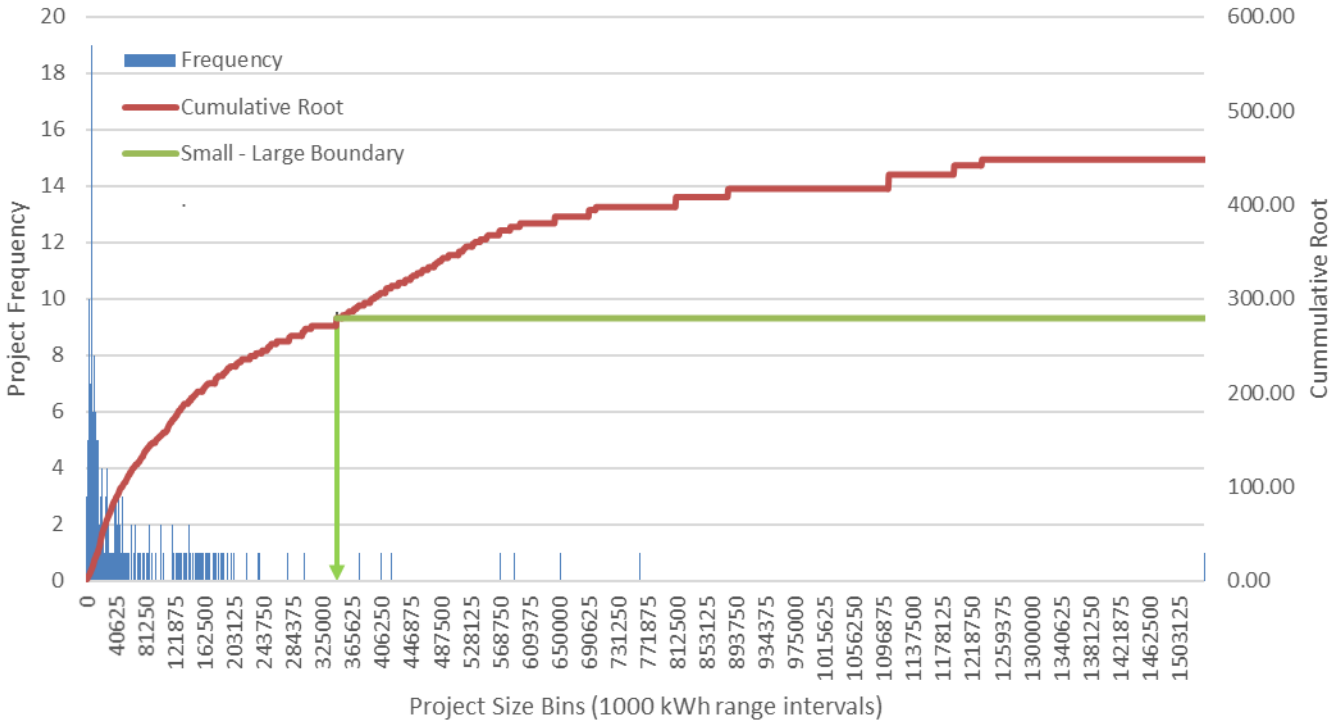
Two different characteristics of a project were used to define which strata it would be included in, the type of measures implemented (lighting vs. non-lighting) and the relative amount of reported energy savings. A project is defined as all lighting or non-lighting measures under the same enrollment number at a single address. If a project had both lighting and non-lighting measures then the lighting measures would make up one project in the lighting strata and the non-lighting measures would make up a second project in the non-lighting strata.

To sub-stratify the lighting and non-lighting strata by the amount of reported energy savings, the evaluation team calculated the savings for each project within the lighting and non-lighting strata and studied the distribution of the project sizes. The Dalenius-Hodges method was used to define the optimal boundary between a “small” project and a “large” project. This method is the most common method of boundary determination for stratification by project size. An illustration of this method is presented in Figure 4-2 for the DEC Lighting strata.

The method uses the number of projects in specified project-size bins (frequency) along with the number of empty bins between each occupied bin (length) to assess the distribution of total strata savings. The cumulative square root of the product of the frequency and length is then used to determine the optimal strata boundaries. For the NR Custom evaluation, two sub-strata (small and large) are needed so the mid-point of the cumulative indicated which project size (kWh) would define the boundary between a small project and a large lighting project.

OFFICIAL COPY
Mar 07 2023

Figure 4-2: Dalenius-Hodges Boundary Design for DEC 2018-2019 Lighting Projects



Using this method, the evaluation team determined a savings threshold of 360 MWh for large lighting projects and 537MWh for large Non-Lighting projects. All projects with savings less than these thresholds would be considered small projects.

4.1.1.2 Targeted Sample Size – DEC

With the population stratified the impact samples were then drawn randomly from each stratum. The total number of sample projects drawn targeted a 90/10 confidence precision based on the total participation counts for the evaluation period and assuming an error ration (C_v) of 0.5. The distribution of the total sample across the four sub strata was determined using the number of projects in each strata, the amount of savings in each strata and the historical Cv values of the same strata from the 2016 - 2017 NC Custom evaluation. Our stratification approach and targeted sample sizes are summarized in Table 4-1.

OFFICIAL COPY
Mar 07 2023

Table 4-1 NR Custom Stratified Sampling Plan - Targeted

Strata	Population	Pop Reported Savings (kWh)	Targeted Sample Size
L-Small (<360 MWh)	359	5,307,346	24
L-Large (≥360 MWh)	58	12,736,521	9
NL-Small (<537 MWh)	99	4,793,389	12
NL-Large (≥537 MWh)	13	9,411,765	10
Total	**529**	**32,249,021**	**55**

4.1.1.3 Targeted Sample Size – DEP

With the population stratified, the impact samples were then drawn randomly from each stratum. The total number of sample projects drawn targeted a 90/10 confidence precision based on the total participation counts for the evaluation period and assuming an error ration (C_v) of 0.5. The distribution of the total sample across the four sub strata was determined using the number of projects in each strata, the amount of savings in each strata and the historical Cv values of the same strata from the 2016 - 2017 NC Custom evaluation. Our stratification approach and targeted sample sizes are summarized in Table 4-2.

Table 4-2 NR Custom Stratified Sampling Plan - Targeted

Strata	Population	Pop Reported Savings (kWh)	Targeted Sample Size
L-Small (<123 MWh)	211	5,307,346	21
L-Large (≥123 MWh)	33	12,736,521	8
NL-Small (<258 MWh)	35	4,793,389	13
NL-Large (≥258 MWh)	13	9,411,765	7
Total	**292**	**32,249,021**	**49**

4.1.2 Data Collection

Once a sample of projects was selected, the impact team requested detailed project documentation for each project and conducted a review of the information. This information was used to formulate any initial questions about the project that could be answered during the initial communications with the participants.

While reviewing project documentation, the evaluation team also verified 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.

OFFICIAL COPY
Mar 07 2023

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 (monthly billing history)
- Incentive payment request forms
- Email correspondence between members of the program management team and participants

Other documents commonly provided on lighting projects 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 SSMVP for each unique premise. These were developed in order to create a standardized, rigorous process for the verification of project claims. 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 verified and gathered 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 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol

Chapter 14: Chiller Evaluation Protocol

Chapter 15: Commercial New Construction Evaluation Protocol

OFFICIAL COPY
Mar 07 2023

Chapter 18: Variable Frequency Drive Evaluation Protocol

Chapter 19: HVAC Controls (DDC/EMS/BAS) Evaluation Protocol

Chapter 22: Compressed Air Evaluation Protocol

The plans also identified a preferred and one or two alternate analysis approaches (level of rigor) along with the critical data to be gathered for each. Table 4-3 provides a few examples of the data points typically gathered for several of the more commonly encountered ECMs.

OFFICIAL COPY
Mar 07 2023

Table 4-3 Key Data Points Gathered for Commonly Encountered ECMs

Measure Name	Baseline or Retrofit
Interior Lighting Retrofits	Quantity of existing fixtures Fixture type of existing fixtures Quantity of retrofit fixtures Fixture type of retrofit fixtures Existing fixture controls, if any New fixture controls, if any Typical schedule and hours of operation Space set point 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 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.)

OFFICIAL COPY

Mar 07 2023

Once completed, each SSMVP was then submitted to the Duke EM&V Team for review and approval. Upon approval from Duke data collection activities were then scheduled with the participant.

Nexant employed alternative data collection methods during the Covid-19 pandemic to manage the risk of exposure to the virus for the safety of the Duke Energy customers and Nexant staff. These alternative data collection methods were defined as the following three tiers:

4.1.2.1 Tier 1 – In-person Site Visits

A Nexant engineer visited the project site and met with the site contact to review the project and collect data first hand. This allowed the Nexant engineer to take spot measurements, install metering equipment and visually verify the installations. This tier was reserved for projects with a large number variables and higher magnitudes of uncertainty that can be better defined and/or reduced by collecting specific information on-site that would not be available using the other two tiers.

4.1.2.2 Tier 2 – Virtual Site Visits

A virtual site visit used software to connect the site contact's mobile device to the Nexant engineer's computer. This software enabled the Nexant engineer to see live video and audio as the site contact walks through their facility. The Nexant engineer was able to direct the site contact to the specific areas and equipment associated with the efficiency project. The Nexant engineer was able to capture pictures from the participant's mobile device camera and ask questions of the site contact. This tier was used for visually verifying equipment installs over the virtual software and directing the participant to collect specific equipment information (name plate info, counts, BMS schedules, etc) that could be identified and collected with the help of the site contact.

4.1.2.3 Tier 3 – Enhanced Desk Reviews

An enhanced desk review used phone interviews and/or teleconferences (with screen sharing) with the participant or site contact to review the project documentation and collect answers to the Nexant engineer's questions. This tier was used for simple projects that could be verified using project documentation and information collected from the site participant (schedules, fixture counts, run times, etc.)

The choice of which tier is used will be based on many factors including the complexity of the efficiency project, the comfort level of the participant with conducting in-person site visits or the virtual site visit technology.

Engineers verified that measures were appropriately implemented in accordance with the SSMVP developed for the site. Engineers would request 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.

4.1.3 Project Level Analyses

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

OFFICIAL COPY
Mar 07 2023

generating the ex-ante[1] savings estimates, the availability of information, and the extent of interactive effects. An overview of each analysis approach applied is provided in Sections 4.1.3.1 through 4.1.3.3.

4.1.3.1 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.

4.1.3.2 Basic Rigor: Simple Engineer Model (SEM) with Verification Only

This approach is very similar to SEM with On-site Measurement, but without direct measurement of key parameters. This approach is generally applied to measures that are not conducive to direct measurement such as outdoor lighting or building envelope improvements but during this evaluation the restrictions on travel and health guidelines associated with the Covid-19 pandemic limited the evaluation team's ability to conduct many on-site activities. To adapt to these limitations the evaluation team used virtual site visit technology to allow engineers to directly observe the ECMs while being virtually escorted through the facilities by a site contact.

4.1.3.3 Enhanced Rigor: Billing Analysis

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).

4.1.3.4 Enhanced Rigor: Whole Building Simulation

Consistent with IPMVP Option D (Calibrated Simulation), this analysis approach was used and is dependent on the evaluation team being able to obtain a complete set of the electronic files for the building energy simulation model developed by the Willdan Group, Inc. to estimate ex-ante energy savings and verification of the as-built conditions.

The evaluation process entailed reviewing the inputs of the model(s) to verify baseline and post-installation conditions are specified correctly and modeled consumption was within ASHRAE criteria. The evaluation team leveraged any available post trend data from the building control system (BAS) or utility consumption data to inform and verify the calibration of the model.

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

OFFICIAL COPY
Mar 07 2023

Nexant adhered to guidelines set forth in the Department of Energy Uniform Methods Project Protocols for Commercial New Construction (Chapter 15) when conducting this analysis.

4.1.3.5 Peak Period Definition

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

Table 4-4 Definition of Peak Demand Periods

	Summer	Winter
Month	July	January
Hour	4pm – 5pm	7am – 8am

4.1.3.6 Interactive Effects

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.

The net change in energy use for a building should be quantified and attributed to the project as an increase or decrease in savings. Calculating this net change for lighting projects depends on several factors which include:

- the type and efficiency of heating and cooling equipment,
- the number of hours the lights operate
- the physical configuration of fixtures being replaced and installed, and
- the wattages of the fixture being replaced and installed.

To calculate the net interactive savings the evaluation team used a method consistent with the algorithms outlined in Chapter 2 of the Uniform Methods Project (Commercial and Industrial Lighting Evaluation Protocol). This method defines interactive cooling and heating energy savings for interior lighting and is detailed in Equation 2.

Equation 2 Interactive Cooling Energy Savings for Interior Lighting

OFFICIAL COPY
Mar 07 2023

$$Interactive\ kWh\ Savings_{Cooling} = kWh_{Lighting\ Savings} \times IF_{kWh,Cooling}$$

Where:

kWh $_{Lighting\ Savings}$ = *savings associated with the lighting measure*

IF $_{kWh,\ Cooling}$ = *Interactive cooling factor*

The interactive cooling factor is the ratio of cooling energy reduction per unit of lighting energy reduction. This is a dimensionless ratio calculated using Equation 3.

Equation 3 Interactive Cooling Factor

$$IF_{kWh,Cooling} = \frac{(SHG_{base} - SHG_{efficient})}{1000 \times EER}$$

Where:

SHG $_{base}$ = *sensible heat gain associated with the operation of the base lighting equipment during the cooling season*

SHG $_{efficient}$ = *sensible heat gain associated with the operation of the efficient lighting equipment during the cooling season*

EER = *Energy Efficiency Ratio of the facilities HVAC equipment*

The sensible heat gain represents the thermal energy added to the conditioned space by the lights. It is calculated using parameters that are specific to the lighting load, hours of use, and the fixture's space fraction. The space fraction accounts for how much of thermal energy from the lamp enters the conditioned space.

Equations to calculate the interactive heating penalty, the additional heating required due to more efficient lighting, are very similar to Equation 2 and Equation 3. Instead of the EER value a Coefficient of Performance (COP) is used.

4.1.4 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 as well as a section summarizing the data collection activities, 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 104 individual M&V Reports developed as part of this evaluation were provided under separate cover.

4.1.5 Program Level Gross Verified Estimation

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

OFFICIAL COPY
Mar 07 2023

savings estimates within the sample is representative of the program as a whole. This ratio is referred to as the realization rate and is calculated using Equation 4.

Equation 4 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.

4.1.5.1 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 5 provides the formula for estimating error ratio.

Equation 5 Error Ratio

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

Equation 6 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 6 Required Sample Size

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

Where:

n_0 = *Required sample size before adjusting for a finite population*

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

P = *Desired relative precision*

OFFICIAL COPY
Mar 07 2023

The sample size formula shown in Equation 6 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, a finite population correction 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. Equation 7 calculates the required sample size for a finite population.

Equation 7 Finite Population Correction

$$n^* = \frac{N * n_0}{N + n_0}$$

Where:

n^* = *Required sample size for a finite population*

N = *Size of the population*

n_0 = *Required sample size before adjusting for a finite population*

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 8 shows the formula used to calculate the margin of error for a parameter estimate.

Equation 8 Error Bound of the Savings Estimate

$$Error\ Bound = SE * z$$

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

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 constant 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 is shown in Equation 9 and is how actual strata and program level relative precision achieved is calculated.

Equation 9 Relative Precision of the Savings Estimate

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

OFFICIAL COPY
Mar 07 2023

4.2 Impact Evaluation Analysis and Findings – DEC

4.2.1 DEC Achieved Sample Size

As mentioned in Section 4.1.1.2, the initial impact sample sizes targeted a 90/10 confidence precision based on the project counts assuming an error ration (C_v) of 0.5 and the distribution of the total sample across the four sub strata was determined using the number of projects in each strata, the amount of savings in each strata and the historical Cv values of the same strata from the 2016 - 2017 NR Custom evaluation. Some participants refused to cooperate with the evaluation activities, so the evaluation team was only able to complete analyses on 12 of the 16 NL-Small sample projects. Our achieved sample sizes are summarized in Table 4-5.

Table 4-5 DEC NR Custom Stratified Sampling - Achieved

Strata	Initial Population	Initial Target Sample Size	Adjusted Population	Adjusted Target	Achieved Sample Size
L-Small (<360 MWh)	369	23	359	23	24
L-Large (≥360 MWh)	59	9	58	10	9
NL-Small (<537 MWh)	101	16	99	16	12
NL-Large (≥537 MWh)	13	10	13	9	10
Total	**542**	**58**	**529**	**58**	**55**

The evaluation team was able to achieve stratum-level sample targets for L-Small, L-Large and NL-Large strata. As will be shown in the next section, the evaluation sample was still able to achieve the targeted 10% precision at the 90% confidence level for energy since the Cv of the evaluated projects was lower than the Cv values used to determine the target sample size.

4.2.2 DEC Gross Verified Impacts

Table 4-6, Table 4-7, and Table 4-8 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.

OFFICIAL COPY
Mar 07 2023

Table 4-6 DEC Gross Verified Energy Savings (kWh) by Stratum

Stratum	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<360 MWh)	25,107,218	26,104,266	103.97%	4.3%
L-Large (≥360 MWh)	41,747,348	41,723,000	99.94%	7.9%
NL-Small (<537 MWh)	12,433,255	11,544,202	92.85%	10.2%
NL-Large (≥537 MWh)	21,106,809	20,350,706	96.42%	3.0%
Program Total	**100,394,630**	**99,722,174**	**97.62%**	**4.3%**

Table 4-7 DEC Gross Verified Summer Peak Demand Savings (kW) by Stratum

Stratum	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<360 MWh)	4,112	3,497	85.04%	27.4%
L-Large (≥360 MWh)	7,109	6,806	95.74%	6.8%
NL-Small (<537 MWh)	2,081	1,610	77.37%	24.0%
NL-Large (≥537 MWh)	3,629	3,706	102.13%	4.7%
Program Total	**16,931**	**15,620**	**99.26%**	**6.8%**

Table 4-8 DEC Gross Verified Winter Peak Demand Savings (kW) by Stratum

Stratum	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<360 MWh)	3,628	3,051	84.08%	40.9%
L-Large (≥360 MWh)	5,899	5,735	97.22%	6.8%
NL-Small (<537 MWh)	1,757	2,211	125.81%	31.9%
NL-Large (≥537 MWh)	2,973	3,481	117.10%	12.5%
Program Total	**14,257**	**14,478**	**110.53%**	**17.0%**

OFFICIAL COPY
Mar 07 2023

The program achieved an overall energy realization rate of 97.62%. Generally, the overall energy realization rate was a result of the verified lighting savings, which achieved more energy savings than reported, balancing out the verified non-lighting savings, which achieved slightly less energy savings than reported. Summer peak and winter peak demand savings are 99.26% and 110.53%, respectively. The following sections provide more details and insights into the contributing factors of each strata's results.

4.2.2.1 DEC Small Lighting Projects

Twenty-four Lighting-Small projects were evaluated from the 2018-2019 NR Custom population. The Lighting-Small sample projects achieved 103.97% verified energy savings, 85.04% verified summer peak demand savings and 84.08% verified winter peak demand savings. The inclusion of interactive effects into the verified savings was the main contributing factor to the higher energy realization rates. Differences between the reported hours of use (HOU) and the verified HOU were found in the sample projects. These differences in HOU resulted in both higher than reported verified savings and lower than reported verified savings depending on if the verified HOU were higher or lower than the reported HOU.

Four of the L-Small projects were found to have used a T12 baseline for the reported savings calculation. The 2016-2017 NR Custom evaluation report recommended a T8 baseline standard based on participant and trade ally survey data, a determination that a T8 baseline had minimal impact and current industry standards. A T8 baseline was used to calculate the verified savings for these four projects. This resulted in lower than reported verified savings for these four sample projects.

4.2.2.2 DEC Large Lighting Projects

Nine Lighting-Large projects were evaluated from the 2018-2019 NR Custom population. The Lighting-Large sample projects achieved 99.94% verified energy savings, 95.74% verified summer peak demand savings and 97.22% verified winter peak demand savings. Like the Lighting-Small stratum, the inclusion of interactive effects resulted in higher verified energy savings in three of the nine projects. Some differences between the reported hours of use (HOU) and the verified HOU with the participants were found but resulted in minor adjustments. One project was found to have used a T12 baseline for the reported savings calculation and the T8 baseline was used to calculate the verified savings for this project. This resulted in significantly lower verified savings for this project.

4.2.2.3 DEC Small Non-lighting Projects

Twelve Non-lighting-Small projects were evaluated from the 2018-2019 NR Custom population. The Non-Lighting-Small sample projects achieved 92.85% verified energy savings, 77.37% verified summer peak demand savings and 125.81% verified winter peak demand savings.

Multiple projects contributed to lower than reported verified savings. There were five new construction project which had a model that was not calibrated to the building's actual utility bill consumption. The evaluation team made changes to the model inputs to calibrate the model and recalculate the verified savings. Four of these new construction projects resulted in lower than reported verified savings and one resulted in higher than reported verified savings. Three walk-in freezer projects had lower than reported electric defrost kW rating values which resulted in verified energy savings of approximately 43% of reported savings. Also, one HVAC upgrade

OFFICIAL COPY
Mar 07 2023

project had lower verified equipment efficiency values, lower set points and a disabled economizer.

4.2.2.4 DEC Large Non-lighting Projects

The Non-lighting-Large sample projects achieved 96.42% verified energy savings, 102.13% verified summer peak demand savings and 117.10% verified winter peak demand savings. Ten Non-lighting-Large projects were evaluated from the 2018-2019 NR Custom population.

Seven of the ten project in this stratum achieved realization rate of 100% of greater. The largest project in the stratum was a new construction project. The model used to calculate the reported savings was found to be out of calibration with utility billing records. The calibration of the model resulted in lower than reported verified savings.

Two HVAC upgrade projects showed lower than reported verified savings. These projects used HVAC models to calculate reported savings. The documentation of these models did not provide detailed calculations or assumptions, so it was difficult to determine the exact cause of the higher reported energy savings estimates. In one case, the application estimated a 70% reduction in the facility's annual consumption. This was based on an estimated consumption of the HVAC equipment that was large then the total historical consumption of the building. A utility billing analysis was used to verify a 40% reduction in the facility's consumption. In the other case, differences in parameters (schedule, CFM, Fan hp, setpoints) between the reported values and verified values were found.

4.2.3 DEC Custom-to-Go vs. Custom Classic

This section provides a comparison of projects that used the Custom-to-Go worksheets and those that used the Classic Custom (Classic) worksheets. The following criteria determines which worksheet is used for NR Custom projects:

- Non-lighting projects with more than 700,000 annual kWh savings must use the appropriate Classic Custom worksheet.
- All lighting projects as well as other projects with less than 700,000 annual kWh savings may use the optional Custom-to-Go worksheets.

Table 4-9 presents the gross reported energy savings by worksheet and measure type. The majority (72%) of gross reported energy savings are submitted through Classic worksheets.

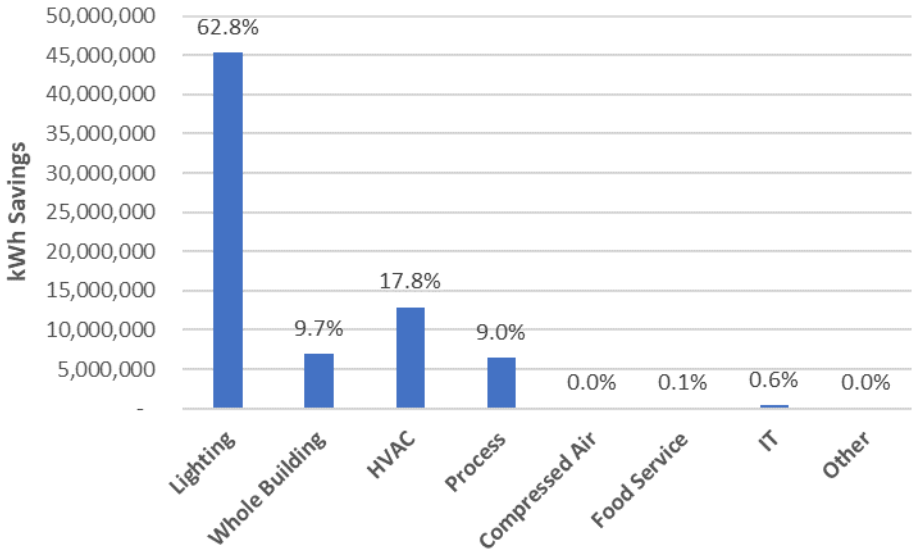
OFFICIAL COPY
Mar 07 2023

Table 4-9 DEC Gross Reported Energy Savings by Worksheet Type

Worksheet Type	Measure Type	Gross Reported Energy Savings (kWh)	Percent of Program
Classic	Lighting	45,402,733	45%
	Non-lighting	26,898,377	27%
Custom-to-Go	Lighting	21,451,833	21%
	Non-lighting	6,641,687	7%
Program Total		**100,394,630**	

Making up 66% of the total program savings, lighting is the one technology category with most savings from both Classic and Custom-to-Go worksheets. Figure 4-3 shows the distribution of gross reported energy savings for classic custom projects broken down by technology category. Figure 4-4 shows the distribution of gross reported energy savings for Custom-to-Go projects. The average reported energy savings of projects using the Classic worksheets is 150,340 kWh for Lighting and 332,079 for Non-lighting. This indicates that most participants are choosing the classic worksheets regardless of the option to use the Custom-to-Go worksheets.

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



OFFICIAL COPY
Mar 07 2023

Figure 4-4 Distribution of DEC Reported Energy Savings for Custom-to-Go Projects by Technology Category

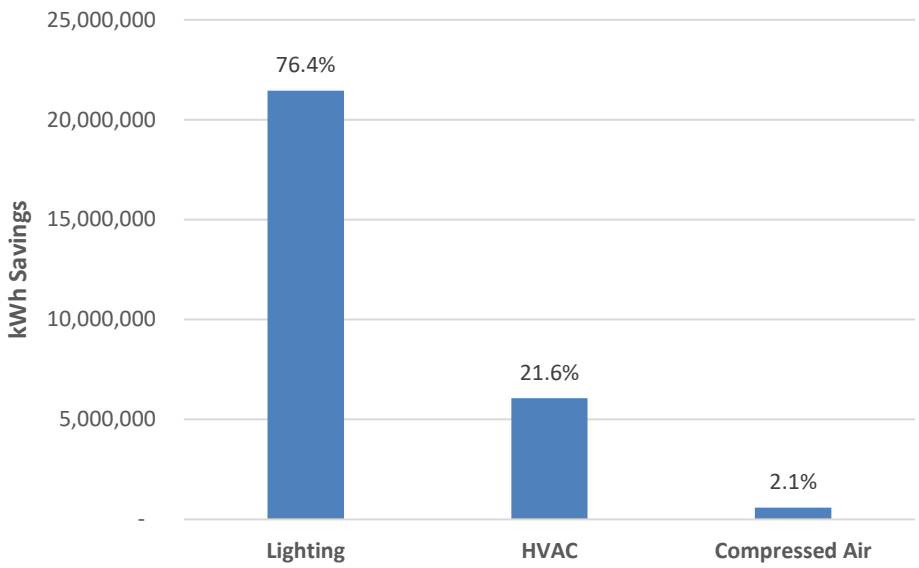


Table 4-10 indicates the reported and verified energy (kWh) savings stratified by technology category (lighting vs. non-lighting) and participation track (Classic vs. Custom-to-Go) for the evaluated sample. The impact evaluation sampling did not stratify for the attribute. These realization rates were not used to estimate the program level verified savings. They are presented here to show any differences between the worksheet types.

Table 4-10 Comparison of Strata-Level Realization Rates – DEC Classic vs. Custom-to-Go

Track	Measure Category	Population	Sample	Sample Reported (kWh)	Sample Verified (kWh)	Realization Rate (%)
Classic	Lighting	302	26	7,314,995	7,386,420	100.98%
	Non-lighting	81	17	16,843,383	16,561,881	98.33%
	Total	**383**	**43**	**24,158,378**	**23,948,302**	**99.13%**
Custom-to-Go	Lighting	115	7	1,486,844	1,468,155	98.74%
	Non-lighting	31	5	2,218,200	1,783,627	80.40%
	Total	**146**	**12**	**3,705,045**	**3,251,782**	**87.77%**

Realization rates for Classic Non-lighting projects (98.33) were higher compared to Custom-to-Go Non-lighting projects (80.40). This is due to a couple of HVAC upgrade projects in the Non-lighting-Large strata showed lower than reported verified savings based on billing analyses approach and differences in HVAC parameters.

OFFICIAL COPY
Mar 07 2023

4.3 Impact Evaluation Analysis and Findings – DEP

4.3.1 DEP Achieved Sample Size

As mentioned in Section 4.1.1.3, the initial impact sample sizes targeted a 90/10 confidence precision based on the project counts assuming an error ration (C_v) of 0.5 and the distribution of the total sample across the four sub strata was determined using the number of projects in each strata, the amount of savings in each strata and the historical Cv values of the same strata from the 2016 - 2017 NR Custom evaluation. Due to the relatively small size of the NL-Small and NL-Large populations and some participants refusing to cooperate with the evaluation activities, the evaluation team was only able to complete analyses on 13 of the 16 NL-Small sample projects and 7 of the 11 NL-Large sample projects. Our achieved sample sizes are summarized in Table 4-11.

Table 4-11 DEP NR Custom Stratified Sampling - Achieved

Strata	Initial Population	Target Sample Size	Achieved Sample Size
L-Small (<123 MWh)	211	21	21
L-Large (≥123 MWh)	33	8	8
NL-Small (<258 MWh)	35	16	13
NL-Large (≥258 MWh)	13	11	7
Total	**292**	**56**	**49**

The evaluation team was able to achieve stratum-level sample targets for both the L-Small and L-Large strata. As will be shown in the next section, the evaluation sample was still able to achieve the targeted 10% precision at the 90% confidence level for energy since the Cv of the evaluated projects was lower than the Cv values used to determine the target sample size.

4.3.2 DEP Gross Verified Impacts

Table 4-12Table 4-6, Table 4-13 and Table 4-14 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.

OFFICIAL COPY
Mar 07 2023

Table 4-12 DEP Gross Verified Energy Savings (kWh) by Stratum

Stratum	Gross Reported Energy Savings (kWh)	Gross Verified Energy Savings (kWh)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<123 MWh)	6,301,713	6,803,085	107.96%	7.7%
L-Large (≥123 MWh)	10,478,150	11,978,543	114.32%	7.4%
NL-Small (<258 MWh)	3,617,228	3,402,256	94.06%	13.6%
NL-Large (≥258 MWh)	6,371,065	5,927,597	93.04%	7.4%
Program Total	**26,768,156**	**28,111,481**	**102.08%**	**5%**

Table 4-13 DEP Gross Verified Summer Peak Demand Savings (kW) by Stratum

Stratum	Gross Reported Summer Demand Savings (kW)	Gross Verified Summer Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<123 MWh)	1,219	1,214	99.53%	13.4%
L-Large (≥123 MWh)	1,448	1,523	105.14%	3.9%
NL-Small (<258 MWh)	884	634	71.76%	25.0%
NL-Large (≥258 MWh)	1,728	1,583	91.61%	7.2%
Program Total	**5,279**	**4,954**	**91.76%**	**6.3%**

Table 4-14 DEP Gross Verified Winter Peak Demand Savings (kW) by Stratum

Stratum	Gross Reported Winter Demand Savings (kW)	Gross Verified Winter Demand Savings (kW)	Realization Rate (%)	Relative Precision @ 90% Confidence
L-Small (<123 MWh)	703	1,012	143.96%	34.1%
L-Large (≥123 MWh)	1,682	1,776	105.63%	3.3%
NL-Small (<258 MWh)	546	772	141.39%	66.8%
NL-Large (≥258 MWh)	1,281	1,193	93.19%	9.7%
Program Total	**4,211**	**4,753**	**105.07%**	**12.8%**

OFFICIAL COPY
Mar 07 2023

The program achieved an overall energy realization rate of 102.08%. Generally, the overall energy realization rate was a result of the verified lighting savings, which achieved more energy savings than reported, balancing out the verified non-lighting savings, which achieved less energy savings than reported. Summer peak and winter peak demand savings are 91.76% and 105.07% respectively. The following sections provide more details and insights into the contributing factors of each strata's results.

4.3.2.1 DEP Small Lighting Projects

Twenty-one Lighting-Small projects were evaluated from the 2018-2019 NR Custom population. The Lighting-Small sample projects achieved 107.96% verified energy savings, 91.76% verified summer peak demand savings and 105.07% verified winter peak demand savings. The inclusion of interactive effects into the verified savings was the main contributing factor to the higher realization rates. Differences between the reported hours of use (HOU) and the verified HOU were found in the sample projects. These differences in HOU mostly resulted in minor reductions in savings that were less than the interactive effects savings, so the overall project realization rates was still higher than reported. There was one project however that had significant differences in verified HOU. These differences were due to the reported HOU not considering differences in weekend and holiday hours.

One of the Lighting-Small projects were found to have used a T12 baseline for the reported savings calculation. The 2016-2017 NR Custom evaluation report recommended a T8 baseline standard based on participant and trade ally survey data, a determination that a T8 baseline had minimal impact and current industry standards. A T8 baseline was used to calculate the verified savings for these four projects. This resulted in lower than reported verified savings for this sample project.

4.3.2.2 DEP Large Lighting Projects

Eight Lighting-Large projects were evaluated from the 2018-2019 NR Custom population. The Lighting-Large sample projects achieved 114.32% verified energy savings, 105.14% verified summer peak demand savings and 105.63% verified winter peak demand savings. Like the Lighting-Small stratum, the inclusion of interactive effects into the verified savings was one of the contributing factors to the higher realization rates.

Some differences between the reported hours of use (HOU) and the verified HOU with the participants were found. Unlike the Lighting-Small stratum, these differences in HOU mostly resulted in higher than reported verified savings.

4.3.2.3 DEP Small Non-lighting Projects

Thirteen Non-lighting-Small projects were evaluated from the 2018-2019 NR Custom population. The 2018-2019 sample projects achieved 94.06% verified energy savings, 71.76% verified summer peak demand savings and 141.39% verified winter peak demand savings. Eight of the thirteen projects have realization rates equal to or greater than 100%, with the remaining five projects contributing to the overall lower than reported verified energy savings.

Five projects in the stratum were new construction projects. Two of the new construction projects were within calibration tolerances. The remaining three new construction projects had a model that was not calibrated to the building's actual utility bill consumption. The evaluation

OFFICIAL COPY

Mar 07 2023

team made changes to the model inputs to calibrate the model and recalculate the verified savings.

For two HVAC projects, verified schedules were found to be different than those used to calculate the reported savings. These differences resulted in higher than reported verified savings.

Like the DEC NL-Small stratum, two walk-in freezer projects from the same applicant had lower than reported electric defrost kW rating values which resulted in lower verified energy savings.

In a chiller installation project, the chiller was no longer in operation and therefore zero energy and demand savings were verified for this project. The chiller was taken out of operation due to changes in the business' processes.

The last project involved a new refrigeration variable refrigerant flow system with new controls. This new refrigeration system was installed at the same time as another Non-lighting Large project under a different Enrollment Number. A utility billing analysis of the facility was used to evaluation the combined effect of both measures but only 36% of the reported energy savings were verified.

4.3.2.4 DEP Large Non-lighting Projects

Seven Non-lighting-Large projects were evaluated from the 2018-2019 NR Custom population. The Non-lighting-Large sample projects achieved 93.04% verified energy savings, 91.61% verified summer peak demand savings and 93.19% verified winter peak demand savings.

Five of the seven projects have realization rates equal to or greater than 100%, with the remaining three projects contributing to the overall lower than reported verified energy savings.

Like the Non-lighting-Small stratum one new construction project had a model that was not calibrated to the building's actual utility bill consumption. The evaluation team made changes to the model inputs to calibrate the model and recalculated the verified savings. This project resulted in lower than verified savings.

The last project involved installing a new refrigeration rack system. This is the same location where the Non-lighting-Small refrigeration project was installed. A utility billing analysis of the facility was used to evaluate the combined effect of both measures but only 36% of the reported energy savings were verified.

4.3.3 DEP Custom-to-Go vs. Custom Classic

This section provides a comparison of projects that used the Custom-to-Go worksheets and those that used the Classic Custom (Classic) worksheets. The following criteria determines which worksheet is used for NR Custom projects:

- Non-lighting projects with more than 700,000 annual kWh savings must use the appropriate Classic Custom worksheet.
- All lighting projects as well as other projects with less than 700,000 annual kWh savings may use the optional Custom-to-Go worksheets.

OFFICIAL COPY
Mar 07 2023

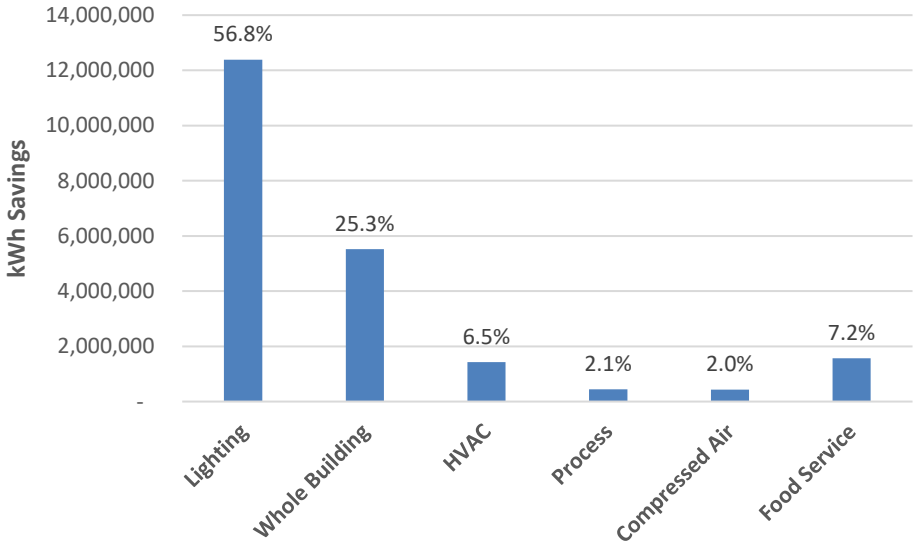
Table 4-15 presents the gross reported energy savings by worksheet and measure type. The majority (81%) of gross reported energy savings are submitted through Classic worksheets.

Table 4-15 DEP Gross Reported Energy Savings by Worksheet Type

Worksheet Type	Measure Type	Gross Reported Energy Savings (kWh)	Percent of Program
Classic	Lighting	12,379,872	46%
	Non-lighting	9,398,740	35%
Custom-to-Go	Lighting	4,399,991	16%
	Non-lighting	589,553	2%
Program Total		**26,768,156**	

Making up 62% of the total program savings, lighting is the one technology category with most savings from both Classic and Custom-to-Go worksheets. Figure 4-5 shows the distribution of gross reported energy savings for classic custom projects broken down by technology category. Figure 4-6 shows the distribution of gross reported energy savings for Custom-to-Go projects. The average energy savings of projects using the Classic worksheets is 75,950 kWh for Lighting and 218,575 for Non-lighting. This indicates that most participants are choosing the classic worksheets regardless of the option to use the Custom-to-Go worksheets.

Figure 4-5 DEP Distribution of Reported Energy Savings for Classic Custom Projects by Technology Category



OFFICIAL COPY
Mar 07 2023

Figure 4-6 DEP Distribution of Reported Energy Savings for Custom-to-Go Projects by Technology Category

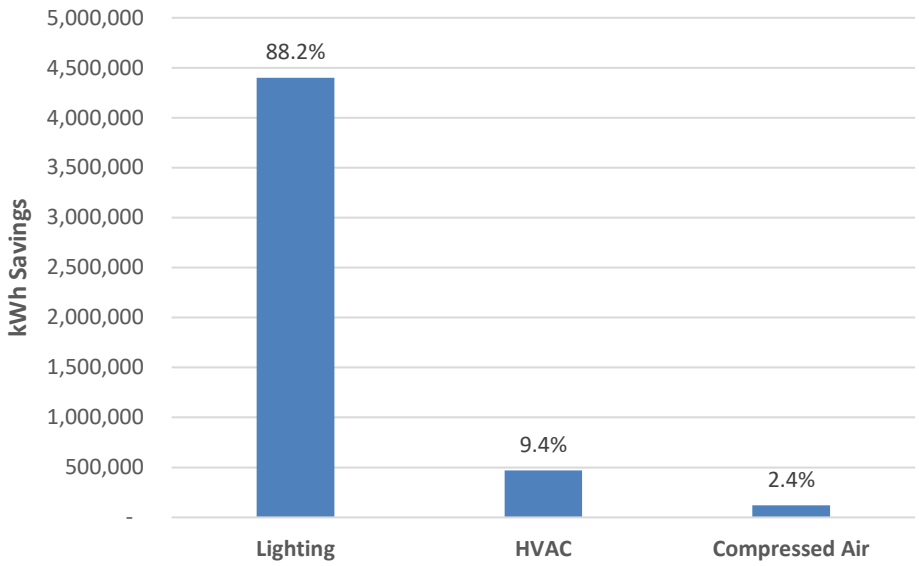


Table 4-16 indicates the reported and verified energy (kWh) savings stratified by technology category (lighting vs. non-lighting) and participation track (Classic vs. Custom-to-Go) for the evaluated sample. The impact evaluation sampling did not stratify for the attribute. These realization rates were not used to estimate the program level verified savings. They are presented here to show any differences between the worksheet types.

Table 4-16 Comparison of Strata-Level Realization Rates – DEP Classic vs. Custom-to-Go

Track	Measure Category	Population	Sample	Sample Reported (kWh)	Sample Verified (kWh)	Realization Rate (%)
Classic	Lighting	163	23	3,370,227	3,875,849	115%
	Non-lighting	43	17	4,133,632	3,840,760	92.9%
	Total	**206**	**40**	**7,503,859**	**7,716,609**	**102.83%**
Custom-to-Go	Lighting	81	6	386,819	361,143	93.4%
	Non-lighting	5	3	468,769	455,989	97.3%
	Total	**86**	**9**	**855,589**	**817,132**	**95.5%**

Realization rates for Classic lighting projects were higher compared to Custom-to-Go lighting projects. This is due to some Custom-to-Go lighting projects that had verified hours of use (HOU), less than the hours used to calculate the reported savings. Also, the inclusion of

OFFICIAL COPY
Mar 07 2023

interactive effects into the verified savings was the main contributing factor to the higher realization rates for Classic lighting projects.

4.4 High Level Findings

4.4.1 Continue High Quality Reviews

The evaluation team saw strong evidence that the Duke NR Custom program team conducts detailed reviews of the project applications, quality control checks and revises measure parameters based on their engineering judgement and input from the participants or trade allies. Engineering reviews by AESC provides an additional level of quality control that helps to minimize most calculation errors or instances of over-claimed energy or demand savings.

The strata-level realization rates indicate that an appropriate level of rigor is being applied to lighting projects and most non-lighting projects. 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.

4.4.2 Lighting Schedules

Of the parameters needed to calculate lighting project savings, verified lighting operating schedules, or annual hours of use, were more often found to be different than what was used to calculate reported savings. Participants and/or trade allies are asked to provide the operating schedules as part of the application process and have the best insights into what the schedule will be for each installed fixture.

There were two general types of differences between the lighting operating schedule reported on the application and the schedules the evaluation team verified with the participants. The first was that the installed fixtures were found to be operating on different weekly operating schedules than captured on the applications. The second type of difference was the number of holidays accounted for in the verified savings.

For lighting projects where trade allies or third parties are estimating the operating schedules, these differences may be due to generalizations or assumptions made for the lighting schedules across different areas and stores. Differences in operating schedules were also seen due to schedules varying by different days of the week where the application indicated the lights operating the same each day of the week.

The Duke Classic lighting worksheet does have fields where a typical weekday, Saturday and Sunday schedule may be entered. The weeks of use in a year is also able to be entered. The evaluation team saw evidence that these fields are not always used and variations in the schedule that was provided by the participant created different savings. Consistent use of these worksheet fields to capture the lighting schedule would help reduce these differences.

Neither the Classic lighting worksheet nor the Custom-to-go worksheet ask specifically about observed holidays. Asking how many days a year the lights are not operating due to holiday closures and incorporating this information into the calculation of operating hours would help minimize these differences.

OFFICIAL COPY
Mar 07 2023

4.4.3 Documentation of Assumptions and Trend data

The project reviews, both during the application process and the evaluation, would benefit from more documentation of all the underlying assumptions and worksheets used for the calculations of savings. In many instances, during the evaluation of non-lighting projects, the model documentation and calculation worksheets were submitted as screenshots, which did not provide access to the algorithms or assumptions used to estimate the savings. Trend data of historical consumption and manufacturer's specification sheets that include detailed performance data would allow more detailed analyses for the proposed measures.

Moreover, project documents did not contain photos of baseline/pre-existing or retrofit equipment. Photos serve as a valuable verification of the installed equipment and provide essential information regarding the condition and operating parameters of the old and new equipment. For example, when retrofitting a pump with a VFD, providing photos of the pump nameplate, new VFD, and the VFD panel showing run speed and all other available parameters would provide valuable information and serve as proof of installation. Also, in cases of equipment replacement, photos of disposed/recycled equipment provide a proof that the inefficient equipment has been taken out of service and would not be used anymore. These photos would also provide information which the evaluator would be able to verify otherwise.

4.4.4 Measurement and Verification Requirements

There were no measurement and verifications (M&V) plans provided within the project documents. M&V plans, and the data collection they require, help confirm the measures supported by the program are installed and resulting in the expected energy and demand savings. M&V plans for large non-lighting projects can greatly assist the review of the program applications and projects being evaluated, in some cases years after the project is implemented.

M&V plans should be consistent with IPMVP Protocols, which require data logging for projects with high uncertainty. The level of data logging requirements is usually dependent on many factors, such as project size (i.e. estimated savings), project scope, incentives amount, and the type of implemented measures. The evaluation team believes that creating M&V protocols and guidelines to be followed by the implementers prior to project approval will increase the accuracy of the reported savings and provide high quality data that will later facilitate a more efficient evaluation. The M&V protocols can be designed in a tiered approach depending on measure type and estimated savings. For example, small lighting projects would not require an M&V plan or data logging but large non-lighting projects involving a large portion of the program savings or measures with high uncertainty would require an M&V plan along with logging data at a representative sample of the equipment.

4.4.5 Calibration of New Construction models

There were sixteen projects in the non-lighting sample that were implemented using the NCEEDA protocol. This protocol defines how savings from new, high-performance buildings that are built above code requirements shall be modeled and estimated. The goal of NCEEDA is to provide timely results on a wide range of design options early enough in design so that those options are still viable within the context of the project. NCEEDA in Duke's Carolinas & Duke Energy Progress Service Territories uses ASHRAE Standard 90.1-2010 for commercial buildings and multifamily buildings greater than three stories. Specifically, NCEEDA uses the

OFFICIAL COPY
Mar 07 2023

methodology of Appendix G with modifications listed in the protocol for the determination of custom savings.

The models of the new buildings are developed using these standards and protocol; simulation software, design specifications and construction drawings; and site visits. The program team is doing a very good job at matching the models to the as-built conditions of the new buildings. The evaluation team found very few instances where an energy saving strategy was not implemented as it was specified in the model.

Assumptions on how the building is expected to be occupied and used are also required to be specified in the models and general values of the necessary parameters are provided by the standards and protocols. In some cases, professional judgement and information from participants is used to inform what values to use. These general occupancy and scheduling parameters do not always match how the new buildings are used or occupied and can lead to modeled consumption levels and patterns that differ from the actual new building's consumption levels and patterns.

Chapter 15 of the Uniform Methods Project (UMP), Commercial New Construction Evaluation Protocol, describes methods to quantify the uncertainty of the models used to estimate the reported savings. The evaluation team had access to additional post construction utility billing data that was not available during the development of the models. This data was used to determine the normalized mean bias error (NMBE) and the coefficient of variation of the root mean square error (CV_{RMSE}) between the modeled consumption of the new building and the actual monthly consumption of the new building. The UMP references ASHRAE 2002 acceptable tolerances for uncertainty in calibrated building models using monthly consumption data as ±5% NMBE and ±15% CV_{RSME}. The evaluation team found that the modeled consumption was outside of these tolerances for four of the five projects. Adjustments to the models were made to get revised models that produced predicted consumption that was within the ASHRAE tolerances and used those models to calculate the verified energy savings.

The realization rates for seven of these projects is 100%. The realization rates for the remaining nine project were 49%, 71%, 74%, 74%, 91%, 98%, 98%, 104% and 110%. These results show the importance of calibrating the models with sufficient post construction data to validate the model's level of uncertainty. The amount of post construction data needed to calibrate a model varies based on the type of building and the occupancy. Buildings with predictable or consistent consumption may only require as little as three to four months. Other buildings with variable loads and seasonal variability may require twelve months or more.

The evaluation team recommends that Duke incorporate a post construction calibration requirement that uses the ASHRAE 14 tolerances to assess the level of uncertainty in the new construction models and make adjustments to the model in order to minimize the uncertainty. The evaluator understands the importance of providing timely services to the participants, and the need for incentive payments as early as possible, thus it is recommended to have a tiered calibration process that depends on the project size and estimated incentives. For example, the implementer can start by using 3 months of utility data, and if the NMBE and CV_{RMSE} are within reasonable bounds (i.e. error bounds can be set be Duke Energy team or consistent with ASHRAE 14 standards) project can proceed, and if the data falls outside the error bounds, more data would need to be collected in an incremental manner (3, 6, and 9 months). Additionally, the

OFFICIAL COPY
Mar 07 2023

evaluator recommends that the tiered approach consider the size of the project (i.e. estimated savings) and ensure that large projects (for example, savings greater than 1 GWh) collect at least 1 year of full data.

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.[2] The survey was designed based on established methodologies outlined in the Pennsylvania Evaluation Framework.[3] This methodology was modified based on discussions with Duke Energy staff before data collection to include additional questions to better understand and incorporate the program's impact on customers' decisions.

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 10 Net-to-Gross Equation

$$NTG_p = (1 - FR_p) + PSO_p + NPSO_p$$

Where:

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

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

PSO_p = *the program-level participant spillover ratio.*

$NPSO_p$ = *the program-level nonparticipant 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 described in Section 4.

Equation 11 Net Verified Energy Savings

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

Where:

kWh_{nv} = *the net-verified kWh savings*

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

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

OFFICIAL COPY
Mar 07 2023

kWh_{gv} = *the gross-verified kWh savings*

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

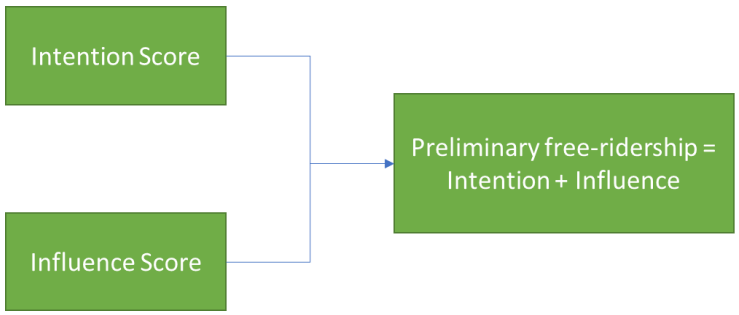
The calculations of the program-level free-ridership and spillover ratios are detailed in the following sections.

5.1.1 Free-Ridership

As mentioned above, free-ridership estimates what proportion of the program's savings would have happened in the absence of the program. Free-ridership considers the customers' plans before 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.

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* before interacting with the program and its *influence* on changing those intentions. Each component (intention and influence) has a value ranging from zero to 50 and is then combined for a free-ridership score ranging from 0 to 100. A free-ridership value of 0 indicates that a customer would not have installed the energy-efficient equipment without the program, whereas a free-ridership value of 100 indicates that a customer would have done the same project on their own, at the same time in the absence of the program.

Figure 5-1 Preliminary Free-ridership Calculation

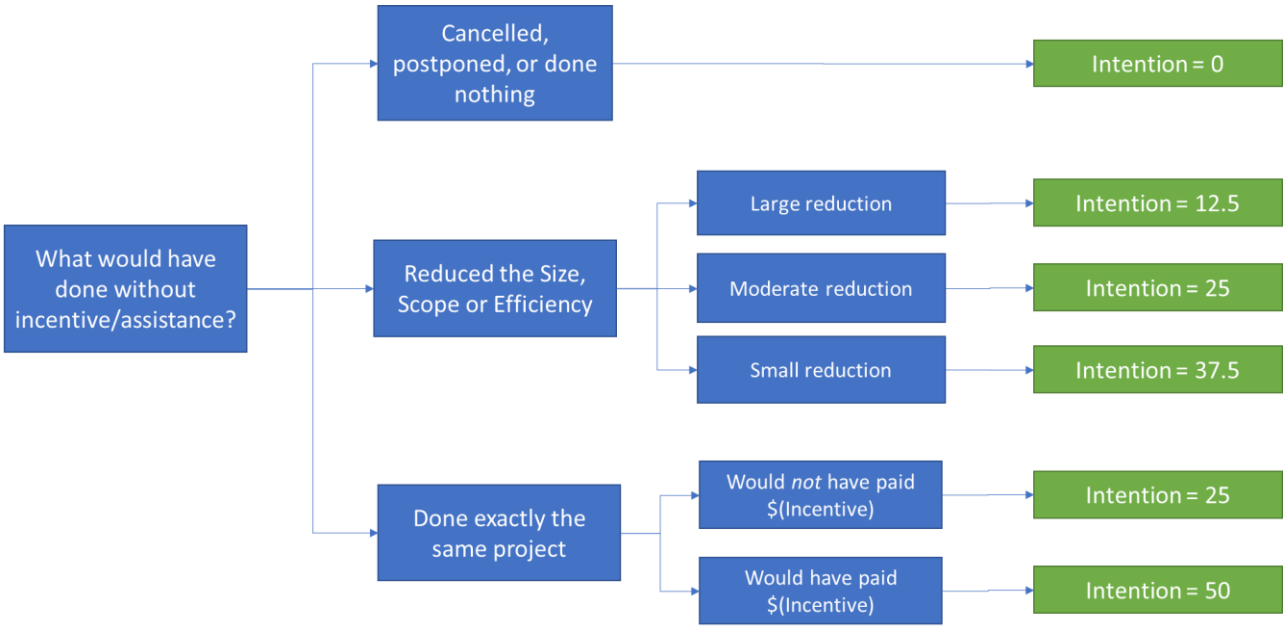


5.1.1.1 Intention

The intention score seeks to capture what most likely would have happened without the program assistance. The program assistance includes not just the incentive but any assistance from items such as audits, technical assistance, and program staff. 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 Figure 5-2.

OFFICIAL COPY
Mar 07 2023

Figure 5-2 Intention Score Flowchart



The initial question of the intention score asks respondents what they would have done without the program assistance. Respondents who indicated they would have canceled, postponed, or done nothing without the program get an immediate intention score of 0.

If the respondent indicated they would do a smaller or less efficient project, they were prompted to categorize it as a small, moderate, or large reduction in scope. This approach attempts to gather the respondent's best estimate of what would have happened without the program, or the counterfactual, recognizing that a precise estimate is not likely to be achieved. The question battery does not seek to follow-up with respondents to understand the exact change to scope or efficiency level to avoid response burden and reduce the risk of false precision.

Lastly, respondents who indicated they would have done the exact same project were asked if they would have paid the additional incentive amount. This question is added to give the program credit by reducing the intention score for customers who would not have had the funds to pay for the project on their own.

The response options and scoring for retrofit projects are outlined in Table 5-1 below.

OFFICIAL COPY
Mar 07 2023

Table 5-1 Net-to-Gross Intention Score Methodology – Retrofit Projects

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

A similar but slightly different set of questions were asked for new construction projects. The question and response options reflect that a project would have occurred but worked to understand how the project would have been different without the program. Responses were scaled on the same 0 to 50 scale, as outlined in Table 5-2 below.

Table 5-2 Net-to-Gross Intention Score Methodology – New Construction Projects

Response	Intention Score
Installed all standard efficiency or code equipment	0
Installed some energy-efficient equipment, but not as much as you did through the program	Closer to standard efficiency or code = 12.5 Closer to what you ended up installing = 37.5 Somewhere in between = 25 Don't know = 25
Installed the same efficient equipment as you did with the program's assistance	Would have paid = 50 Would not have paid = 25 Don't know = 37.5

5.1.1.2 Influence

To recognize the direct points of influence that the program has on customers' decisions, survey respondents were asked to rate the influence of several program aspects. The evaluation team worked with program staff during the survey design stage to identify all the ways program staff work with customers to include all components as part of the influence question. Together, the team included ten different aspects that could have been influential for customers, as outlined in the table below.

OFFICIAL COPY
Mar 07 2023

Table 5-3 Net-to-Gross Program Influence Aspects

Program Aspect
Incentive provided by Duke Energy
The support provided by your Duke Energy business energy advisor
Smart $aver marketing materials or webinars
Previous experience with the Smart $aver program
The technical support provided by Duke Energy engineer staff
The support provided by your Duke Energy account manager
The energy design assistance provided for your new construction project
The bundle options provided for your new construction project
The calculators provided by Duke Energy
Contractor or vendor recommendation

For each aspect, respondents were asked to rate the influence of the aspect where 10 was extremely influential, and 0 was not at all influential. The highest aspect rating for each customer was scored on a scale of 0 to 50, similar to the intention score. The rationale is that if any aspect of the program is highly influential on a customer's decision, the program overall was equally influential (see Table 5-4).

OFFICIAL COPY
Mar 07 2023

Table 5-4 Net-to-Gross Influence Score Methodology

Max FR4 rating	Influence Score
9-10	0
8	6.25
7	12.5
6	18.75
5	25
4	31.25
3	37.5
2	43.75
0-1	50

If a customer indicated their contractor as influential in the project, that is, providing an influence rating of a six or higher, the evaluation team attempted to contact the contractor. We asked the contractor a similar question, asking about the influence the program had on the specific customer. The scoring of the influential vendor influence score is shown below, where contractors used a scale from one to five where one was 'not at all influential,' and five was 'extremely influential.'

Table 5-5 Net-to-Gross Influence Score Methodology – Influential Vendor

Program Aspect	Max Rating → Influence Score
The program incentive provided by Duke Energy	1 → 50 2 → 37.5 3 → 25 4 → 12.5 5 → 0
Your interactions with Duke Energy program staff, including technical assistance	
The support from your Duke Energy trade ally outreach representative	
The program marketing, training, or informational materials	
Your firm's past involvement in Duke Energy's programs	
The energy design assistance provided by Duke Energy	

OFFICIAL COPY
Mar 07 2023

When a customer indicated a contractor was influential in doing the project, and the evaluation team could not complete a survey with the contractor, the customer's influence score was used. In cases where we completed the contractor survey, the methodology indicates to take the highest rating (or lowest influence score) from either the customer or the contractor.

5.1.1.3 Calculation Steps

The intention and final influence scores are added together to produce each respondent's preliminary free-ridership ratio using Equation 12.

Equation 12 Respondent Preliminary Free-ridership Ratio

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

Where:

FR_p = *the preliminary free-ridership score.*

In 2020, the evaluation team incorporated consistency checks in the survey to follow-up when respondents gave inconsistent responses between the Intention and Influence scores. The inconsistency was defined as one score (either Intention or Influence) being greater than or equal to 37.5 and the other score being less than or equal to 12.5. The evaluation team reviewed responses to an open-ended question asking respondents to describe the impact, if any, the Duke Energy assistance had on the decision to install the amount of energy-efficient equipment at the time they did.

If the response validated a higher free-ridership score, the preliminary free-ridership ratio is adjusted using the following calculation:

Equation 13 Consistency Checks Adjustment Supporting Higher Free-ridership

$$FR_{a1} = FR_p + (\frac{1 - FR_p}{2})$$

Where:

FR_a = *the adjusted free-ridership score.*

If the response validated a lower free-ridership score, the preliminary free-ridership ratio is adjusted using the following calculation:

Equation 14 Consistency Checks Adjustment Supporting Lower Free-ridership

$$FR_{a1} = \frac{FR_p}{2}$$

If the response is ambiguous, the preliminary score is not adjusted. There are also no adjustments if the Intention and Influence scores were consistent and in cases where we incorporated influential vendor responses.

A second adjustment further looks at the impact of the program and incentives. Two questions are reviewed to adjust the free-ridership score. The first question asks respondents if they

OFFICIAL COPY
Mar 07 2023

learned about Duke Energy's assistance before or after selecting the specific type of equipment that received the incentive. Suppose the respondent indicated they had chosen the equipment before they heard about the incentive. In that case, the free-ridership score is adjusted upwards to reflect that the customer had already selected program-eligible equipment.

Equation 15 Respondent Final Free-ridership Ratio

$$FR_{a2} = FR_{a1} + \frac{1 - FR_{a1}}{2}$$

The second question asks respondents if their experiences with Duke Energy's program caused their organization to change its purchasing policies or energy-efficient equipment guidelines. If the organization indicated their policies had changed because of Duke Energy, their free-ridership score is adjusted downwards.

Equation 16 Respondent Final Free-ridership Ratio

$$FR_{a3} = FR_{a2} * 50\ percent$$

The final participant free-ridership 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 17.

Equation 17 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 completed without a program incentive, but that still was influenced by the program. Participant spillover was calculated from program participants who reported additional installations. Nonparticipant spillover was calculated from talking with participating contractors about their sales of program-eligible equipment that did not receive Duke Energy incentives.

5.1.2.1 Participant spillover

Participant spillover attributes savings to the program for equipment that participants installed without the incentive that was influenced by the program. For participant spillover, there are two components to arriving at these program-attributable savings.

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

Second, the survey asks the respondent to rate the program's influence 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 participant spillover, shown in Equation 18:

OFFICIAL COPY
Mar 07 2023

Equation 18 Program-Attributable Participant Spillover

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

Where:

kWh_{apso} is the program-attributable participant 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 5-6.

Table 5-6 Participant Spillover Program Influence Values

Reported Smart $aver 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 19):

Equation 19 Program Participant Spillover Ratio

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

5.1.2.2 Nonparticipant Spillover

Nonparticipant spillover attributes savings to the program for equipment contractors install for customers without a Duke Energy incentive that was influenced by the program. Nonparticipant spillover was captured from talking with contractors who participated in the program. Similar to

OFFICIAL COPY
Mar 07 2023

participant spillover, contractor spillover was calculated from two components to arrive at program-attributable savings.

The survey first asked about the sales of program-eligible projects of the same type installed through the Smart $aver program that did not receive an incentive from Duke Energy. The number of projects was used as weighting so that contractors and project sizes were weighted equally.

Contractors were also asked to rate the program's influence on their sales of projects that did not receive an incentive from Duke Energy. That score was used to adjust the spillover amount to recognize the program's impact on their program-eligible sales. The result of this calculation is program-attributable nonparticipant spillover, shown in Equation 20:

Equation 20 Program-Attributable Nonparticipant Spillover

$$Nonparticipant\ SO = Sales \times Influence$$

Where:

Sales is the percent of sales of program-eligible equipment that did not receive an incentive are the program-attributable nonparticipant spillover projects

Influence is the value based on the respondent's rating of the program influence, as shown in Table 5-7.

Table 5-7 Nonparticipant Spillover Influence Values

Reported Smart $aver Program Influence	Influence Value
1	0.0
2	0.5
3	0.5
4	1.0
5	1.0
Don't know / Refused	0.0

5.2 Sampling

Tetra Tech received program tracking data for PY2018 and PY2019 for the Duke Smart $aver Custom Program. The tracking data included 1,187 records (780 DEC and 407 DEP) for the Carolina territories. The tracking data was aggregated to the Sector, or measure-category level, summing incentive amounts and kWh savings, using the Unique Project ID variable. The detailed measure descriptions were retained for reference in the participant survey. After aggregation, the Carolina territories sample frame included 834 measure-level records (544 DEC and 290 DEP), all included in the study's sample. A total of 283 unique customer contacts were associated with the 834 projects included in the sample.

OFFICIAL COPY
Mar 07 2023

The table below reports the sample size and estimated completed surveys for the Carolina territories. Assuming a response rate of 35%, we expected to complete a total of 292 surveys.

Table 5-8 Survey Sample Design by Initiative

Measure Category	Original Tracking Data*	Number of Projects**	Estimated Completed Surveys***
Lighting	1,000	669	234
Whole Building	60	60	21
HVAC	61	54	19
Compressed Air	6	6	2
Process	33	18	6
Food Service	26	26	9
IT	1	1	1
Total	**1,187**	**834**	**292**

*Counts provided are the number of measures.

**The number of the unique customer contact totals 283.

***The number of estimated completed surveys assumes a 35 percent response rate.

5.3 Net-to-Gross Analysis and Findings

The evaluation team conducted surveys with 92 customer respondents (65 were DEC customers and 27 were DEP customers; two respondents participated in both DEC and DEP) who completed 236 different projects in the DEP and DEC territories.

5.3.1 Intention

Most responding customers (132 of 236 projects) reported they would have put off the project, canceled it entirely, or reduced the scope or efficiency of the project if they had not received their incentive. The remaining responding customers (103 projects) said they would have completed their project without the Smart $aver Custom Program. Only three of those customers said they would not have paid the upgrade cost if the incentive were not available. Note: one respondent indicated they did not know what they would have done differently without the program. The full distribution of responses is shown in Table 5-9. These responses resulted in an average, unweighted intention score of 30.7 and a weighted score of 27.7.

OFFICIAL COPY
Mar 07 2023

Table 5-9 What Would You Have Done Had You Not Received an Incentive (Intention)

Response	Intention Score	Total	DEC	DEP
Done nothing	0	10	7	3
Canceled or postponed the project (retrofit) Installed all standard efficiency or code equipment (new construction)	0	38	32	6
Done a smaller or less efficient project (retrofit) Installed some energy efficient equipment, but less (new construction)		84	63	21
	Large reduction = 12.5	*2*	*2*	*0*
	Moderate reduction = 25	*77*	*56*	*21*
	Small reduction = 37.5	*5*	*5*	*0*
	Don't know = 25			
Done exactly the same project (retrofit) Installed the same efficient equipment (new construction)		103	75	28
	Would have paid = 50	*100*	*74*	*26*
	Would not have paid = 25	*3*	*1*	*2*
	Don't know = 37.5			
Don't know	25	1	1	0

5.3.2 Influence

When asked to rate the influence of the program on their decision to complete the energy-efficiency project, nearly 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 average unweighted influence score was 1.1 and a weighted score of 0.8, meaning the program greatly influenced customers.

OFFICIAL COPY
Mar 07 2023

Table 5-10 Influence of the Highest Rated Program Factor

Response	Influence Score	Respondents
0-1	50.00	0
2	43.75	1
3	37.50	0
4	31.25	0
5	25.00	1
6	18.75	0
7	12.50	1
8	6.25	17
9-10	0.00	210
Don't know	25.00	0

The program factor that was rated the highest most often was the incentive, followed by the recommendation of the contractor or vendor. The table below shows how often each program factor was rated the highest. When multiple items were given the same highest rating, the evaluation team counted them in each factor.

Table 5-11 Program Factor with the Highest Influence Rating

Factor	Highest rating	Lowest rating	Mean	Times Factor was Selected as Highest Rated	Respondents
The incentive provided by Duke Energy	10	0	7.3	82	235
The recommendation from your contractor or vendor	10	0	8.9	172	215
Previous experience with the Smart $aver program	10	0	9.0	98	123
The energy design assistance provided for your new construction project (New Construction only)	10	0	7.3	8	19
The technical support provided by Duke Energy engineer staff	10	0	7.1	27	130
The calculators provided by Duke Energy	10	2	9.5	89	105
The support provided by your Duke Energy account manager	10	0	8.3	16	28

OFFICIAL COPY
Mar 07 2023

Factor	Highest rating	Lowest rating	Mean	Times Factor was Selected as Highest Rated	Respondents
The bundle options provided for your new construction project (New Construction only)	10	0	7.3	8	18
Smart $aver marketing materials or webinars	10	0	4.4	11	103
The support provided by your Duke Energy business energy advisor	NA	NA	NA	0	0

Source: Customer Survey; FR4A, FR4B, FR4C, FR4D, FR4E, FR4F, FR4G, FR4H, FR4I, FR4J

Sixty-six customers (203 projects) reported their contractor as influential, and we were able to complete 62 of those surveys. Contractors generally corroborated customer-reported influence. Two customer records had their influence score adjusted due to the contractor reporting greater program influence than what was reported by the customer.

5.3.3 Adjustments

The analysis further adjusted participant free-ridership by reviewing responses if customers provided inconsistent *Influence* and *Intention* responses. A total of 102 records were flagged as being inconsistent. After the evaluation team reviewed the open-ended responses, 12 projects (11 customers) were identified as supporting a higher free-ridership, 11 projects (9 customers) supported a lower free-ridership, and 79 remained ambiguous.

Two final adjustments were made for 1) customers who found out about the program after selecting the equipment and 2) customers who had changed their policies as a result of any Duke Energy conversations. Fourteen respondents had their free-ridership score adjusted, noting they had already selected the equipment before learning about the program. Five customers indicated they had revised their policies based on their experiences with Duke Energy programs or discussions with Duke Energy staff.

5.3.4 Net-to-Gross Results

The following table shows the progression of the free-ridership value based on each of these adjustments.

Table 5-12 Progression of Free-ridership Adjustments (weighted results)

Preliminary FR Score	Contractor adjusted FR Score	FR Score after Consistency Checks	FR Score after Adjusting for when Customer Heard about Program	FR Score after Including Policy Changes (Final FR Score)
28.46%	28.40%	28.71%	30.93%	29.99%

OFFICIAL COPY
Mar 07 2023

The evaluation team reviewed the data for customers who said they installed additional equipment without a program incentive to calculate participant spillover. If the customer indicated the program influenced the project, the team reviewed the project details to determine the amount of spillover attributable to the program. Nineteen customers indicated they installed equipment without an incentive. This resulted in a small amount of participant spillover attributable to the program, less than one percent.

The evaluation team also talked with contractors involved in projects completed by participating customers to calculate nonparticipant spillover. The evaluation team talked to these contractors about program-qualify sales that did not receive a Duke Energy incentive. Nonparticipant spillover was attributed to the program if contractors indicated their Duke program knowledge was responsible for some or all of their sales that did not receive Duke incentives. Contractors provided different reasons for completing program-qualifying projects outside the Duke Energy Custom program. The most common response was because the customer was opted out of the rebate programs (8 respondents). The second most common response (4 respondents) was that the contractor did not offer the incentive to the customer. Two of those were specifically because they were new construction projects. Other common answers included the customer was not eligible (i.e., they have a secondary power source or purchased equipment before applying) (3 respondents) and the incentive amount compared to the paperwork was not worth the time (3 respondents). Additional responses, each mentioned by one contractor, included the following: the size of the project was too small, and the customers needed the equipment immediately, so there was no time. Responses were consistent between the DEC and DEP territories.

The resulting free-ridership, spillover, and net savings are shown in Table 5-13 below.

Table 5-13 Net-to-Gross Evaluation Results

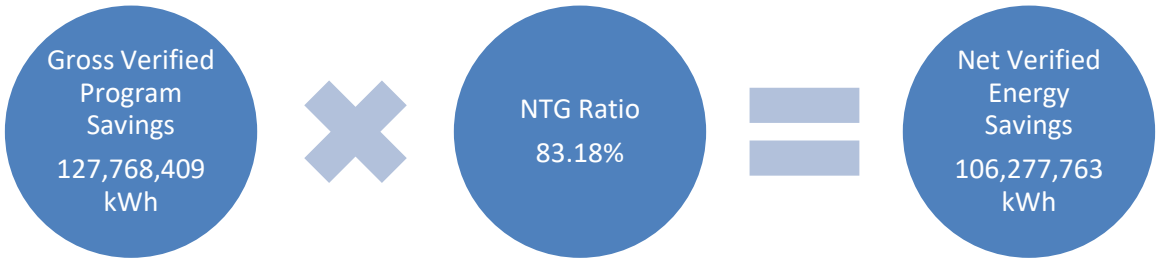
Measurement	DEC	DEP	Combined[4]
Free-ridership (FR)	29.16%	32.67%	29.99%
Net of Free-ridership (1-FR)	70.84%	67.33%	70.01%
Program-influenced Participant Spillover (PSO)	0.28%	0.01%	0.22%
Program-influenced Nonparticipant Spillover (NPSO)	12.54%	24.03%	12.95%
Net-to-Gross (1-FR)+PSO+NPSO	**83.66%**	**91.37%**	**83.18%**
Precision at the 90% confidence interval	± 2.5% for FR ± 2.3% for NPSO	± 4.0% for FR ± 8.1% for NPSO	± 2.1% for FR ± 0.7% for NPSO

[4] The combined results are weighted using the same kWh-based weights used for DEC and DEP results, since this accounts for individual project sizes as well as the relative size of the programs across the two jurisdictions.

OFFICIAL COPY
Mar 07 2023

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 described in Section 4.

Figure 5-3 Net Verified Program Savings Calculation



The overall result of 83.18% net-to-gross reflects that the program primarily influenced customers' energy savings actions. This is an increase from the prior evaluation NTG ratio of 78.8%. Comparisons of free-ridership across the evaluation years are shown in Table 5-14 below. The program team added additional adjustments to the FR calculation for this evaluation, resulting in NAs in the table below.

Table 5-14 Free-ridership Comparison across Evaluations

Program Year	Preliminary FR Score	FR Score after Consistency Checks	FR Score after Adjusting for when Customer Heard about Program	FR Score after Including Policy Changes (Final FR Score)	Spillover	NTG
2018 – 2019	28.5%	28.7%	30.9%	30.0%	13.2%	83.2%
2015 – 2017	21.5%	NA	NA	NA	0.4%	78.8%

We reviewed the results by different elements to see if we could pinpoint any drivers. There were no differences when we looked at if the organization had previously participated in Duke's program. Appendix C shows the free-ridership scores by the different elements the evaluation team reviewed.

We also reviewed results by measure type. Lighting projects made up most program participation, which one could argue generally drove results. Care should be used when reviewing these figures as the number of respondents is low for most measure categories.

OFFICIAL COPY
Mar 07 2023

Table 5-15 Free-ridership Results by Measure Type

Measure	Gross (unverified) Population Savings (kWh)	Population Respondents (n)	Surveyed Savings	Respondents (n)	Free-ridership Ratio
Compressed Air	1,134,983	6	177,131	1	75.0%
Food Service	1,665,624	26	279,593	1	25.0%
HVAC	20,851,033	54	7,990,912	23	9.7%
IT	445,529	1	445,529	1	25.0%
Lighting	83,634,429	669	20,982,001	186	35.3%
Process	6,933,868	18	4,763,127	4	48.9%
Whole Building	12,497,320	60	4,600,464	20	21.3%

We also reviewed stratum results, which show similar results in that the lighting stratum had higher free-ridership than the non-lighting stratum. Free-ridership rates were also higher among the small stratum than the large.

Table 5-16 Free-ridership Results by Stratum

Stratum	Gross (unverified) Population Savings (kWh)	Surveyed Savings (kWh)	Surveyed Respondents (n)	Free-ridership Ratio (%)
L-Large (>500 MWh)	52,225,498	9,215,482	22	28.4%
L-Small (<500 MWh)	31,408,931	11,766,518	164	40.8%
NL-Large (>500 MWh)	27,477,874	13,584,476	10	22.0%
NL-Small (<500 MWh)	16,050,483	4,672,280	40	30.9%
Total	**127,162,786**	**39,238,757**	**236**	**30.0%**

One other element reviewed was national chain stores that participated in the program. These include dollar stores, grocery stores, and convenience stores that typically had numerous locations participate in the program. For these customers, we were able to talk with some of the decision-makers from the store, while others we were able to talk with a third-party vendor, typically a rebate processer, whose role it was to find rebates across geographies where the stores were located. In Duke's Carolina and Progress territories, the free-ridership was slightly higher for customers who participated with multiple locations.

Qualitatively, when talking with the third-party vendors, they indicated that the rebates were a driving factor in the customers doing projects through the program. These customers tend to do

OFFICIAL COPY
Mar 07 2023

more locations because of the rebates and focus on the locations where utility rebates are offered. Some of the large customers, contractors, and third-party vendors they work with have been working with DSM programs long enough to know what will qualify for rebates and what they need to do to get a project approved. These customers may use the rebates to make other projects possible, but those are unlikely to result in spillover for Duke Energy. Additional projects are more likely to be located in nearby communities where rebates are not offered or work that would not have been possible if all the available funds had been spent on the energy efficiency upgrade.

5.3.5 Benchmarking

To provide context to Duke Energy's NTG rates, the evaluation team conducted a secondary literature review, or benchmarking exercise, to examine NTG results for other custom programs and measures for other utilities. This was not meant to be a comprehensive review of all custom programs but rather a quick look into other custom programs. The evaluation team reviewed publicly available reports from different jurisdictions using the same NTG methodology (i.e., FirstEnergy and PPL Electric). All of the reports reviewed were taken from reports based upon independent, survey-based research directed at the program under consideration. **Error! Reference source not found.** contains a bibliography of sources reviewed.

The benchmarking exercise found 15 utilities with custom commercial offerings (Ameren, Black Hills Energy, Energize Connecticut, ComEd, Energy, Entergy Arkansas, Indianapolis Power & Light, Mass Save, Met-Ed, National Grid Rhode Island, Penelec, Penn Power, PPL Electric, Vectren, West Penn Power, and Xcel Energy). NTG ratios for custom commercial programs ranged from 54% (Met-Ed) to 99% (Entergy Arkansas), and free ridership (when listed) ranged from 2% (Entergy Arkansas) to 46% (Met-Ed). NTG ratios for custom commercial lighting programs varied from 73% (Xcel Energy) and 89% (Xcel Energy). Xcel Energy's custom Business HVAC+R Systems program produced an NTG ratio of 87%.

Table 5-17 Commercial Custom Program Benchmarking Summary

Category	Free Ridership Ratio	NTG Ratio
Overall	2% – 46%	54% – 99%
Lighting	NA	73% – 89%
HVAC	NA	87%

Compared with other evaluations using the same NTG calculation approach, including the PA Evaluation Framework, which the Duke algorithm was based on, the results for DEC/DEP are similar to those calculated for most of the Pennsylvania utilities.

OFFICIAL COPY
Mar 07 2023

Table 5-18 Commercial Custom Program Benchmarking Summary of Similar Algorithm

Utility	Free-ridership	Spillover	NTG Ratio	Responses
DEC/DEP	30%	13%	83%	236
Penelec	14%	4%	86%	34
Penn Power	40%	0%	60%	11
West Penn Power	43%	0%	57%	21
Met-Ed	46%	0%	54%	26
PPL	34%	0%	66%	16

OFFICIAL COPY
Mar 07 2023

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 and underperforming or inefficient program processes that are holding back program performance or participation. Because the program is delivered the same between the two territories, we report combined activities and results for DEC and DEP together for the process evaluation. 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 to explore the identified research questions. Table 6-1 summarizes the process evaluation data collection activities.

Table 6-1 Summary of Process Evaluation Data Collection Activities

Target Group	Completes
Staff	8 In-depth interviews
Contractors	4 In-depth interviews (third-party vendors) 62 Telephone surveys (for 67 cases)
Participants	236 Telephone surveys with participant projects (92 unique participant respondents)[5]
Application Data Review	902 DEC/DEP records provided by Duke Energy, with the status of why projects were rejected or closed

6.1.1 Program Staff Interviews and Application Data Review

The evaluation team interviewed eight Duke Energy's Smart $aver Custom Incentive program staff in August 2020. To get a well-rounded perspective on the program design and implementation practices, we talked with two program management staff, an Account Executive for large account management, two Business Energy Advisors, an Energy Efficiency Engineer, and two Trade Ally Outreach Representatives.

The program staff provided valuable feedback on intended operations, processes of the program's stated (and unstated) goals and objectives, perceived barriers to program uptake, and modifications to any program components based on the previous program cycle and the rationale for those modifications. The information the team gathered assisted in designing the interview guides and surveys for customers and contractors.

The evaluation team also interviewed Willdan as the firm that handles paperwork, modeling, technical assistance, and identification of measures as part of the program's new construction energy design assistance. Willdan sees part of their role as educating the market and is

[5] 178 DEC participant projects (65 unique survey respondents); 58 DEP participant projects (27 unique survey respondents) with two respondents who participated in DEC and DEP

OFFICIAL COPY

Mar 07 2023

marketing the program by building relationships with promoters such as architects and building organizations. Willdan works with customers to put a bundle of offerings together with different levels of energy efficiency, providing the documents to the Duke Energy team for preapproval. Once a project is complete, Willdan verifies installation, gathers documentation, puts together reports, and submits applications to Duke Energy for the incentive. There is a collaborative effort between Willdan and Duke Energy to deliver the new construction projects. The two parties pass potential leads and project information between each other, so communication is frequent.

In addition to the program staff interviews, the evaluation team reviewed the application screening process and the program tracking data to ensure necessary data and information was being collected to track program progress. Results from this review are presented in the next section (Section 6.2).

6.1.2 Contractor Interviews and Surveys

Contractors are important market actors, especially in large custom programs. For these programs to succeed, contractors must access and use calculation tools, navigate preapproval processes, and communicate the steps involved to project representatives.

The evaluation team selected all the implementation contractors associated with customer projects from the tracking database provided by Duke Energy. Any contractors in the list identified through the participant survey as “influential vendors” were flagged for additional questions in the contractor survey.

General discussion topics in the survey included program awareness among customers, understanding of program guidelines and processes, interactions with customers, and suggestions for improving the program. Influential vendors were also asked questions about the specific projects if participating customers indicated the contractor influenced their decision to install energy-efficient equipment through the program.

In February 2021, surveys were completed with 67 of 199 program contractors who participated in the program (62 unique vendor respondents). Twenty-seven of the completes were from influential vendors. The average survey length was 10 minutes, and the average number of telephone attempts was 5.0. Table 6-2 outlines the contractor response rate for the evaluation.

Table 6-2 Contractor Response Rate

Disposition	Non-influential vendors	Influential vendors*	Combined**
Starting Sample	**123**	**76**	**199**
Does not recall participating	9	5	14
Incomplete surveys	3	0	3
Refusal	11	2	13
Bad phone number	4	1	5
Attempted but not completed	56	41	97
Completes	**40**	**27**	**67**
Response Rate (Complete/Starting Sample)	**32.5%**	**35.5%**	**33.7%**

OFFICIAL COPY
Mar 07 2023

*Represents 22 unique influential vendor respondents
**A total of 62 unique vendor respondents completed the survey

In addition to the contractor survey, the evaluation team sent emails and called six firms identified through email addresses and contact information in the tracking database as third-party vendors. These third-party vendors did not install or sell equipment. Instead, they often served in a consulting role to firms looking for energy-efficient recommendations and incentives. These firms typically worked with national chains or commercial customers with multiple locations. Four in-depth interviews were conducted in January and February 2021 with these third-party vendors. Three of them advise customers on projects, and the fourth only helps them apply for rebates and incentives.

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 an incentive through Duke Energy's Smart $aver Custom Incentive Program for PY2018 and PY2019. Surveys were conducted with program participants between December 14, 2020, and February 2, 2021. 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 completed for 236 of the 834 projects (178 DEC and 58 DEP) completed through the program (92 unique respondents). Table 6-3 outlines the participant response rate of the evaluation.

Table 6-3 Participant Response Rate

Disposition	DEC	DEP	Overall
Starting Sample	**544**	**290**	**834**
Does not recall participating	16	6	22
Refusal	18	13	31
Incompletes (partial surveys)	2	0	2
Wrong number	3	2	5
Not completed	327	211	538
Completes	**178**	**58**	**236**
Response Rate* (Complete/Starting Sample)	**32.7%**	**20.0%**	**28.3%**

Response rates were lower compared to the 2016-2017 evaluation. This may have been due to the COVID pandemic. We attempted numerous outreach efforts to increase response, including working with account managers, third-party vendors, and Duke staff to get contact information for a people involved in the decision to implement the project.

6.2 Process Evaluation Findings

6.2.1 Program Staff

The program staff interviews were extremely useful in helping the evaluation team understand how the program operates and designing the interview guides and surveys for program

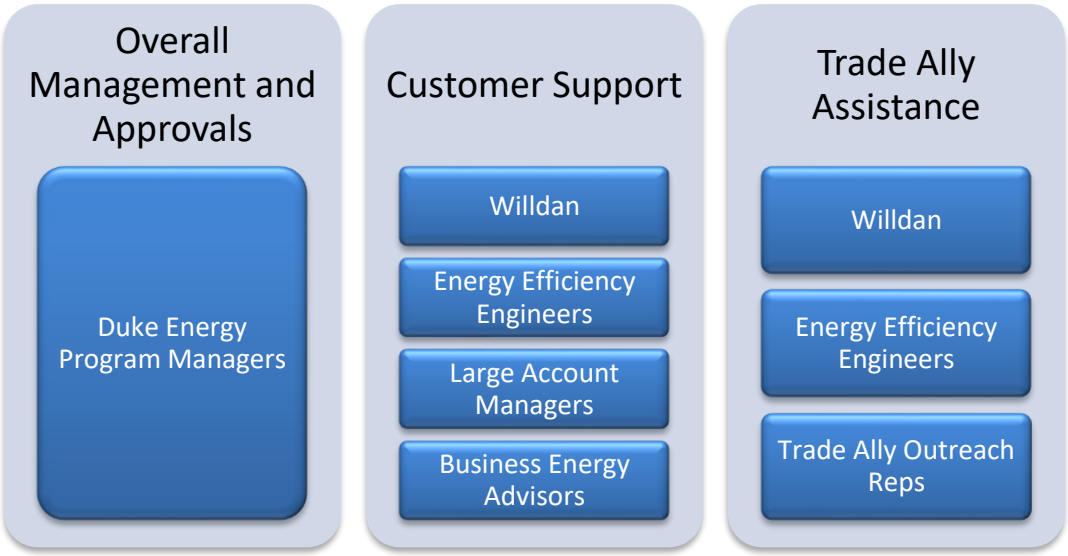
OFFICIAL COPY
Mar 07 2023

participants and contractors. Throughout the findings section, some information from staff interviews has been used to add context around respondent answers. This section details key discussion topics, including the relationships between staff, marketing and outreach strategies, the application process, and the NCEEDA effort.

6.2.1.1 Roles and Relationships

Duke Energy enlists a wide range of staff to promote and deliver the Smart $aver program. In addition to Program Managers, customers will work with Large Account Managers (LAMs) or Business Energy Advisors (BEAs) who get assistance from Energy Efficiency Engineers (EEEs). Trade allies (TAs), who are critical to the program delivery, get information and assistance from the Trade Ally Outreach Representatives.

Figure 6-1 Smart $aver Custom Program Delivery Support



Large Account Managers

Large Account Managers (LAMs) are responsible for large commercial and industrial customer needs. Each LAM works with specific customer segments or types, such as hospitals, schools, manufacturing, government, grocery, etc. The number of customers assigned to each LAM varies, depending on several different factors, but generally ranges from 20-100.

Business Energy Advisors

Duke Energy has a team of 10 Business Energy Advisors (BEAs) that cover the Carolinas and the Midwest. BEAs are regionally based and assist small and medium business customers assigned to them based on usage levels. They work with a much larger group of customers than LAMs do, with each BEA assisting anywhere from 500 to 4,000 customers. BEAs characterize themselves as the liaison between the customer and Duke Energy.

BEAs can work with several hundred customers on various topics, including energy efficiency. To assist customers, BEAs must understand and access information on customer energy use and demand patterns. They look for opportunities for each facility to improve energy use, decrease cost, decrease demand, and access utility rebate programs. When BEAs cannot answer customer questions, they may enlist the help of other Duke Energy staff - particularly

OFFICIAL COPY
Mar 07 2023

Energy Efficiency Engineers. BEAs may also assist customers in identifying trade allies to implement their projects, although BEAs are careful to remain neutral when suggesting contractors. One of the Carolina BEA's makes sure to follow all steps in the process to assist if the customer has any issues.

Energy Efficiency Engineers

Energy Efficiency Engineers (EEEs) review Smart $aver custom projects that come through AESC before they go to offer or payment. If needed, EEEs will work with customers to develop projects before application when LAMs and BEAs ask for assistance. The EEEs may also respond to questions from Willdan for new construction projects and interact with Trade Ally Outreach Reps when trade allies need guidance.

Trade Ally Outreach Representatives

Trade Ally Outreach Representatives (TA Outreach Reps) work with trade allies on prescriptive and custom projects. They make sure trade allies understand program requirements, equipment eligibility and assist with the application process.

Multiple TA Outreach Reps are working with contractors, each assigned to geographic areas. The Carolinas & Progress rep we spoke with educates trade allies on rebate and incentive programs, how the programs work, and how to use them with customers. When trade allies have questions about what qualifies for the program or how to complete the application that the TA Outreach Reps cannot answer, they typically turn to EEEs to get the information they need.

There is a Trade Ally section on the Duke Energy website where trade allies can register for customers looking for trade allies.[6] TA Outreach Reps review the program rules and forms with contractors who register for the Trade Ally Network and in the process, build a relationship with those trade allies. If contractors want training on the Smart $aver tools, the TA Outreach Reps will take care of the training.

6.2.1.2 Marketing and Outreach

Program staff has tried various tactics to reach out to customers, trade allies, architects, and engineers over the years. They have used print materials, webinars, lunch and learns, emails, phone calls, and in-person visits.

Duke Energy has designed and printed handouts for staff in the field to distribute to customers and trade allies. They also ran a marketing postcard to communicate that programs were available and Duke Energy staff could help customers identify energy-efficient opportunities. Social media marketing was also reported to be an effective marketing tool.

Webinars highlighted certain technologies or ways to optimize projects and focused on trade allies and customers. BEAs contributed to webinar content, and contractors would deliver some of the webinars. An annual customer forum has also allowed customers to provide feedback on the Smart $aver program.

Most LAMs and BEAs reported direct outreach to customers through email, phone calls, and in-person visits were their primary marketing approaches. The BEAs have customers they cover

[6] Commercial Trade Allies | Duke Energy (duke-energy.com)

OFFICIAL COPY
Mar 07 2023

but may reach out to targeted groups for certain measures. The BEAs have also recently set up an online presence for easier customer interaction.

TA Outreach Reps will spend most of their time on in-person visits to recruit new trade allies and educate them on the program. The reps may drop off handouts or walk trade allies through the Smart Saver tools. The Carolina TA Outreach Reps we spoke with may be present at customer meetings as the “voice of the utility” in the room and feel that trade allies like to show an association with Duke Energy. The TA Outreach Reps feel that the trade allies need more assistance, as they often work with several utilities, which can cause confusion.

6.2.1.3 Application Process

Once LAMs and BEAs get customers to select equipment, they typically transition the project to a trade ally, and the trade ally assists the customer with the application process. Duke Energy staff will help the customer complete the application, including getting an EEE involved to check eligibility and savings when the customer has questions beyond what the trade ally can assist with.

BEAs in the Carolinas described how they facilitate the identification of a trade ally through the Trade Ally Network and Outreach Reps. The trade allies also help the customer with the application. If there is no trade ally, the BEAs will assist the customer with the application. Both BEAs said not many customers can get through the Custom application process on their own. The BEAs make sure customers have provided all the necessary information.

All applications are tracked in Salesforce. If a customer is approved and does not proceed, the record is closed out. Based on staff relationships with customers, they typically know why projects are not completed. This information is sometime captured in the tracking data, although not all projects have a reason for being closed.

One TA Rep in the Carolinas has noticed a large reduction in the application review time and feels like the online portal is helping. He thinks that some businesses may avoid the Custom program because they think the process is difficult. He tries to help people through the process and answer all the questions that come up.

6.2.1.4 New Construction - NCEEDA

Program Managers for the Smart Saver Custom program feel that NCEEDA offering has been successful and is becoming a larger part of the Custom program. Duke Energy is working with Willdan, who manages the outreach to architects and design engineers up front to incorporate energy-efficient designs in new construction. The goal is to influence better efficiency beyond code. The whole building is modeled, creating options for ‘good,’ ‘better,’ and ‘best’ energy-saving scenarios with ROI attached to each. The assistance from Duke Energy and Willdan is meant to take the burden of finding options and calculating savings off the customer.

EEEs believe that new construction projects are becoming more common and the LAM in the Carolina and Progress territory said that Willdan has been very thorough and handles all the customer’s needs. BEAs in the Carolinas & Progress send any projects they determine may be eligible through the NCEEDA option, but not all of them receive new construction incentives. A few projects revert to prescriptive rebates.

OFFICIAL COPY
Mar 07 2023

The primary challenge mentioned by the BEA regarding the new construction projects is reaching the customer at the optimal time to influence their decision with the efficiency scenarios. The BEA characterized a new partnership with Construct Connect as being very helpful in reaching out to customers at the right time by providing BEAs with information on new construction in the area. It is also a place where Duke Energy can promote the program.

6.2.1.5 Staff Influence

Respondents provided high ratings when asked to rate the influence of Duke Energy staff on their decision to complete their project. On a 0 to 10 scale, where 0 was 'not at all influential' and 10 was 'extremely influential,' respondents rated the influence of their account managers high, producing an average score of 7.1 and Duke Energy engineer staff received a higher average influence score of 8.3. No respondents indicated they worked with a BEA, and therefore there was no influence to report.

Table 6-4 Influence of Duke Staff

	Mean	Minimum	Max	Don't know	Respondents
Account manager	7.1	0	10	7	137
Engineer staff	8.3	0	10	0	28
Business energy advisor	NA	NA	NA	0	0

Source: Participant Survey; FR4B, FR4G, FR4F

6.2.2 Data Review

Two sources of data were reviewed as part of the evaluation. The first was the data associated with the completed projects that was used for the process, NTG, and impact evaluation activities. The second was the data associated with the applications that were submitted from both hard copy and the online portal.

6.2.3 Completed Project Review

An additional part of the evaluation activities included reviewing the program tracking data to ensure the necessary information to track the program and conduct evaluation activities were available. Program staff use the tracking data to document customers who participated in the program, the details of the equipment being installed, and the project's savings. Once the application is received, this information is passed to AESC, the technical review vendor. 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 data to select impact and process evaluation activities samples. One area that impacted the evaluation activities was that the data included contact information for third-party vendors in place of some customer contacts. The third-party vendors tend to work with corporate offices and are involved, sometimes in place of local contacts. However, the evaluation team is interested in understanding (1) how the equipment is operating and (2) the decision-making process to purchase the equipment, and therefore, needs to talk directly with the organization.

OFFICIAL COPY
Mar 07 2023

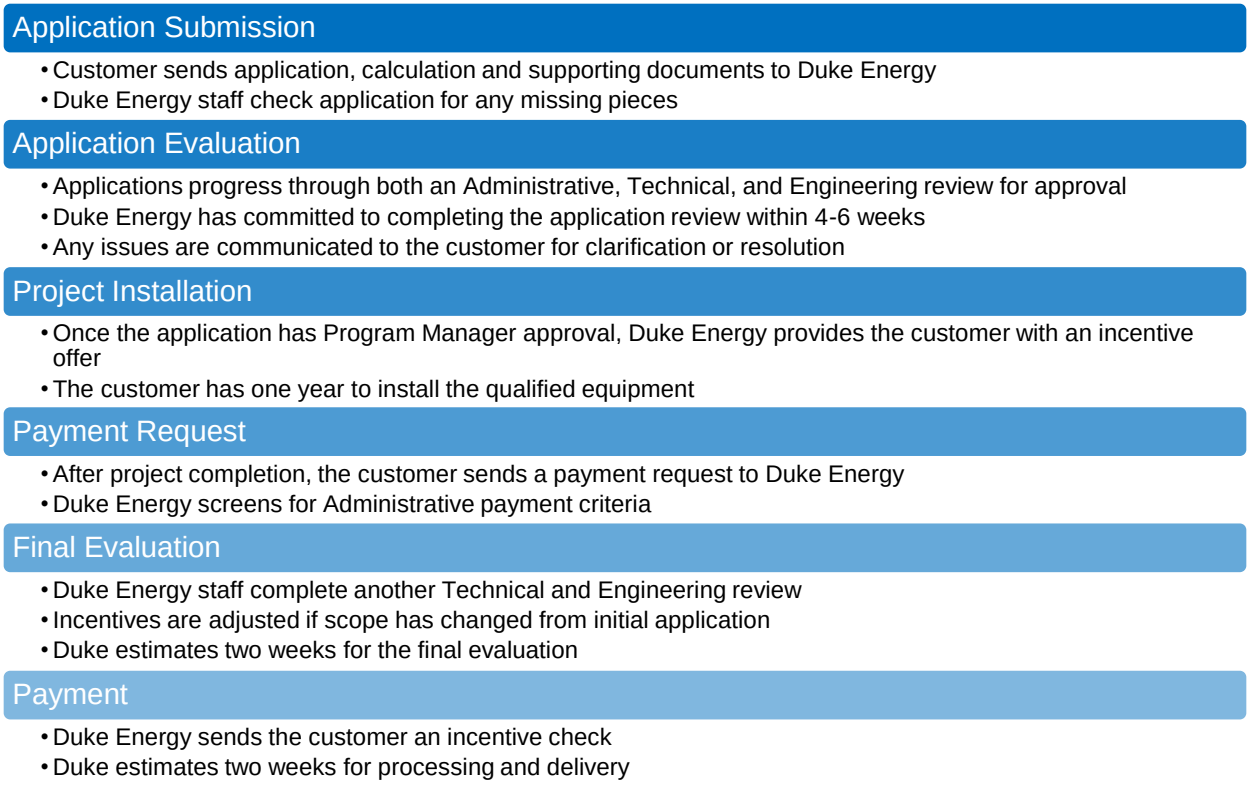
In conducting the process evaluation telephone efforts, some contact information associated with some participants was out of date. Given that evaluation activities went back to 2018, some personnel turnover at companies is expected, resulting in out-of-date contact information for people who no longer work for listed companies. The program team should ensure customer contact information is included for each record in the tracking system.

Application Review

The evaluation team reviewed the Duke Energy application and process, which found a thorough review method as part of the pre-approval process. The Duke team reviews applications to ensure the customer has not already purchased or committed to the project and meets the eligibility requirements outlined in their application.

As we heard from the program staff interviews, customers or trade allies initiate the application process, often with assistance from Duke Energy staff. The application then makes its way through the Duke Energy preapproval, installation, and payment stages.

Figure 6-2 Smart $aver Customer Program Application Process



During the “Application Evaluation” stage, Duke Energy reviews the application for a host of items, including missing documentation, responses to application questions, and energy-saving calculations to determine incentive levels. To better understand how this screening process works, we asked Duke staff to provide projects from the database that had not progressed through to payment and been closed out. The evaluation team received a data file with 902 North Carolina and South Carolina applications that were submitted but were not considered completed.

OFFICIAL COPY

Mar 07 2023

One hundred thirty-five of the projects appear to be still working their way through the application process, and although not completed, they are not closed or rejected. The analysis also shows that Duke's screening process for eligibility is working well. At least 243 cases were screened out, with almost half of them failing the early commitment requirement using Question E:

> *A commitment includes but is not limited to signing a purchase order/contract, ordering equipment or starting construction. Have you made any commitment to your project? (Yes or No)*

Another 274 applications were closed at the customer's request or trade ally's request and 53 were closed due to nonresponse from the customer, either for missing or additional information, or once Duke Energy extended an incentive offer.

OFFICIAL COPY
Mar 07 2023

Table 6-5 Analysis of Incomplete Projects

Closed Reason	Count of cases
Carolina Cases	**902**
Did not appear rejected (Contract approval, M&V Period, payment request received, approved for payment, ongoing)	**135**
Ineligible	***243***
Early commitment (Question E)	103
Opted out	5
Outside Duke territory	1
Payback too short - not cost-effective for Duke	61
Shifted to prescriptive incentive	27
Not DLC qualified	12
Submitted more than 90 days after equipment installation	34
Customer or TA request project close	**274**
Customer/TA request - NA	206
Customer/TA request - too much delay, incentive not enough, didn't install, went prescriptive	62
Declined Duke offer	6
Customer nonresponse	**53**
No response to Request for Information	23
No response to Offer Letter	22
Expired	3
Staff changes, unable to reach customer, business closed	5
No detailed reason	**197**
Auto close - no details	20
No reason recorded for closed lost	74
Administrative close - Application clean-up	103

While each of the above-mentioned reasons provides insights into how the preapproval process is working, there were 94 applications that were closed out without a clear reason and another 103 indicated application clean-up. This reduces the ability to understand where processes are effective, where customers are falling out of the process, and potentially what Duke Energy staff can do to shepherd more projects through the program.

OFFICIAL COPY
Mar 07 2023

Duke Energy has taken an additional step with its application to attempt to monitor and reduce the effects of free-ridership on the program. The application for preapproval has another question, Question G, that asks customers how their project would change without the program incentive. Specifically, the question states:

If an incentive was not available for your project, would you:

a) Purchase and install the entire project
b) Purchase and install some, but not all, of the high-efficiency project
c) Neither purchase nor install any part of the project
d) Don't know

This question is on the application to help the program team understand customer objectives when making the purchasing decision. While this question is on both the hard copy and online applications, it is not required. It also allows customers to select the "Don't know" option, which does not provide much information to the program team. Based on a review of a few applications compared with the survey responses, it also does not appear that the responses are used for any screening.

We reviewed the application responses provided by Duke Energy for the participants who completed the evaluation survey. The unweighted free-ridership results show some planning for all customers, regardless of their initial response. Removing the "Don't Know" option, which corresponded with an average free-ridership score of 36.98%, will allow for a better understanding of the correlation between how customers answer the application question and their responses to the self-report survey questions. Given the inconsistency between the responses, it is important to not rely on this application question alone to identify free-riders.

Table 6-6 Analysis of Application and Free-ridership Responses

Application Response	Count of cases	Unweighted Average FR
Would purchase and install the entire project	10	25.00%
Would purchase and install standard equipment	25	33.50%
Don't know	143	36.98%
Would purchase some, but not all, of the high-efficiency project	12	17.71%
Would not purchase nor install any equipment	46	28.06%

While we would not recommend screening solely on the customer response to this question, we feel that a few revisions to the response categories and flagging certain responses for a discussion with the customer could help Duke Energy manage their free-ridership for the program. Program staff could use this question to discuss project goals and encourage customers to install higher efficiency or more equipment with the program's assistance.

OFFICIAL COPY
Mar 07 2023

6.2.4 Contractors

The evaluation team surveyed 62 unique contractors involved in the installation of participating customers' projects during the evaluation period. We also include feedback from four of the third-party vendors.

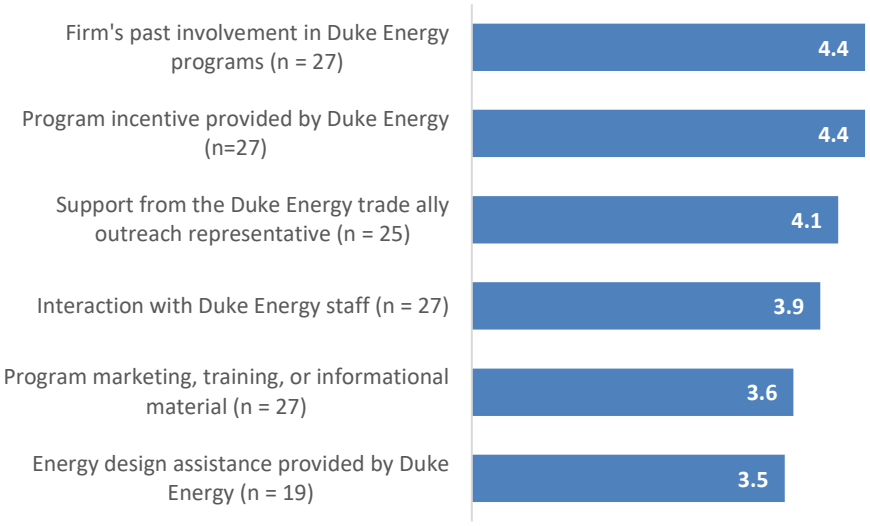
6.2.4.1 Contractor Characteristics

We spoke with a mix of contractors from small businesses to large organizations, with responding contractors reporting between zero to 900 full-time employees. Over half of the contractors interviewed (35 of 62 respondents) had between one and 10 full-time employees, 29 percent (18 of 62) had between 11 and 50, and the remaining 15 percent (9 of 62) had between 50 and 900 full-time employees. Over eighty percent of the responding contractors (50 of 62) do not use part-time staff. Ten of them have less than seven part-time staff, and two had more than 30.

6.2.4.2 Customer Interaction

Most influential vendor respondents (85 percent or 22 of 26) said they incorporate the program incentive into their pricing estimates. For the projects that went through the program, influential vendor respondents felt the program incentive and their past involvement with Duke Energy were the most influential factors on a customer's decision to complete their project. Influential vendors were asked to rate the influence of various factors on their recommendations to specific customers on a 1 to 5 scale, where 1 was 'not at all influential' and 5 was 'very influential.' As shown in Figure 6-3, the program incentive and past involvement received a score of 4.4, while the second most influential factor was support from the Duke Energy trade ally outreach representative (4.1).

Figure 6-3 Influence of Program Components

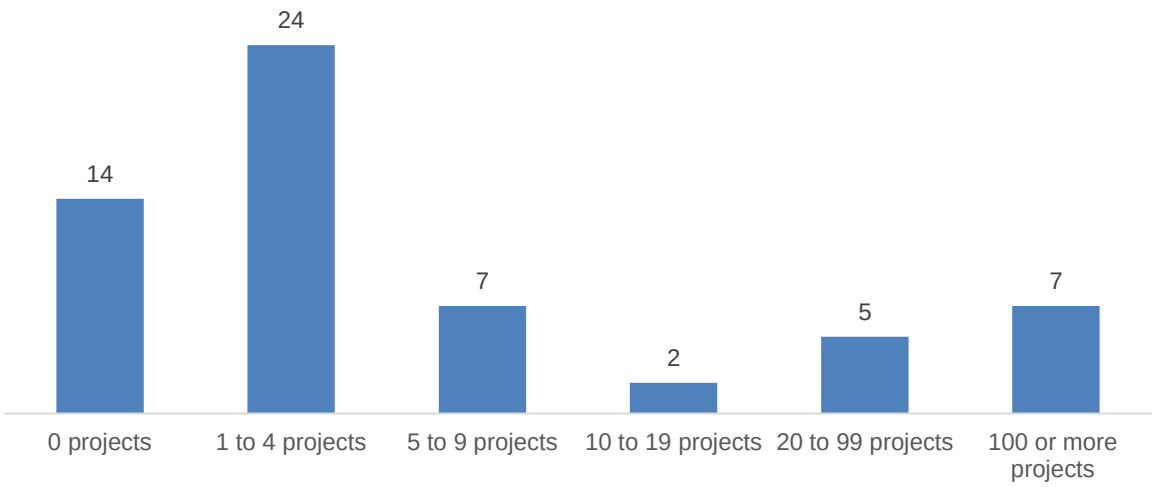


Source: Contractor Survey; FR2

Figure 6-4 shows the number of contractors and an estimate of the number of additional, similar projects sold within the last 12 months. The most common response (14 respondents) from contractors was that they had not completed any similar projects in the last 12 months.

OFFICIAL COPY
Mar 07 2023

Figure 6-4 Number of Similar Projects Completed in Last 12 Months (n=59)



Source: Vendor Survey; P1
Don't know responses have been removed

Almost half of the vendors (22 of 46) reported that all of their high-efficiency projects received incentives through Duke's Energy program. One-third of respondents (15 of the 46) indicated 50 percent or fewer of their projects received Duke Energy incentives.

The third-party vendor interviews focused on retail customers who participated at multiple locations. These large national account customers with multiple locations often take a phased approach to implement energy efficiency, spanning several years. Planning to implementation may take anywhere from two to five years. Store prioritization is typically based on high energy users, store visibility, condition or viability, the project's return on investment, and rebates available. The rebates are usually factored into the ROI.

Equipment specification can also be more complicated for national accounts as there are typically multiple parties involved. There is staff within each company, contractors and equipment dealers, and third-party consultants providing input. One of these parties may reach out to Duke Energy and other utilities for input or assistance at any point in the process.

6.2.4.3 Application Process

As far as the application process, all four third-party vendors assist the customers with applications. Two of the third-party vendors complete the entire application process now that they can sign for the customer. Third-party vendors indicated that most of the projects they help retail customers with are rebated through the Prescriptive program, but whatever equipment is not eligible through Prescriptive is routed through Custom. This requires third-party vendors to understand the programs to get preapproval on the Custom projects early enough to keep identified projects on schedule.

The third-party vendors appreciate the online application portal, making tracking application, preapproval, and rebate/incentive status easier. While a few vendors commented that the

OFFICIAL COPY
Mar 07 2023

application process was easy, and easier than what they experienced with other utility programs, they were likely talking about the Prescriptive process. A couple of vendors said it does not reduce the complexity of the Custom application process. Some specific comments include the following:

> *"The application process has dramatically improved in the last five years. Five years ago it was all paper applications, now with the online portal - it's a really nice improvement in the work flow. We can track processing status for each project. Preapproved projects can be released for installation."*
>
> *"I use the online portal, just in the last year or two. It works pretty well. Some built-in inefficiency for large projects with lots of different measures, those can be cumbersome via the portal. Individual measures require multiple selections for each line item."*
>
> *"Keep a paper option even if they offer online. Please don't go to online application only. They are harder to sign and submit transfers."*

One vendor specifically called out the issue of having to fill out two application forms for each project - one for Prescriptive and one for Custom for a customer that does 100+ projects per year. Although the vendor understands why Duke Energy may choose to follow this process, he suggested that other utilities have more flexibility. Specifically, some utilities allow them to pull all the equipment into the Custom application and measure actual wattage savings for the entire project, which is more accurate and avoids the Prescriptive assumptions. He feels the calculator is burdensome and not designed for national accounts.

Another vendor had a different experience with the application process. They said they received guidance that the Custom program prefers to submit multiple locations as a single application. That would be easier to manage if the vendor could submit a general scope instead of site-specific.

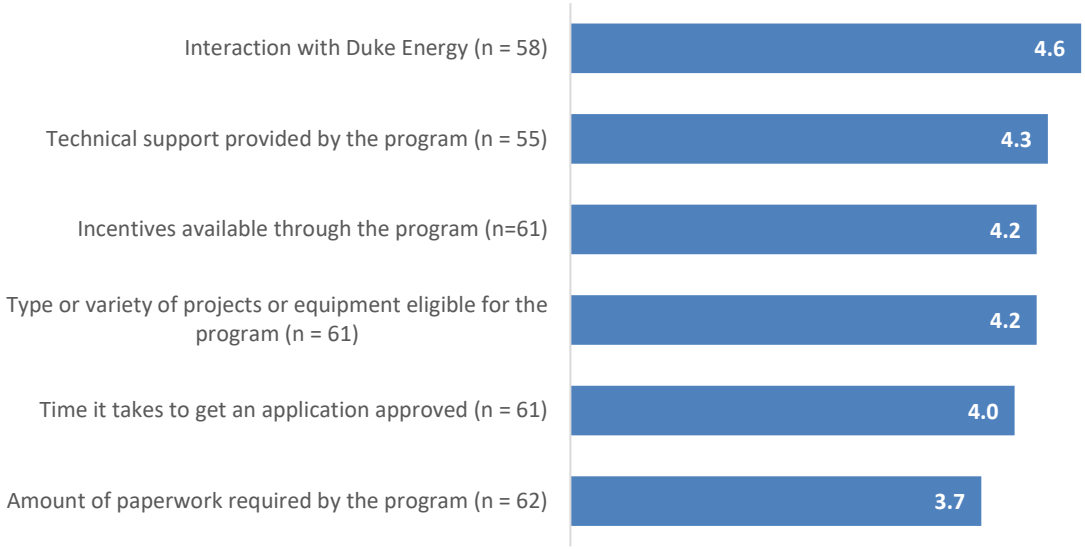
6.2.4.4 Satisfaction

Contractor satisfaction remains high with the Smart $aver Custom Incentive program. Respondents were asked to rate their satisfaction on a 1 to 5 scale where 1 was 'not at all satisfied' and 5 was 'very satisfied.' On average, contractor respondents rated their overall satisfaction with the program 4.3.

Contractors were also asked to rate their satisfaction with different program components using the same scale. Contractors were generally satisfied with the program, with all components mean scores a 3.7 or higher. As shown in Figure 6-5, the program's highest mean score was for the contractors' interactions with Duke Energy program staff (4.6). Like the last evaluation, the lowest rated item was the amount of paperwork (3.7) the program requires. Satisfaction with the program's technical support saw a noticeable improvement from last evaluation, jumping from 3.8 to 4.3.

OFFICIAL COPY
Mar 07 2023

Figure 6-5 Contractor Satisfaction with Program Components



Source: Questions S3A, S3B, S3C, S3D, S3E, S3F
Don't know responses are excluded.

As far as improvements with the program, almost 60%, or 37 of the 62 contractor respondents, indicated they had no recommendations for program changes. This is up significantly from the last evaluation when only nine of the 21 contractors surveyed said they could not think of any improvements. For the remaining 25 respondents, 15 contractors suggested improving the application process, five wanted more types of incentives, and one respondent mentioned increasing marketing for the program.

Table 6-7 Contractor Suggestions for Program Improvements

Suggestion	Overall
Improve application process	15
Add more types of incentives	5
More marketing	1
Respondents	**25**

Source: Contractor Survey; S4o

Some specific comments from contractor respondents include the following:

> *"Make it more simple, straightforward, and easier for the customer to apply for it. Be able to apply value to a customer, a rebate value, prior to submitting it for approval. Progress Energy had a streamlined spreadsheet where a customer plugged in a value."*

> *"You need to add ductless to their rebates."*

OFFICIAL COPY

Mar 07 2023

"Probably some marketing would do well. If they would link the environment and the possibility of helping with indoor air quality (regarding Covid) and link it to the program."

"Offer greater incentives on fixtures that have more efficacy and will light better and last longer. They give as much for a tube as they do for a fixture, and that makes no sense."

"The online tools - there is an inconsistency in the tools for both the prescriptive and custom - with usability."

"They have actually enacted several of the things I've suggested over the year. The issue I'm currently having is eligibility through the portal process. There's something that is not working, and it keeps stalling."

"Midstream is extremely difficult to determine whether a customer is eligible."

While some contractors commented about the prescriptive program, most understood the differences between the two programs. Sixty percent of the responding contractors thought it was somewhat easy (18 of 60 respondents) or very easy (18 respondents) to understand the differences in equipment eligibility between Duke Energy's Custom and Prescriptive programs. Seventeen respondents found understanding the programs' eligibility somewhat difficult, and one respondent described it as very difficult.

6.2.4.5 Effects of the COVID-19 Pandemic

The process evaluation occurred during the COVID-19 pandemic. We included questions in the survey to understand the pandemic's impact on contractor business operations. When asked about how the pandemic had affected their business, most contractor respondents indicated that the pandemic had a moderately negative effect on their business (33 of 62 respondents). Nine contractors said the pandemic had little to no effect, while 13 respondents claimed their business experienced a large negative effect.

When discussing specific ways their business was affected, the most common response was that their business was forced to implement social distancing procedures (28 respondents). As shown in Table 6-8, 18 contractors said they saw a reduction in sales while 19 said they had less access to customers and their work sites.

Table 6-8 Effect of Pandemic

Effects of COVID-19	Respondents
Social distancing and PPE use	28
Less access to customers and facilities	19
Decrease in sales	18
Logistical issues	17
Workers fired or placed on leave	5
Worker shortage	1

OFFICIAL COPY

Mar 07 2023

Effects of COVID-19	Respondents
More sales of COVID mitigation equipment	1
Respondents	**53**

Source: Vendor Survey; CV2

Contractor respondents were divided on when they thought their companies would return to normal operations. Over one-third of the respondents (22 of 57 respondents) said they did not believe their operations would return to normal until after September 2021. On the other hand, ten respondents said their operations never changed significantly.

Contractors also said their sales shifted as a result of the pandemic. Seven contractors said they are selling more COVID mitigation equipment; three mentioned air quality and two mentioned UV lighting equipment. On the logistical side, four contractors said they experienced shipping delays.

6.2.5 Participants

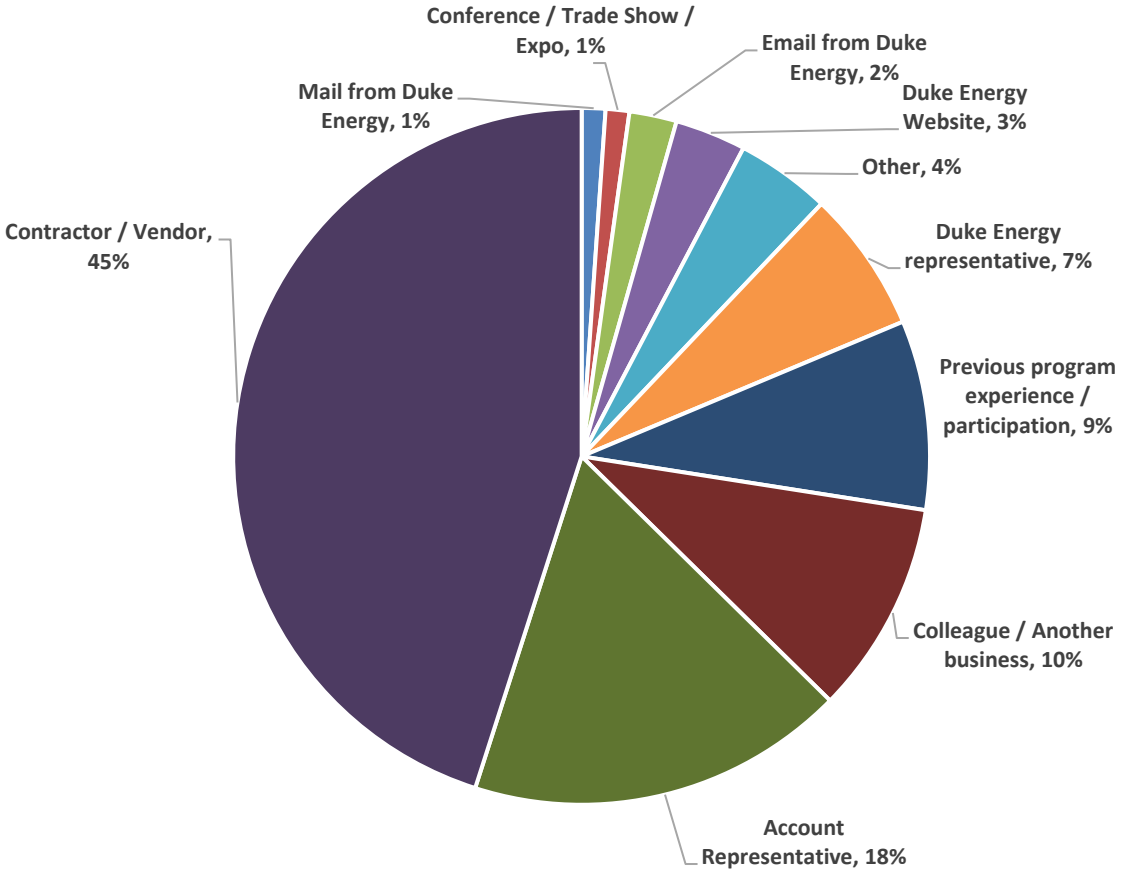
Surveys were conducted with program participants or customers who received an incentive through the SmartSaver Custom Program. This section provides detailed findings from 92 customer respondents who completed the surveys (65 were DEC customers and 27 were DEP customers and two respondents participated in both DEC and DEP).

6.2.5.1 Marketing Practices

Traditional marketing channels, such as direct mail, account managers, ads on social media or other websites, and emails to a subset of customers by segment have been used to promote the program. The program also reaches out to builders and architects to support the new construction portion of the program. Trade Ally Outreach Representatives market the program directly to contractors, which Duke Energy 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 among participant respondents were their contractor or vendor (45 percent), their account representative (18 percent), or a colleague or another business (10 percent). Figure 6-6 shows breakdown of the awareness sources among customer respondents. Sources of awareness were similar between the two territories and similar to the last evaluation’s results.

OFFICIAL COPY
Mar 07 2023

Figure 6-6 Participant Source of Program Awareness (n=91)



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

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 Incentive program, saving money (47%), the incentive (38%), and energy savings (35%) were most frequently mentioned by participants.

OFFICIAL COPY
Mar 07 2023

Table 6-9 Reasons for Participating in Smart $aver Custom Incentive Program

Reason	DEC	DEP	Overall	
			Count	Percent
Saving money	34	9	43	47%
The incentive	21	14	35	38%
Energy savings	23	9	32	35%
Needed new equipment	11	5	16	17%
Following a recommendation	6	3	9	10%
Better equipment for less	5	3	8	9%
Environmental concerns	3	1	4	4%
Respondents	**65**	**27**	**92**	

Source: Question Q6
Multiple responses are allowed
Don't know responses are excluded.

6.2.5.2 Application Process

The review process takes about four to six weeks, according to program staff. Staff mentioned they have been meeting this turnaround time and typically exceed it. This is corroborated by the feedback provided by customer respondents, who were generally highly satisfied with the review process (Table 6-10). When asked about their satisfaction with various aspects of the application process, respondents rated their satisfaction highly, with mean scores for each aspect of the application 8.7 or higher for participants (using a 0 to 10 scale where 0 is 'very dissatisfied' and 10 is 'very satisfied').

Table 6-10 Satisfaction with Application Process

Application Aspect	DEC		DEP		Overall	
	Mean	Respondents	Mean	Respondents	Mean	Respondents
Duke Energy's processing and preapproval of your application	9.0	65	9.0	25	9.0	90
Process to fill out and submit your application	8.7	63	9.2	25	8.9	88
Staff time it took to submit the application	8.8	63	8.9	26	8.8	89

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

About two-thirds of respondents (59 of 91) knew the online application portal. No follow-up questions were asked of this group, but when we looked at program satisfaction with customers aware of the portal and those who were not, we found people aware of the portal were slightly less satisfied (8.6 compared to 9.2). This may not indicate true satisfaction, as the question only asked about awareness of the portal and not the actual use of the portal.

OFFICIAL COPY
Mar 07 2023

Almost 70 percent of respondents (35 of 51) said they worked with a contractor or vendor to implement their project. Over 20 percent of respondents (11 of 51) said they worked with both a contractor and internal staff, while less than ten percent (5 of 51) worked only with internal staff to implement their project.

6.2.5.3 Calculators

As mentioned above, an appropriate worksheet or calculator must be submitted as part of the application process and to receive incentives through the program. 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. While contractors were the most common method used to calculate energy savings, over one-third of respondents reported using the tools Duke Energy provided (Table 6-11). Results were similar between the two territories.

Table 6-11 Calculators Used by Participants

Calculators Used	DEC	DEP	Overall
Contractor calculated	42%	37%	40%
Custom-to-go	38%	30%	36%
Own methods	31%	30%	30%
Other	5%	0%	3%
Respondents	**65**	**27**	**92**

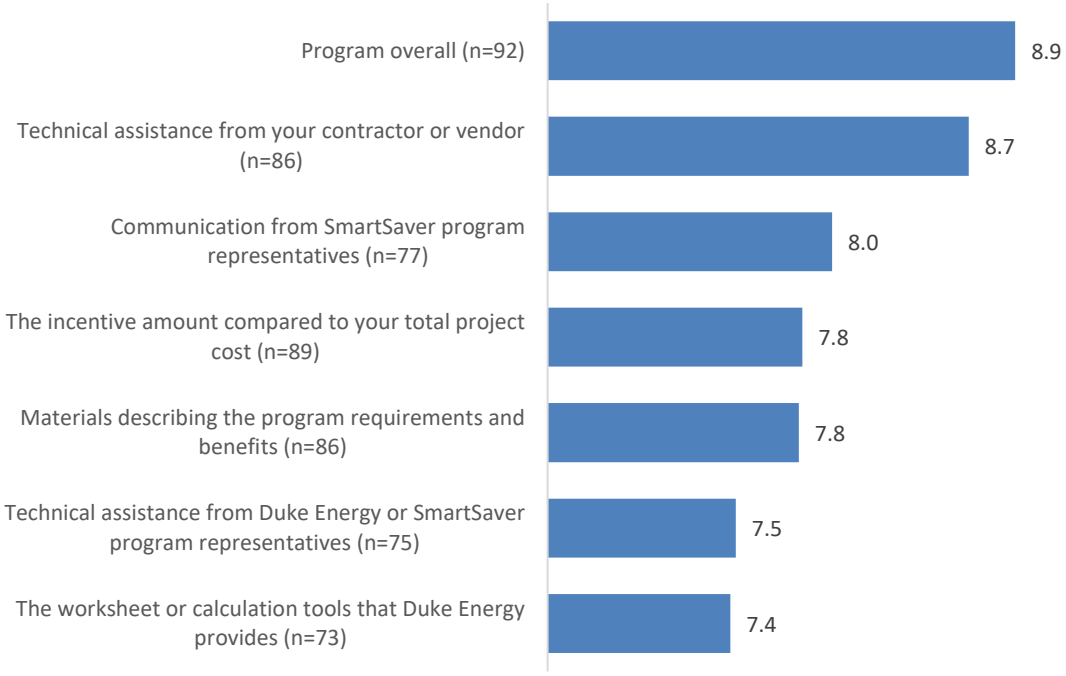
Source: Question Q12
Don't know responses are excluded.

6.2.5.4 Program Satisfaction

Overall, program participants were highly satisfied with the 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, 8.9 overall. 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 7.4 or higher. Satisfaction scores were slightly down from the last evaluation, when all aspects of the program were rated 8.2 or higher. Overall ratings for the Carolina’s territory is shown in Figure 6-7.

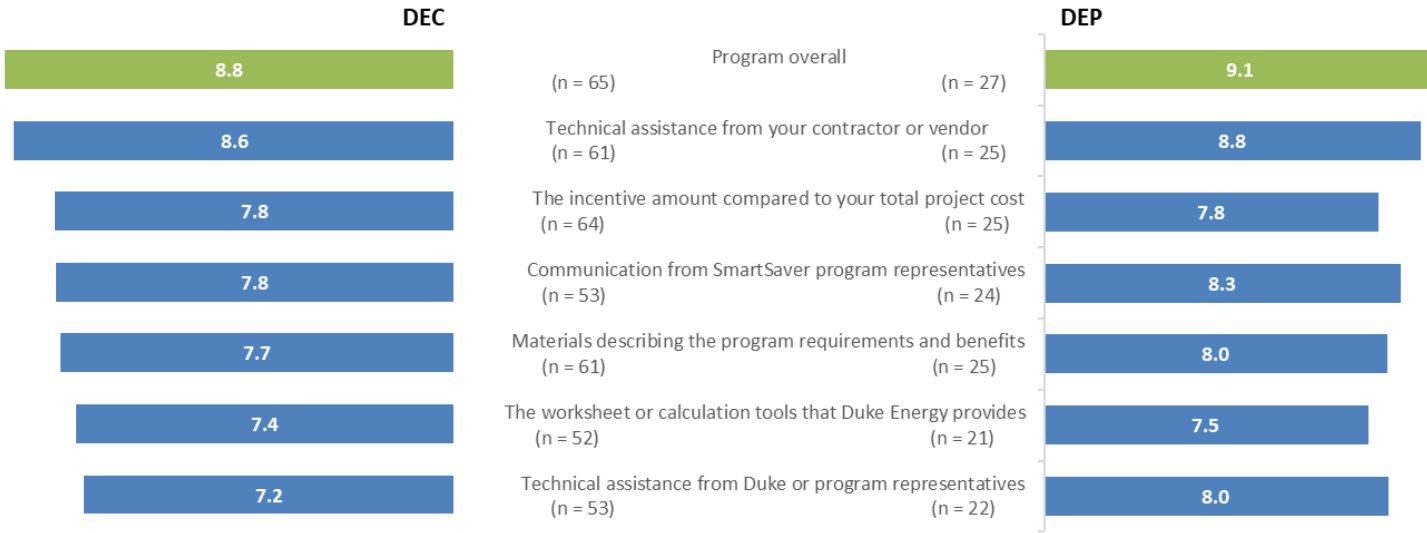
OFFICIAL COPY
Mar 07 2023

Figure 6-7 Program Participant Satisfaction and Value of Program Aspects in Carolina



As shown in Figure 6-8, respondents in the DEC and DEP territories provided very similar responses. The biggest difference in responses between the territories related to the importance of technical assistance from Duke or program representatives. Respondents in the DEP territory said Duke's technical assistance was more important to them than respondents in the DEC territory (8.0 vs. 7.2).

Figure 6-8 Program Participant Satisfaction and Value of Program Aspects



OFFICIAL COPY
Mar 07 2023

Source: Customer Survey; SAT11, SAT5A, SAT5B, SAT5C, SAT5D, SATD5E, SAT5F
Don't know responses are excluded.

While average overall program satisfaction remained flat (8.9 this evaluation versus 9.0 last evaluation), it should be noted that almost all the value scores saw slight reductions. The greatest decrease was seen for the value of the worksheet or calculation tools, which dropped from 8.3 to 7.4. The only program aspect that saw an overall increase in value was the value of technical assistance from the respondent's contractor (8.5 to 8.7).

When we looked at overall satisfaction with the program between customers who mentioned using Duke Energy-provided calculators and those who did not, we found that calculator tool users had slightly higher satisfaction scores (9.2 versus 8.9).

We also looked at how important various aspects of the program were to calculator users. Somewhat expectedly, participants who mentioned using Duke's custom go calculator rated the importance of Duke's worksheets, materials, communication, and technical assistance higher than respondents who did not mention using Duke's calculators. Participants who did not mention using Duke's calculator rated the importance of the technical assistance they received from their contractor higher than participants who used the custom-to-go tool (8.9 vs. 8.4).

Table 6-12 Value of Program Aspects by Calculator Use

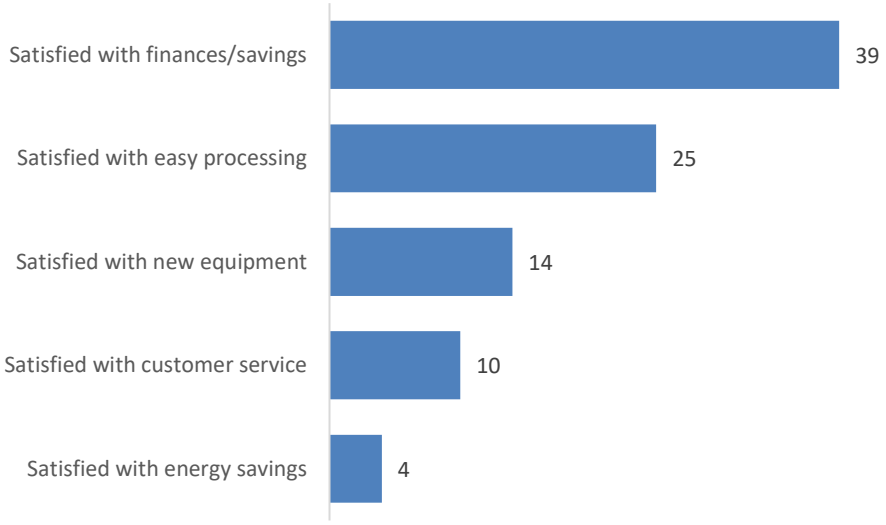
Program Aspect	Custom-to-go		Own / Contractor / Other Methods	
	Mean	Respondents	Mean	Respondents
Overall satisfaction with the program	9.2	33	8.9	50
Technical assistance from your contractor	8.4	30	8.9	47
Communication from Smart Saver program representatives	8.8	28	7.6	41
Technical assistance from Duke Energy or SmartSaver program representatives	8.5	28	7.0	39
Materials describing the program requirements and benefits	8.6	31	7.3	46
The worksheet or calculation tools that Duke Energy provides	8.8	32	6.3	35
The incentive amount compared to your total project cost	8.2	32	7.7	49

Source: Customer Survey; SAT11, SAT5A, SAT5B, SAT5C, SAT5D, SATD5E, SAT5F
Don't know responses are excluded.

Respondents reported many reasons for rating the program highly, including the program's financial incentives (39 respondents) and the easy processing (25 respondents). Also rated highly include receiving new equipment (14 respondents), Duke's customer service (10 respondents), and energy savings (4 respondents). Figure 6-9 shows the five most common responses.

OFFICIAL COPY
Mar 07 2023

Figure 6-9 Reasons for Rating the Program Highly (n=88)



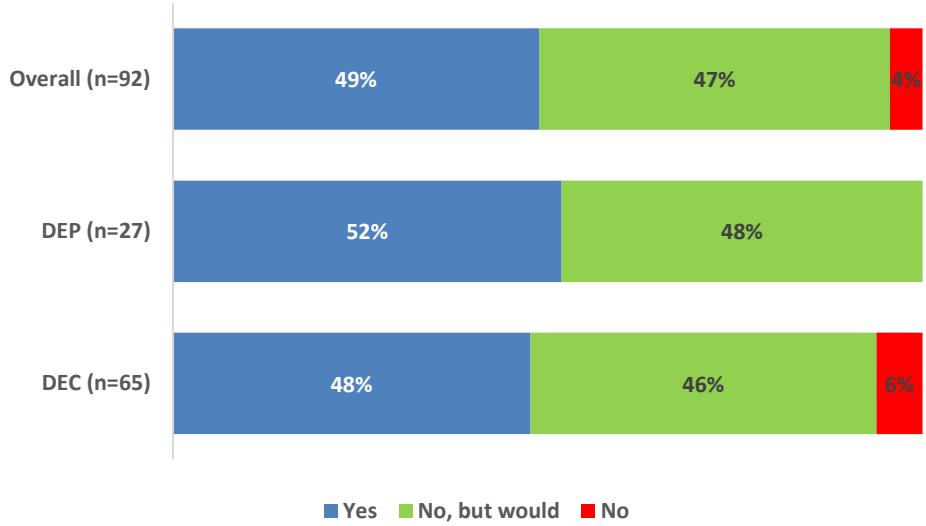
Source: Customer Survey; SAT12

Some customers provided areas of dissatisfaction. These included program processes including the finances or savings (7 respondents), application process (5 respondents), and customer service (1 respondent). One respondent indicated that "it cost me more to participate than I got in savings" and another said they did a large project but felt the incentive was small relative to the project size, specifically saying "that is not an incentive with that small of an amount."

As another gauge of satisfaction, customers were asked if they have recommended the program to others. As shown in the figure below, almost half the participants reported that they had already recommended the program. If provided the opportunity, almost all the remaining respondents said they would recommend the program. However, it should be noted that the last evaluation of the program found no respondents saying they would not recommend the program to others.

OFFICIAL COPY
Mar 07 2023

Figure 6-10 Have You Recommended the Program to Others?



Source: Questions SAT8, SAT9

The primary reason respondents reported rating the program highly (providing a rating of an 8 or higher) was due to the program's financial savings. This was followed by easy processing and the technological improvements seen through their new equipment.

Table 6-13 Reasons for Rating the Program Highly

Reason	DEC	DEP	Overall
Financial savings	46%	40%	44%
Easy processing	25%	36%	28%
New equipment	17%	12%	16%
Customer service	8%	20%	11%
Energy savings	5%	4%	5%
Respondents	**63**	**25**	**88**

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

Thirteen participant respondents rated their satisfaction less than an 8. While some had to do with the application process, other responses varied. Below are some specific comments respondents provided and how they rated their overall satisfaction with the program in parentheses.

"It cost me more to participate than I got in savings." (0)

"Because it is not a very big amount. The HVAC Project we did was for $1.5 million projects, and the incentive we received was only $14,505, that is not an incentive, with that small amount." (3)

OFFICIAL COPY
Mar 07 2023

"Because the application was not very user friendly for a layperson to use with the calculations for a neighborhood nonprofit pool." (6)

"Because you require receipts, I have to go through a general contractor to a subcontractor to a supplier to get those receipts, makes it a bureaucratic nightmare." (6)

"It's expensive – we can't participate because we don't have any big energy-saving projects at the moment" (7)

"If they could do a better job of doing rebates for more items, and make it easier to obtain rebates for known efficiency strategies" (7)

"We got a decent incentive, but we had some difficulties confirming our engineering calculations with our engineers" (7)

"We went through the process and then determined that it doesn't really apply to what we're doing." (7)

"Balancing that we really appreciate the incentive factor, but the hassle factor is so unbelievably difficult to work with." (7)

When asked what they would change about the NR Custom program, over half of the participant respondents (64 of 92) indicated they would not change anything. Of the remaining respondents, 13 respondents mentioned the rebate amount. Other suggestions included improving the initial processing time (five respondents), simplifying the application process (four respondents), updating or extending the list of eligible equipment (three respondents), and removing the pre-approval requirement, increasing awareness about the program (two respondents).

Table 6-14: Recommended Program Changes

Reason	DEC	DEP	Overall
Would not change anything	41	23	64
Increase rebate amount	12	1	13
Improve initial processing time	3	2	5
Other	5	0	5
Simplify application process	4	0	4
Cover more types of equipment	3	0	3
Remove pre-approval requirement	2	0	2
Respondents	**65**	**27**	**92**

Source: Question SAT1
Multiple responses are allowed
Don't know responses are excluded.

OFFICIAL COPY
Mar 07 2023

Some specific comments included the following:

> *"Work through the bureaucracy of the receipts issue"*
>
> *"More user-friendly on the tail end when you're getting your check, getting it to the right person."*
>
> *"It would have been better if they had been more flexible with the timelines."*
>
> "*Eliminate the program or make it worthwhile. (For) smaller companies, it's very difficult to make anything out of the program, (and is) not worth the trouble."*
>
> *"Make (the program) more readily known; if it weren't for our contractor, we would not have been aware."*
>
> *"If we lease the space out and someone else pays the electric bill, they're eligible for the program, and we are not."*
>
> *"Make (the program) more customer-friendly and change it less often. My contractors are not willing to keep up with it."*

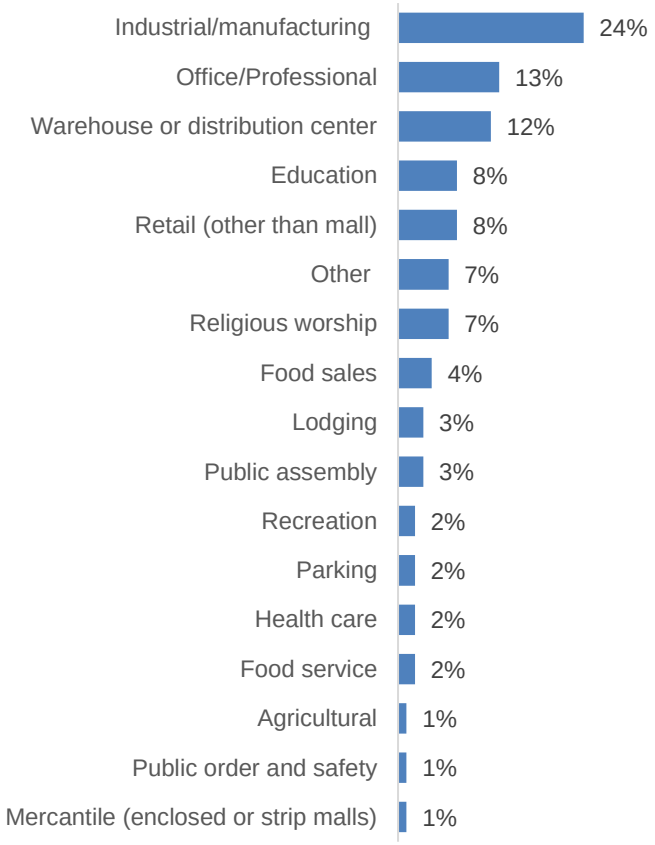
6.2.5.5 Participating Customer Characteristics

Facility types varied across participant respondents' locations. The most frequently mentioned types of businesses were industrial/manufacturing (24 percent), office or professional buildings (13 percent), warehouse or distribution centers (12 percent), and educational buildings (eight percent). The facility types are consistent with how the program was marketed, initially targeting larger industrial customers.[7]

[7] Customers are about to opt in/out of energy efficiency programs and the requirements have been different between DEC and DEP. Historically, DEC was a one year opt in period for the calendar year and customers have a window where they are able to opt in and opt out. DEP customers could opt in at any time. When a customer received an incentive, they were considered opted in for three years.

OFFICIAL COPY
Mar 07 2023

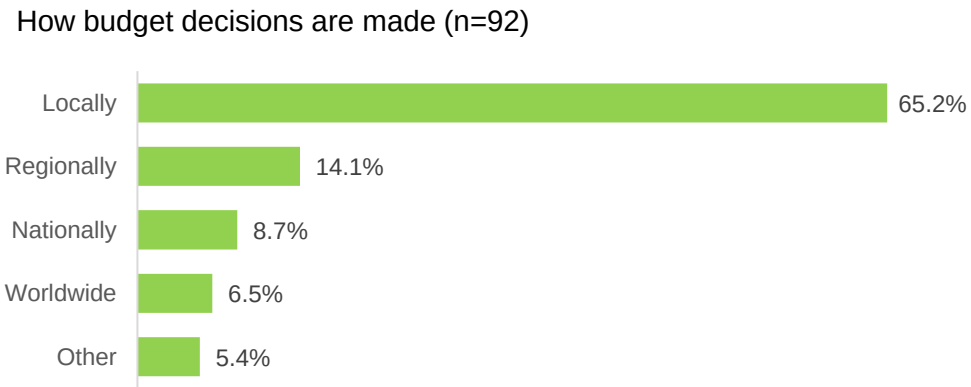
Figure 6-11 Smart $aver Custom Incentive Program Business Activities (n=92)



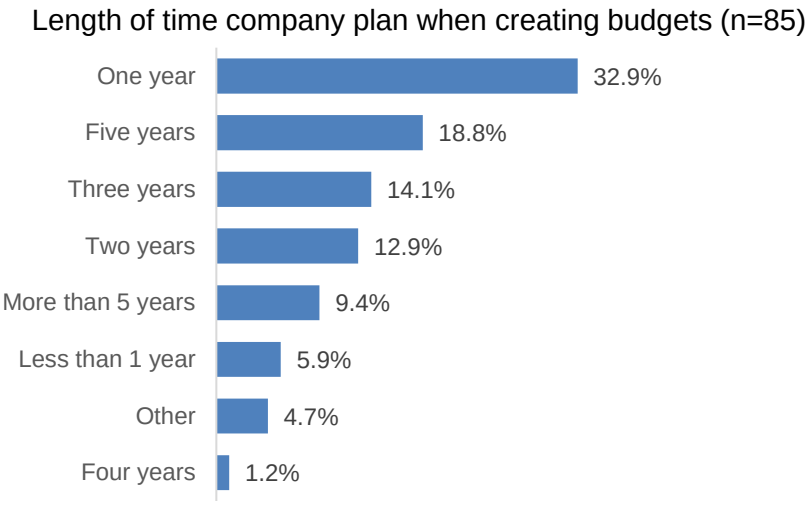
Source: Questions C1
Don't know responses are excluded.

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 (65 percent). Over half of respondents tended to plan one year (33 percent) or five years (19 percent) into the future when creating a budget and financial plans. The figure below shows the participant business characteristics.

Figure 6-12 Smart $aver Custom Incentive Program Participant Characteristics



OFFICIAL COPY
Mar 07 2023



Source: Questions C2 & C3
Don't know responses are excluded.

6.2.5.6 COVID Impacts

The participant survey occurred during the COVID-19 pandemic, similar to the contractor survey. The evaluation team included a few questions in the study to understand the pandemic's impact on any upgrades to customers' energy-using equipment. About one-third of customer respondents (36%) indicated that the organization had plans to upgrade equipment before the pandemic. These customers (32 respondents) were asked how the plans had changed. The majority of respondents (20 of 32) indicated they would have delayed planned projects. Seven respondents said they would have made no changes to their planned projects, three changed their project scope, and two said they would have canceled planned projects.

Respondents were asked to think about the project done during the evaluation period and asked if they had to decide to do the project today what decision they would make. The majority (83%) indicated they would have made no changes to the project. The remaining 15 respondents indicated they would have delayed the project (8 respondents), changed the scope (4 respondents), canceled the project (2 respondents), or done something else (1 respondent).

OFFICIAL COPY
Mar 07 2023

7 Conclusions and Recommendations

7.1 Impact Evaluation

Conclusion 1: The evaluation team saw strong evidence the Duke Program team conducts detailed reviews of the project applications, has quality control checks and revises measure parameters to refine savings estimates. Engineering reviews by AESC provides an additional level of quality control that helps to minimize most calculation errors or instances of over-claimed energy or demand savings. The strata-level realization rates indicate that an appropriate level of rigor is being applied to lighting projects and most non-lighting projects.

Recommendation 1: Continue the level of rigor being applied to projects as it goes through the NR Custom application process while considering the following recommendations to improve the program in specific areas.

Conclusion 2: Of the parameters needed to calculate lighting project savings, verified lighting operating schedules, or annual hours of use, were more often found to be different than the hours used to calculate reported savings. Applicants are asked to provide the operating schedules as part of the application process and participants, not trade allies, may have the best insights into what the schedule will be for each installed fixture.

Recommendation 2: Improve the level of detail collected in the application on the hours of operation. Weekly schedules should be defined and/or verified by the participant. Holidays and seasonal changes should also be captured in the annual hours of use.

Conclusion 3: Project reviews, both during the application process and the evaluation, benefit from documentation of all underlying assumptions and worksheets used for the calculations of savings. Photos serve as a valuable verification of the installed equipment and provide essential information regarding the condition and operating parameters of the old and new equipment. This applies to primarily small and larger non-lighting projects where trend data and manufacturer's specification sheets would allow more detailed analyses of the proposed measures. Lighting projects are very well documented but pictures of baseline equipment prior to it being removed would be useful to refine savings calculations.

Recommendation 3: Collect and document enough information and photos of the project so the calculations of savings could be independently repeated.

Conclusion 4: Measurement and verification (M&V) plans help confirm measures are installed and resulting in the expected energy and demand savings. Differences between expected savings and measured savings can help identify measures that are not performing or have been disabled and thus lead to refined savings estimates for the project. M&V plans for large non-lighting projects can greatly assist the review of the program applications and projects being evaluated, in some cases years after the project is implemented.

Recommendation 4: Require M&V plans that are consistent with recognized protocols for large non-lighting projects involving a large portion of the program savings or measures with high

OFFICIAL COPY
Mar 07 2023

uncertainty. Establish a threshold in kWh savings or incentives dollars above which an M&V plan is required.

Conclusion 5: The Duke NCEEDA protocol defines how savings from new, high-performance buildings shall be modeled and estimated. Assumptions on how the building is expected to be occupied and used are also required but do not always match how the new buildings are used or occupied. This can lead to the modeled consumption and savings not matching the actual consumption and savings.

Recommendation 5: The NCEEDA should incorporate a tiered post construction calibration requirement that uses the ASHRAE 14 tolerances to assess the level of uncertainty in the new construction models and adjust the model in order to minimize the uncertainty.

7.2 Process Evaluation

Conclusion 6: The program continues to operate as intended. Contractor and customer respondents reported high overall satisfaction with the program and many program aspects. The most common source of program awareness from customers was their contractor, consistent with Duke Energy's primary channel to market the program. A high proportion of customers reported the contractor recommendation as an important source of influence on their decision to install high-efficient equipment. Contractor technical assistance also saw high satisfaction, underscoring the critical role. Furthermore, contractors are generally satisfied with the program and appreciate using the incentives as a sales tool.

Recommendation 6a: 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. This engagement should include builders and architects who may be utilizing the new construction design assistance.

Recommendation 6b: Encourage contractors and architects to inform customers of the Duke Energy incentives available while considering equipment options. Early conversations may push customers to purchase program-qualifying equipment rather than standard efficiency.

Conclusion 7: The participant survey was conducted approximately 1 to 3 years after program participation. The more time passes from program participation, the more it can impact the customer recalling the details around the decision to select the specific equipment. Additionally, turnover can occur, so decision-makers may no longer be with the organization. All of which can impact free-ridership.

Recommendation 7: Conduct the free-ridership study closer to the decision-making process. This may help ensure we can talk with the decision-maker to answer questions regarding the decision to do the project through the program. By surveying customers closer to when the decision was made, they should be more likely to remember the factors that went into the decision. Surveys could be conducted on a rolling basis (i.e., quarterly) with those projects where incentives have been paid. Web surveys could be utilized if the project team collects the email address and contact details (name, address, and phone) of the decision-maker at the organization where the equipment was installed.

While customers are more likely to recall the decision process, not enough time will have passed to allow customers to install additional equipment because of the program; therefore,

OFFICIAL COPY
Mar 07 2023

the program may not see any spillover. The evaluation team may consider conducting a separate spillover study, if deemed necessary, to capture any spillover from participating customers.

Conclusion 8: As part of the application process, an appropriate worksheet or calculator must be submitted. Duke Energy provides access to two calculators: Classic Custom and Custom-to-Go, which recently changed. The calculators were transitioned from Excel-based to an online tool. Indications are customers are having difficulty adjusting to the new format. One-third of customer respondents reported using the Custom-to-Go calculator.

Recommendation 8: Monitor how customers and contractors use the calculators and request feedback for any specific changes that users request. Ensure any instructions associated with the calculator are clear to assist customers in entering or completing the necessary information. Coordinate any instruction documents used by Duke Energy staff to compile a comprehensive document.

Conclusion 9: Duke Energy staff report it typically takes between three to four weeks to review applications, faster than the four to six weeks the program indicates, which has resulted in reduced use of the Fast Track option. Participant feedback supports this, with high satisfaction reported for the application process. Contractors felt that the amount of paperwork they needed to submit was an area that the program could improve. Four contractors mentioned how the custom application was too complicated, and they would instead apply for incentives through the prescriptive program and have more prescriptive incentive options.

Recommendation 9a: Continue to monitor the time it takes to review applications to maintain the expedient process Duke Energy has in place.

Recommendation 9b: Monitor the equipment submitted for custom incentives and direct prescriptive measures to the prescriptive program for an easier application process.

Conclusion 10: A relatively new aspect to the program introduced in 2019 was an online application portal. The third-party vendors appreciate the online application portal, making tracking applications, preapproval, and incentive status easier. Still, a couple of the vendors said it does not reduce the complexity of the Custom application itself. Customers were only asked about their awareness of the portal, where one-third of customer respondents indicated they were aware.

Recommendation 10: Continue to market the online application portal to customers and contractors interested in the program. The online portal may help streamline costs and improve consistent application submittal with the necessary information.

Conclusion 11: The Duke team has an efficient and effective process for reviewing applications for preapproval to focus on eligible but not already committed projects. They offer both application and calculation assistance that provides third-party aid to customers and trade allies if needed for a fee. As part of the application, questions are included to identify projects where the customer has already identified or purchased program-qualifying equipment. The questions on the application are a great tool to use in talking with customers about their projects and plans to increase the scope and efficiency of projects. As applications are flagged, the program team can encourage customers to revise the scope to implement more than otherwise.

OFFICIAL COPY
Mar 07 2023

Recommendation 11a: Continue to discuss project scope with customers who may have already committed to a project based on question E[8] of the application. This question identifies customers who have already identified, purchased, or committed to a project or building.

Recommendation 11b: Update question G on the application to 1) require customers to answer the question and 2) revise the wording to allow more response options to be presented. By requiring customers to answer the question, the project team will better understand the type of equipment customers are selecting and if the program assistance is responsible for the project. The response to this question can provide insight into the potential free-ridership of the project. The evaluation team recommends updating the question text to the following:

> G. Without the program assistance and incentive, you would…
>
> - ❑ Purchase and install the same high efficiency equipment
> - ❑ Purchase less of the high efficiency equipment
> - ❑ Purchase the high efficiency equipment at a later date
> - ❑ Purchase standard / code minimum efficiency
> - ❑ Neither purchase nor install any part of the project

The project team can then use this question to flag applications and follow-up with customers to discuss the following: a) Would they consider more efficient equipment or more fixtures? b) How did they select the efficiency of the equipment on the application? c) Does the company have policies that encourage or require purchasing higher efficiency equipment, reducing GHGs or meeting sustainability goals? Answers to these questions will allow Duke Energy staff to determine if the project is a good candidate for an incentive and help further manage free-ridership.

The program team should carefully balance the need to minimize free-ridership with maintaining participation levels and subsequent customer satisfaction. The objective of this follow-up should not be to eliminate free-ridership from the program but to manage how much free-ridership is in the program. Follow-up will also optimize net savings and better understand how the program can encourage customers to achieve more savings than they would achieve on their own.

Recommendation 11c: Document changes customers make to projects from discussions with Duke Energy staff. While customers may feel that they were planning on high-efficiency equipment, conversations with Duke Energy staff can cause them to adjust their plans. The evaluation team can use details from documentation of these discussions to inform how intention is calculated, affecting the NTG score for that customer. Documentation should include the date of the conversation, original technology or efficiency plans, and new technology or efficiency plans.

Conclusion 12: Continue to check opt-in/out status with the customer applications to identify customers doing projects to get the incentive. These discussions will allow Duke Energy staff to determine better if the project is a good candidate for an incentive.

[8] Question E: Have you made any commitment to your project (signed purchase order/contract, ordered equipment, started construction)

OFFICIAL COPY
Mar 07 2023

Recommendation 12: Consider adding a question to the application asking customers about their opt-in/out status to identify customers doing projects to get the incentive. Answers to this question will also allow Duke Energy staff to determine better if the project is a good candidate for an incentive.

Conclusion 13: Transformation in equipment markets drives changes to what should be considered the appropriate baseline. Additionally, program influence and/or advances in technology can shift market baselines (e.g., LEDs and new construction). As the program matures and technologies change, baselines will change as well. The evaluation team found that some of the equipment incentivized through the program could be considered close to the market baseline equipment. Incentivizing LED lighting in high end new construction buildings has the potential for high free ridership since LED technology is becoming the market baseline in these applications. The program team should continue to monitor equipment baselines and adjust them accordingly.

Recommendation 13a: Consider additional application approval criteria, if feasible. These criteria could include a question on the application to identify customers' current ROI threshold for internal project approval. Another question to consider adding to the application or in discussions with customers would be if there are other benefits the company will gain (e.g., avoided O&M costs, better reliability, faster production).

Recommendation 13b: Research market baselines and adjust project baselines and measure savings as needed.

Recommendation 13c: Identify measures replacing equipment at the end of useful service life (EUSL) and assess ROI accordingly. Other questions the program team can ask customers in the discussion include the following:

- Does the company have a preventative maintenance program? If so, when is the equipment scheduled to be replaced?
- How much remaining useful life does the existing equipment have?

OFFICIAL COPY
Mar 07 2023

Appendix A Summary Forms

Duke Energy Carolinas 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 Carolina (DEC) 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)	*Carolina*	*L-Small (<360 MWh)*	*21,838,828*
Evaluation Period	*January 1, 2018 – Dec 31, 2019*		
Annual kWh Net Savings	*83,427,570*	*L-Large (≥360 MWh)*	*34,905,461*
Coincident kW Net Impact - Summer	*13,067*		
Coincident kW Net Impact - Winter	*12,111*	*NL-Small (<537 MWh)*	*9,657,879*
Net-to-Gross Ratio	*83.66*		
Process Evaluation	*Yes*	*NL-Large (≥537 MWh)*	*17,025,400*

Evaluation Methodology

Impact Evaluation Activities

- *55 sample project analyses*
- *Virtual site sites and desk reviews used primarily due to COVID*

Impact Evaluation Findings

- *Energy Realization Rate: 97.62%*
- *Net-to-gross: 83.66%*

Process Evaluation Activities

- *Program Staff; 8 interviews with program staff*
- *Trade Allies; 4 in-depth interviews with high volume contractors, telephone surveys with representative sample of 62 trade allies*
- *Participants; 236 telephone surveys*
- *Application data review*

Process Evaluation Findings

- *Contractors are the primary source of program awareness, and their assistance was the most valued program component by participant respondents*
- *Participant and trade ally satisfaction with the program is high*
- *Interaction with Duke Energy program staff was the highest-rated program component for contractors*
- *Contractors value the program and use incentives to encourage customers to purchase high-efficient equipment*

OFFICIAL COPY

Mar 07 2023

Duke Energy DEP 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 Progress (DEP) 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)	*Progress*	*L-Small (<123 MWh)*	*6,215,979*
Evaluation Period	*January 1, 2018 – Dec 31, 2019*		
Annual kWh Net Savings	*25,685,459*	*L-Large (≥123 MWh)*	*10,944,794*
Coincident kW Net Impact - Summer	*4,526*		
Coincident kW Net Impact - Winter	*4,342*	*NL-Small (<258 MWh)*	*3,108,640*
Net-to-Gross Ratio	*91.37*		
Process Evaluation	*Yes*	*NL-Large (≥258 MWh)*	*5,416,044*

Evaluation Methodology

Impact Evaluation Activities

- *49 sample project analyses*
- *Virtual site sites and desk reviews used primarily due to COVID*

Impact Evaluation Findings

- *Energy Realization Rate: 102.08%*
- *Net-to-gross: 91.37%*

Process Evaluation Activities

- *Program Staff; 8 interviews with program staff*
- *Trade Allies; 4 in-depth interviews with high volume contractors, telephone surveys with representative sample of 62 trade allies*
- *Participants; 236 telephone surveys*
- *Application data review*

Process Evaluation Findings

- *Contractors are the primary source of program awareness, and their assistance was the most valued program component by participant respondents*
- *Participant and trade ally satisfaction with the program is high*
- *Interaction with Duke Energy program staff was the highest-rated program component for contractors*
- *Contractors value the program and use incentives to encourage customers to purchase high-efficient equipment*

OFFICIAL COPY
Mar 07 2023

Appendix B DSMore Input Summary

Table B-1 Verified Impacts per Project by Technology and Project Size- DEC

Stratum	Gross Verified Energy Savings per Project (kWh)	Gross Verified Summer Coincident Demand per Project (kW)	Gross Verified Winter Coincident Demand per Project (kW)	Free Ridership	Spillover	Net to Gross Ratio
L-Small (<360 MWh)	72,714	9.7	8.5	29.16%	12.54%	83.66%
L-Large (≥360 MWh)	719,362	117.4	98.9			
NL-Small (<537 MWh)	116,608	16.3	22.3			
NL-Large (≥537 MWh)	1,565,439	285.1	267.8			

Table B-2 Verified Impacts per Project by Technology and Project Size- DEP

Stratum	Gross Verified Energy Savings per Project (kWh)	Gross Verified Summer Coincident Demand per Project (kW)	Gross Verified Winter Coincident Demand per Project (kW)	Free Ridership	Spillover	Net to Gross Ratio
L-Small (<123 MWh)	32,242.1	5.8	4.8	32.67%	24.03%	91.37%
L-Large (≥123 MWh)	362,986.2	46.1	53.8			
NL-Small (<258 MWh)	97,207.3	18.1	22.1			
NL-Large (≥258 MWh)	455,969.0	121.8	91.8			

OFFICIAL COPY
Mar 07 2023

Appendix C Free-ridership Scores Across Categories

Category	Response	n	Surveyed Savings	Verified Surveyed Savings*	Intention (weighted)	Influence (weighted)	Preliminary Free-ridership (weighted)	Free-ridership after adjustments (weighted)
Overall	Free-ridership	236	39,238,756	38,665,424	27.7%	0.8%	28.5%	30.0%
Locations (identified using contact and business names)	Single	72	19,662,000	19,248,556	12.8%	1.4%	14.3%	16.8%
	Multiple	164	19,576,756	20,063,062	42.9%	0.1%	43.0%	43.6%
Third-party (identified using email addresses)	No	235	39,177,957	39,248,386	28.2%	0.8%	28.9%	30.4%
	Yes	1	60,800	63,232	25.0%	6.3%	31.3%	31.3%
Duke Energy staff (Q1)	Account rep	90	20,795,977	20,800,873	32.9%	0.1%	33.0%	31.9%
	None	146	18,442,779	18,510,745	22.9%	1.5%	24.4%	28.8%
Formal requirements for purchasing equipment (BG3)	Yes	26	11,610,045	11,390,253	9.4%	1.2%	10.6%	8.8%
	No	66	15,593,693	15,336,566	29.1%	1.0%	30.1%	34.2%
Previous program participation (Q5)	Yes	41	17,997,146	17,647,040	24.9%	0.9%	25.7%	22.5%
	No	47	7,765,968	7,704,565	13.3%	1.6%	14.9%	28.0%
Measure type (from sample)	Compressed air	1	177,131	164,377	50.0%	0.0%	50.0%	75.0%
	Food service	1	279,593	257,505	25.0%	0.0%	25.0%	25.0%
	HVAC	23	7,990,912	7,545,362	8.9%	1.3%	10.2%	9.7%
	IT	1	445,529	429,490	50.0%	0.0%	50.0%	25.0%
	Lighting	186	20,982,001	22,010,764	32.5%	0.5%	33.0%	35.3%
	Process	4	4,763,127	4,580,010	45.9%	0.7%	46.6%	48.9%
	Whole building	20	4,600,464	4,324,109	18.3%	1.3%	19.6%	21.3%
	Yes	33	14,291,469	13,928,227	23.1%	0.6%	22.5%	21.9%

OFFICIAL COPY
Mar 07 2023

Category	Response	n	Surveyed Savings	Verified Surveyed Savings*	Intention (weighted)	Influence (weighted)	Preliminary Free-ridership (weighted)	Free-ridership after adjustments (weighted)
Work with Duke Energy staff prior to submitting application for preapproval (BG1)	No	51	12,183,239	12,034,992	17.5%	1.2%	31.3%	24.8%
Business type (C1)	Office/Professional	11	5,128,494	4,850,460	20.6%	1.6%	22.2%	13.3%
	Warehouse or distribution center	11	1,603,927	1,637,158	32.7%	4.4%	37.1%	42.4%
	Food sales	3	436,709	420,906	29.8%	0.0%	29.8%	29.8%
	Food service	2	250,146	232,383	49.5%	6.2%	55.7%	77.4%
	Retail (other than mall)	6	981,090	1,099,355	42.5%	0.0%	42.5%	40.9%
	Mercantile (enclosed or strip malls)	1	62,982	68,021	50.0%	0.0%	50.0%	25.0%
	Education	7	1,234,890	1,205,437	13.7%	0.3%	14.0%	45.2%
	Religious worship	6	411,097	410,325	9.5%	0.0%	9.5%	21.9%
	Public assembly	3	76,973	72,304	34.0%	3.3%	37.4%	55.6%
	Health care	2	574,412	533,054	5.4%	0.0%	5.4%	2.7%
	Lodging	3	63,374	67,489	45.0%	0.0%	45.0%	45.0%
	Public order and safety	1	212,936	200,160	50.0%	25.0%	75.0%	37.5%
	Industrial/manufacturing	25	12,947,213	12,723,984	20.3%	0.5%	20.8%	22.0%
	Agricultural	1	324,914	337,910	50.0%	0.0%	50.0%	87.5%
	Other	10	2,894,583	2,867,874	4.4%	0.0%	4.4%	9.0%
Where budget decision are made (C2)	Locally	60	14,482,357	14,367,205	28.0%	1.2%	29.2%	33.4%
	Regionally	13	3,409,591	3,361,308	29.4%	2.4%	31.8%	26.5%
	Nationally	8	2,949,602	2,841,651	12.4%	1.2%	13.6%	12.1%
	Worldwide	6	5,189,812	5,008,991	1.2%	0.0%	1.2%	1.2%
	Other	5	1,172,377	1,147,663	9.9%	0.0%	9.9%	14.1%

OFFICIAL COPY
Mar 07 2023

Category	Response	n	Surveyed Savings	Verified Surveyed Savings*	Intention (weighted)	Influence (weighted)	Preliminary Free-ridership (weighted)	Free-ridership after adjustments (weighted)
Lighting (from sample)	Lighting	186	20,982,001	22,010,764	32.5%	0.5%	33.0%	35.3%
	Non-Lighting	50	18,256,756	17,300,854	22.7%	1.1%	23.8%	24.2%
New construction (from sample)	No	216	34,638,293	34,987,509	29.4%	0.7%	30.1%	31.6%
	Yes	20	4,600,464	4,324,109	18.3%	1.3%	19.6%	21.3%
Strata (from sample)	Lighting-Large	22	9,215,482	9,722,701	24.6%	0.6%	25.3%	28.4%
	Lighting-Small	164	11,766,518	12,288,062	38.7%	0.5%	39.1%	40.8%
	Non-lighting-Large	10	13,584,476	12,954,724	22.3%	0.0%	22.3%	22.0%
	Non-lighting-Small	40	4,672,280	4,346,130	24.0%	4.2%	28.2%	30.9%
How far into the future company plan budgets and financial plans (C3)	Less than 1 year	5	401,186	416,765	33.3%	2.1%	32.5%	49.3%
	One year	28	4,780,388	4,752,520	16.0%	1.0%	23.8%	21.8%
	2 years	11	5,005,698	4,848,590	14.0%	2.4%	37.8%	14.8%
	3 years	12	6,540,858	6,458,524	36.6%	0.2%	20.8%	38.5%
	4 years	1	1,811,414	1,809,603	0.0%	0.0%	0.0%	0.0%
	5 years	16	5,187,830	4,940,779	14.7%	1.4%	29.9%	11.9%
	More than 5 years	8	1,231,852	1,184,263	13.3%	0.4%	37.9%	42.6%
	Other	4	317,476	312,047	18.4%	6.0%	18.8%	17.5%
Has production or business cycle that impacts energy efficiency projects (C4)	Yes	50	15,681,166	15,322,356	11.0%	0.6%	25.6%	15.4%
	No	40	11,048,531	10,930,640	35.2%	1.8%	32.4%	35.6%
Condition of old equipment (E4)	Operating with no performance issues	9	3,018,928	3,054,836	5.4%	0.4%	18.1%	5.8%
	Operating but in need of repair	16	3,591,367	3,536,179	11.6%	0.7%	21.7%	12.6%

OFFICIAL COPY
Mar 07 2023

Category	Response	n	Surveyed Savings	Verified Surveyed Savings*	Intention (weighted)	Influence (weighted)	Preliminary Free-ridership (weighted)	Free-ridership after adjustments (weighted)
How organization selected new equipment (Q4a)	We did some research on <MEASURE> efficiency and made our own choice	22	11,318,019	11,160,659	27.5%	0.5%	28.6%	30.2%
	Our contractor suggested one <MEASURE> efficiency level, and we agreed	20	2,369,621	2,294,209	18.5%	0.6%	33.9%	30.9%
	Our contractor suggested various <MEASURE> efficiency levels, and we chose one	39	10,357,862	10,315,257	16.5%	2.1%	28.1%	18.0%
	We worked with Duke staff who recommended the specific <MEASURE> efficiency	5	342,448	347,740	37.0%	0.2%	26.3%	45.0%
	Something else	5	1,781,878	1,656,721	13.3%	0.0%	18.8%	9.9%
Used Duke Energy calculators (Q12)	No	59	20,458,141	19,991,173	23.6%	1.2%	30.8%	26.8%
	Yes	33	6,745,597	6,735,646	12.2%	0.6%	24.5%	13.3%
Used own methods (Q12)	No	64	13,338,767	13,039,200	20.5%	1.7%	31.3%	24.9%
	Yes	28	13,864,971	13,687,619	21.0%	0.5%	22.4%	22.0%
Used other methods (Q12)	No	89	26,955,503	26,495,685	20.7%	1.0%	29.0%	23.4%
	Yes	3	248,235	231,134	25.4%	6.0%	16.7%	24.6%
Contractor calculated (Q12)	No	55	18,765,097	18,427,371	19.1%	0.8%	23.6%	20.9%
	Yes	37	8,438,641	8,299,448	24.3%	1.8%	36.0%	29.0%
Custom to go (from sample)	No	163	29,435,427	29,481,871	30.8%	0.7%	37.1%	32.0%
	Yes	73	9,803,330	9,829,747	20.3%	1.1%	25.2%	25.8%

OFFICIAL COPY
Mar 07 2023

Category	Response	n	Surveyed Savings	Verified Surveyed Savings*	Intention (weighted)	Influence (weighted)	Preliminary Free-ridership (weighted)	Free-ridership after adjustments (weighted)
Primary contact (from sample)	Customer	69	9,949,812	9,713,341	33.8%	0.0%	25.0%	33.6%
	Trade ally	167	29,288,945	29,598,277	26.3%	1.0%	36.9%	29.4%
FastTrack (from sample)	No	223	35,037,539	35,152,847	29.6%	0.8%	33.6%	32.2%
	Yes	13	4,201,218	4,158,771	16.5%	0.4%	29.6%	15.2%

*Savings incorporate the stratum-level realization rate with the exception of the overall category that uses the combined DEC/DEP program-level realization rate

OFFICIAL COPY
Mar 07 2023

Appendix D Survey Instruments

D.1 Participant Survey

Duke Energy Nonresidential Custom Program
Participant Survey

Sample Variables

CASEID

CONTACT_NAME Primary customer contact name

PROJECT_ID

COMPANY_NAME

ADDRESS The address of the site where the measure was installed

MEASURE Summary of project measure implemented
- 1 lighting
- 2 process equipment
- 3 compressed air
- 4 HVAC
- 5 food service equipment
- 6 whole building (NC)
- 7 IT equipment
- 8 other

MEASURE_TXT Sting version of measure

MeasureType Type of measure sampled

DESCRIPT## Detailed description of measure

MEASDESC

NC Flag for new construction project
- 1 New construction
- 0 Not new construction

NCEDA Flag for new construction energy design assistance track
- 1 New construction energy design assistance
- 0 Not new construction energy design assistance

OFFICIAL COPY
Mar 07 2023

YEAR The year the measure was completed and paid (2018 or 2019)

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
- NC North Carolina
- SC South Carolina
- IN Indiana
- KY Kentucky

Territory
- DEC Duke Energy Carolinas
- DEP Duke Energy Progress

TOTAL_KWH

MULTFLAG
MULTID
MULTQTY
PRIMARYCASE

VEND_COMPANY
VEND_CONTACT
VEND_PHONE
VEND_PHONE2
VEND_EMAIL

Introduction and Screening

INT01 Hello, my name is _____, 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]

OFFICIAL COPY
Mar 07 2023

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 Smart $aver Custom Incentive Program.

Our records indicate that you participated in Duke Energy's Smart $aver Custom Incentive Program that included a <MEASURE> project in <YEAR> at <ADDRESS>.

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	[SKIP TO OTHER_R]
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]
88	Don't know	[THANK AND TERMINATE 81]
99	Refusal	[THANK AND TERMINATE 91]

AVAILABLE_R May I please speak with that person?

01	Yes	[SKIP TO INT01]
02	No (When would be a good time to call back?)	
03	We have not participated	[THANK AND TERMINATE 82]
88	Don't know	[THANK AND TERMINATE 81]
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

OFFICIAL COPY
Mar 07 2023

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

01	Account representative	[AcctRep=1]
02	Business energy advisor (BEA)	[BEA=1]
03	Contractor / 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	Duke Energy representative (other than an account rep/BEA)	
10	Previous program experience / participation	
11	Other [SPECIFY]	
88	Don't know	
99	Refused	

Q2 dropped mid-field because survey length was too long

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 Q6
02	No	

Q3 dropped mid-field because survey length was too long

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

[RECORD VERBATIM]

Q6 What made you decide to apply to the Smart $aver program?

[RECORD VERBATIM]

Q4 [ASK IF Q1<>3] Did you work with a contractor or vendor to implement the <MEASURE> project or did you only 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]

Q4a Which of the following best describes how your organization selected the new high efficiency equipment for the <MEASURE> project? (Select one)

[READ LIST] [rotate options 1 through 4]

OFFICIAL COPY
Mar 07 2023

01 We did some research on <MEASURE> efficiency and made our own choice
02 [IF CONTRACTOR=1] Our contractor suggested one <MEASURE> efficiency level, and we agreed
03 [IF CONTRACTOR=1] Our contractor suggested various <MEASURE> efficiency levels, and we chose one
04 We worked with Duke staff who recommended the specific <MEASURE> efficiency
05 Something else [SPECIFY]
88 Don't know

BG3 Does your company have any formal requirements or informal guidelines for the purchase, replacement or maintenance of energy-using equipment?

01 Yes
02 No
88 Don’t know
99 Refused

BG4 [IF BG3 = 1] Which of the following best describes these requirements or guidelines? [READ LIST; SELECT ONE] [rotate responses 1-3]

01 Purchase energy efficient equipment regardless of cost
02 Purchase energy efficient equipment if it meets payback or return on investment criteria
03 Purchase standard efficiency equipment that meets code
04 Or something else [SPECIFY]
88 Don’t know
99 Refused

Q5 Prior to your <MEASURE> project in <YEAR>, had you participated in the Smart $aver program before?

01 Yes
02 No
88 Don’t know

BG4a [IF BG3=1 AND Q5=1] Did your experiences with Duke Energy programs or discussions with Duke Energy staff cause you to change your purchasing policies or guidelines for energy efficient equipment?

01 Yes [SPECIFY]
02 No
88 Don’t know
99 Refused

OFFICIAL COPY
Mar 07 2023

Q12 Now I would like to ask a few questions about your energy savings calculations and the program application process. Did you use the calculators provided by Duke Energy, or did you calculate energy savings using your own methods? (Select all that apply)

01 Duke's calculators
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 Calculators provided by Duke Energy
02 Own methods
03 Other [SPECIFY]
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 time it took your staff 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

OFFICIAL COPY

Mar 07 2023

Q11 dropped mid-field because survey length was too long

Q11 [ASK IF Q8=0,1,2,3 OR Q9=0,1,2,3 OR Q10=0,1,2,3] What could the program have done differently to make the application process easier?

[RECORD VERBATIM]

Q13 dropped mid-field because survey length was too long

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
02 No
88 Don't know

Q13a dropped mid-field because survey length was too long

Q13a [ASK IF Q13=1] What additional information was requested? Was it…(READ LIST)

[SELECT ALL THAT APPLY]

01 Information about your building
02 Details about the equipment installed
03 Information about prior equipment replaced
04 Your business schedule
05 Anything else requested [SPECIFY]
88 Don't know

Q25 Are you aware Duke Energy has an online application portal?

01 Yes
02 No
88 Don't know

Q17 [SKIP IF NCEDA = 1 OR NC = 0] Did you receive energy design assistance from Duke Energy for your new construction project?

01 Yes
02 No
88 Don't know

Q19 [ASK Q17=1 OR IF NCEDA = 1] Using a scale of 0 to 10, where 0 is "very dissatisfied" and 10 is "very satisfied", how satisfied are you with the energy design assistance you received through the Smart $aver program as part of your new construction project?

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

OFFICIAL COPY
Mar 07 2023

Q20 [ASK IF NC=1] What was most helpful about the energy design assistance you received?

[RECORD VERBATIM]

Q21 [ASK IF NC=1] Do you have any suggestions for improving the energy design assistance?

[RECORD VERBATIM]

Equipment Questions

[IF NC=1 SKIP TO NEXT SECTION]

E1 Was the high efficiency <MEASURE> installed as part of a new construction or major renovation project? (SELECT ONE)

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

E2 Did the high efficiency <MEASURE> you installed replace any existing <MEASURE> or was it a new type of equipment that you did not have before? (select one)

01	Replaced existing equipment	
02	New equipment	[SKIP TO NEXT SECTION]
88	Don't know	[SKIP TO NEXT SECTION]
99	Refused	[SKIP TO NEXT SECTION]

E3 About how many years old was your existing <MEASURE> equipment?

___	Years
888	Don't know

OFFICIAL COPY

Mar 07 2023

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

E5 [IF E4=1 or 2] Why did you decide to replace your old equipment?

[RECORD VERBATIM RESPONSE]

Background

BG1 Did you work with anyone from Duke Energy or the Smart $aver program prior to submitting your application for preapproval?

01 Yes
02 No
88 Don’t know

BG1a [ASK IF BG1=1] How did the Duke Energy program staff assist you with the project? Did they… [READ LIST] [SELECT ALL THAT APPLY]

01 Connect you with a trade ally
02 Identify potential projects to pursue
03 Identify specific equipment efficiency to install
04 Estimate project financial impacts, including incentives, energy bill savings, or payback
05 Respond to questions about participating in the program, including equipment eligibility or the application process
06 Assist you with anything else [SPECIFY]
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

BG2 [ASK IF Q1=01,02] Using a scale of 0 to 10, where 0 is “very dissatisfied” and 10 is “very satisfied”, how satisfied are you with your <IF Q1=01 SHOW “Account Representative”> <IF Q1=02 SHOW: “Business Energy Advisor”>'s involvement in the <MEASURE> project?

__ [RECORD RESPONSE]
88 Don’t know
99 Refused

OFFICIAL COPY

Mar 07 2023

BG2a [ASK IF BG2=0,1,2,3,4] What could the <IF Q1=01 SHOW "Account Representative"> <IF Q1=02 SHOW: "Business Energy Advisor"> have done differently?

[RECORD VERBATIM]

Net-to-Gross

MeasCHK [ASK IF MULTCHK = 2 ELSE SKIP TO FR0]
[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 <ADDRESS>, 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]

OFFICIAL COPY
Mar 07 2023

FR0 According to our records, you received an incentive of $<INCENTIVE> from Duke Energy to complete your <MEASURE> project.

[IF NCEDA=1 OR Q1=1,2 OR BG1A=1,2,3,4,5,6 OR FASTTRACK=1 OR Q12=1 SHOW "As part of that project…"]
[IF NCEDA=1: you received energy design assistance]
[IF Q1=02: you worked with a Business Energy Advisor]
[IF Q1=01: you worked with an Account Executive]
[IF BG1A=01: program staff connected you with a trade ally]
[IF BG1A=02: program staff helped you identify potential projects to pursue]
[IF BG1A=03: program staff helped you identify specific equipment efficiency to install]
[IF BG1A=04: program staff helped you estimate project financial impacts, including incentives, energy bill savings, or payback]
[IF BG1A=05: program staff responded to questions about participating in the program, including equipment eligibility or the application process]
[IF BG1A=06: program staff helped you by… (other specify:) <BG1Ao response>]
[IF FastTrack=1: your application was reviewed under the fast track option]
[IF Q12=1 or Q12a = 1: you or your contractor used savings calculators provided by Duke Energy]

01 Continue

FN1 [IF Q5=02 OR 88] Did you learn about this assistance from Duke Energy for this project BEFORE or AFTER you selected the specific type of <MEASURE> equipment for which you received the incentive?

01 Before
02 After
88 Don't know
99 Refused

FN2 [IF FN1=02] Just to confirm, you found out about the assistance available through Duke Energy's Smart $aver program after you had already decided to implement the energy efficiency <MEASURE> project?

01 Yes, after
02 No, before
03 Other [SPECIFY]
88 Don't know
99 Refused

OFFICIAL COPY
Mar 07 2023

[IF NC=1, SKIP TO FR1NC]

FR1 Which of the following is most likely what you would have done for your <MEASURE> project if you had not received this assistance 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
99 [DO NOT READ] Refused

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

[IF NC=0, SKIP TO FR3]

FR1NC Which of the following is most likely what you would have installed if you had not received this assistance from Duke Energy? (Read list)

01 Installed all standard efficiency or code equipment
02 Installed some energy-efficient equipment, but not as much as you did through the program
03 Installed the same efficient equipment as you did with the program's assistance
88 [DO NOT READ] Don't know

FR2NC [IF FR1NC=2] Without the Duke Energy design assistance and incentive, would the energy-using equipment in your building have been closer to standard efficiency or code, closer to what you ended up installing, or somewhere in between?

01 Closer to standard efficiency or code
02 Closer to what you ended up installing
03 Somewhere in between
88 [DO NOT READ] Don't know

FR3 [ASK IF FR1=3 OR FR1NC=3] Would your business have paid the additional $<INCENTIVE> to complete the project on your own?

01 Yes
02 No
88 Don't know

OFFICIAL COPY
Mar 07 2023

CC2 [IF FR3=1] Where would the additional $<INCENTIVE> have come from if you had not received the incentive from Duke Energy? Would the funds have come from another project, capital budget, another source or were the funds already allocated? [DO NOT READ]

01 Had the money allocated from the start
02 Transferred money from another project
03 Other [SPECIFY – what source]
04 Would have come out of our operating capital budget
88 Don't know
99 Refused

CC3 [IF FR1=2, 3, 88, 99] In your own words, how would your project have been different without the program's assistance?

[RECORD VERBATIM]

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 [IF Q1=02] The support provided by your Duke Energy business energy advisor
FR4c Smart $aver marketing materials or webinars
FR4d [IF Q5<>2] Previous experience with the Smart $aver program
FR4e [IF CONTRACTOR=1] The recommendation from your contractor or vendor
FR4f [IF NC=0] The technical support provided by Duke Energy engineer staff
FR4g [IF Q1=01] The support provided by your Duke Energy account manager
FR4h [IF NC = 1] The energy design assistance provided for your new construction project
FR4i [IF NC = 1] The bundle options provided for your new construction project
FR4j [IF NC=0 and (Q12 = 1 or Q12a = 1)] The calculators provided by Duke Energy

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

FR4O1 Were there any other interactions you had with Duke Energy or Smart $aver program representatives that influenced your decision to complete the energy efficient <MEASURE> project?

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

OFFICIAL COPY

Mar 07 2023

FR4O2 [ASK IF FR4O1=01] 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 that interaction (if needed: <FR4O1 aspect>) on your decision to complete the <MEASURE> project?

__ Record influence [0-10]
88 Don’t know
99 Refused

CC4 [If FR3 = 1 and any in FR4 > 7 SHOW: "Earlier in the interview you said you would have done the exact same project. But you also said the <FR4 category> was influential in your decision to complete the <MEASURE> project.]

[If FR1 = 1, 4 and not any of FR4a through j = 3,4,5,6,7,8,9,10 SHOW: Earlier in the interview you said you would have cancelled or postponed the project. But you also said none of your contact with the program was influential in your decision to complete the <MEASURE> project.]

In your own words, please describe what impact, if any, all the assistance you received from Duke Energy had on your decision to install the amount of energy-efficient <MEASURE> equipment at the time you did?

[RECORD VERBATIM RESPONSE]

Spillover

[IF MULTCHK=02 SKIP TO V1]

SP1 Since your participation in the Smart $aver 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 NEXT SECTION
88	Don’t know	SKIP TO NEXT SECTION
99	Refused	SKIP TO NEXT SECTION

OFFICIAL COPY
Mar 07 2023

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 NEXT SECTION

[START ROSTER; 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 NUMBER OF UNITS (0-800]
888 Don't know
999 Refused

[END ROSTER]

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 Smart $aver program on your decision to complete the additional energy efficiency project(s)?

__ [RECORD RESPONSE]

Fast Track Feedback

Section dropped mid-field because survey length was too long

FT10 [ASK IF FastTrack=0] 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 that this is now offered?

01 Yes
02 No
88 Don't know

OFFICIAL COPY

Mar 07 2023

FT13 [IF FastTrack = 0] If you have a project under a tight timeline, would you be willing to pay the $550 fee for an accelerated review of your Smart $aver application?

01 Yes
02 No (specify: Why not?)
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 <if FastTrack = 1 show "was", else "is"> the fast track application option?

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

Customer Satisfaction

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 Smart $aver Custom Incentive program?

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

SAT12 Why do you say that?

[RECORD VERBATIM]

SAT13 dropped mid-field because survey length was too long
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 value [0-10]
77 Not applicable
88 Don't know
99 Refused

SAT14 dropped mid-field because survey length was too long
SAT14 [ASK IF SAT13=0,1,2,3] Why do you say that?

[RECORD VERBATIM]

OFFICIAL COPY
Mar 07 2023

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 Smart $aver program components to your organization? [RANDOMIZE LIST]

FOR SAT5A through SAT5F

__ Record value [0-10]
77 Not applicable
88 Don’t know
99 Refused

SAT5a Materials describing the program requirements and benefits
SAT5b Communication from Smart $aver program representatives
SAT5c Technical assistance from Duke Energy or Smart $aver 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

SAT1 What would you change about the Smart $aver 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 Cover more types of equipment (specify: which types?)
06 Simplify application process (specify: what would you simplify?)
07 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?

01 [RECORD VERBATIM]

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

___ [RECORD PERCENT(0-100)]
888 Don’t know
999 Refused

OFFICIAL COPY

Mar 07 2023

SAT8 Have you recommended the Smart $aver 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 Smart $aver Custom Incentive Program to anyone?

01	Yes
02	No
88	Don't know

SAT10 dropped mid-field because survey length was too long

SAT10 Would you consider participating in the Smart $aver Custom Incentive Program again in the future?

01	Yes	
02	No	(specify: Why not?)
88	Don't know	(specify: Please explain)

COVID

CV1 dropped mid-field because survey length was too long

CV1 Overall, how has your organization been affected in 2020 by the COVID-19 pandemic? Has it been a…[READ LIST]

01	Large negative effect
02	Moderate negative effect
03	Little or no effect
04	Moderate positive effect
05	Large positive effect
77	Organization is closed or closing
88	[DO NOT READ] Don't know
99	[DO NOT READ] Refused
55	[DO NOT READ] Skip to next section

CV2 dropped mid-field because survey length was too long

CV2 Please describe how your business operations changed in 2020 as a result of the pandemic.

01	[RECORD VERBATIM]
77	No change

OFFICIAL COPY
Mar 07 2023

CV3 dropped mid-field because survey length was too long

CV3 [if CV2 <> 77] In your opinion, when do you think your business will return to its usual level of operations? [READ IF NEEDED]

01 By the end of December 2020
02 By the end of March 2021
03 By the end of June 2021
04 By the end of September 2021
05 Longer than September 2021
06 I do not believe this business will return to its previous usual level of operations
07 There has been little or no effect on this business's usual level of operations
88 Don't know
99 Refused

CV4 dropped mid-field because survey length was too long

CV4 What impact has COVID-19 had on your purchasing decisions?

01 [RECORD VERBATIM]
77 No impact

In this next section, we ask a few question about how the pandemic has impacted your project planning.

CV6 Prior to the COVID-19 pandemic, did your organization have any plans to upgrade or replace any energy using equipment in 2020?

01 Yes
02 No
88 Don't know
99 Refused

CV7 [IF CV6=1] How did your plans change?

01 No changes to planned projects
02 Delayed planned projects
03 Cancelled planned projects
04 Changed the project scope or specifications [SPECIFY]
05 Other [SPECIFY]
88 Don't know
99 Refused

OFFICIAL COPY
Mar 07 2023

CV8 Thinking about the <MEASURE> project you did in <YEAR>, if you would have to make a decision today about doing that project, what decision would you make?

01 No changes to planned projects
02 Delayed planned projects
03 Cancelled planned projects
04 Changed the project scope or specifications [SPECIFY]
05 Other [SPECIFY]
88 Don't know
99 Refused

Customer Characteristics

C1 What is the main business activity at <ADDRESS> in <CITY>?

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

OFFICIAL COPY
Mar 07 2023

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

V1 [ASK IF FR4E = 7, 8, 9, or 10 ELSE SKIP TO C7] Earlier, you indicated that the recommendation from a contractor, vendor, or supplier influenced your decision to implement the <MEASURE> project.

Could you give me the contact information of the vendor you worked through?

[IF "Don't know": Our records show that you worked with:
Vendor Company: <VEND_COMPANY>
Vendor Contact: <VEND_CONTACT>]]

01 Yes
02 No [SKIP TO C7]

OFFICIAL COPY
Mar 07 2023

V1_ <Programming note: show Contractor, Contractor_Name, and Contractor_phone from the sample as a reference.>

[RECORD VERBATIM]

V1_COMPANY Vendor business name
V1_CITY Vendor city
V1_CONTACT Vendor contact name
V1_PHONE Vendor contact phone number
V1_EMAIL Vendor email

V2 Which of the following assistance did your contractor or vendor provide? (Select all that apply)

Did the contractor assist with…

01 The design phase of the project
02 The selection of equipment to install
03 The completion of the rebate application
04 Any other part of the project (specify)
88 Don't know
99 Refused

[SKIP TO INT99 IF MULTCHK=2]
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 Do you have any comments you would like to share with Duke Energy?

01 Yes [SPECIFY]
02 No

OFFICIAL COPY

INT99 [SKIP IF MULTCHK=02] [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:

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

CP Completed survey

INT98 [ASK IF MULTCHK=02] [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:

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

CM Completed survey

Mar 07 2023

OFFICIAL COPY
Mar 07 2023

D.2 Trade Ally Survey

Duke Energy Midwest Smart $aver Custom Incentive Program
Participating Trade Ally Survey

Sample Variables

CASEID Contractor case identification number

VEND_COMPANY Contractor company name
VEND_CONTACT Contractor contact name
VEND_CITY Contractor city

PHONE_NUM Contractor contact phone number
ALTPHONE_NUM

VEND_EMAIL
Alt_email

VEND_KWH
VEND_PROG
NUMB_PROJECT

IV Flag if the contractor is an influential vendor
- 0 Not an influential vendor
- 1 Influential vendor

MEASURE Summary of project measure implemented
- 1 lighting
- 2 process equipment
- 3 compressed air
- 4 HVAC
- 5 food service equipment
- 6 new construction

MEASURETYPE Detailed description of sampled project, including specific measures installed

DESCRIPT01 to 04

MEASDesc Summary description of sampled measure category

CUST_CASEID
CUST_COMPANY
CUST_CONTACT

OFFICIAL COPY
Mar 07 2023

CUST_PHONE
CUST_EMAIL
CUST_ADDRESS
CUST_CITY
CUST_STATE
CUST_ZIP
YEAR

INSTALLDATE

NC Sampled project is a new construction project
1 New construction
2 Not new construction

Custom_flag
0 Specific equipment
1 Custom project

PART_Q17

Introduction

INT01 Hello, my name is _____, calling on behalf of Duke Energy. We are talking with design professionals and contractors participating in Duke Energy's Smart $aver energy efficiency programs for businesses. I'm not selling anything; I'd just like to ask you about your firm's recent experiences with this program.

[IF CONTACT NAME AVAILABLE] May I speak with <**VEND_CONTACT**>?

[IF CONTACT NAME NOT AVAILABLE] May I speak with the person who would be most knowledgeable about your firm's involvement with Duke Energy's programs?

01 Yes
02 No, R not knowledgeable [OTHER_R]

FAQ (**Why are you conducting this study**: Studies like this will help Duke Energy to continuously improve their business energy efficiency programs).

(**Timing:** This survey should take about 20 minutes. IF NOT A GOOD TIME, SET UP CALL BACK APPOINTMENT OR OFFER TO LET THEM CALL US BACK AT 1-800-454-5070.)

(**Sales concern**: This is not a sales call; we would simply like to learn about your organization's experiences with Duke Energy's energy efficiency programs. Your responses will be kept confidential.)

OFFICIAL COPY
Mar 07 2023

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

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

PREAMBLE I'm with Tetra Tech, an independent research firm. We have been hired by Duke Energy to evaluate their programs. I would like to assure you that 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

Influential Vendor Screener

C_IV_SKIP [IF IV = 0 SKIP TO NEXT SECTION, C_MULT_SKIP1]

INF1 [ASK IF NC=0] Our records show that your firm specified, sold, or installed a <**MEASURE**> project for <**CUST_COMPANY**> at <**CUST_ADDRESS**> in **<CUST_CITY>** around <**INSTALLDATE**> that qualified for a Duke Energy incentive. This project would have included <**MEASDESC**>. Do you recall this project? (Select one)

01 Yes, does recall [SKIP TO INF4]
02 No, does not recall
88 Don't know
99 Refused

INF1NC [ASK IF NC=1] Our records show that your firm was involved with designing or specifying a new construction project for <**CUST_COMPANY**> at <**CUST_ADDRESS**> in **<CUST_CITY>** around <**INSTALLDATE**> that qualified for a Duke Energy incentive. This project would have included <**MEASURE_TYPE**>. Do you recall this project? (Select one)

01 Yes, does recall [SKIP TO INF4]
02 No, does not recall
88 Don't know
99 Refused

OFFICIAL COPY

Mar 07 2023

OTHER_R1 Is there someone else at your firm who would be more familiar with this project? (Select one)

01	Yes	[RECORD CONTACT INFO FOR CALL NOTES]
02	No	[SKIP TO C1]
88	Don't know	[SKIP TO C1]
99	Refused	[THANK AND TERMINATE 91]

AVAILABLE_R1 May I please speak with that person? (Select one)

01	Yes, currently available	[SKIP TO INT01]
02	Yes, but R is not currently available	[INT15 – CALLBACK]
03	No	[SKIP TO C1]
88	Don’t know	[INT15 – CALLBACK]
99	Refused	[THANK AND TERMINATE 91]

INF4 <**CUST_COMPANY**> indicated that you were influential in their decision to implement the <**MEASURE**> project through the program. Just to confirm, were you involved in the decision-making process at the design stage when the <**MEASURE**> project was specified and agreed upon for this facility? (Select one)

01	Yes	[SKIP TO C_MULT_SKIP2]
02	No	[SKIP TO OTHER_R1]
88	Don't know	[SKIP TO OTHER_R1]

Non-Influential Vendor Screener

C_MULT_SKIP1 [IF MULTCHK=2 SKIP SECTION, C_MULT_SKIP2]

C1 [ASK IF NC=0] Our records show that your firm specified, sold, or installed <**MEASURE**> equipment that qualified for incentives through Duke Energy’s Smart $aver Custom program.

Is that correct? (Select one)

01	Yes	
02	No	[THANK AND TERMINATE 82]
88	Don’t know	[THANK AND TERMINATE 81]
99	Refused	[THANK AND TERMINATE 91]

OFFICIAL COPY
Mar 07 2023

C1NC [ASK IF NC=1] Our records show that your firm was involved in designing or specifying new construction projects that qualified for incentives through Duke Energy's Smart $aver Custom program.

Is that correct? (Select one)

01	Yes	
02	No	[THANK AND TERMINATE 82]
88	Don't know	[THANK AND TERMINATE 81]
99	Refused	[THANK AND TERMINATE 91]

C2 Are you the person who would be most knowledgeable about your firm's <**MEASURE**> projects completed through Duke Energy's Smart $aver Custom program? (Select one)

01	Yes	[SKIP TO NEXT SECTION]
02	No	
88	Don't know	

OTHER_R2 Is there someone else at your firm who would be more familiar with your firm's involvement in <**MEASURE**> projects completed through Duke Energy's Smart $aver Custom program? (Select one)

01	Yes	[RECORD CONTACT INFO FOR CALL NOTES]
02	No	[THANK AND TERMINATE 81]
88	Don't know	[THANK AND TERMINATE 81]
99	Refused	[THANK AND TERMINATE 91]

AVAILABLER2 May I please speak with that person? (Select one)

01	Yes, currently available	[SKIP TO INT01]
02	Yes, but R is not currently available	[INT15 – CALLBACK]
03	No	[THANK AND TERMINATE 91]
88	Don't know	[THANK AND TERMINATE 81]
99	Refused	[THANK AND TERMINATE 91]

OFFICIAL COPY
Mar 07 2023

Free-Ridership (asked only of Influential Vendors)

C_MULT_SKIP2 [IF MULTCHK=2 AND INF4<>1 SKIP TO THANK AND TERMINATE 86]

COMPANYCHK [ASK IF MULTCHK=02 ELSE SKIP TO FR2] [INTERVIEWER QUESTION: Is this case's <CUST_COMPANY> variable the same as a previous case's <CUST_COMPANY> variable?]

01	Yes, Duplicate company	[SKIP TO DECISIONCHK]
02	No, New company	[SKIP TO FR2]

DECISIONCHK [ASK IF COMPANYCHK=01] Now thinking about the project at <CUST_ADDRESS> in < CUST_CITY>, were the factors that influenced your recommendations to <CUST_COMPANY> the same or different from the previous project we just discussed?

01	Same decision making process	[SKIP TO INT99]
02	Different decision making process	

FR2 [IF INF4 <> 1 SKIP TO NEXT SECTION, P1] Now on a 1 to 5 scale, where 1 is "not at all influential" and 5 is "extremely influential", how would you rate the influence of the following factors in your recommendations to <**CUST**_**COMPANY**> for this project? (Select one for each) [RANDOMIZE QUESTIONS]

For FR2A through FR2E:

01	Not at all influential
02	
03	
04	
05	Extremely influential
77	Not applicable
88	Don't know
99	Refused

FR2a the program incentive provided by Duke Energy?
FR2b your interactions with Duke Energy program staff, including technical assistance?
FR2c the support from your Duke Energy trade ally outreach representative?
FR2d the program marketing, training, or informational materials?
FR2e your firm's past involvement in Duke Energy's programs?
FR2f the energy design assistance provided by Duke Energy?

OFFICIAL COPY

Mar 07 2023

FR4 Was the program incentive incorporated into your pricing estimate or proposal to <**CUST_COMPANY**> for the project? (Select one)

01 Yes
02 No
88 Don't know
99 Refused

Program Influence on Sales of Qualifying Equipment (asked for Nonparticipant Spillover)

C_MULT_SKIP3 [SKIP TO INT99 IF MULTCHK=02]

P1 [IF INF4 = 1 SHOW: **"**Next,"] I'd like you to think about ALL of the program-eligible <**MEASURE_TYPE**> projects you sold or installed for Duke Energy's nonresidential customers over the past 12 months. I'd like to focus on projects where you installed the same types of <**MEASURE_TYPE**> equipment that you installed through the Smart $aver Custom program.

Over the past 12 months, approximately how many of these <**MEASURE_TYPE**> projects have you sold or installed within the Duke Energy service territory? (Enter whole number)

___ [ENTER NUMBER OF PROJECTS 0-1000]
0 None [SKIP TO S1]
8888 Don't know
9999 Refused

P2 Thinking about all of these <**MEASURE_TYPE**> sales, approximately what percentage do they make up of your total dollar sales of high-efficiency products in Duke Energy's territory? (Enter whole number)

[Interviewer note: We are referring to projects where you installed the same types of <**MEASURE_TYPE**> equipment that you installed through the Smart $aver Custom program.]

___ [ENTER PERCENTAGE 0-100]
888 Don't know
999 Refused

OFFICIAL COPY
Mar 07 2023

P3 Now thinking about those sales, approximately what percentage of these <**MEASURE_TYPE**> sales or installations in Duke Energy's service territory involved an incentive through Duke Energy's program? (Enter whole number)

[Interviewer note: We are referring to projects where you installed the same types of <**MEASURE_TYPE**> equipment that you installed through the Smart $aver Custom program.]

___ [ENTER PERCENTAGE 0-100]
888 Don't know
999 Refused

P10 What percentage of these <**MEASURE_TYPE**> sales or installations did you offer or talk about an incentive through Duke Energy's program? (Enter whole number)

___ [ENTER PERCENTAGE 0-100]
888 Don't know
999 Refused

P4 If the incentives or other assistance from Duke Energy's program were NOT available, do you think your company's overall sales of these types of <**MEASURE_TYPE**> equipment would have been about the same, lower, or higher than what you sold in the past 12 months? (Select one)

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

P5 [ASK IF P4 = 2] By what percentage do you estimate your company's sales of these types of <**MEASURE_TYPE**> equipment would have been lower if Duke Energy's program was NOT available? (Enter whole number)

[IF NEEDED: Your best estimate is okay]

___ [ENTER PERCENTAGE 1-100]
888 Don't know
999 Refused

OFFICIAL COPY
Mar 07 2023

Nonparticipant Spillover

NS1 [ASK IF P3 < 100 AND P3 <> 888, 999 ELSE SKIP TO S1] Earlier you indicated that some of your <**MEASURE_TYPE**> sales did not involve an incentive through Duke Energy's program. Some qualifying projects may not receive incentives for one reason or another.

What are the main reasons why your firm or the customer did not pursue or receive an incentive for this program-eligible equipment?

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

NS2 On a scale of 1 to 5, where 1 is "not at all influential" and 5 is "extremely influential", how influential was Duke Energy Smart $aver Custom program on your sales of energy saving <**MEASURE_TYPE**> projects that did NOT receive an incentive? (Select one)

01 Not at all influential
02
03
04
05 Extremely influential
88 Don't know
99 Refused

OFFICIAL COPY

Mar 07 2023

Program Satisfaction

S1 Next, I'd like to ask you just a few questions about your satisfaction with Duke Energy's Smart $aver Custom Incentives program.

Using a scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "very satisfied", how would you rate your satisfaction with Duke Energy's Smart $aver Custom Incentives program overall? (Select one)

01 Not at all satisfied
02
03
04
05 Very satisfied
88 Don't know
99 Refused

S2 [ASK IF S1 = 1 OR 2] Why do you say that?

[RECORD RESPONSE VERBATIM]

S3 On the same scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "very satisfied", how would you rate your satisfaction with… (Select one for each) [RANDOMIZE QUESTIONS]

For S3A through S3F:
01 Not at all satisfied
02
03
04
05 Very satisfied
77 Not applicable
88 Don't know
99 Refused

S3a. your interactions with Duke Energy program staff?
S3b. the technical support provided by the program?
S3c. the type or variety of projects or equipment eligible for the program?
S3d. the incentives available through the program?
S3e. the amount of paperwork required by the program?
S3f. the time it takes to get an application approved?

OFFICIAL COPY
Mar 07 2023

S5 How easy or difficult is it to understand the differences in equipment eligibility between the custom and prescriptive programs? (Select one)

01 Very easy
02 Somewhat easy
03 Neither easy nor difficult
04 Somewhat difficult
05 Very difficult
88 Don't know
99 Refused

S4 Do you have any recommendations for improvements regarding the program design or operations? (Select one)

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

COVID

CV1 Overall, how much has your organization been affected in 2020 by the COVID-19 pandemic? Has it been a…[READ LIST]

01 Large negative effect
02 Moderate negative effect
03 Little or no effect
04 Moderate positive effect
05 Large positive effect
77 Organization is closed/closing [SKIP TO E3]
88 [DO NOT READ] Don't know
99 [DO NOT READ] Refused

CV2 Please describe how your business operations changed in 2020 as a result of the pandemic.

[RECORD VERBATIM]
77 No change
88 Don't know
99 Refused

OFFICIAL COPY
Mar 07 2023

CV3 In your opinion, when do you think your business will return to its usual level of operations? [READ IF NEEDED]

01 By the end of March 2021
02 By the end of June 2021
03 By the end of September 2021
04 Longer than September 2021
05 I do not believe this business will return to its previous usual level of operations
06 There has been little or no effect on this business's usual level of operations
07 Already did
88 Don't know
99 Refused

CV4 What impact, if any, has COVID-19 had on your equipment recommendations?

01 No effect
02 Effect (specify)

Wrap-Up

E1 Just for classification purposes, approximately how many full time and part time staff does your firm employ at your location?

E1a. ___ Full-time [0-750]
E1b. ___ Part-time (includes seasonal employees) [0-750]
888 Don't know

E3 Do you have any additional comments that you would like to share with Duke Energy about their Smart $aver Custom Incentives program?

01 Yes [SPECIFY]
02 No

INT99 [SKIP IF MULTCHK=2] I'd like to thank you for your time with this important study. Have a good day.

CP Completed

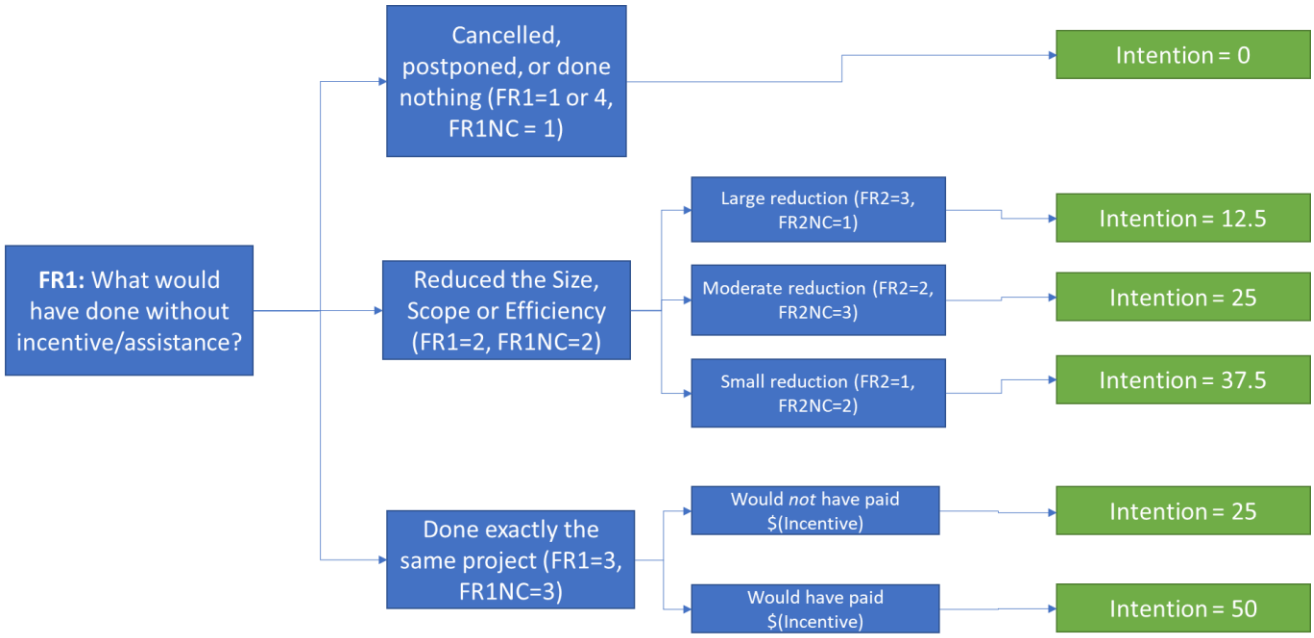
INT98 [ASK IF MULTCHK=2] I'd like to thank you for your time with this important study. Have a good day.

CM Completed

OFFICIAL COPY
Mar 07 2023

Appendix E Algorithms

E.1 Intention Score



E.2 Influence Score

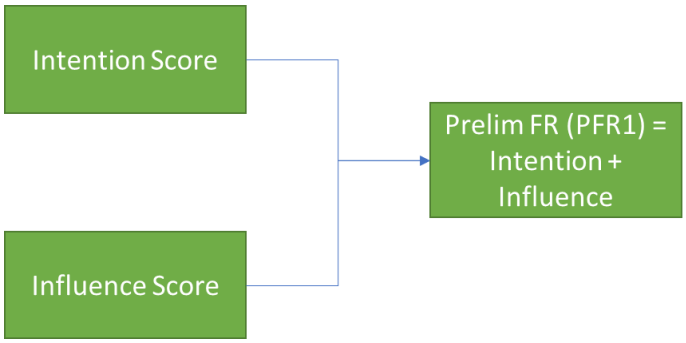
Max FR4 rating	Influence Score
9-10	0
8	6.25
7	12.5
6	18.75
5	25
4	31.25
3	37.5
2	43.75
0-1	50

OFFICIAL COPY
Mar 07 2023

E.3 Vendor Influence Reconciliation

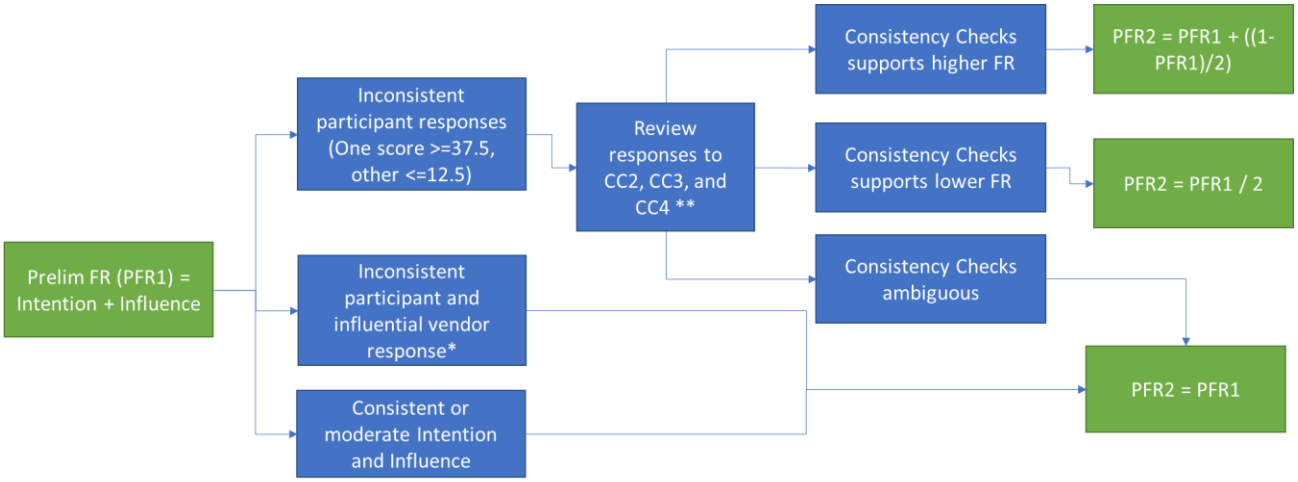
Customer rating of vendor influence	Vendor survey?	Vendor Program Influence Score (max vendor FR2)	Customer Program Influence Score (max customer FR4)	Final Program Influence Score
<=5	No	n/a	0-50	0-50
>=6	Not completed	n/a	12.5	12.5
>=6	Yes	12.5	31.25	12.5
>=6	Yes	25	18.75	18.75

E.4 Preliminary free-ridership score



OFFICIAL COPY
Mar 07 2023

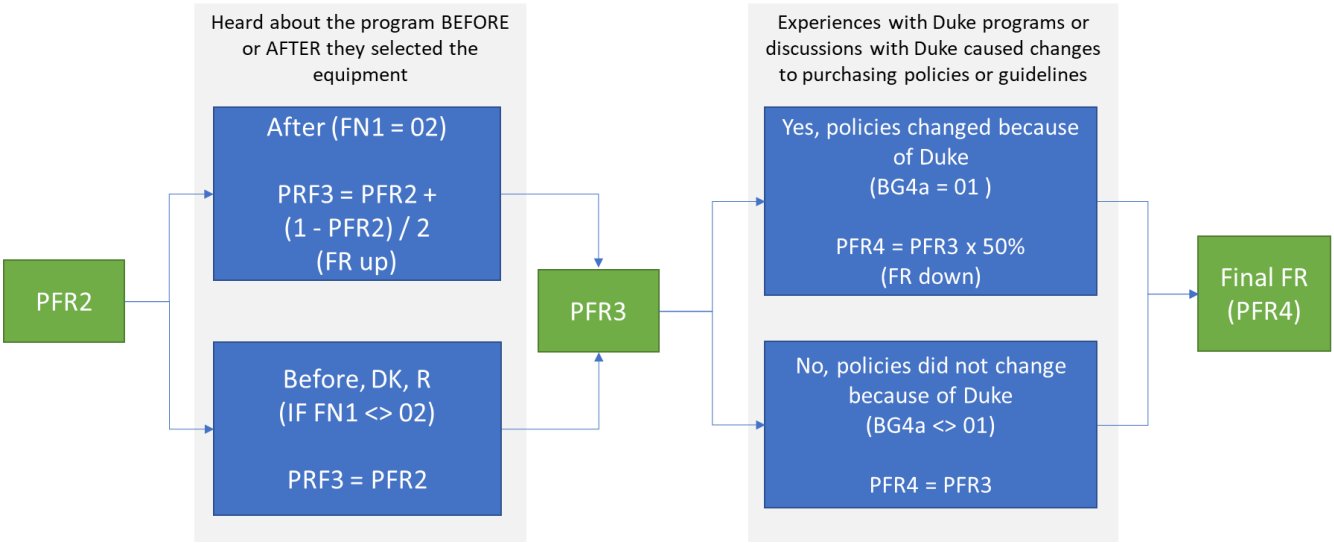
E.5 Consistency check reconciliation



* If inconsistency is due to incorporation of vendor influence, consistency check questions will not be applied since individuals' responses are not inconsistent

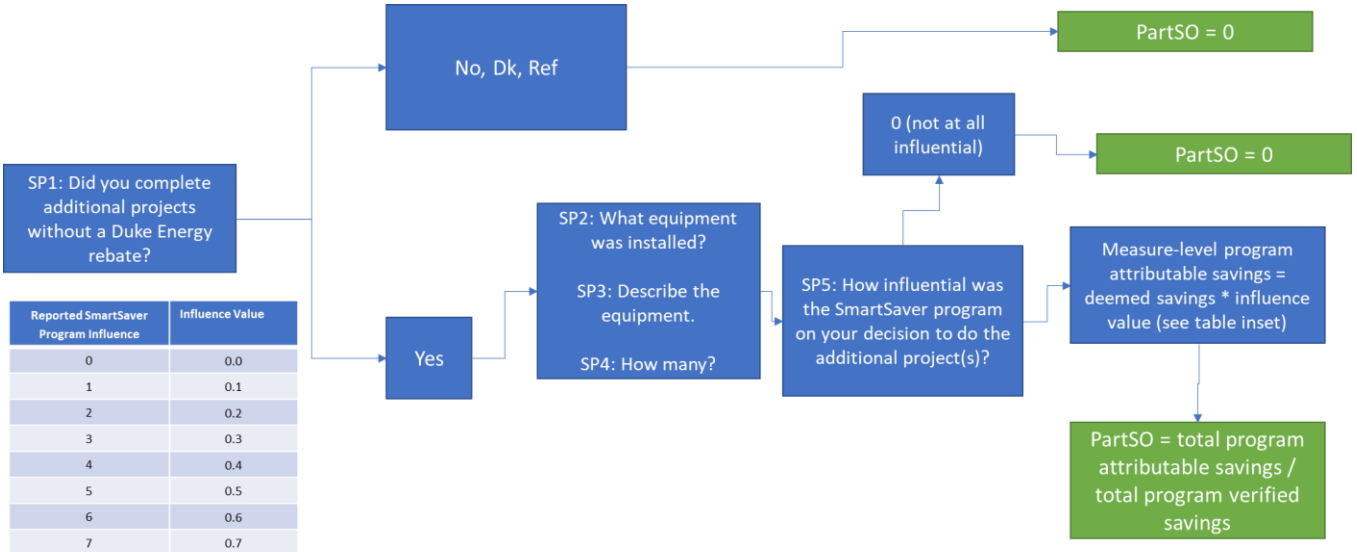
** Consistency questions were reviewed (CC2, CC3, CC4) and determined if (1) they were consistent and (2) if it supported either higher or lower FR.

E.6 Free-ridership adjustments



OFFICIAL COPY
Mar 07 2023

E.7 Participant Spillover



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

OFFICIAL COPY
Mar 07 2023

Appendix F Benchmarking Bibliography

Below are the reports reviewed as part of the benchmarking activity.

1. ADM Associates and Tetra Tech. Final Annual Report to the Pennsylvania Public Utility Commission Phase III of Act 129 Program Year 10. November 15, 2019. https://www.firstenergycorp.com/content/dam/customer/Customer%20Choice/Files/PA/ACT129/PY10-Report.pdf
2. Black Hills Energy. Black Hills Colorado Electric, LLC Annual Status Report Energy-Efficiency Programs. 2020. https://www.dora.state.co.us/pls/efi/efi.show_document?p_dms_document_id=943461&p_session_id=
3. Cadmus. 2018 Demand-Side Management Portfolio Evaluation Report. June 27, 2019. https://iurc.portal.in.gov/_entity/sharepointdocumentlocation/d27581b6-2b9c-e911-a97c-001dd800951b/bb9c6bba-fd52-45ad-8e64-a444aef13c39?file=44945_IPL_Submission%20of%20DSM%20Evaluation%202018%20Report_070119.pdf
4. Cadmus. 2018 Vectren Demand-Side Management Portfolio Process and Electric Impacts Evaluation. May 30, 2019. https://www.vectren.com/assets/downloads/planning/irp/IRP-2018-vectren-electric-dsm-evaluation.pdf
5. Cadmus. PPL Electric Utilities Annual Report to the Pennsylvania Public Utility Commission PHASE III OF ACT 129 PY11 ANNUAL REPORT. February 15, 2021. https://www.pplelectric.com/-/media/PPLElectric/Save-Energy-and-Money/Docs/Act129_Phase3/Reports/PPLPY11AnnualReport20210215FINAL.ashx
6. ComEd. ComEd Programs NTG Approach For CY2020. October 1, 2019. https://ilsag.s3.amazonaws.com/ComEd_NTG_History_and_CY2020_Recs_2019-10-01.pdf
7. EMI Consulting. Connecticut Energy Efficiency Board C1644 EO Net-to-Gross Study. July 1, 2019. https://www.energizect.com/sites/default/files/C1644%20Energy%20Opportunities%20Net-to-Gross%20Review%20Draft_7.1.19.pdf
8. Entergy Arkansas. Arkansas Energy Efficiency Program Portfolio Annual Report – Program Year 2017. May 1, 2018. http://www.apscservices.info/EEInfo/EEReports/Entergy%202017.pdf
9. NMR, DNV GL, and Tetra Tech. Massachusetts Sponsors' Commercial and Industrial Programs Free-ridership and Spillover Study. August 18, 2018. https://ma-eeac.org/wp-content/uploads/TXC_49_CI-FR-SO-Report_14Aug2018.pdf
10. Opinion Dynamics. Ameren Illinois Company 2019 Business Program Impact Evaluation Report. April 30, 2020. https://ilsag.s3.amazonaws.com/2019-AIC-Business-Program-Annual-Impact-Evaluation-Report-FINAL-2020-04-30.pdf
11. Public Service Company of Colorado. 2021/2022 Demand-Side Management Plan. March 16, 2021. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/CO-DSM/CO_2021-22_DSM_Plan_Final.pdf
12. Tetra Tech. 2019 Commercial and Industrial Programs Free-Ridership and Spillover Study. January 18, 2021. http://rieermc.ri.gov/wp-content/uploads/2021/01/national-grid-rhode-island-2020-ci-fr-so-report_final.pdf

OFFICIAL COPY
Mar 07 2023

Nexant

Headquarters

101 2nd Street, Suite 1000

San Francisco CA 94105-3651

Tel: (415) 369-1000

Fax: (415) 369-9700

www.nexant.com