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February 12, 2021

VIA ELECTRONIC MAILING

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building, 2nd Floor
400 North Street
Harrisburg, PA 17120

**Re: Duquesne Light Company's Energy Efficiency and Conservation Phase III Plan
Final Annual Report - Program Year 11
Docket No. M-2015-2515375**

Dear Secretary Chiavetta:

Enclosed for filing, please find the Final Annual Report for the period of June 1, 2019 through May 31, 2020, Program Year 11, of Duquesne Light Company's Energy Efficiency and Conservation Phase III Plan. Duquesne Light is also providing a copy of this Report to the Act 129 Statewide Evaluator.

Should you have any questions, please do not hesitate to contact me or Dave Defide at 412-393-6107.

Respectfully Submitted,

A handwritten signature in blue ink, appearing to read "Michael Zimmerman".

Michael Zimmerman
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Enclosures

Cc: Certificate of Service

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served upon the following persons, in the manner indicated, in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant):

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Final Annual Report to the Pennsylvania Public Utility Commission Phase III of Act 129

**Program Year 11
(June 1, 2019 – May 31, 2020)**

**For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan**

Prepared for:



Duquesne Light Company

Submitted by:

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February 15, 2021

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Table of Contents

1. Introduction	1
2. Summary of Achievements	3
2.1 Carryover Savings from Phase II of Act 129	3
2.2 Phase III Energy Efficiency Achievements to Date	4
2.3 Phase III DR Achievements to Date	7
2.4 Phase III Performance by Customer Segment.....	9
2.5 Summary of Participation by Program	11
2.6 Summary of Impact Evaluation Results	12
2.7 Summary of Energy Impacts by Program	14
2.8 Summary of Demand Impacts by Program	18
2.9 Summary of Fuel Switching Impacts.....	22
2.10 Summary of Cost-Effectiveness Results.....	22
2.11 Comparison of Performance to Approved EE&C Plan	27
2.12 Findings and Recommendations	31
3. Evaluation Results by Program	33
3.1 Evaluation Activities	33
3.2 Residential Energy Efficiency Program.....	36
3.3 Residential Appliance Recycling Program	53
3.4 Residential Behavioral Savings Program.....	64
3.5 Residential Whole House Retrofit Program	81
3.6 Low-Income Energy Efficiency Program.....	84
3.7 Commercial Efficiency and Express Efficiency Programs	93
3.8 Small/Medium and Large Nonresidential Midstream Lighting Program.....	112
3.9 Small Commercial Direct Install Program	122
3.10 Multifamily Housing Retrofit Program	125
3.11 Industrial Efficiency Program	131
3.12 Public Agency Partnership Program	137
3.13 Community Education Energy Efficiency Program.....	145
3.14 Large Curtailable Load Program.....	152
4. Portfolio Finances and Cost Recovery.....	165
4.1 Program Finances	165
Appendix A. Upstream Lighting Cross Sector Sales	A-1
Appendix B. Site Inspection Summary.....	B-1
Appendix C. HER Impact Evaluation Detail	C-1
Appendix D. PY11 and P3TD Summary by Customer Segment and Carveout	D-1
Appendix E. Survey Dispositions	E-1

Appendix F. Respondent Demographics F-1

Figures

Figure 2.1-1. Carryover Savings from Phase II of Act 129..... 3

Figure 2.1-2. Customer Segment-Specific Carryover from Phase II 4

Figure 2.2-1. EE&C Plan Performance Toward Phase III Portfolio Compliance Target 5

Figure 2.2-2. EE&C Plan Performance Toward Phase III Low-Income Compliance Target 6

Figure 2.2-3. EE&C Plan Performance Against Phase III GNI Compliance Target 7

Figure 2.3-1. Event Performance Compared to 85% Per-Event Target 9

Figure 2.7-1. PYTD Energy Savings by Program 15

Figure 2.7-2. P3TD Energy Savings by Program..... 16

Figure 2.8-1. PYTD Demand Savings by Energy Efficiency Program..... 19

Figure 2.8-2. P3TD Demand Savings by Energy Efficiency Program 20

Figure 3.2-1. How did you learn about the program? n = 761 (all kits), 114 (low-income kits), 647 (market rate kits), 86 (rebates); multiple responses allowed..... 45

Figure 3.2-2. Kits (Low-Income) Program Influence (n = 114) 46

Figure 3.2-3. Kits (Market Rate) Program Influence (n = 647) 46

Figure 3.2-4. REEP Rebate Program Influence (n = 86)..... 47

Figure 3.2-5. PY11 Kits Satisfaction Rates n = 635 (market rate); 114 (low-income)..... 48

Figure 3.2-6. REEP Rebates Satisfaction Rate (n = 86)..... 49

Figure 3.2-7. Program Improvement Opportunities (rebates: n = 86; kits: n = 761) 49

Figure 3.3-1. How did you first learn about Appliance Recycling Program? (n = 202, multiple responses allowed) 59

Figure 3.3-2. PY11 RARP Program Influence (n = 202) 59

Figure 3.3-3. PY11 RARP Satisfaction Rates (n = 202)..... 60

Figure 3.4-1. Through which method does your household receive its Home Energy Report? (n=126; multiple options allowed) 71

Figure 3.4-2. How many of these reports did you receive (or access) over the last year? (printed: n = 73, email: n = 62, web portal: n = 6; multiple options allowed)..... 72

Figure 3.4-3. Does anyone in your household read the reports? (printed: n = 73, email: n = 62, web portal: n = 6) 73

Figure 3.4-4. What energy efficient purchases or upgrades do you recall making in the last year? (n = 135; multiple options allowed) 74

Figure 3.4-5. Influence of Home Energy Reports in Changing Behavior (n = 81) 75

Figure 3.4-6. To what extent did the Home Energy Report influence you to make these energy efficient purchases or upgrades? (n = 101) 76

Figure 3.4-7. How satisfied are you with Home Energy Reports program overall? (n = 135) ... 77

Figure 3.4-8. How satisfied are you with Duquesne Light as a company? (n = 135)..... 77

Figure 3.7-1. How did you first hear about the Watt Choices Program? (n=40) 100

Figure 3.7-2. How influential were the following on your decision to install the energy efficient equipment? (n=38)..... 100

Figure 3.7-3. PY11 Watt Choices Customer Satisfaction Rates (n=38)..... 101

Figure 3.7-4. Examples of Positive Responses for Watt Choices Program (n=13) 102

Figure 3.7-5. What do you see as the main barriers for organizations like yours to participating in the program? Select up to 3 responses. (n = 56*) 103

Figure 3.7-6. PY11 Watt Choices Trade Ally Satisfaction Rates (n=13) 105

Figure 3.7-7. Examples of Watt Choices Trade Ally Feedback (n=13)..... 106

Figure 3.13-1. Positive Responses from CEEP Teachers (n = 3) 149

Equations

Equation 3.4-1. LDV Model Specification	65
Equation 3.4-2. Fixed-Effects Regression Model.....	66
Equation 3.14-1. LCL Base Regression	157
Equation 3.14-2. LCL Base Simple Regression.....	157

Tables

Table 2.3-1. DR PYVTD and VTD Performance by Event (MW)	8
Table 2.4-1. PY11 Summary Statistics by Customer Segment.....	10
Table 2.4-2. Phase III Summary Statistics by Customer Segment.....	10
Table 2.5-1. Program Participation Definitions	11
Table 2.5-2. EE&C Portfolio Participation by Program.....	12
Table 2.6-1. Impact Evaluation Results Summary.....	13
Table 2.6-2. PY11 Residential High Impact Measures	13
Table 2.6-3. PY11 Nonresidential High Impact Measures	14
Table 2.7-1. Incremental Annual Energy Savings by Program (MWh/yr)	17
Table 2.7-2. Lifetime Energy Savings by Program (MWh).....	18
Table 2.8-1. Peak Demand Savings by Energy Efficiency Program (MW/yr)	20
Table 2.8-2. Verified Gross DR Impacts by Program.....	22
Table 2.10-1. Summary of Portfolio Finances – Gross Verified	22
Table 2.10-2. PY11 Gross TRC Ratios by Program (\$1,000)	24
Table 2.10-3. PY11 Net TRC Ratios by Program (\$1,000)	25
Table 2.10-4. P3TD Gross TRC Ratios by Program (\$1,000).....	26
Table 2.10-5. P3TD Net TRC Ratios by Program (\$1,000).....	27
Table 2.11-1. Comparison of PY11 Expenditures to Phase III EE&C Plan (\$1,000)	28
Table 2.11-2. Comparison of P3TD Expenditures to Phase III EE&C Plan (\$1,000).....	28
Table 2.11-3. Comparison of PY11 Actual Program Savings to EE&C Plan Projections for PY11	29
Table 2.11-4. Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III.....	30
Table 2.12-1. Summary of Evaluation Recommendations	31
Table 3.1-1. Evaluation Activity Matrix	34
Table 3.2-1. PY11 Residential Rebated Measures.....	36
Table 3.2-2. REEP Participation and Reported Impacts	38
Table 3.2-3. REEP Gross Impact Sample Design for PY11.....	40
Table 3.2-4. REEP Gross Impact Results for Energy	40
Table 3.2-5. REEP Gross Impact Results for Demand.....	40
Table 3.2-6. REEP Net Impact Sample Design	42
Table 3.2-7. REEP Net Impact Evaluation Results.....	42
Table 3.2-8. Free Ridership Scores for REEP Rebated Products.....	43
Table 3.2-9. Free Ridership Scores for REEP Kit LEDs and LED Nightlights	43
Table 3.2-10. PY11 REEP High Impact Measure	43
Table 3.2-11. REEP PYTD and P3TD Savings Summary	44
Table 3.2-12. Summary of REEP Finances – Gross Verified.....	50
Table 3.2-13. Summary of REEP Finances – Net Verified	51

Table 3.2-14. Kits Program Findings and Recommendations.....	52
Table 3.2-15. REEP Rebates Program Findings and Recommendations.....	53
Table 3.3-1. RARP Participation and Reported Impacts.....	54
Table 3.3-2. RARP Gross Impact Sample Design for PY11	55
Table 3.3-3. RARP Gross Impact Results for Energy.....	55
Table 3.3-4. RARP Gross Impact Results for Demand.....	56
Table 3.3-5. RARP Net Impact Sample Design.....	57
Table 3.3-6. RARP Net Impact Evaluation Results.....	57
Table 3.3-7. PY11 RARP High Impact Measure.....	57
Table 3.3-8. RARP PYTD and P3TD Savings Summary	58
Table 3.3-9. Summary of RARP Finances – Gross Verified	61
Table 3.3-10. Summary of RARP Finances – Net Verified	62
Table 3.3-11. RARP Program Findings and Recommendations.....	63
Table 3.4-1. HER Participation and Reported Impacts	65
Table 3.4-2. HER Gross Impact Sample Design for PY11.....	67
Table 3.4-3. HER Gross Impact Results for Energy	67
Table 3.4-4. HER Gross Impact Results for Demand.....	67
Table 3.4-5. HER PYTD and P3TD Savings Summary	69
Table 3.4-6. PY11 Residential Behavioral Participant Survey Sample Design	70
Table 3.4-7. Summary of Program Finances – Gross Verified.....	78
Table 3.4-8. Summary of HER Program Finances – Net Verified	79
Table 3.4-9. Home Energy Reports Program Findings and Recommendations.....	80
Table 3.5-1. WHRP PYTD and P3TD Savings Summary	81
Table 3.5-2. Summary of WHRP Program Finances – Gross Verified.....	82
Table 3.5-3. Summary of WHRP Program Finances – Net Verified.....	83
Table 3.6-1. LIEEP Gross Impact Sample Design for PY11	87
Table 3.6-2. LIEEP Gross Impact Results for Energy.....	87
Table 3.6-3. LIEEP Gross Impact Results for Demand.....	88
Table 3.6-4. LIEEP PYTD and P3TD Savings Summary.....	90
Table 3.6-5. Summary of Program Finances – Gross Verified.....	90
Table 3.6-6. Summary of LIEEP Program Finances – Net Verified.....	92
Table 3.6-7. LIEEP Findings and Recommendations	93
Table 3.7-1. CEP/EXP Participation and Reported Impacts	94
Table 3.7-2. CEP/EXP Gross Impact Sample Design.....	95
Table 3.7-3. CEP/EXP Gross Impact Results for Energy	95
Table 3.7-4. CEP/EXP Gross Impact Results for Demand	96
Table 3.7-5. PY11 CEP/EXP Net Impact Sample Design.....	97
Table 3.7-6. PY11 CEP/EXP Net Impact Evaluation Results.....	97
Table 3.7-7. PY11 Nonresidential High Impact Measures	97
Table 3.7-8. EXP/CEP PYTD and P3TD Savings Summary.....	98
Table 3.7-9. PY11 CEP, EXP, and IEP Sample Design	99
Table 3.7-10. PY11 CEP, EXP, and IEP Interview Sample Design	104
Table 3.7-11. C&I Trade Ally Program Barriers and Challenges.....	106
Table 3.7-12. Summary of EXP Finances – Gross Verified	107
Table 3.7-13. Summary of EXP Finances – Net Verified	108
Table 3.7-14. Summary of CEP Finances – Gross Verified.....	109
Table 3.7-15. Summary of CEP Finances – Net Verified.....	110
Table 3.7-16. Findings and Recommendations for CEP, EXP, and IEP	112
Table 3.8-1. Midstream Lighting Participation and Reported Impacts.....	113
Table 3.8-2. Midstream Lighting Gross Impact Sample Design for PY10/PY11	114

Table 3.8-3. Midstream Lighting Gross Impact Results for Energy	114
Table 3.8-4. Midstream Lighting Gross Impact Results for Demand.....	115
Table 3.8-5. Midstream Lighting Net Impact Evaluation Results.....	116
Table 3.8-6. Midstream Lighting PYTD and P3TD Savings Summary	116
Table 3.8-7. Summary of Small/Medium Midstream Program Finances – Gross Verified.....	117
Table 3.8-8. Summary of Small/Medium Midstream Program Finances – Net Verified.....	118
Table 3.8-9. Summary of Large Midstream Program Finances – Gross Verified	119
Table 3.8-10. Summary of Large Midstream Program Finances – Net Verified	120
Table 3.8-11. Finding and Recommendation for Midstream Lighting.....	121
Table 3.9-1. SCDI PYTD and P3TD Savings Summary	122
Table 3.9-2. Summary of SCDI Program Finances – Gross Verified	122
Table 3.9-3. Summary of SCDI Program Finances – Net Verified	123
Table 3.10-1. MFHR Program Participation and Reported Impacts.....	125
Table 3.10-2. MFHR Gross Impact Sample Design for PY11	126
Table 3.10-3. MFHR Program Gross Impact Results for Energy	126
Table 3.10-4. MFHR Program Gross Impact Results for Demand.....	126
Table 3.10-5. MFHR Program Net Impact Evaluation Results.....	127
Table 3.10-6. MFHR PYTD and P3TD Savings Summary.....	127
Table 3.10-7. Summary of MFHR Program Finances – Gross Verified.....	128
Table 3.10-8. Summary of MFHR Program Finances – Net Verified	129
Table 3.10-9. PY11 Findings and Recommendations for the MFHR Program.....	131
Table 3.11-1. IEP Participation and Reported Impacts.....	132
Table 3.11-2. IEP Gross Impact Sample Design for PY10 and PY11	132
Table 3.11-3. IEP Gross Impact Results for Energy	133
Table 3.11-4. IEP Gross Impact Results for Demand.....	133
Table 3.11-5. PY11 IEP Net Impact Sample Design	134
Table 3.11-6. PY11 IEP Efficiency Net Impact Evaluation Results	134
Table 3.11-7. PY11 Nonresidential High Impact Measures	134
Table 3.11-8. IEP PYTD and P3TD Savings Summary	135
Table 3.11-9. Summary of IEP Finances – Gross Verified	135
Table 3.11-10. Summary of IEP Finances – Net Verified	136
Table 3.12-1. PAPP Participation and Reported Impacts	138
Table 3.12-2. PAPP Gross Impact Sample Design for PY10 and PY11	139
Table 3.12-3. PAPP Gross Impact Results for Energy	139
Table 3.12-4. PAPP Gross Impact Results for Demand.....	139
Table 3.12-5. PAPP Net Impact Evaluation Results	140
Table 3.12-6. PAPP PYTD and P3TD Savings Summary	141
Table 3.12-7. Summary of PAPP Finances – Gross Verified.....	142
Table 3.12-8. Summary of PAPP Finances – Net Verified.....	143
Table 3.12-9. PY11 Findings and Recommendation for PAPP.....	145
Table 3.13-1. CEEP Participation and Reported Impacts	146
Table 3.13-2. CEEP Gross Impact Sample Design	146
Table 3.13-3. CEEP Gross Impact Results for Energy	147
Table 3.13-4. CEEP Gross Impact Results for Demand.....	147
Table 3.13-5. CEEP Net Impact Evaluation Results.....	147
Table 3.13-6. CEEP PYTD and P3TD Savings Summary	148
Table 3.13-7. PY11 CEEP Interview Sample Design	148
Table 3.13-8. Summary of CEEP Finances – Gross Verified.....	150
Table 3.13-9. Summary of CEEP Finances – Net Verified	151
Table 3.13-10. CEEP Finding and Recommendation	152

Table 3.14-1. LCL Participation and Reported Impacts	154
Table 3.14-2. Incremental Variables To Be Tested	158
Table 3.14-3. LCL Gross Impact Evaluation Design for PY11	160
Table 3.14-4. LCL Gross Impact Results for Demand	160
Table 3.14-5. Summary of LCL Finances – Gross Verified.....	161
Table 3.14-6. Summary of LCL Finances – Net Verified.....	162
Table 3.14-7. LCL Findings and Recommendations.....	164
Table 4.1-1. PY11 Program and Portfolio Total Finances (\$1,000)	165
Table 4.1-2. PY3TD Program and Portfolio Total Finances (\$1,000).....	166
Table 4.1-3. EE&C Plan Expenditures by Cost Recovery Category (\$1,000)	167
Table A-1. Estimation of Percentage of LEDs Being Installed in Nonresidential Settings, Based on PY9 Intercept Survey Results	A-1
Table A-2. Final Allocations for Residential Upstream Lighting Lamps and Costs	A-1
Table A-3. Residential Upstream Lighting Savings Summary.....	A-2
Table B-1. PY11 Site Visit Summary.....	B-1
Table B-2. PY10 Site Visit Summary (informing PY11 Savings).....	B-2
Table C-1. Active Participant Counts by Wave.....	C-1
Table C-2. Wave Regression Savings Details	C-2
Table C-3. Wave Regression Savings Percent Details.....	C-3
Table C-4. Wave Monthly Regression Savings (MWh/yr).....	C-4
Table C-5. Wave Average Daily Use.....	C-4
Table C-6. Upstream Adjustment Factors	C-5
Table C-7. Savings Adjustments and Final Savings	C-6
Table D-1. Summary of Customer Segment Energy Savings	D-1
Table D-2. Summary of Customer Segment Demand Savings.....	D-1
Table D-3. Summary of Customer Segment Demand Response Savings	D-1
Table D-4. Summary of Low-Income Carveout Savings	D-2
Table D-5. Summary of GNI Carveout Savings	D-2
Table D-6. Summary of Program Energy Savings.....	D-3
Table D-7. Summary of Program Demand Savings.....	D-4
Table D-8. Summary of Demand Response Program	D-4
Table E-1. Survey Disposition Summary	E-1
Table F-1. PY11 Survey Demographics for REEP and RARP	F-1
Table F-2. PY11 Survey Demographics for Residential Behavioral and Whole Home Retrofit Programs	F-2
Table F-3. PY11 Survey Firmographics for CEP, EXP, and IEP.....	F-3

Acronyms

CBL	Customer Baseline
C&I	Commercial and Industrial
CDH	Cooling Degree Hours
CEEP	Community Education Energy Efficiency Program
CEP	Commercial Efficiency Program
CL	Confidence Level
CO	Carryover
CSP	Conservation Service Provider or Curtailment Service Provider
C_v	Coefficient of Variation
DLC	Direct Load Control
DR	Demand Response
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE&C	Energy Efficiency and Conservation
EF	Energy Factor
EM&V	Evaluation, Measurement, and Verification
EUL	Effective Useful Life
EXP	Express Efficiency Program
GNI	Government, Nonprofit, Institutional
HER	Home Energy Report
HIM	High Impact Measure
HOT	Hold-Out Test
HOU	Hours of Use
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
IEP	Industrial Efficiency Program
IMP	Interim Measure Protocol
ISR	In-Service Rate
kW	Kilowatt
kWh	Kilowatt-hour
LCL	Large Curtailable Load
LDV	Lagged Dependent Variable
LED	Light-Emitting Diode
LFER	Linear Fixed-Effects Regression
LIEEP	Low-Income Energy Efficiency Program
LLF	Line Loss Factors
LMP	Locational Marginal Price
LNUP	Large Nonresidential Upstream Light Program (Large Midstream Lighting)
M&V	Measurement and Verification

MFHR	Multifamily Housing Retrofit
MOU	Memorandum of Understanding
MW	Megawatt
MWh	Megawatt-hour
NPV	Net Present Value
NTG	Net-to-Gross
P3TD	Phase III to Date
PA PUC	Pennsylvania Public Utility Commission
PAPP	Public Agency Partnership Program
PPR	Post-Program Regression
PSA	Phase III to Date Preliminary Savings Achieved; equal to VTD + PYRTD
PSA+CO	PSA savings plus Carryover from Phase II
PUF	Part-Use Factor
PY	Program Year: e.g. PY8, from June 1, 2016, to May 31, 2017
PYRTD	Program Year Reported to Date
PYVTD	Program Year Verified to Date
RARP	Residential Appliance Recycling Program
RCT	Randomized Control Trial
REEP	Residential Energy Efficiency Program
RTD	Phase III to Date Reported Gross Savings
RTO	Regional Transmission Organization
RUL	Remaining Useful Lifetime
SCDI	Small Commercial Direct Install
SEER	Seasonal Energy Efficiency Ratio
SF	Square Feet
SNUP	Small Nonresidential Upstream Light Program (Small/Medium Midstream Lighting)
SWE	Statewide Evaluator
TRC	Total Resource Cost
TRM	Technical Reference Manual
TUS	Bureau of Technical Utility Services
UEC	Unit Energy Consumption
VTD	Phase III to Date Verified Gross Savings
W	Watt
WHRP	Whole House Retrofit Program
WSA	Weather Sensitivity Adjustment

Types of Savings

Gross Savings: The change in energy consumption and/or peak demand that results directly from program-related actions taken by participants in an Energy Efficiency and Conservation (EE&C) program, regardless of why they participated.

Net Savings: The total change in energy consumption and/or peak demand that is attributable to an EE&C program. Depending on the program delivery model and evaluation methodology, the net savings estimates may differ from the gross savings estimate due to adjustments for the effects of free riders, changes in codes and standards, market effects, participant and nonparticipant spillover, and other causes of changes in energy consumption or demand not directly attributable to the EE&C program.

Reported Gross: Also referred to as *ex ante* (Latin for beforehand) savings. The energy and peak demand savings values calculated by the electric distribution company (EDC) or its program Implementation Conservation Service Providers (ICSP) and stored in the program tracking system.

Unverified Reported Gross: The Phase III Evaluation Framework allows EDCs and the evaluation contractors the flexibility to not evaluate each program every year. If an EE&C program is being evaluated over a multi-year cycle, the reported savings for a program year where evaluated results are not available are characterized as unverified reported gross until the impact evaluation is completed and verified savings can be calculated and reported.

Verified Gross: Also referred to as *ex post* (Latin for from something done afterward) gross savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after the gross impact evaluation and associated M&V efforts have been completed.

Verified Net: Also referred to as *ex post* net savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after application of the results of the net impact evaluation. Typically calculated by multiplying the verified gross savings by a net-to-gross (NTG) ratio.

Annual Savings: Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand an EE&C measure or program can be expected to save over the course of a typical year. Annualized savings are noted as MWh/yr or MW/yr. The Pennsylvania Technical Reference Manual provides algorithms and assumptions to calculate annual savings, and Act 129 compliance targets for consumption reduction are based on the sum of the annual savings estimates of installed measures or behavior change.

Lifetime Savings: Energy and demand savings expressed in terms of the total expected savings over the useful life of the measure. Typically calculated by multiplying the annual savings of a measure by its effective useful life. The Total Resource Cost (TRC) test uses savings from the full lifetime of a measure to calculate the cost-effectiveness of EE&C programs.

Program Year Reported to Date (PYRTD): The reported gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year. PYTD values for energy efficiency will always be reported gross savings in a semiannual or preliminary annual report.

Program Year Verified to Date (PYVTD): The verified gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year as determined by the impact evaluation findings of the independent evaluation contractor.

Phase III to Date (P3TD): The energy and peak demand savings achieved by an EE&C program or portfolio within Phase III of Act 129. Reported in several permutations described below.

Phase III to Date Reported (RTD): The sum of the reported gross savings recorded to date in Phase III of Act 129 for an EE&C program or portfolio.

Phase III to Date Verified (VTD): The sum of the verified gross savings recorded to date in Phase III of Act 129 for an EE&C program or portfolio, as determined by the impact evaluation finding of the independent evaluation contractor.

Phase III to Date Preliminary Savings Achieved (PSA): The sum of the verified gross savings (VTD) from previous program years in Phase III where the impact evaluation is complete plus the reported gross savings from the current program year (PYTD).

Phase III to Date Preliminary Savings Achieved + Carryover (PSA+CO): The sum of the verified gross savings from previous program years in Phase III plus the reported gross savings from the current program year plus any verified gross carryover savings from Phase II of Act 129. This is the best estimate of an EDC's progress toward the Phase III compliance targets.

Phase III to Date Verified + Carryover (VTD + CO): The sum of the verified gross savings recorded to date in Phase III plus any verified gross carryover savings from Phase II of Act 129.

1. Introduction

Pennsylvania Act 129 of 2008, signed on October 15, 2008, mandated energy savings and demand reduction goals for the largest electric distribution companies (EDCs) in Pennsylvania for Phase I (2008 through 2013). Phase II of Act 129 began in 2013 and concluded in 2016. In late 2015, each EDC filed a new energy efficiency and conservation (EE&C) plan with the Pennsylvania Public Utilities Commission (PA PUC) detailing the proposed design of its portfolio for Phase III. These plans were updated based on stakeholder input and subsequently approved by the PA PUC in 2016.

Implementation of Phase III of the Act 129 programs began on June 1, 2016. This report documents the progress and effectiveness of the Phase III EE&C accomplishments for Duquesne Light Company (Duquesne Light) in program year 11 (PY11), as well as the cumulative accomplishments of the Phase III programs since inception. It also documents the energy savings carried over from Phase II. The Phase II carryover savings count toward EDC savings compliance targets for Phase III.

This report details the participation, spending, reported gross, verified gross, and verified net impacts of the energy efficiency programs in PY11. Compliance with Act 129 savings goals is ultimately based on verified gross savings. This report also includes estimates of cost-effectiveness according to the total resource cost test (TRC).¹ Duquesne Light retained Guidehouse Inc. (Guidehouse)² as an independent evaluation contractor for Phase III of Act 129. Guidehouse is responsible for the measurement and verification of the savings and calculation of gross verified and net verified savings.

Guidehouse also performed a process evaluation to examine the design, administration, implementation, and market response to the EE&C programs. This report presents the key findings and recommendations identified by the process evaluation and documents any changes to EE&C program delivery considered based on the recommendations.

Phase III of Act 129 includes a demand response (DR) goal for Duquesne Light. DR events are limited to the months of June through September, which are the first 4 months of the Act 129 program year. Because the DR season is completed early in the program year, it is possible to complete the independent evaluation of verified gross savings for DR sooner than is possible for energy efficiency programs. Duquesne Light initiated its DR program in PY9 and continued activities into PY11. Verified gross savings results from the EDC's PY11 DR season, which ran from June through September 2019, were originally reported in the PY11 Semiannual Report submitted in January 2020.

In response to the COVID-19 pandemic, on May 26, 2020, the PA PUC issued a Secretarial Letter announcing changes to its Act 129 EDC reporting requirements. Specifically, the deadline

¹ The Pennsylvania TRC Test for Phase I was adopted by PUC order at Docket No. M-2009-2108601 on June 23, 2009 (2009 PA TRC Test Order). The TRC Test Order for Phase I later was refined in the same docket on August 2, 2011 (2011 PA TRC Test Order). The 2013 TRC Order for Phase II of Act 129 was issued on August 30, 2012. The 2016 TRC Test Order for Phase III of Act 129 was adopted by PUC order at Docket No. M-2015-2468992 on June 11, 2015.

² On October 11, 2019, Guidehouse LLP completed its acquisition of Navigant Consulting, Inc. and its operating subsidiaries. For more information, see: <https://guidehouse.com/news/corporate-news/2019/guidehouse-completes-acquisition-of-navigant>.

for this PY11 Annual Report was moved 90 days, from November 15, 2020 to February 15, 2021.³

³ Secretarial Letter. Re: Act 129 EDC Reporting Deadlines Docket No. M 2014-2424864. May 26, 2020.
<https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/electric-distribution-company-act-129-reporting/>.

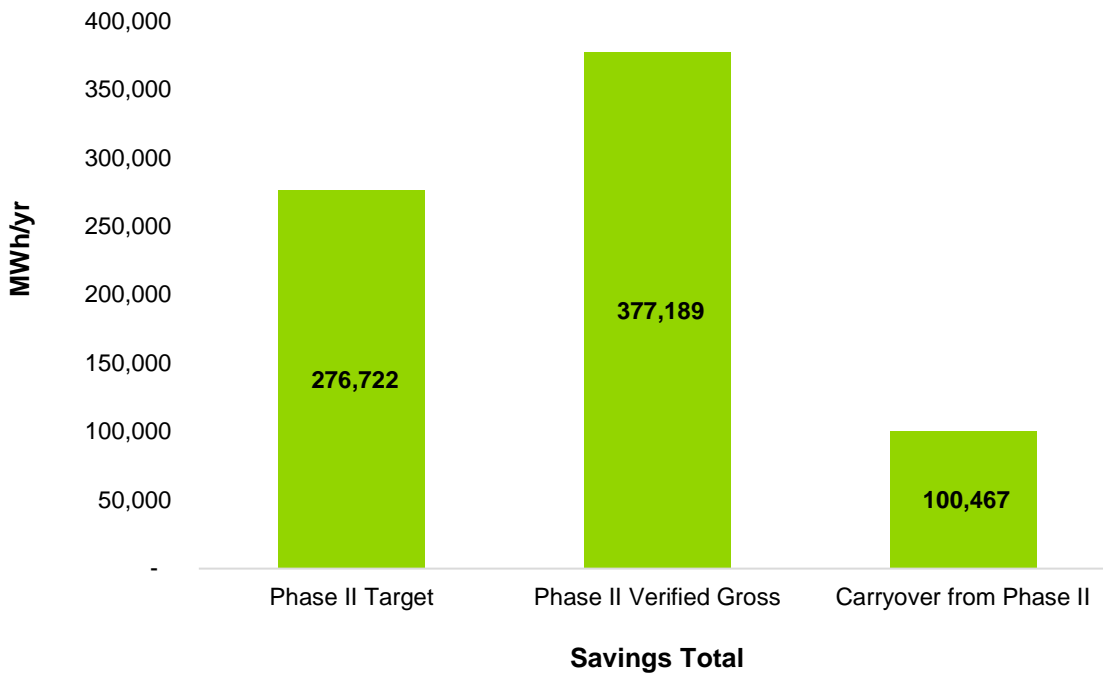
2. Summary of Achievements

2.1 Carryover Savings from Phase II of Act 129

Duquesne Light achieved 100,467 MWh/yr of portfolio-level carryover savings from Phase II.

Figure 2.1-1 illustrates the carryover calculation by comparing Duquesne Light’s Phase II verified gross savings total to the Phase II compliance target.

Figure 2.1-1. Carryover Savings from Phase II of Act 129



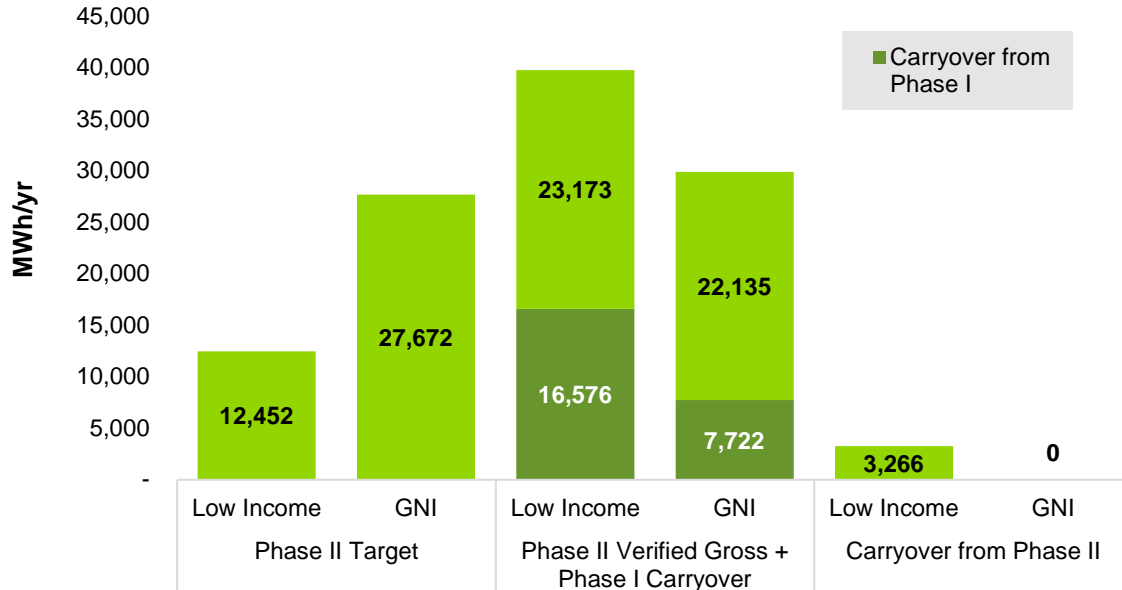
Source: Guidehouse analysis

The PA PUC’s Phase III Implementation Order⁴ allowed EDCs to carry over savings in excess of the Phase II government, nonprofit, and institutional (GNI) savings goal and excess savings from the low-income customer segment.⁵ Figure 2.1-2. shows the calculation of carryover savings for the low-income and GNI targets.

⁴ Pennsylvania Public Utility Commission, *Energy Efficiency and Conservation Program Implementation Order*, at Docket No. M-2014-2424864, (*Phase III Implementation Order*). Entered June 11, 2015.

⁵ Proportionate to those savings achieved by dedicated low-income programs in Phase II.

Figure 2.1-2. Customer Segment-Specific Carryover from Phase II



Source: Guidehouse analysis

2.2 Phase III Energy Efficiency Achievements to Date

Since the beginning of PY11 on June 1, 2019, Duquesne Light has claimed the following savings:

- 98,139 MWh/yr of reported gross electric energy savings (program year reported to date [PYRTD])⁶
- 13.14 MW/yr of reported gross peak demand savings (PYRTD) from energy efficiency programs
- 97,349 MWh/yr of verified gross electric energy savings (program year verified to date [PYVTD])
- 13.17 MW/yr of verified gross peak demand savings (PYVTD) from energy efficiency programs

Since the beginning of Phase III of Act 129 on June 1, 2016, Duquesne Light has achieved the following savings:

- 362,906 MWh/yr of reported gross electric energy savings (RTD)
- 44.45 MW/yr of reported gross peak demand savings (RTD) from energy efficiency programs

⁶ PYRTD savings here are less than the PY11 Preliminary Annual Report by 1.8 MWh/yr and 0.00 MW/yr. After that report's filing in July 2020, Duquesne Light removed four Residential measures determined to be erroneous entries: one efficiency kit (410 kWh/yr, 0.04 kW/yr) and three recycled and replaced freezers (1,355 kWh/yr, 0.15 kW/yr). These adjustments are reflected throughout this report.

- 365,567 MWh/yr of verified gross electric energy savings (VTD)
- 44.97 MW/yr of verified gross peak demand savings (VTD) from energy efficiency programs

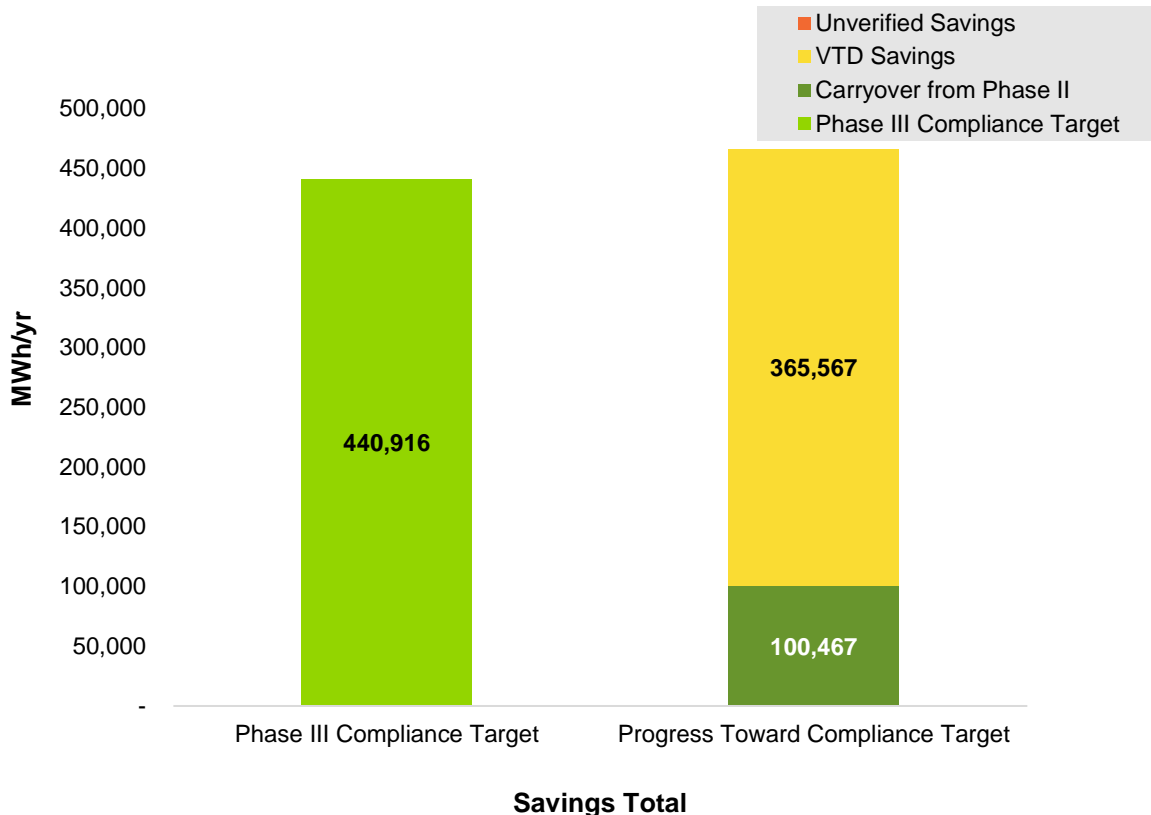
Including carryover savings from Phase II, Duquesne Light has achieved:

- 466,034 MWh/yr of VTD + portfolio-level carryover (CO) energy savings.
 - This represents 105.7% of the May 31, 2021 energy savings compliance target of 440,916 MWh/yr.

Appendix D includes additional detail on PY11 and Phase III to date (P3TD) energy and peak demand savings by customer segment, carveout, portfolio, and program.

Figure 2.2-1. summarizes Duquesne Light’s progress toward the Phase III portfolio compliance target. It also includes savings previously recorded as unverified savings in the PY10 Annual Report for the Small/Medium and Large Nonresidential Midstream Lighting Programs. Throughout this report, these newly verified savings from PY10 are included in realization rate numerators, and no corresponding PY10 reported savings are included in the denominators—only PY11 reported savings are in the denominators. The Small/Medium and Large Nonresidential Midstream Lighting Program PY11 realization rates will appear higher than what historical program performance suggests. Reference Section 3.8 for additional and stratum-specific performance details.

Figure 2.2-1. EE&C Plan Performance Toward Phase III Portfolio Compliance Target

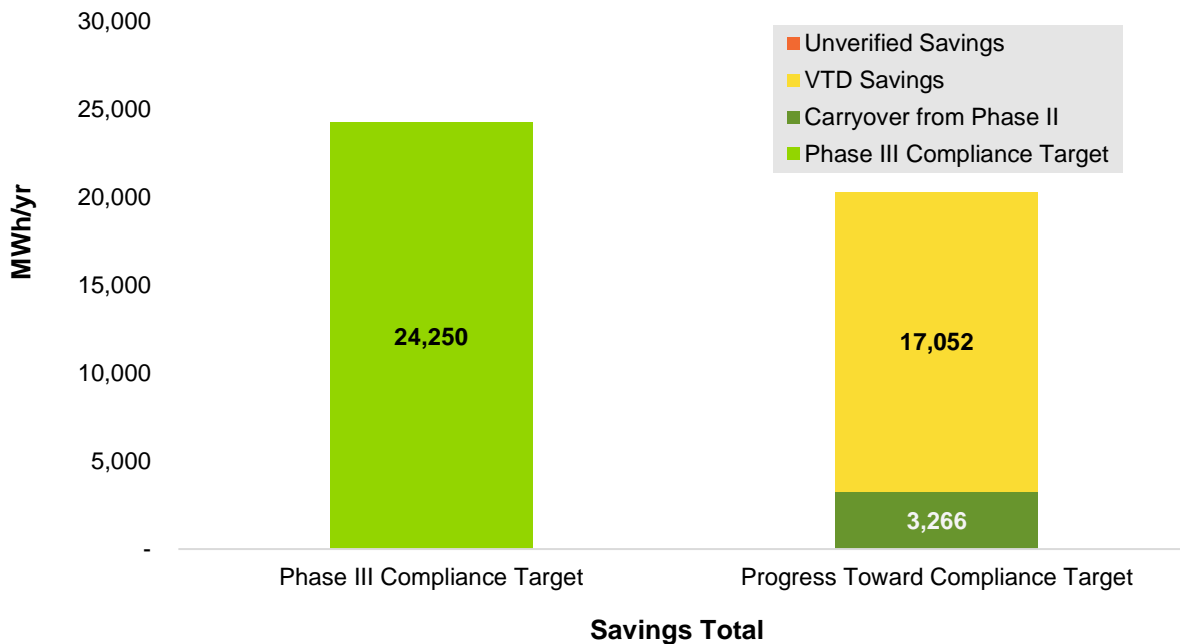


Source: Guidehouse analysis

The Phase III Implementation Order directed EDCs to offer conservation measures to the low-income customer segment based on the proportion of electric sales attributable to low-income households. The proportionate number of measures targeted for Duquesne Light is 8.4%. Duquesne Light offers 102 EE&C measures to its residential and nonresidential customer classes. Twenty measures are available to the low-income customer segment at no cost to the customer. This represents 19.6% of the total measures offered in the EE&C Plan and exceeds the proportionate number of measures target.

The PA PUC also established a low-income energy savings target of 5.5% of the portfolio savings goal. The low-income savings target for Duquesne Light is 24,250 MWh/yr and is based on verified gross savings. Figure 2.2-2. compares the VTD performance for the low-income customer segment to the Phase III savings target. Duquesne Light has achieved 83.8% of the Phase III low-income energy savings target.

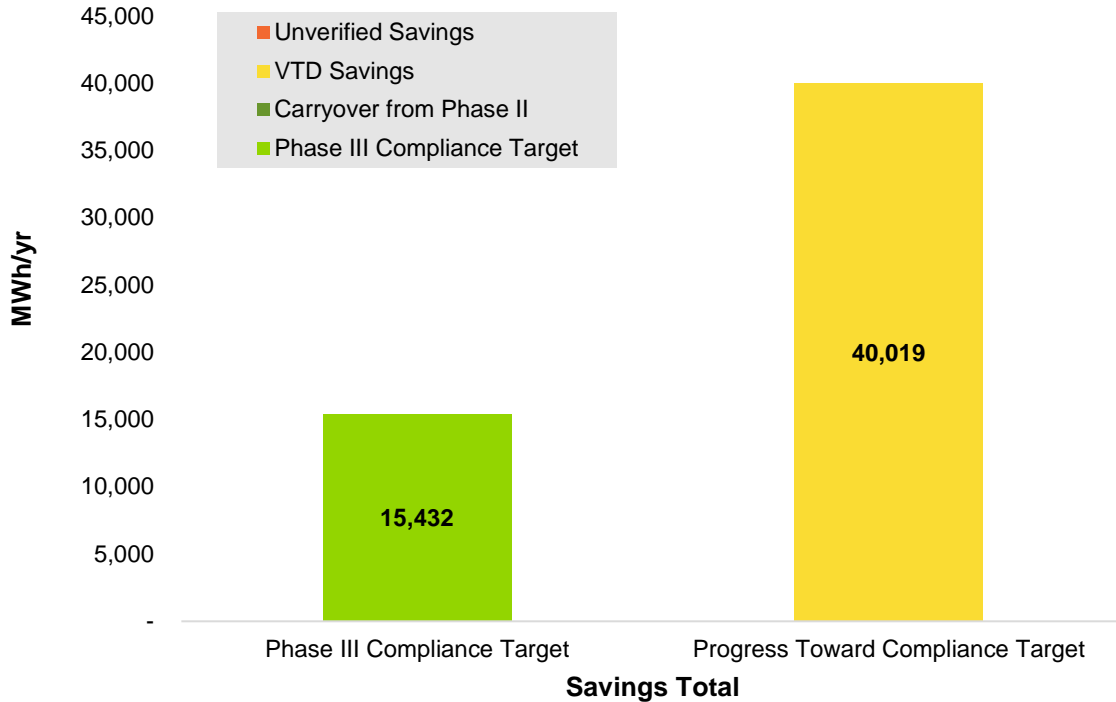
Figure 2.2-2. EE&C Plan Performance Toward Phase III Low-Income Compliance Target



Source: Guidehouse analysis

The Phase III Implementation Order established a GNI energy savings target of 3.5% of the portfolio savings goal. The GNI savings target for Duquesne Light is 15,432 MWh/yr and is based on verified gross savings. Figure 2.2-3. compares the VTD performance for the GNI customer segment to the Phase III savings target. Duquesne Light has achieved 259.3% of the Phase III GNI energy savings target.

Figure 2.2-3. EE&C Plan Performance Against Phase III GNI Compliance Target



Source: Guidehouse analysis

2.3 Phase III DR Achievements to Date

The Phase III DR performance target for Duquesne Light is 42 MW. Compliance targets for DR programs are based on average performance across events. Targets were established at the system level, which means the load reductions measured at the customer meter must be escalated to reflect transmission and distribution losses.

Act 129 DR events are triggered by PJM’s day-ahead load forecast. When the day-ahead forecast is above 96% of the peak load forecast for the year, a DR event is initiated for the following day. In PY11, four DR events were called. Table 2.3-1 lists the days that DR events were called and the verified gross demand reductions achieved by each program. Table 2.3-1 also lists the average DR performance for PY11 and for P3TD. Duquesne Light’s average DR performance to date is above the Phase III compliance reduction target by 31% (performance–goal/goal). DR participation is voluntary for PY12. Therefore, Phase III compliance is based on achieved impacts through PY11.

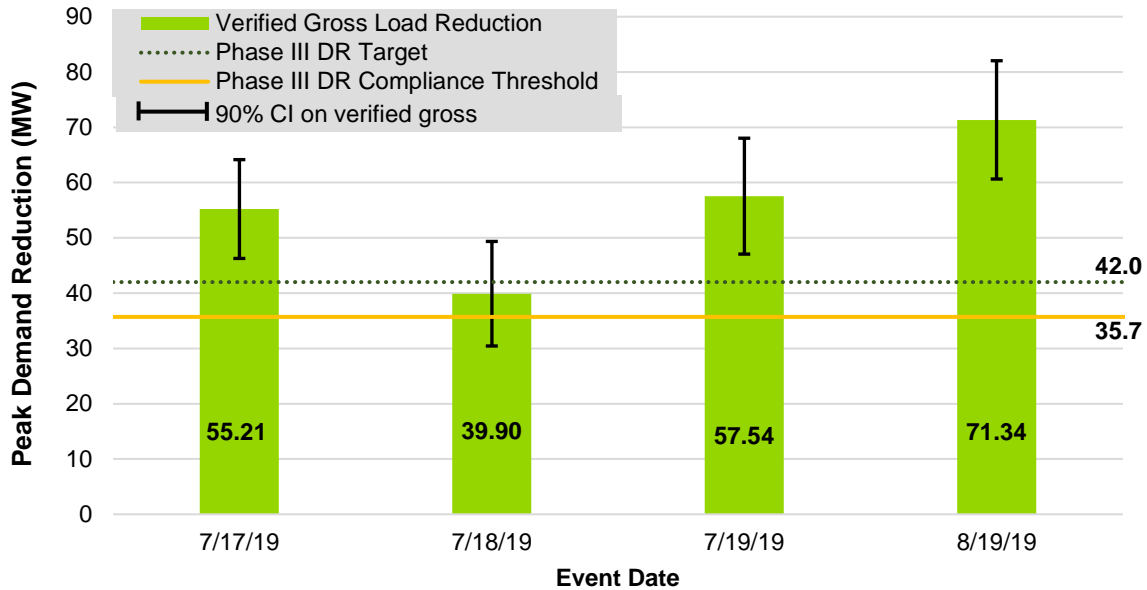
Table 2.3-1. DR PYVTD and VTD Performance by Event (MW)

Event Date	Start Hour (Hour Ending)	End Hour (Hour Ending)	Small C&I Load Curtailment	Large C&I Load Curtailment	Residential Direct Load Control	Behavioral Demand Response	Average Portfolio MW Impact
2017-06-13	15	18	0.47	61.51	N/A	N/A	61.98
2017-07-20	15	18	0.43	63.37	N/A	N/A	63.80
2017-07-21	15	18	0.39	50.98	N/A	N/A	51.37
2018-07-02	15	18	1.63	73.28	N/A	N/A	74.90
2018-07-03	15	18	0.59	51.76	N/A	N/A	52.35
2018-08-06	15	18	2.15	50.03	N/A	N/A	52.17
2018-08-28	15	18	1.32	37.46	N/A	N/A	38.78
2018-09-04	15	18	1.52	58.36	N/A	N/A	59.88
2018-09-05	15	18	0.75	37.08	N/A	N/A	37.82
2019-07-17	15	18	1.61	53.61	N/A	N/A	55.21
2019-07-18	16	19	1.56	38.34	N/A	N/A	39.90
2019-07-19	15	18	1.26	56.28	N/A	N/A	57.54
2019-08-19	15	18	1.17	70.16	N/A	N/A	71.34
PYVTD – Average PY11 DR Event Performance							56.00
VTD – Average Phase III DR Event Performance							55.16

Source: Guidehouse analysis

The PA PUC's Phase III Implementation Order also established a requirement that EDCs achieve at least 85% of the Phase III compliance reduction target in each DR event. For Duquesne Light, this translates to a 35.7 MW minimum for each DR event. Figure 2.3-1. compares the performance of each of the DR events in PY11 to the event-specific minimum and average targets.

Figure 2.3-1. Event Performance Compared to 85% Per-Event Target



Source: Guidehouse analysis

2.4 Phase III Performance by Customer Segment

Table 2.4-1 presents the participation, savings, and spending by customer sector for PY11. The residential, small commercial and industrial (C&I), and large C&I sectors are defined by EDC tariff; the residential low-income and GNI sector were defined by statute (66 Pa. C.S. § 2806.1). The residential low-income segment is a subset of the residential customer class, and the GNI segment includes customers who are part of the small C&I or large C&I rate classes. The savings, spending, and participation values for the low-income and GNI segments have been removed from the parent sectors in Table 2.4-1.

Table 2.4-1. PY11 Summary Statistics by Customer Segment

Parameter	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
Number of Participants	62,433	18,695	533	320	220	82,201
PY11 Energy Realization Rate	89%	99%	130%	91%	107%	99%
PYVTD MWh/yr	30,044	3,831	19,667	28,635	15,172	97,349
PY11 Demand Realization Rate	90%	101%	138%	99%	84%	100%
PYVTD MW/yr (Energy Efficiency)	3.32	0.38	2.94	4.72	1.81	13.17
PYVTD MW (DR)	N/A	N/A	0.69	50.16	5.15	56.00
Incentives (\$1,000)*	\$1,041	\$254	\$1,358	\$2,247	\$1,213	\$6,113

*Related to cross-sector sales, a portion of Residential Energy Efficiency (Upstream Lighting) incentives are reallocated from Residential (Non-Low-Income) to Small C&I (Non-GNI).

Participant counts in this table differ from the PY11 Preliminary Annual Report, which excluded participant counts for certain programs. Counts were not available at the time of that report's filing. Participant counts throughout this report include the following additions: Residential Behavioral Savings (49,020), Low-Income Energy Efficiency (14,764 for Low-Income Home Energy Reports and 1,482 for Low-Income Whole House Retrofit Program), Small/Medium Midstream Lighting (238), and Large Midstream Lighting (99).

Source: Guidehouse analysis

Table 2.4-2 summarizes plan performance by sector since the beginning of Phase III.

Table 2.4-2. Phase III Summary Statistics by Customer Segment

Parameter	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
Number of Participants*	280,040	82,702	1,885	818	529	365,974
P3TD Energy Realization Rate	94%	92%	128%	97%	102%	101%
VTD MWh/yr	152,453	13,808	69,997	89,290	40,019	365,567
P3TD Demand Realization Rate	94%	95%	132%	102%	80%	101%
VTD MW (Energy Efficiency)	16.74	1.41	10.39	11.84	4.58	44.97
VTD MW (DR)**	N/A	N/A	0.72	49.12	5.32	55.16
Incentives (\$1,000)***	\$5,316	\$887	\$3,660	\$6,759	\$3,058	\$19,680

*Phase III participation counts for the Large Curtailable Load Program are included here but are not cumulative. Instead, counts for this program represent the maximum number of annual participants during the phase.

**These VTD MW achievements are not cumulative but represent the average Phase III DR event performance.

***Related to cross-sector sales, a portion of Residential Energy Efficiency (Upstream Lighting) incentives are reallocated from Residential (Non-Low-Income) to Small C&I (Non-GNI).

Source: Guidehouse analysis

2.5 Summary of Participation by Program

Participation is defined differently for programs depending on the program delivery channel and data tracking practices. The participant definition nuances vary by program and are summarized in Table 2.5-1. Table 2.5-2 provides the current participation totals for PY11 and Phase III.

Table 2.5-1. Program Participation Definitions

Program	Component	Definition
Residential Energy Efficiency		
Low-Income Energy Efficiency		
Residential Appliance Recycling		
Express Efficiency		
Small/Medium Midstream Lighting		
Small Commercial Direct Install	Downstream/ midstream rebates or kits	A participant is a customer participating in the given program within a given reporting period (e.g., Q1 through Q4 for PY11) represented by a unique participant account number. The counts appearing in Table 2.5-2 represent the summations of the unique customer participant account numbers in the tracking system for the given program in each of the periods represented (i.e., PYRTD or P3TD). Customers participating in a program more than once within a reporting period (e.g., PYRTD) are counted once; customers participating more than once but in different annual periods or programs are counted more than once (once in each period or program).
Multifamily Housing Retrofits		
Commercial Efficiency		
Community Education Energy Efficiency		
Large Midstream Lighting		
Industrial Efficiency		
Public Agency Partnership		
Large Curtailable Load	DR curtailment	A participant is a customer participating in the program within the program event period for the program year (e.g., June-September 2019) represented by a unique participant account number. The count appearing in Table 2.5-2 represents the summation of the unique customer participant account numbers in the tracking system for the program, including all account numbers for which DR activity has been reported for at least one event during the program period for the year.
Residential Behavioral Savings Program	Home energy reports	A participant is a customer that is a member of the program's treatment group whose energy consumption is analyzed at the end of the program year, represented by an unique account number.
Residential Energy Efficiency (Upstream Lighting)	Upstream rebates for lamp sales	Participation cannot be counted because reported program data comprises lamp sales activities and not individual participating customer activities.
Residential Energy Efficiency	Giveaways	A portion of REEP program savings result from giveaways during events in which the utility has participated (event giveaways). Duquesne Light tracks events and the measures given away, not the individual participants who receive the measures.
Low-Income Energy Efficiency		A portion of program savings results from low-income-specific events during which the utility provides free kits to attendees. Duquesne Light tracks events and the measures given away, not the individual participants who receive the measures.

Program	Component	Definition
Residential Whole House Retrofit	Direct install audits	Defined similarly to the downstream/midstream rebates or kits component. Additionally, whole house retrofits also occur in multifamily buildings where a mix of market rate and low-income audits occur. The income status of individual participants is not known, but the known building-level proportion of tenants that are low-income is used to split the total count of participants between the market rate and low-income programs. Whole house retrofit program activities in some multifamily buildings engage property owners and building managers and not individual tenants. In either case, a participant is defined as a rate-paying customer who received any efficiency measure from the program (i.e., a treated dwelling).
Low-Income Whole House Retrofit		

Source: Guidehouse analysis

Table 2.5-2. EE&C Portfolio Participation by Program

Program	PYTD Participation	P3TD Participation
Residential Energy Efficiency	11,345	54,029
Residential Energy Efficiency (Upstream Lighting)	N/A	N/A
Residential Appliance Recycling	2,068	8,114
Residential Behavioral Savings	49,020	217,571
Residential Whole House Retrofit	0	326
Low-Income Energy Efficiency	18,695	82,702
Express Efficiency	265	965
Small/Medium Midstream Lighting	238	725
Small Commercial Direct Install	0	140
Multifamily Housing Retrofit	15	40
Commercial Efficiency	63	199
Large Midstream Lighting	99	395
Industrial Efficiency	43	109
Public Agency Partnership	134	353
Community Energy Efficiency	24	114
Large Curtailable Load	192	192*
Portfolio Total	82,201	365,974

*P3TD participation counts for the Large Curtailable Load Program are not cumulative; instead, they represent the maximum number of annual participants during the phase.

Source: Guidehouse analysis

2.6 Summary of Impact Evaluation Results

During PY11, Guidehouse completed impact evaluations for many of the energy efficiency programs in the portfolio. Table 2.6-1 summarizes the realization rates and net-to-gross (NTG) ratios by program or evaluation initiative.

Table 2.6-1. Impact Evaluation Results Summary

Program/Initiative	Energy Realization Rate	Demand Realization Rate	NTG Ratio
Residential Energy Efficiency	95%	100%	76%
Residential Energy Efficiency (Upstream Lighting)	97%	97%	43%
Residential Appliance Recycling	94%	94%	47%
Residential Behavioral Savings	68%	68%	100%
Residential Whole House Retrofit	N/A	N/A	100%
Low-Income Energy Efficiency	99%	101%	100%
Express Efficiency	138%	146%	72%
Small/Medium Midstream Lighting	122%	129%	72%
Small Commercial Direct Install	N/A	N/A	100%
Multifamily Housing Retrofit	102%	108%	45%
Commercial Efficiency	98%	101%	79%
Large Midstream Lighting	99%	85%	72%
Industrial Efficiency	85%	99%	61%
Public Agency Partnership	109%	80%	45%
Community Education	98%	102%	45%
Large Curtailable Load	N/A	121%	100%

Source: Guidehouse analysis

2.6.1 High Impact Measures

Findings from NTG research are not used to adjust compliance savings in Pennsylvania. Instead, NTG research provides directional information for program planning purposes. Guidehouse conducted high impact measure (HIM) research for measures implemented during PY11. The team reviewed the PY11 residential program activities and identified refrigerator recycling as the measure that provides the most reported energy savings (37%) in the residential sector. The second highest-saving residential HIM is LED bulbs within Residential Energy Efficient Program (REEP) kits. Table 2.6-2 presents estimated free ridership, spillover, and NTG ratios for PY11 HIMs in the residential sector.

Table 2.6-2. PY11 Residential High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Appliance Recycling	Refrigerators	61%	8%	46%
Residential Energy Efficiency (Kits)	LED Bulbs	32%	11%	79%

Source: Guidehouse analysis

Guidehouse also identified LED interior low-/high-bay fixtures, LED exterior area lighting fixtures, and LED linear replacement lamps as HIMs for the nonresidential sector. Table 2.6-3 presents estimated free ridership, spillover, and NTG ratios for HIMs in the nonresidential sector.

Table 2.6-3. PY11 Nonresidential High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Express/Commercial/ Industrial Efficiency	LED Interior Low-/High-Bay Fixture	42%	0%	58%
Express/Commercial/ Industrial Efficiency	LED Exterior Area Lighting Fixture	13%	0%	87%
Express/Commercial/ Industrial Efficiency	LED Linear Replacement Lamp	3%	0%	97%

Source: Guidehouse analysis

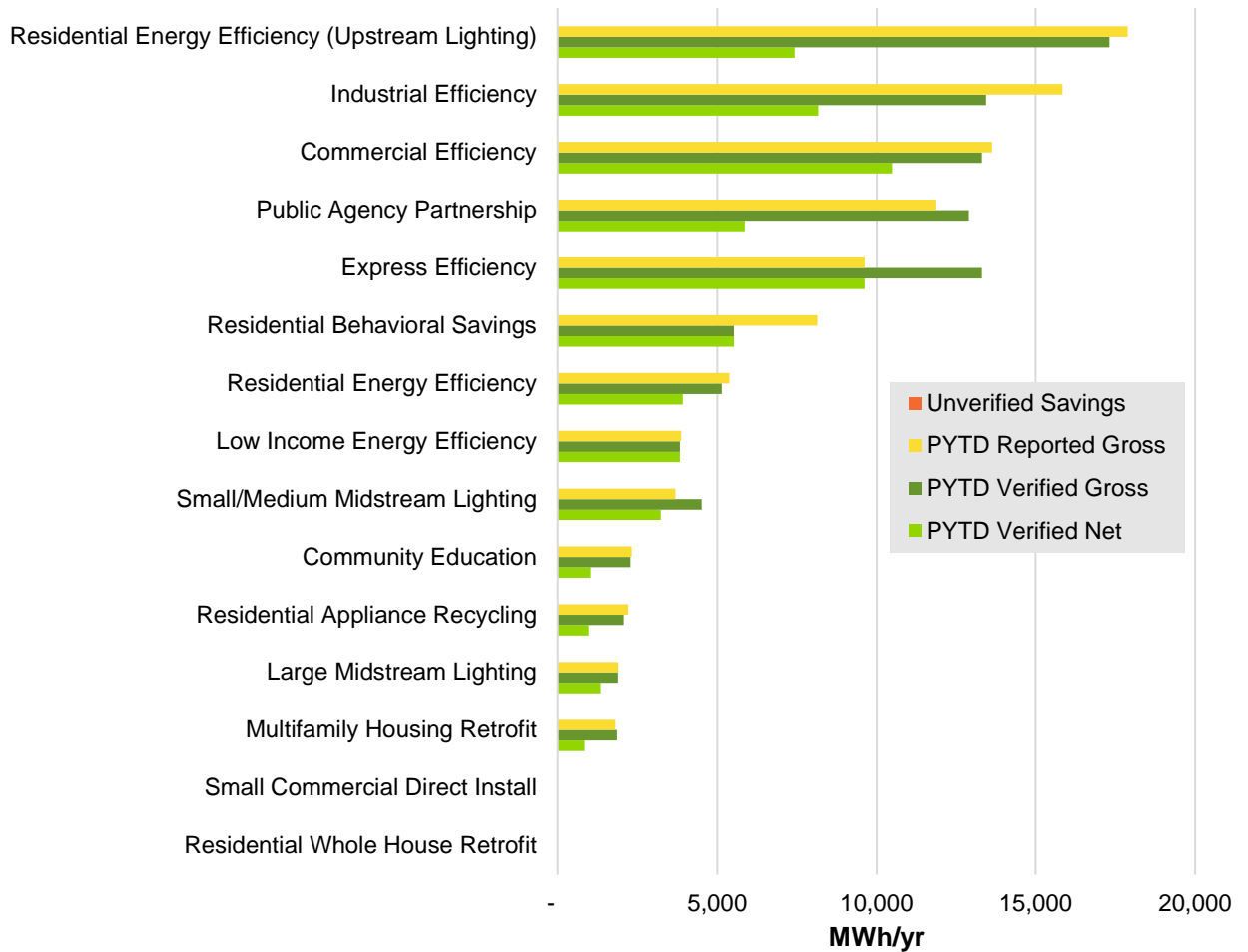
2.7 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/yr). Each program year, the annual savings achieved by EE&C program activity are recorded as incremental annual (or first-year) savings and added to an EDC’s progress toward compliance. Incremental annual savings estimates are presented in Section 2.7.1. Lifetime energy savings incorporate the effective useful life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC test by program participants when assessing the economics of upgrades and by the statewide evaluator (SWE) when calculating the emissions benefits of Act 129 programs. Section 2.7.2 presents the lifetime energy savings by program.

2.7.1 Incremental Annual Energy Savings by Program

Figure 2.7-1. summarizes the PYTD energy savings by program for PY11. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. The verified gross savings are adjusted by the energy realization rate and the verified net savings are adjusted by both the realization rate and the NTG ratio.

Figure 2.7-1. PYTD Energy Savings by Program

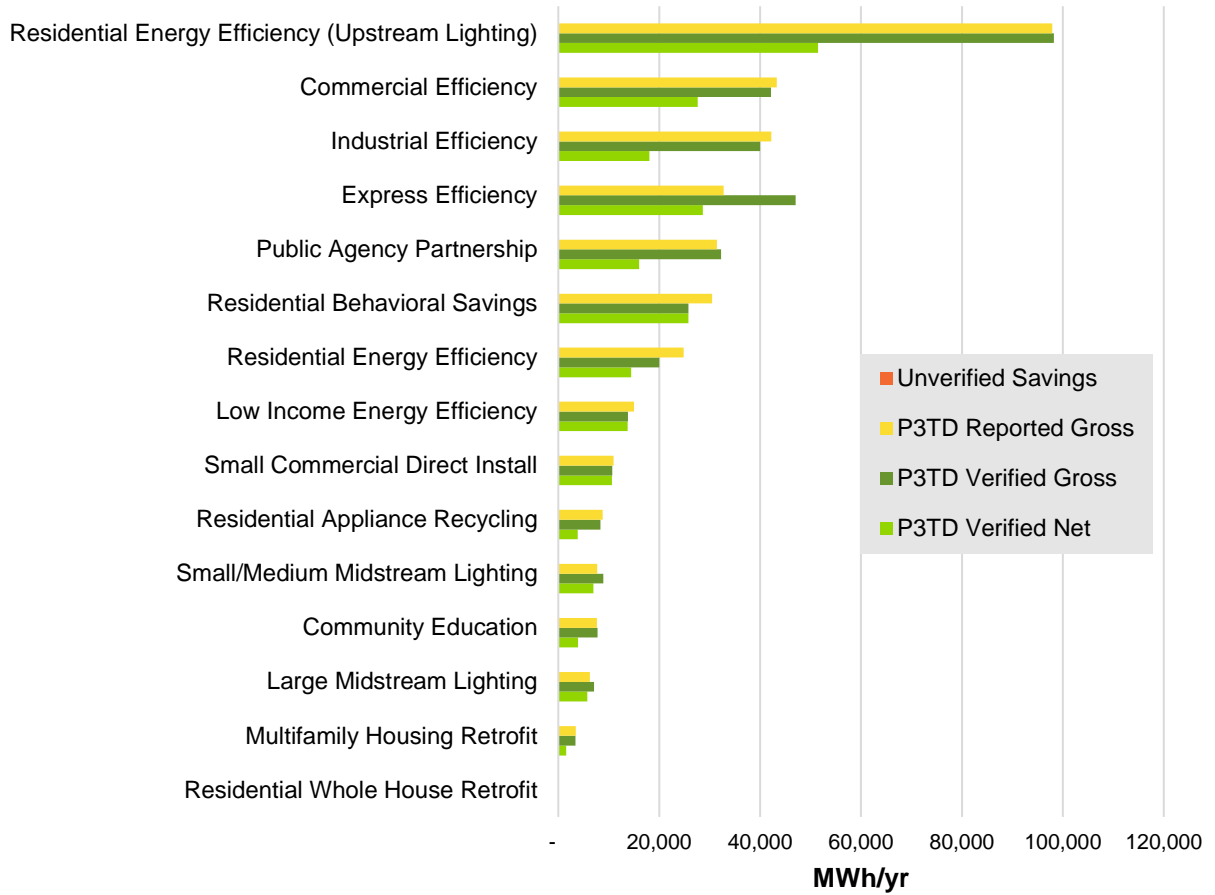


In addition to PY11 verified savings, this figure also includes newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings. These are associated with the Small/Medium Midstream Lighting and Large Midstream Lighting Programs.

Source: Guidehouse analysis

Figure 2.7-2. summarizes the energy savings by program for Phase III of Act 129.

Figure 2.7-2. P3TD Energy Savings by Program



In addition to PY11 verified savings, this figure also includes newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings. These are associated with the Small/Medium Midstream Lighting and Large Midstream Lighting Programs.

Source: Guidehouse analysis

Table 2.7-1 summarizes energy impacts by program through PY11. The Small/Medium Midstream Lighting and Large Midstream Lighting Programs also include newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings.

Table 2.7-1. Incremental Annual Energy Savings by Program (MWh/yr)

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential Energy Efficiency	5,384	5,137	3,913	24,808	20,019	14,411
Residential Energy Efficiency (Upstream Lighting)	17,882	17,316	7,425	97,895	98,210	51,488
Residential Appliance Recycling	2,206	2,066	966	8,793	8,322	3,876
Residential Behavioral Savings	8,135	5,525	5,525	30,503	25,789	25,789
Residential Whole House Retrofit	0	0	0	134	114	114
Low-Income Energy Efficiency	3,870	3,831	3,831	15,018	13,808	13,714
Express Efficiency	9,620	13,308	9,621	32,787	47,007	28,662
Small/Medium Midstream Lighting	3,691	4,509	3,226	7,709	8,890	6,947
Small Commercial Direct Install	0	0	0	10,934	10,688	10,613
Multifamily Housing Retrofit	1,807	1,851	842	3,448	3,411	1,591
Commercial Efficiency	13,633	13,315	10,486	43,278	42,177	27,600
Large Midstream Lighting	1,897	1,879	1,344	6,263	7,100	5,732
Industrial Efficiency	15,841	13,441	8,170	42,223	40,013	18,052
Public Agency Partnership	11,857	12,897	5,867	31,457	32,230	16,006
Community Education	2,317	2,275	1,035	7,655	7,789	3,933
Portfolio Total	98,139	97,349	62,251	362,906	365,567	228,529

Source: Guidehouse analysis

The VTD savings reported from prior years for the Industrial Efficiency Program have changed since the PY10 final annual report was submitted. The SWE determined that PY10 verified savings related to this program were greater than originally reported.

- **Gross energy:** 22 MWh/yr increase
- **Net energy:** 7 MWh/yr increase

2.7.2 Lifetime Energy Savings by Program

Table 2.7-2 presents the PYTD and P3TD lifetime energy savings by program. Lifetime energy savings are calculated by multiplying the annual energy savings by the EUL. Per the PA 2016 TRC Order, the measure EUL does not exceed 15 years for any measure in the portfolio. Early replacement measures are subject to a dual baseline calculation, leading to modified lifetime savings. For these measures, savings relative to the in-place baseline equipment are used for the remaining useful lifetime (RUL) of the base equipment. After the RUL, savings relative to code equipment are used for the remainder of the efficient measure's EUL.

Table 2.7-2. Lifetime Energy Savings by Program (MWh)

Program Name	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential Energy Efficiency	27,265	20,767	184,698	131,322
Residential Energy Efficiency (Upstream Lighting)	59,057	25,323	660,761	362,774
Residential Appliance Recycling	13,805	6,453	56,480	26,307
Residential Behavioral Savings	5,525	5,525	25,402	25,402
Residential Whole House Retrofit	0	0	975	975
Low-Income Energy Efficiency	11,896	11,896	63,762	63,264
Express Efficiency	158,633	112,256	616,156	370,969
Small/Medium Midstream Lighting	17,397	12,448	51,965	42,014
Small Commercial Direct Install	0	0	143,726	142,717
Multifamily Housing Retrofit	27,580	12,547	45,899	21,101
Commercial Efficiency	197,602	155,620	625,739	409,655
Large Midstream Lighting	6,858	4,907	48,363	40,025
Industrial Efficiency	191,312	116,282	586,104	263,113
Public Agency Partnership	186,667	84,921	467,468	232,323
Community Education	34,105	15,516	114,765	57,778
Portfolio Total	937,701	584,461	3,692,264	2,189,741

Source: Guidehouse analysis

The VTD lifetime savings reported from prior years for the Industrial Efficiency Program have changed since the PY10 final annual report was submitted. The SWE determined that PY10 verified lifetime savings related to this program were greater than originally reported. These lifetime savings adjustments relate directly to the PY10 verified savings adjustments previously described under Table 2.7-1.

- **Gross lifetime energy:** 323 MWh/yr increase
- **Net lifetime energy:** 99 MWh/yr increase

2.8 Summary of Demand Impacts by Program

Duquesne Light's Phase III EE&C programs achieve peak demand reductions in two ways. The first is through coincident reductions from energy efficiency measures and the second is through dedicated DR offerings that exclusively target temporary demand reductions on peak days. Energy efficiency reductions coincident with system peak hours are reported and used in the calculation of benefits in the TRC test but do not contribute to Phase III peak demand reduction compliance goals. Phase III peak demand reduction targets are exclusive to DR programs.

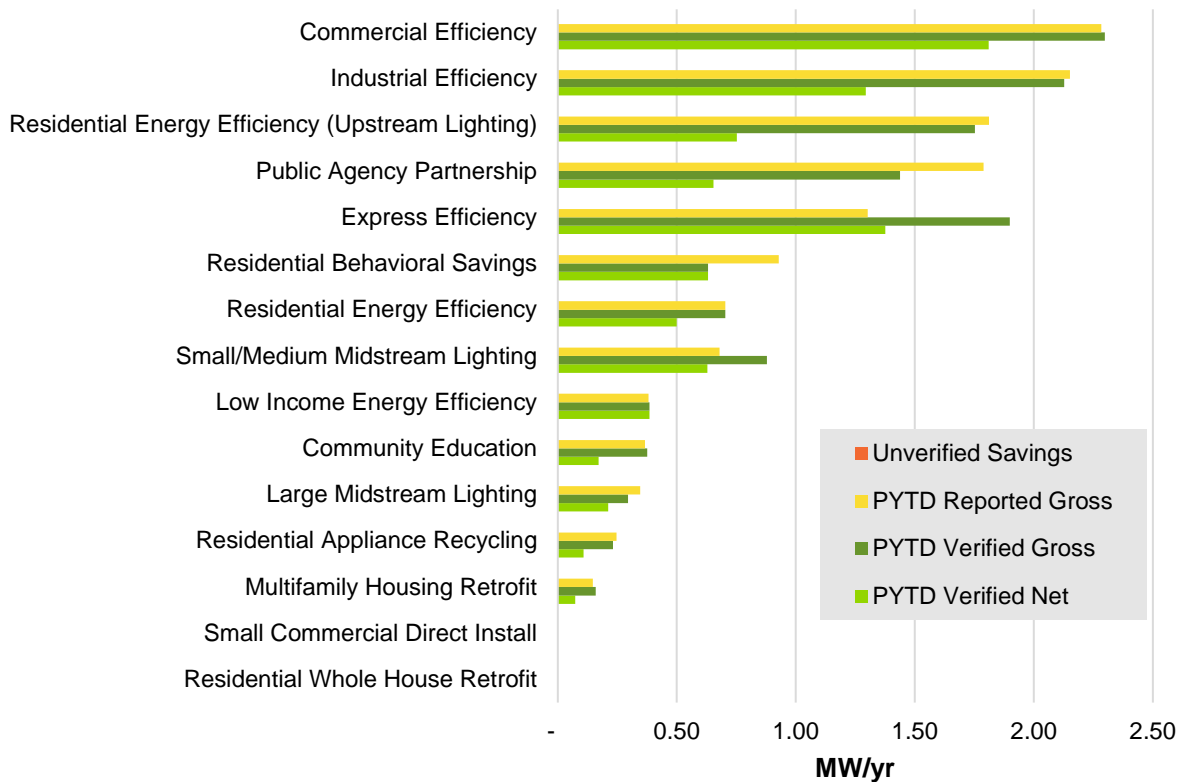
The two types of peak demand reduction savings are treated differently for reporting purposes. Peak demand reductions from energy efficiency are generally additive across program years, meaning the P3TD savings reflect the sum of the first-year savings in each program year.

Conversely, DR goals are based on average portfolio impacts across all events, so cumulative DR performance is expressed as the average performance of each of the DR events called in P3TD. Because of these differences, demand impacts from energy efficiency and DR are reported separately in the following subsections.

2.8.1 Energy Efficiency

Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2:00 p.m. to 6:00 p.m. EDT on non-holiday weekdays from June through August. Unlike Phase I and Phase II Act 129 reporting, the peak demand impacts from energy efficiency in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. Figure 2.8-1. summarizes the PYTD demand savings by energy efficiency program for PY11.

Figure 2.8-1. PYTD Demand Savings by Energy Efficiency Program

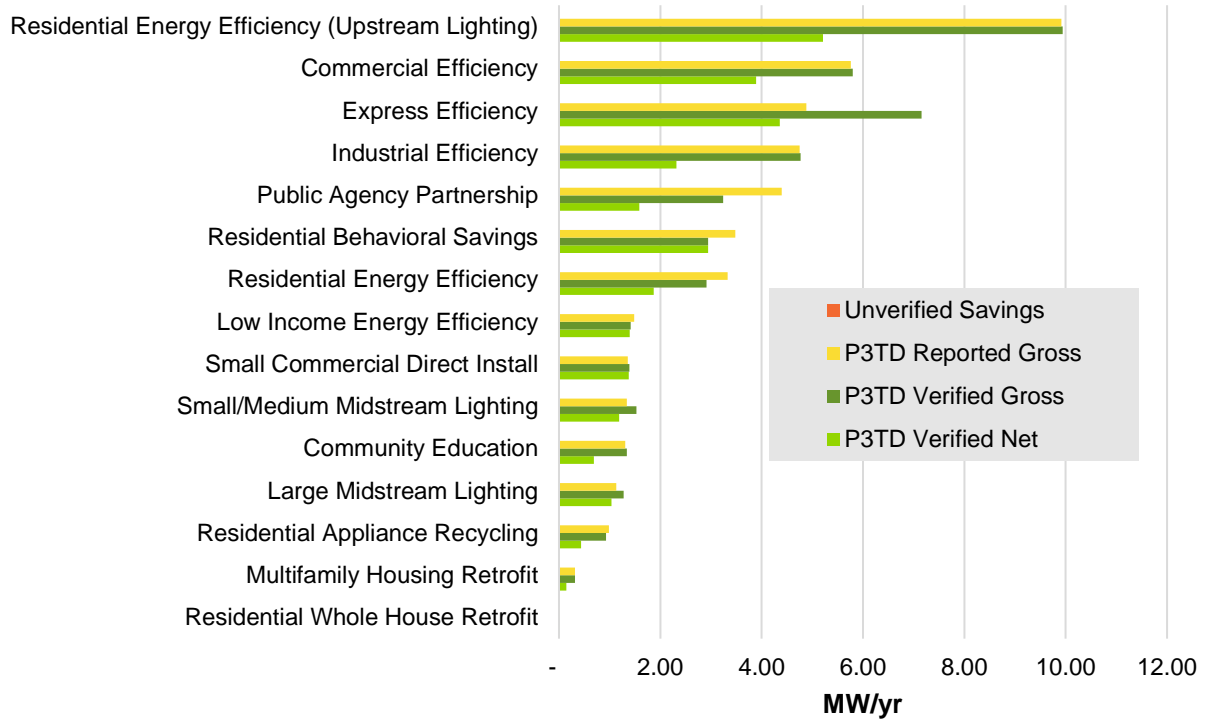


In addition to PY11 verified savings, this figure also includes newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings. These are associated with the Small/Medium Midstream Lighting and Large Midstream Lighting Programs.

Source: Guidehouse analysis

Figure 2.8-2. summarizes the P3TD demand savings by energy efficiency program for Phase III of Act 129.

Figure 2.8-2. P3TD Demand Savings by Energy Efficiency Program



In addition to PY11 verified savings, this figure also includes newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings. These are associated with the Small/Medium Midstream Lighting and Large Midstream Lighting Programs.

Source: Guidehouse analysis

Table 2.8-1 summarizes the peak demand impacts by energy efficiency program through the current reporting period. The Small/Medium Midstream Lighting and Large Midstream Lighting Programs also include newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings.

Table 2.8-1. Peak Demand Savings by Energy Efficiency Program (MW/yr)

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Energy Efficiency	0.70	0.70	0.50	3.33	2.91	1.87
Residential Energy Efficiency (Upstream Lighting)	1.81	1.75	0.75	9.92	9.94	5.21
Residential Appliance Recycling	0.25	0.23	0.11	0.98	0.93	0.43
Residential Behavioral Savings	0.93	0.63	0.63	3.48	2.94	2.94
Residential Whole House Retrofit	0	0	0	0.01	0.01	0.01
Low-Income Energy Efficiency	0.38	0.38	0.38	1.49	1.41	1.40
Express Efficiency	1.30	1.90	1.38	4.88	7.16	4.36
Small/Medium Midstream Lighting	0.68	0.88	0.63	1.34	1.53	1.19
Small Commercial Direct Install	0	0	0	1.36	1.39	1.38
Multifamily Housing Retrofit	0.15	0.16	0.07	0.31	0.31	0.15

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Commercial Efficiency	2.28	2.30	1.81	5.76	5.80	3.89
Large Midstream Lighting	0.35	0.30	0.21	1.13	1.28	1.04
Industrial Efficiency	2.15	2.13	1.29	4.75	4.77	2.32
Public Agency Partnership	1.79	1.44	0.65	4.40	3.24	1.59
Community Education	0.37	0.38	0.17	1.31	1.34	0.69
Portfolio Total	13.14	13.17	8.59	44.45	44.97	28.46

Guidehouse removed the Large Curtailable Load Program from this table given it is not an energy efficiency program; rather, it is a DR program. The reader should note this difference from previous years' reports.

Source: Guidehouse analysis

Although the SWE determined that PY10 verified energy savings changed for the Industrial Efficiency Program since the PY10 final annual report was submitted, peak demand impacts remain unchanged at two decimal places within Table 2.8-1.

2.8.2 DR

Act 129 defines peak demand savings from DR as the average reduction in electric demand during the hours when a DR event is initiated. Phase III DR events are initiated according to the following guidelines:

- Curtailment events shall be limited to the months of June through September.
- Curtailment events shall be called for the first 6 days of each program year (starting in PY9) in which the peak hour of PJM's day-ahead forecast for the PJM regional transmission organization (RTO) is greater than 96% of the PJM RTO summer peak demand forecast for the months of June through September.
- Each curtailment event shall last 4 hours.
- Each curtailment event shall be called such that it will occur during the day's forecasted peak hour(s) above 96% of PJM's RTO summer peak demand forecast.
- Once six curtailment events have been called in a program year, the peak demand reduction program shall be suspended for that program year.

The peak demand impacts from DR are presented at the system level in this report and reflect adjustments to account for transmission and distribution losses. Duquesne Light uses the following line loss percentages/multipliers by sector.

- Residential = 6.9% or 1.0741
- Small C&I = 6.9% or 1.0741
- Large C&I = 6.9% or 1.0741 and 0.8% or 1.0081⁷

Table 2.8-2 summarizes the PYVTD and VTD demand reductions for each of the DR programs in the EE&C Plan and for the whole DR portfolio. VTD demand reductions are the average

⁷ The 0.8% line loss factor applies to certain participants on the HPVS rate.

performance across all Phase III DR events independent of how many events occurred in a given program year. The relative precision columns in Table 2.8-2 indicate the margin of error (at the 90% confidence interval) around the PYVTD and VTD demand reductions.

Table 2.8-2. Verified Gross DR Impacts by Program

Program	PYVTD Gross MW	PYVTD Relative Precision (90%)	VTD Gross MW	VTD Relative Precision (90%)*
Large Curtailable Load	56.00	8.9%	55.16	5.8%
Portfolio Total	56.00	8.9%	55.16	5.8%

*This represents the error from the baseline uncertainty of the DR analysis. This does not represent sampling error.

Source: Guidehouse analysis

Guidehouse estimated impacts using either a customer baseline (CBL) with an optional weather sensitivity adjustment or using a regression analysis. The determination of which approach to use for each customer was based on which method provided the most accurate estimate of consumption when applied to hypothetical events in summer 2019 (the testing criteria described in Guidehouse's Phase III Evaluation Plan).

2.9 Summary of Fuel Switching Impacts

No fuel switching measures are offered through Duquesne Light EE&C programs.

2.10 Summary of Cost-Effectiveness Results

Table 2.10-1 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 2.10-1 were calculated using gross verified impacts. Net present value (NPV) PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 2.10-1. Summary of Portfolio Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$6,113		\$17,487	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$6,640		\$22,418	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$12,753		\$39,905	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$55	\$438
6	Administration, Management, and Technical Assistance ^[3]	\$476	\$435	\$1,816	\$3,185
7	Marketing ^[4]	\$7	\$0	\$141	\$20
8	Program Delivery ^[5]	\$0	\$9,911	\$1,177	\$29,418
9	EDC Evaluation Costs	\$983		\$2,823	
10	SWE Audit Costs	\$400		\$1,757	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
11	Program Overhead Costs (sum of rows 5 through 10)	\$12,212	\$40,831
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$24,965	\$80,736
14	Total NPV Lifetime Electric Energy Benefits	\$34,033	\$113,897
15	Total NPV Lifetime Electric Capacity Benefits	\$17,522	\$49,821
16	Total NPV Lifetime Operation and Maintenance Benefits	\$1,921	\$17,594
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$3,668	-\$8,671
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$49,808	\$172,641
19	TRC Benefit-Cost Ratio ^[8]	2.00	2.14

[1] Includes direct install equipment costs and costs for EE&C kit.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

* Rows 1-11 are presented in nominal dollars (PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020); P3TD = \$2016

Source: Guidehouse analysis

TRC benefit-cost ratios are calculated by comparing the total NPV TRC benefits and the total NPV TRC costs. Table 2.10-2 shows the TRC ratios by program and for the portfolio. The benefits in Table 2.10-2 were calculated using gross verified impacts. Costs and benefits are expressed in 2019 dollars.

PY11 portfolio gross TRC cost-effectiveness generally was strong and carried primarily by the nonresidential programs including the Commercial Efficiency, Industrial Efficiency, and Public Agency Partnership programs. These three programs represent over 40 percent of the PY11 gross impacts and 55 percent of the total TRC benefits. TRCs fell below 1.00 for all residential programs except for Residential Appliance Recycling. Two programs, Residential Whole House Retrofit and Small Commercial Direct Install, saw TRC scores of zero given that no savings were reported in PY11. However, program administrative costs were relatively limited for these programs. Finally, the portfolio gross TRC is 2.00.

Table 2.10-2. PY11 Gross TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$3,609	\$4,456	0.81	(\$847)
Residential Appliance Recycling	\$673	\$377	1.79	\$296
Residential Behavioral Savings	\$273	\$926	0.29	(\$653)
Residential Whole House Retrofit	\$0	\$79	0.00	(\$79)
Low-Income Energy Efficiency	\$486	\$1,209	0.40	(\$723)
Residential Subtotal	\$5,041	\$7,047	0.72	(\$2,007)
Express Efficiency	\$7,236	\$2,710	2.67	\$4,526
Small/Medium Midstream Lighting	\$949	\$479	1.98	\$470
Small Commercial Direct Install	\$0	\$77	0.00	(\$77)
Multifamily Housing Retrofit	\$1,064	\$2,579	0.41	(\$1,515)
Commercial Efficiency	\$9,528	\$2,954	3.23	\$6,574
Large Midstream Lighting	\$356	\$350	1.02	\$6
Industrial Efficiency	\$9,139	\$2,825	3.23	\$6,314
Public Agency Partnership	\$8,875	\$3,045	2.92	\$5,830
Community Education	\$1,738	\$1,007	1.73	\$732
Large Curtailable Load	\$5,882	\$1,892	3.11	\$3,990
Nonresidential Subtotal	\$44,768	\$17,918	2.50	\$26,850
Portfolio Total	\$49,808	\$24,965	2.00	\$24,844

Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

Source: Guidehouse analysis

Table 2.10-3 presents PY11 cost-effectiveness using net verified savings to calculate benefits. Net TRC cost-effectiveness for the residential programs generally followed the pattern of gross TRC cost-effectiveness. Costs and benefits for net TRCs are the same as those for gross TRCs for Residential Behavioral Savings, Low-Income Energy Efficiency, and Large Curtailable Load given that NTG ratios are assumed to be 1.00. Nonresidential net TRC cost-effectiveness results were also positive for seven of the 15 programs.

Table 2.10-3. PY11 Net TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$1,825	\$3,294	0.55	(\$1,469)
Residential Appliance Recycling	\$315	\$377	0.83	(\$62)
Residential Behavioral Savings	\$273	\$926	0.29	(\$653)
Residential Whole House Retrofit	\$0	\$79	0.00	(\$79)
Low-Income Energy Efficiency	\$486	\$1,209	0.40	(\$723)
Residential Subtotal	\$2,899	\$5,885	0.49	(\$2,987)
Express Efficiency	\$5,232	\$2,303	2.27	\$2,929
Small/Medium Midstream Lighting	\$679	\$419	1.62	\$260
Small Commercial Direct Install	\$0	\$77	0.00	(\$77)
Multifamily Housing Retrofit	\$484	\$1,507	0.32	(\$1,023)
Commercial Efficiency	\$7,504	\$2,529	2.97	\$4,975
Large Midstream Lighting	\$255	\$321	0.80	(\$66)
Industrial Efficiency	\$5,555	\$2,324	2.39	\$3,231
Public Agency Partnership	\$4,037	\$1,978	2.04	\$2,060
Community Education	\$791	\$696	1.14	\$95
Large Curtailable Load	\$5,882	\$1,892	3.11	\$3,990
Nonresidential Subtotal	\$30,418	\$14,044	2.17	\$16,374
Portfolio Total	\$33,317	\$19,930	1.67	\$13,387

Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

Source: Guidehouse analysis

Table 2.10-4 summarizes cost-effectiveness by program for Phase III of Act 129. Cost and benefits are discounted back to 2016.

Table 2.10-4. P3TD Gross TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$43,849	\$22,341	1.96	\$21,508
Residential Appliance Recycling	\$2,323	\$1,273	1.82	\$1,050
Residential Behavioral Savings	\$1,366	\$1,420	0.96	(\$53)
Residential Whole House Retrofit	\$58	\$428	0.14	(\$370)
Low-Income Energy Efficiency	\$2,520	\$3,800	0.66	(\$1,280)
Residential Subtotal	\$50,115	\$29,261	1.71	\$20,855
Express Efficiency	\$24,748	\$7,041	3.51	\$17,707
Small/Medium Midstream Lighting	\$2,829	\$1,043	2.71	\$1,786
Small Commercial Direct Install	\$5,636	\$3,171	1.78	\$2,464
Multifamily Housing Retrofit	\$1,531	\$3,817	0.40	(\$2,286)
Commercial Efficiency	\$24,734	\$9,913	2.50	\$14,821
Large Midstream Lighting	\$2,824	\$1,593	1.77	\$1,231
Industrial Efficiency	\$22,522	\$6,928	3.25	\$15,593
Public Agency Partnership	\$17,801	\$8,851	2.01	\$8,950
Community Education	\$5,480	\$3,984	1.38	\$1,496
Large Curtailable Load	\$14,422	\$5,135	2.81	\$9,287
Nonresidential Subtotal	\$122,525	\$51,475	2.38	\$71,050
Portfolio Total	\$172,641	\$80,736	2.14	\$91,905

Source: Guidehouse analysis

Table 2.10-5 presents P3TD cost-effectiveness results using net verified savings to calculate benefits. Cost and benefits are discounted back to 2016.

Table 2.10-5. P3TD Net TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$25,557	\$16,877	1.51	\$8,680
Residential Appliance Recycling	\$1,082	\$1,273	0.85	(\$191)
Residential Behavioral Savings	\$1,366	\$1,420	0.96	(\$53)
Residential Whole House Retrofit	\$58	\$428	0.14	(\$370)
Low-Income Energy Efficiency	\$2,515	\$3,800	0.66	(\$1,285)
Residential Subtotal	\$30,578	\$23,797	1.28	\$6,781
Express Efficiency	\$14,928	\$5,745	2.60	\$9,182
Small/Medium Midstream Lighting	\$2,302	\$948	2.43	\$1,353
Small Commercial Direct Install	\$5,596	\$3,171	1.76	\$2,425
Multifamily Housing Retrofit	\$705	\$2,515	0.28	(\$1,811)
Commercial Efficiency	\$16,195	\$7,486	2.16	\$8,709
Large Midstream Lighting	\$2,344	\$1,513	1.55	\$831
Industrial Efficiency	\$10,264	\$5,323	1.93	\$4,941
Public Agency Partnership	\$8,860	\$5,954	1.49	\$2,906
Community Education	\$2,817	\$2,597	1.08	\$220
Large Curtailable Load	\$14,422	\$5,135	2.81	\$9,287
Nonresidential Subtotal	\$78,431	\$40,388	1.94	\$38,043
Portfolio Total	\$109,009	\$64,184	1.70	\$44,824

Source: Guidehouse analysis

The P3TD results presented in this section include PY10 TRC updates to the Large Curtailable Load Program. The previous PY10 TRC Benefits calculation double counted line loss factors. TRC Benefits were overstated by \$243 while TRC Costs were not affected. Guidehouse updated both the PY10 gross and net TRC results from 3.13 to 3.00. The changes to PY10 verified savings for the Industrial Efficiency Program previously described in Section 2.7 did not result in any TRC changes within this section.

2.11 Comparison of Performance to Approved EE&C Plan

Table 2.11-1 presents PY11 expenditures by program compared to the budget estimates set forth in the EE&C Plan for PY11. All the dollars in Table 2.11-1 are nominal.

Table 2.11-1. Comparison of PY11 Expenditures to Phase III EE&C Plan (\$1,000)

Program	PY11 Budget from EE&C Plan	PY11 Actual Expenditures	Ratio (Actual/Plan)
Residential Energy Efficiency	\$2,264	\$3,069	1.36
Residential Appliance Recycling	\$187	\$454	2.43
Residential Behavioral Savings	\$285	\$926	3.24
Residential Whole House Retrofit	\$176	\$79	0.45
Low-Income Energy Efficiency	\$1,642	\$1,445	0.88
Express Efficiency	\$1,948	\$1,873	0.96
Small/Medium Midstream Lighting	\$690	\$479	0.69
Small Commercial Direct Install	\$1,153	\$77	0.07
Multifamily Housing Retrofit	\$1,050	\$1,115	1.06
Commercial Efficiency	\$2,074	\$1,677	0.81
Large Midstream Lighting	\$1,524	\$350	0.23
Industrial Efficiency	\$3,445	\$2,251	0.65
Public Agency Partnership	\$2,194	\$2,202	1.00
Community Education	\$526	\$436	0.83
Large Curtailable Load	\$1,864	\$1,892	1.02
Portfolio Total	\$21,022	\$18,325	0.87

Source: Guidehouse analysis

Table 2.11-2 presents P3TD expenditures by program compared to the budget estimates set forth in the EE&C Plan through PY11. All dollars in Table 2.11-2 are nominal.

Table 2.11-2. Comparison of P3TD Expenditures to Phase III EE&C Plan (\$1,000)

Program	Phase III Budget from EE&C Plan through PY11	P3TD Actual Expenditures	Ratio (Actual/Plan)
Residential Energy Efficiency	\$14,050	\$15,520	1.10
Residential Appliance Recycling	\$1,159	\$1,716	1.48
Residential Behavioral Savings	\$1,771	\$1,630	0.92
Residential Whole House Retrofit	\$1,091	\$468	0.43
Low-Income Energy Efficiency	\$4,351	\$4,522	1.04
Express Efficiency	\$5,898	\$6,281	1.07
Small/Medium Midstream Lighting	\$2,089	\$1,182	0.57
Small Commercial Direct Install	\$3,490	\$3,376	0.97
Multifamily Housing Retrofit	\$3,179	\$2,448	0.77
Commercial Efficiency	\$7,108	\$5,957	0.84
Large Midstream Lighting	\$5,223	\$1,756	0.34

Program	Phase III Budget from EE&C Plan through PY11	P3TD Actual Expenditures	Ratio (Actual/Plan)
Industrial Efficiency	\$11,809	\$6,398	0.54
Public Agency Partnership	\$7,005	\$5,782	0.83
Community Education	\$1,679	\$1,705	1.02
Large Curtailable Load	\$6,415	\$6,210	0.97
Portfolio Total	\$76,318	\$64,951	0.85

Source: Guidehouse analysis

Table 2.11-3 compares PY11 verified gross program savings to the energy savings projections filed in the EE&C Plan.

Table 2.11-3. Comparison of PY11 Actual Program Savings to EE&C Plan Projections for PY11

Program	EE&C Plan for PY11	PY11 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Energy Efficiency	8,630	22,454	2.60
Residential Appliance Recycling	2,204	2,066	0.94
Residential Behavioral Savings	6,037	5,525	0.92
Residential Whole House Retrofit	525	0	0.00
Low-Income Energy Efficiency	4,626	3,830	0.83
Express Efficiency	7,030	13,308	1.89
Small/Medium Midstream Lighting	5,839	4,509	0.77
Small Commercial Direct Install	3,280	0	0.00
Multifamily Housing Retrofit	2,228	1,851	0.83
Commercial Efficiency	10,115	13,315	1.32
Large Midstream Lighting	14,090	1,879	0.13
Industrial Efficiency	16,804	13,441	0.80
Public Agency Partnership	11,693	12,897	1.10
Community Education	2,812	2,275	0.81
Large Curtailable Load	N/A	N/A	N/A
Portfolio Total	95,913	97,349	1.01

Source: Guidehouse analysis

Table 2.11-4 compares Phase III verified gross program savings to the energy savings projections filed in the EE&C Plan.

Table 2.11-4. Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III

Program	EE&C Plan Through PY11	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Energy Efficiency	81,989	118,228	1.44
Residential Appliance Recycling	6,612	8,322	1.26
Residential Behavioral Savings	18,110	25,789	1.42
Residential Whole House Retrofit	1,226	114	0.09
Low-Income Energy Efficiency	11,925	13,808	1.16
Express Efficiency	28,118	47,007	1.67
Small/Medium Midstream Lighting	13,625	8,890	0.65
Small Commercial Direct Install	7,654	10,688	1.40
Multifamily Housing Retrofit	6,238	3,411	0.55
Commercial Efficiency	40,460	42,177	1.04
Large Midstream Lighting	32,877	7,100	0.22
Industrial Efficiency	67,217	40,013	0.60
Public Agency Partnership	39,757	32,230	0.81
Community Education	6,561	7,789	1.19
Large Curtailable Load	N/A	N/A	N/A
Portfolio Total	362,368	365,567	1.01

Source: Guidehouse analysis

- Duquesne Light achieved 139% of the EE&C Plan energy savings goals specified for the residential programs through PY11. Duquesne Light expended 106% of the EE&C Plan residential program budgets through the same 4-year term. Similar to previous years, the Upstream Lighting component of REEP and the Residential Behavioral Savings Program remain the primary drivers for these achievements. This is even the case with Upstream Lighting activities discontinuing at the end of 2019. The Whole House Retrofit Program (WHRP) did not record any market rate savings in PY11. Similar to previous years, efforts focused primarily on the low-income market segment of WHRP.
- The nonresidential program energy savings achieved by Duquesne Light in PY11 fell short of the utility's nonresidential program savings goal, as reflected in its EE&C Plan, achieving 86% of PY11 goals. Over PY8 through PY11, Duquesne Light achieved 82% of its savings goal and expended 73% of the EE&C Plan nonresidential program budgets (excluding the Large Curtailable Load Program). The Express Efficiency, Commercial Efficiency, Industrial Efficiency, and Public Agency Partnership Programs contributed over 80% of PY11 savings, each contributing roughly 20% of the nonresidential program energy savings achievements.
- PY11 was the third and final year the Large Curtailable Load Program reported demand achievements contributing toward compliance targets (because PY12 is a voluntary year). Since the beginning of Phase III and through 13 events called across PY9 to

PY11, the program has expended 97% of its budget and achieved above the Phase III compliance reduction target by 31% (performance–goal/goal).

2.12 Findings and Recommendations

Duquesne Light continued activities into the fourth year of Phase III. The Large Curtailable Load Program included four events in PY11, which were the last compliance-required events for the phase.⁸ Nonresidential program energy savings represented over half of the portfolio energy efficiency savings. While Residential Energy Efficiency (Upstream Lighting) wound down and discontinued activities during PY11, it still represented nearly half of residential savings. The COVID-19 pandemic struck in the fourth quarter of PY11, but Duquesne Light still maintained a productive program year that achieved significant savings, engaged participants, met changing customer needs, and maintained high satisfaction. Guidehouse evaluated all active PY11 program activities in some cases modifying verification approaches, and Table 2.12-1 presents overarching findings and recommendations for consideration during future planning and evaluations.

Table 2.12-1. Summary of Evaluation Recommendations

Evaluation Activity	Finding	Recommendation
Satisfaction	<p>Participants generally report high satisfaction with the PY11 residential and nonresidential programs. The following are the proportion estimates of survey participants rating each program at least 7 or higher on a 0-10 point scale, where 10 means very satisfied and 0 means not at all satisfied:</p> <ul style="list-style-type: none"> • REEP Kits: 91%; average rating is 9.1 • REEP Rebates: 72%; average rating is 8.2 • Residential Appliance Recycling Program (RARP): 95%; average rating is 9.4 • Behavioral: 75%; average rating is 7.9 • Commercial/Express/Industrial: 97%, average rating is 9.6 <p>Comparing average satisfaction ratings to evaluations conducted in previous years, Guidehouse observed that Duquesne Light has maintained high satisfaction among its participating customers throughout the phase and during the pandemic (surveys were conducted after March 2020).</p>	<p>As a result of Duquesne Light's efforts to-date to engage customers, opportunities to improve satisfaction for the remainder of the phase are generally confined to specific, focused, and minor implementation adjustments. Duquesne Light should continue to identify and implement these adjustments with its CSPs. For example, for RARP, Guidehouse heard that participants would prefer a more specific time range for appliance collection pickup.</p>
C&I Customer Contacts	<p>Guidehouse heard several instances where C&I program customers and trade allies had a hard time finding the appropriate Duquesne Light contact for program questions. This was made more difficult by the need to contact a different person for different programs.</p>	<p>Looking ahead to Phase IV, Duquesne Light should identify opportunities to consolidate to fewer Duquesne Light staff or CSP contacts. Additionally and where feasible, contact information (on websites, applications, etc.) could include specific Duquesne Light or team member names to promote a stronger connection to the programs.</p>

⁸ PY12 DR is voluntary: PA PUC. *Petition to Amend the Commission's June 19, 2015 Implementation Order. M-2014-2424864*. May 21, 2020. <https://www.puc.pa.gov/pdocs/1665150.docx>

Evaluation Activity	Finding	Recommendation
<p>Email Outreach</p>	<p>Through the participant process evaluation surveys conducted this year, Guidehouse heard that many participants are learning about residential programs by receiving kits, obtaining home energy reports (HERs), and visiting the Duquesne Light website. The website and previous participation knowledge drive awareness of nonresidential programs. Overall, email marketing does not appear to be a primary driver.</p>	<p>In future program years, Duquesne Light should explore more email campaigns to raise awareness. Duquesne Light could also consider collecting email addresses from participants as part of recruiting, so that follow-up promotional materials can be shared to encourage cross-program participation. Currently, email addresses are not gathered and stored consistently across the portfolio. Inexpensive email campaigns may prove useful in Phase IV where easier-to-obtain lighting savings will be less available to the utility and targets may be harder to reach. However, email efforts will need to consider other Duquesne Light marketing efforts so that customers are not inundated with utility messaging.</p>
<p>Data Collection</p>	<p>Based on Guidehouse’s experience with Act 129 programs and the recent changes to certain measures within the Technical Reference Manual (TRM), particularly lighting measures, the team anticipates that activities will shift away from lighting to more non-lighting measures in future program years, including Phase IV. Non-lighting measures, especially C&I and custom measures, typically require more project information to support verification.</p>	<p>Duquesne Light should require more data collection from its CSPs during project implementation and approval, particularly of baseline specifications and operating characteristics. Duquesne Light will need to consider the possible burden on customers if more information is required for a project. However, collecting additional data upfront should mean that savings can be verified sooner, with less variability from initial estimates, and with fewer customer touchpoints.</p>

Source: Guidehouse analysis

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY11 along with the outcomes of those activities.

3.1 Evaluation Activities

Not every program receives an evaluation every year. For example, in-depth research activities, including participant process and NTG surveys, were not completed in PY11 for all programs. REEP Rebates, REEP Kits, RARP, Express Efficiency, Commercial Efficiency, and Industrial Efficiency included NTG surveys. For programs not surveyed to inform NTG estimates, Guidehouse used previous year results from PY10 or earlier and applied them to PY11 results to arrive at net impacts. Table 3.1-1 shows the evaluation activity matrix as conveyed in the Phase III Evaluation Plan. Following these reporting activities, Guidehouse and Duquesne Light anticipate refining the planned activities for the final program year's evaluation.

Table 3.1-1. Evaluation Activity Matrix

Program	PY8			PY9			PY10			PY11			PY12		
	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process
Residential Energy Efficiency*	X			X	X	X	X			X	X	X	X		
Upstream Lighting**	X			X	X	X	X			X					
Residential Appliance Recycling	X	X	X				X			X	X	X	X		
Residential Behavioral Savings	X	***		X	***	X	X	***		X	***	X	X	***	
Residential Whole House Retrofit				X		X	X		X						
Low-Income Energy Efficiency ^t	X			X		X	X			X		X	X		
Express Efficiency ^{ttt}	X			X	X	X	X			X	X	X	X		
Midstream Lighting ^{ttt}	X	X	X	X			X	X	X	X			X	X	X
Small Commercial Direct Install	X				tt	tt									
Multifamily Housing Retrofit	X				X	X				X		X			
Commercial Efficiency ^{ttt}	X			X	X	X	X			X	X	X	X		
Industrial Efficiency ^{ttt}				X	X	X	X			X	X	X	X		

Program	PY8			PY9			PY10			PY11			PY12		
	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process	Gross	Net	Process
Public Agency Partnership ^{†††}	X			X	X	X	X		X	X		X			
Community Education	X				X	X	X					X		X	
Large Curtailable Load				X			X			X			X		

*While verification surveys are not performed each year for REEP, Guidehouse conducts an application review for the program's rebates, which influences the program's realization rate.

** Upstream Lighting activities discontinued in PY11. Guidehouse does not anticipate any program activities in PY12.

***Results of the impact evaluation for this program are net savings, such that no separate net savings assessment is necessary.

† At least one component of this program receives impact evaluation each year.

†† NTG and process evaluation research was planned for the Small Commercial Direct Install (SCDI) program in PY9. However, this program achieved savings and budget targets early in the phase and, as a result, Duquesne Light reduced program activities during PY10 and beyond.

††† Several nonresidential program impact evaluations rely on 2-year rolling sample approaches. Generally, projects from each program year inform the gross verified impact results.

Source: Guidehouse Evaluation Plan

3.2 Residential Energy Efficiency Program

REEP is designed to encourage customers to make an energy efficient choice when purchasing and installing household appliance and equipment measures by offering customers educational materials and financial incentives. Program educational materials include an online survey to help promote the availability of the REEP rebates. Duquesne Light also holds regular events within several retail stores to educate consumers on energy efficiency products and to provide a platform for more broadly educating consumers on other programs falling under Duquesne Light's portfolio. Table 3.2-1 identifies the measures rebated during PY11.

Table 3.2-1. PY11 Residential Rebated Measures

Measure
ENERGY STAR®-Certified Dehumidifier
ENERGY STAR-Certified Freezer
ENERGY STAR-Certified Refrigerator
ENERGY STAR-Certified Room Air Conditioner
Residential Connected Thermostats
Programmable Thermostat
Variable Speed Pool Pump
Smart Strip Surge Protector
Central Air Conditioner (>15 SEER)
Heat Pump (>15 SEER, >8.5 HSPF)
Furnace with High Efficiency Fan Motor
ENERGY STAR-Certified Ductless Mini-Split Heat Pump
ENERGY STAR-Certified Heat Pump Water Heater (EF >2.0)
Solar Water Heater
Ceiling/Attic Insulation (\geq R-49)
Floor Insulation (\geq R-30)
Wall Insulation (add R-6)
Occupancy Sensor (infrared, ultrasonic detector, hardwired)

Source: Duquesne Light⁹

REEP also provides measures in the form of energy efficiency kits free of charge to Duquesne Light customers who attend targeted community outreach events or who complete self-paced online home energy audits. In PY11, similar to previous years, energy efficiency kits contained LED bulbs and LED nightlights, specifically:

- Apogee LED kit (for those who completed the online home energy audit): Reported savings: 410 kWh

⁹ Duquesne Light. Energy Efficiency Rebate Program. Phase III Rebates. <https://www.dlcwattchoices.com/residentialrebates/>. Retrieved October 26, 2020.

- Four 9 W LEDs
- Two 11 W LEDs
- Two 15 W LEDs
- Two LED nightlights
- Four bulb LED kit (for those who attended targeted community outreach events):
Reported savings: 180 kWh
 - Two 9 W LEDs
 - One 11 W LED
 - One 15 W LED
- Lamp giveaways (i.e., single lamp kits given away at outreach events)
 - One 9 W LED (reported savings: 36 kWh)
 - One LED nightlight (reported savings: 25 kWh)

In addition to the equipment rebate and efficiency kit program components, a third REEP program component—upstream lighting—provides point of purchase discounts on LEDs for customers. This program component is a more streamlined approach to discounting and is more readily engaged by customers because it does not require rebate forms. The elimination of rebate forms at the transaction level, in favor of bulk processing, significantly cuts processing costs. Upstream lighting activities continued through December 2019, and Duquesne Light reported no measures or activities during 2020. As a result, Duquesne Light’s reported savings and Guidehouse’s verified savings use a consistent baseline for TRM savings calculations. That is, the TRM’s post-2020 reduced wattage baselines are not applied to any program LEDs.¹⁰

Participation is counted differently for rebate, kit, and upstream lighting participants. For rebates and kits tied to an individual customer, a participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or in different programs are counted more than once (once in each year or program). A portion of REEP kits’ program savings result from giveaways during events in which the utility has participated (event giveaways). For these events, Duquesne Light tracks events and the measures given away and not the individual participants who received the measures, so participation cannot be determined. Finally, participation in the REEP upstream lighting program component is not defined because reported program data tracks lamp sales activities, not individual participating customers/purchasers.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3.2-2 presents the participation counts, reported energy and demand savings, and incentive payments for REEP in PY11 by customer segment.

¹⁰ TRM Section 2.1.1 ENERGY STAR Lighting at Table 2-2 specifies the deemed baselines to use for general service lamps installed in 2020 or after. PA PUC Technical Reference Manual. <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>

Table 3.2-2. REEP Participation and Reported Impacts

Parameter	Residential (Non-Low-Income) REEP	Residential (Non-Low-Income) REEP Upstream Lighting	Residential (Non-Low-Income) Total
PYTD No. of Participants*	11,345	N/A	11,345
PYRTD MWh/yr	5,384	17,882	23,267
PYRTD MW/yr	0.70	1.81	2.52
PY11 Incentives (\$1,000)**		\$964	

Excludes counts of customers who received efficiency kits during events giveaways and customers who purchased discounted bulbs via the upstream lighting component, neither of which is tracked at the customer level.

**Duquesne Light combines financial-related information here for the two program components—Residential Energy Efficiency and Residential Energy Efficiency (Upstream Lighting)—under Residential Energy Efficiency. Otherwise, energy and demand impacts are reported separately for these two programs.

Source: Guidehouse analysis

3.2.2 Gross Impact Evaluation

Guidehouse conducted primary research for the REEP gross impact evaluation in PY11. This research included separate and distinct activities for the three components: equipment rebates, efficiency kits, and upstream lighting.

For equipment rebates, the PY11 evaluation relied on two data sources to estimate realization rates for energy and demand savings: the PY11 participant survey that produced a verified installation rate, and an application file review of PY11 projects. Findings from both efforts were combined to arrive at the PY11 gross impact results. Guidehouse transitioned to an online survey in PY11 from a phone survey in PY9. As a result, the evaluation team was able to collect 88 completed responses. This total exceeded the sample target of 75 participants. The team then reviewed at least one project file from each of the 88 respondents, which equated to 106 rebated measures being evaluated, with some participants receiving a rebate for more than one measure. Duquesne Light sent Guidehouse copies of each participant’s project file, where the team verified the following:

- Participation in the program, usually verified with a completed application form.
- Measure purchased or installed, usually verified with a receipt for the measure, a work order, or invoices detailing the equipment was installed.
- Participant status as a Duquesne Light customer, usually verified with a copy of their Duquesne Light utility bill for mail-in participants. Otherwise, Guidehouse concluded customer status for all participants who completed an online application or who used the Duquesne Light marketplace because an active Duquesne Light account number is required to access the utility’s program website.

The team’s application file review relied on the following verification checklist for deemed or partially deemed savings measures. Duquesne Light continues to see increased rebate activities on its web portal. These application file review activities also served as a means to verify the fidelity of the data processing carried out by the CSP.

- Participant has a valid utility account number.

- Measure(s) is on approved list and all parameters necessary for calculating savings are present.
- Rebate payment date is in the current program period being verified.
- Proof of purchase identifies qualifying measure and is dated within the period being verified.
- Unit kilowatt-hours and kilowatts are correct for each listed measure; for partially deemed measures this involves reviewing the additional inputs required by the TRM and recalculating the unit energy savings. These inputs were not always provided in the Duquesne Light program database (PMRS); rather, they were sometimes obtained for the sample of participants by reviewing the application files, receipts indicating measure details, or through searches of secondary sources for a given make or model number. When available, Guidehouse used a TRM deemed or default value to estimate savings.

For the REEP kits, Guidehouse completed a census of the individual measures making up each kit against the TRM for accuracy. The evaluation team then applied the verified installation rate found through this year's survey effort that used responses from 609 participants.

For upstream lighting, Guidehouse also completed a multi-pronged approach to verify gross impact results. First, the evaluation team checked the CSP's detailed records against what had been reported in PMRS, both for savings and for bulb counts, for a census of the line items in the CSP's detailed participation data. Additionally, the team recalculated savings for each lamp and built up to a total savings value for upstream lighting. Total savings were calculated by confirming the default baseline wattage, applying the TRM savings algorithm, and confirming the ENERGY STAR status of the bulb.

The upstream lighting evaluation also relied on the results of the PY9 in-store intercepts to estimate the proportions of program bulbs (standard and specialty LEDs) going into residential and nonresidential sockets. During PY9, the evaluation team completed intercept interviews in 12 stores and interviewed 327 individuals; 210 of these individuals purchased program bulbs. The portion of bulbs going into nonresidential sockets experience additional hours of use (HOU) over residential sockets. Per Duquesne Light's EE&C Plan, Guidehouse reallocated savings from REEP to the C&I Express Efficiency Program (Section 3.7). Additional details on the in-store intercepts and reallocation of savings are provided in Appendix A.

Table 3.2-3 shows the evaluation activities for PY11 REEP gross impacts. Table 3.2-4 and Table 3.2-5 show the gross energy and demand results, respectively.

Table 3.2-3. REEP Gross Impact Sample Design for PY11

Stratum	Population Size*	Achieved Sample Size	Evaluation Activity
Rebates	2,453	112	Participant surveys, engineering desk reviews/application file reviews for a sample of projects
Kits	9,642	609	Participant surveys, TRM review
Upstream Lighting – Standard LEDs	N/A	N/A	Apply PY9 cross-sector sales rate, census review of PMRS and detailed CSP records
Upstream Lighting – Specialty LEDs	N/A	N/A	Apply PY9 cross-sector sales rate, census review of PMRS and detailed CSP records
Program Total	12,095	721	

*Counts differ from Table 3.2-2, which shows a unique count of participants. This table shows the unique count of participants in each stratum. For example, a customer participating in both rebates and kits is counted once in each.
 Source: Guidehouse Evaluation Plan

Table 3.2-4. REEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Rebates	710	108%	0.87	12.0%
Kits	4,675	94%	0.24	1.4%
Standard LED	11,217	91%	0.48	6.3%
Specialty LED	6,665	106%	0.32	7.0%
Program Total	23,267	97%		3.7%

Source: Guidehouse Evaluation Plan

Table 3.2-5. REEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Rebates	0.29	107%	0.52	7.1%
Kits	0.41	95%	0.25	1.5%
Standard LED	1.14	91%	0.48	6.3%
Specialty LED	0.68	106%	0.32	7.0%
Program Total	2.52	98%		3.5%

Source: Guidehouse Evaluation Plan

The following factors led to variations between the reported and verified savings and to the observed realization rates for the REEP components.

- **Equipment rebates:**
 - Savings adjusted for 26 of the 106 measures examined via the application file review.
 - Guidehouse observed that of the 32 central air conditioning units evaluated, the equipment size was rounded down to the nearest ton for 10 units and rounded up for one unit. For example, many 2.5 ton units were rounded down in the program tracking data to 2 tons. In addition, 12 central air conditioning units had SEER values that did not match the invoice in the application.
 - The evaluation team's random sample drew two ductless mini-split measures and three air source heat pumps. For each case, the team found that application details were limited and required online research. The verified savings differed from reported savings for most cases, yielding energy realization rates ranging from 100% to 496%.
- **Efficiency kits:**
 - From the TRM review, deemed savings per kit changed only slightly, by an increase in savings of about 1% per kit. The same adjustment was made in PY9 and PY10.
 - Guidehouse found that, on average, respondents installed or planned to install roughly 7 of the 8 LEDs included in the kits. This installation rate is the largest driver of the REEP kits realization rate.
- **Upstream lighting:**
 - Guidehouse's recalculation of savings using the TRM and baseline bulb wattage assumptions adjusted the realization rate to 101% for energy and demand savings before making any adjustments for cross-sectors sales (i.e., before accounting for any HOU changes). Changes primarily related to the evaluation team assuming different baseline wattages for some bulbs.
 - The team also reviewed bulbs to confirm ENERGY STAR compliance and program eligibility, and made confirmations for all but one of the model numbers.
 - Guidehouse reallocated some savings to the C&I Express Efficiency Program based on the PY9 in-store intercept findings. Savings for those bulbs going into nonresidential sockets increased due to longer HOU assumptions.
 - For standard LEDs, the team found that 22 of 633 PY9 bulbs (3.5%) were installed in multifamily common areas.
 - For specialty LEDs, the team found that 25 of 599 PY9 bulbs (4.2%) were installed in office and lodging buildings.
 - When the HOU changes are made for cross-sector sales, the realization rate increases to 110% for energy and 115% for demand.
 - For PY11, the team then moved an equivalent percentage of bulbs from REEP to the Express Efficiency Program. The removal of these bulbs from REEP resulted in final realization rates of 97% for energy and demand.
 - Additional details on these reallocations are provided in Appendix A.

3.2.3 Net Impact Evaluation

Per Guidehouse’s Evaluation Plan, the team conducted free ridership and spillover research in PY11 for the REEP rebates and kits program components separately. The evaluation team’s free ridership and spillover research aligned to the methodologies required by the SWE within the Framework’s Appendix C.¹¹ Table 3.2-6 summarizes REEP net impacts sample size and response rates. Table 3.2-7 shows the results of the analysis. The team did not conduct NTG research for upstream lighting in PY11. Instead, results from PY9 are used, similar to the approach used in PY10. The findings from PY9 are also shown in Table 3.2-7.

Guidehouse estimates the REEP NTG ratio for rebates is 61% and 79% for kits. The evaluation team estimated spillover of approximately 41 kWh per survey respondent for customers who received a rebate and 31 kWh per respondent for customers who received a kit.

Table 3.2-6. REEP Net Impact Sample Design

Stratum	Population Size	Achieved Sample Size	Response Rate
REEP Rebates	2,453	112	11%
REEP Kits	9,642	609*	7%
Program Total	12,095	721	7%

* These completed surveys only represent counts of market rate kit participants because net impact evaluation is conducted only for market rate. Guidehouse assumes a NTG ratio of 100% for low-income kit participants.

Source: Guidehouse analysis.

Table 3.2-7. REEP Net Impact Evaluation Results

Stratum	Free Ridership	Spillover	NTG Ratio	Relative Precision at 85% CL
REEP Rebates	46%	7%	61%	10.8%
REEP Kits	32%	11%	79%	1.2%
Standard LED	66%	9%	43%	16.2%
Specialty LED	65%	9%	43%	18.1%
Program Total	58%	9%	50%	7.9%

Source: Guidehouse analysis

The team quantified free ridership scores by product offered for REEP rebates, as Table 3.2-8 shows. The highest free ridership rates calculated were for freezers and refrigerators, and the lowest was for programmable thermostats and heat pumps. Table 3.2-8 is illustrative—sometimes only one respondent is informing the findings. Similar to previous years, statistically significant REEP rebate NTGs were developed at the initiative level; Guidehouse did not stratify by equipment type.

¹¹ SWE Phase III Evaluation Framework. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework102616.pdf

Table 3.2-8. Free Ridership Scores for REEP Rebated Products

Rebated Equipment	PY11 Installed Measure Count for Survey Respondents	Average Free Ridership
ENERGY STAR Freezer	1	88%
ENERGY STAR Refrigerator	17	68%
Air Source Heat Pump	3	63%
Ductless Minisplit Heat Pump	3	63%
Insulation	1	63%
Central Air Conditioner	32	56%
High Efficiency Fan Heating	27	54%
ENERGY STAR Dehumidifier	13	48%
Programmable Thermostat	18	40%
Heat Pump Water Heater	1	38%

Source: Guidehouse analysis

Guidehouse also quantified free ridership scores separately for the LED lamps and LED nightlights within the kits. Table 3.2-9 lists the average FR values.

Table 3.2-9. Free Ridership Scores for REEP Kit LEDs and LED Nightlights

Kit Items	PY11 Installed Measure Count for Survey Respondents	Average Free Ridership
LEDs (four 9 W, two 11 W, two 15 W)	4,864	32%
LED Nightlights (two bulbs)	1,008	34%

Source: Guidehouse analysis

HIM Research

Guidehouse conducted HIM research for measures implemented during PY11. The team reviewed the PY11 residential program activities and identified LED bulbs within REEP kits as a HIM. Table 3.2-10 presents estimated free ridership, spillover, and NTG ratios for PY11 for this residential sector HIM.

Table 3.2-10. PY11 REEP High Impact Measure

Program	HIM	Free Ridership	Spillover	NTG Ratio
REEP Kits	LED Bulbs	32%	11%	79%

Source: Guidehouse analysis

3.2.4 Verified Savings Estimates

In Table 3.2-11 the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for REEP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.2-11. REEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	23,267	2.52
PYVTD Gross	22,454	2.46
PYVTD Net	11,338	1.25
RTD	122,703	13.24
VTD Gross	118,228	12.85
VTD Net	65,900	7.08

Source: Guidehouse Evaluation Plan

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.2.5 Process Evaluation

Guidehouse conducted process evaluation research for the REEP rebates and kits program components in PY11; this research focused on program awareness, satisfaction, and barriers to participation. The evaluation team deployed an online survey to a sample of PY11 program participants. The team also conducted interviews with program managers and the CSP. These interviews aided survey question updates. Additionally, the interviews confirmed the REEP program processes and implementation has remained consistent since PY10. The following sections summarize the findings.

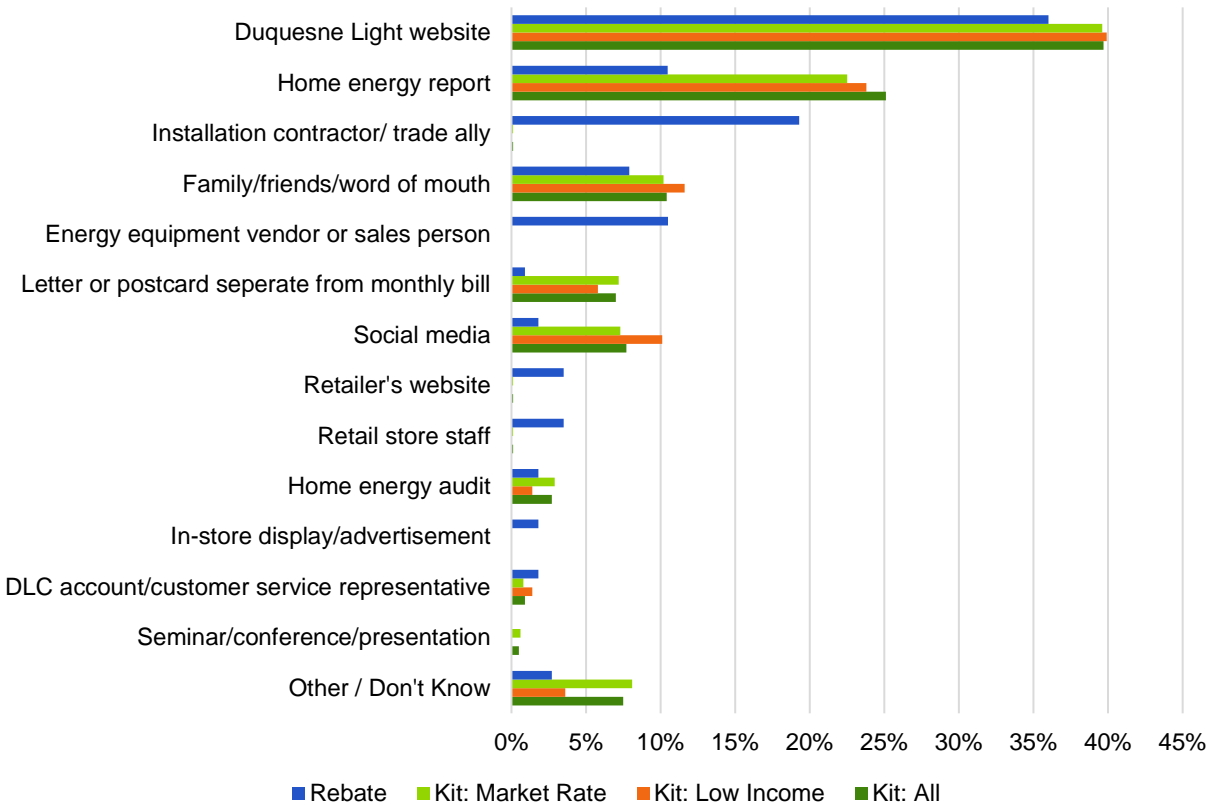
Guidehouse also combined results from low-income kit and market rate kit survey efforts within this section to offer a comparison, given the similarities in measures and implementation. Additionally, the survey targeted kit participants who completed self-paced online home energy audits, the same participants surveyed for impact evaluation. Impact evaluation results for low-income kits can be found in Section 3.6.

Program Awareness

Guidehouse asked participants to identify how they learned about the program. As Figure 3.2-1. shows, respondents indicated the most common sources of program awareness for kits were the Duquesne Light website (40%); the home energy reports (HERs) (25%); and family, friends, and word of mouth (10%). For rebates, the most common sources of program awareness were the Duquesne Light website (36%), the installation contractor or trade ally (19%), energy equipment vendor or salespersons (11%), and the HERs (10%).

Figure 3.2-1. How did you learn about the program?

n = 761 (all kits), 114 (low-income kits), 647 (market rate kits), 86 (rebates); multiple responses allowed



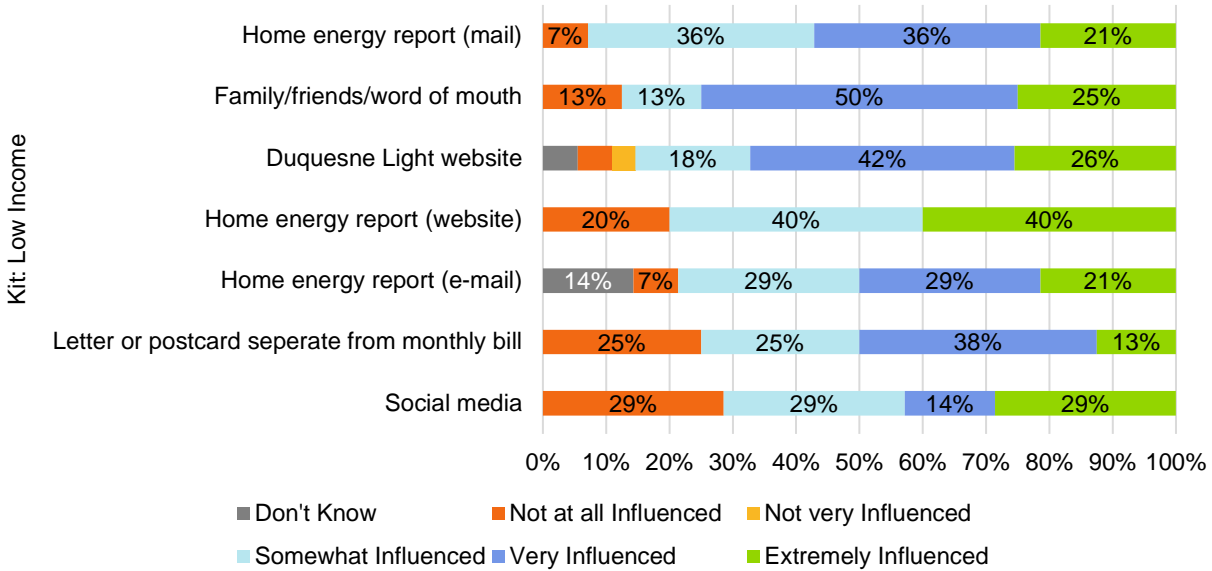
Source: Guidehouse analysis

Guidehouse also asked participants if they had heard about any other Duquesne Light energy efficiency program. Seventeen percent responded they had among kit participants and 23% among rebate participants. Of those who heard about other programs, their awareness was evenly distributed among the residential programs: rebate or kits (e.g., a rebate participant said they heard about kits or vice versa), HERs, Appliance Recycling, and Whole House Energy Audit.

Program Influence

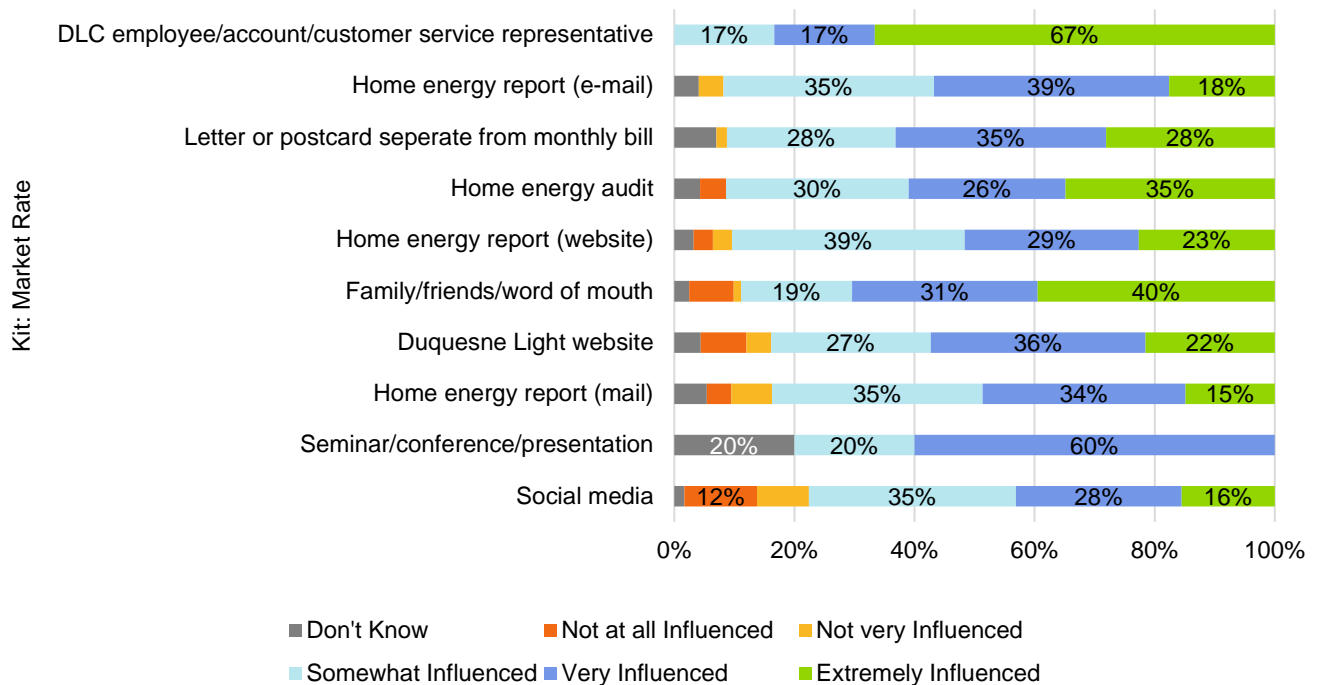
Guidehouse asked respondents how sources of program awareness influenced their decision to participate in kits and rebates. The team asked participants to rate strength of influence only for customers who selected that source of awareness option. Guidehouse investigated program influence for low-income and market rate kit customers separately, with results shown for low-income kits in Figure 3.2-2. and for market rate kits in Figure 3.2-3.. Guidehouse only showed the influence ratings in these graphs for options that received 5 or more responses. The strongest sources of influence are similar for low-income and market rate customers, which include the HERs, Duquesne Light employee/account/customer service representatives, family/friends/word of mouth, a home energy audit, the Duquesne Light website, and letters/postcards. Social media is the weakest source of influence for both low-income and market rate customers.

Figure 3.2-2. Kits (Low-Income) Program Influence (n = 114)



Only influence scores for sources of awareness options that received 5 or more responses are shown in this figure.
Source: Guidehouse analysis

Figure 3.2-3. Kits (Market Rate) Program Influence (n = 647)

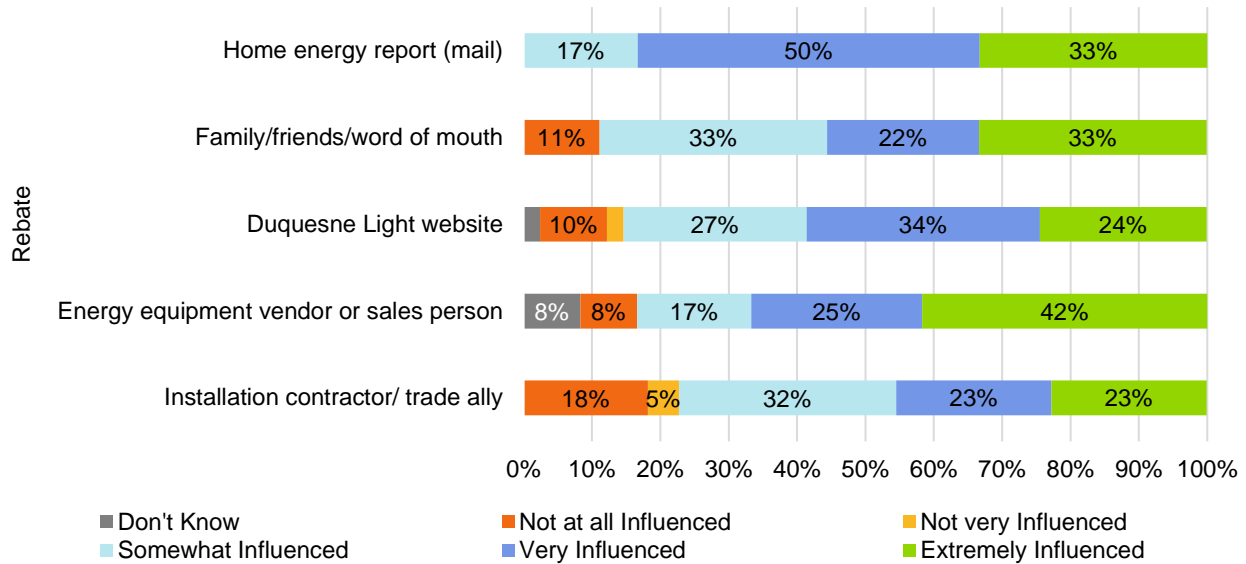


Only influence scores for sources of awareness options that received 5 or more responses are shown in this figure.
Source: Guidehouse analysis

As Figure 3.2-4. shows, for REEP rebates (among sources where the team received 5 or more responses), the strongest sources for influencing program participation are the HERs (9

responses), energy equipment vendor or salespersons (12 responses), Duquesne Light website (41 responses), and family/friends/word of mouth (9 responses).

Figure 3.2-4. REEP Rebate Program Influence (n = 86)



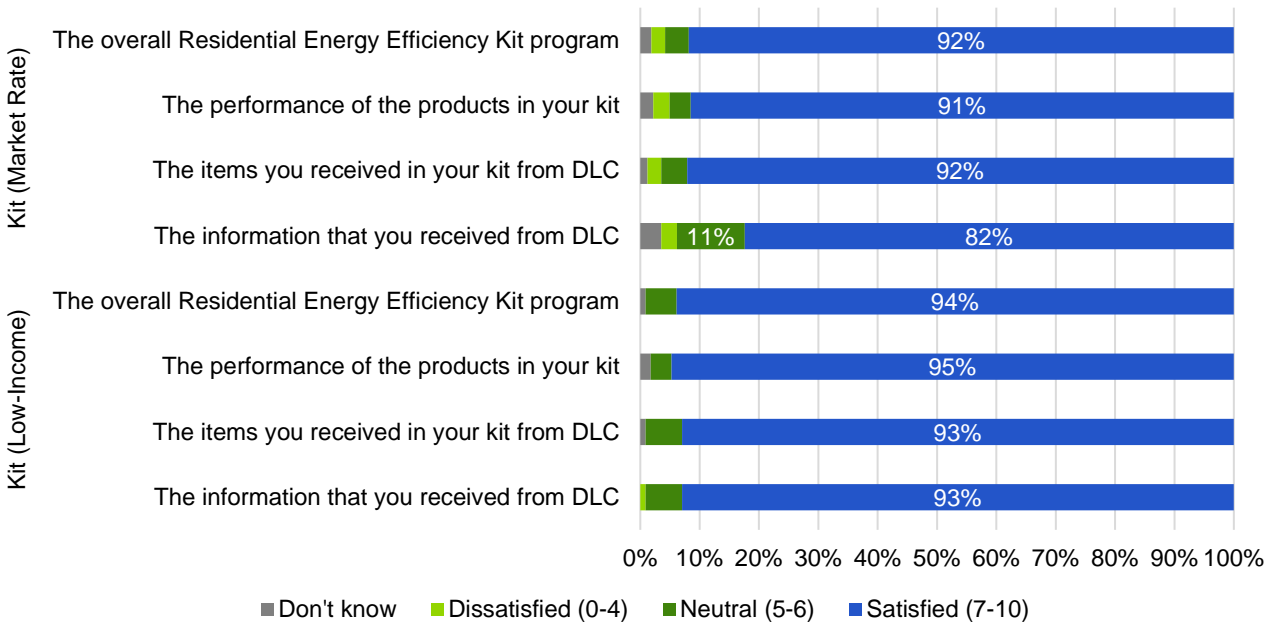
Only influence scores for sources of awareness options that received 5 or more responses are shown in this figure.
Source: Guidehouse analysis

Satisfaction

Guidehouse asked kit participants about their satisfaction with various program aspects and with the program overall using a scale of 0-10, where 10 means very satisfied. As Figure 3.2-5 shows, the PY11 kit participants generally reported high satisfaction with all aspects of the program, where Guidehouse considers a rating of 7 or above on a 0-10 scale as a satisfied customer. Guidehouse found that 92% among market rate and 94% among low-income respondents were satisfied with the program. They also rated most of the program aspects 7 or above on the 0-10 scale. Respondents were the least satisfied with the information they received from Duquesne Light about energy efficiency programs and products, but 82% of respondents still provided scores of 7 or greater for that question. The average overall satisfaction rate for this program was 9.1, which is only slightly lower than the average satisfaction rate of 9.3 when this evaluation was last conducted in PY9. Overall, 97% of respondents said they were somewhat, very, or extremely likely to recommend this program to other people they know.

When customers provided reasons for giving the program ratings of below 5 (33 out of 749 respondents), they reported the product was defective (e.g., bulbs do not work, exploded, flicker, burned out fast), they do not like the color temperature or the light output (e.g., too dim, too yellow), or the program was not very useful, informative, or helpful.

Figure 3.2-5. PY11 Kits Satisfaction Rates
n = 635 (market rate); 114 (low-income)

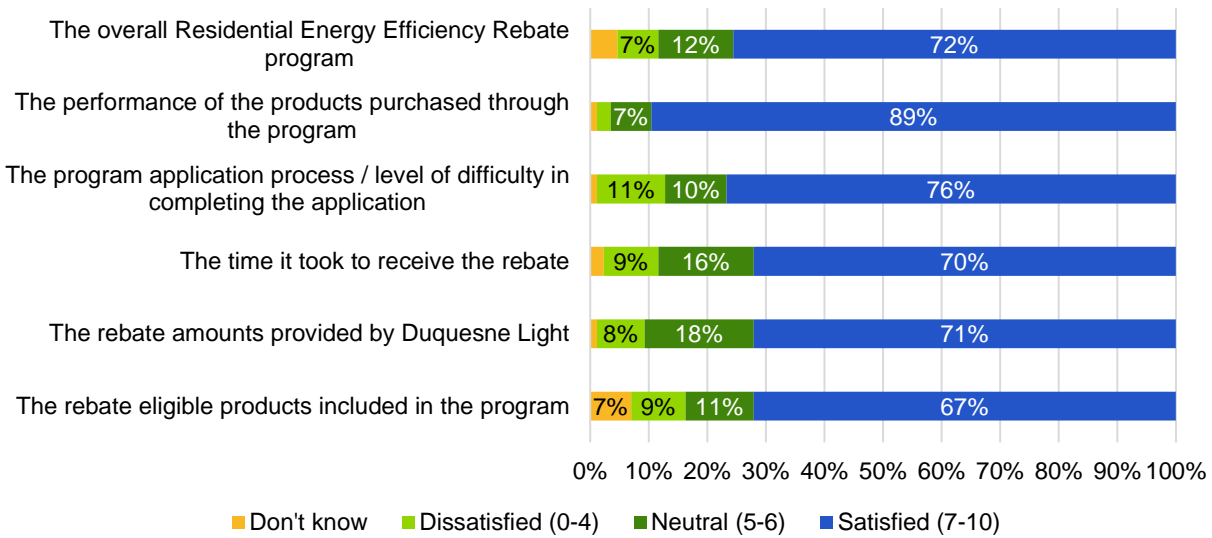


Source: Guidehouse analysis

For REEP rebates, as Figure 3.2-6. shows, most participants also generally reported high satisfaction with most aspects of the program. Guidehouse found that 72% of respondents were satisfied with the program, rating the program as 7 or higher on a scale of 0-10. Survey respondents were most satisfied with performance of the products purchased through the program and the program application process. Survey respondents were the least satisfied with the eligible products offered by the program, the time it took to receive the rebate, and the rebate amount provided by Duquesne Light. The average overall satisfaction rate for REEP Rebates was 8.2, which is slightly lower than the average satisfaction rate of 8.6 when this evaluation was last conducted in PY9. Overall, 93% of respondents said they were somewhat, very, or extremely likely to recommend this program to other people they know.

When customers provided reasons for giving the program ratings of below 5 (15 out of 86 respondents), they reported a desire for a larger selection of qualifying products, that it was hard to know exactly which products qualify (to avoid rebate rejections), or they did not hear back after applying for the rebate. Some participants also reported it was difficult to provide the requested documentation, and one respondent encountered an error in processing where they received only part of their rebate. One customer reported receiving multiple emails asking for the same information that was already provided, and another reported having to submit the rebate application multiple times. Duquesne Light has seen a gradual shift away from paper rebates to more online applications and Duquesne Light marketplace rebate activities. This respondent feedback may relate to the changes in the program administration processes related to this shift toward online applications.

Figure 3.2-6. REEP Rebates Satisfaction Rate (n = 86)

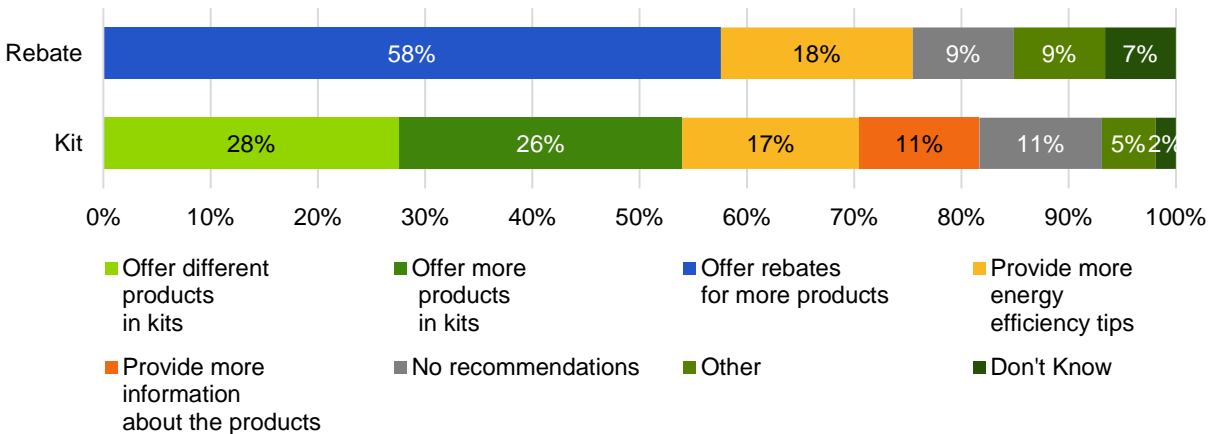


Source: Guidehouse analysis

Program Improvement Opportunities

Guidehouse also asked participants if they had any recommendations on ways to improve the program. Among survey respondents who received kits, 87% provided suggestions for program improvements. Among respondents who received rebates, 84% provided suggestions. The team offered various potential suggestions for customers to select. Figure 3.2-7. summarizes program improvement recommendations made by survey respondents.

Figure 3.2-7. Program Improvement Opportunities (rebates: n = 86; kits: n = 761)



Source: Guidehouse analysis

Many kit participants would like to see different products (28% of respondents) or more products in kits (26%). Meanwhile, some participants would also like to know more about energy savings tips (17%) and more information about the kit products (11%). Among the 64 customers who provided other recommendations for kits, the most common recommendations were to provide better quality items (5), provide rebates for other products (5), and offer greater variety of

products (i.e., responses other than the survey’s “offer different products in kits” answer option), such as bulbs with higher light output (5), bulbs with different color temperatures (3), and smart strips/surge protectors (4). Customers asked for flexibility in selection of products in the kit (4), more information on where to purchase these products (4), and more tips and ideas for energy conservation (1). One customer recommended an app for tracking power consumption.

The majority of REEP rebate participants asked for rebates for more energy efficient products (58% of respondents) and many (18%) asked for more energy efficiency tips. Among the 9 customers who provided other recommendations, they asked for larger rebate amounts (2) and a better listing of products that qualify for rebates (1). Some asked for an easier application process (2), status updates and follow-ups (1), and examples from the utility of products and installation professionals (1). Previous surveys (PY9 and earlier) have found that large portions of respondents do not have any recommendations. The team concluded this change in responses is likely driven by the switch from telephone to web-based surveying.

3.2.6 Cost-Effectiveness Reporting

Table 3.2-12 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.2-12 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.2-12. Summary of REEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$964		\$4,634	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$1,387		\$8,099	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$2,351		\$12,733	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$71
6	Administration, Management, and Technical Assistance ^[3]	\$40	\$63	\$237	\$487
7	Marketing ^[4]	\$6	\$0	\$134	\$0
8	Program Delivery ^[5]	\$0	\$1,793	\$91	\$7,897
9	EDC Evaluation Costs	\$144		\$420	
10	SWE Audit Costs	\$58		\$267	
11	Program Overhead Costs (sum of rows 5 through 10)	\$2,105		\$9,607	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$4,456		\$22,341	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
14	Total NPV Lifetime Electric Energy Benefits	\$2,922	\$27,252
15	Total NPV Lifetime Electric Capacity Benefits	\$1,083	\$7,981
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$10,979
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$397	-\$2,364
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$3,609	\$43,849
19	TRC Benefit-Cost Ratio ^[8]	0.81	1.96

[1] Includes direct install equipment costs and costs for EE&C kit.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse Evaluation Plan

Table 3.2-13 presents program financials and cost-effectiveness on a net savings basis.

Table 3.2-13. Summary of REEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$964		\$4,634	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$225		\$2,636	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,189		\$7,269	
5	Design & Development ^[2]	\$0	\$0	\$4	\$71
6	Administration, Management, and Technical Assistance ^[3]	\$40	\$63	\$237	\$487
7	Marketing ^[4]	\$6	\$0	\$134	\$0
8	Program Delivery ^[5]	\$0	\$1,793	\$91	\$7,897
9	EDC Evaluation Costs	\$144		\$420	
10	SWE Audit Costs	\$58		\$267	
11	Program Overhead Costs (sum of rows 5 through 10)	\$2,105		\$9,607	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$3,294	\$16,877
14	Total NPV Lifetime Electric Energy Benefits	\$1,478	\$15,746
15	Total NPV Lifetime Electric Capacity Benefits	\$548	\$4,507
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$6,474
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$201	-\$1,170
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$1,825	\$25,557
19	TRC Benefit-Cost Ratio ^[8]	0.55	1.51

[1] Includes direct install equipment costs and costs for EE&C kit.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse Evaluation Plan

3.2.7 Status of Recommendations

The impact and process evaluation activities in PY11 led to the following findings and recommendations. Table 3.2-14 summarizes the findings and recommendations for kits and Table 3.2-15 for rebates; each table also includes summaries of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.2-14. Kits Program Findings and Recommendations

Findings	Recommendations
Program Awareness	
<ul style="list-style-type: none"> About 17% of kit survey respondents heard about other Duquesne Light energy efficiency programs. 	<ul style="list-style-type: none"> Duquesne Light should explore ways to continue offering kits to customers given their ability to promote other Duquesne Light programs. With the TRM changes in PY12 that reduce the savings potential for standard LEDs, Duquesne Light will need to determine different measure offerings for kits.
<p>Duquesne Light Response: Accepted. Duquesne Light is exploring measure options for the content of kits with a focus on water heating savings. Additionally, Duquesne Light is considering developing marketing materials for customers to cross-promote programs.</p>	

Findings	Recommendations
Satisfaction	
<ul style="list-style-type: none"> Participants reported very high satisfaction with the kits (with 91% rating it at least 7 or higher). However, Guidehouse heard many comments where respondents wanted more products, more information about products, or they wanted different products within the kits. 	<ul style="list-style-type: none"> Duquesne Light should consider providing customers the flexibility to choose which products they prefer to receive within their kit. A short, predefined menu of efficient products to choose from would provide a greater variety of products, provide customers the power of choice, and likely increase in-service rates (ISRs) given that customers are more likely to install items of their preference.
<p>Duquesne Light Response: Under consideration. Duquesne Light is exploring measure options for the content of kits for PY12 and will evaluate fulfillment options and cost-effectiveness associated with providing kit selection options for Phase IV.</p>	

Source: Guidehouse analysis

Table 3.2-15. REEP Rebates Program Findings and Recommendations

Findings	Recommendations
Reported Savings	
<ul style="list-style-type: none"> Conservative assumptions continue to be made when calculating savings for air source heat pumps and ductless mini-splits, thus leaving program savings unclaimed. In one instance, Guidehouse found that savings for a ductless mini-split were short by nearly 500%. 	<ul style="list-style-type: none"> Duquesne Light should consider expanding data collection for a selection of priority measures, especially if they will be prominent measures during Phase IV so reported savings align closer to verified savings.
<p>Duquesne Light Response: Under consideration. Duquesne Light is updating program tracking data systems for Phase IV activities. Efforts include determining if there are opportunities to expand data collection requirements for a few select measures that balance additional data collection burdens against the benefits of more accurate savings estimates. Additionally, updates to the default values for ductless mini-splits which will be effective in Phase IV will lead to increased accuracy in reported energy savings.</p>	
Program Awareness	
<ul style="list-style-type: none"> The most common sources of program awareness are Duquesne Light’s website (36% of responses), the installation contractor or trade ally (19%), energy equipment vendor or salesperson (11%), and HERs (10%). About 23% of rebate survey respondents heard about other Duquesne Light energy efficiency programs. 	<ul style="list-style-type: none"> Duquesne Light should continue advertising REEP and their various program offerings in the HERs and among previous program participants, who may not be aware of other EE programs Duquesne Light offers. For example, the rebate application can include a check box for participants to select if they would like to receive additional information via email about other rebate programs and ways to save energy.
<p>Duquesne Light Response: Advertising continues (accepted recommendation). Application changes are under consideration. Any changes to the rebate application forms such as this example would occur in Phase IV as part of program design efforts that are focused on increasing cross-promotion and customer awareness and participation.</p>	

Source: Guidehouse analysis

3.3 Residential Appliance Recycling Program

RARP seeks to produce cost-effective, long-term, coincident peak demand reduction and annual energy savings in the residential market sector. The program plans to do this by removing operable, inefficient, primary and secondary refrigerators and freezers from the power grid in an environmentally safe manner.

To stimulate participation, RARP offers incentives to customers who allow the utility to remove and recycle eligible refrigerators and freezers (\$35). The program implementation contractor in PY11 was ARCA.

A RARP participant is a customer participating within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or in different programs are counted more than once (once in each year or program).

3.3.1 Participation and Reported Savings by Customer Segment

Table 3.3-1 presents the participation counts, reported energy and demand savings, and incentive payments for RARP in PY11 by customer segment.

Table 3.3-1. RARP Participation and Reported Impacts

Parameter	Residential (Non-Low-Income)
PYTD No. of Participants	2,068
PYRTD MWh/yr	2,206
PYRTD MW/yr	0.25
PY11 Incentives (\$1,000)	\$77

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Guidehouse conducted primary research for the RARP gross impact evaluation during PY8 and limited its activities for the program during PY9 and PY10. In PY11, the team confirmed impacts using similar methods as PY8. Specifically, the evaluation relied on two data sources to estimate realization rates for energy and demand savings: a census review of CSP PY11 program tracking data and survey results verifying recycling events and part-use factors (PUFs) with PY11 participants.

The census review of program tracking data also included the recalculation of recycled refrigerator and freezer unit energy consumptions (UECs) as specified by the TRM and using all the appliance data collected by the CSP. The program tracking data review consisted of the following steps:

- Comparison of CSP tracking data to Duquesne Light participant data for consistency
- Check of equipment specifications within CSP tracking data to confirm measure eligibility (for example, refrigerators and freezers must be 10 years or older and at least 10 cubic feet in size)
- Recalculation of savings for each appliance using the TRM’s regression equation and the equipment specifications gathered by the CSP

Next, the evaluation team completed participant surveys. In Duquesne Light’s PY11 sampling plan, the team targeted 150 participants for RARP to meet precision targets of 15% at 85% confidence. The sample design, which combined gross impacts, net impacts, and process

evaluation efforts, also targeted recycled refrigerators as a HIM for NTG research. The sampling plan targeted survey completions with 115 refrigerator participants and 25 freezer participants. During PY8, the team relied on telephone surveys but switched to online surveying (via Qualtrics) in PY11 given the availability of email addresses.

Guidehouse completed surveys with 202 participants who recycled 217 appliances. Within that group, 168 participants recycled 177 refrigerators and 40 participants recycled 40 freezers. Some of those participants are counted within both groups given that participants can recycle up to two appliances per address per calendar year. The survey verified the recycling event and gathered information to estimate PUFs separately for refrigerators and freezers.

In summary, the gross impact realization rates are informed by the following:

- Recalculation of the UEC (i.e., savings) for each appliance using the TRM's regression equation and the equipment specifications gathered by the CSP.
- Accounting for savings only for equipment that meet the program's eligibility criteria. Guidehouse incorporated these adjustments into the updated UECs.
- An updated PUF based on survey responses. Guidehouse also incorporated the PUF into the updated UECs.
- Survey responses that confirmed the recycling event and the appliance type.

Table 3.3-2 shows the evaluation activities for PY11 RARP gross energy and demand. Table 3.3-3 and Table 3.3-4 show the gross energy and demand results for RARP, respectively.

Table 3.3-2. RARP Gross Impact Sample Design for PY11

Stratum	Population Size*	Achieved Sample Size	Evaluation Activity
Refrigerators	1,839	177	Participant survey, recalculate savings for all units using TRM and equipment specifications
Freezers	374	40	Participant survey, recalculate savings for all units using TRM and equipment specifications
Program Total	2,213	217	

*Strata-specific population counts shown here differ from the program population count of Table 3.3-1. Participants who recycled both a refrigerator and a freezer are counted once for the program but counted once within each stratum within this table.

Source: Guidehouse analysis

Table 3.3-3. RARP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Refrigerators	1,893	95%	0.10	1.1%
Freezers	313	87%	0.20	4.6%
Program Total	2,206	94%		1.1%

Source: Guidehouse analysis

Table 3.3-4. RARP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Refrigerators	0.21	95%	0.10	1.1%
Freezers	0.04	87%	0.20	4.6%
Program Total	0.25	94%		1.1%

Source: Guidehouse analysis

The following factors led to the variation between the reported and verified savings and to the observed realization rates. Ultimately, the variations drove the realization rates below a value of 100%.

- Through recalculating the UECs, inputs to the regression equation changed so that UECs and realization rates reduced. For example, Guidehouse found that only 17% of refrigerators and 6% of freezers were manufactured before 1990. This result is lower than Duquesne Light's estimate used for reported savings and tracking data, which is 56% for refrigerators and 85% for freezers.
- Guidehouse found 19 refrigerators and 2 freezers that did not meet Duquesne Light's eligibility criteria. Units were either younger than 10 years or outside of the 10-30 cubic feet size range. Verified savings exclude these units.
- The survey found a refrigerator PUF of 95.1% and a freezer PUF of 96.2%. These findings are slightly less than the TRM's assumption of 98.5% and 96.9%, respectively.
- The survey inquired about 177 refrigerators and 40 freezers and confirmed recycling events for that many units. That is, Guidehouse found an ISR of 100%, so this aspect of the verification did not change the realization rate. However, the survey found that one respondent did not recycle a refrigerator as reported; one respondent who confirmed that a refrigerator was recycled confirmed that an additional, unreported freezer was recycled; and reported data recorded a recycled freezer for a respondent who indicated the appliance was a refrigerator instead. The sum impact of these discrepancies is no change to the ISR.

3.3.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan, the team conducted free ridership and spillover research in PY11 for RARP. The same survey respondents informing gross impacts also informed net impacts. The evaluation team's free ridership and spillover research aligned to the methodologies required by the SWE within the Framework's Appendix B.¹² The team investigated free ridership individually for refrigerators and freezers. Table 3.3-5 summarizes RARP net impacts sample size and response rates. Table 3.3-6 shows the results of the analysis.

¹² SWE Phase III Evaluation Framework. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework102616.pdf

Table 3.3-5. RARP Net Impact Sample Design

Stratum	Population Size*	Achieved Sample Size	Response Rate
Refrigerators	1,839	177	12%
Freezers	374	40	14%
Program Total (unique customers only)	2,213	217	12%

*Strata-specific population counts shown here differ from the program population count of Table 3.3-1. Participants who recycled both a refrigerator and a freezer are counted once for the program but counted once within each stratum within this table.

Source: Guidehouse analysis

Table 3.3-6. RARP Net Impact Evaluation Results

Stratum	Free Ridership	Spillover	NTG Ratio	Relative Precision at 85% CL
Refrigerators	62%	8%	46%	8.0%
Freezers	56%	5%	49%	12.5%
Program Total	61%	8%	47%	7.0%

Source: Guidehouse analysis

Guidehouse estimates a RARP NTG ratio of 46%, informed by the strata-specific results from a mix of refrigerator and freezer participation. Spillover increased slightly since PY8, estimated at 79 kWh per survey respondent who recycled a refrigerator and 38 kWh per respondent who recycled a freezer. Free ridership also increased slightly since PY8, resulting in the same NTG ratio across PY8 and PY11.

HIM Research

Guidehouse conducted HIM research for measures implemented during PY11. The team reviewed the PY11 residential program activities and identified refrigerator recycling as the measure that provides the most reported energy savings (37%) in the residential sector. Table 3.3-7 presents estimated free ridership, spillover, and NTG ratios for PY11 for this residential sector HIM.

Table 3.3-7. PY11 RARP High Impact Measure

Program	HIM	Free Ridership	Spillover	NTG Ratio
Appliance Recycling	Refrigerators	61%	8%	46%

Source: Guidehouse analysis

3.3.4 Verified Savings Estimates

In Table 3.3-8 the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RARP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.3-8. RARP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,206	0.25
PYVTD Gross	2,066	0.23
PYVTD Net	966	0.11
RTD	8,793	0.98
VTD Gross	8,322	0.93
VTD Net	3,876	0.43

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

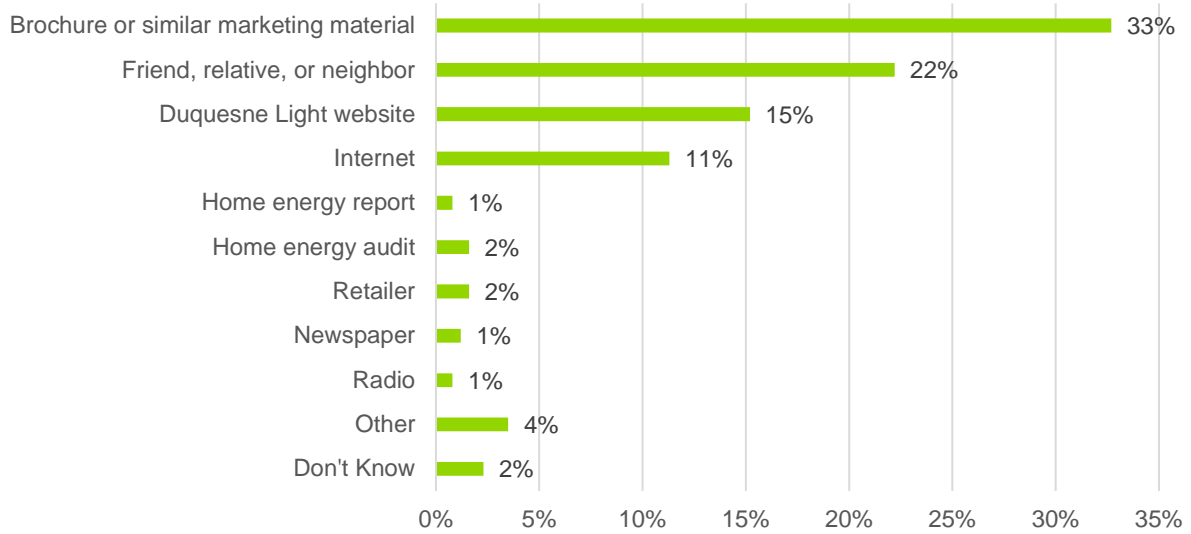
3.3.5 Process Evaluation

Guidehouse conducted process evaluation research for RARP in PY11; this research focused on program awareness, satisfaction, and barriers to participation. The evaluation team deployed an online survey to a sample of PY11 program participants who recycled refrigerators and freezers. The team also conducted interviews with program managers and the CSP. These interviews aided survey question updates. Additionally, the interviews confirmed the RARP implementation has largely remained consistent since PY10. The sections below summarize the findings.

Program Awareness

Guidehouse asked RARP participants to identify where they first heard about the program. As Figure 3.3-1. shows, respondents indicated the most common sources of program awareness were brochures and marketing materials (33%); friends, relatives, or neighbors (22%); and Duquesne Light's website (15%).

Figure 3.3-1. How did you first learn about Appliance Recycling Program?
(n = 202, multiple responses allowed)



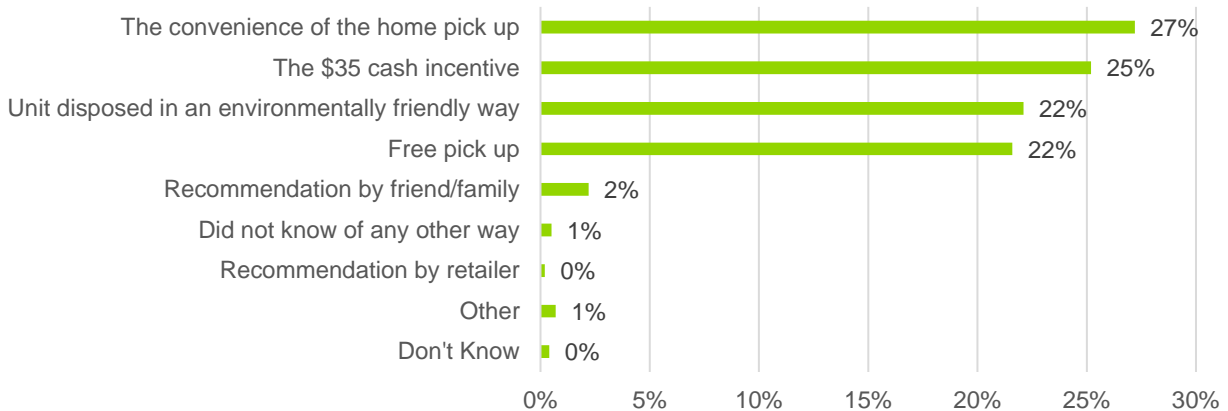
Source: Guidehouse analysis

Guidehouse also asked RARP participants if they had heard about any other Duquesne Light energy efficiency programs, and 25% responded that they had. Of those who heard about other programs, 34% of respondents heard about REEP kits, 22% heard about REEP rebates, 21% heard about Whole House Energy Audits, and 14% heard about HERs.

Program Influence

Guidehouse asked participants about their reasons for recycling their appliance(s) through the program. As shown in Figure 3.3-2, survey respondents reported that the top four reasons they chose to participate in the program were the convenience of the home pickup (27%), the cash incentive (25%), free pickup (22%), and that the appliance was disposed of in a way that is good for the environment (22%). Respondents also reported that all of these factors, except the cash incentive, had a very strong influence on their participation, with 95% of customers rating the influence of each factor 7 or greater on a scale of 0-10, where 10 means very influenced. The cash incentive had the lowest fraction of people scoring its influence as high. However, 75% of people still provided a rating of 7 or greater for its influence.

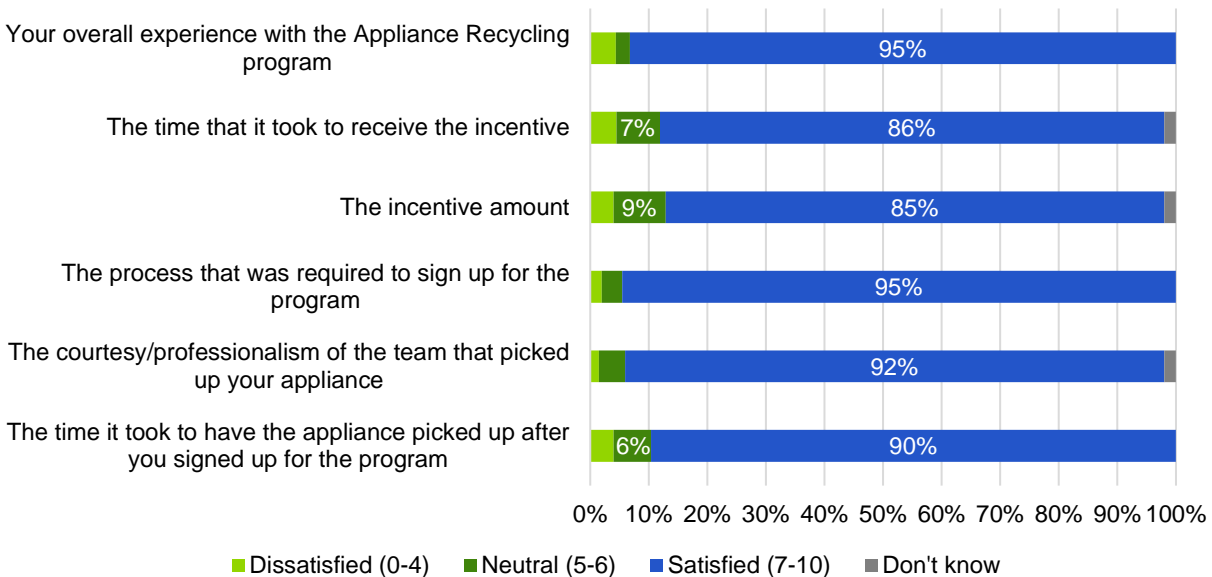
Figure 3.3-2. PY11 RARP Program Influence (n = 202)



Satisfaction

Guidehouse asked RARP participants about their satisfaction with various program aspects and with the program overall using a scale of 0-10, where 10 means very satisfied. As Figure 3.3-3 shows, the PY11 participants generally reported high satisfaction with all aspects of the program; these findings are consistent with findings from previous years. Survey respondents were the least satisfied with the incentive amount and the time it took to receive the incentive. They were most satisfied with the process it took to sign up for the program. The average overall satisfaction rate for this program was 9.4, and 95% of respondents are satisfied with the program.

Figure 3.3-3. PY11 RARP Satisfaction Rates (n = 202)



Source: Guidehouse analysis

Program Improvement Opportunities

Guidehouse also asked participants if they had any recommendations on ways to improve the program. Twenty-one percent of respondents provided suggestions for program improvement. The most common suggestions were to use a more specific time for the pickup (16 mentions out of 202), arrive during the first quoted pickup time and not during an alternate time (6), and have the collection team be neater (2). A few customers provided other recommendations, suggesting an increase in the incentive amount (5), an increase in the amount of advertising for the program (3), and better service, such as better trained staff for customer service and more personable and careful personnel for equipment pickup (4).

3.3.6 Cost-Effectiveness Reporting

Table 3.3-9 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.3-9 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.3-9. Summary of RARP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$77		\$267	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$77		-\$267	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$6
6	Administration, Management, and Technical Assistance ^[3]	\$41	\$7	\$70	\$44
7	Marketing ^[4]	\$0	\$0	\$0	\$20
8	Program Delivery ^[5]	\$0	\$310	\$53	\$1,015
9	EDC Evaluation Costs	\$13		\$38	
10	SWE Audit Costs	\$6		\$24	
11	Program Overhead Costs (sum of rows 5 through 10)	\$377		\$1,273	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$377		\$1,273	
14	Total NPV Lifetime Electric Energy Benefits	\$521		\$1,790	
15	Total NPV Lifetime Electric Capacity Benefits	\$152		\$532	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	\$0		\$0	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$673		\$2,323	
19	TRC Benefit-Cost Ratio ^[8]	1.79		1.82	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.3-10 presents program financials and cost-effectiveness on a net savings basis.

Table 3.3-10. Summary of RARP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$77		\$267	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$77		-\$267	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$6
6	Administration, Management, and Technical Assistance ^[3]	\$41	\$7	\$70	\$44
7	Marketing ^[4]	\$0	\$0	\$0	\$20
8	Program Delivery ^[5]	\$0	\$310	\$53	\$1,015
9	EDC Evaluation Costs	\$13		\$38	
10	SWE Audit Costs	\$6		\$24	
11	Program Overhead Costs (sum of rows 5 through 10)	\$377		\$1,273	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$377		\$1,273	
14	Total NPV Lifetime Electric Energy Benefits	\$243		\$834	
15	Total NPV Lifetime Electric Capacity Benefits	\$71		\$248	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$0	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		\$0	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$315		\$1,082	
19	TRC Benefit-Cost Ratio ^[8]	0.83		0.85	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
[1]	Includes direct install equipment costs.		
[2]	Includes direct costs attributable to plan and to advance the programs.		
[3]	Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.		
[4]	Includes the marketing CSP and marketing costs by program CSPs.		
[5]	Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.		
[6]	Total TRC Costs includes Total EDC Costs and Participant Costs.		
[7]	Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.		
[8]	TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.		

Source: Guidehouse analysis

3.3.7 Status of Recommendations

The impact and process evaluation activities in PY11 led to the findings and recommendations shown in Table 3.3-11; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.3-11. RARP Program Findings and Recommendations

Findings	Recommendations
Reported Savings	
<ul style="list-style-type: none"> Guidehouse's EM&V activities produced updated UECs based on PY11 recycled appliances. 	<ul style="list-style-type: none"> Duquesne Light should update reporting data and measure-level savings assumptions with this information so that PY12 reported savings can align closely to PY12 verified savings. Guidehouse does not anticipate a significant change in appliance characteristics over the course of a year.
Duquesne Light Response: Accepted. PY12 reported savings will reflect updates in subsequent reports.	
<ul style="list-style-type: none"> Duquesne Light's eligibility criteria states that appliances must be 10 cubic feet or larger. However, the TRM appliance recycling measure applies only to appliances that are between 10 and 30 cubic feet. Guidehouse found three units recycled in PY11 that exceeded 30 cubic feet. 	<ul style="list-style-type: none"> Duquesne Light should update its eligibility requirement to align with the TRM that places a maximum cap on appliance size of 30 cubic feet.
Duquesne Light Response: Accepted. Duquesne Light is updating requirements.	
Satisfaction	
<ul style="list-style-type: none"> Participants report high satisfaction with the program (95% rated it a 7 or higher). The most common suggestion for program improvement was to use a more specific time for the pickup (16 mentions out of 202). 	<ul style="list-style-type: none"> Duquesne Light should direct the CSP to reduce the collection pickup window to a more specific range.
Duquesne Light Response: Accepted. Duquesne Light will address this issue with the Phase IV implementation CSP.	

Source: Guidehouse analysis

3.4 Residential Behavioral Savings Program

The Residential Behavioral Savings Program, also known as the HER Program, influences behavior changes in customers by providing information via energy reports to participants. These reports are provided to participants via mail, email, and via access through the Duquesne Light website. These reports provide participants with information about their recent energy use and compare the usage to that of similar homes. The reports also provide participants with energy-saving tips, some of which are tailored to the participants' circumstances. Other studies have shown this set of information stimulates participants to reduce their energy use, creating average energy savings in the 1%-2% range. Furthermore, these reports provide information on other Duquesne Light energy efficiency programs, which helps influence customers to participate in those programs and install energy efficient equipment.

Duquesne Light launched the HER Program in PY4 to target high use residential customers. The current program participation levels include 13,070 customers from the 2012 market rate wave, 35,950 participants from the 2015 market rate wave, 12,030 customers from the 2015 low-income wave, and 2,734 customers from the 2018 low-income wave (based on PY11 monthly averages). Savings for the 2015 and 2018 low-income waves are reported and verified under the Low-Income Energy Efficiency Program (LIEEP). The administration, implementation, and evaluation for those low-income participants is similar to their market rate participant counterparts. The low-income evaluation results are detailed in Section 3.6.

Guidehouse obtained new low-income classifications during the PY8 evaluation as part of a 2016 low-income status rescreening effort conducted by Duquesne Light. These classifications were used to identify any market rate customers that had been reclassified as low-income and vice versa. No rescreening has occurred to update reclassifications, and per the PY11 SWE-approved Evaluation Plan, Guidehouse maintains these reclassifications. The savings from these customers, though not included in the low-income waves, contribute to the low-income PY11 savings for LIEEP, as shown in Section 3.6. Ultimately with this update and consistent with PY8 through PY10 approaches, 3.5% of the 2012 market rate wave savings and 4.2% of the 2015 market rate wave savings are reallocated to Low-Income HER savings.

A participant is a customer receiving HERs during the program year (i.e., PY11). The participant count represents the number of unique participants who received HERs during PY11. The program is an opt-out program in which the CSP, Oracle, enrolls participants in the program based on a randomized control trial (RCT) program design. Enrolled customers can opt out of the program by calling or emailing the program implementer.

In the RCT design, eligible customers are randomly assigned to treatment and control groups. Due to random assignment, any difference in usage between treatment customers (i.e., the program participants) and control customers is a result of participation in the program.

3.4.1 Participation and Reported Savings by Customer Segment

Table 3.4-1 presents the participation counts, reported energy and demand savings, and incentive payments for HERs in PY11. Low-income HER participant results are reflected in LIEEP, as shown in Section 3.6.

Table 3.4-1. HER Participation and Reported Impacts

Parameter	Residential (Non-Low-Income)
PYTD No. of Participants	49,020
PYRTD MWh/yr	8,135
PYRTD MW/yr	0.93
PY11 Incentives (\$1,000)	\$0

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

The main methodological issue for the impact evaluation is to estimate the counterfactual energy use by households participating in the HER Program. Stated another way, the impact evaluation compares actual energy usage against the estimated energy that participating households would have used in the absence of the program. The program used an RCT experimental design, meaning that households were randomly allocated to the control and treatment groups. This eliminated the issue of selection bias that complicates the evaluation of many behavioral programs. The random assignment of households to the treatment and control groups means the control group should serve as a robust baseline against which the energy use of the treatment households can be compared to estimate savings from enrollment in the HER Program.

Guidehouse estimated program savings by adhering to the SWE’s guidance described by the Framework.¹³ The evaluation team used a monthly lagged dependent variable (LDV) model, also known as a post-program regression (PPR) model. This model uses post-enrollment program observations only and replaces the household fixed effect with the household’s energy use in the same calendar month of the pre-program year to account for household-level variation in energy use. The model takes the form shown in

Equation 3.4-1.

Equation 3.4-1. LDV Model Specification

$$kWh_{im} = \beta_o + \sum_{m=1}^{12} \beta_{1m} yrmo_m + \sum_{m=1}^{12} \beta_{2m} yrmo_m \cdot kWh_{im-12} + \sum_{m=1}^{12} \beta_{3m} yrmo_m \cdot treatment_{im} + \varepsilon_{im}$$

where

- kWh_{im} is customer i 's average daily energy usage in bill m .
- β_o is the intercept of the regression equation.
- β_{1m} is the coefficient on the bill year-month m .
- $yrmo_m$ is the indicator variable equal to 1 for each year-month in the analysis.
- β_{2m} is the coefficient on the home-specific pre-assignment usage term, which is interacted with bill month.
- kWh_{im-12} is customer i 's average daily energy usage lagged by 12 months.
- β_{3m} is the estimated treatment effect in kilowatt-hours per day per customer. This is the main parameter of interest.

¹³ SWE Framework. http://www.puc.pa.gov/Electric/pdf/Act129/SWE_PhaseIII-Evaluation_Framework102616.pdf

$treatment_{im}$ is the treatment indicator variable. Equal to 1 when the treatment is in effect for the treatment group and 0 otherwise.

ε_{im} is the error term.

The LDV model is the preferred model used for reporting savings. As a check on the robustness of the savings estimates, Guidehouse also ran a linear fixed-effects regression (LFER) model. Due to the experimental design of the program, the two models should generate similar results. In the LFER model, average daily consumption by participant and nonparticipant i in billing period m is denoted by kWh_{im} . This is referred to as a fixed-effects model because it includes a household-specific fixed-effects term. Equation 3.4-2 formally presents the equation for this model.

Equation 3.4-2. Fixed-Effects Regression Model

$$kWh_{im} = \beta_i + \sum_{m=1}^{12} \beta_{1m} yrmo_m + \sum_{m=1}^{12} \beta_{2m} yrmo_m \cdot treatment_{im} + \varepsilon_{im}$$

where

β_i is the household-specific fixed-effect that implicitly captures all participant-specific and nonparticipant-specific effects on electricity use that do not change over time. The calculation of the fixed-effect term does not require knowledge of which characteristics at each household are unchanged.

β_{1m} is the coefficient on the bill year-month m .

β_{2m} is the estimated treatment effect in kilowatt-hours per day. This is the main parameter of interest. Estimated separately for each month and year.

An advantage of the LFER model is that the time-invariant characteristics (observed and unobserved) are excluded from the model through the household fixed-effect term. The drawback of the LFER model is that it is less precise because the household-level fixed effect term relies exclusively on within-customer variation. The explanatory powers of time-invariant characteristics are lost because those terms are eliminated from the model. Guidehouse found the LFER model corroborated the savings found from the LDV model.

The evaluation team deployed specific data management methodologies to prepare billing data for the regressions. These methodologies are informed, in part, by feedback Guidehouse received from the SWE during previous evaluations. Monthly billing data were calendarized by expanding the billing periods (which follow variable meter read schedules) to daily data and then collapsing them into a common calendar basis. Each month of usage data represents an aggregation of the usage data from the bills that contain data for that month. Estimated reads, which are infrequent for Duquesne Light, were handled by summing the consecutive estimated reads with the first actual read that followed and dividing that aggregated use across the number of days since the previous actual read. Participants and nonparticipants that moved out of Duquesne Light territory during PY11 were included in the regression analysis until move-out occurred and monthly billing data ceased. There is a monotonically decreasing number of participants per month for each cohort.

Guidehouse calculated participant counts following a standard approach where the last available month of billing data is calculated for each account and the household is assumed to be active for all months prior. This participant counting approach provides a monthly participant

count for the program year. A customer is considered a participant for PY11 so long as their account was active for at least 1 month during PY11.

Table 3.4-2 summarizes the sampling strategy for the PY11 evaluation. Both regression models use billing data from all treatment and control households enrolled in the HER Program. The sampling strategy is considered to be a census approach where data from all households are used in the analysis, as Table 3.4-2 shows.

Table 3.4-2. HER Gross Impact Sample Design for PY11

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
HER	49,020	49,020	Regression analysis
Program Total	49,020	49,020	

Source: Guidehouse analysis

The verified ex post energy savings for HER in PY11 were 5,525 MWh, after accounting for double counted savings with other Duquesne Light energy efficiency programs. Guidehouse calculated the demand savings by dividing the total energy savings for the year (in megawatt-hours) by 8,760 hours, yielding 0.63 MW. A summary of ex ante HER Program energy and demand savings are shown in Table 3.4-3 and Table 3.4-4, respectively. Additional details are provided in Appendix C.

Table 3.4-3. HER Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
HER	8,135	68%	N/A	0.0%
Program Total	8,135	68%		0.0%

Source: Guidehouse analysis

Table 3.4-4. HER Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
HER	0.93	68%	N/A	0.0%
Program Total	0.93	68%		0.0%

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and to the observed realization rates.

- Energy savings per participant home were verified lower than the CSP's reported estimate.
 - The CSP did not complete a double counted savings analysis.
 - Double counted savings made up 27% of gross verified HER savings, an increase over PY10 double counted savings.

- The CSP did not complete low-income rescreening.
 - Low-income rescreening transferred 3.5% of the 2012 market rate wave and 4.2% of the 2015 market rate wave savings to the low-income HER component.

Behavioral Program and Component Absolute Precision

Guidehouse calculated the absolute precision results for the HER waves. Section 6.1.1.1.1 of the Phase III Evaluation Framework requires the program-level verification for these behavioral programs to achieve an absolute precision of $\pm 0.5\%$ at the 95% confidence level (two-tailed), while individual waves may have a wider margin of error. Appendix C provides regression details, precisions, and error estimates.

Errors are not reflected in Table 3.4-3 or Table 3.4-4. Instead, those tables reflect the uncertainty associated with the sampling (i.e., relative precision at the 85% confidence level). Guidehouse analyzed all HER Program data via its census approach and did not use sampling. There is no sampling uncertainty.

3.4.3 Net Impact Evaluation

Free ridership and participant spillover are incorporated in the results of the regression analysis due to the RCT design of the HER Program. Section 2.2.2 of the SEE Action protocol states:

RCTs eliminate this free-rider concern during the study period because the treatment and control groups each contain the same number of free riders through the process of random assignment to the treatment or control groups. When the two groups are compared, the energy savings from the free riders in the control group cancel out the energy savings from the free riders in the treatment group, and the resulting estimate of program energy savings is an unbiased estimate of the savings caused by the program (the true program savings). [Participant spillover], in which participants engage in additional energy efficiency actions outside of the program as a result of the program, is also automatically captured by an RCT design for energy use that is measured within a household.

However, the RCT design does not account for nonparticipant spillover. Section 2.2.2 of the SEE Action protocol continues:

[Non-participant spillover] issues in which a program influences the energy use of non-program participants are not addressed by RCTs. In these cases in which non-participant spillover exists, an evaluation that relies on RCT design could underestimate the total program-influenced savings.

Free ridership and spillover are incorporated into the results of the HER regression analysis based on customer billing records. Nonparticipant spillover is not included in the regression analysis, but the industry standard approach is to assume that nonparticipant spillover is small for this type of program. It would be primarily driven by conversations that participants may have with nonparticipant Duquesne Light customers, which are expected to have a relatively small impact on nonparticipant energy savings. The conservative approach used by Guidehouse is to assume that nonparticipant spillover is 0% and that the NTG ratio for the HER Program is conservatively assumed to be 100%. As a result, the net and gross savings estimates are the same for the HER Program. There is no NTG sample for the HER Program.

The team did not consider a sample for the net impact analysis, and net impacts equal the gross impacts. The NTG ratio is assumed to be 100%.

HIM Research

Guidehouse did not conduct research for HIMs for the HER Program in PY11.

3.4.4 Verified Savings Estimates

In Table 3.4-5 the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for HER in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.4-5. HER PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	8,135	0.93
PYVTD Gross	5,525	0.63
PYVTD Net	5,525	0.63
RTD	30,503	3.48
VTD Gross	25,789	2.94
VTD Net	25,789	2.94

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.4.5 Process Evaluation

Guidehouse completed a process evaluation for the Residential Behavioral Savings (i.e., HER) Program in PY11. The evaluation team interviewed the Duquesne Light program manager and program implementer. These interviews aided the team with updates for a planned participant survey. Additionally, the interviews confirmed that implementation has largely remained consistent since PY10. With the customer surveys, Guidehouse gathered feedback from PY11 HER program participants about their level of engagement with the reports, experience and satisfaction with the report delivery, reports' influence on their decision-making, and opportunities for program improvement. A qualified survey participant was a Duquesne Light residential customer with an active electric account who received reports in PY11 via mail, email, or through Duquesne Light's website.

Market rate HER impact evaluation results are reported within this section, Section 3.4, and low-income HER impact evaluation results are reported in Section 3.6. However, to offer points of comparison, this process evaluation section presents the combined evaluation efforts that focused on both market rate and low-income HER participants.

3.4.5.1 Participant Survey Methodology

As part of this evaluation, Guidehouse conducted a survey via email and telephone for a sample of residential customers who received reports. The evaluation team stratified by low-income and market rate customers. The team also stratified by contact information to ensure sufficient responses across the range of report receipt methods: mail, online access, or email. Guidehouse could not obtain email addresses for all participants, so stratifying by contact information promoted a representative sample. Additionally, the evaluation team did not have contact information differentiated by receipt method given that it can be mixed mode. The results throughout this section are organized by income status and report receipt method. Table 3.4-6 shows the population count of PY11 HER program participants, survey method, sample targets, and completed surveys.

Table 3.4-6. PY11 Residential Behavioral Participant Survey Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample	Completed Surveys
Market Rate Participants (email)	27,218	Online survey	20	53
Market Rate Participants (phone)	22,644	Phone survey	20	11
Low-Income Participants (email)	6,447	Online survey	20	33
Low-Income Participants (phone)	5,584	Phone survey	20	38
Total	61,893		80	135

*The population is representative of program participants who have chosen to not opt out of the program at the time of surveying. This population count, related to the participant survey, differs from the gross impact evaluation population count where a specific counting method (described in Section 3.4.2) is used to arrive at a population. Stratification was based on designated income level and the type of contact information available for each participant (email or phone).

Source: Guidehouse analysis

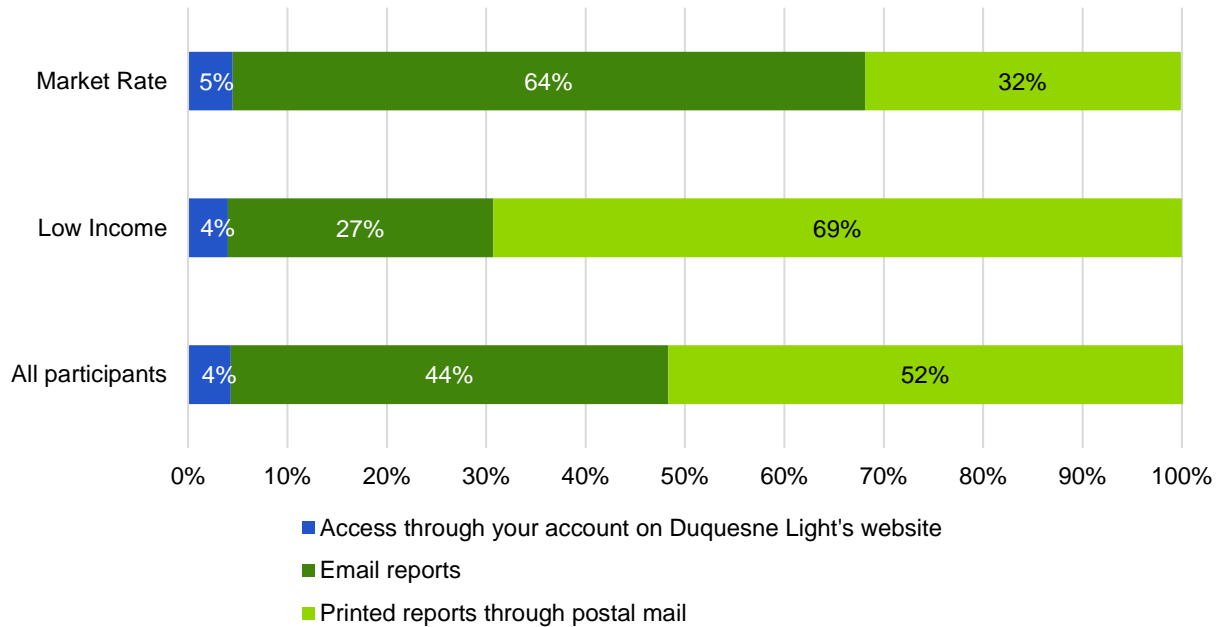
3.4.5.2 Participant Survey Findings

The following sections present the responses collected through this survey for participant level of engagement, program’s influence on customers’ decision-making and behavior, and customer satisfaction ratings.

Level of Engagement

Respondents were asked about if and how many reports they recalled receiving in the previous year, how frequently they read the reports, and how they received or accessed them. Duquesne Light sends out an HER via email every month and sends a printed report to low-income customers six times a year and to market rate customers twice a year. The web-based report is available to customers on a continuous basis if the customer decides to log into the web portal. The large majority of HER program participants (94%) recalled receiving the report. Figure 3.4-1. shows that market rate customers primarily receive their reports through email (64%), while low-income customers primarily receive their reports through mail (69%). Only 4% of the participants access the report through the website.

Figure 3.4-1. Through which method does your household receive its Home Energy Report? (n=126; multiple options allowed)

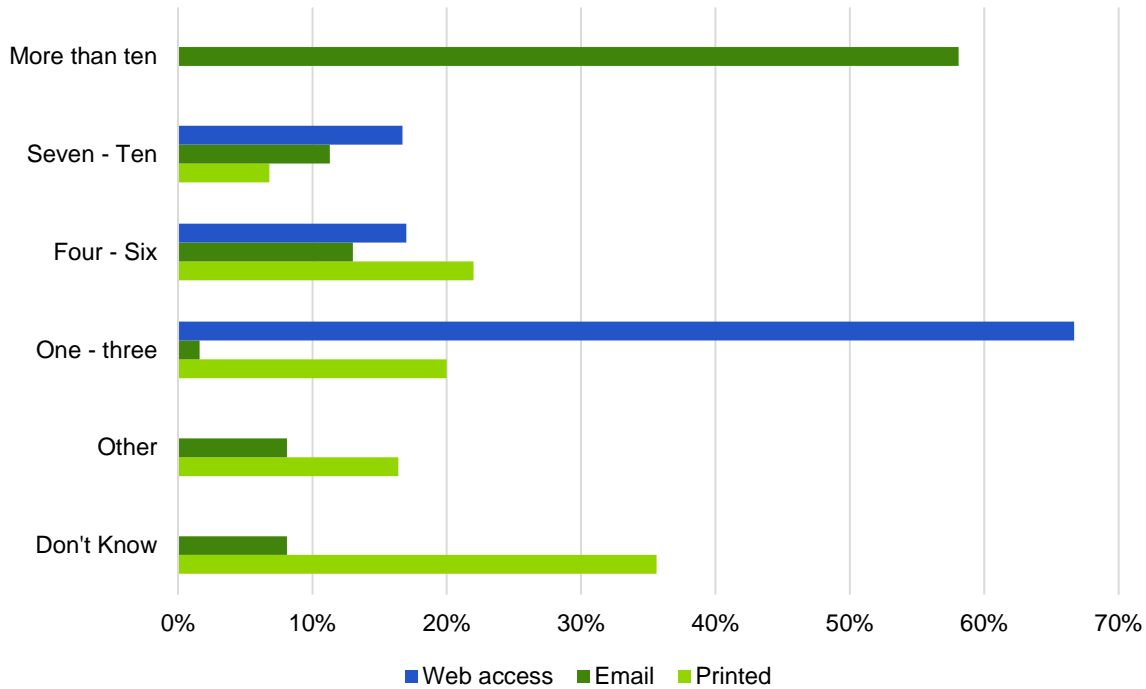


Source: Guidehouse analysis

The results of the survey show very high engagement among the program participants. Participant awareness of HERs has greatly increased since PY7—the majority of participants at that time could not recall how many reports they had received in the previous year. In PY9 only about 30% of customers reported receiving more than 10 reports. In PY11, Figure 3.4-2. shows, the majority of participants who received their reports through email recalled receiving more than 10 reports (58%) over the last year. Among participants who received their reports through mail, 22% reported receiving four to six reports and 7% reported receiving 7-10 reports,¹⁴ although the program only sends out six reports per year to low-income customers and two reports per year to market rate customers. Of the six respondents who reported they also access their reports through the web portal, most of them (4) access it only once per year. These respondents access the web report in addition to receiving either a printed or email report.

¹⁴ This is likely a result of respondents conflating the count of reports they received through mail, email, and web because many customers receive their reports through more than one delivery channel.

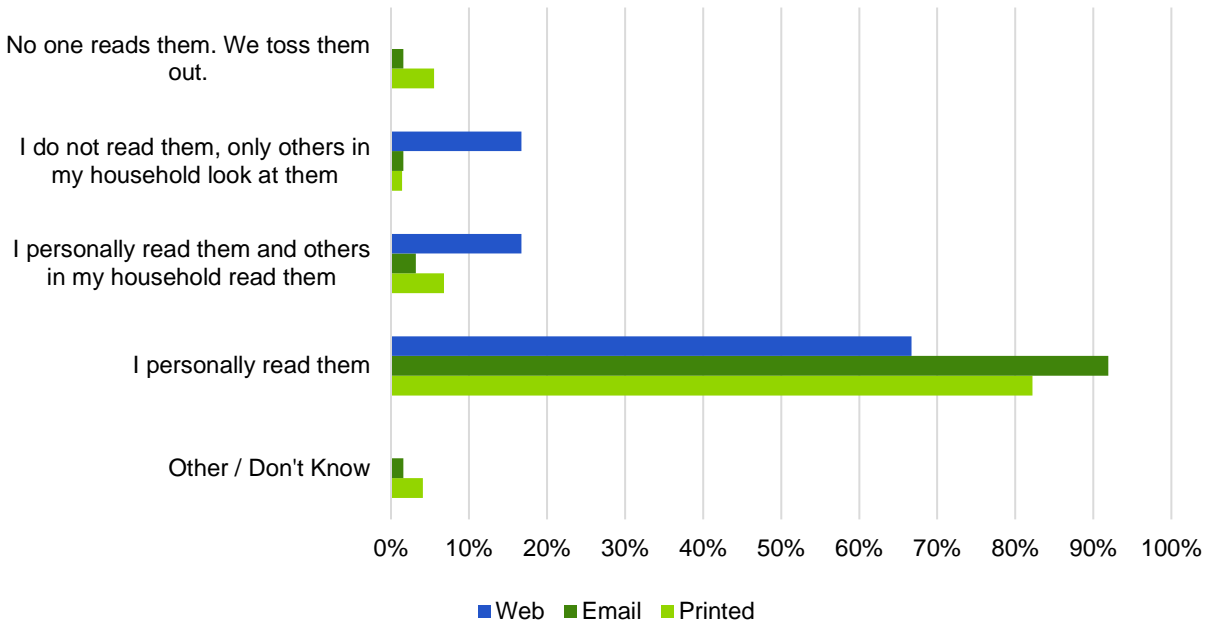
Figure 3.4-2. How many of these reports did you receive (or access) over the last year?
(printed: n = 73, email: n = 62, web portal: n = 6; multiple options allowed)



Source: Guidehouse analysis

A large majority of survey respondents reported they personally read the reports. As Figure 3.4-3. shows, 82% of respondents who received printed reports through mail read the report personally and 7% read them along with other people in their household. Only 6% of respondents did not read the reports. Among respondents who receive reports through email, 92% of respondents stated they read the reports personally and 3% read them along with others in their household. Only 2% report that no one in their household reads them. All low-income respondents reported personally reading the email and web reports; meanwhile, 83% of low-income participants read the printed reports personally, 4% read them along with other people in their household, and 8% reported tossing them out. Among market rate respondents, all of them reported either personally reading the reports or others in their household reading the reports; no one reported tossing reports out.

Figure 3.4-3. Does anyone in your household read the reports?
(printed: n = 73, email: n = 62, web portal: n = 6)

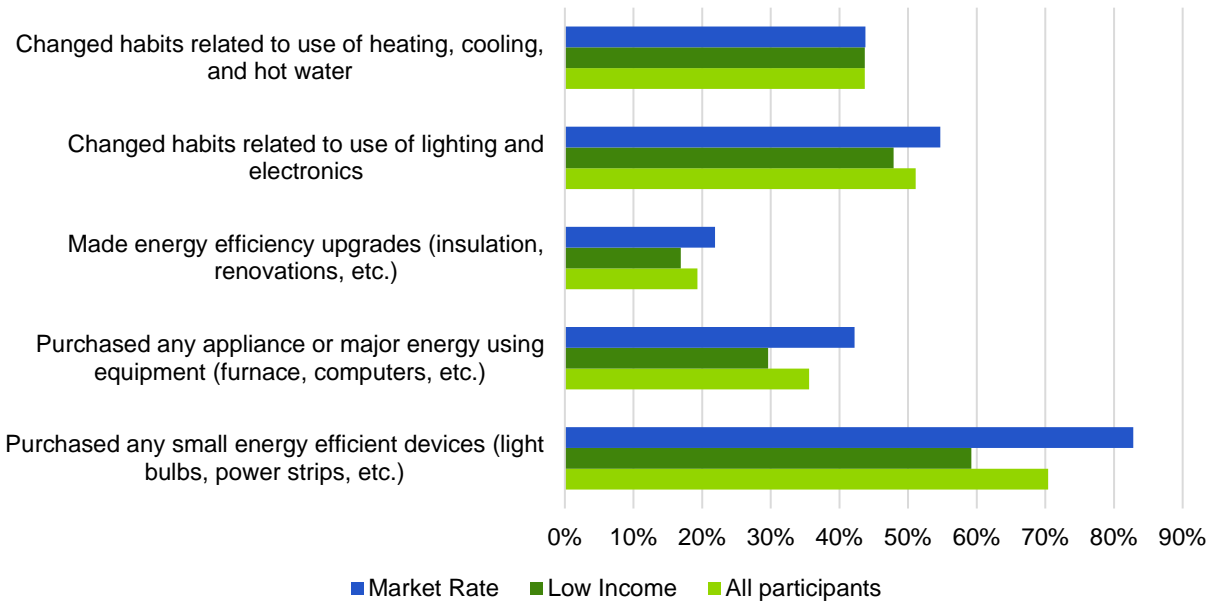


Source: Guidehouse analysis

Program’s Influence on Customer Behavior and Purchasing Decisions

Guidehouse asked HER participants if they had changed their habits related to conserving energy, purchased any energy efficient products, or made any energy efficiency upgrades in the past year. Of respondents, 84% reported taking some form of action toward conserving energy within the past year, as Figure 3.4-4. summarizes. These changes included modifying their habits related to use of heating, cooling, and hot water (51%), as well as changing habits related to lighting and electronics (44%). About 83% of market rate participants and 59% of low-income participants purchased small energy efficiency devices, such as efficient light bulbs or power strips. Many market rate and low-income customers also purchased appliances and major energy-using equipment such as furnaces and computers (42% market rate and 30% low-income); they also made major energy efficiency upgrades related to insulation or renovation (22% market rate and 17% low-income).

Figure 3.4-4. What energy efficient purchases or upgrades do you recall making in the last year? (n = 135; multiple options allowed)

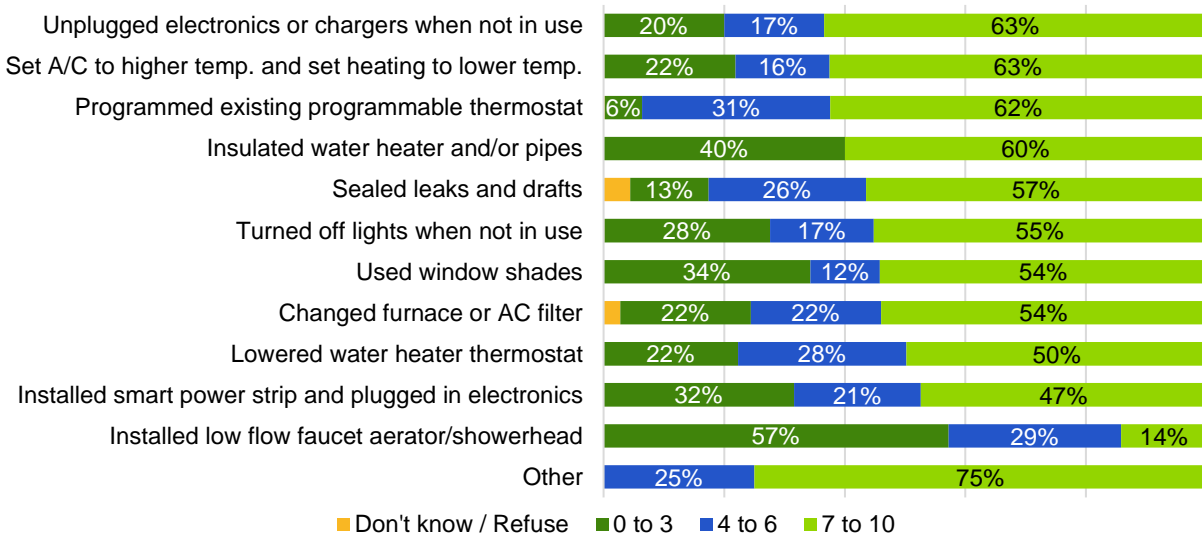


Source: Guidehouse analysis

To understand the influence of the program on a participant’s decision-making process, Guidehouse asked participants how influential the HERs were in making these changes in their behavior and purchasing decisions to reduce their energy usage (see Figure 3.4-5.). Guidehouse inquired about program influence on a scale of 0-10, where 10 was very influential and 0 was not at all influential.

The survey results show the HERs have a significant influence on participants changing their behavior. Depending on the action, 14%-75% of participants who reduced energy usage in their home claimed that the reports had a major influence on their decisions, rating their influence at 7 or higher on a scale of 0-10. Participants reported the highest influence of the reports on their decisions to unplug electronics or chargers when not in use, setting thermostats to higher or lower temperatures, and programming existing thermostats. The lowest influence was on installing low flow faucet aerators or showerheads.

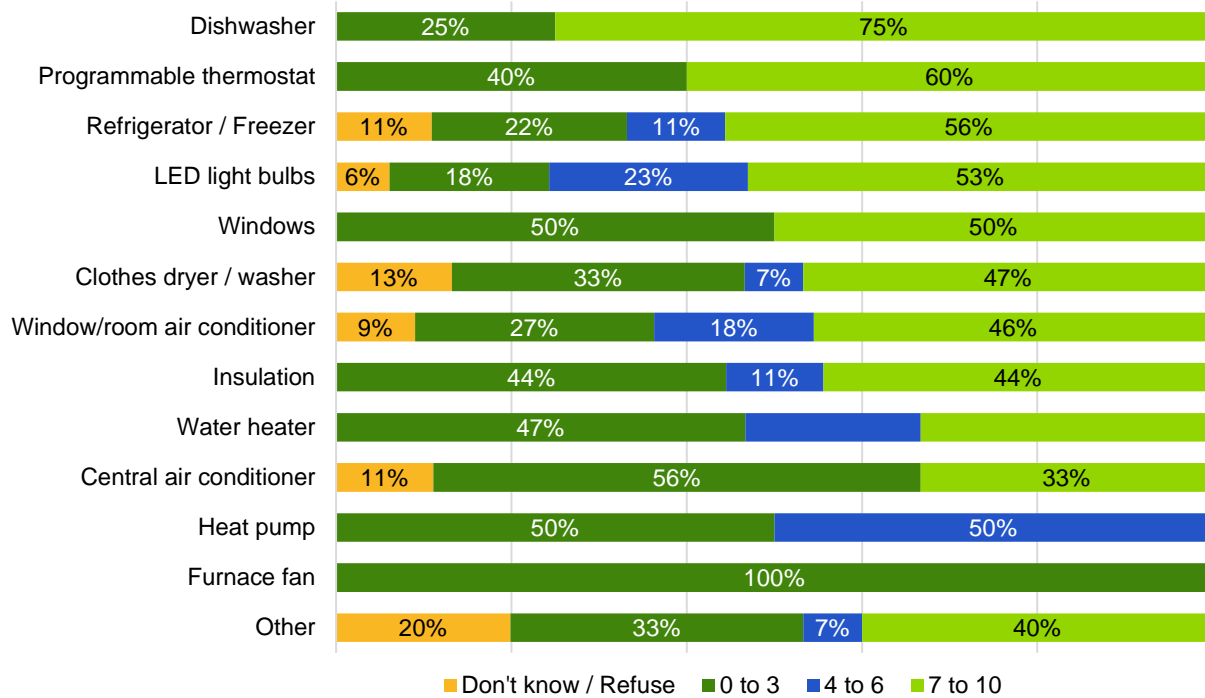
Figure 3.4-5. Influence of Home Energy Reports in Changing Behavior (n = 81)



Source: Guidehouse analysis

The survey results also show the reports have a strong influence on participants' decisions to purchase major energy efficient appliances and equipment. As Figure 3.4-6. shows, among respondents who chose to install major appliances or equipment, 33%-75% of respondents claim the reports had a significant influence on their decision to make these purchases, rating their influence at 7 or higher on a 0-10 scale. Respondents reported the highest influence of the program on their purchase of dishwashers, programmable thermostats, and refrigerators or freezers. Only customers who purchased furnace fans and heat pumps stated the influence of the reports on these purchases was fairly weak to none.

Figure 3.4-6. To what extent did the Home Energy Report influence you to make these energy efficient purchases or upgrades? (n = 101)



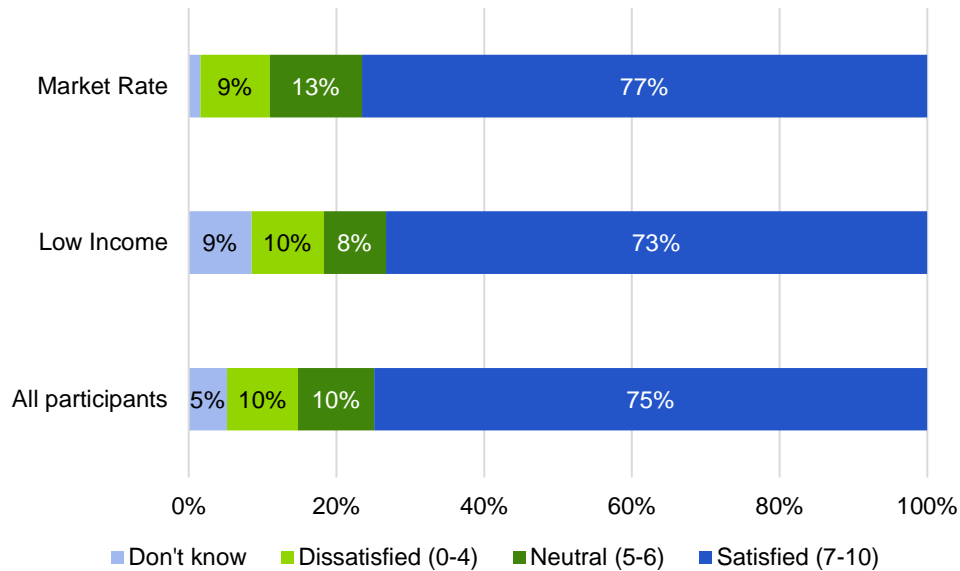
Source: Guidehouse analysis

Satisfaction

Overall, three-quarters of respondents reported they are satisfied with their HERs, rating the program as 7 or above on a 0-10 scale, as Figure 3.4-7. shows. Guidehouse found that 77% of market rate and 73% of low-income participants were satisfied. Of respondents, 10% expressed some level of dissatisfaction with the report (defined by rating the program as 4 or below). In comparison to results received in previous evaluations, 70% of respondents in PY7 and 82% of respondents in PY9 reported satisfaction with their reports.¹⁵ More respondents (10%) expressed dissatisfaction with the information presented in their HERs than in PY9, where only 6% reported some level of dissatisfaction. Dissatisfied PY11 respondents said the information in the reports was either not helpful or useful (6), inaccurate (3), they do not understand the purpose of the reports (2), or they gave other reasons (3). The average satisfaction rating for the HER Program was 7.9 on a scale of 0-10. The PY9 average satisfaction was 8.4 on a scale of 1-10.

¹⁵ The scale of the satisfaction ratings has been updated from a scale of 1-10 in PY9 to a scale of 0-10 in PY11, which could be one of the contributing factors to a slightly lower average.

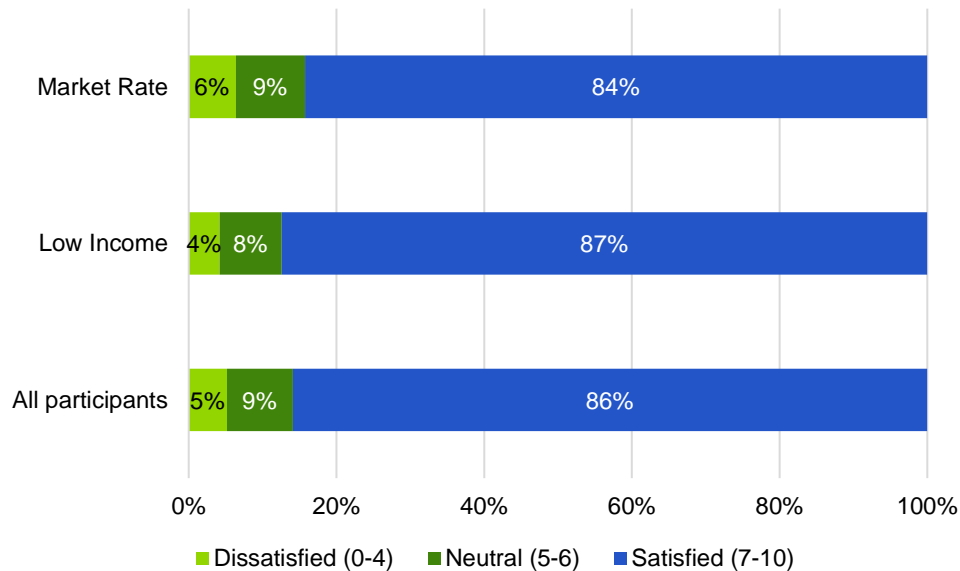
Figure 3.4-7. How satisfied are you with Home Energy Reports program overall? (n = 135)



Source: Guidehouse analysis

As Figure 3.4-8. shows, Guidehouse also asked about customers' satisfaction with Duquesne Light, where 86% of customers reported being satisfied with the company. Satisfaction among low-income customers is observed to be slightly higher (3% more). Only 5% of respondents reported some level of dissatisfaction with Duquesne Light. Reasons for dissatisfaction included that the electricity rates are too high (5), infrastructure is unreliable (2), or a billing problem (1). The average satisfaction rating for the company was 8.6 on a scale of 0-10.

Figure 3.4-8. How satisfied are you with Duquesne Light as a company? (n = 135)



Source: Guidehouse analysis

3.4.6 Cost-Effectiveness Reporting

Table 3.4-7 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.4-7. Summary of Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$41	\$8	\$80	\$63
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$848	\$59	\$1,115
9	EDC Evaluation Costs	\$21		\$57	
10	SWE Audit Costs	\$8		\$34	
11	Program Overhead Costs (sum of rows 5 through 10)	\$926		\$1,420	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$926		\$1,420	
14	Total NPV Lifetime Electric Energy Benefits	\$203		\$919	
15	Total NPV Lifetime Electric Capacity Benefits	\$71		\$447	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$0	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		\$0	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$273		\$1,366	
19	TRC Benefit-Cost Ratio ^[8]	0.29		0.96	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
[1]	Includes direct install equipment costs.		
[2]	Includes direct costs attributable to plan and to advance the programs. Note: The design of the HER Program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.		
[3]	Includes processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.		
[4]	Includes the marketing CSP and marketing costs by program CSPs.		
[5]	Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.		
[6]	Total TRC Costs includes Total EDC Costs and Participant Costs.		
[7]	Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.		
[8]	TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.		

Source: Guidehouse analysis

Table 3.4-8 presents program financials and cost-effectiveness on a net savings basis.

Table 3.4-8. Summary of HER Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants [1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	EDC	CSP	EDC
5	Design & Development [2]	\$0	\$0	\$0	\$0
6	Administration, Management, and Technical Assistance [3]	\$41	\$8	\$41	\$8
7	Marketing [4]	\$0	\$0	\$0	\$0
8	Program Delivery [5]	\$0	\$848	\$0	\$848
9	EDC Evaluation Costs	\$21		\$57	
10	SWE Audit Costs	\$8		\$34	
11	Program Overhead Costs (sum of rows 5 through 10)	\$926		\$1,420	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs [6] (net present value of sum of rows 4, 11, and 12)	\$926		\$1,420	
14	Total NPV Lifetime Electric Energy Benefits	\$203		\$919	
15	Total NPV Lifetime Electric Capacity Benefits	\$71		\$447	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$0	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		\$0	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$273	\$1,366
19	TRC Benefit-Cost Ratio ^[8]	0.29	0.96

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs. Note: The design of the HER Program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.4.7 Status of Recommendations

The impact and process evaluation activities in PY11 led to the findings and recommendations shown in Table 3.4-9; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.4-9. Home Energy Reports Program Findings and Recommendations

Findings	Recommendations
Program Engagement	
<ul style="list-style-type: none"> Only about 4% of customers in each group access the report via website portal. 	<ul style="list-style-type: none"> To increase awareness and use of the web portal, Duquesne Light should direct its CSP to advertise how to access it in the reports sent via email and mail.
Duquesne Light Response: Accepted. Duquesne Light is informing its CSP of this recommendation and will look for additional methods to increase customer use of tools made available to them.	
Program Influence	
<ul style="list-style-type: none"> Of customers who received HERs, 60% changed their behavior related to energy conservation and 75% reported making small device purchases, major home renovation upgrades, or large appliance or equipment purchases over the last year. The HER Program has a very strong influence on participants' behavior and their decisions to purchase major energy efficient appliances or equipment, where the majority of participants report either moderate or high influence of the program on their decisions. 	<ul style="list-style-type: none"> No recommendation.
Duquesne Light Response: N/A	

Source: Guidehouse analysis

3.5 Residential Whole House Retrofit Program

The Residential Whole House Retrofit Program (WHRP) provides resources to market rate residential customers to obtain a residential home energy audit, direct install measures, and rebates for the range of eligible measures similar to those included in the rebates component of the REEP Program. The program services offered are generally the same for low-income customers and for market rate (non-low-income) customers. Program participants may live in single-family or multifamily dwellings. Furthermore, WHRP audits can be requested by utility customers or they can be initiated by property owners. Property owner-requested audits tend to be identical to resident-requested audits, except that they are initiated differently. Duquesne Light is also teaming up with the gas utility within its service territory to serve some customers supplied by both organizations. Similar audits are conducted, and costs are shared by both utilities.

Duquesne Light focused its direct install and audit efforts on the low-income market segment during PY11. Savings were not achieved in this market rate program during this program year. Instead, Duquesne Light only reported savings for the low-income component of WHRP within LIEEP—see Section 3.6 for details. As a result, Guidehouse did not evaluate this non-low-income portion of WHRP in PY11.

3.5.1 Verified Savings Estimates

No savings are recorded for WHRP in PY11, as shown in Table 3.5-1. Totals from previous program years are summed to calculate the P3TD program impacts.

Table 3.5-1. WHRP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	0	0
PYVTD Gross	0	0
PYVTD Net	0	0
RTD	134	0.01
VTD Gross	114	0.01
VTD Net	114	0.01

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 annual report.

3.5.2 Cost-Effectiveness Reporting

Table 3.5-2 presents a detailed breakdown of program finances and cost-effectiveness. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.5-2. Summary of WHRP Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$5
6	Administration, Management, and Technical Assistance ^[3]	\$41	\$5	\$72	\$39
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$17	\$65	\$188
9	EDC Evaluation Costs	\$11		\$34	
10	SWE Audit Costs	\$5		\$22	
11	Program Overhead Costs (sum of rows 5 through 10)	\$79		\$428	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$79		\$428	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$29	
15	Total NPV Lifetime Electric Capacity Benefits	\$0		\$9	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$16	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		\$4	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0		\$58	
19	TRC Benefit-Cost Ratio ^[8]	0.00		0.14	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.5-3 presents program financials and cost-effectiveness on a net savings basis.

Table 3.5-3. Summary of WHRP Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	EDC	CSP	EDC
5	Design & Development ^[2]	\$0	\$0	\$3	\$5
6	Administration, Management, and Technical Assistance ^[3]	\$41	\$5	\$72	\$39
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$17	\$65	\$188
9	EDC Evaluation Costs	\$11		\$34	
10	SWE Audit Costs	\$5		\$22	
11	Program Overhead Costs (sum of rows 5 through 10)	\$79		\$428	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
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14	Total NPV Lifetime Electric Energy Benefits	\$0		\$29	
15	Total NPV Lifetime Electric Capacity Benefits	\$0		\$9	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$16	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		\$4	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0		\$58	
19	TRC Benefit-Cost Ratio ^[8]	0.00		0.14	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
[1]	Includes direct install equipment costs.		
[2]	Includes direct costs attributable to plan and to advance the programs.		
[3]	Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.		
[4]	Includes the marketing CSP and marketing costs by program CSPs.		
[5]	Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.		
[6]	Total TRC Costs includes Total EDC Costs and Participant Costs.		
[7]	Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.		
[8]	TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.		

Source: Guidehouse analysis

3.5.3 Status Recommendations

Guidehouse has no recommendations for the market rate portion of WHRP at this time.

3.6 Low-Income Energy Efficiency Program

The LIEEP comprises participation by qualified low-income customers (households at or below 150% of federal poverty income guidelines) in the following program components, as noted in Duquesne Light's EE&C Plan:

- Low-Income Kits Program (Low-Income Kits)
- Residential Behavioral Savings Program (Low-Income HER)
- Whole House Retrofit Program (Low-Income WHRP)
- Multifamily Housing Retrofits Program (MFHR)¹⁶

For the Low-Income Kits, Low-Income HER, and Low-Income WHRP components, verified savings attributable to the low-income sector are reflected in LIEEP and in Duquesne Light's progress toward the Phase III low-income carveout goal. While not a part of LIEEP, a portion of savings from the MFHR Program also contributes to the low-income carveout goal. MFHR Program impacts are discussed in Section 3.10.

Duquesne Light provides low-income customers with energy efficiency kits at no charge. These low-income kit activities are captured and reported under LIEEP and contribute to the low-income carveout goal. These low-income kits are equivalent to the kits distributed by Duquesne Light through REEP to market rate participants and are specifically targeted to low-income participants through the utility's outreach efforts. A participant is a customer participating in the program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. This is the same counting method as used for the REEP kits.

Duquesne Light also engaged low-income utility customers through a number of low-income-specific community events where it handed out energy efficiency measures such as kits and

¹⁶ Duquesne Light completed 18 MFHR projects during PY11. The evaluation found that 99.97% of verified savings contribute to the low-income carveout.

LED lamps. For these community events, Duquesne Light tracks events and the measures given away but not the individual participants who receive the measures. Participation counts are not defined for these measures.

Low-Income HER participation is defined as a customer under the low-income rate class and receiving HERs during the program year. The current program participation levels include 12,030 customers from the 2015 low-income wave and 2,734 customers from the 2018 low-income wave (based on PY11 monthly averages). As discussed in Section 3.4, Guidehouse identified 3.5% of customers in the 2012 market rate wave and 4.2% of customers in the 2015 market rate wave as being reclassified as low-income customers. The savings from these customers, though not included in the low-income waves, are incorporated into the low-income PY11 savings for LIEEP and contribute to the low-income carveout goal.

Finally, Low-Income WHRP provides resources to qualifying low-income customers that are eligible to receive an onsite audit and the direct installation of select measures at no charge to the customer. Low-income customers are also eligible to receive other major measures, installed at no cost if appropriate, beyond the direct installation measures. These can include replacement refrigerators, for example. Program participants may live in single-family or multifamily dwellings. Furthermore, WHRP audits can be requested by utility customers or they can be initiated by property owners. Property owner-requested audits tend to be identical to resident-requested audits, except that they are initiated differently. Customers with gas space and water heating receive a walkthrough audit, whereas customers with electric space and water heating are eligible to receive a comprehensive audit. Duquesne Light is also teaming up with the gas utility within its service territory to serve some customers supplied by both organizations. Similar audits are conducted, and costs are shared by both utilities. When audits are requested for multifamily dwellings by a building's property owner, the low-income status of each treated apartment is not reported. Instead, the property owner reports the percentage of low-income dwellings in the building; this percentage is used to distribute savings between WHRP (non-low-income) and LIEEP. No units were audited this year that had less than 100% low-income status.

3.6.1 Participation and Reported Savings by Customer Segment

Table A-. presents the participation counts, reported energy and demand savings, and incentive payments for LIEEP in PY11 by customer segment. The counts in Table A-. relate to Low-Income Kits, Low-Income HER, and Low-Income WHRP. As previously mentioned, MFHR Program impacts are discussed in Section 3.10.

Table A-. LIEEP Participation and Reported Impacts

Parameter	Residential Low-Income Kits	Residential Low-Income HER	Residential Low-Income WHRP	Residential Low-Income Total
PYTD No. of Participants	2,449	14,764	1,482	18,695
PYRTD MWh/yr	1,469	1,696	705	3,870
PYRTD MW/yr	0.12	0.19	0.07	0.38
PY11 Incentives (\$1,000)		\$254		\$254

Source: Guidehouse analysis

3.6.2 Gross Impact Evaluation

In-depth gross impact evaluations occurred for Low-Income Kits, Low-Income HER, and Low-Income WHRP.

Guidehouse completed Low-Income Kit activities in coordination with the market rate REEP kits program and applied the same methodologies as detailed in Section 3.2. Guidehouse conducted surveys with 112 participants who received kits. Similarly, Guidehouse completed Low-Income HER activities in coordination with the HER market rate program and applied the same methodologies as detailed in Section 3.4.

Table 3.6-1. shows the LIEEP sample design for PY11. LIEEP components are not stratified except for Low-Income WHRP. Low-Income WHRP was implemented through three efforts during PY11: resident-initiated audits, property owner-initiated audits, and multifamily building-level retrofits. Of the two audit-based implementations, the former is initiated by a Duquesne Light customer, while the latter is initiated by a multifamily property owner of a residential Duquesne Light customer who occupies a dwelling unit. Although they differ in how they are initiated, the audits themselves typically have otherwise consistent implementation. In addition to audit-based participation, many multifamily participants are identified through the MFHR, and the implemented measures are not associated with an audit. In these situations, common-area efficiency improvements are made to the building through MFHR, but any measures installed to individually metered dwellings are referred to the WHRP for in-apartment improvements. These are captured within the third Low-Income WHRP stratum shown in Table 3.6-1..

For the three Low-Income WHRP strata shown in Table 3.6-1., Guidehouse first conducted engineering desk reviews for all reported measures and recalculated savings using the TRM. Then, the team used the following evaluation approaches for each stratum to arrive at ISRs.

- Low-Income WHRP–Resident-initiated audits: Guidehouse surveyed 78 participants to verify equipment installations.
 - Due to a survey error, the team was able to verify all but refrigerator and freezer recycling and replacement measures. Where this error occurred, the team instead applied the refrigerator recycling and replacement ISR determined from PY9 and PY10 surveying which was 100%.
- Low-Income WHRP–Property owner-initiated audits: Contact information was not available (telephone numbers or emails) for the Duquesne Light customers within dwelling units where these retrofits occurred. Therefore, the team applied ISRs from PY10 surveying efforts.
- Low-Income WHRP–Multifamily building level retrofits: The team used ISRs from PY10 onsite verification efforts.

The engineering desk reviews and ISR determinations were then combined to arrive at the final verified results for Low-Income WHRP.

Table 3.6-1. LIEEP Gross Impact Sample Design for PY11

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Low-Income Kits	2,449	112	Participant survey and TRM review
Low-Income HER	14,764	14,764	Regression analysis
Low-Income WHRP – Resident-initiated audits	898	78	Participant surveys and engineering desk reviews
Low-Income WHRP – Property owner-initiated audits	577	N/A	Engineering desk review; apply PY10 realization rates
Low-Income WHRP – Multifamily building-level retrofits	7*	N/A	Engineering desk review; apply PY10 realization rates
Program Total	18,695	14,954	

*Low-Income WHRP multifamily building-level retrofits population is 7, representing the number of projects.

Source: Guidehouse analysis

Table 3.6-2 and Table 3.6-3 show the energy and demand gross impact results for LIEEP, respectively.

Table 3.6-2. LIEEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Low-Income Kits	1,469	90%	0.22	3.0%
Low-Income HER	1,696	111%	N/A	0.0%
Low-Income WHRP – Resident-initiated audits	431	82%	0.61	10.1%
Low-Income WHRP – Property owner-initiated audits	167	95%	0.14	3.7%
Low-Income WHRP – Multifamily building-level retrofits	107	95%	0.14	3.7%
Program Total	3,870	99%		1.4%

Source: Guidehouse analysis

Table 3.6-3. LIEEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Low-Income Kits	0.12	91%	0.25	3.4%
Low-Income HER	0.19	111%	N/A	0.0%
Low-Income WHRP – Resident-initiated audits	0.04	83%	0.70	11.6%
Low-Income WHRP – Property owner-initiated audits	0.02	97%	0.14	3.9%
Low-Income WHRP – Multifamily building-level retrofits	0.01	97%	0.14	3.9%
Program Total	0.38	101%		1.4%

Source: Guidehouse analysis

The following factors led to the variation between the reported and verified savings and led to the observed realization rates.

- **Low-Income Kits:**

- From the TRM review, deemed savings per kit changed only slightly, by an increase in savings of about 1% per kit. The team made the same adjustment for REEP Kits (Section 3.2).
- Guidehouse found that, on average, respondents installed or plan to install roughly seven of the eight LED lights provided. The LED ISR is the primary driver for the 90% energy and 91% demand realization rates.

- **Low-Income HER:**

- The verified ex post energy savings for Low-Income HER in PY11 were 1,890 MWh after adjusting for double counted savings with other Duquesne Light energy efficiency programs. Low-Income HER demand savings are calculated by dividing the energy savings by 8,760 hours, which is consistent with PY8 through PY10 and guidance from the Framework. Low-Income HER demand savings were 0.22 MW.
- The energy realization rate for Low-Income HER is 111%. Guidehouse found that energy savings per participant home were verified at slightly lower than the CSP's reported estimate. Before rebalancing low-income individuals from the market rate HER wave (see Section 3.4), the realization rate was 98%. Reallocating a portion of savings (225 MWh) from the market rate HER wave to the low-income HER wave increased the realization rate.

- **Low-Income WHRP:**

- For the resident-initiated audit participants surveyed, Guidehouse found an ISR of 76% for direct install measures (excluding refrigerator and freezer recycling and replacement).
- All refrigerator and freezer recycling and replacement measures received ISRs of 100%, based on the PY9 and PY10 survey verification efforts and the PY10 onsite verification efforts. All of those recycling and replacement activities were confirmed by Guidehouse.
- Guidehouse also recalculated deemed measures savings for all measures implemented.

Behavioral Program and Component Absolute Precision

Guidehouse calculated the absolute precision results for the Low-Income HER wave. Section 6.1.1.1.1 of the Phase III Evaluation Framework requires the program-level verification for these behavioral programs to achieve an absolute precision of $\pm 0.5\%$ at the 95% confidence level (two-tailed), while individual waves may have a wider margin of error. Appendix C provides regression details, precisions, and error estimates.

Errors are not reflected in Table 3.6-2 or Table 3.6-3. Instead, those tables reflect the uncertainty associated with the sampling (i.e., relative precision at the 85% confidence level). Guidehouse analyzed all HER Program data via its census approach and did not use sampling. There is no sampling uncertainty to report.

3.6.3 Net Impact Evaluation

NTG ratios are assumed to equal 100% for LIEEP. Guidehouse assumes that no free ridership or spillover activity occurred among the low-income participants of LIEEP in PY11. This assumption is consistent with SWE guidance. Low-Income HER gross impacts equal net impacts given the nature of the RCT approach (see Section 3.4).

HIM Research

Guidehouse did not conduct HIM research for LIEEP in PY11.

3.6.4 Verified Savings Estimates

In Table 3.6-4 the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LIEEP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.6-4. LIEEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	3,870	0.38
PYVTD Gross	3,831	0.38
PYVTD Net	3,831	0.38
RTD	15,018	1.49
VTD Gross	13,808	1.41
VTD Net	13,714	1.40

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.6.5 Process Evaluation

Guidehouse conducted interviews with four of the CSP's onsite auditors for Low-Income WHRP. Guidehouse targeted questions to understand program administration, customer satisfaction, and the onsite audit process. All of the auditors stated that participants appreciate the LEDs they received. However, the auditors also highlighted that Duquesne Light may be missing savings opportunities by not offering additional types of LEDs outside of the standard A-lines. For example, auditors suggested that Duquesne Light consider providing auditors with candelabras, PAR, or globe type lamps. The auditors also indicated that smart strip measures can be "hit or miss" with some participants embracing them and others uninstalling them. The auditors learn about uninstalling events through follow-up calls they conduct with participants. As part of the participant survey, Guidehouse asked participants about 72 smart strips reported and found that only 54 remained installed. Finally, the auditors expressed frustration with the amount of paperwork required during the onsite activities, especially during a pandemic where transferring physical documents between participants creates social distancing concerns. Three of the auditors recommended electronic documentation methods (e.g. tablets or iPads) as a remedy. The auditors indicated that those tools have streamlined similar audits in other jurisdictions.

Section 3.2.5 and section 3.4.5 include results and findings from the process evaluation of PY11 REEP Kits and HER activities, respectively. These activities combined market rate and low-income evaluation tasks.

3.6.6 Cost-Effectiveness Reporting

Table 3.6-5 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.6-5 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.6-5. Summary of Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$254	\$762

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$236		-\$193	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$18		\$569	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$6	\$27
6	Administration, Management, and Technical Assistance ^[3]	\$42	\$27	\$128	\$198
7	Marketing ^[4]	\$0	\$0	\$6	\$0
8	Program Delivery ^[5]	\$0	\$1,034	\$65	\$2,512
9	EDC Evaluation Costs	\$62		\$176	
10	SWE Audit Costs	\$26		\$113	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,191		\$3,231	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,209		\$3,800	
14	Total NPV Lifetime Electric Energy Benefits	\$419		\$1,944	
15	Total NPV Lifetime Electric Capacity Benefits	\$103		\$515	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$121	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$36		-\$61	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$486		\$2,520	
19	TRC Benefit-Cost Ratio ^[8]	0.40		0.66	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HER Program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.6-6 presents program financials and cost-effectiveness on a net savings basis.

Table 3.6-6. Summary of LIEEP Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$254		\$762	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$236		-\$193	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$18		\$569	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$6	\$27
6	Administration, Management, and Technical Assistance ^[3]	\$42	\$27	\$128	\$198
7	Marketing ^[4]	\$0	\$0	\$6	\$0
8	Program Delivery ^[5]	\$0	\$1,034	\$65	\$2,512
9	EDC Evaluation Costs	\$62		\$176	
10	SWE Audit Costs	\$26		\$113	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,191		\$3,231	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,209		\$3,800	
14	Total NPV Lifetime Electric Energy Benefits	\$419		\$1,944	
15	Total NPV Lifetime Electric Capacity Benefits	\$103		\$515	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$121	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$36		-\$61	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$486		\$2,520	
19	TRC Benefit-Cost Ratio ^[8]	0.40		0.66	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HER Program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.6.7 Status of Recommendations

The impact and process evaluation activities in PY11 led to the findings and recommendations shown in Table 3.6-7; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery. Findings and recommendations presented in the market rate programs that are counterpart to Low-Income Kits (see Section 3.2.7) and Low-Income HER (see Section 3.4.7) also inform the LIEEP evaluation.

Table 3.6-7. LIEEP Findings and Recommendations

Findings	Recommendations
WHRP Data Management	
<ul style="list-style-type: none"> Guidehouse heard from onsite auditors that physical paperwork can be cumbersome and make efficient data collection difficult. Additionally, onsite auditors said that the pandemic made exchanges of physical report and application papers with participants difficult given the desire for social distancing. 	<ul style="list-style-type: none"> Duquesne Light should direct its CSP to adopt digital solutions for onsite audit teams. Specifically, CSPs should use tablets to track and record direct install and other program information. Tablets would allow onsite auditors to email participants electronic copies of reports and applications.
<p>Duquesne Light Response: Under consideration. Duquesne Light will explore options as part of its Phase IV planning. Modifications to the PMRS tracking system for Phase IV will support uploading digital information.</p>	
Direct Install Measure Offerings	
<ul style="list-style-type: none"> Guidehouse heard from onsite auditors that participants tend to have a mix of bulb types installed within their homes (e.g., candelabras, PAR, globe), so only offering A-line type LEDs is leaving potential program savings on the table. 	<ul style="list-style-type: none"> Duquesne Light should consider adding non-standard bulb types to their list of direct installation offerings in future program years, including Phase IV.
<p>Duquesne Light Response: Under consideration. Duquesne Light is exploring alternative direct install measures and identifying possible opportunities for implementation.</p>	

Source: Guidehouse analysis

3.7 Commercial Efficiency and Express Efficiency Programs

As noted in Duquesne Light’s Phase III EE&C Plan filing,¹⁷ “the Express Efficiency, Commercial Efficiency, and Industrial Efficiency Programs provide common incentives for a full range of common measures to assist C&I customers of all sizes and in all key market segments to overcome barriers to adopt energy efficiency measures. These programs put in place a baseline program design, with set incentive levels and measure content. The design provides an overarching programmatic structure with calculated incentives for customized projects or itemized incentives for standard measures.”

While all three programs share these characteristics, as a group they represent a significant percentage of projected portfolio savings. Only two (Express Efficiency and Commercial Efficiency) have been grouped together for evaluation purposes—the Industrial Efficiency Program (IEP) is evaluated separately.

The Express Efficiency Program (EXP) provides rebates to offset the higher cost of high efficiency equipment when compared to standard efficiency equipment. Program incentives promote customer indifference to the higher cost of high efficiency equipment and increase customer adoption of high efficiency equipment. EXP targets all Duquesne Light C&I customers

¹⁷ Duquesne Light Company – Revised Phase III Energy Efficiency and Conservation Plan

with maximum demand less than 300 kW that are not already participating in other Act 129 programs. EXP is delivered by a core team of Duquesne Light staff.

Similar to EXP, the Commercial Efficiency Program (CEP) provides rebates to offset the higher cost of high efficiency equipment when compared to standard efficiency equipment. Program incentives promote customer indifference to the higher cost of high efficiency equipment and increase customer adoption of high efficiency equipment. CEP also includes energy audits, which provide business customers a reliable source of information about their energy use and ways to save energy, reduce operating costs, lower carbon emissions, and improve air quality. CEP targets all Duquesne Light commercial customers with maximum monthly demand equal to or greater than 300 kW. CEP is delivered by Franklin Energy, the program's CSP. Key support by Franklin Energy includes outreach and assistance to trade allies that sell and install qualifying products, use of energy surveys to assist customers in identifying opportunities, and application qualification and payment processing.

A participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or programs are counted more than once (once in each year or program).

3.7.1 Participation and Reported Savings by Customer Segment

Table 3.7-1 presents the participation counts, reported energy and demand savings, and incentive payments for the two programs in PY11 by customer segment and program.

Table 3.7-1. CEP/EXP Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Total
PYTD No. of Participants	266	64	330
PYRTD MWh/yr	9,620	13,633	23,253
PYRTD MW/yr	1.30	2.28	3.58
PY11 Incentives (\$1,000)	\$633	\$724	\$1,357

Source: Guidehouse analysis

3.7.2 Gross Impact Evaluation

For the PY11 evaluation and as described in the PY11 Evaluation Plan, Guidehouse relied on projects previously sampled and verified from PY10 and combined those with additional sampled projects from PY11. The evaluation team used this rolling 2-year verification approach to estimate the realization rate for PY11. The team will use a similar method for PY12—these PY11 projects will be combined with PY12 projects to create a new realization rate for PY12 activities.

Table 3.7-2 provides the resulting population and sampling sizes. Table 3.7-3 and Table 3.7-4 show the gross energy and demand results for CEP/EXP, respectively.

CEP/EXP site verifications were not directly affected by COVID-19 safety concerns, as all projects in the Small stratum were already slated for phone verifications. The team did not

reduce sample size targets within sampling plans. Sites in the Medium and Large strata received site visits with COVID-19 safety protocols in place.

Table 3.7-2. CEP/EXP Gross Impact Sample Design

Stratum	Population Size (PY11)	Achieved Sample Size (PY10/PY11 Combined)	Evaluation Activity
Commercial/Express - Large	9	6	Verification only visit, verification and trending visit
Commercial/Express - Medium	46	15	Verification only visit, verification and trending visit
Commercial/Express - Small	302	15	Phone verification*, verification only visit
Standard LED (cross-sector upstream lighting)**	0	0	Apply PY9 cross-sector sales rate, census review of PMRS and detailed CSP records
Specialty LED (cross-sector upstream lighting)**	0	0	Apply PY9 cross-sector sales rate, census review of PMRS and detailed CSP records
Program Total	357	36	

*Some PY11 sites that would normally have received a site visit received a phone verification due to COVID-19-related safety concerns.

**Cross-sector sales from the REEP upstream lighting program to commercial customers are included in the CEP/EXP Program group. Appendix A details the methodology and results.

Source: Guidehouse analysis

Table 3.7-3. CEP/EXP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	PYVTD MWh/yr	Sample C _v	Relative Precision at 90% CL*
Commercial/Express - Large	5,709	79%	4,505	0.39	31.7%
Commercial/Express - Medium	10,695	103%	11,026	0.11	5.0%
Commercial/Express - Small	6,849	127%	8,706	0.40	18.3%
Standard LED (cross-sector upstream lighting)**	0	N/A	411	7.38	184.8%
Specialty LED (cross-sector upstream lighting)**	0	N/A	1,974	13.26	200.7%
Program Total	23,253	114%	26,622		17.3%

*CEP/EXP was sampled targeting 90/15 for PY10.

**Cross-sector sales from the REEP upstream lighting program to commercial customers are included in the CEP/EXP Program group. Appendix A details the methodology and results. These savings, which are included in verified but not reported values, contribute to higher realization rates and lower precision for the program.

Source: Guidehouse analysis

Table 3.7-4. CEP/EXP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	PYVTD MW/yr	Sample C _v	Relative Precision at 90% CL*
Commercial – Large	0.97	82%	0.80	0.30	24.4%
Commercial – Medium	1.60	107%	1.70	0.20	8.9%
Commercial – Small	1.02	134%	1.37	0.68	31.0%
Standard LED (cross-sector upstream lighting)**	0	N/A	0.09	7.38	184.8%
Specialty LED (cross-sector upstream lighting)**	0	N/A	0.25	13.26	200.7%
Program Total	3.58	117%	4.20		16.8%

*CEP/EXP was sampled targeting 90/15 for PY10.

**Cross-sector sales from the REEP upstream lighting program to commercial customers are included in the CEP/EXP Program group. Appendix A details the methodology and results. These savings, which are included in verified but not reported values, contribute to higher realization rates.

Source: Guidehouse analysis

In accordance with guidance from the SWE,¹⁸ Guidehouse analyzed savings for PY11 projects as though operations at the sites had not changed due the COVID-19 pandemic. The evaluation team did ask site contacts for information as to how the pandemic had changed sites' operations (HOU, production, etc.), but this data were used to normalize savings to a non-pandemic year rather than to calculate savings directly.

The factors affecting the CEP and EXP realization rates for PY11 are as follows:

- Thirteen projects had verified HOU that differed from the values used in the ex ante calculations. This primarily affected sites where the implementer used deemed HOU from the 2016 TRM.
- Five projects had controls on the lights that were either not accounted for in the ex ante calculations or mislabeled in the ex ante calculations.
- Six sites had fewer fixtures installed than indicated in the project files, reducing savings.
- Three sites had different fixture wattages installed than indicated in the project files.
- One site had a different heating type than anticipated, changing savings slightly.

3.7.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan, the team conducted free ridership and spillover research in PY11 for the CEP and EXP Programs. The evaluation team's free ridership and spillover research aligned to the methodologies required by the SWE Evaluation Framework.¹⁹ Guidehouse attempted a census of all PY11 program participants using a combination of online and phone surveys, depending on available contact information. The evaluation team attempted

¹⁸ "PY11 EM&V and the Coronavirus Outbreak," June 3, 2020

¹⁹ Evaluation Framework for Pennsylvania Act 129 Phase III Energy Efficiency and Conservation Programs. Final Version. October 21, 2016. Appendix C. Common approach for Measuring Free Riders for Downstream Programs. C.4.3 Assessment of Intention in Nonresidential Programs. Appendix D. Common Approach for Measuring Spillover for Downstream Programs. D.3.3. Nonresidential Participant Spillover.

to contact participants up to six times via email or phone, achieving 32 survey completes for the net impact portion of the survey, Table 3.7-5 shows. Each participant was asked about one project and up to three measures, with one question on whether their decision-making was the same for any other projects if they participated in the program multiple times during PY11. The estimated free ridership, spillover, and NTG results are shown Table 3.7-6.

Table 3.7-5. PY11 CEP/EXP Net Impact Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rates
Express Efficiency	150	Online and phone survey	Census attempt (18)	28	19%
Commercial Efficiency	36	Online and phone survey	Census attempt (9)	4	11%
Total	186		27	32	17%

*The population counts represent all unique customers with unique contact information (email address or phone number) who participated in this program.

Source: Guidehouse analysis

Table 3.7-6. PY11 CEP/EXP Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTG Ratio	Sample C _v	Relative Precision at 85% CL
Express Efficiency	10%	0%	90%	0.18	5.0%
Commercial Efficiency	38%	0%	62%	0.49	46.9%
Total	21%	0%	79%		10.3%

Source: Guidehouse analysis

HIM Research

Guidehouse conducted HIM research for measures implemented during PY11. The team identified LED interior low-/high-bay fixtures, LED exterior area lighting fixtures, and LED linear replacement lamps as HIMs for the nonresidential sector. Table 3.7-7 presents estimated free ridership, spillover, and NTG ratios for these HIMs in the nonresidential sector. For ease of reference, this table is also displayed in the IEP report section, Section 3.11.

Table 3.7-7. PY11 Nonresidential High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Express/Commercial/Industrial Efficiency	LED Interior Low/High-Bay Fixture	42%	0%	58%
Express/Commercial/Industrial Efficiency	LED Exterior Area Lighting Fixture	13%	0%	87%
Express/Commercial/Industrial Efficiency	LED Linear Replacement Lamp	3%	0%	97%

Source: Guidehouse analysis

3.7.4 Verified Savings Estimates

In Table 3.7-8 Guidehouse applied the realization rates and NTG ratios to the reported energy and demand savings estimates to calculate the verified savings estimates for CEP and EXP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.7-8. EXP/CEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	23,253	3.58
PYVTD Gross	26,622	4.20
PYVTD Net	20,107	3.19
RTD	76,066	10.64
VTD Gross	89,185	12.95
VTD Net	56,263	8.25

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.7.5 Process Evaluation

Guidehouse completed process evaluation for CEP, EXP, and IEP in PY11. As part of this process, the evaluation team conducted two evaluation activities—customer surveys and trade ally interviews—to obtain feedback about their experience and satisfaction with the program delivery processes and opportunities for program improvement. The team also conducted interviews with program managers and the CSPs. These interviews aided survey and interview question updates. These interviews also confirmed that CEP, EXP, and IEP processes and implementation has remained consistent since PY10. The evaluation team combined the findings for these three programs in one section because of similarities in how these programs are implemented and the findings that resulted from this evaluation. Guidehouse also found some overlap because some trade allies are active in multiple programs. The sections below discuss the approach, results, and findings for each evaluation activity.

3.7.5.1 Participant Survey

The participant survey focused on customers who participated in CEP, EXP, and IEP in PY11. Guidehouse attempted a census and distributed the survey, which included process and net impact questions in one survey instrument, to 229 participants. The team received 38 fully completed surveys and four partially completed surveys. Table 3.7-9 provides an overview of the sample design.

Table 3.7-9. PY11 CEP, EXP, and IEP Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
Express Efficiency	150	Online and phone survey	Census attempt (18)	26	17%
Commercial Efficiency	36	Online and phone survey	Census attempt (9)	4	11%
Industrial Efficiency	43	Online and phone survey	Census attempt (16)	8	19%
Total	229		43	38	17%

*These population counts represent unique customers who participated in these programs in PY11.

Source: Guidehouse analysis

The process sections of the survey included questions on four main research topics:

- Program awareness
- Program influence and engagement
- Program satisfaction
- Program barriers and challenges

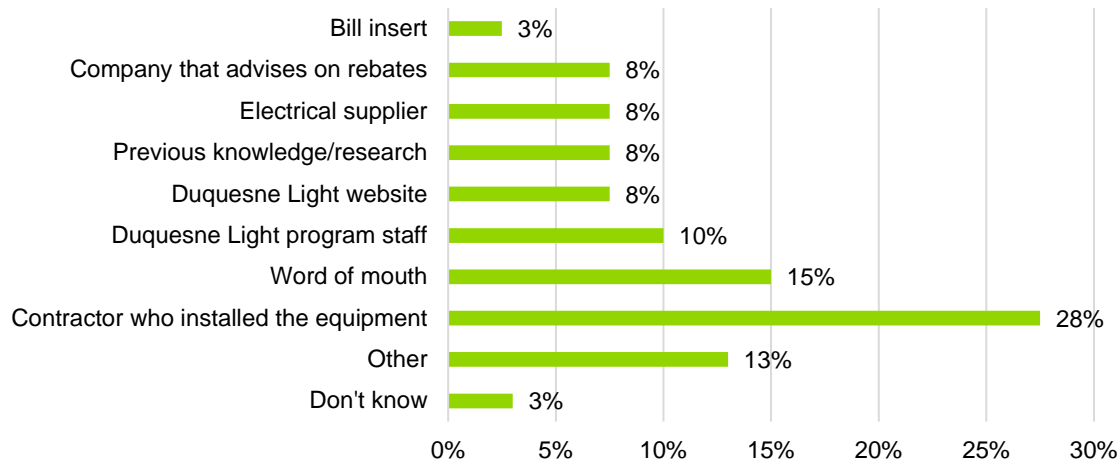
Guidehouse aimed to understand participants’ experiences in the program and identify areas for future improvement. The remainder of the section outlines the findings for each of these sections.

Program Awareness

Guidehouse asked participants to identify how they first heard about the Watt Choices Program.²⁰ As Figure 3.7-1. shows, respondents indicated the most common sources of program awareness are installation contractors who install equipment (28%) and word of mouth (15%). Five participants (13%) selected “other” but did not provide the exact source. Notably, no respondents in this sample first heard about the program through program brochures, Duquesne Light account executives, CSPs, or traditional media (e.g., radio, TV, magazines). These responses illustrate the importance of continuing to establish relationships to drive program participation through installation contractors and to pursue opportunities to increase program awareness through other channels, such as bill inserts, emails, brochures, the Duquesne Light website, and Duquesne Light account representatives.

²⁰ Duquesne Light Watt Choices, Business Programs. The customer and trade ally-facing program branding. <https://www.duquesnelight.com/energy-money-savings/watt-choices/business>

Figure 3.7-1. How did you first hear about the Watt Choices Program? (n=40)

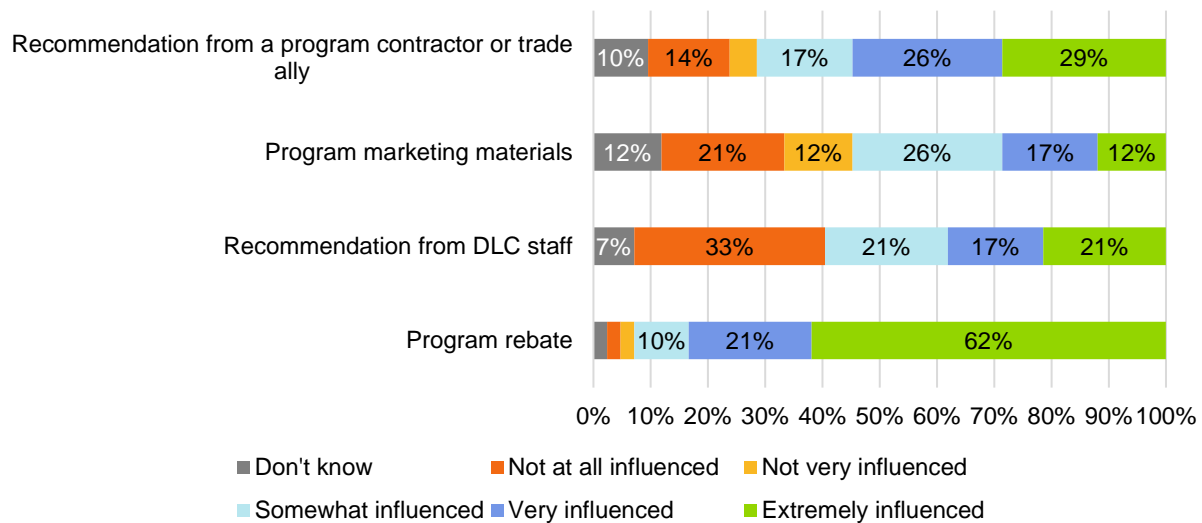


Source: Guidehouse analysis

Program Influence

Guidehouse asked participants how much the program influenced them to purchase and install energy efficient equipment. In general, responses show that multiple program components played a critical role in influencing customer behavior. The program marketing materials were the least influential in promoting program participation of the options provided; however, 29% of respondents still reported they were very or extremely influential in their decision. The program rebate and recommendations from a program contractor or trade ally were the most influential in their decision to purchase energy efficient equipment, with 83% and 55% of respondents, respectively, reporting being very or extremely influenced in their decision. These results indicate that participants place a high value on the monetary incentives and information provided by trusted advisors. Figure 3.7-2. provides an overview of the responses.

Figure 3.7-2. How influential were the following on your decision to install the energy efficient equipment? (n=38)

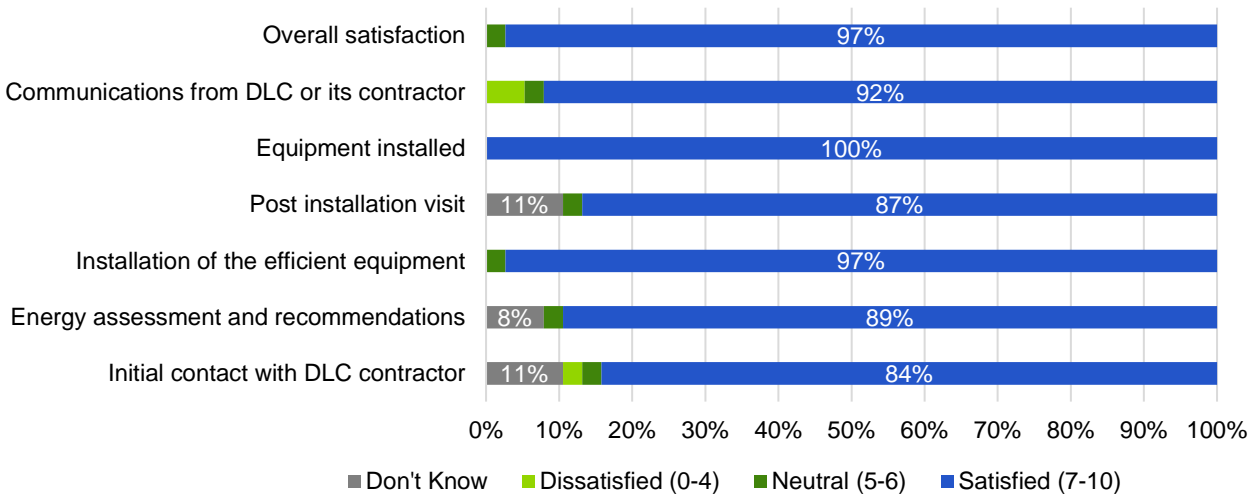


Source: Guidehouse analysis

Satisfaction

Guidehouse also gauged participants' sentiments toward various aspects of the program to understand how the program can be improved in the future. Overall, participants reported very high satisfaction rates with the program, rating the program, on average, a 9.6 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. The large majority of participants (97%) rated the program 7 or higher on a scale of 0-10, and most also rated each step of the program participation process 7 or higher. Participants provided the highest ratings for the equipment installed, with 100% of respondents providing a score of 7 or higher. Participants also reported high satisfaction with their initial contact with the Duquesne Light contractor; however, their satisfaction was slightly lower than the other program aspects Guidehouse inquired about in the survey. Figure 3.7-3. shows the results of customer satisfaction with the program.

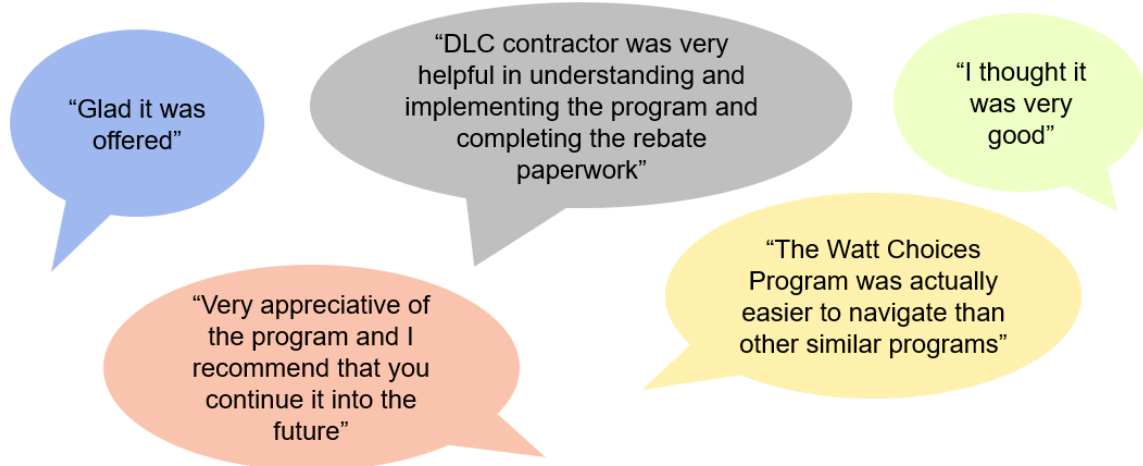
Figure 3.7-3. PY11 Watt Choices Customer Satisfaction Rates (n=38)



Source: Guidehouse analysis

Guidehouse also asked for open-ended feedback, where many respondents provided positive feedback. Figure 3.7-4. shows examples of positive comments.

Figure 3.7-4. Examples of Positive Responses for Watt Choices Program (n=13)



DLC refers to Duquesne Light in these direct quotes.

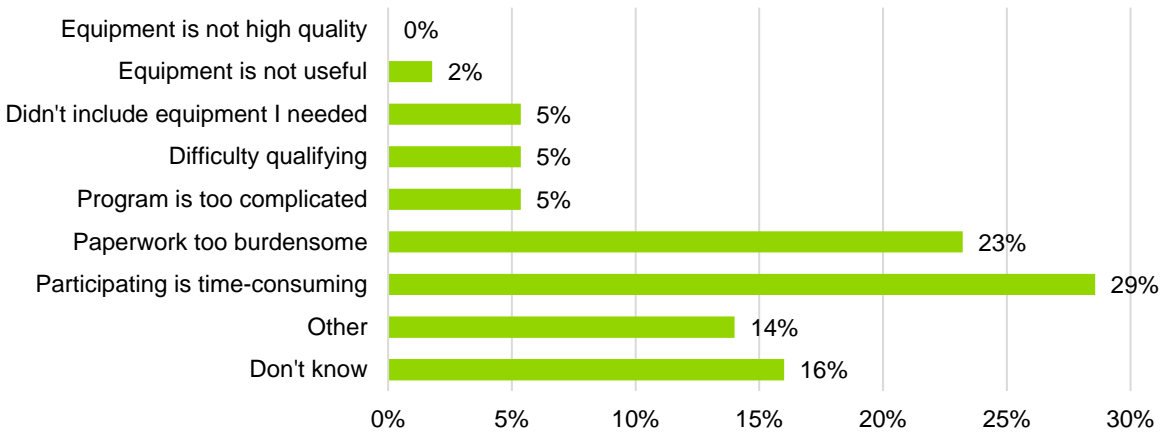
Source: Guidehouse analysis

A small portion of respondents who expressed some dissatisfaction with the program highlighted opportunities to improve the program; these opportunities seem to represent isolated incidents or unique circumstances of their projects. For instance, one customer was dissatisfied due to the length of time it took to receive the rebate. Another customer stated they would like Duquesne Light to make it easier to obtain a rebate for installing multiple items without having to provide duplicate information for the same equipment. One respondent requested making the program easier for customers to get set up to participate, and another requested additional information on how long the rebates will be available. These comments provide insight into methods Duquesne Light can use to continue to provide a great program experience for its customers.

Program Barriers and Challenges

Guidehouse also asked participants about program barriers and challenges associated with program participation. Overall, participants reported they are mainly concerned with the time commitment and effort required to participate in the program. Roughly one-quarter (23%) of customers indicated that participating is time-consuming, and one-third (29%) reported the paperwork is too burdensome. As Figure 3.7-5. shows, participants were least concerned with the equipment quality or usefulness. Other responses included cost (1 response), not understanding what measures qualify (1 response), and the desire for retroactive rebate submission (1 response). These responses illustrate that Duquesne Light should consider further streamlining program processes by reducing paperwork, where and if possible, and identifying methods to reduce the time commitment required to participate in this program.

Figure 3.7-5. What do you see as the main barriers for organizations like yours to participating in the program? Select up to 3 responses. (n = 56*)



The survey did not include a “no barriers” or “none” response.

*This count represents the total number of responses associated with each answer option (not unique customers who responded to this question).

Source: Guidehouse analysis

Recommendations resulting from the survey findings are included in Section 3.7.7.

3.7.5.2 Trade Ally Interviews

Guidehouse also conducted in-depth trade ally interviews to further supplement the process evaluation of the Watt Choices Program. Duquesne Light does not have a formal trade ally network; however, many companies work with the program and promote it to their customers in the Duquesne Light territory. The evaluation team reached out to the trade allies who participated in CEP, EXP, and IEP in Phase III.

Guidehouse attempted to contact via email or phone all 69 trade allies for whom contact information was available. The evaluation team obtained these contacts from the CSPs and from a random sample of EXP applications. The EXP contacts were pulled from project invoices obtained from Duquesne Light. In cases where the team could not identify a contact familiar with the program from these materials, Guidehouse also attempted to find the correct contact information using publicly available information or by asking other staff at the organization. Many of the contacts and organizations in the final sample had participated in multiple programs, and the team asked those trade allies about all of the programs in which they participated.

Guidehouse completed 13 interviews with the trade allies; they provided detailed input on their participation in the various programs. These trade allies represented a mix of manufacturers, equipment suppliers, distributors, energy auditors, installation contractors, engineering firms, architecture firms, and incentive management companies. Table 3.7-10 provides an overview of the sample design and the completed interviews.

Table 3.7-10. PY11 CEP, EXP, and IEP Interview Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Interviews	Completed Interviews**	Response Rate
Commercial/Express Efficiency	53	Phone interview	15	9	17%
Industrial Efficiency	16	Phone interview	9	4	25%
Total	69		26	13	19%

*Similar contacts were provided by various CSPs indicating that trade allies work with all types of nonresidential customers.

**Two respondents were from the same organization. However, the respondents operated separately within the company and are counted as two distinct respondents.

Source: Guidehouse analysis

Guidehouse aimed to understand the trade allies’ experiences with the program and to identify areas for future improvement. The interviews focused on three main research areas:

- Program awareness
- Program satisfaction
- Program barriers and challenges

Trade allies had significant insight into the program barriers and challenges, as many of them fill out the rebate application on behalf of their customers and estimate the rebate amounts. The following sections detail the findings from these interviews for each research area.

Program Awareness

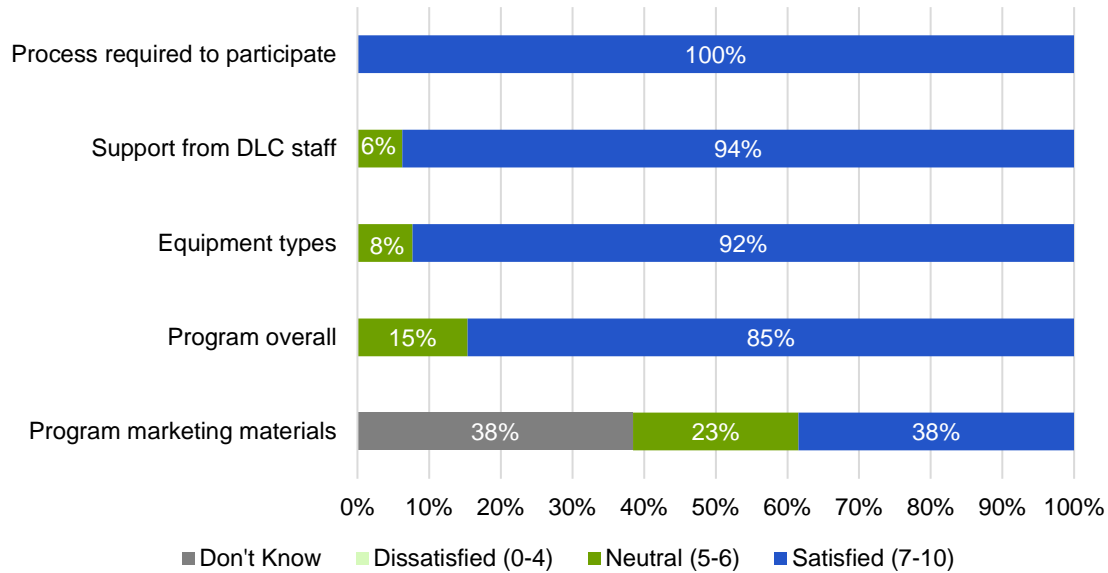
Trade allies reported first hearing about the Watt Choices Program through a variety of sources. The most common source of awareness was the Duquesne Light website. About half of respondents learned about the program through the website (6 responses out of 13). Three respondents reported having participated in this program for a long time and could not recall the initial source of their awareness. The others learned about the program from a Duquesne Light representative contacting them, through a seminar, or heard about it from another utility. These responses illustrate that Duquesne Light was able to generate the majority of its program partners through its website and direct outreach, while also maintaining successful relationships and retaining its long-standing partners for many years.

Satisfaction

The program satisfaction questions aimed to gauge trade allies’ sentiments toward various aspects of the program to understand how the program can be improved in the future. Overall, the trade allies who were interviewed reported very high satisfaction rates with the program, rating it, on average, an 8.8 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. All except one of the trade allies (92%) rated the program 7 or higher and rated most of the other program components 7 or higher as well. The trade allies provided the highest ratings for the process required to participate in the program and support from Duquesne Light staff, where all respondents provided a score of 7 or higher. They felt the least satisfied with the program marketing materials, with 23% providing a score of 6 or below. Five out of 13 (40%)

interviewees reported being unaware of any marketing materials. This was the primary reason for the ratings below 7 for the program marketing materials. Figure 3.7-6. provides the results of the trade allies' satisfaction with the programs and the program components.

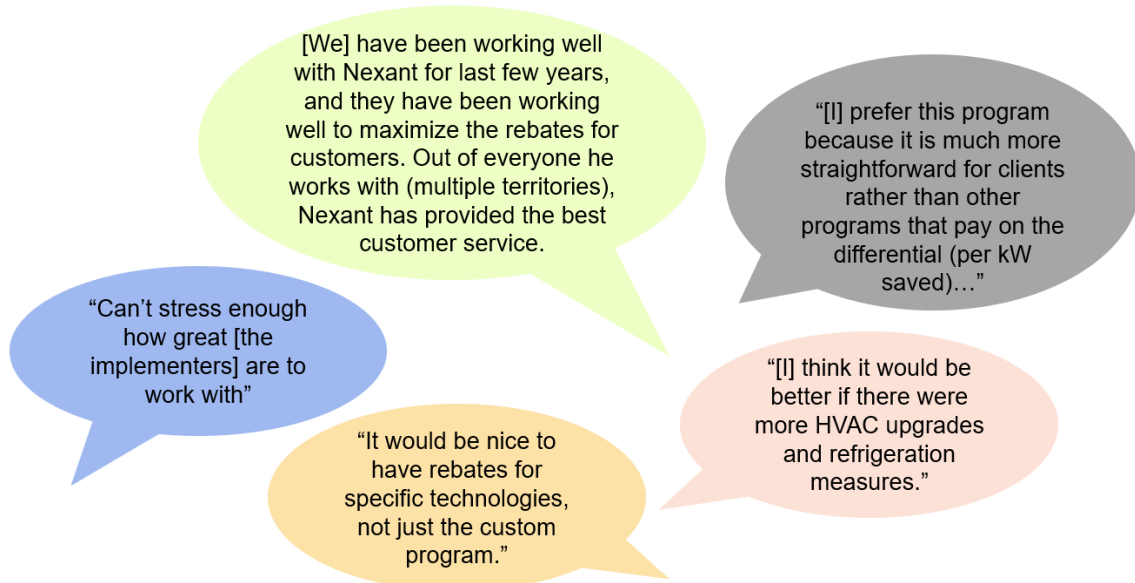
Figure 3.7-6. PY11 Watt Choices Trade Ally Satisfaction Rates (n=13)



Source: Guidehouse analysis

The trade allies provided various types of informative feedback throughout the interviews, reinforcing the high satisfaction score ratings. This feedback included positive comments about the program structure and about Duquesne Light's CSPs, Nexant and Franklin. Some trade allies also provided constructive feedback related to rebates and technologies offered. Figure 3.7-7. shows examples of some of the comments Guidehouse received about these programs.

Figure 3.7-7. Examples of Watt Choices Trade Ally Feedback (n=13)



Source: Guidehouse analysis

Program Barriers and Challenges

Guidehouse asked the trade allies if they are aware of any program barriers or challenges to program participation. Of respondents, 60% reported no barriers or challenges, and some stated the program is easy and straightforward to participate in. However, a few noted that some barriers to participation still exist. These barriers included lack of program awareness, gaps in measure offerings, and challenges related to the application materials and program contacts. Table 3.7-11 describes each of the responses received in more detail.

Table 3.7-11. C&I Trade Ally Program Barriers and Challenges

Barrier	Description
Program awareness	Two trade allies felt that program awareness was a barrier to participation. One of them requested Duquesne Light provide more information via email about program offerings, updates, and special offers.
Point of contact	Two trade allies noted they needed to talk to multiple Duquesne Light staff to receive answers to their questions about the programs. This was a result of the fact that depending on the size of the customer, different people were responsible for administering the program. Both respondents felt it was challenging to determine the best person to contact. One person specifically said they found it challenging to discern the differences amongst the three programs (EXP, CEP, and IEP), and they were often “bounced around” among various program managers.
Rebate application	Two trade allies noted some areas of improvement for the application process. Each provided a suggestion for improving it: <ul style="list-style-type: none"> • Use a single document to track incentives, HOU, and third-party payment authorization. • Share a project/application ID with trade allies, so they can accurately match rebate checks with the applications they submitted. Some trade allies work with multiple utilities.

Barrier	Description
Measure offerings	Five trade allies suggested additional measures could be added to Duquesne Light’s prescriptive catalogue, such as additional HVAC, refrigeration, food service equipment, lighting, and controls. Specifically, they mentioned motor retrofits for HVAC and refrigeration, zero-energy doors for refrigeration, LED downlights, higher wattage exterior lighting, occupancy sensors, horticultural lighting, food service equipment, HVAC controls, and daylight harvesting. They reported observing a growing demand for some of these technologies.
	Additionally, some interviewees understood that some measures can be rebated through the Custom Program. However, two of them suggested it would be easier to sell advanced energy efficiency technologies to customers if they were clearly specified in the prescriptive rebate catalog.

Source: Guidehouse analysis

A summary of findings and resulting recommendations from the trade ally interviews is included in Section 3.7.7.

3.7.6 Cost-Effectiveness Reporting

Table 3.7-12 through Table 3.7-15 present a detailed breakdown of program finances and cost-effectiveness. EXP and CEP results are shown separately. TRC benefits in Table 3.7-12 and Table 3.7-14 were calculated using gross verified impacts for EXP and CEP, respectively. Table 3.7-13 and Table 3.7-15 present program financials and cost-effectiveness on a net savings basis for both programs. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.7-12. Summary of EXP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$633		\$1,994	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$837		\$1,441	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,470		\$3,436	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$36
6	Administration, Management, and Technical Assistance ^[3]	\$50	\$43	\$181	\$297
7	Marketing ^[4]	\$1	\$0	\$2	\$0
8	Program Delivery ^[5]	\$0	\$997	\$435	\$2,201
9	EDC Evaluation Costs	\$104		\$283	
10	SWE Audit Costs	\$46		\$167	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,240		\$3,605	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,710	\$7,041
14	Total NPV Lifetime Electric Energy Benefits	\$5,637	\$18,393
15	Total NPV Lifetime Electric Capacity Benefits	\$1,967	\$6,882
16	Total NPV Lifetime Operation and Maintenance Benefits	\$316	\$1,364
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$685	-\$1,891
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$7,236	\$24,748
19	TRC Benefit-Cost Ratio ^[8]	2.67	3.51

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.7-13. Summary of EXP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$633		\$1,995	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$430		\$145	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,063		\$2,140	
5	Design & Development ^[2]	\$0	\$0	\$3	\$36
6	Administration, Management, and Technical Assistance ^[3]	\$50	\$43	\$181	\$297
7	Marketing ^[4]	\$1	\$0	\$2	\$0
8	Program Delivery ^[5]	\$0	\$997	\$435	\$2,201
9	EDC Evaluation Costs	\$104		\$283	
10	SWE Audit Costs	\$46		\$167	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,240		\$3,605	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,303	\$5,745
14	Total NPV Lifetime Electric Energy Benefits	\$4,076	\$11,128
15	Total NPV Lifetime Electric Capacity Benefits	\$1,422	\$4,145
16	Total NPV Lifetime Operation and Maintenance Benefits	\$228	\$810
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$495	-\$1,155
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$5,232	\$14,928
19	TRC Benefit-Cost Ratio ^[8]	2.27	2.60

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.7-14. Summary of CEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$724		\$2,110	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$1,277		\$4,618	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$2,001		\$6,727	
5	Design & Development ^[2]	\$0	\$0	\$3	\$41
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$41	\$152	\$298
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$749	\$55	\$2,204
9	EDC Evaluation Costs	\$93		\$266	
10	SWE Audit Costs	\$38		\$166	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
11	Program Overhead Costs (sum of rows 5 through 10)	\$953	\$3,186
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,954	\$9,913
14	Total NPV Lifetime Electric Energy Benefits	\$7,001	\$18,341
15	Total NPV Lifetime Electric Capacity Benefits	\$2,845	\$6,100
16	Total NPV Lifetime Operation and Maintenance Benefits	\$557	\$1,818
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$874	-\$1,525
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$9,528	\$24,734
19	TRC Benefit-Cost Ratio ^[8]	3.23	2.50

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.7-15. Summary of CEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$724		\$2,110	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$852		\$2,191	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,576		\$4,300	
5	Design & Development ^[2]	\$0	\$0	\$3	\$41
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$41	\$152	\$298
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$749	\$55	\$2,204

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
9	EDC Evaluation Costs	\$93	\$266
10	SWE Audit Costs	\$38	\$166
11	Program Overhead Costs (sum of rows 5 through 10)	\$953	\$3,186
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,529	\$7,486
14	Total NPV Lifetime Electric Energy Benefits	\$5,513	\$11,992
15	Total NPV Lifetime Electric Capacity Benefits	\$2,240	\$4,078
16	Total NPV Lifetime Operation and Maintenance Benefits	\$438	\$1,173
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$688	-\$1,048
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$7,504	\$16,195
19	TRC Benefit-Cost Ratio ^[8]	2.97	2.16

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.7.7 Status of Recommendations

The evaluation activities in PY11 led to the findings and recommendations shown in Table 3.7-16. Given the combined research effort, these process evaluation findings and recommendations include information from the participant surveys and trade ally interviews conducted for CEP, EXP, and IEP. Additional details about IEP can be found in Section 3.11.

Table 3.7-16. Findings and Recommendations for CEP, EXP, and IEP

Findings	Recommendations
Program Awareness and Influence	
<ul style="list-style-type: none"> Participants first heard about the programs from contractors who installed the equipment (28%), word of mouth (15%), and program staff (10%). Trade allies most frequently learned about the programs from the program website (6 responses). More than 90% of participants reported that rebates were at least somewhat influential in their decision to install energy efficient equipment. Similarly, more than 70% of participants reported that recommendations from installation contractors and trade allies were at least somewhat influential in their decisions to install energy efficient equipment. 	<ul style="list-style-type: none"> Duquesne Light should continue to build relationships with existing trade allies and expand relationships to other trade allies. Duquesne Light should leverage its website to provide more detailed information specifically tailored to potential new participants by clarifying the eligible measures, how trade allies can confirm if custom projects can be eligible, and what customers are eligible.
<p>Duquesne Light response: Under consideration. Duquesne Light will explore website update opportunities that would be made for Phase IV. Additionally, Duquesne Light believes that the Phase IV program design with a single-point of contact for all C&I programs may increase cross-promotions with programs and help increase customer awareness and participation.</p>	
Barriers and Challenges to Participation	
<ul style="list-style-type: none"> Some trade allies found it challenging to identify the correct point of contact for the three programs. Respondents said they needed to talk to multiple program managers to get needed information. 	<ul style="list-style-type: none"> Duquesne Light should provide a single point of contact for each customer or trade ally regardless of the customer/project size.
<p>Duquesne Light response: Accepted. Duquesne Light will share this recommendation with its program managers and CSPs for PY12 and instruct them to clarify contact information with participants. Additionally, Duquesne Light believes that the Phase IV program design with a single-point of contact for all C&I programs may increase cross-promotions with programs and help increase customer participation.</p>	
<ul style="list-style-type: none"> Participants reported burdensome paperwork as one of the main barriers for participating in the program. Similar to feedback heard from participants, trade allies noted that the program application materials could be improved. Specifically, they requested consolidating document requirements and appending unique project IDs to applications for easier tracking of rebate progress within the trade allies' organization. 	<ul style="list-style-type: none"> Duquesne Light should identify opportunities to streamline the application process by consolidating requested information into fewer documents. As part of any application streamlining effort, Duquesne Light should print unique project/application IDs on paperwork and issued checks to aid rebate progress tracking for trade allies and participants.
<p>Duquesne Light response: Under consideration. Duquesne Light will explore these opportunities to improve C&I program documentation and recordkeeping as part of the Phase IV activities.</p>	
<ul style="list-style-type: none"> Trade allies recommended adding measures related to HVAC, refrigeration, food service equipment, and lighting and controls to Duquesne Light's prescriptive catalog. 	<ul style="list-style-type: none"> Duquesne Light should explore additional measures as part of its Phase IV plan design, specifically the expanded measure lists included in the Phase IV TRM.
<p>Duquesne Light response: Under consideration. Phase IV planning is currently ongoing.</p>	

Source: Guidehouse analysis

3.8 Small/Medium and Large Nonresidential Midstream Lighting Program

The Duquesne Light Nonresidential Midstream Lighting Program was designed to remove barriers by providing point-of-sale incentives to commercial customers. Common barriers in

traditional programs include lengthy application processes and rebate delays. However, this nonresidential program offers instant rebates at the point of purchase to eligible customers who purchase program LEDs from participating Duquesne Light distributor partners. Duquesne Light electric commercial rate customers and contractors are eligible to participate, with the exclusion of new construction projects. CLEAResult is the CSP responsible for establishing program guidelines, monitoring program operations, and managing distributor participation.

A participant in this program is the account number associated with one or more qualifying purchases within the program year (e.g., Q1 through Q4 for PY11).

3.8.1 Participation and Reported Savings by Customer Segment

Table 3.8-1 presents the participation counts, reported energy and demand savings, and incentive payments for the Midstream Lighting Program in PY11 by customer segment.

Table 3.8-1. Midstream Lighting Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Total
PYTD No. of Participants	238	99	337
PYRTD MWh/yr	3,691	1,897	5,588
PYRTD MW/yr	0.68	0.35	1.03
PY11 Incentives (\$1,000)	\$212	\$104	\$316

Source: Guidehouse analysis

3.8.2 Gross Impact Evaluation

Because of program changes beginning in October 2018 that impacted the realization rates, Guidehouse applied the realization rate calculated in PY8 and PY9 to the first 4 months of PY10 (June 1-September 30). The evaluation team then evaluated the next 20 months (through the end of PY11) in a manner consistent with other programs by targeting 85/15 confidence/precision over the 20-month period. In the interim, while those evaluation activities occurred, the latter 8 months of PY10 were conveyed as unverified savings in the PY10 report but are now recorded here as verified.

Several projects (n=12) were implemented before the program changes in October 2018 and, using the original program rules, were not reported until the third and fourth quarters of PY10. These projects were included as verified savings in the PY10 report. The verified savings from the remainder of the projects from the 20-month period are included in this report.

Guidehouse divided the Large and Small programs into three strata each for the purposes of sampling and defined a project as a unique customer name/invoice and upload date combination, as this grouped the purchases by both location and time. This created six strata where savings are verified. The Extra Large strata are defined as projects having more than 20 kW in demand savings, as verification methodology is different for these projects (as detailed in the PY11 Evaluation Plan). Table 3.8-2 provides the resulting population and sampling sizes.

Table 3.8-3 and Table 3.8-4 show the gross energy and demand results for the Midstream Lighting Program.

Due to COVID-19 safety concerns with onsite verification visits, Guidehouse changed 17 sampled projects from onsite visits to telephone verifications. This represents all the projects in the Small and Large strata. Projects in the certainty stratum received site visits with COVID-19 safety protocols observed. The team did not reduce sample size targets within sampling plans due to COVID-19.

Table 3.8-2. Midstream Lighting Gross Impact Sample Design for PY10/PY11

Stratum*	Population Size**	Achieved Sample Size	Evaluation Activity***
LNUP-Extra Large	2	2	Phone verification, verification only site visit
LNUP-Large	41	9	Phone verification, verification only site visit
LNUP-Small	190	6	Phone verification, verification only site visit
SNUP-Extra Large	5	2	Phone verification, verification only site visit
SNUP-Large	75	7	Phone verification, verification only site visit
SNUP-Small	268	5	Phone verification, verification only site visit
Program Total	581	31	

*SNUP is the Small/Medium Nonresidential Upstream (Midstream Lighting) Program and LNUP is the Large Nonresidential Upstream (Midstream Lighting) Program.

**Participant counts when sampling reflect the total number of projects rather than the total number of participants.

***Some PY11 sites that would normally have received a site visit received a phone verification due to COVID-19-related safety concerns.

Source: Guidehouse analysis

Table 3.8-3. Midstream Lighting Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample Co _v	Relative Precision at 85% CL
LNUP-Extra Large	280	70%	0.34	99.5%
LNUP-Large	1,005	66%	0.96	51.1%
LNUP-Small	612	168%	0.95	66.2%
SNUP-Extra Large	757	133%	0.29	85.2%
SNUP-Large	2,143	121%	0.51	31.9%
SNUP-Small	791	116%	0.38	30.0%
Program Total	5,588	114%		16.7%

Source: Guidehouse analysis

The previously unverified savings are included in the program total realization rate numerator and no corresponding verified savings are included in the denominator. As a result, the program total realization rate appears higher than what historical program performance suggests.

Table 3.8-4. Midstream Lighting Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
LNUP-Extra Large	0.05	55%	0.39	114.1%
LNUP-Large	0.18	64%	1.38	73.3%
LNUP-Small	0.11	133%	1.07	74.4%
SNUP-Extra Large	0.14	144%	0.12	34.9%
SNUP-Large	0.40	122%	0.42	25.9%
SNUP-Small	0.14	135%	0.45	35.5%
Program Total	1.03	114%		15.3%

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and to the observed realization rates.

- **ISR:** CLEAResult, the CSP for this program, assumed an ISR of 89% for each site. Most sites had a verified ISR of 100%, though several had a lower ISR.
- **HOU:** Guidehouse updated HOU based on customer-reported HOU for all sites rather than only those sites with a savings greater than 20 kW. This led to a variation in HOU among the verified sites. LNUP sites were particularly affected by this driver, leading to a wide variation in site realization rates (from 29% to 314%) and a correspondingly low relative precision for those strata.

Midstream Lighting in general, and particularly LNUP, show wider realization rate variation than typical downstream projects, and wider variation than anticipated by Guidehouse as reflected in sample planning C_v assumptions. As a result, PY11 verified gross impacts did not meet the required 15% precision target. Originally, Guidehouse did not intend to evaluate the Midstream program during PY12, but plans to sample additional LNUP projects from PY12 to supplement these findings and improve the realization rate precision prior to applying it to the PY12 projects.

3.8.3 Net Impact Evaluation

Per the PY11 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for Midstream Lighting in PY11. The team relied on PY10 results for the estimates of participant free ridership and spillover. Table 3.8-5 shows the NTG ratio applied to Midstream Lighting projects.

Table 3.8-5. Midstream Lighting Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Estimated Participant Spillover	NTG Ratio	Relative Precision at 85% CL
A-Line LEDs	26%	0%	74%	31.9%
Other LEDs – All Other Projects	33%	0%	67%	41.9%
Total	28%	0%	72%	24.7%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for the Midstream Lighting Program in PY11.

3.8.4 Verified Savings Estimates

In Table 3.8-6, Guidehouse applied the realization rates and NTG ratios to the reported energy and demand savings estimates to calculate the verified savings estimates for Midstream Lighting in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.8-6. Midstream Lighting PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	5,588	1.03
PYVTD Gross	6,388	1.17
PYVTD Net	4,571	0.84
RTD	13,972	2.47
VTD Gross	15,991	2.81
VTD Net	12,679	2.22

Source: Guidehouse analysis

Table 3.8-6 also includes verified savings from PY10 that were originally recorded as unverified in the PY10 final annual report. Otherwise, the VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.8.5 Process Evaluation

Guidehouse did not conduct process evaluation research for Midstream Lighting during PY11.

3.8.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3.8-7 and Table 3.8-10. Small/Medium Midstream and Large Midstream results are shown separately. TRC benefits in Table 3.8-7 and Table 3.8-9 were calculated using gross verified impacts for Small/Medium Midstream and Large Midstream, respectively. Table 3.8-8 and Table 3.8-10 present program financials and cost-effectiveness on a net savings basis for both programs,

respectively. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.8-7. Summary of Small/Medium Midstream Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]		\$212		\$443
2	EDC Incentives to Trade Allies		\$0		\$0
3	Participant Costs (net of incentives/rebates paid by utilities)		\$0		-\$3
4	Incremental Measure Costs (sum of rows 1 through 3)		\$212		\$440
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$13
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$13	\$78	\$92
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$178	\$56	\$225
9	EDC Evaluation Costs		\$33		\$85
10	SWE Audit Costs		\$12		\$52
11	Program Overhead Costs (sum of rows 5 through 10)		\$267		\$603
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs		\$0		\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)		\$479		\$1,043
14	Total NPV Lifetime Electric Energy Benefits		\$692		\$1,714
15	Total NPV Lifetime Electric Capacity Benefits		\$351		\$722
16	Total NPV Lifetime Operation and Maintenance Benefits		\$0		\$573
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)		-\$93		-\$180
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)		\$949		\$2,829
19	TRC Benefit-Cost Ratio ^[8]		1.98		2.71

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
[1]	Includes direct install equipment costs.		
[2]	Includes direct costs attributable to plan and to advance the programs.		
[3]	Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.		
[4]	Includes the marketing CSP and marketing costs by program CSPs.		
[5]	Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.		
[6]	Total TRC Costs includes Total EDC Costs and Participant Costs.		
[7]	Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.		
[8]	TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.		

Source: Guidehouse analysis

Table 3.8-8. Summary of Small/Medium Midstream Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$212		\$443	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$60		-\$97	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$152		\$346	
5	Design & Development ^[2]	\$0	\$0	\$3	\$13
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$13	\$78	\$92
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$178	\$56	\$225
9	EDC Evaluation Costs	\$33		\$85	
10	SWE Audit Costs	\$12		\$52	
11	Program Overhead Costs (sum of rows 5 through 10)	\$267		\$603	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$419		\$948	
14	Total NPV Lifetime Electric Energy Benefits	\$495		\$1,388	
15	Total NPV Lifetime Electric Capacity Benefits	\$251		\$581	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$475	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$67		-\$142	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$679		\$2,302	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
19	TRC Benefit-Cost Ratio ^[8]	1.62	2.43

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.8-9. Summary of Large Midstream Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$104		\$417	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		-\$19	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$104		\$399	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$30
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$30	\$125	\$220
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$88	\$55	\$446
9	EDC Evaluation Costs	\$68		\$194	
10	SWE Audit Costs	\$28		\$122	
11	Program Overhead Costs (sum of rows 5 through 10)	\$246		\$1,194	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$350		\$1,593	
14	Total NPV Lifetime Electric Energy Benefits	\$280		\$1,597	
15	Total NPV Lifetime Electric Capacity Benefits	\$114		\$733	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$664	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$38		-\$170	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$356	\$2,824
19	TRC Benefit-Cost Ratio ^[8]	1.02	1.77

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.8-10. Summary of Large Midstream Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$104		\$417	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$29		-\$98	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$75		\$319	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$30
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$30	\$125	\$220
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$88	\$55	\$446
9	EDC Evaluation Costs	\$68		\$194	
10	SWE Audit Costs	\$28		\$122	
11	Program Overhead Costs (sum of rows 5 through 10)	\$246		\$1,194	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$321		\$1,513	
14	Total NPV Lifetime Electric Energy Benefits	\$200		\$1,323	
15	Total NPV Lifetime Electric Capacity Benefits	\$82		\$607	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$552	

17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$27	-\$139
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$255	\$2,344
19	TRC Benefit-Cost Ratio ^[8]	0.80	1.55

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.8.7 Status of Recommendations

The evaluation activities in PY11 led to the finding and recommendations shown in Table 3.8-11; the table also includes a summary of how Duquesne Light plans to address the recommendations in program delivery.

Table 3.8-11. Finding and Recommendation for Midstream Lighting

Findings	Recommendations
Contact Information	
<ul style="list-style-type: none"> Many contacts are unaware they have participated in the program or that their name was used as a contact for follow-up verification, leading to difficulty evaluating the program. This is particularly true at larger facilities where the contact is either a higher level official in the organization or the contact number given is for a general line rather than a specific site contact. 	<ul style="list-style-type: none"> Duquesne Light should add language to the data collection form stating the site contact should be someone knowledgeable of the lighting installations or that two contacts are required (e.g., a purchaser and a more general site contact for facility details or decision information).
Duquesne Light response: Under consideration. Duquesne Light will explore these opportunities to improve documentation and application forms for midstream implementations as part of the Phase IV activities.	
Verification Results and Precision	
<ul style="list-style-type: none"> The gross impact verification effort did not achieve the targeted precision (85/15) due to greater than expected variability in results. 	<ul style="list-style-type: none"> Duquesne Light should direct its evaluator to adjust future sampling approaches so that precision targets are achieved.
Duquesne Light response: Accepted. This has been implemented. Although verification activities were not originally planned for Midstream Lighting in PY12, Duquesne Light directed Guidehouse to sample PY12 projects to supplement the current sample whose verification results inform the realization rate for PY11 and PY12. Additional sample will inform an updated PY12 realization rate with the goal of achieving a narrower relative precision. Additionally, Guidehouse will make use of phone verifications as appropriate to expedite sample completion and in anticipation of pandemic conditions.	

Source: Guidehouse analysis

3.9 Small Commercial Direct Install Program

The SCDI program offers no-cost direct installation of energy efficient measures at small and medium C&I customer locations. This program targets Duquesne Light C&I customers with monthly demand less than 300 kW. The program has been highly successful in Phase III and exhausted its budget by the end of PY10 Q1. Therefore, no further savings were achieved in PY11, and Guidehouse did not evaluate the program in PY11 for gross impacts, as detailed in the Evaluation Plan approved by the SWE.

3.9.1 Verified Savings Estimates

In Table 3.9-1, Guidehouse conveys that no savings are recorded for SCDI in PY11. Totals from previous program years are summed to calculate the P3TD program impacts.

Table 3.9-1. SCDI PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	0	0
PYVTD Gross	0	0
PYVTD Net	0	0
RTD	10,934	1.36
VTD Gross	10,688	1.39
VTD Net	10,613	1.38

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged.

3.9.2 Cost-Effectiveness Reporting

Table 3.9-2 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.9-2 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.9-2. Summary of SCDI Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$21
6	Administration, Management, and Technical Assistance ^[3]	\$15	\$21	\$85	\$152

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$0	\$52	\$2,659
9	EDC Evaluation Costs	\$32		\$123	
10	SWE Audit Costs	\$9		\$76	
11	Program Overhead Costs (sum of rows 5 through 10)	\$77		\$3,171	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$77		\$3,171	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$4,417	
15	Total NPV Lifetime Electric Capacity Benefits	\$0		\$1,466	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$12	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		-\$259	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0		\$5,636	
19	TRC Benefit-Cost Ratio ^[8]	0.00		1.78	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.9-3 presents program financials and cost-effectiveness on a net savings basis.

Table 3.9-3. Summary of SCDI Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$0	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		\$0	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$0	

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$21
6	Administration, Management, and Technical Assistance ^[3]	\$15	\$21	\$85	\$152
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$0	\$52	\$2,659
9	EDC Evaluation Costs	\$32		\$123	
10	SWE Audit Costs	\$9		\$76	
11	Program Overhead Costs (sum of rows 5 through 10)	\$77		\$3,171	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$77		\$3,171	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$4,386	
15	Total NPV Lifetime Electric Capacity Benefits	\$0		\$1,455	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$12	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0		-\$257	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0		\$5,596	
19	TRC Benefit-Cost Ratio ^[8]	0.00		1.76	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.9.3 Status of Recommendations

Guidehouse has no recommendations for the SCDI program at this time.

3.10 Multifamily Housing Retrofit Program

MFHR targets multifamily housing for income-qualified occupants and provides a one-stop shop, simplifying program participation and energy efficiency measure adoption. The program assists its customers in improving the efficiency of common area spaces in building-level metered multifamily buildings serving low-income households. However, the program will serve the dwelling units of a qualified building if they are also served by a building-level meter.

MFHR is delivered by a core team of Duquesne Light staff supported by MCR Performance Solutions (MCR) staff. Program services include the administration of energy efficiency audits, technical assistance for measure-level project review and bundling, property aggregation, contractor negotiation, and equipment bulk purchasing. Services also include processing rebate applications and other funding source documentation requirements.

A participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or programs are counted more than once (once in each year or program).

3.10.1 Participation and Reported Savings by Customer Segment

Table 3.10-1 presents the participation counts, reported energy and demand savings, and incentive payments for the MFHR Program in PY11 by customer segment.

Table 3.10-1. MFHR Program Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)
PYTD No. of Participants	15
PYRTD MWh/yr	1,807
PYRTD MW/yr	0.15
PY11 Incentives (\$1,000)	\$502

While this program falls under the small C&I sector, a percentage of its savings are counted toward the low-income compliance target. See discussion of LIEEP in Section 3.6 for more information.

Source: Guidehouse analysis

3.10.2 Gross Impact Evaluation

Because of safety concerns related to COVID-19 in an enclosed multifamily setting and with the approval of the SWE, Guidehouse only performed phone verifications for the MFHR Program in PY11. Table 3.10-2 provides the resulting population and sampling sizes. Table 3.10-3 and Table 3.10-4 show the gross energy and demand results for MFHR, respectively.

Table 3.10-2. MFHR Gross Impact Sample Design for PY11

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
MFHR - Large	5	5	Phone verifications
MFHR - Small	13	3	Phone verifications
Total	18	8	

Source: Guidehouse analysis

Table 3.10-3. MFHR Program Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
MFHR - Large	1,351	99%	0.00	0.0%
MFHR - Small	456	113%	0.09	11.6%
Total	1,807	102%		2.3%

Source: Guidehouse analysis

Table 3.10-4. MFHR Program Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
MFHR - Large	0.09	103%	0.00	0.0%
MFHR - Small	0.06	117%	0.15	19.3%
Total	0.15	108%		5.6%

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and to the observed realization rates for MFHR.

- Three sites had HOU that differed from what the project files indicated. Of these, two had mislabeled boiler rooms as residential spaces.
- Two sites had lower fixture quantities than reported, reducing savings.
- One site had a different control type than anticipated. The fixtures had an integrated photocell, which was not included in the ex ante calculations.

3.10.3 Net Impact Evaluation

Similar to PY10, Guidehouse did not conduct an NTG evaluation for MFHR in PY11. Per Guidehouse's Evaluation Plan, the team relied on PY9 results for the estimates of participant free ridership and spillover.

Guidehouse applied the NTG factor for MFHR using the results from the PY9 telephone survey of program participants. The evaluation team attempted a census of all decision makers across MFHR, the Public Agency Partnership Program (PAPP), and the Community Education Energy Efficiency Program (CEEP) in PY9, achieving 16 survey completes, where each decision maker was asked about one project and up to three measures. Similar to PY9, the team used a single

combined NTG ratio of 0.45 for these three programs and applied it to all programs and strata, as shown in Table 3.10-5.

Table 3.10-5. MFHR Program Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Estimated Participant Spillover	NTG Ratio	Relative Precision at 85% CL
MFHR/CEEP/PAPP	55%	0%	45%	32.8%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for MFHR in PY11.

3.10.4 Verified Savings Estimates

In Table 3.10-6, Guidehouse applied the realization rates and NTG ratios to the reported energy and demand savings estimates to calculate the verified savings estimates for the MFHR Program in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.10-6. MFHR PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,807	0.15
PYVTD Gross	1,851	0.16
PYVTD Net	842	0.07
RTD	3,448	0.31
VTD Gross	3,411	0.31
VTD Net	1,591	0.15

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.10.5 Process Evaluation

Guidehouse conducted program manager, CSP, and trade ally interviews for the process evaluation of MFHR in PY11. The interviews with the program manager and the CSP aided interview question updates for the trade allies. Additionally, these interviews confirmed that the MFHR Program processes and implementation has remained consistent since PY10. Duquesne Light does not have a formal trade ally network; however, a few companies work with the program and promote the program to customers in the Duquesne Light territory. Guidehouse was able to obtain a list of three company representatives who worked with this program during PY11 from the CSP. The following sections summarize the objectives and results of these interviews.

Trade Ally Interviews

Guidehouse contacted all three trade allies who participated in MFHR in PY11 based on information provided by the CSP. The evaluation team attempted to contact these representatives via email or phone up to six times, depending on the available contact information. The team was only able to complete two interviews to obtain insight into the MFHR Program.

The objective of the interviews was to obtain feedback from these trade allies about their experience and satisfaction with the MFHR Program and to assess any potential program barriers and challenges. Overall, the two interviewees expressed very positive sentiments about the program. One reported experiencing an easy participation process with no challenges or barriers. One highlighted they were happy with the great support provided by the CSP. These two interviewees mentioned that the program is helpful in promoting energy efficiency in this specific market and rated the MFHR Program overall as a 9.0 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. Both interviewees rated all aspects of the program, such as process, equipment types eligible, and the support provided, as 8 or above on a scale of 0-10.

One person mentioned a challenge presented during a potential sale of energy efficiency projects. Currently, the rebate amount offered to multifamily customers varies on a project-by-project basis because it is calculated as a cost share after an audit is completed. Uncertainty in the incentive amount makes it challenging to communicate costs and finalize a potential sale of energy efficient equipment with customers. The trade ally suggested that having a standardized incentive rate would be less complicated to explain to the multifamily housing customers.

A summary of findings and resulting recommendations from the interviews is included in Section 3.10.7.

3.10.6 Cost-Effectiveness Reporting

Table 3.10-7 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.10-7 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.10-7. Summary of MFHR Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$502		\$742	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$1,464		\$1,679	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,966		\$2,421	
5	Design & Development ^[2]	\$0	\$0	\$5	\$19
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$19	\$95	\$138
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$502	\$52	\$885

9	EDC Evaluation Costs	\$43	\$124
10	SWE Audit Costs	\$18	\$78
11	Program Overhead Costs (sum of rows 5 through 10)	\$613	\$1,397
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,579	\$3,817
14	Total NPV Lifetime Electric Energy Benefits	\$942	\$1,301
15	Total NPV Lifetime Electric Capacity Benefits	\$197	\$292
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$0
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$75	-\$62
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$1,064	\$1,531
19	TRC Benefit-Cost Ratio ^[8]	0.41	0.40

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.10-8 presents program financials and cost-effectiveness on a net savings basis.

Table 3.10-8. Summary of MFHR Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$502		\$742	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$392		\$377	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$894		\$1,119	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$5	\$19
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$19	\$95	\$138

7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$502	\$52	\$885
9	EDC Evaluation Costs		\$43		\$124
10	SWE Audit Costs		\$18		\$78
11	Program Overhead Costs (sum of rows 5 through 10)		\$613		\$1,397
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs		\$0		\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)		\$1,507		\$2,515
14	Total NPV Lifetime Electric Energy Benefits		\$428		\$599
15	Total NPV Lifetime Electric Capacity Benefits		\$90		\$134
16	Total NPV Lifetime Operation and Maintenance Benefits		\$0		\$0
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)		-\$34		-\$28
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)		\$484		\$705
19	TRC Benefit-Cost Ratio ^[8]		0.32		0.28

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.10.7 Status of Recommendations

The evaluation activities in PY11 led to the finding and recommendation shown in Table 3.10-9; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.10-9. PY11 Findings and Recommendations for the MFHR Program

Findings	Recommendations
Program Awareness, Barriers, and Challenges	
<ul style="list-style-type: none"> This finding is based on only two interviews, where one person provided this suggestion. One trade ally mentioned that uncertainty in the incentive amount makes it challenging to communicate costs and finalize a potential sale of energy efficient equipment with multifamily customers. They suggested offering a standardized incentive rate for multifamily projects. 	<ul style="list-style-type: none"> Duquesne Light should expand their list of prescriptive measure offerings that would be common in multifamily buildings and standardize their incentive rates to increase certainty in estimating rebate amounts earlier in the project lifecycle. Guidehouse understands this would assist in sales of energy efficiency equipment in this market segment.
<p>Duquesne Light response: Under consideration. With the understanding that this recommendation originates from a single data point, Duquesne Light will explore these opportunities as part of the Phase IV activities.</p>	

Source: Guidehouse analysis

3.11 Industrial Efficiency Program

Similar to EXP and CEP, IEP provides rebates to offset the higher cost of high efficiency equipment when compared to standard efficiency equipment. Program incentives promote customer indifference to the higher cost and increase customer adoption of high efficiency equipment. IEP also includes energy assessments, energy manager walkabouts, system optimization studies, consultations, and project reviews at no cost to the customer.

IEP assists eligible industrial customers by identifying and pursuing energy management and energy efficiency improvements in their facilities. Industrial facilities in Duquesne Light’s service territory with monthly electric demand greater than 300 kW are eligible to participate in IEP.

A participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or in different programs are counted more than once (once in each year or program).

3.11.1 Participation and Reported Savings by Customer Segment

Table 3.11-1 presents the participation counts, reported energy and demand savings, and incentive payments for IEP in PY11 by customer segment.

Table 3.11-1. IEP Participation and Reported Impacts

Parameter	Large C&I (Non-GNI)
PYTD No. of Participants	43
PYRTD MWh/yr	15,841
PYRTD MW/yr	2.15
PY11 Incentives (\$1,000)	\$704

Source: Guidehouse analysis

3.11.2 Gross Impact Evaluation

Guidehouse completed both onsite and phone verifications for the IEP PY11 projects. Because of the size and complexity of industrial projects, which often consist of large numbers of line items, the evaluation team samples IEP at the measure level rather than at the project level.

For the PY11 evaluation and as described in the Guidehouse Evaluation Plan, the team relied on measures previously sampled and verified from PY10 and combined those with additional sampled measures from PY11. The evaluation team used this rolling 2-year verification approach to estimate the realization rate for PY11. Guidehouse will use a similar method for PY12—these PY11 measures will be combined with PY12 measures to create a new realization rate for PY12 activities.

Table 3.11-2 provides the resulting population and sampling sizes. Table 3.11-3 and Table 3.11-4 show the gross energy and demand results for IEP, respectively.

Due to COVID-19 safety concerns with onsite verification visits, Guidehouse changed two sampled projects from onsite visits to telephone verifications, both in the Medium stratum. The team did not reduce sample size targets within sampling plans. Two other sites, representing a total of four measures, received site visits in PY11 with COVID-19 safety protocols in place.

Table 3.11-2. IEP Gross Impact Sample Design for PY10 and PY11

Stratum	Population Size*	Achieved Sample Size (PY10/PY11 Combined)	Evaluation Activity
Industrial – Large	1	1	Verification and trending visit
Industrial – Medium	32	8	Verification only visit, verification and trending visit
Industrial – Small	282	10	Verification only visit, verification and trending visit, phone verification
Total	315	19	

*Participant counts when sampling reflect the total number of measures rather than the total number of participants.

Source: Guidehouse analysis

Table 3.11-3. IEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate (PY10/PY11 Combined)	Sample C _v	Relative Precision at 90% CL*
Industrial – Large	3,887	100%	0.00	0.0%
Industrial – Medium	8,497	72%	0.50	33.6%
Industrial – Small	3,457	100%	0.07	3.9%
Program Total	15,841	85%		14.0%

*IEP was sampled targeting 90/15 for PY11.

Source: Guidehouse analysis

Table 3.11-4. IEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate (PY10/PY11 Combined)	Sample C _v	Relative Precision at 90% CL*
Industrial – Large	0.46	100%	0.00	0.0%
Industrial – Medium	1.19	98%	0.42	28.1%
Industrial – Small	0.50	100%	0.08	4.9%
Program Total	2.15	99%		14.2%

*IEP was sampled targeting 90/15 for PY11.

Source: Guidehouse analysis

Factors affecting the PY11 realization rates for IEP (which include measures reported in both PY10 and PY11) were:

- Two lighting measures had a lower fixture quantity than reported, reducing savings for those line items.
- For one custom site, the model number of the installed equipment was different than the expected number. This increased savings for that site.
- One custom site incorrectly normalized chiller usage due to increased production. Correcting this lowered savings for that measure.

3.11.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan, the team conducted free ridership and spillover research in PY11 for IEP. The evaluation team's free ridership and spillover research aligned to the methodologies required by the SWE Evaluation Framework.²¹ Guidehouse attempted a census of all program participants in PY11 using a combination of online and phone surveys, depending on available contact information. The team attempted to contact program participants up to six times via email or phone, achieving 10 completed surveys for the NTG portion of the survey, as Table 3.11-5 shows. Each participant was asked about one project and up to three measures,

²¹ Evaluation Framework for Pennsylvania Act 129 Phase III Energy Efficiency and Conservation Programs. Final Version. October 21, 2016. Appendix C. Common approach for Measuring Free Riders for Downstream Programs. C.4.3 Assessment of Intention in Nonresidential Programs. Appendix D. Common Approach for Measuring Spillover for Downstream Programs. D.3.3. Nonresidential Participant Spillover.

with a question on whether their decision-making was the same for any other projects if they participated in the program multiple times during PY11. The estimated free ridership, spillover, and NTG results are shown in Table 3.11-6.

Table 3.11-5. PY11 IEP Net Impact Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Achieved Sample Surveys	Response Rate
Industrial Efficiency	43	Online and phone survey	Census attempt (16)	10	23%

*This population represents all PY11 unique customers who participated in Industrial Efficiency.

Source: Guidehouse

Table 3.11-6. PY11 IEP Efficiency Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTG Ratio	Sample Cv	Relative Precision at 85% CL
Industrial Efficiency	39%	0%	61%	0.35	17.4%

Source: Guidehouse analysis

HIM Research

Guidehouse conducted HIM research for measures implemented during PY11. The team identified LED interior low-/high-bay fixtures, LED exterior area lighting fixtures, and LED linear replacement lamps as HIMs for the nonresidential sector. Table 3.11-7 presents estimated free ridership, spillover, and NTG ratios for these HIMs in the nonresidential sector. For ease of reference, this table is also displayed in the CEP/EXP Program report section, Section 3.7.

Table 3.11-7. PY11 Nonresidential High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Express/Commercial/Industrial Efficiency	LED Interior Low/High-Bay Fixture	42%	0%	58%
Express/Commercial/Industrial Efficiency	LED Exterior Area Lighting Fixture	13%	0%	87%
Express/Commercial/Industrial Efficiency	LED Linear Replacement Lamp	3%	0%	97%

Source: Guidehouse analysis

3.11.4 Verified Savings Estimates

In Table 3.11-8 the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for IEP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.11-8: IEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	15,841	2.15
PYVTD Gross	13,441	2.13
PYVTD Net	8,170	1.29
RTD	42,223	4.75
VTD Gross	40,013	4.77
VTD Net	18,052	2.32

Source: Guidehouse analysis

The VTD savings contribution from prior years has changed since the PY10 final annual report was submitted. The SWE determined that PY10 verified savings were greater than originally reported.

- **Gross energy:** 22 MWh/yr increase
- **Net energy:** 7 MWh/yr increase

3.11.5 Process Evaluation

Given the similarities in program structure of IEP and CEP/EXP, Guidehouse combined the process evaluation discussion and results of IEP with the CEP/EXP process evaluation section. Refer to Section 3.7.5 for the results.

3.11.6 Cost-Effectiveness Reporting

Table 3.11-9 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.11-9 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.11-9. Summary of IEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$704		\$1,650	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$574		\$1,237	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,278		\$2,887	
5	Design & Development ^[2]	\$0	\$0	\$4	\$69
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$68	\$220	\$496
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$1,231	\$55	\$2,483

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
9	EDC Evaluation Costs	\$154	\$441
10	SWE Audit Costs	\$62	\$273
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,547	\$4,041
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,825	\$6,928
14	Total NPV Lifetime Electric Energy Benefits	\$7,152	\$18,334
15	Total NPV Lifetime Electric Capacity Benefits	\$2,532	\$4,940
16	Total NPV Lifetime Operation and Maintenance Benefits	\$146	\$314
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$691	-\$1,067
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$9,139	\$22,522
19	TRC Benefit-Cost Ratio ^[8]	3.23	3.25

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.11-10 presents program financials and cost-effectiveness on a net savings basis.

Table 3.11-10. Summary of IEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$704		\$1,650	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$73		-\$368	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$777		\$1,282	
5	Design & Development ^[2]	\$0	\$0	\$4	\$69

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
6	Administration, Management, and Technical Assistance ^[3]	\$32	\$68	\$220	\$496
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$1,231	\$55	\$2,483
9	EDC Evaluation Costs	\$154		\$441	
10	SWE Audit Costs	\$62		\$273	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,547		\$4,041	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$2,324		\$5,323	
14	Total NPV Lifetime Electric Energy Benefits	\$4,347		\$8,234	
15	Total NPV Lifetime Electric Capacity Benefits	\$1,539		\$2,383	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$89		\$143	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$420		-\$497	
18	Total NPV TRC Benefits ^[7] (Sum of rows 14 through 17)	\$5,555		\$10,264	
19	TRC Benefit-Cost Ratio ^[8]	2.39		1.93	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.11.7 Status of Recommendations

Recommendations for IEP are included with the EXP/CEP recommendations in Section 3.7.7. Guidehouse has no findings or recommendations unique to only IEP for PY11.

3.12 Public Agency Partnership Program

The PAPP serves public agency customers such as federal, state, and local governments; municipalities; and school districts and may serve some healthcare systems, institutions of higher education, and other nonprofit entities (i.e., GNI sector customers). PAPP engages these

customers in a partnership to implement an Energy Efficiency Action Plan. Each public agency partnership is established through the execution of a memorandum of understanding (MOU) by and between Duquesne Light and the selected local governmental agency. The MOU establishes working groups composed of Duquesne Light and agency representatives who identify project areas within agency departments (and jurisdictional agencies). Working groups define project scopes of service and establish project agreements to co-fund agreed-to projects. The project agreements contain the terms to use local agency staff to reach, prescreen, and enroll program participants.

PAPP is run by MCR, and MCR support for the program includes initial outreach to customers, the administration of energy efficiency audits, technical assistance for measure-level project review and bundling, property aggregation, contractor negotiation, and equipment bulk purchasing. MCR integrates funding sources to include program and agency co-funding, performance contracting, grant funding, and available financing options.

In PY11, Duquesne Light leveraged the opportunity presented by pandemic-related school closures to implement an additional delivery channel with PAPP that targeted schools with direct shipments of linear replacement LEDs. Duquesne Light purchased bulbs at a bulk discount and shipped them to schools. In turn, schools took advantage of the closures to replace linear fluorescent fixtures with LED replacements that are about 50% more efficient. Schools also signed affidavits agreeing to install lamps within 30 days of receipt. Guidehouse sampled three of these projects as part of the normal evaluation effort, finding both that the bulbs were installed as required and that customers were (anecdotally) very satisfied with the program. While Guidehouse did not sample these projects as a separate stratum, the sampled projects achieved a realization rate above 100%.

A participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different years or in different programs are counted more than once (once in each year or program).

3.12.1 Participation and Reported Savings by Customer Segment

Table 3.12-1 presents the participation counts, reported energy and demand savings, and incentive payments for PAPP in PY11 by customer segment.

Table 3.12-1. PAPP Participation and Reported Impacts

Parameter	PAPP (GNI)
PYTD No. of Participants	134
PYRTD MWh/yr	11,857
PYRTD MW/yr	1.79
PY11 Incentives (\$1,000)	\$1,115

Source: Guidehouse analysis

3.12.2 Gross Impact Evaluation

Guidehouse completed onsite verifications and phone verifications for PAPP PY11 projects. As described in the Evaluation Plan, the evaluation team relied on projects previously sampled and verified from PY10 and combined those with additional sampled projects from PY11. The team used this rolling 2-year verification approach to estimate the realization rate for PY11.

Guidehouse will use a similar method for PY12—these PY11 projects will be combined with PY12 projects to create a new realization rate for PY11 activities.

Table 3.12-2 provides the resulting population and sampling sizes. Table 3.12-3 and Table 3.12-4 show the gross energy and demand results for PAPP.

Due to COVID-19 safety concerns with onsite verification visits, Guidehouse changed three sampled projects from onsite visits to telephone verifications. One of these sites was a nursing home, the others requested a phone interview rather than a site visit. The team did not reduce sample size targets within sampling plans. The remaining sites with incentives over \$5,000 each received site visits with COVID-19 safety protocols in place.

Table 3.12-2. PAPP Gross Impact Sample Design for PY10 and PY11

Stratum	Population Size	Achieved Sample Size (PY10/PY11 Combined)	Evaluation Activity
PAPP – Large	32	8	Verification only visit, verification and trending visit
PAPP – Small	139	20	Verification only visit, phone verification*
Total	171	28	

*Some PY11 sites that would normally have received a site visit received a phone verification due to COVID-19-related safety concerns.

Source: Guidehouse analysis

Table 3.12-3. PAPP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate (PY10/PY11 Combined)	Sample C _v	Relative Precision at 85% CL
PAPP – Large	8,303	96%	0.30	17.0%
PAPP – Small	3,554	139%	0.77	25.8%
Program Total	11,857	109%		13.7%

Source: Guidehouse analysis

Table 3.12-4. PAPP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate (PY10/PY11 Combined)	Sample C _v	Relative Precision at 85% CL
PAPP – Large	1.24	49%	2.23	127.4%
PAPP – Small	0.55	151%	0.74	24.9%

Program Total	1.79	80%	51.4%
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Source: Guidehouse analysis

Factors affecting the PAPP realization rates for PY11 (which include projects reported in both PY10 and PY11) are as follows:

- Several projects (n=11) had HOU, confirmed either via customer interview or energy management system settings, that were different than the HOU used to calculate ex ante savings.
- Guidehouse used billing data to update the analysis for one pumping system project, leading to slightly increased energy savings and decreased demand savings for that project.
- One project had fewer fixtures installed than reported in the project files.
- For the projects sampled from the self-install schools delivery channel implemented in Q4 of PY11, Guidehouse was able to verify which type of fixtures (e.g., 2-lamp vs, 3-lamp fixtures) were included in the retrofit. This changed savings slightly due to assumed baseline wattage changes Guidehouse made. All three sampled self-install school sites saw 100% ISRs or greater.

3.12.3 Net Impact Evaluation

Guidehouse did not conduct NTG evaluation for PAPP in PY11. Per Guidehouse’s Evaluation Plan, the team relied on PY9 results for the estimates of participant free ridership and spillover.

Guidehouse applied the NTG factor for PAPP using the results from the PY9 phone survey of program participants. Guidehouse attempted a census of all unique decision makers across PAPP, CEEP, and MFHR in PY9, achieving 16 survey completes, where each unique decision maker was asked about one project and up to three measures. The evaluation team used a single combined NTG ratio of 0.45 for these three programs and applied it to all programs and strata, as Table 3.12-5 shows.

Table 3.12-5. PAPP Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Estimated Participant Spillover	NTG Ratio	Relative Precision at 85% CL
PAPP/CEEP/MFHR	55%	0%	45%	32.8%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for PAPP in PY11.

3.12.4 Verified Savings Estimates

In Table 3.12-6 Guidehouse applied the realization rates and NTG ratios to the reported energy and demand savings estimates to calculate the verified savings estimates for PAPP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.12-6. PAPP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	11,857	1.79
PYVTD Gross	12,897	1.44
PYVTD Net	5,867	0.65
RTD	31,457	4.40
VTD Gross	32,230	3.24
VTD Net	16,006	1.59

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.12.5 Process Evaluation

Guidehouse completed program manager, CSP, and trade ally interviews for the process evaluation of PAPP in PY11. The interviews with the program manager and the CSP aided the team with question updates for the trade ally interviews. These interviews also confirmed that PAPP program processes and implementation has remained consistent since PY10. Duquesne Light does not have a formal trade ally network; however, many companies work with the program and promote the program to the public agencies in the Duquesne Light territory. Guidehouse was able to obtain from the CSP a list of the company representatives who worked with Duquesne Light public agencies during Phase III. The following sections summarize the objectives and results of these interviews.

Trade Ally Interviews

Guidehouse focused on reaching out to a census of trade allies who participated in PAPP in Phase III. The evaluation team attempted to contact via email or phone 37 representatives from 24 companies for whom the team had available contact information (obtained from the CSP). Guidehouse attempted to contact these representatives up to six times via email or phone, depending on the available contact information.

The evaluation team completed three interviews with these trade allies, obtaining some insights into the program. Some of these contacts had participated in multiple programs, and there was an overlap in the interviews: one person was able to provide feedback for both PAPP and MFHR, and another for PAPP and CEP, EXP, and IEP. These trade allies represented an electric distributor, an architectural firm, and an electrical contractor company. The team was not able to reach most of the representatives for a variety of reasons. Some of the biggest factors were representatives were no longer with the company or they temporarily were out of office. It is likely that many representatives were unreachable due to the COVID-19 pandemic.

The objective of the interviews was to obtain feedback from these trade allies about their experience and satisfaction with PAPP and assess program barriers and challenges. Overall, the interviews provided positive sentiments about the program. A couple of interviewees stated that offering this program makes it a lot easier for them to sell energy efficient equipment, and the program often “made a huge difference” or “sealed the deal” with some customers who may have been uncertain about their equipment upgrades. On average, these three interviewees

rated the program overall as an 8.0 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. All of them rated all aspects of the program, such as process, equipment types eligible, and support from Duquesne Light, as 7 or above—8.7, 8.7, and 8.3, respectively. Guidehouse was able to obtain the following additional insights into the program:

- **Program awareness:** Among the three respondents, one learned about the program from program representatives doing in-person outreach and seminars, another learned about it from their customer, and the last person has participated for a long time and could not recall their source of awareness. All three mentioned they were not aware of any marketing materials, but some thought that having some type of brochure would be useful to communicate the rebate information and program benefits to the public agencies, such as the housing authorities. Word of mouth is not a reliable source of program awareness because the trade allies see their knowledge and offering of Duquesne Light rebates as a competitive advantage.
- **Program barriers:** Each respondent mentioned one of the following barriers:
 - Program awareness is a challenge for one person who did not know much about this program, such as which agencies or equipment types qualify for rebates, and wished they would have learned about the program sooner. They suggested providing more information to architectural firms to understand the program offerings and to bring them to the attention of their clients.
 - One person mentioned a challenge identifying the correct point of contact to submit the rebate application or ask questions, as it is typically unknown whether a customer qualifies for the public or commercial program.
 - Another person suggested that public agencies could use additional financial assistance from this program because these agencies typically have limited funds to invest in new equipment and upgrades.
- **New construction:** Two of the three interviewees mentioned they see potential to expand this program to incentivize energy efficient technologies for new construction projects.

A summary of findings and resulting recommendations from the interviews is included in Section 3.12.7.

3.12.6 Cost-Effectiveness Reporting

Table 3.12-7 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.12-7 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.12-7. Summary of PAPP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants [1]	\$1,115	\$1,955
2	EDC Incentives to Trade Allies	\$0	\$0
3	Participant Costs (net of incentives/rebates paid by utilities)	\$843	\$3,729

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,958		\$5,685	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$38
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$37	\$140	\$277
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$899	\$52	\$2,261
9	EDC Evaluation Costs	\$86		\$244	
10	SWE Audit Costs	\$34		\$150	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,087		\$3,166	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$3,045		\$8,851	
14	Total NPV Lifetime Electric Energy Benefits	\$6,953		\$14,095	
15	Total NPV Lifetime Electric Capacity Benefits	\$1,758		\$3,370	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$808		\$1,119	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$644		-\$783	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$8,875		\$17,801	
19	TRC Benefit-Cost Ratio ^[8]	2.92		2.01	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.12-8 presents program financials and cost-effectiveness on a net savings basis.

Table 3.12-8. Summary of PAPP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$1,115	\$1,955
2	EDC Incentives to Trade Allies	\$0	\$0

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
3	Participant Costs (net of incentives/rebates paid by utilities)		-\$224		\$832
4	Incremental Measure Costs (sum of rows 1 through 3)		\$891		\$2,788
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$38
6	Administration, Management, and Technical Assistance ^[3]	\$31	\$37	\$140	\$277
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$899	\$52	\$2,261
9	EDC Evaluation Costs	\$86		\$244	
10	SWE Audit Costs	\$34		\$150	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,087		\$3,166	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,978		\$5,954	
14	Total NPV Lifetime Electric Energy Benefits	\$3,163		\$7,021	
15	Total NPV Lifetime Electric Capacity Benefits	\$800		\$1,657	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$367		\$538	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$293		-\$356	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$4,037		\$8,860	
19	TRC Benefit-Cost Ratio ^[8]	2.04		1.49	

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.12.7 Status of Recommendations

The impact and process evaluation activities in PY11 led to the findings and recommendations shown in Table 3.12-9; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.12-9. PY11 Findings and Recommendation for PAPP

Findings	Recommendations
Implementation	
<ul style="list-style-type: none"> Duquesne Light launched the self-install schools delivery channel within weeks of the COVID-19 pandemic restrictions. After evaluating, the program achieved high success, good realization rates, and Guidehouse heard anecdotally through discussions with verification site contacts that there is high satisfaction among the schools. 	<ul style="list-style-type: none"> Duquesne Light should continue looking for opportunities when the situation presents itself to supplement program activities with direct responses to the pandemic.
<p>Duquesne Light response: Accepted. Duquesne Light will continue to leverage opportunities to benefit its customers.</p>	
Program Awareness, Barriers, and Challenges	
<ul style="list-style-type: none"> Similar to what Guidehouse heard from other trade allies, trade allies interviewed for PAPP said they found it challenging to identify the correct point of contact for the program. 	<ul style="list-style-type: none"> Duquesne Light should clarify on its website and forms who trade allies and participants can contact for questions. Duquesne Light should consider listing a specific person.
<p>Duquesne Light response: Accepted. Duquesne Light will share this recommendation with its program managers and CSPs for PY12 and instruct them to clarify contact information with participants. Duquesne Light believes that Phase IV program design with a single-point of contact for all C&I programs, including GNI, will increase cross-promotions with programs and help increase customer participation.</p>	

Source: Guidehouse analysis

3.13 Community Education Energy Efficiency Program

CEEP launched in PY8 and is designed to prepare middle school and high school students to become energy efficiency auditors and provide hands-on training while they perform energy audits at their schools. The objective is to build the community capacity and early workforce development to support energy audits throughout the community at small businesses and residential energy audits for income-qualified populations. The program is delivered by MCR, which is responsible for developing program marketing materials, enrolling schools in the program, providing training and materials to schools, evaluating the resulting action plans, and entering project information into PMRS.

The program is designed to primarily target the schools where the students complete the training. With support from MCR, students will develop a Conservation Action Plan that identifies additional school district buildings in which students plan to complete audits; these plans may also identify other community buildings.

The program also involves a competition. Participating schools are automatically enrolled in the competition and prizes are awarded based on the energy savings achieved (based on a percentage of original energy consumption) and on the content of the Conservation Action Plan.

Schools that do not participate in the training or Conservation Action Plan portion of the program may also participate by having rebated equipment installed or custom projects developed and deployed.

A participant is a customer participating in the given program within a given reporting year (e.g., Q1 through Q4 for PY11) represented by a unique participant account number within the tracking system. Customers participating in a program more than once within a reporting year (i.e., PYRTD) are counted once; customers participating more than once but in different year or in different programs are counted more than once (once in each year or program).

3.13.1 Participation and Reported Savings by Customer Segment

Table 3.13-1 presents the participation counts, reported energy and demand savings, and incentive payments for CEEP in PY11 by customer segment.

Table 3.13-1. CEEP Participation and Reported Impacts

Parameter	CEEP (GNI)
PYTD No. of Participants	24
PYRTD MWh/yr	2,317
PYRTD MW/yr	0.37
PY11 Incentives (\$1,000)	\$0

Source: Guidehouse analysis

3.13.2 Gross Impact Evaluation

As detailed in Guidehouse's PY11 Evaluation Plan, the team did not conduct primary gross impact evaluation research for CEEP in PY11. Instead, the team applied the realization rates for CEEP found in PY10 to PY11 program activities.

Table 3.13-2 provides the resulting population and conveys that no PY11 sample is drawn this year. Table 3.13-3 and Table 3.13-4 show the gross energy and demand results for CEEP.

Table 3.13-2. CEEP Gross Impact Sample Design

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Community Ed – Large	7	N/A	Apply PY10 results to PY11
Community Ed – Small	24	N/A	Apply PY10 results to PY11
Total	31	N/A	

Source: Guidehouse analysis

Table 3.13-3. CEEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Community Ed – Large	1,831	94%	0.08	11.0%
Community Ed – Small	486	114%	0.26	25.1%
Program Total	2,317	98%		10.3%

Source: Guidehouse analysis

Table 3.13-4. CEEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Community Ed – Large	0.29	99%	0.01	1.4%
Community Ed – Small	0.08	115%	0.36	34.5%
Program Total	0.37	102%		8.1%

Source: Guidehouse analysis

Factors affecting the CEEP realization rates are as follows (from the PY10 evaluation activities):

- For one site, the HOU reported by the customer during the verification was much higher than the deemed HOU, increasing both energy and demand savings for that site.
- A second site reported that the heating type for the school was electric rather than the unknown value used in the ex ante calculations. The resulting change in interactive factor lowered the energy savings but did not affect the demand savings.

3.13.3 Net Impact Evaluation

Per the Evaluation Plan, Guidehouse did not conduct a net impact evaluation for CEEP in PY11. The team relied on PY9 results for the estimates of participant free ridership and spillover. Table 3.13-5 shows the combined NTG ratio resulting from the PY9 survey of CEEP, MFHR, and PAPP participants.

Table 3.13-5. CEEP Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Estimated Participant Spillover	NTG Ratio	Relative Precision at 85% CL
CEEP/MFHR/PAPP	55%	0%	45%	32.8%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for CEEP in PY11.

3.13.4 Verified Savings Estimates

In Table 3.13-6 Guidehouse applied the realization rates and NTG ratios to the reported energy and demand savings estimates to calculate the verified savings estimates for CEEP in PY11. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3.13-6. CEEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,317	0.37
PYVTD Gross	2,275	0.38
PYVTD Net	1,035	0.17
RTD	7,655	1.31
VTD Gross	7,789	1.34
VTD Net	3,933	0.69

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY10 final annual report.

3.13.5 Process Evaluation

Guidehouse completed a process evaluation for CEEP in PY11. The team interviewed the program manager, the CSP, and all of the school representatives who participated in this program in the last school year. The interviews with the program manager and the CSP aided question updates for the interviews with the school representatives. These interviews also confirmed that the CEEP program processes and implementation has remained consistent since PY10. The school representatives were all teachers who helped administer the program through lessons based on provided CEEP materials. These teacher interviews focused on three main research topics: program awareness and influence, program satisfaction, and program barriers and challenges. Guidehouse aimed to understand participants' experiences in the program and identify areas for future improvement.

Guidehouse interviewed all three teachers who participated in this program, as Table 3.13-7 shows. Three other schools wanted to participate in this program, but they were unable to do so for a variety of internal reasons and challenges related to the pandemic. Those nonparticipants are excluded from this research.

Table 3.13-7. PY11 CEEP Interview Sample Design

Stratum Name	Population Count	Evaluation Method	Targeted Sample	Achieved Sample
CEEP	3	Phone Interview	3	3

Source: Guidehouse analysis

The following sections discuss the findings for each of the three research topics.

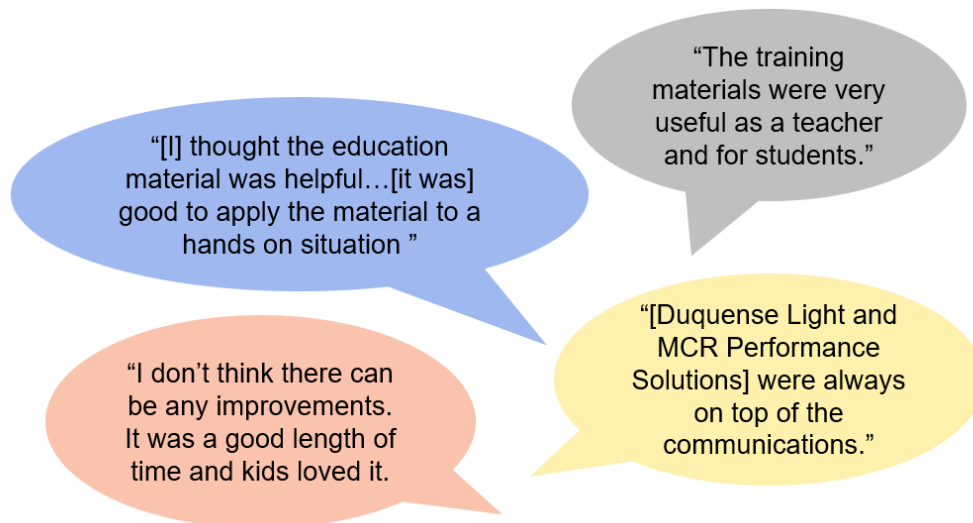
Program Awareness and Influence

All three teachers first heard about this program through their coworkers. Two of the teachers noted their coworkers heard about the program through an email from Duquesne Light. These teachers suggested increasing outreach to raise program awareness and ultimately increase school participation. In terms of program influence on behavior, two respondents stated their school already made or planned to make energy efficiency upgrades after participating in CEEP. One of these respondents stated the school planned to make upgrades, and the other respondent noted their superintendent planned to change the school’s future energy plan based on the Conservation Action Plan completed as part of CEEP. These responses indicate the program played a role in influencing schools to perform energy efficiency upgrades to a certain extent. Upgrades included installing LED lighting and sensors.

Program Satisfaction

Guidehouse asked the teachers about their perception of CEEP and Duquesne Light. They rated their satisfaction with various aspects of the program, such as information received from Duquesne Light, program materials, and CEEP overall. The teachers rated their satisfaction with the program and its components very highly, providing a rating of 9 or 10 for each component on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. Figure 3.13-1. provides a few positive quotes from these teachers that reinforce their positive experience with this program.

Figure 3.13-1. Positive Responses from CEEP Teachers (n = 3)



Source: Guidehouse analysis

Program Barriers and Challenges

Guidehouse asked the teachers to identify any barriers or challenges posed by the program that may discourage further participation and methods to reduce barriers for future participants. The teachers mentioned that the two main barriers are the amount of time it takes to participate in the program and that the CEEP materials do not always align with the students’ existing curriculum. Two of the three teachers noted that finding meeting times or embedding the curriculum within their lessons was challenging at times. One teacher felt they were only able to implement the curriculum as part of an extracurricular activity, the Environmental Club. Another teacher stated that only a couple of classes could fit the program’s educational materials into their existing curriculum. These challenges for teachers were also mentioned by the program

and CSP managers during those interviews. To overcome these barriers, the teachers recommend offering the program materials in a variety of options that require different time commitments. For example, depending on the time available for teachers to work with the students, Duquesne Light could offer them a shorter course option and a full course option. The short version could focus on fewer topics and offer simpler or quicker exercises than the full version of the program.

A summary of findings and resulting recommendations from the interviews is included in Section 3.13.7.

3.13.6 Cost-Effectiveness Reporting

Table 3.13-8 provides a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.13-8 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.13-8. Summary of CEEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$390	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$571		\$2,457	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$571		\$2,847	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$8	\$9	\$33	\$66
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$390	\$16	\$917
9	EDC Evaluation Costs	\$21		\$57	
10	SWE Audit Costs	\$8		\$36	
11	Program Overhead Costs (sum of rows 5 through 10)	\$436		\$1,137	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,007		\$3,984	
14	Total NPV Lifetime Electric Energy Benefits	\$1,312		\$3,770	
15	Total NPV Lifetime Electric Capacity Benefits	\$468		\$1,410	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$95		\$614	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$137		-\$314	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$1,738	\$5,480
19	TRC Benefit-Cost Ratio ^[8]	1.73	1.38

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.13-9 presents program financials and cost-effectiveness on a net savings basis.

Table 3.13-9. Summary of CEEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$0		\$390	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$260		\$1,070	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$260		\$1,460	
5	Design & Development ^[2]	\$0	\$0	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$8	\$9	\$33	\$66
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$390	\$16	\$917
9	EDC Evaluation Costs	\$21		\$57	
10	SWE Audit Costs	\$8		\$36	
11	Program Overhead Costs (sum of rows 5 through 10)	\$436		\$1,137	
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0		\$0	
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$696		\$2,597	
14	Total NPV Lifetime Electric Energy Benefits	\$597		\$1,908	

15	Total NPV Lifetime Electric Capacity Benefits	\$213	\$727
16	Total NPV Lifetime Operation and Maintenance Benefits	\$43	\$325
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$62	-\$143
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$791	\$2,817
19	TRC Benefit-Cost Ratio ^[8]	1.14	1.08

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.13.7 Status of Recommendations

Table 3.13-10 summarizes the finding and recommendation for CEEP based on interviews with teachers who participated in this program in PY11; the table also includes a summary of how Duquesne Light plans to address the recommendation in program delivery.

Table 3.13-10. CEEP Finding and Recommendation

Findings	Recommendations
Program Barriers and Challenges	
<ul style="list-style-type: none"> The teachers interviewed reported that time constraints and alignment of the program content with existing school curriculum are the two main barriers to program participation. 	<ul style="list-style-type: none"> To accommodate teachers with varying time constraints and curriculum loads, Duquesne Light should consider providing multiple program options for teachers and students, such as a short course and a full course, which require varying amounts of time commitment for teachers and students.
<p>Duquesne Light response: Under consideration. Phase IV planning is currently ongoing and this recommendation will be considered should the final Phase IV plan include a similar educational component.</p>	

Source: Guidehouse analysis

3.14 Large Curtailable Load Program

The Duquesne Light Large Curtailable Load (LCL) program is a C&I DR program designed to engage large Duquesne Light C&I customers in demand reduction during the utility system's peak hours. Enerlogics, Duquesne Light's CSP, contracts with individual businesses located in the Duquesne Light territory to provide DR when Act 129 events are called. Act 129 DR events are triggered by PJM's day-ahead load forecast. When the day-ahead forecast is above 96% of the peak load forecast for the year, a DR event is initiated for the following day. Participating

customers contracted by the CSP may choose to opt out of some events or some hours of events.

Specific conditions trigger DR events during Phase III. The Phase III Implementation Order and subsequent Clarification Order provided clear instructions to EDCs about which hours would be used to measure DR performance (i.e., when to call DR events):

1. Curtailment events shall be limited to the months of June through September.
2. Curtailment events shall be called for the first 6 days in which the peak hour of PJM's day-ahead forecast for the PJM RTO is greater than 96% of the PJM RTO summer peak demand forecast for the months of June through September each year of the program.
3. Each curtailment event shall last 4 consecutive hours.
4. Each curtailment event shall be called such that it will occur during the day's forecasted peak hour(s) above 96% of PJM's RTO summer peak demand forecast.
5. Once six curtailment events have been called in a program year, the peak demand reduction program shall be suspended for that program year.
6. The reductions attributable to a 4-consecutive-hour curtailment event will be based on the average megawatt reduction achieved during each hour of an event.
7. Compliance will be determined based on the average megawatt reductions achieved from events called in the last 4 years of the Phase III program.
8. In their plans, the EDCs must demonstrate the EDC program cost to acquire megawatts from customers who participate in PJM's Emergency Load Reduction Program is no more than half the cost to acquire megawatts from customers in the same rate class that are not participating in PJM's Emergency Load Reduction Program.

Several important operational details were not addressed explicitly in the Phase III Implementation Order or the Clarification Order. The SWE, Bureau of Technical Utility Services (TUS), and EDCs have discussed these issues collectively and reached consensus on the following clarifications:

- To support wholesale energy market operations, PJM provides an hourly load forecast online that is updated every 15 minutes.²² A subset of the 96 daily forecasts are archived by PJM.²³ EDCs should use the 9:45 a.m. forecast as the forecast of record when determining whether the following day will be an Act 129 DR event or not.
- The 96% threshold and resulting Act 129 event dispatch determinations will rely solely on Table B-1 of the January PJM Load Forecast Report called for in the Phase III Clarification Order.
- Act 129 DR events are limited to non-holiday weekdays.

Compliance targets for DR programs were established at the system level, which means the load reductions measured at the customer meter must be escalated to reflect transmission and

²² <http://www.pjm.com/markets-and-operations/energy/real-time/7-day-load-forecast.aspx>

²³ <http://www.pjm.com/markets-and-operations/ops-analysis/historical-load-forecasts.aspx>

distribution losses. The peak demand impacts presented in this section have been adjusted for line losses.

3.14.1 Participation and Reported Savings by Customer Segment

Table 3.14-1 presents the participation counts, reported peak demand savings, and EDC expenditures for the LCL program in PY11 by customer segment.

Table 3.14-1. LCL Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYTD No. of Participants	15	115	62	192
PYRTD MW/yr	0.65	40.22	5.49	46.35
PY11 Incentives (\$1,000)	\$11	\$715	\$98	\$824

Source: Guidehouse analysis

3.14.2 Gross Impact Evaluation

This section of the report summarizes Guidehouse's approach for evaluating impacts in PY11 and some interim outputs (i.e., impacts by strata).

Guidehouse used two different approaches to estimate program impacts on a customer-by-customer basis:

- **CBL:** The standard 4-of-5 CBL with an optional weather sensitivity adjustment (WSA).²⁴ This is the approach used by the CSP for determining settlement.
- **Regression:** A single-customer linear regression, selected from a set of 33 model specifications estimated on five datasets.

The approach selected for each customer was determined based on the testing procedure described in the Evaluation Plan and approved by the SWE. This is also described below.

The remainder of this section is divided into the following three subsections:

- **Testing and Selection of Appropriate Impact Estimation Approach.** A summary of the test regime used by Guidehouse to determine which of two potential evaluation approaches is most appropriate for each participating customer.
- **Impact Estimation.** Details of the two approaches to be used to estimate impacts.
- **Impact Findings and Lessons.** Summary tables of impacts by approach type, lessons learned, and additional actions to be taken for the next year's program evaluation.

Testing and Selection of Appropriate Impact Estimation Approach

Guidehouse selected hold-out test (HOT) or simulated event dates. The testing protocol ranks the accuracy of the alternative approaches based on how accurately those approaches can

²⁴ PJM, *Weather Sensitive Adjustment Using the WSA Factor Method*.

See "Example 3" in this document for a detailed example of how the factors are applied.

predict baseline demand on days when baseline demand is observed—days on which no Act 129 events take place. The approach that most successfully predicts actual customer demand during HOT dates was the one applied to that customer for the evaluation of PY11 impacts.

The test procedure is as follows:

Step 1: Select HOT Event Dates

HOT event days are selected based on the PJM day-ahead forecast in consultation with the SWE. The HOT event days are the 3 days in the given summer:

- With the highest day-ahead PJM demand forecast
- In which the given participant did not participate in PJM Economic or Emergency DR
- In which there is no apparent response to PJM 5CP pricing²⁵
- Excluding days in which participants received notification of a true Act 129 event

The purpose of these exclusions is to remove the potential confounding effects of other non-baseline customer behavior in reaction to market or program signals. The HOT days selected for one participant may be different from those selected for another participant (e.g., one participant may participate in PJM DR and another may not).

Step 2: Estimate Baselines Using CBL

For each HOT event and participant pair, a baseline is estimated using the 4-of-5 CBL with and without the WSA. Only the HOT event day for which the baseline is being calculated is considered an event for the purposes of the qualification rules. This allows the CBL being tested to still take advantage of the information in proximate, similar non-event days to help develop the baseline.

Step 3: Estimate Baselines Using Regression

For each HOT event and participant pair, a baseline²⁶ is estimated using each of the regression specifications nominated for testing. Each regression will be re-estimated three times for each customer, once for each HOT event.

A HOT event will only be considered an event for testing purposes if it is the accuracy of the regression's prediction for that event being tested. For example: if July 12 and July 13 both qualify as HOT events, the regression equation estimated to predict the July 12 baseline will not exclude or dummy out the event on July 13. Likewise, the regression equation estimated to predict the July 13 HOT event will not exclude or dummy out the July 12 HOT event. This allows the regression being tested to still take advantage of the information in proximate, similar non-event days to help develop the baseline.

²⁵ Determined through visual inspection and comparison of the candidate day load profile with proximate day profiles in consultation with the SWE. Although 5CP days are not explicitly dropped when estimating regressions, it is important that they be dropped from HOT event days since leaving them in may bias the model testing process toward a lower, less accurate, baseline.

²⁶ In this case the baseline is defined by the predicted values output by the estimated equation when the variable values for the event dummy variables $C_{c,t}$ are set to zero.

Step 4: Calculate Mean Absolute Error by Approach and Customer and Select Approach

For a given customer, the mean absolute error is calculated for the simulated event period on the HOT event day. The approach (CBL or regression) that delivers the lowest mean absolute error for a given customer will be selected as the approach used to estimate that customer's DR impacts.

Impact Estimation

Guidehouse uses one of two approaches to estimate impacts for each customer (selected based on the testing procedure above): either the 4-of-5 CBL with optional WSA, or an individual customer regression.

CBL

The CSP CBL that was tested is a standard 4-of-5 CBL supplemented with an optional WSA factor to account for differences in weather on the event days and on the days included in the CBL look-back window. The baseline is estimated in following fashion:

1. Remove non-qualifying days. Remove all weekends and public holidays, Act 129 event days, and, as per Section 6.2.2.1.5 of the Phase III Evaluation Framework, all PJM Emergency and Economic events.
2. Identify look-back window. Identify the 5-day window of qualifying days preceding the event.
3. Calculate non-event day demand in event window. Calculate the average participant demand during the event window (e.g., 1 p.m.-5 p.m.) for each of the 5 qualifying non-event days in the look-back window. This delivers five averages, one for each day.
4. Drop low day. Drop the non-event day with the lowest average event window demand.
5. Calculate unadjusted CBL. The event-specific CBL—the baseline—values are estimated to be the average demand, by hour of day, in the 4 non-event days not dropped from within the look-back window.
6. Apply WSA factors and adjust baseline. Use the approach outlined in detail in Example 2 of the PJM WSA document to account for differences between average non-event-day look-back window temperature and event-day temperature.
7. Calculate impacts. Impacts are the difference between the adjusted baseline and the actual demand during the event hours in which the given customer participated (i.e., did not opt out).

Linear Regression

Guidehouse used hourly meter-level data for all participants.²⁷ Where multiple meters were provided for a single customer, data were aggregated to a single time-series. The estimation set included only demand observations on non-holiday weekdays in the months of April through September. Each event's notification day was also filtered out of the data. None of the LCL participants were also participants in the PJM Economic DR Program in PY11, but had some

²⁷ Data were provided at quarter-hour frequency, but to match the frequency of the impacts reported by the CSP all of the analysis took place at the hourly level.

been subject to these events, the days on which those events occurred (for the given customer) would also have been dropped.

Guidehouse tested 33 regression model specifications on five datasets and selected the model and data that provided the most accurate baseline for each customer. All regression model specifications build on a base regression model, shown in Equation 3.14-1:

Equation 3.14-1. LCL Base Regression

$$y_t = \alpha + \sum_{h=1}^{24} \beta_{h,1} hour_{h,t} + \sum_{m=4}^9 \sum_{h=1}^{24} \beta_{h,m,2} hour_{h,t} month_{m,t} + \sum_{d=1}^5 \sum_{h=1}^{24} \beta_{h,d,3} hour_{h,t} DoW_{d,t} + \sum_{c=1}^C \gamma_c C_{c,t} + \varepsilon_t$$

Where:

- y_t = The given customer’s demand in hour of sample t .
- $hour_{h,t}$ = Twenty-four dummy variables capturing the hours of the day. Equal to 1 where hour t is the q -th hour of the day, and 0 otherwise.
- $month_{m,t}$ = Six dummy variables capturing the month. Equal to 1 when hour of sample t falls in month m , and 0 otherwise.
- $DoW_{d,t}$ = Five dummy variables capturing the day of the week. Equal to 1 when hour of sample t falls in day of the week d and 0 otherwise.
- $C_{c,t}$ = C number of dummy variables that capture the individual event periods for which the given customer meter participated.²⁸ The number of variables is equal to the number of hourly periods in which the given participant meter elected to participate in Act 129 events. Equal to 1 when hour of sample t falls in the c -th event hour of the summer of 2019 and 0 otherwise. Each dummy variable takes a value of 1 only once in the time series.
- α, β, γ = Are all uniquely estimable parameters of the regression equation estimating (in each case) the conditional mean effect of the variable to which it is attached on the dependent variable y_t .

Simplified Base Model

For PY11, Guidehouse received approval from the SWE to also include a simplified version of the base model, shown in Equation 3.14-2, that does not interact hour with day of week or month. This model was added due to concerns that the base model may be over-fitting the 3 HOT days for some customers.

Equation 3.14-2. LCL Base Simple Regression

$$y_t = \sum_{h=1}^{24} \beta_{h,1} hour_{h,t} + \sum_{d=1}^5 \beta_{d,2} DoW_{d,t} + \sum_{m=5}^9 \beta_{m,3} Month_{m,t} + \sum_{c=1}^C \gamma_c C_{c,t} + \varepsilon_t$$

Additional Variables

Guidehouse also tested specifications that include the following additional variables.

²⁸ As per the memorandum from the Phase III SWE team of 2017-04-26 (“Frequently Asked Questions Regarding Act 129 Demand Response”), participating meters may elect to participate for only some of the event hours, providing they submit their planned participation prior to the beginning of an event.

- cdh_t = Cooling degree hours (base – 65°F) observed in the hour in which hour t falls. This variable is represented as “cdh” in Table 3.14-2.
- $spline_{s,t}$ = A set of S dummy variables acting as a temperature spline to be applied in a manner similar to that outlined in PJM Manual 19.²⁹ The cdh_t value interacted with the spline (see Table 3.14-2) in the equation is the difference between the observed CDH and the lower threshold of the given spline, or 0 (whichever is higher).
For example, where S is equal to 2, cdh_t is equal to 30 and the spline threshold is equal to 20, $spline_{1,t}$ would take a value of 1 (dummy) and be multiplied by 20, and $spline_{2,t}$ would also take a value of 1 (dummy) and be multiplied by 10 (30 minus 20). Spline breaks are determined based on the distribution of average event-window cdh_t values observed in summer under analysis. This variable is represented as “spline” in Table 3.14-2.
- $EMA6cdh_t$ = An exponential moving average of cdh_t observed in the 6-hour period leading up to, and including, hour t . This variable is represented as “ema_6_cdh” in Table 3.14-2.
- $EMA24cdh_t$ = Identical to $EMA6cdh_t$, except for 24, instead of, 6 hours. This variable is represented as “ema_24_cdh” in Table 3.14-2.
- $daLMP_t$ = The day-ahead PJM forecast of the locational marginal price (LMP) of power for hour t . This variable is represented as “da_imp” in Table 3.14-2.
- $rtLMP_t$ = The real-time PJM LMP for hour t . This variable is represented as “rt_imp” in Table 3.14-2.

Table 3.14-2 provides the 32 model specifications tested for each participant, in addition to the core base model shown in Equation 3.14-1. All variables shown in Table 3.14-2 are added to the base model for testing.³⁰ Interactions of multiple variables are represented as multiplications (e.g., “cdh*hour”).

Table 3.14-2. Incremental Variables To Be Tested

Spec #	Var1	Var2	Var3	Var4
1	cdh*hour			
2	cdh*hour*spline			
3	cdh*hour	ema_6_cdh*hour		
4	cdh*hour*spline	ema_6_cdh*hour		
5	cdh*hour*spline	ema_6_cdh*spline		

²⁹ PJM Manual 19, *Load Forecasting and Analysis Revision 32*, Section 3.4
<https://www.pjm.com/-/media/documents/manuals/m19.ashx>

³⁰ For example, Spec #1 would include all the variables listed in Equation 4, but would also include an interaction between the hourly dummies and the cooling degree hour term.

Spec #	Var1	Var2	Var3	Var4
6	cdh*hour	ema_24_cdh*hour		
7	cdh*hour*spline	ema_24_cdh*hour		
8	cdh*hour*spline	ema_24_cdh*hour*spline		
9	cdh*hour		hour*month*cdh	hour*dow*cdh
10	cdh*hour*spline		hour*month*cdh	hour*dow*cdh
11	cdh*hour	ema_6_cdh*hour	hour*month*cdh	hour*dow*cdh
12	cdh*hour*spline	ema_6_cdh*hour	hour*month*cdh	hour*dow*cdh
13	cdh*spline*hour	ema_6_cdh*spline	hour*month*cdh	hour*dow*cdh
14	cdh*hour	ema_24_cdh*hour	hour*month*cdh	hour*dow*cdh
15	cdh*hour*spline	ema_24_cdh*hour	hour*month*cdh	hour*dow*cdh
16	cdh*hour*spline	ema_24_cdh*hour*spline	hour*month*cdh	hour*dow*cdh
17	cdh*hour		hour*month*cdh*spline	hour*dow*cdh*spline
18	cdh*hour*spline		hour*month*cdh*spline	hour*dow*cdh*spline
19	cdh*hour	ema_6_cdh*hour	hour*month*cdh*spline	hour*dow*cdh*spline
20	cdh*hour*spline	ema_6_cdh*hour	hour*month*cdh*spline	hour*dow*cdh*spline
21	cdh*spline*hour	ema_6_cdh*spline	hour*month*cdh*spline	hour*dow*cdh*spline
22	cdh*hour	ema_24_cdh*hour	hour*month*cdh*spline	hour*dow*cdh*spline
23	cdh*hour*spline	ema_24_cdh*hour	hour*month*cdh*spline	hour*dow*cdh*spline
24	cdh*hour*spline	ema_24_cdh*hour*spline	hour*month*cdh*spline	hour*dow*cdh*spline
25	da_imp*hour			
26	da_imp*hour	cdh*hour		
27	da_imp*hour	cdh*hour	ema_6_cdh*hour	
28	da_imp*hour	cdh*hour	ema_24_cdh*hour	
29	rt_imp*hour			
30	rt_imp*hour	cdh*hour		
31	rt_imp*hour	cdh*hour	ema_6_cdh*hour	
32	rt_imp*hour	cdh*hour	ema_24_cdh*hour	

Source: Guidehouse analysis

Data Exclusions

All 34 model specifications above (the base model, base simple model, and 32 additions) exclude from the estimation dataset:

- Weekends and holidays
- Days in which the given participant also participated in PJM’s Economic or Emergency DR events
- Days on which participants are notified of Act 129 events

Data from the months April through September are included in the regression.

In addition to the exclusions above, Guidehouse tested the following exclusions for all model specifications:

- Excluding all non-event days in which the average customer demand during the typical event window (12 p.m.-8 p.m., EDT) is in the bottom:
 - 10% of the distribution
 - 20% of the distribution
 - 30% of the distribution
 - 40% of the distribution

Each of these exclusions is applied after the other exclusions. For example, if there are 140 days in the period of interest and 40 are dropped due to the exclusion rules that apply to all regressions, then the subset in the first sub-bullet immediately above (bottom 10% of days dropped) that is included in the estimation will be 90 days (90% of 140 minus 40).

For every customer, 170 different sets of parameters are estimated—34 specifications, once with no additional exclusions and 4 times with different exclusion rules.

Impact Findings and Lessons Learned

The reported and verified impacts grouped by the two approaches are summarized in Table 3.14-3 and Table 3.14-4. These are followed by a discussion of the factors driving the realization rate. Guidehouse recommends using the same evaluation methodology for the PY11 evaluation.

Table 3.14-3. LCL Gross Impact Evaluation Design for PY11

Stratum	Population Size	PYRTD MW	Evaluation Approach
CBL	39	7.72	4-of-5 CBL with optional WSA adjustment
Regression ³¹	153	38.64	Linear regression
Program Total	192	46.35	

Source: Guidehouse analysis

Table 3.14-4. LCL Gross Impact Results for Demand

Stratum	PYRTD MW	Demand Realization Rate	PYVTD MW	Relative Precision at 90% CL
CBL	7.72	105%	8.10	9.3%
Regression ³²	38.64	124%	47.90	10.2%
Program Total	46.35	121%	56.00	8.9%

*This represents the error from the baseline uncertainty of the DR analysis. This does not represent sampling error.

³¹ The strata were defined by Guidehouse based on the testing protocol above. Reported impacts, calculated by Duquesne Light’s CSP are all estimated using a 4-of-5 CBL (most with a WSA adjustment). The CSP did not estimate impacts using regression analysis.

³² See previous footnote.

Source: Guidehouse analysis

The difference between the reported and verified impacts is driven by two key factors. First, reported impacts are based on the PMRS reported savings using a 4-of-5 CBL with optional WSA, whereas Guidehouse tested a set of regression models in addition to the two CBLs and selected the method providing the most accurate baseline. In cases when a CBL was the winning method, Guidehouse's impacts prior to adjusting for line losses were 0.5% lower than CSP-reported impacts. This difference occurs when the most accurate baseline included the WSA and the CSP baseline did not or vice versa. In cases when a regression was the winning method, Guidehouse's impacts prior to adjusting for line losses were 2.5% lower than CSP-reported impacts. In aggregate, the regression-based baselines were slightly lower than the baselines used by the CSP.

The second factor driving differences between the reported and verified impacts is the application of line loss factors (LLFs). The CSP-reported impacts do not include line losses. Guidehouse applied a commercial LLF of 1.0741 and an industrial LLF of 1.0081 depending on the participant. Verified impacts increased by approximately 4.5% after applying the LLFs.

3.14.3 Process Evaluation

Guidehouse did not conduct process evaluation research for LCL during PY11.

3.14.4 Cost-Effectiveness Reporting

Table 3.14-5 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3.14-5 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2019 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3.14-5. Summary of LCL Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$824		\$2,124	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		-\$362	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$824		\$1,761	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$5	\$44
6	Administration, Management, and Technical Assistance ^[3]	\$9	\$44	\$121	\$318
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$875	\$16	\$2,411
9	EDC Evaluation Costs	\$98		\$281	
10	SWE Audit Costs	\$42		\$177	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,068		\$3,373	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,892	\$5,135
14	Total NPV Lifetime Electric Energy Benefits	\$0	\$0
15	Total NPV Lifetime Electric Capacity Benefits	\$5,882	\$14,422
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$0
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0	\$0
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$5,882	\$14,422
19	TRC Benefit-Cost Ratio ^[8]	3.11	2.81

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

Table 3.14-6 presents program financials and cost-effectiveness on a net savings basis.

Table 3.14-6. Summary of LCL Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$824		\$2,124	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$0		-\$362	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$824		\$1,761	
		EDC	EDC	CSP	EDC
5	Design & Development ^[2]	\$0	\$0	\$0	\$0
6	Administration, Management, and Technical Assistance ^[3]	\$9	\$44	\$9	\$44
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$0	\$875	\$0	\$875
9	EDC Evaluation Costs	\$98		\$281	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
10	SWE Audit Costs	\$42	\$177
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,068	\$3,373
12	NPV of Increases in Costs of Natural Gas (or other fuels) for Fuel Switching Programs	\$0	\$0
13	Total NPV TRC Costs ^[6] (net present value of sum of rows 4, 11, and 12)	\$1,892	\$5,135
14	Total NPV Lifetime Electric Energy Benefits	\$0	\$0
15	Total NPV Lifetime Electric Capacity Benefits	\$5,882	\$14,422
16	Total NPV Lifetime Operation and Maintenance (Benefits)	\$0	\$0
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0	\$0
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$5,882	\$14,422
19	TRC Benefit-Cost Ratio ^[8]	3.11	2.81

[1] Includes direct install equipment costs.

[2] Includes direct costs attributable to plan and to advance the programs.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. NOTE: Savings carried over from Phase II are not to be included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

Source: Guidehouse analysis

3.14.5 Status of Recommendations

The PY11 impact evaluation activities led to the findings shown in Table 3.14-7. Guidehouse has no recommendations at this time.

Table 3.14-7. LCL Findings and Recommendations

Findings	Recommendations
Phase III Achievements	
<ul style="list-style-type: none"> With the PUC’s rule changes which “permit EDCs to implement approved DR programs on a voluntary basis for the fifth and final program year,”³³ Duquesne Light has achieved its Phase III objectives and exceeded its Phase III performance targets by 31%. 	<ul style="list-style-type: none"> No recommendation
Duquesne Light Response: N/A	
Implementation	
<ul style="list-style-type: none"> Duquesne Light plans to implement the program in PY12 although implementation is voluntary and not required for Act 129 Phase III compliance. Implementation in the final year of Phase III will benefit customers and Duquesne Light as evidenced in the historical TRC results. 	<ul style="list-style-type: none"> No recommendation
Duquesne Light Response: N/A	

Source: Guidehouse analysis

³³ PA PUC. Petition to Amend the Commission’s June 19, 2015 Implementation Order. M-2014-2424864. May 21, 2020. <https://www.puc.pa.gov/pcdocs/1665150.docx>

4. Portfolio Finances and Cost Recovery

This section provides an overview of the expenditures associated with Duquesne Light's portfolio and the recovery of those costs from ratepayers.

4.1 Program Finances

Table 4.1-1 shows program-specific and portfolio total finances for PY11. The columns in Table 4.1-1 and Table 4.1-2 are adapted from the Direct Program Cost categories in the PA PUC's EE&C Plan template³⁴ for Phase III. EDC Materials, Labor, and Administration includes costs associated with Duquesne Light's own employees. Implementation Conservation Service Provider (ICSP) Materials, Labor, and Administration includes both the program implementation contractor and the costs of any other outside vendors employed by Duquesne Light to support program delivery. The dollar figures shown in Table 4.1-1 and Table 4.1-2 are based on Duquesne Light tracking of expenditures with no adjustments to account for inflation.³⁵

Table 4.1-1. PY11 Program and Portfolio Total Finances (\$1,000)

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Residential Energy Efficiency*	\$964	\$46	\$1,857	\$144	\$3,011
Residential Appliance Recycling	\$77	\$41	\$317	\$13	\$448
Residential Behavioral Savings	\$0	\$41	\$856	\$21	\$918
Residential Whole House Retrofit	\$0	\$41	\$22	\$11	\$74
Low-Income Energy Efficiency	\$254	\$42	\$1,061	\$62	\$1,419
Express Efficiency	\$633	\$51	\$1,039	\$104	\$1,827
Small/Medium Midstream Lighting	\$212	\$31	\$191	\$33	\$467
Small Commercial Direct Install	\$0	\$15	\$21	\$32	\$68
Multifamily Housing Retrofit	\$502	\$31	\$521	\$43	\$1,097
Commercial Efficiency	\$724	\$32	\$790	\$93	\$1,639
Large Midstream Lighting	\$104	\$32	\$118	\$68	\$322
Industrial Efficiency	\$704	\$32	\$1,299	\$154	\$2,189
Public Agency Partnership	\$1,115	\$31	\$936	\$86	\$2,168
Community Education	\$0	\$8	\$399	\$21	\$428
Large Curtailable Load	\$824	\$9	\$919	\$98	\$1,850
Common Portfolio Costs**					

³⁴ <http://www.puc.pa.gov/pcdocs/1372426.doc>, Section 10

³⁵ The cost recovery of program expenses through riders generally happens promptly so that costs are being recovered from ratepayers in the same dollars that they are incurred.

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Portfolio Total	\$6,113	\$483	\$10,346	\$983	\$17,925
SWE Costs***	N/A	N/A	N/A	N/A	\$400
Total	\$6,113	\$483	\$10,346	\$983	\$18,325

* Duquesne Light combines financial related information here for the two programs 1) Residential Energy Efficiency and 2) Residential Energy Efficiency (Upstream Lighting) under Residential Energy Efficiency. Otherwise, energy and demand impacts are reported separately for these two programs.

** Common Portfolio Costs include costs associated with program tracking data management, support (legal, IT), and portfolio-level marketing.

*** SWE costs are outside of the 2% spending cap.

Source: Guidehouse analysis

Table 4.1-2 shows program-specific and portfolio total finances since the inception of Phase III .

Table 4.1-2. PY3TD Program and Portfolio Total Finances (\$1,000)

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Residential Energy Efficiency*	\$5,018	\$501	\$9,238	\$474	\$15,231
Residential Appliance Recycling	\$298	\$140	\$1,209	\$43	\$1,690
Residential Behavioral Savings	\$0	\$157	\$1,371	\$65	\$1,593
Residential Whole House Retrofit	\$0	\$154	\$252	\$38	\$444
Low-Income Energy Efficiency	\$887	\$224	\$3,089	\$199	\$4,399
Express Efficiency	\$2,254	\$646	\$2,878	\$321	\$6,099
Small/Medium Midstream Lighting	\$500	\$151	\$379	\$96	\$1,126
Small Commercial Direct Install	\$0	\$152	\$3,005	\$138	\$3,295
Multifamily Housing Retrofit**	\$874	\$167	\$1,182	\$140	\$2,363
Commercial Efficiency	\$2,401	\$229	\$2,846	\$301	\$5,777
Large Midstream Lighting	\$460	\$200	\$745	\$219	\$1,624
Industrial Efficiency	\$1,856	\$303	\$3,445	\$498	\$6,102
Public Agency Partnership	\$2,269	\$214	\$2,860	\$276	\$5,619
Community Education	\$428	\$57	\$1,116	\$65	\$1,666
Large Curtailable Load	\$2,435	\$154	\$3,111	\$318	\$6,018
Common Portfolio Costs**					
Portfolio Total	\$19,680	\$3,449	\$36,726	\$3,191	\$63,046
SWE Costs***	N/A	N/A	N/A	N/A	\$1,905

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Total	\$19,680	\$3,449	\$36,726	\$3,191	\$64,951

* Duquesne Light combines financial related information here for the two programs 1) Residential Energy Efficiency and 2) Residential Energy Efficiency (Upstream Lighting) under Residential Energy Efficiency. Otherwise, energy and demand impacts are reported separately for these two programs.

** Common Portfolio Costs include costs associated with program tracking data management, support (legal, IT), and portfolio-level marketing.

*** SWE costs are outside of the 2% spending cap.

Source: Guidehouse analysis

Act 129 allows Pennsylvania EDCs to recover EE&C Plan costs through a cost recovery mechanism. Duquesne Light's cost recovery charges are organized separately by five customer sectors to ensure that the electric rate classes that finance the programs are the rate classes that receive the direct energy and conservation benefits. Cost recovery is governed by tariffed rate class, so it is necessarily tied to the way customers are metered and charged for electric service. Readers should be mindful of the differences between Table 4.1-3 and Section 2.4. For example, the low-income customer segment is a subset of Duquesne Light's residential tariff(s) and are not listed in Table 4.1-3.

Table 4.1-3. EE&C Plan Expenditures by Cost Recovery Category (\$1,000)

Cost Recovery Sector	Rate Classes Included	PYTD Spending	P3TD Spending
Residential	RS, RH, RA	\$5,969	\$23,834
Small/Medium Commercial	GS, GM, GMH	\$3,410	\$13,155
Small/Medium Industrial	GM, GMH	\$646	\$2,074
Large Commercial	GL, GLH, L	\$4,505	\$13,358
Large Industrial	GL, GLH, L, HVPS	\$3,795	\$12,530
Portfolio Total		\$18,325	\$64,951

Includes SWE costs.

Duquesne Light filed a petition to modify its Revised Phase III EE&C Plan to implement a combined EE&C Plan surcharge for the Small & Medium Commercial Class and the Small & Medium Industrial Class – *Petition of Duquesne Light Company for Approval of a Modification to its Revised Act 129 Phase III Energy Efficiency and Conservation Plan, Docket No. M-2015-2515375*, petition granted by the PUC on March 12, 2020. Changes to the Cost Recovery Sectors resulting from that petition will be reflected in subsequent reports.

Source: Guidehouse analysis

Certain PY11 costs are reallocated to reflect the portion of upstream lighting program LEDs being installed in nonresidential sockets. As a result, Table 4.1-1 through Table 4.1-3 differ from the versions shown in the July Preliminary Final report. Specifically, \$242 was moved from Residential to Small/Medium Commercial and Industrial. Details are provided in Appendix A.

Additionally, \$50 from PY11 was reallocated from Large Industrial to Small/Medium Commercial and Industrial. Costs from the Large Curtailable Load Program were initially included in the Large Industrial sector only. Updates were made to Table 4.1-3 to align with some participants that are Small C&I.

Appendix A. Upstream Lighting Cross Sector Sales

Guidehouse completed in-store intercepts during PY9 to re-evaluate cross sector sales that were last updated during PY7. The results developed and reported during PY9 are also being used in this report for PY11. Based on those PY9 in-store intercept surveys, Guidehouse estimates that 3.8% of bulbs purchased through Residential Energy Efficiency (Upstream Lighting) are installed in nonresidential locations. This 3.8% estimate is based on a weighted average of responses received for standard bulbs (3.5% cross sector) and specialty bulbs (4.2% cross sector).

Table A-1 shows the results of the cross-sector sales research conducted in PY9 that inform these PY11 verified results.

Table A-1. Estimation of Percentage of LEDs Being Installed in Nonresidential Settings, Based on PY9 Intercept Survey Results

Bulb Type	Total No. of Bulbs	Total No. Respondents	Total Residential Bulbs	Total Nonresidential Bulbs	% Nonresidential
Standard LED	633	120	611	22	3.5%
Specialty LED	599	98	574	25	4.2%

Source: Guidehouse analysis

All upstream lighting activities are assigned to REEP by Duquesne Light as reflected in reported savings. Lighting installed in nonresidential locations, as verified by Guidehouse, are reassigned to C&I Express Efficiency (EXP), as prescribed by Duquesne Light's EE&C Plan. The realization rates in the previous program specific sections (Section 3.2 for REEP and Section 3.7 for EXP) reflect these lamp reassignments and savings adjustments related to different operating characteristics. Upstream lighting installed in nonresidential locations experience higher energy savings and larger demand reductions due to longer HOU and higher coincidence factors, respectively. Table A-2 shows the final allocation of lamps and costs for upstream lighting after cross-sector installations are considered. Table A-3 shows similar allocations for energy and demand savings in addition to adjustments resulting from verification activities.

Table A-2. Final Allocations for Residential Upstream Lighting Lamps and Costs

Program	Bulb Type	Reported: Lamp Counts	Verified: Lamp Counts	Reported: Incentives (\$1,000)	Verified: Incentives (\$1,000)	Reported: Admin Costs (\$1,000)	Verified: Admin Costs (\$1,000)
REEP	Standard LED	263,983	254,808	\$440	\$425	\$1,568	\$1,352
REEP	Specialty LED	139,988	134,145	\$256	\$245		
EXP	Standard LED	0	9,175	\$0	\$15	\$0	\$216
EXP	Specialty LED	0	5,843	\$0	\$11		
Total		403,971	403,971	\$696	\$696	\$1,568	\$1,568

Source: Guidehouse analysis

Table A-3. Residential Upstream Lighting Savings Summary

Program	Bulb Type	PYRTD MWh/yr	PYVTD MWh/yr	PYRTD MW/yr	PYVTD MW/yr
REEP	Standard LED	11,217	10,237	1.14	1.04
REEP	Specialty LED	6,665	7,080	0.68	0.72
EXP	Standard LED	0	1,974	0.00	0.25
EXP	Specialty LED	0	411	0.00	0.09
Total		17,882	22,290	1.81	2.09

Source: Guidehouse analysis

Appendix B. Site Inspection Summary

Table B-1 summarizes the PY11 site visit activities carried out for the evaluation and informing these PY11 verification results. Guidehouse performed more phone verifications and fewer site visits in PY11 due to safety concerns around the COVID-19 pandemic. Most sites in small strata were converted to phone interviews, along with all Midstream Lighting sites except those with reported demand savings greater than 20 kW. Site visits from PY10 also inform the PY11 results. Guidehouse includes Table B-2 for reference.

Table B-1. PY11 Site Visit Summary

Program	Inspection Firm	Number of Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies
Commercial Efficiency (Large Commercial)	Karpinski Engineering	4	3	Bulb counts, HOU, control type, interaction factor
Express Efficiency	Karpinski Engineering	3	2	Bulb counts, HOU, control type
Small/Medium and Large Nonresidential Upstream Lighting	Karpinski Engineering	3	3	HOU, ISR, interaction factor
Multifamily Housing Retrofit	Karpinski Engineering	0	N/A	HOU, bulb counts
Industrial Efficiency (Large Industrial)	Karpinski Engineering	2*	2	Fixture counts, custom chiller analysis, model number discrepancy
Public Agency Partnership Program	Karpinski Engineering	7	5	HOU, control type, detailed fixture type
Total		19	15	

* One of the site inspections shown here relates to three sample points.

Source: Guidehouse analysis

Table B-2. PY10 Site Visit Summary (informing PY11 Savings)

Program	Inspection Firm	Number of Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies
Commercial Efficiency (Large Commercial)	Karpinski Engineering, Guidehouse	9	7	Bulb counts, HOU, control type, interaction factor, custom analysis
Express Efficiency	Karpinski Engineering	5	3	Bulb counts, HOU, control type
Small/Medium and Large Nonresidential Upstream Lighting	Karpinski Engineering	10	10	HOU, ISR, interaction factor
Community Education	Karpinski Engineering	4	2	HOU, bulb counts, interaction factor
Industrial Efficiency (Large Industrial)	Karpinski Engineering, Guidehouse	3*	1	Custom Compressor Analysis
Public Agency Partnership Program	Karpinski Engineering	2	2	HOU, control type, detailed fixture type, fixture count
Total		33	25	

* One of the site inspections shown here relates to two sample points.

Source: Guidehouse analysis

Appendix C. HER Impact Evaluation Detail

Table C-1 through Table C-5 show the regression results details for the two waves that compose the HER Program and the two waves that compose the Low-Income HER component of LIEEP.

Table C-1. Active Participant Counts by Wave

Month	2012 Market Rate	2015 Market Rate	2015 Low-Income	2018 Low-Income
Jun 2019	13,835	38,705	10,519	3,003
Jul 2019	13,782	38,467	10,423	2,949
Aug 2019	13,715	38,228	10,313	2,877
Sep 2019	13,648	37,959	10,205	2,819
Oct 2019	13,611	37,738	10,104	2,779
Nov 2019	13,555	37,521	9,997	2,738
Dec 2019	13,500	37,343	9,891	2,697
Jan 2020	13,461	37,169	9,814	2,658
Feb 2020	13,418	37,014	9,742	2,618
Mar 2020	13,376	36,883	9,657	2,590
Apr 2020	13,337	36,720	9,580	2,554
May 2020	13,294	36,563	9,515	2,529

Source: Guidehouse analysis

Table C-2. Wave Regression Savings Details

Month	2012 Market Rate		2015 Market Rate		2015 Low-Income		2018 Low-Income	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2019	-0.60	0.13	-0.38	0.11	-0.30	0.18	-0.55	0.19
Jul 2019	-0.62	0.16	-0.51	0.13	-0.40	0.22	-0.53	0.28
Aug 2019	-0.56	0.14	-0.45	0.12	-0.40	0.20	-0.43	0.26
Sep 2019	-0.49	0.13	-0.34	0.10	-0.40	0.18	-0.39	0.24
Oct 2019	-0.50	0.10	-0.36	0.08	-0.52	0.16	-0.17	0.22
Nov 2019	-0.60	0.12	-0.32	0.10	-0.63	0.21	-0.32	0.30
Dec 2019	-0.72	0.14	-0.29	0.11	-0.52	0.23	-0.22	0.32
Jan 2020	-0.75	0.14	-0.29	0.11	-0.36	0.23	-0.26	0.32
Feb 2020	-0.72	0.14	-0.32	0.11	-0.32	0.23	-0.19	0.32
Mar 2020	-0.62	0.12	-0.34	0.10	-0.72	0.22	-0.10	0.27
Apr 2020	-0.52	0.12	-0.31	0.09	-0.73	0.19	-0.02	0.24
May 2020	-0.55	0.12	-0.32	0.10	-0.59	0.20	0.00	0.29

Source: Guidehouse analysis

Table C-3. Wave Regression Savings Percent Details

Month	2012 Market Rate		2015 Market Rate		2015 Low-Income		2018 Low-Income	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2019	1.67%	0.70%	1.36%	0.74%	1.33%	1.52%	2.59%	1.77%
Jul 2019	1.33%	0.67%	1.41%	0.69%	1.37%	1.48%	1.97%	2.05%
Aug 2019	1.36%	0.69%	1.39%	0.71%	1.52%	1.50%	1.77%	2.10%
Sep 2019	1.44%	0.74%	1.27%	0.75%	1.75%	1.57%	1.83%	2.17%
Oct 2019	1.86%	0.73%	1.75%	0.77%	2.60%	1.55%	0.89%	2.25%
Nov 2019	2.04%	0.83%	1.48%	0.86%	2.75%	1.80%	1.44%	2.66%
Dec 2019	2.18%	0.82%	1.18%	0.85%	2.07%	1.81%	0.90%	2.58%
Jan 2020	2.30%	0.85%	1.22%	0.88%	1.45%	1.83%	1.06%	2.54%
Feb 2020	2.31%	0.90%	1.41%	0.92%	1.31%	1.90%	0.79%	2.65%
Mar 2020	2.23%	0.86%	1.66%	0.95%	3.35%	1.98%	0.50%	2.55%
Apr 2020	1.94%	0.86%	1.53%	0.92%	3.62%	1.87%	0.13%	2.51%
May 2020	2.04%	0.90%	1.56%	0.98%	2.93%	1.92%	0.01%	3.02%

Source: Guidehouse analysis

Table C-4. Wave Monthly Regression Savings (MWh/yr)

Month	2012 Market Rate	2015 Market Rate	2015 Low-Income	2018 Low-Income
Jun 2019	250.15	440.82	95.96	49.86
Jul 2019	263.43	607.07	129.32	48.09
Aug 2019	238.17	529.31	129.14	38.61
Sep 2019	202.20	388.04	121.82	32.94
Oct 2019	211.70	426.97	161.54	14.43
Nov 2019	242.16	365.49	188.83	26.44
Dec 2019	302.86	332.15	159.35	18.46
Jan 2020	311.03	335.36	109.22	21.36
Feb 2020	269.14	335.81	86.18	13.78
Mar 2020	258.64	393.24	216.54	8.33
Apr 2020	206.57	336.93	210.61	1.88
May 2020	228.00	360.84	172.64	0.12

Savings are prior to any overlap adjustments or reassignments for low-income identification.

Source: Guidehouse analysis

Table C-5. Wave Average Daily Use

Wave	Average Daily Use (kWh)
2012 Market Rate	32.1
2015 Market Rate	24.5
2015 Low-Income	22.8
2018 Low-Income	22.0

Source: Guidehouse analysis

To the extent that the HER waves increase participation in other solutions, some savings from the evaluation's regression analysis could be double counted if appropriate adjustments are not made. Double counting can be avoided for downstream programs that track participation at the customer level by generating estimates of uplift—that is, the increase in participation in the given program among HER participants. This is also known as the overlap savings.

To generate estimates of uplift, Guidehouse followed the Phase III Evaluation Framework guidance on completing dual participation analyses. The Phase III Evaluation Framework conveys that exposure to the HER messaging often motivates participants to take advantage of other Duquesne Light program offerings that may be promoted through HER promotional materials. This exposure creates a situation where households in the treatment groups tend to participate in other programs at a higher rate than households in the control groups. The Phase III Evaluation Framework methodology calls for program-specific uplift calculations, and the SWE requests those values be reported.

The evaluation team estimated aggregate uplift across residential programs. From a theoretical standpoint, the program uplift, which is associated with suggestions provided in the HERs, may be allocated to either the Behavioral Program (or LIEEP for the Low-Income HER waves) or the other program involved in its realization since the savings would not have occurred in the

absence of either program. However, the industry standard approach is to subtract the amount of the overlap savings from the Behavioral Program savings; the team followed this approach. This approach is also consistent with the detailed methodology described in Section 6.1.1.8.1 of the Phase III Evaluation Framework.

Guidehouse calculated downstream overlap savings using reported values from other Duquesne Light energy efficiency programs. If those savings exceeded 5% of gross verified HER savings, the evaluation team examined downstream overlap savings at the program and measure level. If a single program, initiative, or measure exceeded 20% of total downstream double counted savings and the realization rate for the applicable measure(s) was outside the range of 90% to 110%, the team used the verified savings values (rather than reported savings values) for the applicable measure(s) in the downstream overlap savings calculation. No measures installed in PY11 met these criteria. Verified savings values were applied for energy efficiency kits installed in PY9 and PY10.

Guidehouse’s overlap analysis also accounts for upstream programs, in particular the upstream lighting component of REEP. The calculation of overlap savings from upstream programs is complicated by the fact that participation is not tracked at the customer level and the approaches described previously for specific homes are infeasible. Per Section 6.1.1.8.2 of the Phase III Evaluation Framework, the team used the Framework’s assumed upstream reduction factor dependent on the number of years of activity for the given wave. That reduction factor was subtracted from the estimate of energy savings for each wave after downstream overlap savings had been removed.

Table C-6 shows the upstream reduction factors. Table C-7 shows how adjustments are applied to the regression results to arrive at the final verified savings values. Table C-7 also incorporates the market segment reclassifications for certain participants, as described in Section 3.4, in addition to demand impacts.

Table C-6. Upstream Adjustment Factors

Years Since Cohort Inception	Default Upstream Reduction Factor	Waves
1	0.75%	-
2	1.50%	2018 Low-Income
3	2.25%	-
4 and beyond	3.00%	2012 Market Rate, 2015 Low-Income, 2015 Market Rate

Source: Phase III Evaluation Framework

Table C-7. Savings Adjustments and Final Savings

Wave	Regression Savings (MWh/yr)	Downstream Dual Participation Savings (MWh/yr)	Upstream Dual Participation Savings (MWh/yr)	Market Segment Reclassifications (MWh/yr)	Net Savings (MWh/yr)	Demand Savings (MWh/yr)
2012 Market Rate	2,984	-501	-75	-84	2,325	0.27
2015 Market Rate	4,852	-1,408	-103	-140	3,200	0.37
2015 Low-Income	1,781	-286	-45	225	1,675	0.19
2018 Low-Income	274	-55	-3	0	216	0.02

Source: Guidehouse analysis

Appendix D. PY11 and P3TD Summary by Customer Segment and Carveout

Table D-1 and Table D-2 show the breakdown of the portfolio savings by customer segment for energy and demand savings, respectively. Table D-3 shows the breakdown of demand response savings by customer segment.

Table D-1. Summary of Customer Segment Energy Savings

Energy Efficiency Programs	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYRTD (MWh/yr)	33,608	3,870	15,118	31,371	14,174	98,139
PYVTD Gross (MWh/yr)	30,044	3,831	19,667	28,635	15,172	97,349
RTD (MWh/yr)	162,134	15,018	54,878	91,764	39,112	362,906
VTD Gross (MWh/yr)	152,453	13,808	69,997	89,290	40,019	365,567

Source: Guidehouse analysis

Table D-2. Summary of Customer Segment Demand Savings

Energy Efficiency Programs	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYRTD (MW/yr)	3.69	0.38	2.13	4.78	2.16	13.14
PYVTD Gross (MW/yr)	3.32	0.38	2.94	4.72	1.81	13.17
RTD (MW/yr)	17.72	1.49	7.90	11.63	5.71	44.45
VTD Gross (MW/yr)	16.74	1.41	10.39	11.84	4.58	44.97

Source: Guidehouse analysis

Table D-3. Summary of Customer Segment Demand Response Savings

Demand Response Program	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYVTD (MW/yr)	N/A	N/A	0.69	50.16	5.15	56.00
VTD (MW/yr)	N/A	N/A	0.72	49.12	5.32	55.16

Source: Guidehouse analysis

The PY11 low-income carveout in Table D-4 comprises savings from three LIEEP components and a portion of the MFHR program. Table D-5 shows the GNI carveout which comprises savings from PAPP and CEEP.

Table D-4. Summary of Low-Income Carveout Savings

Low-Income Carve-Out	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Carryover from Phase II		3,266
LIEEP (LI Kits, LI HER, LI WHRP)	3,831	13,808
LI-MFHR (a portion of program savings)	1,850	3,244
Total	5,681	17,052
Total (VTD+CO)		20,318
Goal		24,250
Percent of Goal (including CO)		83.8%

Source: Guidehouse analysis

Table D-5. Summary of GNI Carveout Savings

GNI Carve-Out	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Carryover from Phase II		0
Public Agency Partnership	12,897	32,230
Community Education	2,275	7,789
Total	15,172	40,019
Total (VTD+CO)		40,019
Goal		15,432
Percent of Goal (including CO)		259.3%

Source: Guidehouse analysis

Table D-6 and Table D-7 show the breakdown of the portfolio savings at the program level for energy and demand savings, respectively, for energy efficiency programs. Table D-8 shows the summary of demand response savings for the demand response program.

Table D-6. Summary of Program Energy Savings

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)
Residential Energy Efficiency	5,384	5,137	24,808	20,019
Residential Energy Efficiency (Upstream Lighting)	17,882	17,316	97,895	98,210
Residential Appliance Recycling	2,206	2,066	8,793	8,322
Residential Behavioral Savings	8,135	5,525	30,503	25,789
Residential Whole House Retrofit	0	0	134	114
Low-Income Energy Efficiency	3,870	3,831	15,018	13,808
Express Efficiency	9,620	13,308	32,787	47,007
Small/Medium Midstream Lighting	3,691	4,509	7,709	8,890
Small Commercial Direct Install	0	0	10,934	10,688
Multifamily Housing Retrofit	1,807	1,851	3,448	3,411
Commercial Efficiency	13,633	13,315	43,278	42,177
Large Midstream Lighting	1,897	1,879	6,263	7,100
Industrial Efficiency	15,841	13,441	42,223	40,013
Public Agency Partnership	11,857	12,897	31,457	32,230
Community Education	2,317	2,275	7,655	7,789
Total	98,139	97,349	362,906	365,567

Source: Guidehouse analysis

Table D-7. Summary of Program Demand Savings

Program	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)
Residential Energy Efficiency	0.70	0.70	3.33	2.91
Residential Energy Efficiency (Upstream Lighting)	1.81	1.75	9.92	9.94
Residential Appliance Recycling	0.25	0.23	0.98	0.93
Residential Behavioral Savings	0.93	0.63	3.48	2.94
Residential Whole House Retrofit	0.00	0.00	0.01	0.01
Low-Income Energy Efficiency	0.38	0.38	1.49	1.41
Express Efficiency	1.30	1.90	4.88	7.16
Small/Medium Midstream Lighting	0.68	0.88	1.34	1.53
Small Commercial Direct Install	0.00	0.00	1.36	1.39
Multifamily Housing Retrofit	0.15	0.16	0.31	0.31
Commercial Efficiency	2.28	2.30	5.76	5.80
Large Midstream Lighting	0.35	0.30	1.13	1.28
Industrial Efficiency	2.15	2.13	4.75	4.77
Public Agency Partnership	1.79	1.44	4.40	3.24
Community Education	0.37	0.38	1.31	1.34
Total	13.14	13.17	44.45	44.97

Source: Guidehouse analysis

Table D-8. Summary of Demand Response Program

Program	PYVTD Gross (MW/yr)	VTD Gross (MW/yr)
Large Curtailable Load	56.00	55.16

Source: Guidehouse analysis

Appendix E. Survey Dispositions

Guidehouse conducted program participant surveys and trade ally interviews in PY11. Generally, the evaluation team attempted to reach a given contact via email with up to three follow-up reminders or through at least six call attempts scheduled at different times of day and days of the week. The team also relied on small dollar amount incentives in some instances. Table E-1 shows the final dispositions for the survey and interview efforts.

Table E-1. Survey Disposition Summary

Program	Population	Completed Surveys	Response Rate	Time to Complete (mins)	Refused	Respondent Not Available	No Answer/ Answering Machine/ Phone Busy	Other
REEP Rebate	2,453	112	11%	7	N/A	N/A	N/A	N/A
REEP Kits / REEP Kits Low Income	9,728	815	7%	10	N/A	N/A	N/A	N/A
Appliance Recycling	2,213	201	12%	10	N/A	N/A	N/A	N/A
Home Energy Report (MR & LI) (email)	33,665	86	7%	12	N/A	N/A	N/A	N/A
Home Energy Report (MR & LI) (phone)	28,228	49	3%	13	8%	3%	80%	6%
Commercial/Express (email & phone)	186	32	17%	18	N/A	N/A	N/A	N/A
Industrial (email & phone)	43	10	23%	14	N/A	N/A	N/A	N/A
Commercial/Express/Industrial (phone only)	152	11	7%	22	5%	18%	70%	5%
Commercial/Express/Industrial Trade Allies (phone & email)*	67	13	19%	30	N/A	N/A	N/A	N/A
PAPP*	37	3	8%	30	N/A	N/A	N/A	N/A
Multifamily Trade Allies*	3	2	67%	30	0%	0%	0%	33%
CEEP Teacher Interviews	3	3	100%	30	0%	0%	0%	0%

*The recruitment efforts for the trade allies to participate in the interview were conducted interchangeably via phone and email.

Source: Guidehouse analysis

Appendix F. Respondent Demographics

Table F-1 shows the respondent demographics for the REEP kits, REEP rebates, and RARP surveys conducted in PY11. Table F-2 shows the respondent demographics for the Residential Behavioral and Low-Income WHRP surveys. Table F-3 shows firmographics for PY11 process and NTG survey participants for CEP, EXP, and IEP in aggregate.

Table F-1. PY11 Survey Demographics for REEP and RARP

Program		REEP Kit		REEP Rebate		RARP	
Sample Size (n)		761		86		202	
		Count	%	Count	%	Count	%
Household	Members in Household (Average)	2.2		2.4		2.4	
Age	Under 18	0	0%	0	0%	0	0%
	18 to 24	7	1%	0	0%	2	1%
	25 to 34	48	6%	8	9%	9	4%
	35 to 44	97	13%	16	19%	14	7%
	45 to 54	109	14%	9	10%	27	13%
	55 to 64	210	28%	17	20%	58	29%
	65 or over	249	33%	34	40%	79	39%
	Don't Know	1	0%	0	0%	0	0%
	Refused	40	5%	2	2%	13	6%
Home Size	Less than 1,000 SF	89	12%	4	5%	8	4%
	1,000 SF to 1,500 SF	195	26%	24	28%	34	17%
	1,500 SF to 2,000 SF	157	21%	22	26%	52	26%
	2,000 SF to 2,500 SF	94	12%	17	20%	31	15%
	2,500 SF to 3,000 SF	34	4%	5	6%	17	8%
	3,000 SF or more	31	4%	7	8%	8	4%
	Don't Know	133	17%	6	7%	35	17%
	Refused	28	4%	1	1%	17	8%
Income	Under \$14,999	30	4%	1	1%	4	2%
	\$15,000 to \$17,999	17	2%	0	0%	4	2%
	\$18,000 to \$23,999	31	4%	1	1%	3	1%
	\$24,000 to \$29,999	35	5%	1	1%	6	3%
	\$30,000 to \$36,999	44	6%	2	2%	10	5%
	\$37,000 to \$42,999	44	6%	4	5%	5	2%
	\$43,000 to \$49,999	40	5%	0	0%	11	5%
	\$50,000 to \$74,999	95	12%	9	10%	23	11%
	\$75,000 to \$99,999	93	12%	13	15%	14	7%
	\$100,000 or more	106	14%	22	26%	34	17%
	Don't Know	0	0%	0	0%	0	0%
	Refused	226	30%	33	38%	88	44%

Program		REEP Kit		REEP Rebate		RARP	
Sample Size (n)		761		86		202	
		Count	%	Count	%	Count	%
Education	Less than high school	4	1%	0	0%	0	0%
	High school / GED	111	15%	10	12%	23	11%
	Some college	121	16%	11	13%	24	12%
	2-year college	88	12%	7	8%	22	11%
	4-year college	225	30%	24	28%	54	27%
	Master's degree	105	14%	22	26%	37	18%
	Doctoral Degree	16	2%	2	2%	6	3%
	Professional degree (JD, MD)	13	2%	1	1%	5	2%
	Prefer not to answer	78	10%	9	10%	31	15%

Source: Guidehouse analysis

Table F-2. PY11 Survey Demographics for Residential Behavioral and Whole Home Retrofit Programs

Program		Behavioral		Low-Income WHRP	
Sample Size (n)		135		103	
		Count	%	Count	%
Household	Members in Household (Average) (excluding DK/Refused)	2.3		3	
Age	Under 18	0	0%	1	1%
	18 to 24	0	0%	2	2%
	25 to 34	4	3%	17	17%
	35 to 44	19	14%	28	27%
	45 to 54	22	16%	19	18%
	55 to 64	33	24%	21	20%
	65 or over	55	41%	12	12%
	Don't Know	0	0%	0	0%
	Refused	2	1%	3	3%
Home Size	Less than 1,000 SF	7	5%	9	9%
	1,000 SF to 1,500 SF	17	13%	19	18%
	1,500 SF to 2,000 SF	20	15%	19	18%
	2,000 SF to 2,500 SF	10	7%	8	8%
	2,500 SF to 3,000 SF	5	4%	3	3%
	3,000 SF or more	6	4%	1	1%
	Don't Know	69	51%	42	41%
	Refused	1	1%	2	2%
Income	Under \$14,999	33	24%	34	33%
	\$15,000 to \$17,999	8	6%	11	11%
	\$18,000 to \$23,999	7	5%	16	16%
	\$24,000 to \$29,999	9	7%	11	11%
	\$30,000 to \$36,999	5	4%	9	9%

Program		Behavioral		Low-Income WHRP	
Sample Size (n)		135		103	
		Count	%	Count	%
	\$37,000 to \$42,999	1	1%	4	4%
	\$43,000 to \$49,999	2	1%	3	3%
	\$50,000 to \$74,999	8	6%	4	4%
	\$75,000 to \$99,999	5	4%	1	1%
	\$100,000 or more	20	15%	0	0%
	Don't Know	0	0%	0	0%
	Refused	37	27%	10	10%
Education	Less than high school	8	6%	3	3%
	High school / GED	42	31%	33	32%
	Some college	18	13%	19	18%
	2-year college	18	13%	23	22%
	4-year college	25	19%	17	17%
	Master's degree	16	12%	3	3%
	Doctoral Degree	3	2%	0	0%
	Professional degree (JD, MD)	2	1%	0	0%
	Prefer not to answer	3	2%	5	5%

Source: Guidehouse analysis.

Table F-3. PY11 Survey Firmographics for CEP, EXP, and IEP

Program		CEP, EXP, IEP	
Sample Size		38	
		Count	%
Facility type	Office	10	26%
	Retail	2	5%
	Restaurant/bar	0	0%
	Food store	1	3%
	Warehouse/wholesale	6	16%
	Hotel/motel	0	0%
	Personal service	3	8%
	Elementary/secondary schools	0	0%
	College/trade schools	0	0%
	Hospital	0	0%
	Other health services	0	0%
	Miscellaneous/other commercial	3	8%
	Government service/public service	0	0%
	Manufacturing	12	32%
	Apartment complexes	1	3%
	Don't Know	0	0%

Program		CEP, EXP, IEP	
Sample Size		38	
		Count	%
Ownership	I am the owner or operator of the facility	9	24%
	Our organization owns and occupies this facility	10	26%
	Our organization owns this facility but it is rented to someone else	3	8%
	Our organization rents this facility	9	24%
	Other	7	18%
	Don't Know	0	0%
	Age	Less than 2 years	1
2 to 4 years		2	5%
5 to 9 years		3	8%
10 to 19 years		11	29%
20 to 29 years		19	50%
30 years or more		2	5%
Don't Know		0	0%
Employees	1 to 4	3	8%
	5 to 9	2	5%
	10 to 19	12	32%
	20 to 99	16	42%
	100 to 499	1	3%
	500 to 749	1	3%
	750 to 999	0	0%
	1,000 or more	1	3%
	Don't Know	2	5%

Source: Guidehouse analysis.

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