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November 12, 2021

Via Electronic Filing

Ms. 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
Preliminary Annual Report - Program Year 12
Docket No. M-2015-2515375**

Dear Secretary Chiavetta:

Enclosed for filing, please find the Final Annual Report for Program Year 12 of Duquesne Light Company's Energy Efficiency and Conservation Phase III Plan.

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

Respectfully Submitted,

A handwritten signature in blue ink, appearing to read "Michael Zimmerman", is written over a light blue circular stamp.

Michael Zimmerman
Senior Counsel, Regulatory

Enclosure

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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Dated: November 12, 2021



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

**Program Year 12
(June 1, 2020 – May 31, 2021)**

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

Prepared for:



Duquesne Light Company

Submitted by:

Guidehouse Inc.
1200 19th Street NW, Suite 700
Washington, DC 20036

November 12, 2021

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Acronyms

BAS	Building Automation System
CBL	Customer Baseline
CO	Carryover
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
EV	Electric Vehicle
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
PMRS	Program Management and Reporting System
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
PYTD	Program Year 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
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

The 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 the PA PUC subsequently approved them 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 12 (PY12) and 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 PY12. 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 (M&V) of the savings and calculation of gross verified and net verified savings.

Guidehouse 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 possible changes to EE&C program delivery based on the recommendations.

Phase III of Act 129 includes a demand response (DR) goal for Duquesne Light. DR events are limited to 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, the independent evaluation of verified gross savings for DR can be completed sooner than is possible for energy efficiency programs. Duquesne Light initiated its DR program in PY9 and continued activities into PY12. Verified gross savings results from the EDC's PY12 DR season, which ran from June through September 2019, were originally reported in the PY12 Semiannual Report submitted in January 2020.

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.

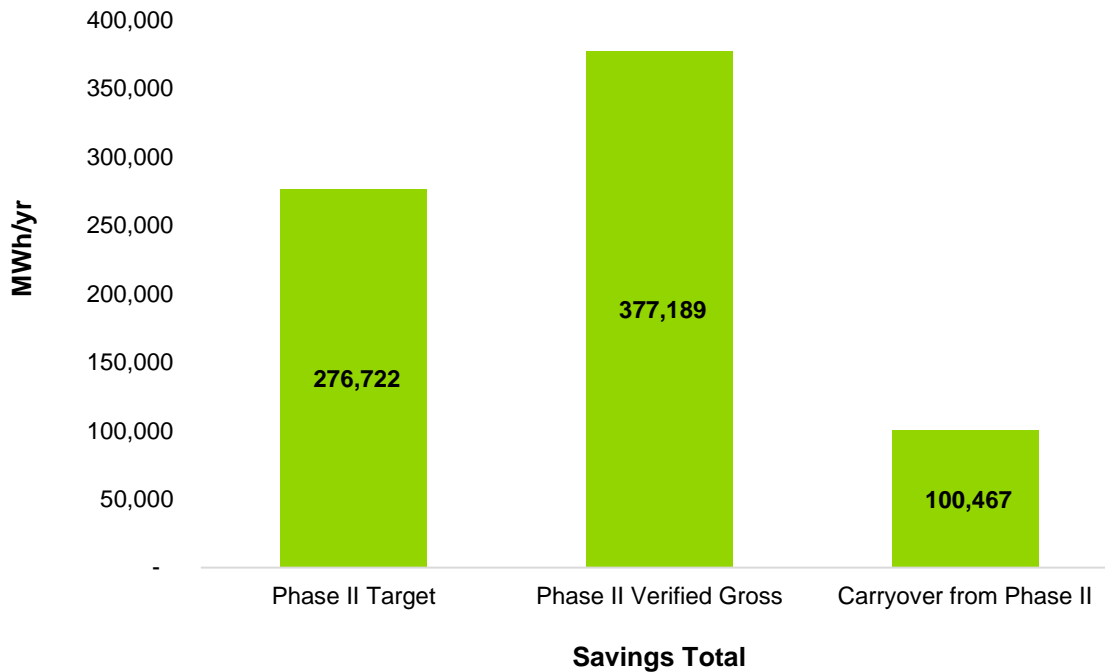
² On October 11, 2019, Guidehouse LLP completed its acquisition of Navigant Consulting, Inc. and its operating subsidiaries. For more information, see: <https://guidehouse.com/news/corporate-news/2019/guidehouse-completes-acquisition-of-navigant>.

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

Figure 2-1. Carryover Savings from Phase II of Act 129



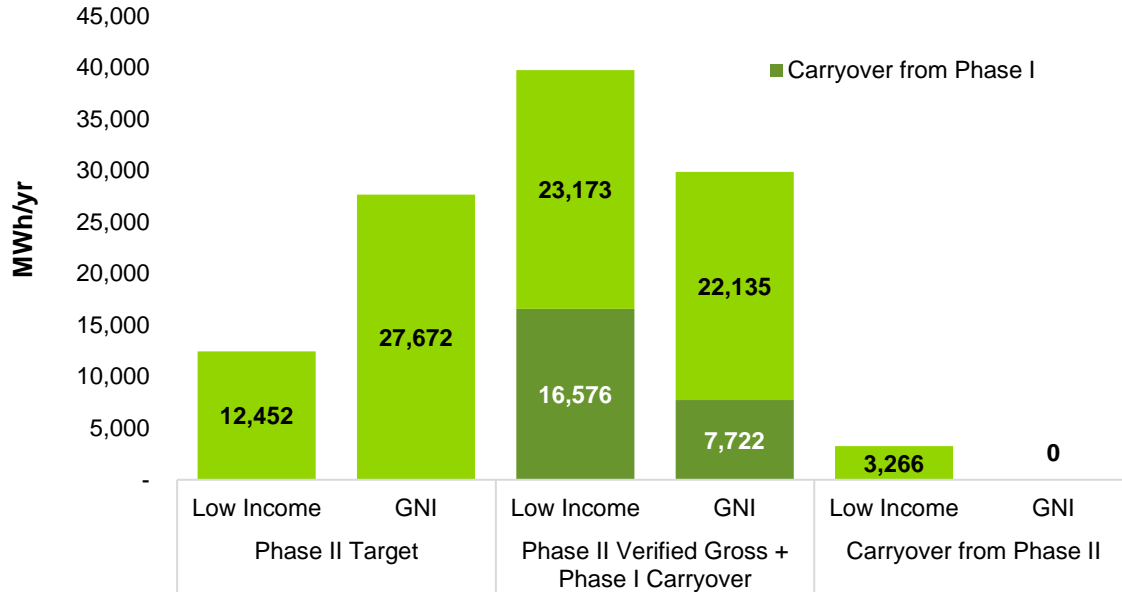
Source: Guidehouse analysis

The PA PUC’s Phase III Implementation Order³ allowed EDCs to carryover savings in excess of the Phase II government, nonprofit, and institutional (GNI) savings goal and excess savings from the low-income customer segment.⁴ Figure 2-2 shows the calculation of carryover savings for the low-income and GNI targets.

³ 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.

⁴ Proportionate to those savings achieved by dedicated low-income programs in Phase II.

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



Source: Guidehouse analysis

2.2 Phase III Energy Efficiency Achievements to Date

Since the beginning of PY12 on June 1, 2020, Duquesne Light has claimed the following savings:

- 99,859 MWh/yr of reported gross electric energy savings (program year reported to date [PYRTD])⁵
- 14.16 MW/yr of reported gross peak demand savings (PYRTD) from energy efficiency programs
- 103,486 MWh/yr of verified gross electric energy savings (program year verified to date [PYVTD])
- 14.93 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 achieved the following savings:

- 462,765 MWh/yr of reported gross electric energy savings (RTD)

⁵ PYRTD savings here are greater than the PY12 Preliminary Annual Report by 8,901 MWh/yr and 1.02 MW/yr. This primarily reflects the addition of savings from the HER and LI HER programs. However, after the Preliminary Report's filing in July 2021, it was discovered that two months' worth of activity for RARP had not been uploaded to Duquesne Light's tracking data. This equates to 306 MWh/yr and 0.03 MW/yr. These adjustments are reflected throughout this report.

- 58.61 MW/yr of reported gross peak demand savings (RTD) from energy efficiency programs
- 469,053 MW/yr of verified gross electric energy savings (VTD) from energy efficiency programs
- 59.90 MW/yr of verified gross peak demand savings (VTD) from energy efficiency programs

Including carryover savings from Phase II, Duquesne Light achieved:

- 569,520 MWh/yr of VTD and portfolio-level carryover (CO) energy savings.
 - This represents 129% of the May 31, 2021 energy savings compliance target of 440,916 MWh/yr.

Looking ahead to Phase IV:

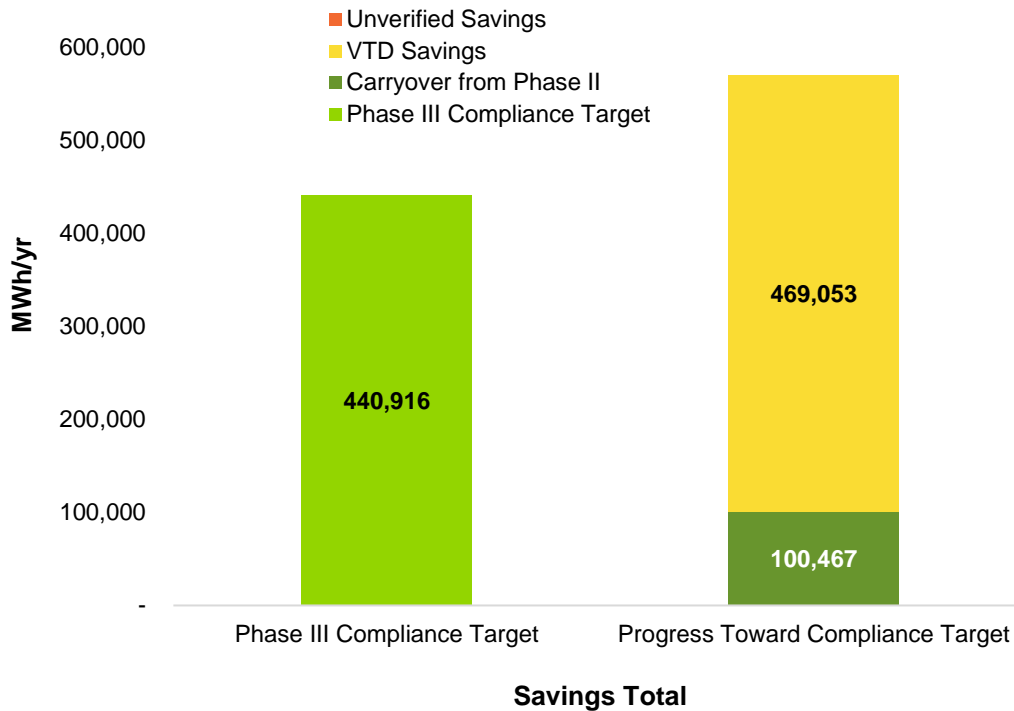
- With 469,053 MWh/yr of VTD energy savings achieved during Phase III, Duquesne Light achieved an estimated 28,137 MWh/yr of carryover energy savings from Phase III to Phase IV. This represents 8.08% of the Phase IV portfolio savings target.⁶

Appendix D includes additional detail on PY12 and Phase III to date (P3TD) energy and peak demand savings by customer segment, carveout, portfolio, and program.

Figure 2-3 summarizes Duquesne Light's progress toward the Phase III portfolio compliance target.

⁶ In the June 18, 2020 Implementation Order, the Commission adopted the percentage reduction targets recommended by the SWE. Duquesne Light Company's ("Duquesne Light" or "Duquesne" or the "Company"), energy consumption reduction target for the Phase IV five-year energy efficiency consumption is 348,126 MWh and demand reduction target is 62 MW.

Figure 2-3. EE&C Plan Performance Toward Phase III Portfolio Compliance Target



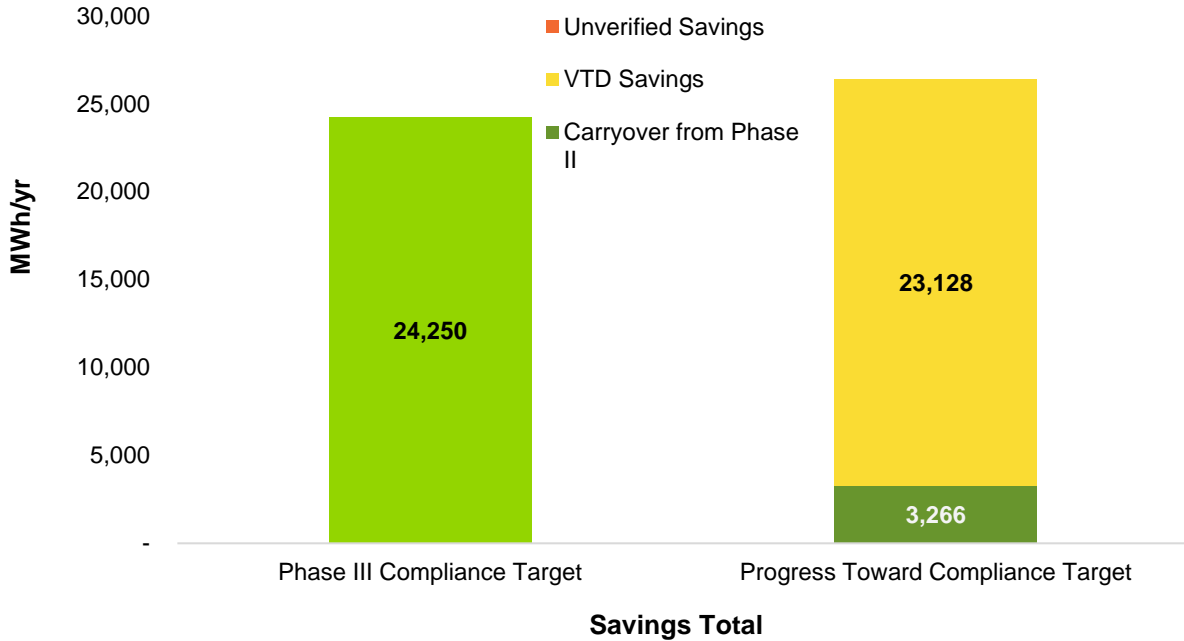
Source: Guidehouse analysis

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 113 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 17.7% of the total measures offered in the EE&C Plan and exceeds the proportionate number of measures target.

The PA PUC 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 2-4 compares the VTD performance for the low-income customer segment to the Phase III savings target. Duquesne Light achieved 108.8% of the Phase III low-income energy savings target.

Looking ahead to Phase IV, with 23,128 MWh/yr of VTD low-income energy savings achieved during Phase III, Duquesne Light does not have low-income carryover energy savings from Phase III to Phase IV.

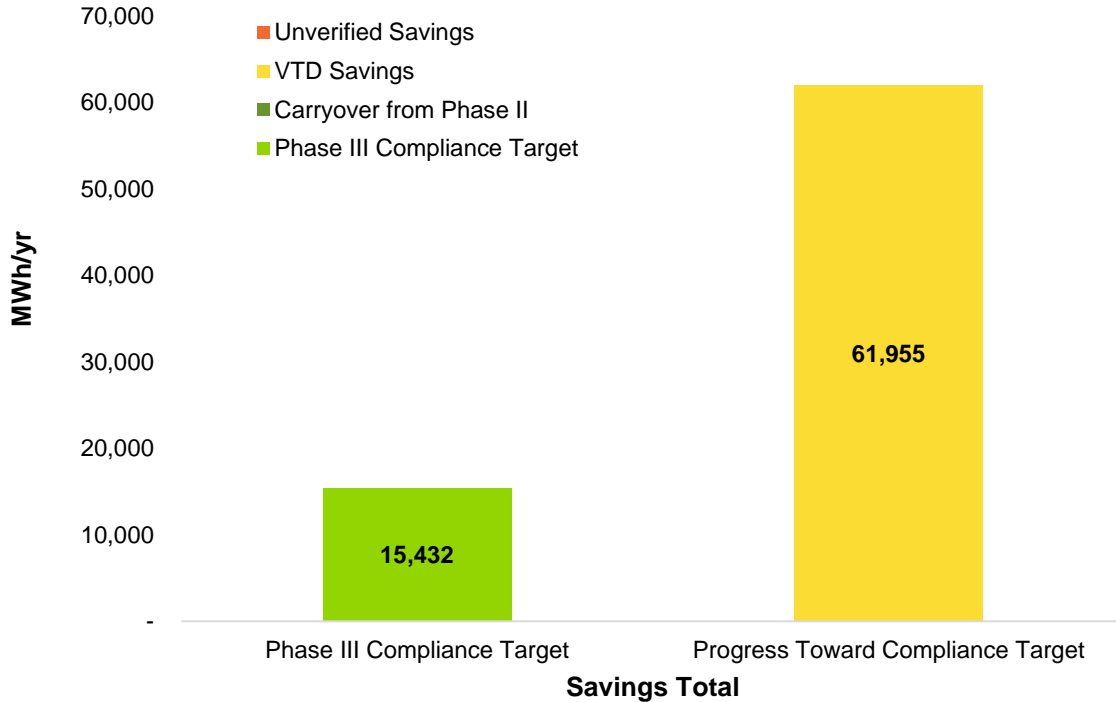
Figure 2-4. EE&C Plan Performance Toward Phase III Low-Income Compliance Target



Source: Guidehouse analysis

The Phase III Implementation Order established a GNI energy savings target of 3.5% of the portfolio savings goal. Duquesne Light’s GNI savings target is 15,432 MWh/yr and is based on verified gross savings. Figure 2-5 compares the VTD performance for the GNI customer segment to the Phase III savings target. Duquesne Light has achieved 401.5% of the Phase III GNI energy savings target.

Figure 2-5. 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. Four DR events were called in PY12. Table 2-1 lists the days DR events were called and the verified gross demand reductions achieved by each program. Table 2-1 also lists the average DR performance for PY12 and for P3TD. Duquesne Light’s average DR performance to date is above the Phase III compliance reduction target by 31% (performance–goal/goal).

The EDCs were not required to obtain peak demand reductions in the first program year of Phase III (PY8) and DR programs were deemed voluntary by the PA PUC in PY12 due to the

COVID-19 pandemic.⁷ Therefore, Phase III compliance is based on achieved impacts through PY11.

Table 2-1. 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
2020-07-20	15	18	2.78	39.30	N/A	N/A	42.07
2020-07-27	15	18	2.27	48.32	N/A	N/A	50.59
2020-07-29	16	19	2.14	32.93	N/A	N/A	35.08
2020-08-25	15	18	1.40	22.82	N/A	N/A	24.22
2020-08-27	16	19	0.68	9.39	N/A	N/A	10.07
PYVTD – Average PY12 DR Event Performance							32.41
VTD – Average Phase III DR Event Performance*							55.16

*DR participation was voluntary for PY12. Therefore, Phase III compliance is based on achieved impacts through PY11.

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 through PY11. Although voluntary DR events during PY12 did not count toward Duquesne Light's compliance

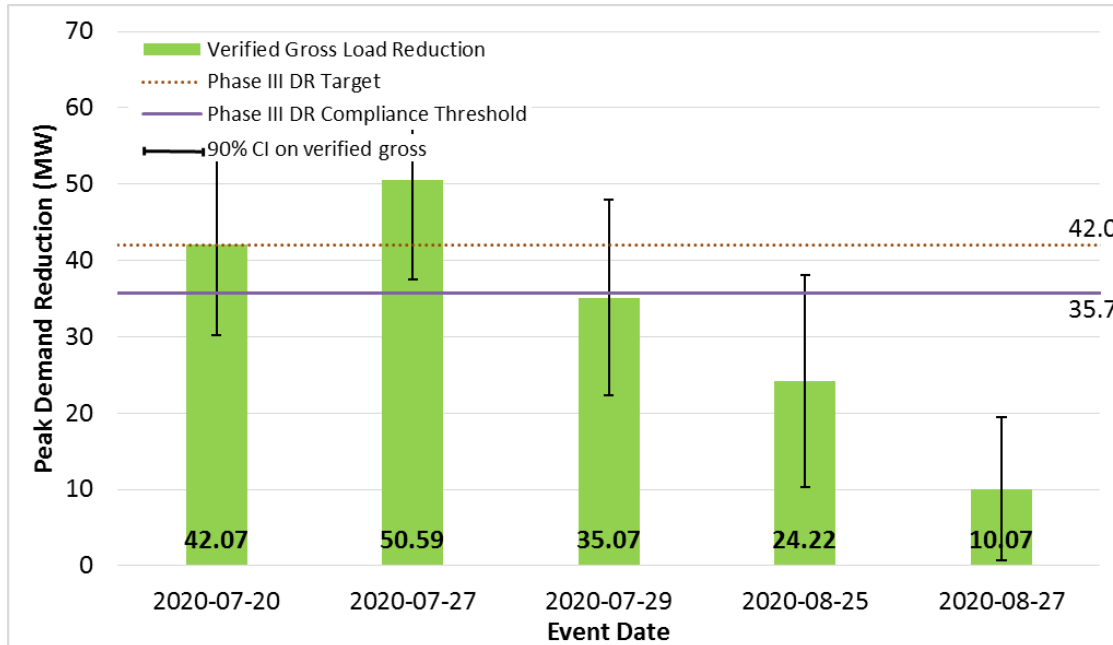
⁷ The Commission granted the EAP's petition to modify compliance with peak demand reduction (DR) targets because of the COVID-19 pandemic. The EAP requested that the Commission modify the Phase III Implementation Order to measure compliance with peak DR targets based on electric distribution company (EDC) performance during the second, third, and fourth program years of Phase III (June 1, 2017 through May 31, 2020), and permit EDCs to implement approved DR programs on a voluntary basis for the fifth and final program year (June 1, 2020 through May 31, 2021). EAP sought expedited consideration of this Petition.

See *Petition to Amend the Commission's June 19, 2015 Implementation Order* at Docket No. M-2014-2424864, (Phase III Implementation Order) Phase III Modification Order entered June 3, 2020.

<http://www.puc.pa.gov/pcdocs/1665150.docx>

targets, for informational purposes, Figure 2-6 compares the performance of each DR event in PY12 to the event-specific minimum and average targets that would otherwise have applied.

Figure 2-6. Event Performance Compared to 85% Per-Event Target



Source: Guidehouse analysis

2.4 Phase III Performance by Customer Segment

Table 2-2 presents the participation, savings, and spending by customer sector for PY12. The EDC tariff defines the residential, small commercial and industrial (C&I), and large C&I sectors; a statute (66 Pa. C.S. § 2806.1) defined the residential low-income and GNI sector. 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. Guidehouse removed the savings, spending, and participation values for the low-income and GNI segments from the parent sectors in Table 2-2.

Table 2-2. PY12 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	52,285	14,033	441	255	260	67,274
PY12 Energy Realization Rate	82%	104%	127%	99%	116%	104%
PYVTD MWh/yr	7,934	4,462	13,305	55,849	21,936	103,486
PY12 Demand Realization Rate	83%	107%	166%	87%	131%	105%
PYVTD MW/yr (Energy Efficiency)	1.06	0.44	2.66	6.86	3.91	14.93

Parameter	Residential (Non-Low-Income)	Residential Low-Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYVTD MW (DR)	N/A	N/A	0.55	26.14	5.71	32.41
Incentives (\$1,000)*	\$316	\$195	\$1,708	\$3,945	\$1,449	\$7,614

Participant counts in this table differ from the PY12 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 (46,424), Low-Income Energy Efficiency (13,377 for Low-Income Home Energy Reports and 656 for Low-Income Whole House Retrofit Program), Small/Medium Midstream Lighting (158), and Large Midstream Lighting (75).

Source: Guidehouse analysis

Table 2-3 summarizes plan performance by sector since the beginning of Phase III.

Table 2-3. 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*	332,325	96,735	2,291	853	657	432,861
P3TD Energy Realization Rate	93%	95%	127%	98%	107%	101%
VTD MWh/yr	160,387	18,270	83,302	145,140	61,955	469,053
P3TD Demand Realization Rate	94%	98%	137%	96%	98%	102%
VTD MW (Energy Efficiency)	17.79	1.85	13.05	18.70	8.49	59.90
VTD MW (DR)**	N/A	N/A	0.72	49.12	5.32	55.16
Incentives (\$1,000)***	\$5,632	\$1,082	\$5,369	\$10,704	\$4,507	\$27,294

*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, excluding the voluntary PY12 program 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 2-4. Table 2-5 provides the participation totals for PY12 and Phase III.

Table 2-4. 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 PY12) represented by a unique participant account number. The counts appearing in Table 2-5 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 2021) represented by a unique participant account number. The count appearing in Table 2-5 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 a 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 the Residential Energy Efficiency Program (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.
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

Program	Component	Definition
Low-Income Whole House Retrofit		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).

Source: Guidehouse analysis

Table 2-5. EE&C Portfolio Participation by Program

Program	PYTD Participation	P3TD Participation
Residential Energy Efficiency	4,839	58,868
Residential Energy Efficiency (Upstream Lighting)	N/A	N/A
Residential Appliance Recycling	1,022	9,136
Residential Behavioral Savings	46,424	263,995
Residential Whole House Retrofit	0	326
Low-Income Energy Efficiency	14,033	96,735
Express Efficiency	237	1,202
Small/Medium Midstream Lighting	158	883
Small Commercial Direct Install	0	140
Multifamily Housing Retrofit	26	66
Commercial Efficiency	43	242
Large Midstream Lighting	75	470
Industrial Efficiency	32	141
Public Agency Partnership	190	543
Community Energy Efficiency	0	114
Large Curtailable Load	195	195*
Portfolio Total	67,274	433,056

*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 PY12, Guidehouse completed impact evaluations for many of the energy efficiency programs in the portfolio. Table 2-6 summarizes the realization rates and net-to-gross (NTG) ratios by program or evaluation initiative.

Table 2-6. Impact Evaluation Results Summary

Program/Initiative	Energy Realization Rate	Demand Realization Rate	NTG Ratio
Residential Energy Efficiency	115%	103%	66%

Program/Initiative	Energy Realization Rate	Demand Realization Rate	NTG Ratio
Residential Energy Efficiency (Upstream Lighting)	N/A	N/A	N/A
Residential Appliance Recycling	90%	90%	47%
Residential Behavioral Savings	75%	75%	100%
Residential Whole House Retrofit	N/A	N/A	N/A
Low-Income Energy Efficiency	104%	107%	100%
Express Efficiency	133%	194%	79%
Small/Medium Midstream Lighting	123%	128%	88%
Small Commercial Direct Install	N/A	N/A	N/A
Multifamily Housing Retrofit	108%	112%	45%
Commercial Efficiency	114%	110%	79%
Large Midstream Lighting	87%	75%	88%
Industrial Efficiency	96%	81%	61%
Public Agency Partnership	116%	131%	86%
Community Education	N/A	N/A	N/A
Large Curtailable Load*	N/A	66%	100%

*DR participation was voluntary for PY12. Therefore, Phase III compliance is based on achieved impacts through PY11.

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 PY12. The team reviewed the PY12 Public Agency Participation Program and Nonresidential Midstream Lighting Program and identified LED Linear Replacement Lamps as the measure that provides the most reported energy savings in the Public Agency Participation Program and A-Line LEDs in the Nonresidential Midstream Lighting Program. Table 2-7 presents estimated free ridership, spillover, and NTG ratios for PY12 HIMs.

Table 2-7. PY12 High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Public Agency Partnership Program (PAPP)	LED Linear Replacement Lamps	8.4%	0%	91.6%
Nonresidential Midstream Lighting	A-line LEDs	5.7%	0%	94.3%

Source: Guidehouse analysis

2.7 Summary of Energy Impacts by Program

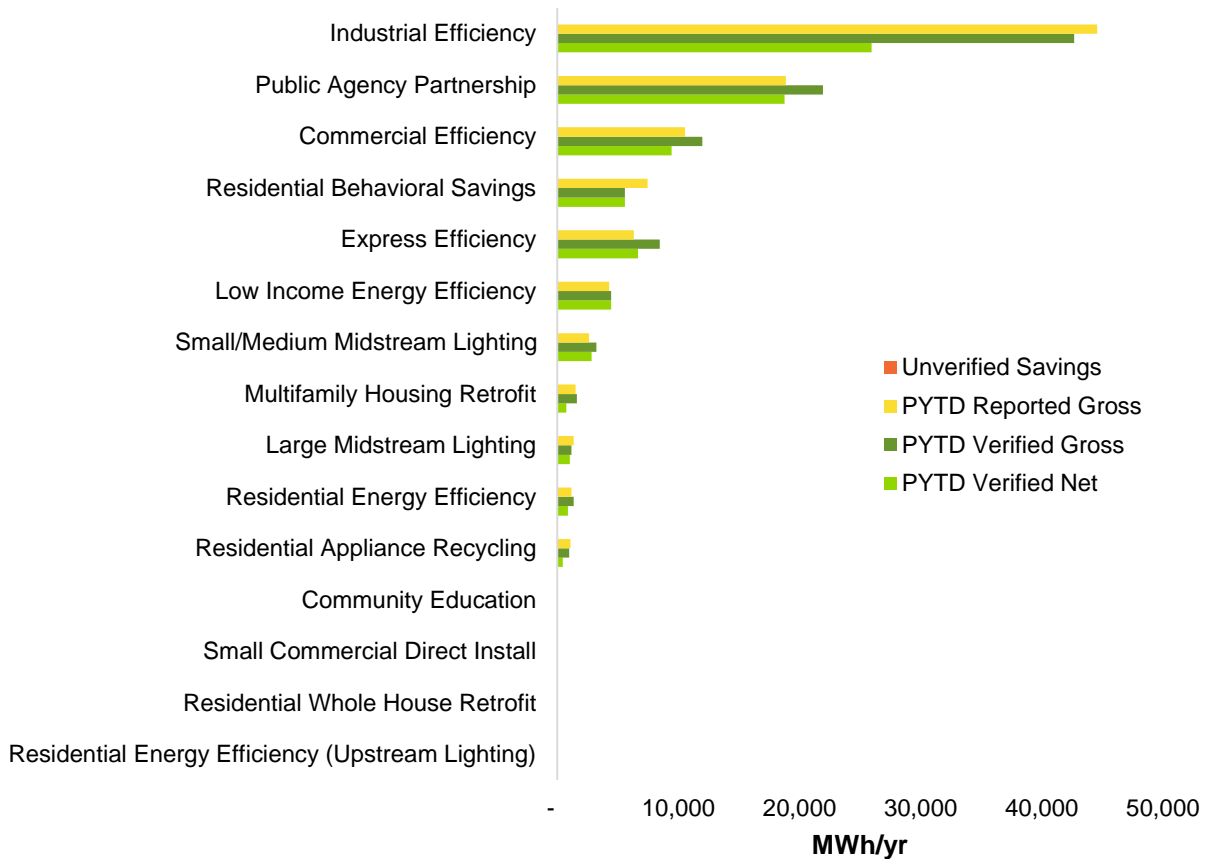
Act 129 compliance targets are based on annualized savings estimates (MWh/yr). Each program year, the annual savings achieved by EE&C program activity are recorded as

incremental annual (or first-year) savings and added to an EDC’s progress toward compliance. Section 2.7.1 presents the incremental annual savings estimates. 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 summarizes the PYTD energy savings by program for PY12. This report presents energy impacts 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.

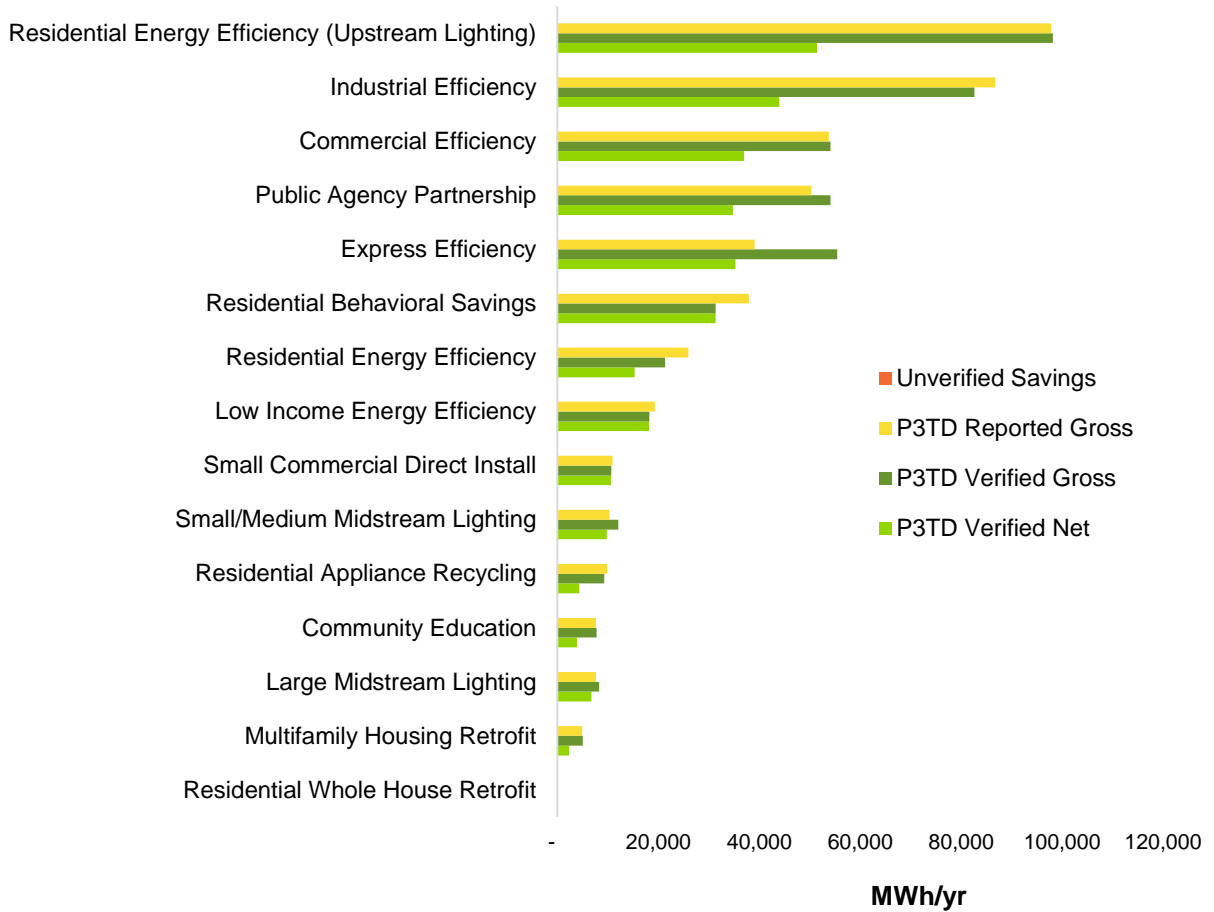
Figure 2-7. PYTD Energy Savings by Program



Source: Guidehouse analysis

Figure 2-8 summarizes the energy savings by program for Phase III of Act 129.

Figure 2-8. P3TD Energy Savings by Program



Source: Guidehouse analysis

Table 2-8 summarizes energy impacts by program through PY12.

Table 2-8. 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	1,175	1,352	893	25,983	21,371	15,304
Residential Energy Efficiency (Upstream Lighting)	0	0	0	97,895	98,210	51,488
Residential Appliance Recycling	1,101	988	461	9,894	9,310	4,338
Residential Behavioral Savings	7,452	5,594	5,594	37,955	31,383	31,383
Residential Whole House Retrofit	0	0	0	134	114	114
Low-Income Energy Efficiency	4,285	4,462	4,462	19,303	18,270	18,176
Express Efficiency	6,339	8,456	6,660	39,126	55,463	35,322

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Small/Medium Midstream Lighting	2,626	3,224	2,834	10,335	12,114	9,781
Small Commercial Direct Install	0	0	0	10,934	10,688	10,613
Multifamily Housing Retrofit	1,506	1,625	739	4,953	5,036	2,330
Commercial Efficiency	10,552	11,978	9,433	53,831	54,155	37,033
Large Midstream Lighting	1,365	1,182	1,039	7,628	8,282	6,771
Industrial Efficiency	44,576	42,690	25,948	86,799	82,703	44,000
Public Agency Partnership	18,882	21,936	18,777	50,339	54,165	34,783
Community Education	0	0	0	7,655	7,789	3,933
Portfolio Total	99,859	103,486	76,839	462,765	469,053	305,368

Source: Guidehouse analysis

2.7.2 Lifetime Energy Savings by Program

Table 2-9 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 2-9. 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	17,033	11,250	201,731	142,572
Residential Energy Efficiency (Upstream Lighting)	0	0	660,761	362,774
Residential Appliance Recycling	6,551	3,058	63,032	29,366
Residential Behavioral Savings	5,594	5,594	30,996	30,996
Residential Whole House Retrofit	0	0	975	975
Low-Income Energy Efficiency	26,789	26,789	90,551	90,053
Express Efficiency	125,788	99,063	741,944	470,033
Small/Medium Midstream Lighting	18,493	16,256	70,458	58,270
Small Commercial Direct Install	0	0	143,726	142,717
Multifamily Housing Retrofit	18,578	8,452	64,477	29,553
Commercial Efficiency	179,520	141,380	805,259	551,034
Large Midstream Lighting	7,124	6,262	55,487	46,288
Industrial Efficiency	637,401	387,422	1,223,505	650,535

Program Name	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Public Agency Partnership	328,249	280,984	795,717	513,307
Community Education	0	0	114,765	57,778
Portfolio Total	1,371,121	986,510	5,063,386	3,176,251

Source: Guidehouse analysis

2.8 Summary of Demand Impacts by Program

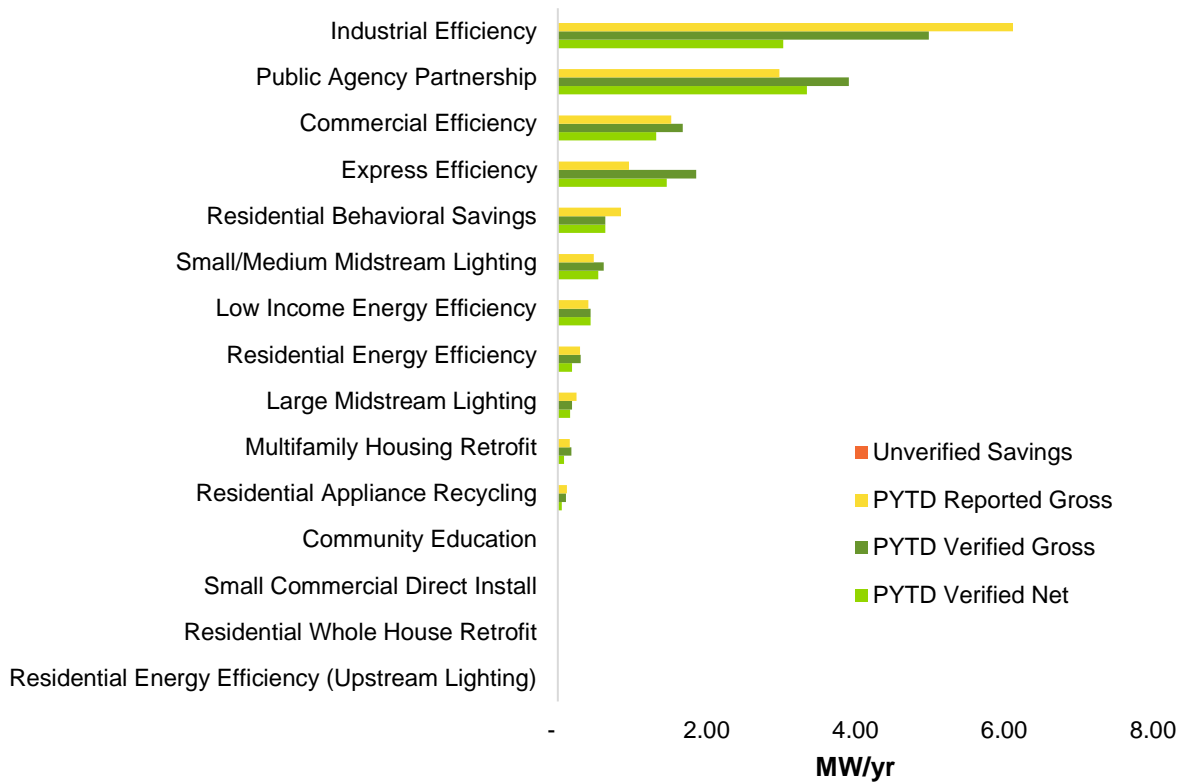
Duquesne Light’s Phase III EE&C programs achieve peak demand reductions in two ways. The first is through coincident reductions from energy efficiency measures and the second is through dedicated DR offerings that exclusively target temporary demand reductions on peak days. Energy efficiency reductions coincident with system peak hours are reported and used in the calculation of benefits in the TRC test. However, these reductions 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, the following subsections report demand impacts from energy efficiency and DR separately.

2.8.1 Energy Efficiency

Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2 p.m. to 6 p.m. EDT on non-holiday weekdays from June through August. Unlike Phase I and Phase II Act 129 reporting, this report presents the peak demand impacts from energy efficiency at the meter level and the impacts do not reflect adjustments for transmission and distribution losses. Figure 2-9 summarizes the PYTD demand savings by energy efficiency program for PY12.

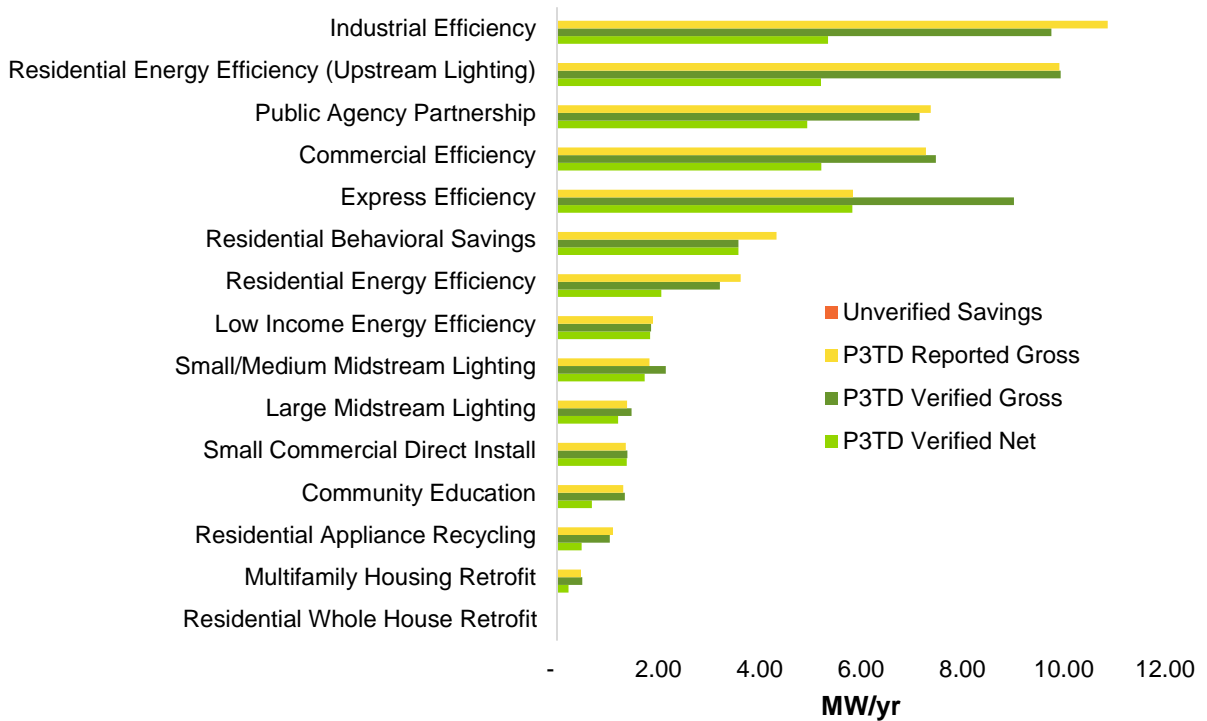
Figure 2-9. PYTD Demand Savings by Energy Efficiency Program



Source: Guidehouse analysis

Figure 2-10 summarizes the P3TD demand savings by energy efficiency program for Phase III of Act 129.

Figure 2-10. P3TD Demand Savings by Energy Efficiency Program



Source: Guidehouse analysis

Table 2-10 summarizes the peak demand impacts by energy efficiency program through the current reporting period. The Small/Medium Midstream Lighting and Large Midstream Lighting Programs include newly verified savings from PY10 that Guidehouse recorded in the previous annual report as unverified savings.

Table 2-10. 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	0.30	0.31	0.19	3.63	3.22	2.06
Residential Energy Efficiency (Upstream Lighting)	0	0	0	9.92	9.94	5.21
Residential Appliance Recycling	0.12	0.11	0.05	1.11	1.04	0.49
Residential Behavioral Savings	0.85	0.64	0.64	4.33	3.58	3.58
Residential Whole House Retrofit	0	0	0	0.01	0.01	0.01
Low-Income Energy Efficiency	0.41	0.44	0.44	1.90	1.85	1.84
Express Efficiency	0.96	1.86	1.47	5.84	9.02	5.83
Small/Medium Midstream Lighting	0.48	0.62	0.54	1.83	2.15	1.73
Small Commercial Direct Install	0	0	0	1.36	1.39	1.38
Multifamily Housing Retrofit	0.16	0.18	0.08	0.48	0.50	0.23
Commercial Efficiency	1.52	1.68	1.32	7.28	7.48	5.21

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Large Midstream Lighting	0.25	0.19	0.17	1.38	1.47	1.20
Industrial Efficiency	6.12	4.99	3.03	10.87	9.76	5.35
Public Agency Partnership	2.98	3.91	3.35	7.38	7.16	4.94
Community Education	0	0	0	1.31	1.34	0.69
Portfolio Total	14.16	14.93	11.29	58.61	59.90	39.75

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

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 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 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 report presents peak demand impacts from DR at the system level and the impacts 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
- Commercial = 6.9% or 1.0741
- Industrial = 0.8% or 1.0081

Table 2-11 summarizes the PYVTD and VTD demand reductions for each DR program in the EE&C Plan and for the whole DR portfolio. VTD demand reductions are the average performance across all Phase III DR events independent of how many events occurred in a given program year. The relative precision columns in Table 2-11 indicate the margin of error (at the 90% confidence interval) around the PYVTD and VTD demand reductions.

Table 2-11. Verified Gross DR Impacts by Program

Program	PYVTD Gross MW	PYVTD Relative Precision (90%)	VTD Gross MW**	VTD Relative Precision (90%)*
Large Curtailable Load (voluntary)	32.41	48.83%	55.16	5.80%
Portfolio Total	32.41	48.83%	55.16	5.80%

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

** DR participation was voluntary for PY12. Therefore, Phase III compliance is based on achieved impacts through PY11.

Source: Guidehouse analysis

Impacts were estimated using either a customer baseline (CBL) with an optional weather sensitivity adjustment⁸ or a regression analysis. The PY12 set of regression models includes all models from PY11. 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 a set of three hypothetical events in summer 2020 (the accuracy metric is described in Guidehouse's Phase III Evaluation Plan). Enerlogics, Duquesne Light's DR Program CSP, developed the weather sensitivity adjustment (WSA) factors applied to the CBL and included them in the data request files provided to the SWE.

2.9 Summary of Fuel Switching Impacts

Duquesne Light EE&C programs offer no fuel switching measures.

2.10 Summary of Cost-Effectiveness Results

Table 2-12 breaks down program finances and cost-effectiveness. TRC benefits in Table 2-13 were calculated using gross verified impacts. Net present value (NPV) PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 2-12. Summary of Portfolio Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$7,614		\$23,317	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$9,052		\$29,350	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$16,666		\$52,667	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$55	\$438
6	Administration, Management, and Technical Assistance ^[3]	\$245	\$854	\$2,004	\$3,839
7	Marketing ^[4]	\$0	\$0	\$141	\$20

⁸ PJM, *Weather Sensitive Adjustment Using the WSA Factor Method*:

<http://www.pjm.com/~media/markets-ops/demand-response/dsr-weather-sensitive-adjustment-using-wsa-factor-method.ashx>

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
8	Program Delivery ^[5]	\$220	\$8,944	\$1,346	\$36,267
9	EDC Evaluation Costs	\$736		\$3,387	
10	SWE Audit Costs	\$300		\$1,986	
11	Program Overhead Costs (sum of rows 5 through 10)	\$11,299		\$49,483	
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)	\$27,965		\$102,150	
14	Total NPV Lifetime Electric Energy Benefits	\$53,364		\$154,761	
15	Total NPV Lifetime Electric Capacity Benefits	\$20,475		\$65,500	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$2,616		\$19,597	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$3,522		-\$11,368	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$72,933		\$228,490	
19	TRC Benefit-Cost Ratio ^[8]	2.61		2.24	

[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 2-13 shows the TRC ratios by program and for the portfolio. The benefits in Table 2-14Table 2-13 were calculated using gross verified impacts. Costs and benefits are expressed in 2020 dollars.

PY12 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 74% of the PY12 gross impacts and 79% of the total TRC benefits. TRCs were above 1.00 for all residential programs except for Residential Energy Efficiency. Three programs, Residential Whole House Retrofit, Community Education, and Small Commercial Direct Install, saw TRC scores of zero given that no savings were reported in PY12. However, program administrative costs were relatively limited for these programs. Finally, the portfolio gross TRC is 2.61.

Table 2-13. PY12 Gross TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$986	\$1,667	0.59	(\$681)
Residential Appliance Recycling	\$338	\$229	1.48	\$109
Residential Behavioral Savings	\$321	\$139	2.31	\$182
Residential Whole House Retrofit	\$0	\$636	0.00	(\$636)
Low-Income Energy Efficiency	\$1,323	\$1,233	1.07	\$90
Residential Subtotal	\$2,969	\$3,904	0.76	(\$935)
Express Efficiency	\$6,904	\$2,034	3.39	\$4,870
Small/Medium Midstream Lighting	\$951	\$746	1.27	\$205
Small Commercial Direct Install	\$0	\$40	0.00	(\$40)
Multifamily Housing Retrofit	\$797	\$1,717	0.46	(\$920)
Commercial Efficiency	\$8,758	\$2,375	3.69	\$6,383
Large Midstream Lighting	\$348	\$365	0.95	(\$16)
Industrial Efficiency	\$29,838	\$9,501	3.14	\$20,337
Public Agency Partnership	\$18,975	\$5,359	3.54	\$13,615
Community Education	\$0	\$242	0.00	(\$242)
Large Curtailable Load	\$3,392	\$1,681	2.02	\$1,711
Nonresidential Subtotal	\$69,964	\$24,060	2.91	\$45,903
Portfolio Total	\$72,933	\$27,965	2.61	\$44,969

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

Table 2-14 presents PY12 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. Net TRC cost-effectiveness results were also positive for seven of the 15 programs.

Table 2-14. PY12 Net TRC Ratios by Program (\$1,000)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Energy Efficiency	\$652	\$1,388	0.47	(\$737)
Residential Appliance Recycling	\$158	\$229	0.69	(\$71)
Residential Behavioral Savings	\$321	\$139	2.31	\$182
Residential Whole House Retrofit	\$0	\$636	0.00	(\$636)
Low-Income Energy Efficiency	\$1,323	\$1,233	1.07	\$90
Residential Subtotal	\$2,454	\$3,625	0.68	(\$1,171)
Express Efficiency	\$5,437	\$1,762	3.09	\$3,676

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Small/Medium Midstream Lighting	\$836	\$683	1.22	\$153
Small Commercial Direct Install	\$0	\$40	0.00	(\$40)
Multifamily Housing Retrofit	\$363	\$1,471	0.25	(\$1,108)
Commercial Efficiency	\$6,898	\$2,051	3.36	\$4,846
Large Midstream Lighting	\$306	\$354	0.87	(\$47)
Industrial Efficiency	\$18,136	\$6,777	2.68	\$11,359
Public Agency Partnership	\$16,243	\$4,735	3.43	\$11,507
Community Education	\$0	\$242	0.00	(\$242)
Large Curtailable Load	\$3,392	\$1,681	2.02	\$1,711
Nonresidential Subtotal	\$51,610	\$19,796	2.61	\$31,815
Portfolio Total	\$54,064	\$23,421	2.31	\$30,643

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

Table 2-15 summarizes cost-effectiveness by program for Phase III of Act 129. Cost and benefits are discounted back to 2016.

Table 2-15. 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	\$44,604	\$23,617	1.89	\$20,987
Residential Appliance Recycling	\$2,582	\$1,448	1.78	\$1,134
Residential Behavioral Savings	\$1,612	\$1,526	1.06	\$86
Residential Whole House Retrofit	\$58	\$915	0.06	(\$857)
Low-Income Energy Efficiency	\$3,533	\$4,744	0.74	(\$1,211)
Residential Subtotal	\$52,389	\$32,250	1.62	\$20,139
Express Efficiency	\$30,035	\$8,598	3.49	\$21,436
Small/Medium Midstream Lighting	\$3,557	\$1,614	2.20	\$1,943
Small Commercial Direct Install	\$5,636	\$3,202	1.76	\$2,434
Multifamily Housing Retrofit	\$2,142	\$5,132	0.42	(\$2,990)
Commercial Efficiency	\$31,441	\$11,732	2.68	\$19,710
Large Midstream Lighting	\$3,091	\$1,872	1.65	\$1,219
Industrial Efficiency	\$45,370	\$14,204	3.19	\$31,166
Public Agency Partnership	\$32,331	\$12,955	2.50	\$19,376
Community Education	\$5,480	\$4,169	1.31	\$1,311
Large Curtailable Load	\$17,020	\$6,422	2.65	\$10,598
Nonresidential Subtotal	\$176,101	\$69,900	2.52	\$106,201
Portfolio Total	\$228,490	\$102,150	2.24	\$126,340

Source: Guidehouse analysis

Table 2-16 presents P3TD cost-effectiveness results using net verified savings to calculate benefits. Cost and benefits are discounted back to 2016.

Table 2-16. 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	\$26,055	\$17,940	1.45	\$8,116
Residential Appliance Recycling	\$1,203	\$1,448	0.83	(\$245)
Residential Behavioral Savings	\$1,612	\$1,526	1.06	\$86
Residential Whole House Retrofit	\$58	\$915	0.06	(\$857)
Low-Income Energy Efficiency	\$3,528	\$4,744	0.74	(\$1,216)
Residential Subtotal	\$32,457	\$26,573	1.22	\$5,884
Express Efficiency	\$19,091	\$7,095	2.69	\$11,997
Small/Medium Midstream Lighting	\$2,942	\$1,471	2.00	\$1,471
Small Commercial Direct Install	\$5,596	\$3,202	1.75	\$2,394
Multifamily Housing Retrofit	\$982	\$3,641	0.27	(\$2,659)
Commercial Efficiency	\$21,477	\$9,057	2.37	\$12,420
Large Midstream Lighting	\$2,578	\$1,784	1.45	\$794
Industrial Efficiency	\$24,152	\$10,513	2.30	\$13,639
Public Agency Partnership	\$21,298	\$9,580	2.22	\$11,718
Community Education	\$2,817	\$2,782	1.01	\$35
Large Curtailable Load	\$17,020	\$6,422	2.65	\$10,598
Nonresidential Subtotal	\$117,952	\$55,546	2.12	\$62,406
Portfolio Total	\$150,409	\$82,119	1.83	\$68,290

Source: Guidehouse analysis

2.11 Comparison of Performance to Approved EE&C Plan

Table 2-17 presents PY12 expenditures by program compared to the budget estimates set forth in the EE&C Plan for PY12. All the dollars in Table 2-17 are nominal.

Table 2-17. Comparison of PY12 Expenditures to Phase III EE&C Plan (\$1,000)

Program	PY12 Budget from EE&C Plan	PY12 Actual Expenditures	Ratio (Actual/Plan)
Residential Energy Efficiency	\$1,703	\$1,124	0.66
Residential Appliance Recycling	\$140	\$267	1.90
Residential Behavioral Savings	\$215	\$139	0.65
Residential Whole House Retrofit	\$132	\$636	4.81
Low-Income Energy Efficiency	\$1,749	\$1,364	0.78
Express Efficiency	\$1,995	\$1,322	0.66
Small/Medium Midstream Lighting	\$707	\$693	0.98
Small Commercial Direct Install	\$1,181	\$164	0.14
Multifamily Housing Retrofit	\$1,075	\$1,706	1.59
Commercial Efficiency	\$2,074	\$1,686	0.81
Large Midstream Lighting	\$1,524	\$522	0.34
Industrial Efficiency	\$3,445	\$4,869	1.41
Public Agency Partnership	\$1,486	\$2,291	1.54
Community Education	\$356	\$242	0.68
Large Curtailable Load	\$1,864	\$1,889	1.01
Portfolio Total	\$19,647	\$18,913	0.96

Source: Guidehouse analysis

Table 2-18 presents P3TD expenditures by program compared to the budget estimates set forth in the EE&C Plan through PY12. All dollars in Table 2-18 are nominal.

Table 2-18. Comparison of P3TD Expenditures to Phase III EE&C Plan (\$1,000)

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Residential Energy Efficiency	\$15,753	\$16,644	1.06
Residential Appliance Recycling	\$1,299	\$1,983	1.53
Residential Behavioral Savings	\$1,985	\$1,769	0.89
Residential Whole House Retrofit	\$1,224	\$1,104	0.90
Low-Income Energy Efficiency	\$6,100	\$5,886	0.96
Express Efficiency	\$7,893	\$7,603	0.96
Small/Medium Midstream Lighting	\$2,796	\$1,875	0.67
Small Commercial Direct Install	\$4,671	\$3,540	0.76
Multifamily Housing Retrofit	\$4,254	\$4,154	0.98
Commercial Efficiency	\$9,182	\$7,643	0.83
Large Midstream Lighting	\$6,747	\$2,278	0.34

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Industrial Efficiency	\$15,254	\$11,267	0.74
Public Agency Partnership	\$8,492	\$8,073	0.95
Community Education	\$2,036	\$1,947	0.96
Large Curtailable Load	\$8,279	\$8,099	0.98
Portfolio Total	\$95,965	\$83,864	0.87

Source: Guidehouse analysis

Table 2-19 compares PY12 verified gross program savings to the energy savings projections filed in the EE&C Plan.

Table 2-19. Comparison of PY12 Actual Program Savings to EE&C Plan Projections for PY12

Program	EE&C Plan for PY12	PY12 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Energy Efficiency	4,315	1,352	0.31
Residential Appliance Recycling	2,204	988	0.45
Residential Behavioral Savings	6,037	5,594	0.93
Residential Whole House Retrofit	525	0	0.00
Low-Income Energy Efficiency	4,626	4,462	0.96
Express Efficiency	7,030	8,456	1.20
Small/Medium Midstream Lighting	5,839	3,224	0.55
Small Commercial Direct Install	3,280	0	0.00
Multifamily Housing Retrofit	2,674	1,625	0.61
Commercial Efficiency	10,115	11,978	1.18
Large Midstream Lighting	14,090	1,182	0.08
Industrial Efficiency	16,804	42,690	2.54
Public Agency Partnership	7,016	21,936	3.13
Community Education	2,812	0	0.00
Large Curtailable Load	N/A	N/A	N/A
Portfolio Total	87,366	103,486	1.18

Source: Guidehouse analysis

Table 2-20 compares Phase III verified gross program savings to the energy savings projections filed in the EE&C Plan.

Table 2-20. Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III

Program	EE&C Plan Through PY12	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Energy Efficiency	86,304	119,580	1.39
Residential Appliance Recycling	8,816	9,310	1.06
Residential Behavioral Savings	24,146	31,383	1.30
Residential Whole House Retrofit	1,751	114	0.06
Low-Income Energy Efficiency	16,551	18,270	1.10
Express Efficiency	35,148	55,463	1.58
Small/Medium Midstream Lighting	19,464	12,114	0.62
Small Commercial Direct Install	10,934	10,688	0.98
Multifamily Housing Retrofit	8,912	5,036	0.57
Commercial Efficiency	50,575	54,155	1.07
Large Midstream Lighting	46,967	8,282	0.18
Industrial Efficiency	84,021	82,703	0.98
Public Agency Partnership	46,772	54,165	1.16
Community Education	9,372	7,789	0.83
Large Curtailable Load	N/A	N/A	N/A
Portfolio Total	449,734	469,053	1.04

Source: Guidehouse analysis

- Duquesne Light achieved 130% of the EE&C Plan energy savings goals specified for the residential programs through PY12. Duquesne Light expended 104% of the EE&C Plan residential program budgets through the same 5-year term. Given there were no savings for the Upstream Lighting component as in previous years, the Residential Behavioral Savings Program was the primary driver for these achievements. The Whole House Retrofit Program (WHRP) and the Upstream Lighting program did not record any market rate savings in PY12. 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 PY12 exceeded the utility's nonresidential program savings goal, as reflected in its EE&C Plan, achieving 131% of PY12 goals. Over PY8 through PY12, Duquesne Light achieved 93% of its savings goal and expended 89% 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 88% of PY12 savings, with Industrial Efficiency contributing the most at roughly 40% of the nonresidential program energy savings achievements.

2.12 Findings and Recommendations

Duquesne Light continued activities into the fifth year of Phase III. The Large Curtailable Load Program included four events in PY12, which were excluded from the phase compliance calculations due to participation being voluntary in PY12.⁹ Nonresidential program energy savings represented a large majority of the portfolio energy efficiency savings. The COVID-19 pandemic began in the fourth quarter of PY11 and persisted throughout PY12, 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 PY12 program activities in some cases modifying verification approaches, and Table 2-21 presents overarching findings and recommendations for consideration during future planning and evaluations.

Table 2-21. Summary of Evaluation Recommendations

Evaluation Activity	Finding	Recommendation
Satisfaction	<p>Participants generally report high satisfaction with the PY12 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"> • PAPP: 87%; average rating is 9.0 • Nonresidential Midstream Lighting: 100%; 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.</p>
Data Collection	<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>
Demand Savings	<p>Although there has not historically been demand targets in Act 129, Phase IV will include demand targets.</p>	<p>Guidehouse recommends that Duquesne Light and the CSPs add more rigorous demand calculations to their savings estimates, such as following the TRM and using a coincidence factor for custom projects.</p>

Source: Guidehouse analysis

⁹ 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/pcdocs/1665150.docx>

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY12 along with the outcomes of those activities.

3.1 Evaluation Activities

Guidehouse does not conduct an evaluation for every program during each program year. Table 3-1 shows the evaluation activity matrix, as conveyed in the Phase III Evaluation Plan, summarizing the schedule of major evaluation activities that involve primary research for each EE initiative. For example, in-depth research activities, including participant process and NTG surveys, were planned to be completed only for PAPP and Nonresidential Midstream Lighting program in PY12. For programs not surveyed to inform NTG estimates, Guidehouse used results from PY11 or earlier and applied them to PY12 results to arrive at net impacts.

Table 3-1. Evaluation Activity Matrix

Program	Percent of Projected Portfolio kWh	Impact/Verification					NTG/Process				
		PY8	PY9	PY10	PY11	PY12	PY8	PY9	PY10	PY11	PY12
REEP Rebate***	0.5%	*	X	*	X	*	*	X	*	X	*
REEP Kit	1.6%	*	X	*	X	*	*	X	*	X	*
REEP Upstream Lighting	17.1%	*	X	*	*	-	*	X	*	*	-
Residential Behavioral Savings	6.9%	X	X	X	X	X	*	X	*	X	*
Whole House	2.6%	-	X	X	X	*	-	X	*	X	*
Appliance Recycling	2.0%	X	*	*	X	*	X	*	*	X	*
Commercial Sector Incentive (Commercial Efficiency and Express Efficiency)****	19.1%	X	2-year rolling sample approach			*	X	*	X	*	
Industrial Efficiency****	18.7%	*	2-year rolling sample approach			*	X	*	X	*	
Midstream Lighting****	14.8%	**	X	2-year sample informing PY10, PY11, PY12		X	*	X	*	X	
Small Commercial Direct Install	2.4%	X	*	*	-	-	*	*	*	-	-
MF Retrofit	2.0%	X	*	*	X	*	*	X	*	X	*
PAPP****	10.4%	X	2-year rolling sample approach			*	X	*	*	X	
Community Education EE	2.1%	X	*	X	*	*	*	X	*	X	*
Portfolio	100.2%										

* This program year results use values from the most recent year's evaluation.

** Participation occurred only over one-third of PY8 and, while onsite surveys were conducted, results were combined with onsite survey results for PY9 and reported in that year.

*** Although no primary research was conducted for this program in PY12, Guidehouse completed a sample of project file reviews.

**** Uses value from most recent evaluation activities that are based on 2-year period samples. For Midstream Lighting in PY10, the first 4 months will use the same realization rate as PY9; the last 8 months will be conveyed as unverified until the PY10/PY11 evaluation results are prepared. For PY12 Midstream Lighting, Guidehouse will also add approximately four projects to the PY10 and PY11 sample to update results and improve the estimate's precision.

- There is no program activity in this program year due to the program being discontinued.

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 that broadly educates consumers on other programs falling under Duquesne Light's portfolio. Table 3-2 identifies the measures rebated during PY12.

Table 3-2. PY12 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)
Ceiling/Attic Insulation (\geq R-49)
Floor Insulation (\geq R-30)
Wall Insulation (add R-6)
Occupancy Sensor (infrared, ultrasonic detector, hardwired)

Source: Duquesne Light¹⁰

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 PY12, 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: 110 kWh
 - Four 9 W LEDs

¹⁰ Duquesne Light. Energy Efficiency Rebate Program. Phase III Rebates. <https://www.dlcwattchoices.com/residentialrebates/>. Retrieved October 26, 2020.

- 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: 29 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: 7 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 does not require rebate forms, so it is more readily engaged by. Eliminating rebate forms at the transaction level in favor of bulk processing significantly cuts processing costs. Upstream lighting activities continued through December 2019; Duquesne Light reported no activities during calendar years 2020 or 2021.

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 PY12) represented by a 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 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.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-3 presents the participation counts, reported energy and demand savings, and incentive payments for REEP in PY12 by customer segment.

Table 3-3. 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*	4,839	N/A	4,839
PYRTD MWh/yr	1,175	N/A	1,175
PYRTD MW/yr	0.30	N/A	0.30

Parameter	Residential (Non-Low-Income) REEP	Residential (Non-Low-Income) REEP Upstream Lighting	Residential (Non-Low-Income) Total
PY12 Incentives (\$1,000)**	\$278		\$278

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 historically combines financial-related information here for the two program components—Residential Energy Efficiency and Residential Energy Efficiency (Upstream Lighting)—under Residential Energy Efficiency. However, there was no Upstream Lighting activity in PY12. Otherwise, energy and demand impacts are reported separately for these two programs.

Source: Guidehouse analysis

3.2.2 Gross Impact Evaluation

Consistent with the Evaluation Plan, Guidehouse conducted a minimal amount of primary research for the REEP gross impact evaluation in PY12. There was no activity for the upstream lighting component and so no evaluation activity took place. Guidehouse applied the evaluation findings from PY11 to the efficiency kits and equipment rebates components. The only research Guidehouse conducted in PY12 involved an application file review for the equipment rebate component.

For equipment rebates, the PY12 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 PY12 projects. Findings from both efforts were combined to arrive at the PY12 gross impact results. Guidehouse transitioned from a phone survey in PY9 to an online survey starting in PY11. As a result, the evaluation team collected 88 completed responses. This total exceeded the sample target of 75 participants. The team then reviewed 79 project files from PY12 participants. 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 (Program Management and Reporting System, or 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 PY11's survey effort that used responses from 609 participants.

Table 3-4 shows the evaluation activities for PY12 REEP gross impacts. Table 3-5 and Table 3-6 show the gross energy and demand results, respectively.

Table 3-4. REEP Gross Impact Sample Design for PY12

Stratum	Population Size*	Achieved Sample Size	Evaluation Activity
Kits	3,110	0	
Kits (Bulbs)	19	0	TRM review. Applied verified installation rate from PY11
Kits (Night Lights)	2	0	
Rebates	2,355	79	Engineering desk reviews/application file reviews for a sample of projects. Applied verified installation rate from PY11
Program Total	5,486	79	

*Counts differ from Table 3-3, 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 3-5. REEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Kits	341.76	100%	0.29	1.6%
Kits (Bulbs)	7.26	90%	0.31	1.7%
Kits (Night Lights)	21.97	87%	0.42	2.3%
Rebates	803.91	122%	1.02	16.6%
Program Total	1,174.9	115%		12.1%

Source: Guidehouse Evaluation Plan

Table 3-6. REEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Kits	0.02	103%	0.31	1.7%
Kits (Bulbs)	0.00	85%	0.31	1.7%
Kits (Night Lights)	0.00	N/A	0.42	2.3%
Rebates	0.28	103%	0.49	7.9%
Program Total	0.30	103%		7.4%

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 17 of the 79 measures examined via the application file review.
 - Guidehouse observed that, of the 12 central air conditioning units evaluated, the equipment size was rounded down to the nearest ton for four units. For example, many 2.5 ton units were rounded down in the program tracking data to 2 tons. In addition, four central air conditioning units had SEER values that did not match the invoice in the application.
 - The evaluation team’s random sample drew four ductless mini-split measures and four 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 105% to 980%.
 - The evaluation team’s random sample also drew two swimming pool pumps with variable speed motors. The deemed inputs from the TRM and the inputs from the application generated savings that were 358% greater than what was claimed.
 - The evaluation team’s random sample also drew one occupancy sensor that was claiming savings based on a greater number of watts controlled than what was reported in the application. This resulted in an energy realization rate of 10% for this measure.
- **Efficiency Kits:**
 - Guidehouse adjusted the savings per kit to reflect an in-service rate (ISR) of 1.0, instead of the deemed TRM value of 0.92 for LEDs and 0.97 for nightlights. This was done because an ISR was already included in the PY11 realization rate, and so was removed so that it was not applied twice in PY12.
- **Upstream Lighting:**
 - There was no Upstream Lighting activity in PY12.

3.2.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for REEP rebates and kits in PY12. The team relied on PY11 results for the estimates of participant free ridership and spillover. Table 3-7 shows the NTG ratio applied to REEP rebates and kits projects.

Table 3-7. 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%
Program Total	42%	8%	66%	7.3%

Source: Guidehouse analysis from PY11

HIM Research

Guidehouse did not conduct HIM research for REEP rebates and kits in PY12.

3.2.4 Verified Savings Estimates

In Table 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 REEP in PY12. The team added these totals to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-8. REEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,175	0.30
PYVTD Gross	1,352	0.31
PYVTD Net	893	0.19
RTD	123,878	13.54
VTD Gross	119,580	13.16
VTD Net	66,793	7.27

Source: Guidehouse Evaluation Plan

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.2.5 Process Evaluation

Consistent with the evaluation plan, Guidehouse did not conduct process evaluation research for REEP rebates and kits in PY12.

3.2.6 Cost-Effectiveness Reporting

Table 3-9 breaks down program finances and cost-effectiveness. The team calculated TRC benefits in Table 3-9 using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-9. Summary of REEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$278		\$4,847	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$543		\$8,515	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$821		\$13,362	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$71
6	Administration, Management, and Technical Assistance ^[3]	\$24	\$138	\$255	\$593
7	Marketing ^[4]	\$0	\$0	\$134	\$0
8	Program Delivery ^[5]	\$17	\$500	\$104	\$8,280
9	EDC Evaluation Costs	\$119		\$511	
10	SWE Audit Costs	\$48		\$304	
11	Program Overhead Costs (sum of rows 5 through 10)	\$846		\$10,255	
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)	\$1,667		\$23,617	
14	Total NPV Lifetime Electric Energy Benefits	\$658		\$27,756	
15	Total NPV Lifetime Electric Capacity Benefits	\$354		\$8,253	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$10,979	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$26		-\$2,383	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$986		\$44,604	
19	TRC Benefit-Cost Ratio ^[8]	0.59		1.89	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
[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 3-10 presents program financials and cost-effectiveness on a net savings basis.

Table 3-10. Summary of REEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$278		\$4,847	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$264		\$2,838	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$542		\$7,685	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$71
6	Administration, Management, and Technical Assistance ^[3]	\$24	\$138	\$255	\$593
7	Marketing ^[4]	\$0	\$0	\$134	\$0
8	Program Delivery ^[5]	\$17	\$500	\$104	\$8,280
9	EDC Evaluation Costs	\$119		\$511	
10	SWE Audit Costs	\$48		\$304	
11	Program Overhead Costs (sum of rows 5 through 10)	\$846		\$10,255	
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)	\$1,388		\$17,940	
14	Total NPV Lifetime Electric Energy Benefits	\$434		\$16,079	
15	Total NPV Lifetime Electric Capacity Benefits	\$234		\$4,686	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$6,474	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$17		-\$1,183	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$652		\$26,055	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
19	TRC Benefit-Cost Ratio ^[8]	0.47	1.45

[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 PY12 led to the following findings and recommendations. Table 3-11 summarizes the findings and recommendations for kits and Table 3-12 for rebates; the tables also details how Duquesne Light plans to address the recommendation in program delivery. There were no key findings or recommendations for the kits program in PY12.

Table 3-11. Kits Program Findings and Recommendations

Findings	Recommendations
None to report	

Source: Guidehouse analysis

Table 3-12. 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, leading to variations between claimed and verified savings. 	<ul style="list-style-type: none"> Duquesne Light should consider expanding data collection for a selection of priority measures, especially if these measures will be prominent measures during Phase IV, so reported savings align closer to verified savings.

Duquesne Light Response: In progress. 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 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 effective in Phase IV will lead to increased accuracy in reported energy savings.

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 \$35 incentives to customers who allow the utility to remove and recycle eligible refrigerators and freezers. The program implementation contractor in PY12 was ARCA.

A RARP participant is a customer participating within a given reporting year (e.g., Q1 through Q4 for PY12) represented by a 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 3-13 presents the participation counts, reported energy and demand savings, and incentive payments for RARP in PY12 by customer segment.

Table 3-13. RARP Participation and Reported Impacts

Parameter	Residential (Non-Low-Income)
PYTD No. of Participants	1,022
PYRTD MWh/yr	1,101
PYRTD MW/yr	0.12
PY12 Incentives (\$1,000)	\$38

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Guidehouse conducted primary research for the RARP gross impact evaluation during PY8 and PY11, and limited its activities for the program during PY9, PY10, and PY12. In PY12, the team used evaluation findings from PY11 in addition to confirming impacts based on a census review of PY12 CSP program tracking data to develop a realization rate. 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

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

- 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 of equipment that only meets the program's eligibility criteria. Guidehouse incorporated these adjustments into the updated UECs.

Table 3-14 shows the evaluation activities for PY12 RARP gross energy and demand. Table 3-15 and Table 3-16 show the gross energy and demand results for RARP, respectively.

Table 3-14. RARP Gross Impact Sample Design for PY12

Stratum	Population Size*	Achieved Sample Size	Evaluation Activity
Refrigerators	916	0	Applied evaluation findings from PY11 and recalculated savings for all units using TRM and equipment specifications
Freezers	156	0	
Program Total	1,072	0	

*Strata-specific population counts shown here differ from the program population count of Table 3-13. 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 3-15. RARP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Refrigerators	950	92%	0.06	0.6%
Freezers	151	73%	0.06	0.6%
Program Total	1,101	90%		0.6%

Source: Guidehouse analysis

Table 3-16. RARP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Refrigerators	0.11	92%	0.06	0.6%
Freezers	0.02	73%	0.06	0.6%
Program Total	0.12	90%		0.6%

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 UECs and realization rates reduced. For example, Guidehouse found that only 8% of refrigerators and 13% 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.

3.3.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for RARP in PY12. The team relied on PY11 results for the estimates of participant free ridership and spillover. Table 3-17 shows the NTG ratio applied to RARP projects.

Table 3-17. 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%	7.2%

Source: Guidehouse analysis from PY11

HIM Research

Guidehouse did not conduct HIM research for RARP in PY12.

3.3.4 Verified Savings Estimates

In Table 3-18 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-18. RARP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,101	0.12
PYVTD Gross	988	0.11
PYVTD Net	461	0.05
RTD	9,894	1.11
VTD Gross	9,310	1.04
VTD Net	4,338	0.49

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.3.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RARP during PY12.

3.3.6 Cost-Effectiveness Reporting

Table 3-19 presents a detailed breakdown of program finances and cost-effectiveness. Guidehouse calculated the TRC benefits in Table 3-19 using gross verified impacts. NPV PYTD

costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-19. Summary of RARP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$38		\$296	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$38		-\$296	
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]	\$24	\$12	\$88	\$53
7	Marketing ^[4]	\$0	\$0	\$0	\$20
8	Program Delivery ^[5]	\$17	\$161	\$66	\$1,138
9	EDC Evaluation Costs	\$10		\$46	
10	SWE Audit Costs	\$5		\$28	
11	Program Overhead Costs (sum of rows 5 through 10)	\$229		\$1,448	
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)	\$229		\$1,448	
14	Total NPV Lifetime Electric Energy Benefits	\$264		\$1,993	
15	Total NPV Lifetime Electric Capacity Benefits	\$74		\$589	
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)	\$338		\$2,582	
19	TRC Benefit-Cost Ratio ^[8]	1.48		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 3-20 presents program financials and cost-effectiveness on a net savings basis.

Table 3-20. Summary of RARP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$38		\$296	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$38		-\$296	
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]	\$24	\$12	\$88	\$53
7	Marketing ^[4]	\$0	\$0	\$0	\$20
8	Program Delivery ^[5]	\$17	\$161	\$66	\$1,138
9	EDC Evaluation Costs	\$10		\$46	
10	SWE Audit Costs	\$5		\$28	
11	Program Overhead Costs (sum of rows 5 through 10)	\$229		\$1,448	
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)	\$229		\$1,448	
14	Total NPV Lifetime Electric Energy Benefits	\$123		\$929	
15	Total NPV Lifetime Electric Capacity Benefits	\$34		\$274	
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)	\$158		\$1,203	
19	TRC Benefit-Cost Ratio ^[8]	0.69		0.83	

[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 PY12 led to the findings and recommendations Table 3-21 shows; the table also summarizes how Duquesne Light plans to address the recommendation in program delivery.

Table 3-21. 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 PY12 recycled appliances. 	<ul style="list-style-type: none"> Duquesne Light should consider updating reporting data and measure-level savings assumptions with this information so that reported savings can more closely align to verified savings.

Duquesne Light Response: In process. Duquesne Light is updating their tracking database in Phase IV to collect the required data for calculating savings at the measure level.

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. The program provides these reports to participants via mail, email, and via access through the Duquesne Light website. These reports provide participants 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 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 12,550 customers from the 2012 market rate wave, 33,874 participants from the 2015 market rate wave, 11,025 customers from the 2015 low-income wave, and 2,352 customers from the 2018 low-income wave (based on PY12 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. Section 3.6 details the low-income evaluation results.

Guidehouse obtained new low-income classifications during the PY8 evaluation as part of a 2016 low-income status rescreening effort Duquesne Light conducted. 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 PY12 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 PY12 savings for LIEEP, as Section 3.6 shows. 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., PY12). The participant count represents the number of unique participants who received HERs during PY12. 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 3-22 presents the participation counts, reported energy and demand savings, and incentive payments for HERs in PY12. Low-income HER participant results are reflected in LIEEP, as Section 3.6 shows.

Table 3-22. HER Participation and Reported Impacts

Parameter	Residential (Non-Low-Income)
PYTD No. of Participants	46,424
PYRTD MWh/yr	7,452
PYRTD MW/yr	0.85
PY12 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. In other words, 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 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.¹¹ 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 Equation 3-1 shows.

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

Equation 3-1. LDV Model Specification

$$kWh_{im} = \beta_0 + \sum_{m=1}^{12} \beta_{1m} yrmo_m + \sum_{m=1}^{12} \beta_{2m} yrmo_m \cdot kWh_{im-12} + \sum_{m=1}^{12} \beta_{3m} yrmo_m \cdot treatment_{im} + \varepsilon_{im}$$

Where:

kWh_{im}	is customer i 's average daily energy usage in bill m .
β_0	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.
$treatment_{im}$	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 3-2 presents the equation for this model.

Equation 3-2. 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 model's drawback 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 partially informed 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 who moved out of Duquesne Light territory during PY12 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 PY12 so long as their account was active for at least 1 month during PY12.

Table 3-23 summarizes the sampling strategy for the PY12 evaluation. Both regression models use billing data from all treatment and control households enrolled in the HER Program. The sampling strategy is a census approach where data from all households are used in the analysis, as Table 3-23 shows.

Table 3-23. HER Gross Impact Sample Design for PY12

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
HER	46,424	46,424	Regression analysis
Program Total	46,424	46,424	

Source: Guidehouse analysis

The verified ex post energy savings for HER in PY12 were 5,594 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 0.64 MW. Table 3-24 and Table 3-25 summarize ex ante HER Program energy and demand savings, respectively. Appendix C provides additional details.

Table 3-24. HER Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
HER	7,452	75%	N/A	0.0%
Program Total	7,452	75%		0.0%

Source: Guidehouse analysis

Table 3-25. HER Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
HER	0.85	75%	N/A	0.0%
Program Total	0.85	75%		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 29% of gross verified HER savings, an increase over PY11 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.

Table 3-24 or Table 3-25 do not reflect the standard errors from the regression analysis. 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 a 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 the following:

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 as follows:

[Nonparticipant spillover] issues in which a program influences the energy use of non-program participants are not addressed by RCTs. In these cases in which nonparticipant 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 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 assumes that nonparticipant spillover is 0% and the NTG ratio for the HER Program is 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 research HIMs for the HER Program in PY12.

3.4.4 Verified Savings Estimates

In Table 3-26 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-26. HER PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	7,452	0.85
PYVTD Gross	5,594	0.64
PYVTD Net	5,594	0.64
RTD	37,955	4.33
VTD Gross	31,383	3.58
VTD Net	31,383	3.58

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.4.5 Process Evaluation

Guidehouse did not conduct process evaluation research for the Residential Behavioral Savings Program during PY12.

3.4.6 Cost-Effectiveness Reporting

Table 3-27 breaks down program finances and cost-effectiveness. The team calculated TRC benefits using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-27. 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]	\$24	\$19	\$98	\$77
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$17	\$55	\$72	\$1,157
9	EDC Evaluation Costs	\$17		\$70	
10	SWE Audit Costs	\$7		\$40	
11	Program Overhead Costs (sum of rows 5 through 10)	\$139		\$1,526	
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)	\$139		\$1,526	
14	Total NPV Lifetime Electric Energy Benefits	\$248		\$1,109	
15	Total NPV Lifetime Electric Capacity Benefits	\$73		\$503	
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)	\$321		\$1,612	
19	TRC Benefit-Cost Ratio ^[8]	2.31		1.06	

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 3-28 presents program financials and cost-effectiveness on a net savings basis.

Table 3-28. 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	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$24	\$19	\$98	\$77
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$17	\$55	\$72	\$1,157
9	EDC Evaluation Costs	\$17			\$70
10	SWE Audit Costs	\$7			\$40
11	Program Overhead Costs (sum of rows 5 through 10)	\$139			\$1,526
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)	\$139			\$1,526
14	Total NPV Lifetime Electric Energy Benefits	\$248			\$1,109
15	Total NPV Lifetime Electric Capacity Benefits	\$73			\$503
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)	\$321	\$1,612
19	TRC Benefit-Cost Ratio ^[8]	2.31	1.06

[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 PY12 led to the findings and recommendations Table 3-29 shows; the table also summarizes how Duquesne Light plans to address the recommendation regarding data management.

Table 3-29. HER Findings and Recommendations

Findings	Recommendations
Data Management	
<ul style="list-style-type: none"> For customers missing a bill period in the data provided by Duquesne Light, Oracle assigned an account inactive date as of the last available bill and a new account active date when the billing data resumed. For some customers, the evaluation extract contained truncated billing history, removing bills prior to the newly assigned account active date. For PY12, Duquesne Light provided a batch of catch-up files, after which Oracle implemented a manual fix that corrected this issue for the majority of affected customers. 	<ul style="list-style-type: none"> Oracle and Duquesne Light should establish a process to ensure account active and inactive dates are accurately reflected in the evaluation extract. A file tracking system may help identify gaps in the billing history that require the transfer of catch-up billing files. Guidehouse will update their analysis to check for issues with the account active and inactive dates.
<p>Duquesne Light Response: Under consideration. Duquesne Light will work with Oracle to explore options to enhance data sharing procedures in Phase IV to minimize this issue moving forward.</p>	

Source: Guidehouse analysis

3.5 Residential Whole House Retrofit Program

The Residential 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 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 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 PY12. No savings were recorded for the 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 the non-low-income portion of WHRP in PY12.

3.5.1 Verified Savings Estimates

No savings are recorded for WHRP in PY12, as Table 3-30 shows. Totals from previous program years are summed to calculate the P3TD program impacts.

Table 3-30. 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 PY11 final annual report.

3.5.2 Process Evaluation

Guidehouse did not conduct process evaluation research for the residential WHRP during PY12.

3.5.3 Cost-Effectiveness Reporting

Table 3-31 provides a summary of program finances and cost-effectiveness. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-31. 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

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
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]	\$24	\$10	\$90	\$47
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$574	\$77	\$628
9	EDC Evaluation Costs	\$9		\$41	
10	SWE Audit Costs	\$3		\$24	
11	Program Overhead Costs (sum of rows 5 through 10)	\$636		\$915	
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)	\$636		\$915	
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		0.06	

[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 3-32 presents program financials and cost-effectiveness on a net savings basis.

Table 3-32. 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

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
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]	\$24	\$10	\$90	\$47
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$574	\$77	\$628
9	EDC Evaluation Costs	\$9			\$41
10	SWE Audit Costs	\$3			\$24
11	Program Overhead Costs (sum of rows 5 through 10)	\$636			\$915
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)	\$636			\$915
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			0.06

[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

3.5.4 Status Recommendations

Due to the lack of program activity in PY12, 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)¹²

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. Although not a part of LIEEP, a portion of savings from the MFHR Program also contributes to the low-income carveout goal. Section 3.10 discusses MFHR Program impacts.

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 PY12) represented by a unique participant account number within the tracking system. This is the same counting method used for the REEP Kits.

Duquesne Light also engaged low-income utility customers through low-income-specific community events where it handed out energy efficiency measures such as kits and 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. Current program participation levels include 11,025 customers from the 2015 low-income wave and 2,352 customers from the 2018 low-income wave (based on PY12 monthly averages). As Section 3.4 discusses, 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 PY12 savings for LIEEP and contribute to the low-income carveout goal.

Finally, Low-Income WHRP provides resources to qualifying low-income customers who 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

¹² Duquesne Light completed 32 MFHR projects during PY12. The evaluation found that 99.32% of verified savings contribute to the low-income carveout.

multifamily dwellings. Furthermore, WHP 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 WHP (non-low-income) and LIEEP.

3.6.1 Participation and Reported Savings by Customer Segment

Table 3-33 presents the participation counts, reported energy and demand savings, and incentive payments for LIEEP in PY12 by customer segment. The table's counts relate to Low-Income Kits, Low-Income HER, and Low-Income WHP. Section 3.10 discusses MFHR Program impacts.

Table 3-33. LIEEP Participation and Reported Impacts

Parameter	Residential Low-Income Kits	Residential Low-Income HER	Residential Low-Income WHP	Residential Low-Income Total
PYTD No. of Participants		13,377	656	14,033
PYRTD MWh/yr	83	1,125	3,077	4,285
PYRTD MW/yr	0.00	0.13	0.28	0.41
PY12 Incentives (\$1,000)				\$195

Source: Guidehouse analysis

3.6.2 Gross Impact Evaluation

In-depth gross impact evaluations occurred for Low-Income HER only in PY12, and the evaluation findings from PY11 were applied to Low-Income Kits and Low-Income WHP.

Guidehouse completed Low-Income HER activities in coordination with the HER market rate program and applied the same methodologies Section 3.4 details.

Table 3-34 shows the LIEEP sample design for PY12. LIEEP components are not stratified except for Low-Income WHP. Low-Income WHP was implemented through three efforts during PY12: 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 typically have 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 WHP for in-apartment improvements. These are captured within the third Low-Income WHP stratum shown in Table 3-34.

Table 3-34. LIEEP Gross Impact Sample Design for PY12

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Low-Income HER	13,377	13,377	Regression analysis
Low-Income Kits	576	0	TRM review. Applied verified installation rate found in PY11
Low-Income Kits (Bulbs)	5	0	
Low-Income Kits (Night Lights)	4	0	
Low-Income WHRP – Multifamily Site Other	373	0	Applied PY11 realization rates
Low-Income WHRP Multifamily Site Refrigerators	17	0	
Low-Income WHRP Single-Family Site Freezer	14	0	
Low-Income WHRP Single-Family Other	333	0	
Low-Income WHRP Single-Family Site Refrigerators	15	0	
Program Total	14,714	13,377	

*Low-Income WHRP multifamily building-level retrofits population is forty-seven, representing the number of projects.
 Source: Guidehouse analysis

Table 3-35 and Table 3-36 show LIEEP’s energy and demand gross impact results, respectively.

Table 3-35. LIEEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Low-Income HER	1,125	152%	0.00	0.0%
Low-Income Kits	63	98%	0.32	4.0%
Low-Income Kits (Bulbs)	5	95%	0.34	4.1%
Low-Income Kits (Night Lights)	15	87%	0.43	5.2%
Low-Income WHRP – Multifamily Site Other	1,034	93%	0.42	21.5%
Low-Income WHRP Multifamily Site Refrigerators	317	100%	0.00	0.0%
Low-Income WHRP Single-Family Site Freezer	28	100%	0.00	0.0%
Low-Income WHRP Single-Family Other	1,483	78%	0.38	6.2%
Low-Income WHRP Single-Family Site Refrigerators	215	100%	0.00	0.0%

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
Program Total	4,285	104%		4.9%

Source: Guidehouse analysis

Table 3-36. LIEEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
Low-Income HER	0.13	152%	0.00	0.0%
Low-Income Kits	0.00	101%	0.34	4.1%
Low-Income Kits (Bulbs)	0.00	89%	0.34	4.1%
Low-Income Kits (Night Lights)	0.00	N/A	0.43	5.2%
Low-Income WHRP – Multifamily Site Other	0.09	94%	0.41	20.9%
Low-Income WHRP Multifamily Site Refrigerators	0.04	100%	0.00	0.0%
Low-Income WHRP Single-Family Site Freezer	0.00	100%	0.00	0.0%
Low-Income WHRP Single-Family Other	0.12	75%	0.48	9.5%
Low-Income WHRP Single-Family Site Refrigerators	0.02	100%	0.00	0.0%
Program Total	0.41	107%	0.13	4.6%

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:**
 - Guidehouse adjusted the savings per kit to reflect an ISR of 1.0 instead of the deemed TRM value of 0.92 for LEDs and 0.97 for Nightlights. This was done because an ISR was already included in the PY11 realization rate, and so was removed so that it was not applied twice in PY12. The team made the same adjustment for REEP Kits (Section 3.2).
- **Low-Income HER:**
 - The verified ex post energy savings for Low-Income HER in PY12 were 1,714 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 0.20 MW.
 - The energy realization rate for Low-Income HER is 152%. Guidehouse found that energy savings per participant home were verified to be higher 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 132%. Reallocating a portion of savings (228 MWh) from the market rate HER wave to the low-income HER wave further increased the realization rate.

- **Low-Income WHRP:**

- Guidehouse did not evaluate the Low-Income WHRP in PY12, so no adjustments were made to the reported savings.

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.

Table 3-35 or Table 3-36 do not reflect errors. 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 PY12. 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 PY12.

3.6.4 Verified Savings Estimates

In Table 3-37 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-37. LIEEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	4,285	0.41
PYVTD Gross	4,462	0.44
PYVTD Net	4,462	0.44
RTD	19,303	1.90
VTD Gross	18,270	1.85
VTD Net	18,176	1.84

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.6.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LIEEP during PY12.

3.6.6 Cost-Effectiveness Reporting

Table 3-38 details program finances and cost-effectiveness. TRC benefits in Table 3-38 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted to 2016.

Table 3-38. Summary of Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$195		\$911	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$131		-\$293	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$64		\$618	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$6	\$27
6	Administration, Management, and Technical Assistance ^[3]	\$24	\$57	\$147	\$242
7	Marketing ^[4]	\$0	\$0	\$6	\$0
8	Program Delivery ^[5]	\$17	\$1,004	\$78	\$3,280
9	EDC Evaluation Costs	\$47		\$212	
10	SWE Audit Costs	\$20		\$128	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,169		\$4,126	
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)	\$1,233	\$4,744
14	Total NPV Lifetime Electric Energy Benefits	\$1,042	\$2,742
15	Total NPV Lifetime Electric Capacity Benefits	\$229	\$690
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$121
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$53	-\$20
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$1,323	\$3,533
19	TRC Benefit-Cost Ratio ^[8]	1.07	0.74

[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 3-39 presents program financials and cost-effectiveness on a net savings basis.

Table 3-39. Summary of LIEEP Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$195		\$911	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$131		-\$293	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$64		\$618	
5	Design & Development ^[2]	\$0	\$0	\$6	\$27
6	Administration, Management, and Technical Assistance ^[3]	\$24	\$57	\$147	\$242
7	Marketing ^[4]	\$0	\$0	\$6	\$0
8	Program Delivery ^[5]	\$17	\$1,004	\$78	\$3,280
9	EDC Evaluation Costs	\$47		\$212	
10	SWE Audit Costs	\$20		\$128	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,169		\$4,126	

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)	\$1,233	\$4,744
14	Total NPV Lifetime Electric Energy Benefits	\$1,042	\$2,739
15	Total NPV Lifetime Electric Capacity Benefits	\$229	\$689
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$121
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$53	-\$20
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$1,323	\$3,528
19	TRC Benefit-Cost Ratio ^[8]	1.07	0.74

[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 PY12 led to the findings and recommendations Table 3-40 shows; the table also summarizes 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 3-40. LIEEP Findings and Recommendations

Findings	Recommendations
WHRP Data Management	
<ul style="list-style-type: none"> Data uploaded into Duquesne Light's data tracking system is often bucketed together under a single project ID. This can make it difficult to align Duquesne Light's tracking data with the CSP's tracking data. 	<ul style="list-style-type: none"> Duquesne Light should break out data at the measure level in the tracking data.
<p>Duquesne Light Response: In progress. Duquesne Light has revamped its tracking database to accommodate this level of detail in Phase IV.</p>	

Source: Guidehouse analysis

3.7 Commercial Efficiency and Express Efficiency Programs

As Duquesne Light's Phase III EE&C Plan filing notes,¹³ "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."

Although 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) were grouped 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 with maximum demand less than 300 kW who are not already participating in other Act 129 programs. A core team of Duquesne Light staff delivers EXP.

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. Franklin Energy provides key support, including 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 PY12) 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 3-41 presents the participation counts, reported energy and demand savings, and incentive payments for the two programs in PY12 by customer segment and program.

¹³ Duquesne Light Company – Revised Phase III Energy Efficiency and Conservation Plan

Table 3-41. CEP/EXP Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Total
PYTD No. of Participants	237	43	280
PYRTD MWh/yr	6,339	10,552	16,891
PYRTD MW/yr	0.96	1.52	2.49
PY12 Incentives (\$1,000)	\$569	\$834	\$1,402

Source: Guidehouse analysis

3.7.2 Gross Impact Evaluation

For the PY12 evaluation (and as described in the PY12 Evaluation Plan), Guidehouse relied on projects previously sampled and verified from PY11 and combined those with additional sampled projects from PY12. The evaluation team used this rolling 2-year verification approach to estimate the realization rate for PY12.

Table 3-42 provides the resulting population and sampling sizes. Table 3-43 and Table 3-44 show the gross energy and demand results for CEP/EXP, respectively.

CEP/EXP site verifications were significantly affected by COVID-19 safety protocols. Guidehouse suspended all site visits during most of the verification period, and the CEP/EXP projects scheduled for site visits were verified virtually instead. Phone verifications were left as is.

Table 3-42. CEP/EXP Gross Impact Sample Design

Stratum	Population Size (PY12)	Achieved Sample Size (PY11/PY12 Combined)	Evaluation Activity
Commercial/Express – Large	8	4	Phone/virtual verification*, Verification only visit, verification and trending visit
Commercial/Express – Medium	27	10	Phone/virtual verification*, Verification only visit, verification and trending visit
Commercial/Express – Small	265	7	Phone/virtual verification*, verification only visit
Program Total	300	21	

*Some PY12 sites that would normally have received a site visit received a phone verification or virtual verification due to COVID-19-related safety concerns.

Source: Guidehouse analysis

Table 3-43. CEP/EXP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 90% CL*
Commercial/Express – Large	5,977	113%	0.11	12.4%
Commercial/Express – Medium	5,417	106%	0.12	7.2%

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 90% CL*
Commercial/Express – Small	5,497	144%	0.31	22.5%
Program Total	16,891	121%		8.5%

*CEP/EXP was sampled targeting 90/15 for PY12.

Source: Guidehouse analysis

Table 3-44. CEP/EXP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 90% CL*
Commercial – Large	0.87	96%	0.04	4.8%
Commercial – Medium	0.73	109%	0.29	16.9%
Commercial – Small	0.88	216%	0.39	28.8%
Program Total	2.48	143%	0.22	14.3%

*CEP/EXP was sampled targeting 90/15 for PY12.

Source: Guidehouse analysis

In accordance with guidance from the SWE,¹⁴ Guidehouse analyzed savings for PY12 projects as though operations at the sites had not changed due to the COVID-19 pandemic. The evaluation team did ask site contacts for information as to how the pandemic had changed sites' operations (hours of use [HOU], production, etc.), but this data was 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 PY12 follow (including projects verified in PY11 but included in the PY12 analysis):

- Ten 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.
- Three projects had controls on the lights that were either not accounted for in the ex ante calculations or mislabeled in the ex ante calculations.
- Three sites had fewer fixtures installed than indicated in the project files, reducing savings.
- One site had different fixture wattages installed than indicated in the project files.
- One site had a different heating type than anticipated, changing savings slightly.

¹⁴ "PY12 EM&V and the Coronavirus Outbreak," June 3, 2020

3.7.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for CEP and EXP in PY12. The team relied on PY11 results for the estimates of participant free ridership and spillover. Table 3-45 shows the NTG ratio applied to CEP/EXP projects.

Table 3-45. 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 did not conduct HIM research for CEP and EXP in PY12.

3.7.4 Verified Savings Estimates

In Table 3-46 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-46. EXP/CEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	16,891	2.48
PYVTD Gross	20,434	3.54
PYVTD Net	16,092	2.79
RTD	92,957	13.12
VTD Gross	109,618	16.49
VTD Net	72,355	11.04

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.7.5 Process Evaluation

Guidehouse did not conduct process evaluation research for CEP and EXP during PY12.

3.7.6 Cost-Effectiveness Reporting

Table 3-47 through Table 3-50 break down program finances and cost-effectiveness. EXP and CEP results are shown separately. The team calculated the TRC benefits in Table 3-47 and Table 3-49 using gross verified impacts for EXP and CEP, respectively. Table 3-48 and Table

3-50 present program financials and cost-effectiveness on a net savings basis for both programs. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-47. Summary of EXP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$572		\$2,432	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$709		\$1,984	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,281		\$4,417	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$36
6	Administration, Management, and Technical Assistance ^[3]	\$25	\$72	\$200	\$352
7	Marketing ^[4]	\$0	\$0	\$2	\$0
8	Program Delivery ^[5]	\$15	\$555	\$447	\$2,626
9	EDC Evaluation Costs	\$61		\$330	
10	SWE Audit Costs	\$25		\$186	
11	Program Overhead Costs (sum of rows 5 through 10)	\$753		\$4,182	
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)	\$2,034		\$8,598	
14	Total NPV Lifetime Electric Energy Benefits	\$4,638		\$21,944	
15	Total NPV Lifetime Electric Capacity Benefits	\$2,358		\$8,688	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$260		\$1,563	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$352		-\$2,160	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$6,904		\$30,035	
19	TRC Benefit-Cost Ratio ^[8]	3.39		3.49	

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 3-48. 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]	\$572		\$2,433	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$437		\$480	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,009		\$2,913	
5	Design & Development ^[2]	\$0	\$0	\$3	\$36
6	Administration, Management, and Technical Assistance ^[3]	\$25	\$72	\$200	\$352
7	Marketing ^[4]	\$0	\$0	\$2	\$0
8	Program Delivery ^[5]	\$15	\$555	\$447	\$2,626
9	EDC Evaluation Costs	\$61		\$330	
10	SWE Audit Costs	\$25		\$186	
11	Program Overhead Costs (sum of rows 5 through 10)	\$753		\$4,182	
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)	\$1,762		\$7,095	
14	Total NPV Lifetime Electric Energy Benefits	\$3,652		\$13,925	
15	Total NPV Lifetime Electric Capacity Benefits	\$1,857		\$5,567	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$205		\$967	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$277		-\$1,367	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$5,437		\$19,091	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
19	TRC Benefit-Cost Ratio ^[8]	3.09	2.69

[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 3-49. Summary of CEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$920		\$2,814	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$603		\$5,079	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,523		\$7,894	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$41
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$86	\$164	\$364
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$634	\$67	\$2,690
9	EDC Evaluation Costs	\$70		\$320	
10	SWE Audit Costs	\$30		\$189	
11	Program Overhead Costs (sum of rows 5 through 10)	\$852		\$3,838	
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)	\$2,375		\$11,732	
14	Total NPV Lifetime Electric Energy Benefits	\$6,754		\$23,513	
15	Total NPV Lifetime Electric Capacity Benefits	\$2,137		\$7,737	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$361		\$2,094	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$494		-\$1,903	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$8,758	\$31,441
19	TRC Benefit-Cost Ratio ^[8]	3.69	2.68

[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 3-50. Summary of CEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$920		\$2,814	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$279		\$2,404	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$1,199		\$5,219	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$41
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$86	\$164	\$364
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$634	\$67	\$2,690
9	EDC Evaluation Costs	\$70		\$320	
10	SWE Audit Costs	\$30		\$189	
11	Program Overhead Costs (sum of rows 5 through 10)	\$852		\$3,838	
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)	\$2,051		\$9,057	
14	Total NPV Lifetime Electric Energy Benefits	\$5,319		\$16,065	
15	Total NPV Lifetime Electric Capacity Benefits	\$1,683		\$5,367	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$284		\$1,391	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$389	-\$1,345
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$6,898	\$21,477
19	TRC Benefit-Cost Ratio ^[8]	3.36	2.37

[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

Table 3-51 details the findings and recommendations for PY12 evaluation activities.

Table 3-51. Findings and Recommendations for CEP and EXP

Findings	Recommendations
Reported Savings	
<ul style="list-style-type: none"> Although there has not historically been demand targets in Act 129, Phase IV will include demand targets. 	<ul style="list-style-type: none"> Guidehouse recommends that Duquesne Light and the CSPs add more rigorous demand calculations to their savings estimates, such as following the TRM and using a coincidence factor for custom projects (Section 1.11 of the TRM).
<p>Duquesne Light response: Under consideration. Duquesne Light has notified the nonresidential CSP that Phase IV includes program demand targets, and expects that CSPs will follow the TRM to provide peak demand savings estimates.</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's 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 PY12).

3.8.1 Participation and Reported Savings by Customer Segment

Table 3-52 presents the participation counts, reported energy and demand savings, and incentive payments for the Midstream Lighting Program in PY12 by customer segment.

Table 3-52. Midstream Lighting Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Total
PYTD No. of Participants	158	75	233
PYRTD MWh/yr	2,626	1,365	3,991
PYRTD MW/yr	0.48	0.25	0.74
PY12 Incentives (\$1,000)	\$473	\$250	\$723

Source: Guidehouse analysis

3.8.2 Gross Impact Evaluation

Because of program changes that began in October 2018 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.

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 the PY12 Evaluation Plan details). Since the Midstream Lighting Programs did not reach 15% precision in PY11, Guidehouse sampled an additional four projects from the Large Midstream Lighting Program for verification in PY12. All four projects were completed in Q1. Table 3-53 provides the resulting population and sampling sizes. Table 3-54 and Table 3-55 show the gross energy and demand results for the Midstream Lighting Program.

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

Table 3-53. Midstream Lighting Gross Impact Sample Design for PY10-PY12

Stratum*	Population Size**	Achieved Sample Size	Evaluation Activity***
LNUP-Extra Large	4	2	Phone verification, verification only site visit
LNUP-Large	19	11	Phone verification, verification only site visit

Stratum*	Population Size**	Achieved Sample Size	Evaluation Activity***
LNUP-Small	118	8	Phone verification, verification only site visit
SNUP-Extra Large	3	2	Phone verification, verification only site visit
SNUP-Large	62	7	Phone verification, verification only site visit
SNUP-Small	173	5	Phone verification, verification only site visit
Program Total	379	35	

*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 and PY12 sites that would normally have received a site visit received a phone verification due to COVID-19-related safety concerns.

Source: Guidehouse analysis

Table 3-54. Midstream Lighting Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
LNUP-Extra Large	566	70%	0.54	157.8%
LNUP-Large	649	84%	0.68	32.1%
LNUP-Small	151	159%	1.84	105.2%
SNUP-Extra Large	539	133%	0.25	73.6%
SNUP-Large	1,830	121%	0.47	29.2%
SNUP-Small	257	116%	0.75	59.7%
Program Total	3,991	110%		16.3%

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 3-55. 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	0.11	55%	0.62	181.2%
LNUP-Large	0.12	75%	0.82	38.4%
LNUP-Small	0.03	151%	1.87	107.0%
SNUP-Extra Large	0.10	144%	0.10	30.2%
SNUP-Large	0.34	122%	0.38	23.4%
SNUP-Small	0.05	135%	0.90	71.2%
Program Total	0.74	110%	0.25	14.2%

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. It also shows wider variation than anticipated by Guidehouse, as reflected in sample planning C_v assumptions. As a result, PY12 verified gross impacts did not meet the required 15% precision target. Originally, Guidehouse did not intend to evaluate the Midstream Program during PY12. Instead, the team sampled four additional LNUP projects from PY12 to supplement these findings and improve the realization rate precision prior to applying it to the PY12 projects. However, these sites showed similar variation to the PY10 and PY11 sites included in this analysis, and the program still failed to hit the precision targets.

3.8.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse conducted net impact evaluation for Midstream Lighting in PY12. Guidehouse estimated NTG factors for the Midstream Lighting Program based on results from the telephone survey of program participants. In total, 27 Midstream Lighting Program participants completed a battery of NTG questions. Table 3-56 shows the free ridership, spillover, and the NTG ratio applied to Midstream Lighting projects based on the net impact evaluation.

Table 3-56. PY12 Midstream Lighting Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Estimated Participant Spillover	NTG Ratio	Relative Precision at 85% CL
Midstream Lighting	12.1%	0%	87.9%	4.4%

Source: Guidehouse analysis

HIM Research

Guidehouse conducted HIM research for measures implemented during PY12. Guidehouse identified A-line LEDs as a HIM through a review of PY12 program tracking data. Table 3-57 presents estimated free ridership, spillover, and NTG ratio for this HIM for the Nonresidential Midstream Lighting Program.

Table 3-57. PY12 Nonresidential High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Nonresidential Midstream Lighting	A-line LEDs	5.7%	0%	94.3%

Source: Guidehouse analysis

3.8.4 Verified Savings Estimates

In Table 3-58 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 PY12. The team added these totals to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-58. Midstream Lighting PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	3,991	0.74
PYVTD Gross	4,406	0.81
PYVTD Net	3,873	0.71
RTD	17,963	3.21
VTD Gross	20,396	3.62
VTD Net	16,552	2.94

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.8.5 Process Evaluation

Guidehouse completed a process evaluation for the Midstream Lighting Program in PY12. As part of this process the evaluation team conducted customer surveys to obtain feedback about their experience and satisfaction with the program delivery processes and opportunities for

program improvement. The team also interviewed the program manager and the CSP. These interviews informed survey and interview question updates. These interviews also confirmed that the Midstream Lighting Program processes and implementation has remained consistent since PY11. The following section discusses the approach, results, and findings for this evaluation activity.

3.8.5.1 Participant Survey

The participant survey focused on customers who participated in the Nonresidential Midstream Lighting Program in PY12. Guidehouse's contractor hired to conduct this survey, Issues & Answers, attempted a census and reached out to 223 program participants by phone using up to six contact attempts. The survey instrument included process and net impact evaluation questions in one survey instrument. The team received 27 fully completed surveys. Table 3-59 summarizes the sample design, sample targets, and achieved response rate.

Table 3-59. PY12 C&I Midstream Lighting Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
Midstream Lighting	223	Phone survey	Census attempt (23)	27	12%
Total	223		23	27	12%

*The population count represents unique customers who participated in this program in PY12.

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

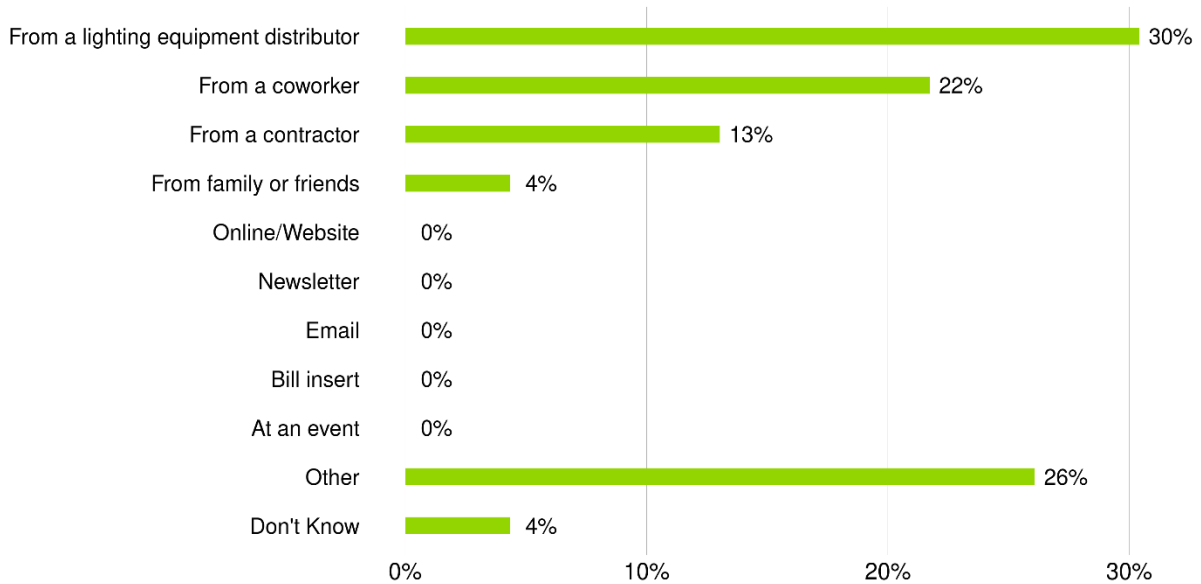
Guidehouse aimed to understand participants' experiences in the program and identify areas for future improvement. The remainder of the section outlines the findings for each of these topics.

Program Awareness

Most program participants responsible for the decision to purchase discounted LED lighting products were aware of their participation in the Nonresidential Midstream Lighting Program. Of the 27 participants who completed the survey, 23 (85%) reported that they were aware that Duquesne Light provided a discount on the LED lighting products purchased prior to the survey. As Figure 3-1 shows, when respondents were asked about how they learned about the program, they indicated that the most common source of program awareness is learning about the program from lighting equipment distributors (30%). Five respondents (22%) heard about this program from a coworker, three (13%) from a contractor, and one (4%) from family and friends. Six respondents (26%) learned about the program via other sources, such as vendors (three) and word of mouth (two), and one previously participated in a similar program at another property.

No respondents in this sample indicated hearing about the program online or via a website, newsletter, bill insert, email, or event. These responses illustrate the importance of continually establishing relationships with customers to increase program awareness and to drive program participation through other marketing channels, such as establishing an online presence, promoting the Duquesne Light website, and sending bill inserts, emails, and newsletters.

Figure 3-1. How did you first hear about the C&I Midstream Lighting Program? (n=23)

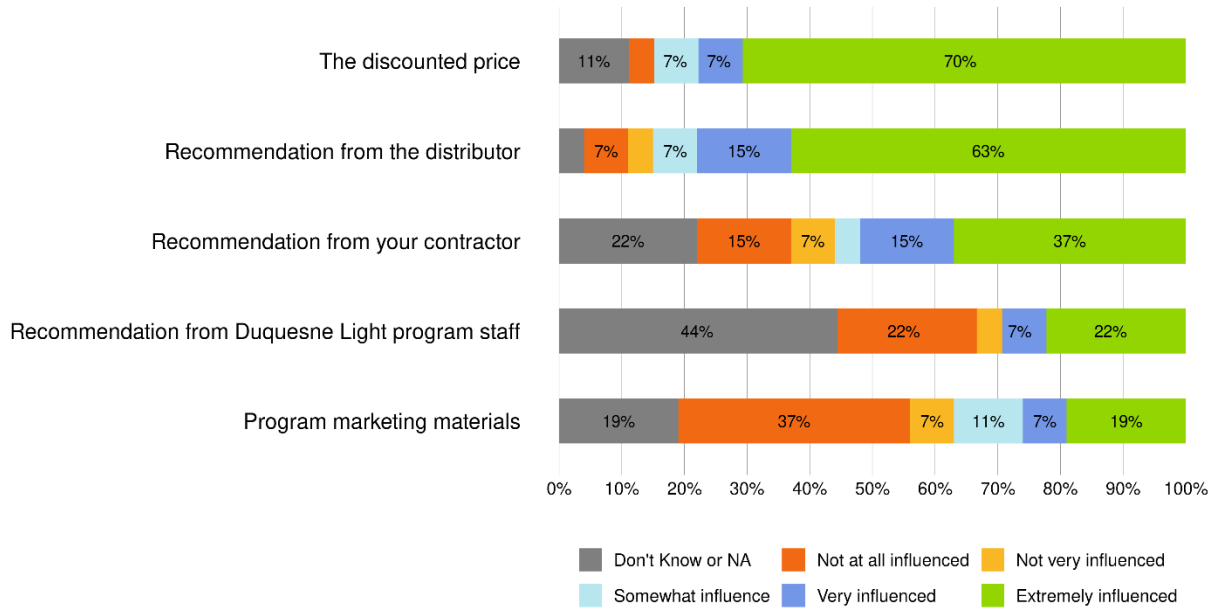


Source: Guidehouse analysis

Program Influence

Guidehouse asked participants how much the program influenced their decision to purchase and install energy efficient equipment. Responses show that multiple program components played a critical role in influencing customer behavior. The discounted price of the LED equipment and recommendations from the distributor were the most influential in their decision to purchase energy efficient equipment with 77% and 78% of respondents, respectively, reporting being very or extremely influenced in their decision. Program marketing materials were the least influential in promoting program participation of the options provided with only 26% of respondents reporting being very or extremely influenced in their decision. These results indicate that participants place a high value on the financial incentives and information from trusted advisors. Additionally, there is an opportunity to improve marketing materials to clearly show the benefits to purchasing LED products, which may influence customers to invest in energy efficiency. Figure 3-2 summarizes the responses.

Figure 3-2. How influential were the following on your decision to install the energy efficient equipment? (n=27)

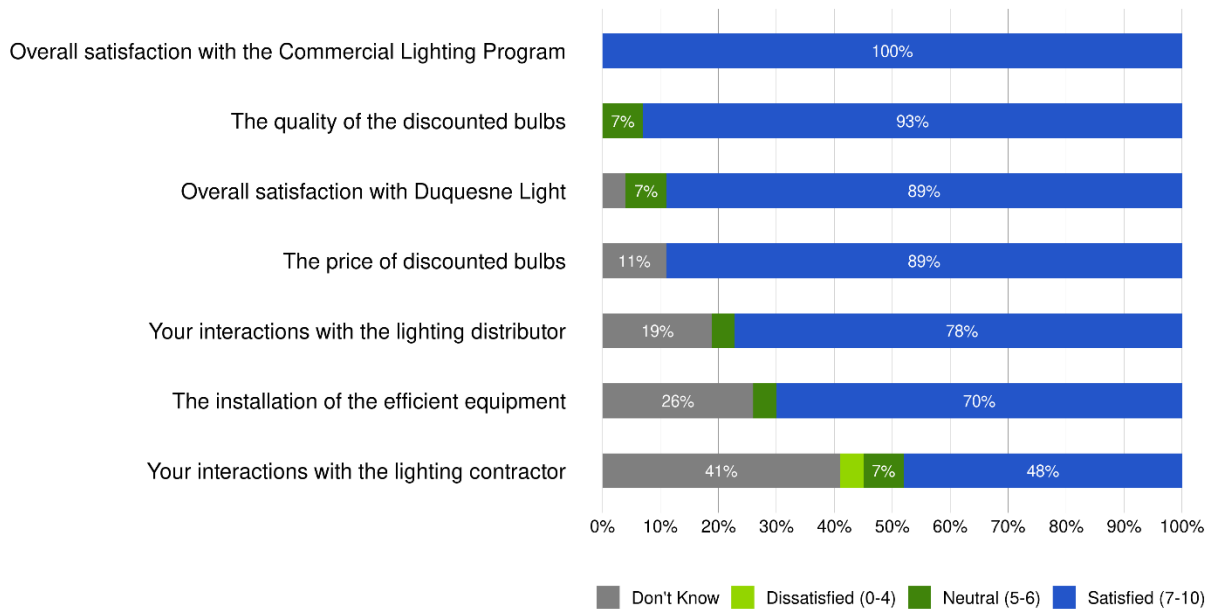


Source: Guidehouse analysis

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, 9.6 on a scale of 0 to 10, where 0 means not at all satisfied and 10 means very satisfied. All survey respondents rated the program 7 or higher. The majority of respondents also rated all aspects of program participation process 7 or higher, except for the interactions with the lighting contractor for which only 48% gave a rating of 7 or higher. Many survey respondents (41%) could not provide a rating for their interactions with lighting contractor and responded as “don’t know or N/A.” Participants were most satisfied with the quality and price of the discounted bulbs, with 93% and 89% of respondents providing a rating of 7 or higher, respectively. Figure 3-3 shows the results of participating customer satisfaction with the program. Additionally, participants report high overall satisfaction rating with Duquesne Light with 89% of survey respondents providing a rating of 7 or higher. Furthermore, 59% of survey respondents reported that they view Duquesne Light more favorably as a result of their participation in the Midstream Lighting Program. The remaining respondents reported their perception of Duquesne Light stayed the same, and no one reported viewing Duquesne Light less favorably.

Figure 3-3. PY12 C&I Midstream Lighting Participant Satisfaction Rates (n=27)



Source: Guidehouse analysis

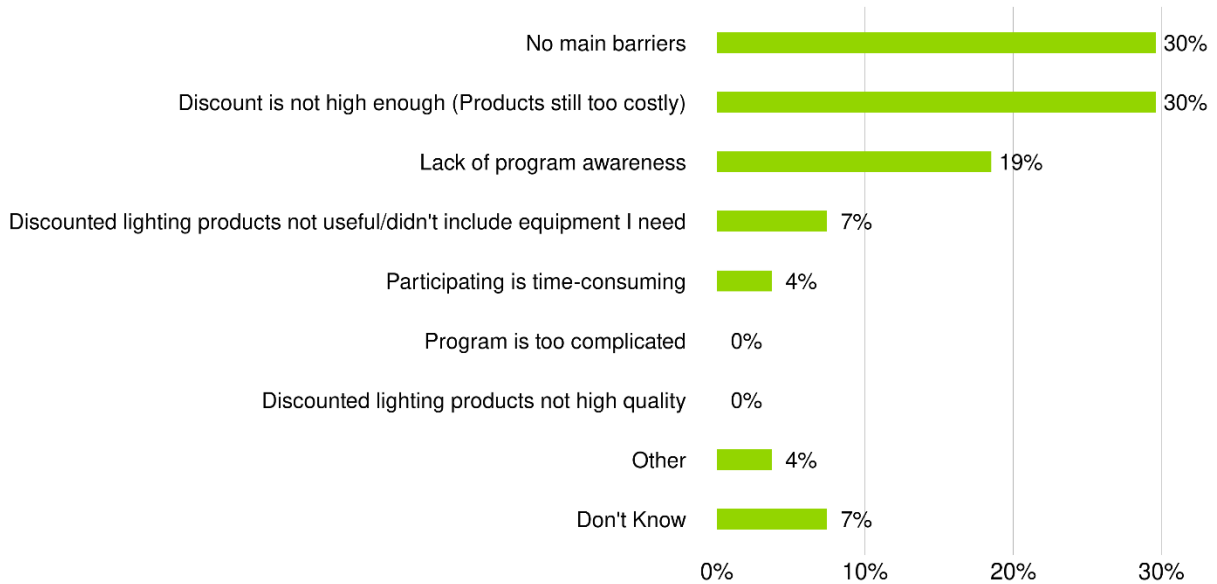
Some respondents offered suggestions to improve the program. Seven survey respondents (26%) suggested improving marketing and communication to increase awareness of the program. Three respondents (11%) suggested increasing the discount provided by Duquesne Light, and two (7%) suggested expanding the program to include different types of LEDs. These comments provide insight into opportunities for Duquesne Light to continue providing customers with a great program experience.

Program Barriers and Challenges

Guidehouse also asked participants about program barriers and challenges associated with program participation. While 30% of the participants reported that they do not see any significant barriers, another 30% reported that the price of LED products was too high, and the provided discount was not high enough. Additionally, five survey respondents (19%) reported lack of program awareness as a barrier.¹⁵ Two participants (7%) reported that the program did not include the equipment they needed. Although no survey respondents considered the program too complicated, one found the program was too time consuming. Furthermore, no one reported that the equipment was low quality nor that participating was time consuming. One other response included a customer expressing concerns over the approval process. Figure 3-4 summarizes the results on program barriers and challenges. These responses illustrate that Duquesne Light should consider increasing program awareness if they would like to see an increase in program participation.

¹⁵ Lack of program awareness was not one of the multiple-choice options provided in survey; however, five people responded with this sentiment when providing answers via the “Other” option. Guidehouse grouped these responses and included them separately in the figure to show how this perceived barrier compares to the remaining response options.

Figure 3-4. What do you see as the main barriers for organizations like yours to participating in the program? Select up to 3 responses. * (n = 27)



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

Source: Guidehouse analysis.

Section 3.8.7 includes recommendations resulting from the survey findings.

3.8.6 Cost-Effectiveness Reporting

Table 3-60 and Table 3-63 break down program finances and cost-effectiveness. Small/Medium Midstream and Large Midstream results are shown separately. TRC benefits in Table 3-60 and Table 3-62 were calculated using gross verified impacts for Small/Medium Midstream and Large Midstream, respectively. Table 3-61 and Table 3-63 present program financials and cost-effectiveness on a net savings basis for both programs, respectively. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-60. Summary of Small/Medium Midstream Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$473	\$805
2	EDC Incentives to Trade Allies	\$0	\$0
3	Participant Costs (net of incentives/rebates paid by utilities)	\$53	\$38
4	Incremental Measure Costs (sum of rows 1 through 3)	\$526	\$843

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$13
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$25	\$90	\$111
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$120	\$68	\$317
9	EDC Evaluation Costs	\$33		\$110	
10	SWE Audit Costs	\$10		\$59	
11	Program Overhead Costs (sum of rows 5 through 10)	\$220		\$771	
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)	\$746		\$1,614	
14	Total NPV Lifetime Electric Energy Benefits	\$720		\$2,266	
15	Total NPV Lifetime Electric Capacity Benefits	\$307		\$958	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$573	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$77		-\$239	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$951		\$3,557	
19	TRC Benefit-Cost Ratio ^[8]	1.27		2.20	

[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 3-61. Summary of Small/Medium Midstream Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$473	\$805
2	EDC Incentives to Trade Allies	\$0	\$0
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$10	-\$105

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$463		\$700	
		EDC	CSP	EDC	CSP
5	Design & Development [2]	\$0	\$0	\$3	\$13
6	Administration, Management, and Technical Assistance [3]	\$16	\$25	\$90	\$111
7	Marketing [4]	\$0	\$0	\$0	\$0
8	Program Delivery [5]	\$16	\$120	\$68	\$317
9	EDC Evaluation Costs	\$33		\$110	
10	SWE Audit Costs	\$10		\$59	
11	Program Overhead Costs (sum of rows 5 through 10)	\$220		\$771	
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)	\$683		\$1,471	
14	Total NPV Lifetime Electric Energy Benefits	\$633		\$1,873	
15	Total NPV Lifetime Electric Capacity Benefits	\$270		\$787	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$475	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$67		-\$194	
18	Total NPV TRC Benefits [7] (sum of rows 14 through 17)	\$836		\$2,942	
19	TRC Benefit-Cost Ratio [8]	1.22		2.00	

[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 3-62. Summary of Large Midstream Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants [1]	\$250	\$609
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)		-\$157		-\$139
4	Incremental Measure Costs (sum of rows 1 through 3)		\$93		\$470
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$30
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$62	\$137	\$267
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$15	\$104	\$67	\$526
9	EDC Evaluation Costs		\$53		\$234
10	SWE Audit Costs		\$22		\$138
11	Program Overhead Costs (sum of rows 5 through 10)		\$272		\$1,402
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)		\$365		\$1,872
14	Total NPV Lifetime Electric Energy Benefits		\$278		\$1,810
15	Total NPV Lifetime Electric Capacity Benefits		\$99		\$809
16	Total NPV Lifetime Operation and Maintenance Benefits		\$0		\$664
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)		-\$29		-\$193
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)		\$348		\$3,091
19	TRC Benefit-Cost Ratio ^[8]		0.95		1.65

[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 3-63. Summary of Large Midstream Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants [1]	\$250		\$609	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$168		-\$227	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$82		\$382	
		EDC	CSP	EDC	CSP
5	Design & Development [2]	\$0	\$0	\$3	\$30
6	Administration, Management, and Technical Assistance [3]	\$16	\$62	\$137	\$267
7	Marketing [4]	\$0	\$0	\$0	\$0
8	Program Delivery [5]	\$15	\$104	\$67	\$526
9	EDC Evaluation Costs	\$53		\$234	
10	SWE Audit Costs	\$22		\$138	
11	Program Overhead Costs (sum of rows 5 through 10)	\$272		\$1,402	
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)	\$354		\$1,784	
14	Total NPV Lifetime Electric Energy Benefits	\$244		\$1,510	
15	Total NPV Lifetime Electric Capacity Benefits	\$87		\$674	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$552	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$26		-\$158	
18	Total NPV TRC Benefits [7] (sum of rows 14 through 17)	\$306		\$2,578	
19	TRC Benefit-Cost Ratio [8]	0.87		1.45	

[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 PY12 led to the finding and recommendations Table 3-64 shows. The table also summarizes how Duquesne Light plans to address the recommendations in program delivery.

Table 3-64. Finding and Recommendation for Nonresidential Midstream Lighting

Findings	Recommendations
Program Awareness, Outreach and Marketing	
<ul style="list-style-type: none"> • Most of survey respondents (85%) reported that they were aware that Duquesne Light provided a discount on the LED products purchased prior to the survey. • The most common source of program awareness was lighting equipment distributors (30%). • No respondents indicated hearing about the program online, via website, newsletter, bill insert, email, or event. • Although 30% of respondents reported no significant barriers, 19% indicated that lack of program awareness was a barrier. 	<ul style="list-style-type: none"> • Duquesne Light should continue to establish relationships with customers to increase program awareness and to drive program participation through other marketing channels, such as establishing an online presence, promoting the Duquesne Light website, and sending bill inserts, emails, or newsletters. • Duquesne Light should continue to leverage lighting equipment distributors as a key driver of customer awareness and participation.
<p>Duquesne Light response: Under consideration. Duquesne Light will explore these opportunities to improve program awareness as part of the Phase IV activities.</p>	
Satisfaction	
<ul style="list-style-type: none"> • Respondents reported very high satisfaction with the program, rating it on average 9.6 on a scale of 0 to 10, where 0 means not at all satisfied and 10 means very satisfied. All survey respondents rated the program 7 or higher. • Respondents reported high overall satisfaction with Duquesne Light with 89% of survey respondents providing a rating of 7 or higher. • Majority (59%) of respondents reported that they view Duquesne Light more favorably because of their participation in the program. The remaining respondents reported their perception stayed the same, and no one reported to view Duquesne Light less favorably. 	<ul style="list-style-type: none"> • No additional recommendations.
<p>Duquesne Light response: None necessary.</p>	
Verification Results and Precision	
<ul style="list-style-type: none"> • Despite adding sites to the prior evaluation, the gross impact verification effort did not achieve the targeted precision (85/15) due to continued variability in results. This can be attributed in part to lights being installed in 24/7 locations without that being noted in the tracking database. 	<ul style="list-style-type: none"> • Duquesne Light can help ensure that distributors understand application reporting options for specifying where lights are installed in 24/7 locations, to reduce variability in evaluation results.
<p>Duquesne Light response: Under consideration. Duquesne Light will look for opportunities to encourage the implementer to explain the three HOU options to participating distributors.</p>	

Source: Guidehouse analysis

3.9 Small Commercial Direct Install Program

The Small Commercial Direct Install (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. No further savings were achieved in PY12, and Guidehouse did not evaluate the program in PY12 for gross impacts, as detailed in the Evaluation Plan approved by the SWE.

3.9.1 Verified Savings Estimates

In Table 3-65 Guidehouse conveys that no savings are recorded for SCDI in PY12. Totals from previous program years are summed to calculate the P3TD program impacts.

Table 3-65. 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 since the PY11 final annual report.

3.9.2 Cost-Effectiveness Reporting

Table 3-66 breaks down program finances and cost-effectiveness. Table 3-66 shows the TRC benefits calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-66. Summary of SCDI Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]	\$124		\$95	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$124		-\$95	
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]	\$0	\$9	\$85	\$159

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$15	\$0	\$63	\$2,659
9	EDC Evaluation Costs	\$11		\$132	
10	SWE Audit Costs	\$5		\$80	
11	Program Overhead Costs (sum of rows 5 through 10)	\$40		\$3,202	
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)	\$40		\$3,202	
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		1.76	

[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

Table 3-67 presents program financials and cost-effectiveness on a net savings basis.

Table 3-67. Summary of SCDI Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$124	\$95
2	EDC Incentives to Trade Allies	\$0	\$0
3	Participant Costs (net of incentives/rebates paid by utilities)	-\$124	-\$95
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]	\$0	\$9	\$85	\$159
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$15	\$0	\$63	\$2,659
9	EDC Evaluation Costs		\$11		\$132
10	SWE Audit Costs		\$5		\$80
11	Program Overhead Costs (sum of rows 5 through 10)		\$40		\$3,202
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)		\$40		\$3,202
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		1.75

[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

Due to a lack of program activity in PY12, 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 PY12) 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 3-68 presents the participation counts, reported energy and demand savings, and incentive payments for the MFHR Program in PY12 by customer segment.

Table 3-68. MFHR Program Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)
PYTD No. of Participants	26
PYRTD MWh/yr	1506
PYRTD MW/yr	0.16
PY12 Incentives (\$1,000)	\$441

Although 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

As Guidehouse's PY12 Evaluation Plan details, the team did not conduct primary gross impact evaluation research for MFHR in PY12. Instead, the team applied the realization rates for MFHR found in PY10 to PY12 program activities.

Table 3-69 provides the resulting population and sampling sizes. Table 3-70 and Table 3-71 show the gross energy and demand results for MFHR, respectively.

Table 3-69. MFHR Gross Impact Sample Design for PY12

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
MFHR – Large	4	5	Phone verifications
MFHR – Small	27	3	Phone verifications
Total	31	8	

Source: Guidehouse analysis

Table 3-70. MFHR Program Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate	Sample C _v	Relative Precision at 85% CL
MFHR – Large	510	99%	0.03	2.3%
MFHR – Small	995	113%	0.09	11.8%
Total	1,506	108%		5.8%

Source: Guidehouse analysis

Table 3-71. MFHR Program Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate	Sample C _v	Relative Precision at 85% CL
MFHR – Large	0.06	103%	0.12	9.7%
MFHR – Small	0.10	117%	0.18	23.6%
Total	0.16	112%	0.13	11.4%

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and to the observed realization rates for MFHR (from the PY11 evaluation):

- 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

Guidehouse did not conduct an NTG evaluation for MFHR in PY12. Per Guidehouse’s PY12 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 MFHR, as Table 3-72 shows.

Table 3-72. 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%	24.8%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for MFHR in PY12.

3.10.4 Verified Savings Estimates

In Table 3-73 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-73. MFHR PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,506	0.16
PYVTD Gross	1,625	0.18
PYVTD Net	739	0.08
RTD	4,953	0.48
VTD Gross	5,036	0.50
VTD Net	2,330	0.23

Source: Guidehouse analysis

The VTD savings contribution from prior years remains unchanged since the PY11 final annual report.

3.10.5 Process Evaluation

Guidehouse did not conduct process evaluation research for MFHR during PY12.

3.10.6 Cost-Effectiveness Reporting

Table 3-74 breaks down program finances and cost-effectiveness. TRC benefits in Table 3-74 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-74. Summary of MFHR Program Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$441		\$1,079	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$11		\$1,687	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$452		\$2,767	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$5	\$19
6	Administration, Management, and Technical Assistance ^[3]	\$1	\$37	\$96	\$167
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$15	\$1,165	\$64	\$1,777
9	EDC Evaluation Costs	\$34		\$150	
10	SWE Audit Costs	\$13		\$88	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,265		\$2,365	
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)	\$1,717		\$5,132	
14	Total NPV Lifetime Electric Energy Benefits	\$675		\$1,818	
15	Total NPV Lifetime Electric Capacity Benefits	\$182		\$431	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$0	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$60		-\$108	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$797		\$2,142	
19	TRC Benefit-Cost Ratio ^[8]	0.46		0.42	

[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 3-75 presents program financials and cost-effectiveness on a net savings basis.

Table 3-75. Summary of MFHR Program Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
		EDC	CSP	EDC	CSP
1	EDC Incentives to Participants ^[1]		\$441		\$1,079
2	EDC Incentives to Trade Allies		\$0		\$0
3	Participant Costs (net of incentives/rebates paid by utilities)		-\$235		\$197
4	Incremental Measure Costs (sum of rows 1 through 3)		\$206		\$1,276
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$5	\$19
6	Administration, Management, and Technical Assistance ^[3]	\$1	\$37	\$96	\$167
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$15	\$1,165	\$64	\$1,777
9	EDC Evaluation Costs		\$34		\$150
10	SWE Audit Costs		\$13		\$88
11	Program Overhead Costs (sum of rows 5 through 10)		\$1,265		\$2,365
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)		\$1,471		\$3,641
14	Total NPV Lifetime Electric Energy Benefits		\$307		\$834
15	Total NPV Lifetime Electric Capacity Benefits		\$83		\$197
16	Total NPV Lifetime Operation and Maintenance Benefits		\$0		\$0
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)		-\$27		-\$49
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)		\$363		\$982
19	TRC Benefit-Cost Ratio ^[8]		0.25		0.27

[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

Guidehouse has no recommendations for the MFHR Program at this time.

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 PY12) 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 3-76 presents the participation counts, reported energy and demand savings, and incentive payments for IEP in PY12 by customer segment.

Table 3-76. IEP Participation and Reported Impacts

Parameter	Large C&I (Non-GNI)
PYTD No. of Participants	32
PYRTD MWh/yr	44,576
PYRTD MW/yr	6.12
PY12 Incentives (\$1,000)	\$2,313

Source: Guidehouse analysis

3.11.2 Gross Impact Evaluation

Guidehouse completed both onsite and phone verifications for the IEP PY12 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 PY12 evaluation (and as described in the Guidehouse Evaluation Plan), the team relied on measures previously sampled and verified from PY11 and combined those with additional sampled measures from PY12. The evaluation team used this rolling 2-year verification approach to estimate the realization rate for PY12.

Table 3-77 provides the resulting population and sampling sizes. Table 3-78 and Table 3-79 show the gross energy and demand results for IEP, respectively.

Due to COVID-19 safety concerns with onsite verification visits, Guidehouse changed four sampled projects from onsite visits to telephone or virtual verifications in both the Medium and Large strata. The team did not reduce sample size targets within sampling plans. Three other sites, representing a total of five measures, received site visits in PY12 with COVID-19 safety protocols in place.

Table 3-77. IEP Gross Impact Sample Design for PY10 and PY12

Stratum	Population Size*	Achieved Sample Size (PY10/PY12 Combined)	Evaluation Activity
Industrial – Large	10	8	Verification and trending visit, phone/virtual verification
Industrial – Medium	27	8	Verification only visit, verification and trending visit, phone/virtual verification
Industrial – Small	129	8	Verification only visit, verification and trending visit, phone verification
Total	166	24	

*Participant counts when sampling reflect the total number of measures rather than the total number of participants.
 Source: Guidehouse analysis

Table 3-78. IEP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate (PY10/PY12 Combined)	Sample C _v	Relative Precision at 90% CL*
Industrial – Large	34,780	99%	0.05	3.1%
Industrial – Medium	7,708	79%	0.46	31.1%
Industrial – Small	2,087	99%	0.02	1.2%
Program Total	44,576	96%		4.6%

*IEP was sampled targeting 90/15 for PY12.
 Source: Guidehouse analysis

Table 3-79. IEP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate (PY10/PY12 Combined)	Sample C _v	Relative Precision at 90% CL*
Industrial – Large	4.73	75%	0.13	9.0%
Industrial – Medium	1.01	106%	0.33	22.1%
Industrial – Small	0.38	99%	0.01	0.6%
Program Total	6.12	81%	0.12	7.2%

*IEP was sampled targeting 90/15 for PY12.
 Source: Guidehouse analysis

Factors affecting the PY12 realization rates for IEP (which include measures reported in both PY11 and PY12) included the following:

- Two lighting measures had a lower fixture quantity than reported, reducing savings for those line items.
- Two indoor agriculture sites staggered the lighting schedules to even out load. This did not affect energy savings but led to a significant reduction in demand. One of these sites also had an incorrect efficient fixture wattage in the ex ante savings calculations. Fixing this increased the energy and demand savings.
- One site saw lower savings than expected primarily due to the project files not containing a full range of production for the efficient condition. Additional data from the customer provided data for this range, indicating the measure did not save as much energy in high production times. This led to a lower savings for both energy and demand for this site.

3.11.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for IEP in PY12. The team relied on PY11 results for the estimates of participant free ridership and spillover. Table 3-80 shows the NTG ratio applied to IEP projects.

Table 3-80. IEP Efficiency Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTG Ratio	Sample C _v	Relative Precision at 85% CL
Industrial Efficiency	39%	0%	61%	0.35	17.4%

Source: Guidehouse analysis

HIM Research

Guidehouse did not conduct HIM research for IEP in PY12.

3.11.4 Verified Savings Estimates

In Table 3-81 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-81. IEP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	44,576	6.12
PYVTD Gross	42,690	4.99
PYVTD Net	25,948	3.03
RTD	86,799	10.87
VTD Gross	82,703	9.76
VTD Net	44,000	5.35

Source: Guidehouse analysis

The VTD savings contribution from prior years has not changed since the submission of the PY12 final annual report.

3.11.5 Process Evaluation

Guidehouse did not conduct process evaluation research for IEP during PY12.

3.11.6 Cost-Effectiveness Reporting

Table 3-82 breaks down program finances and cost-effectiveness. TRC benefits in Table 3-82 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-82. Summary of IEP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$2,690		\$3,710	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$4,255		\$4,496	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$6,945		\$8,205	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$69
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$138	\$232	\$602
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$17	\$2,222	\$68	\$4,185
9	EDC Evaluation Costs	\$116		\$529	
10	SWE Audit Costs	\$47		\$309	
11	Program Overhead Costs (sum of rows 5 through 10)	\$2,556		\$5,999	
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)	\$9,501		\$14,204	
14	Total NPV Lifetime Electric Energy Benefits	\$25,082		\$37,541	
15	Total NPV Lifetime Electric Capacity Benefits	\$6,295		\$9,761	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$82		\$377	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$1,622		-\$2,309	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$29,838		\$45,370	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
19	TRC Benefit-Cost Ratio ^[8]	3.14	3.19

[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 3-83 presents program financials and cost-effectiveness on a net savings basis.

Table 3-83. Summary of IEP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$2,690		\$3,710	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$1,531		\$805	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$4,221		\$4,515	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$69
6	Administration, Management, and Technical Assistance ^[3]	\$16	\$138	\$232	\$602
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$17	\$2,222	\$68	\$4,185
9	EDC Evaluation Costs	\$116		\$529	
10	SWE Audit Costs	\$47		\$309	
11	Program Overhead Costs (sum of rows 5 through 10)	\$2,556		\$5,999	
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)	\$6,777		\$10,513	
14	Total NPV Lifetime Electric Energy Benefits	\$15,245		\$19,909	
15	Total NPV Lifetime Electric Capacity Benefits	\$3,826		\$5,313	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$50		\$182	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$986	-\$1,252
18	Total NPV TRC Benefits ^[7] (Sum of rows 14 through 17)	\$18,136	\$24,152
19	TRC Benefit-Cost Ratio ^[8]	2.68	2.30

[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

The impact and process evaluation activities in PY12 led to the findings and recommendations shown in Table 3-84; the table also summarizes how Duquesne Light plans to address the recommendation in program delivery.

Table 3-84. PY12 Findings and Recommendation for IEP

Findings	Recommendations
<ul style="list-style-type: none"> Two indoor agriculture sites had low demand realization rates due to lighting schedules indicated in the trend data that were not accounted for in the ex-ante calculations. Although there has not historically been demand targets in Act 129, Phase IV will include demand targets. 	<ul style="list-style-type: none"> Guidehouse recommends that Duquesne Light and the CSPs calculate demand in accordance with the TRM for custom projects.
<p>Duquesne Light response: Under consideration. Duquesne Light will encourage the CSPs to calculate demand savings in accordance with the TRM in Phase IV.</p>	

3.12 Public Agency Partnership Program

The PAPP serves public agency customers such as federal, state, and local governments; municipalities; and school districts. It also 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 PY12, the opportunity presented by pandemic-related school closures enabled Duquesne Light to continue 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 a total of nine of these projects as part of the normal evaluation effort across PY11 and PY12, finding that the bulbs were installed as required and that customers were (anecdotally) very satisfied with the program. Although Guidehouse did not sample these projects as a separate stratum, all but one of 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 PY12) 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 3-85 presents the participation counts, reported energy and demand savings, and incentive payments for PAPP in PY12 by customer segment.

Table 3-85. PAPP Participation and Reported Impacts

Parameter	PAPP (GNI)
PYTD No. of Participants	190
PYRTD MWh/yr	18,882
PYRTD MW/yr	2.98
PY12 Incentives (\$1,000)	\$1,266

Source: Guidehouse analysis

3.12.2 Gross Impact Evaluation

Guidehouse completed onsite verifications and phone verifications for PAPP PY12 projects. As described in the Evaluation Plan, the evaluation team relied on projects previously sampled and verified from PY11 and combined those with additional sampled projects from PY12. The team used this rolling 2-year verification approach to estimate the realization rate for PY12.

Table 3-86 provides the resulting population and sampling sizes. Table 3-87 and Table 3-88 show the gross energy and demand results for PAPP, respectively.

Due to COVID-19 safety concerns with onsite verification visits, Guidehouse changed four sampled projects from onsite visits to telephone verifications. One of these sites was a hospital, 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, including one large lighting site that received metering.

Table 3-86. PAPP Gross Impact Sample Design for PY10 and PY12

Stratum	Population Size	Achieved Sample Size (PY10/PY12 Combined)	Evaluation Activity
PAPP - Certainty	2	2	Verification and trending visit, phone/virtual verification*
PAPP - Large	37	8	Verification only visit, verification and trending visit, phone/virtual verification*
PAPP - Small	235	20	Verification only visit, phone/virtual verification*
Program Total	274	30	

*Some PY12 sites that would normally have received a site visit received a phone verification due to COVID-19-related safety concerns.

Source: Guidehouse analysis

Table 3-87. PAPP Gross Impact Results for Energy

Stratum	PYRTD MWh/yr	Energy Realization Rate (PY10/PY12 Combined)	Sample C _v	Relative Precision at 85% CL
PAPP - Certainty	5,478	97%	0.00	0.0%
PAPP – Large	7,853	95%	0.09	4.9%
PAPP – Small	5,551	165%	0.75	25.2%
Program Total	18,882	116%		10.5%

Source: Guidehouse analysis

Table 3-88. PAPP Gross Impact Results for Demand

Stratum	PYRTD MW/yr	Demand Realization Rate (PY10/PY12 Combined)	Sample C _v	Relative Precision at 85% CL
PAPP - Certainty	0.46	99%	0.00	0.0%
PAPP – Large	1.48	116%	0.28	16.1%
PAPP – Small	1.04	167%	0.59	19.7%
Program Total	2.98	131%	0.29	10.8%

Source: Guidehouse analysis

Factors affecting the PAPP realization rates for PY12 (which include projects reported in both PY11 and PY12) are as follows:

- Most projects (n=14) had HOU confirmed either via customer interview, energy management system settings, or onsite metering 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.
- Two projects 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 PY12, Guidehouse verified 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.
- One very large site, consisting of a chiller plant consolidation, saw slightly lower than 100% savings due to a discrepancy in trend data. Data received with the project files conflicted with data for the same period (pre-COVID-19) directly from the customer. Guidehouse could not be 100% sure which data was accurate, so used an average of the two datasets to calculate savings for this site.

3.12.3 Net Impact Evaluation

Per the PY12 Guidehouse Evaluation Plan, Guidehouse conducted net impact evaluation for PAPP in PY12. Guidehouse estimated NTG for PAPP based on results from the online survey launched via email of program participants. In total, 31 PAPP participants completed a battery of NTG questions. Table 3-89 shows the estimated free ridership, spillover, and the NTG ratio resulting from the PY12 survey of PAPP participants.

Table 3-89. PAPP Net Impact Evaluation Results

Target Group	Estimated Free Ridership	Spillover	NTG Ratio	Relative Precision at 85% CL
PAPP	14.4%	0.0%	85.6%	2.7%

Source: Guidehouse analysis

For spillover, Guidehouse analyzed the responses to a battery of spillover questions. The evaluation team designed these questions to identify cases where spillover was possible and to quantify the self-reported energy savings from the spillover equipment installation. Three survey respondents reported some spillover actions, which have been quantified based on the relative savings of spillover compared to the project as reported by the respondents and the influence of the program on the spillover savings. However, none of the survey respondents reported spillover that could be quantified to the standard established in the SWE Phase III Process Evaluation Report. In particular, the evaluation team could not prove the existence of the spillover action and could not collect sufficient detail to develop an engineering algorithm designed to estimate savings.

Table 3-90. Spillover Estimates Reported by Respondents

Savings from Rebated Project (kWh)	Influence of Program on Additional Improvement	Relative % Savings from Additional Improvement
10,300	3	Do Not Know
94,763	5	30% More
8,887	4	20% Less

Source: Guidehouse analysis

As Table 3-90 shows, respondents identified potential spillover savings, although an exact amount could not be quantified. Spillover savings can only be claimed in situations where a detailed engineering analysis can be made of the installed measure or project, and this was not feasible for these interviews. Therefore, in PY12, the spillover for the program is estimated as 0%.

HIM Research

Guidehouse conducted HIM research for measures implemented during PY12. Guidehouse identified LED Linear Replacement Lamps as a HIM through a review of PY12 program tracking data. Table 3-91 presents estimated free ridership, spillover, and NTG ratios for this HIM for PAPP.

Table 3-91. PY12 PAPP High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
PAPP	LED Linear Replacement Lamp	8.4%	0%	91.6%

Source: Guidehouse analysis

3.12.4 Verified Savings Estimates

In Table 3-92 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

Table 3-92. PAPP PYTD and P3TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	18,882	2.98
PYVTD Gross	21,936	3.91
PYVTD Net	18,777	3.35
RTD	50,339	7.38
VTD Gross	54,165	7.16
VTD Net	34,783	4.94

Source: Guidehouse analysis

3.12.5 Process Evaluation

Guidehouse completed a process evaluation for PAPP in PY12. As part of this process, the evaluation team conducted customer surveys to obtain feedback about their experience and satisfaction with the program delivery processes and opportunities for program improvement. The team also interviewed the program manager and the CSP. These interviews aided survey and interview question updates and confirmed that PAPP processes and implementation has remained consistent since PY11. The following sections discuss the approach, results, and findings for each evaluation activity.

3.12.5.1 Participant Survey

The participant survey focused on customers who participated in PAPP in PY12. Guidehouse attempted a census and distributed the online survey via email to 135 participants. The survey instrument included process and net impact evaluation questions. The team received 31 fully completed surveys. Table 3-93 summarizes the sample design.

Table 3-93. PY12 PAPP Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
PAPP	135	Online survey	Census attempt (22)	31	23%
Total	135		22	31	23%

*This population count represents unique customers who participated in this program in PY12.

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 this section outlines the findings for each of these topics.

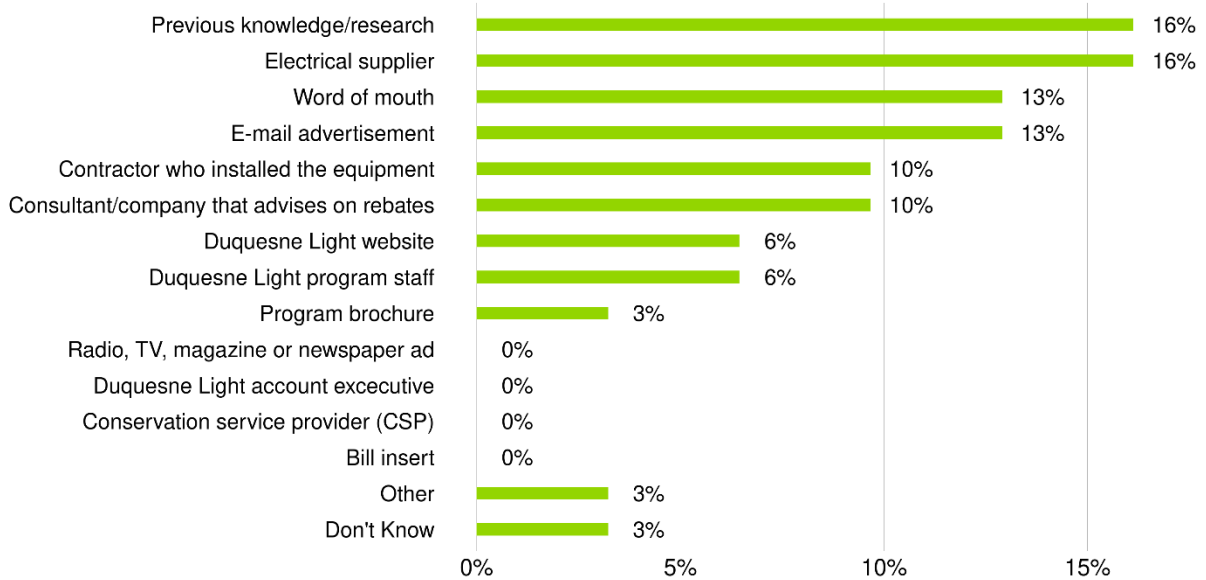
Program Awareness

Guidehouse asked participants to identify how they first heard about PAPP. Participants reported a variety of sources of program awareness. The top four sources of program awareness were previous knowledge or research about the program (16%), learning about the program from the electrical supplier (16%), email advertisement (13%), and word of mouth (13%), as Figure 3-5 shows. No survey respondents heard about this program through Duquesne Light account executives, CSPs, bill inserts, or traditional media (e.g., radio, TV, magazines). The wide variety of sources of program awareness indicate that Duquesne Light has strong networks and had pursued multiple channels of marketing and outreach. These responses illustrate the importance of continuing to drive program participation through multiple channels, to continue to focus on email advertisements, and consider opportunities to expand marketing and outreach via other channels, such as bill inserts, the Duquesne Light website, program staff, account executives/representatives, etc.

When asked about which marketing efforts or materials promoting PAPP were participants aware of, the top three responses were the program website (32%), application form (23%), and program brochure (16%). A large portion of PAPP survey respondents (39%) were not aware of any marketing efforts or materials. Survey respondents who were aware of marketing efforts or materials reported that they were somewhat (40%) or very useful (40%). Additionally, participants recommended that the best way for Duquesne Light to reach out to customers and

get them to participate in the program is through email (55%), distributors/manufacturers (39%), and account representatives (35%).

Figure 3-5. How did you first hear about PAPP? (n=31)

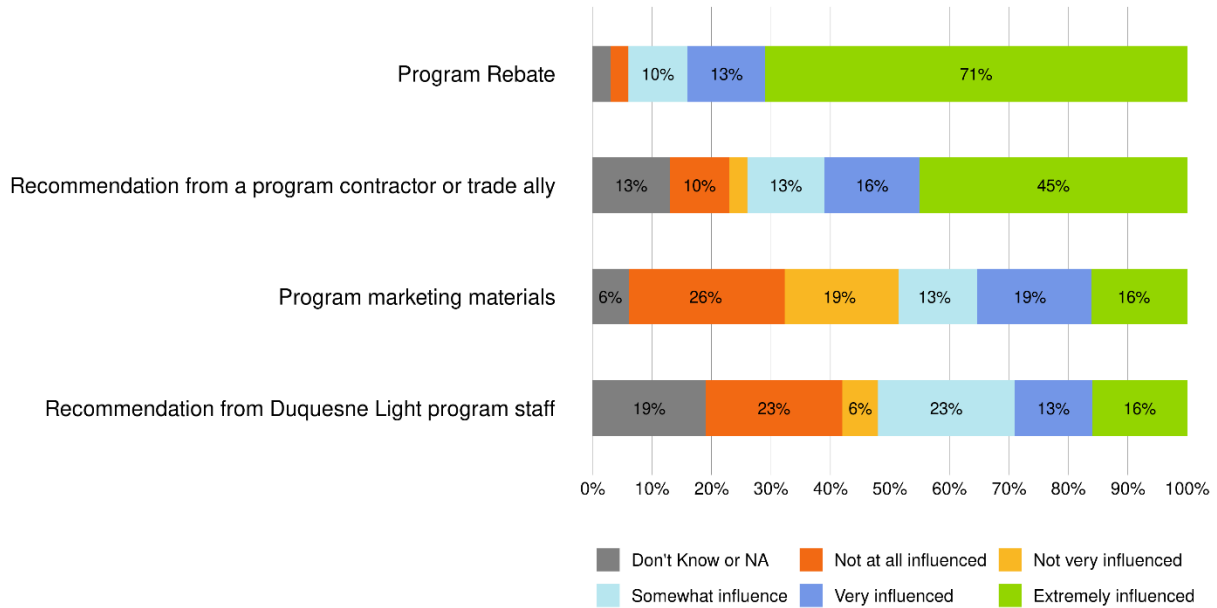


Source: Guidehouse analysis

Program Influence

Guidehouse asked participants how much the program influenced them to purchase and install energy efficient equipment. Responses show program rebate and recommendations from a program contractor or trade ally were the most influential in a participant’s decision to purchase energy efficient equipment, with 84% and 61% of respondents reporting being very or extremely influenced in their decision, respectively. Program marketing materials were less influential in promoting program participation with 35% of respondents reporting being very or extremely influenced in their decision. Recommendations from program staff were least influential of the options provided with 29% of respondents 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 program contractors or trade allies. Figure 3-6 details the responses.

Figure 3-6. How influential were the following on your decision to install the energy efficient equipment? (n=31)

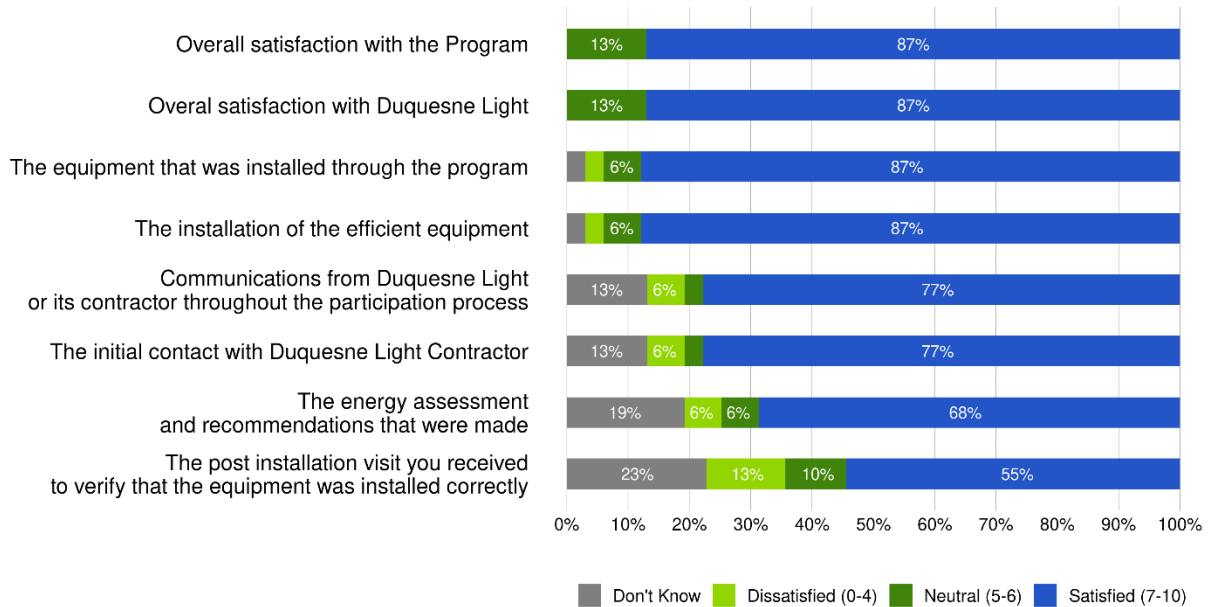


Source: Guidehouse analysis

Satisfaction

Guidehouse gauged participants’ sentiments toward various aspects of the program to understand how it can be improved in the future. Overall, participants reported high satisfaction rates with the program, rating the program on average 9 on a scale of 0 to 10, where 0 means not at all satisfied and 10 means very satisfied. A majority of the participants (87%) rated the program 7 or higher on a scale of 0 to 10. Additionally, most program aspects also received high satisfaction ratings from survey respondents. The highest satisfaction reported was for the equipment and the installation process, with 87% of survey respondents providing a rating of 7 or higher. Figure 3-7 shows the results of participants’ satisfaction with the program. Furthermore, 68% of survey respondents reported that they view Duquesne Light more favorably as a result of their participation in the program. The remaining respondents reported their perception of Duquesne Light stayed the same, and no one reported to view Duquesne Light less favorably.

Figure 3-7. PY12 PAPP Participant Satisfaction Rates (n=31)



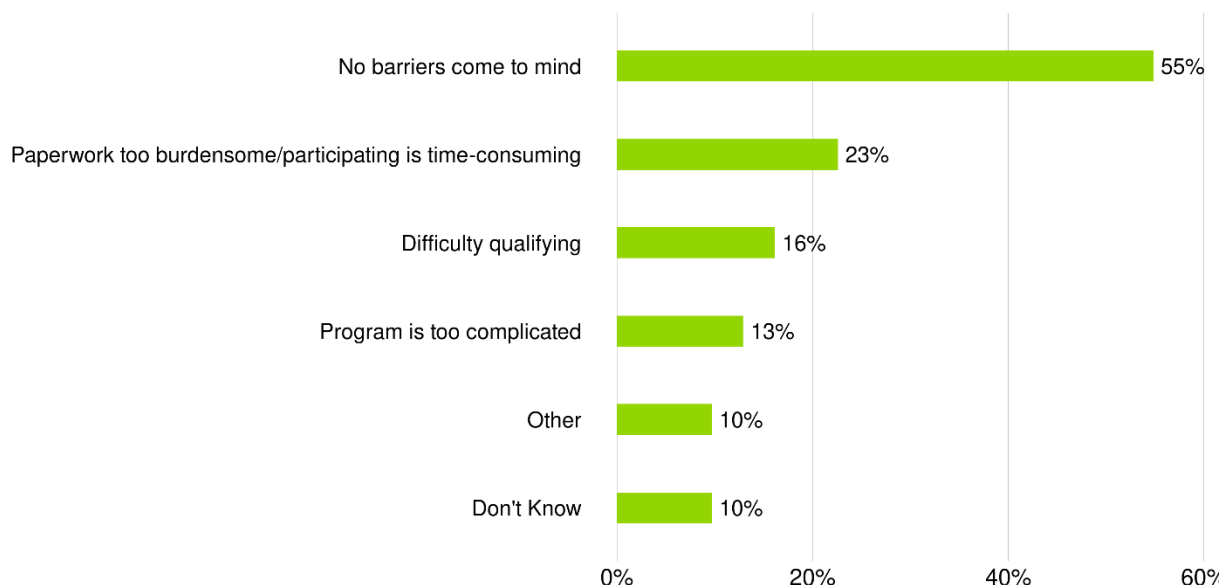
Source: Guidehouse analysis

Although it appears that four people (13%) reported a low satisfaction rating of below 4 with their post installation visit, the reasons provided by these respondents indicate that they did not receive a post installation visit. As not all participants receive post installation visits, it appears that this could have been more clearly communicated in the survey instrument or during program application process. Other reasons provided for low satisfaction ratings of program aspects included not being contacted by the contractor or by program staff or not receiving an energy assessment. Similarly, these responses indicate that participants would prefer to have greater engagement with contractors and program staff, which would include energy assessments, post installation visits, and contractor support with installations.

Program Barriers and Challenges

Guidehouse also asked participants about program barriers and challenges associated with program participation. More than half of survey respondents (55%) see no barriers to program participation. Only 23% of survey respondents indicated that paperwork is too burdensome and 16% reported difficulties with qualifying energy efficiency equipment. Figure 3-8 summarizes survey responses. Two other responses included lack of awareness (one) and obtaining qualification/certification for lighting fixtures (one) from Duquesne Light. These responses illustrate that Duquesne Light should consider further streamlining program processes by reducing paperwork, if possible, and identifying methods to improve the equipment qualification process for this program.

Figure 3-8. What do you see as the main barriers for organizations like yours to participating in the program? Select up to 3 responses. (n = 31)



Source: Guidehouse analysis

A few survey respondents provided suggestions to improve the program. Two participants suggested providing which and if specific products qualify for rebates prior to customers submitting the necessary documentation. One suggested reducing the paperwork. Another suggested extending program application deadlines and expanding the list of qualifying energy efficiency measures to include building automation systems (BASs). Additionally, Guidehouse asked about what other measures participants would like to see offered as part of this program. Survey respondents suggested BAS, HVAC system controls, greater variety of HVAC equipment, refrigerators and coolers, retrocommissioning, EV charging stations, and incentives for power factor corrections. Some of these measures Duquesne Light already offers through custom programs, but these responses indicate an opportunity for greater awareness of program qualifying equipment. These comments provide insight into the methods Duquesne Light can use to continue to provide a great program experience for its customers and opportunities for expanding program participation, if desired.

Section 3.12.7 includes recommendations resulting from the survey findings.

3.12.6 Cost-Effectiveness Reporting

Table 3-94 breaks down program finances and cost-effectiveness. TRC benefits in Table 3-94 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-94. Summary of PAPP Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
1	EDC Incentives to Participants ^[1]	\$1,633	\$3,206
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)	\$2,701		\$5,798	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$4,334		\$9,004	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$38
6	Administration, Management, and Technical Assistance ^[3]	\$25	\$80	\$160	\$338
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$812	\$64	\$2,883
9	EDC Evaluation Costs	\$65		\$294	
10	SWE Audit Costs	\$27		\$171	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,025		\$3,951	
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)	\$5,359		\$12,955	
14	Total NPV Lifetime Electric Energy Benefits	\$13,004		\$24,053	
15	Total NPV Lifetime Electric Capacity Benefits	\$4,973		\$7,178	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$1,912		\$2,583	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$915		-\$1,484	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$18,975		\$32,331	
19	TRC Benefit-Cost Ratio ^[8]	3.54		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 3-95 presents program financials and cost-effectiveness on a net savings basis.

Table 3-95. Summary of PAPP Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$1,633		\$3,206	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$2,077		\$2,423	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$3,710		\$5,629	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$4	\$38
6	Administration, Management, and Technical Assistance ^[3]	\$25	\$80	\$160	\$338
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$16	\$812	\$64	\$2,883
9	EDC Evaluation Costs	\$65		\$294	
10	SWE Audit Costs	\$27		\$171	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,025		\$3,951	
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)	\$4,735		\$9,580	
14	Total NPV Lifetime Electric Energy Benefits	\$11,132		\$15,545	
15	Total NPV Lifetime Electric Capacity Benefits	\$4,257		\$4,917	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$1,637		\$1,791	
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	-\$783		-\$956	
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$16,243		\$21,298	
19	TRC Benefit-Cost Ratio ^[8]	3.43		2.22	

[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 PY12 led to the findings and recommendations Table 3-96 shows; the table also summarizes how Duquesne Light plans to address the recommendation in program delivery.

Table 3-96. PY12 Findings and Recommendation for PAPP

Findings	Recommendations
Program Awareness, Marketing and Outreach	
<ul style="list-style-type: none"> Participants reported that their top sources of program awareness were previous knowledge or research about the program (16%), learning about the program from the electrical supplier (16%), email advertisement (13%), and through word of mouth (13%). Survey respondents suggested that the best method to reach out to customers to get them to participate are through email (55%), distributors/manufacturers (39%), and account representatives (35%). 	<ul style="list-style-type: none"> If Duquesne Light desires greater participation, Duquesne Light should continue to expand methods of outreach to increase program awareness among customers by exploring further opportunities of outreach via email, through distributors or manufacturers, and through account representatives.
<p>Duquesne Light response: Accepted. Duquesne Light will continue to leverage opportunities to expand program awareness among its customers.</p>	
Program Barriers and Challenges	
<ul style="list-style-type: none"> More than half of survey respondents (55%) see no barriers to program participation. A quarter of survey respondents (23%) indicated that paperwork is too burdensome, and 16% reported difficulties with qualifying EE equipment. 	<ul style="list-style-type: none"> There are few barriers to participation. Duquesne Light should continue to explore pathways to simplify program documentation and improve qualification process and awareness of which EE equipment qualifies for program rebates.
<p>Duquesne Light response: Accepted. Duquesne Light will continue to seek out opportunities to improve equipment qualification process and simplify the documentation requirements for program participation.</p>	
Satisfaction	
<ul style="list-style-type: none"> Respondents reported very high satisfaction with the program, rating it on average 9 on a scale of 0 to 10, where 0 means not at all satisfied and 10 means very satisfied. Majority (87%) of survey respondents rated the program 7 or higher. Respondents reported high overall satisfaction with Duquesne Light with 87% of survey respondents providing a rating of 7 or higher. Majority (68%) of respondents reported that they view Duquesne Light more favorably because of their participation in the program. The remaining respondents reported their perception stayed the same, and no one reported to view Duquesne Light less favorably. 	<ul style="list-style-type: none"> No additional recommendations.
<p>Duquesne Light response: None necessary.</p>	
Reported Savings	
<ul style="list-style-type: none"> Guidehouse found that several lighting sites listed fixtures by schedule but did not separate them by space type. This made verification more difficult, both for the field tech and for the customer, and increased uncertainty in results. 	<ul style="list-style-type: none"> Duquesne Light should encourage CSPs to include a fixture inventory form broken out by space to ease evaluation, particularly for large or complex project.

Findings

Recommendations

Duquesne Light response: Duquesne Light and Guidehouse met with the CSP teams for Phase IV to clarify expectations for documentation moving forward.

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. The program provides hands-on training while the students 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 PY12) 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).

CEEP saw no participation in PY12, since schools moved to a virtual format during the COVID-19 pandemic and this program design was not feasible.

3.13.1 Verified Savings Estimates

In Table 3-97 Guidehouse conveys that no savings are recorded for CEEP in PY12. Totals from previous program years are summed to calculate the P3TD program impacts.

Table 3-97. CEEP 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	7,655	1.31

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
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 PY11 final annual report.

3.13.2 Process Evaluation

Guidehouse did not conduct process evaluation research for CEEP during PY12.

3.13.3 Cost-Effectiveness Reporting

Table 3-98 breaks down program finances and cost-effectiveness. TRC benefits in Table 3-98 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-98. 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)	\$0		\$2,457	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$2,847	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$5	\$18	\$37	\$79
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$5	\$193	\$20	\$1,064
9	EDC Evaluation Costs	\$15		\$69	
10	SWE Audit Costs	\$6		\$41	
11	Program Overhead Costs (sum of rows 5 through 10)	\$242		\$1,322	
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)	\$242		\$4,169	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$3,770	
15	Total NPV Lifetime Electric Capacity Benefits	\$0		\$1,410	
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0		\$614	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0	-\$314
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0	\$5,480
19	TRC Benefit-Cost Ratio ^[8]	0.0	1.31

[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 3-99 presents program financials and cost-effectiveness on a net savings basis.

Table 3-99. 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)	\$0		\$1,070	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$0		\$1,460	
5	Design & Development ^[2]	\$0	\$0	\$3	\$9
6	Administration, Management, and Technical Assistance ^[3]	\$5	\$18	\$37	\$79
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$5	\$193	\$20	\$1,064
9	EDC Evaluation Costs	\$15		\$69	
10	SWE Audit Costs	\$6		\$41	
11	Program Overhead Costs (sum of rows 5 through 10)	\$242		\$1,322	
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)	\$242		\$2,782	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
14	Total NPV Lifetime Electric Energy Benefits	\$0	\$1,908
15	Total NPV Lifetime Electric Capacity Benefits	\$0	\$727
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$325
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0	-\$143
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$0	\$2,817
19	TRC Benefit-Cost Ratio ^[8]	0.00	1.01

[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

3.13.4 Status of Recommendations

Guidehouse has no recommendations for CEEP at this time.

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. PJM's day-ahead load forecast triggers Act 129 DR events. 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 instructed 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 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 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, and EDCs 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.¹⁶ PJM archives a subset of the 96 daily forecasts.¹⁷ 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 distribution losses. The peak demand impacts presented in this section were adjusted for line losses.

DR participation was voluntary for PY12. Duquesne Light called events that were 4 hours in duration, aligned with events in previous years of Phase III. Program participation levels were similar to those from PY11. However, program impacts were lower than those in previous program years due to lower customer loads and higher customer opt-outs.

3.14.1 Participation and Reported Savings by Customer Segment

Table 3-100 presents the participation counts, reported peak demand savings, and EDC expenditures for the LCL Program in PY12 by customer segment.

¹⁶ <http://www.pjm.com/markets-and-operations/energy/real-time/7-day-load-forecast.aspx>

¹⁷ <http://www.pjm.com/markets-and-operations/ops-analysis/historical-load-forecasts.aspx>

Table 3-100. LCL Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
PYTD No. of Participants	20	105	70	195
PYRTD MW/yr	0.55	26.14	5.71	32.41
PY12 Incentives (\$1,000)	\$102	\$549	\$184	\$834

Source: Guidehouse analysis

3.14.2 Gross Impact Evaluation

This section summarizes Guidehouse’s approach for evaluating impacts in PY12 and some interim outputs (i.e., impacts by strata). Guidehouse used the following two approaches to estimate program impacts on a customer-by-customer basis:

- **CBL:** The standard 4-of-5 CBL with an optional WSA.¹⁸ 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 testing procedure described in the Evaluation Plan and approved by the SWE determined the approach selected for each customer. 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 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 PY12 impacts.

The test procedure is as follows:

Step 1: Select HOT Event Dates

¹⁸ 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.

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 pricing¹⁹
- Excluding days in which participants received notification of a true Act 129 event

These exclusions help 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 (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 baseline²⁰ 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.

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

¹⁹ 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.

²⁰ 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.

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 the following fashion:

1. Remove non-qualifying days. Remove all weekends and public holidays, Act 129 event days, and all PJM Emergency and Economic events per Section 6.2.2.1.5 of the Phase III Evaluation Framework.
2. Identify the 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.²¹ 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 PY12, but if some had 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, as Equation 3-3 shows:

²¹ Data was 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.

Equation 3-3. 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.²² 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 PY12, Guidehouse received approval from the SWE to also include a simplified version of the base model, shown in Equation 3-4, 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 3-4. 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.

- 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-.
- $spline_{s,t}$ = A set of S dummy variables acting as a temperature spline to be applied in a manner similar to that outlined in PJM Manual 19.²³ The cdh_t value interacted

²² 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.

²³ PJM Manual 19, *Load Forecasting and Analysis Revision 32*, Section 3.4, <https://www.pjm.com/-/media/documents/manuals/m19.ashx>.

with the spline (see Table 3-) 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-.

$EMA6cdh_t$ = 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-.

$EMA24cdh_t$ = Identical to $EMA6cdh_t$, except for 24, instead of, 6 hours. This variable is represented as “ema_24_cdh” in Table 3-.

$daLMP_t$ = 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-.

$rtLMP_t$ = The real-time PJM LMP for hour t . This variable is represented as “rt_imp” in Table 3-.

Table 3-101 provides the 32 model specifications tested for each participant, in addition to the core base model Equation 3-4 shows. All variables in Table 3-101 are added to the base model for testing.²⁴ Interactions of multiple variables are represented as multiplications (e.g., “cdh*hour”).

Table 3-101. 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		
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

²⁴ 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
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 the following 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

The regression includes data from May through September, where available.

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 are 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 sets of parameters are estimated—34 specifications, once with no additional exclusions and 4 times with different exclusion rules.

Impact Findings and Lessons Learned

Table 3-102 and Table 3-103 summarize the reported and verified impacts grouped by the two approaches. These are followed by a discussion of the factors driving the realization rate. Guidehouse recommends using the same evaluation methodology for the PY12 evaluation.

Table 3-102. LCL Gross Impact Evaluation Design for PY12

Stratum	Population Size	PYRTD MW	Evaluation Approach
CBL	28	3.67	4-of-5 CBL with optional WSA adjustment
Regression ²⁵	167	28.74	Linear regression
Program Total	195	32.41	

Source: Guidehouse analysis

Table 3-103. LCL Gross Impact Results for Demand

Stratum	PYRTD MW	Demand Realization Rate	PYVTD MW	Relative Precision at 90% CL
CBL	3.72	99%	3.67	7.2%
Regression ²⁶	44.28	65%	28.74	20.3%
Program Total	48.00	68%	32.41	48.8%

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

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 8.1% 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

²⁵ 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.

²⁶ See previous footnote.

method, Guidehouse's impacts prior to adjusting for line losses were 38.7% lower than CSP-reported impacts. In aggregate, the regression-based baselines were substantially lower than the baselines used by the CSP, with most of this difference coming from the program's largest participant.

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 6.1% after applying the LLFs.

3.14.3 Process Evaluation

Guidehouse did not conduct process evaluation research for LCL during PY12.

3.14.4 Cost-Effectiveness Reporting

Table 3-104 breaks down program finances and cost-effectiveness. TRC benefits in Table 3-104 were calculated using gross verified impacts. NPV PYTD costs and benefits are expressed in 2020 dollars. NPV costs and benefits for P3TD financials are discounted back to 2016.

Table 3-104. Summary of LCL Finances – Gross Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$2,124	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$626		\$117	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$626		\$2,241	
		EDC	CSP	EDC	CSP
5	Design & Development ^[2]	\$0	\$0	\$5	\$44
6	Administration, Management, and Technical Assistance ^[3]	\$5	\$91	\$125	\$388
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$6	\$845	\$21	\$3,058
9	EDC Evaluation Costs	\$76		\$340	
10	SWE Audit Costs	\$32		\$201	
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,055		\$4,181	
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)	\$1,681		\$340	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$201	
15	Total NPV Lifetime Electric Capacity Benefits	\$3,392		\$4,181	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
16	Total NPV Lifetime Operation and Maintenance Benefits	\$0	\$340
17	Total NPV Lifetime Non-Electric Benefits (fossil fuel, water)	\$0	\$201
18	Total NPV TRC Benefits ^[7] (sum of rows 14 through 17)	\$3,392	\$4,181
19	TRC Benefit-Cost Ratio ^[8]	2.02	2.65

[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 3-105 presents program financials and cost-effectiveness on a net savings basis.

Table 3-105. Summary of LCL Finances – Net Verified

Row #	Cost Category	PYTD (\$1,000)		P3TD (\$1,000)	
1	EDC Incentives to Participants ^[1]	\$0		\$2,124	
2	EDC Incentives to Trade Allies	\$0		\$0	
3	Participant Costs (net of incentives/rebates paid by utilities)	\$626		\$117	
4	Incremental Measure Costs (sum of rows 1 through 3)	\$626		\$2,241	
		EDC	EDC	CSP	EDC
5	Design & Development ^[2]	\$0	\$0	\$5	\$44
6	Administration, Management, and Technical Assistance ^[3]	\$5	\$91	\$125	\$388
7	Marketing ^[4]	\$0	\$0	\$0	\$0
8	Program Delivery ^[5]	\$6	\$845	\$21	\$3,058
9	EDC Evaluation Costs	\$76			\$340
10	SWE Audit Costs	\$32			\$201
11	Program Overhead Costs (sum of rows 5 through 10)	\$1,055		\$4,181	
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)	\$1,681		\$6,422	
14	Total NPV Lifetime Electric Energy Benefits	\$0		\$0	

Row #	Cost Category	PYTD (\$1,000)	P3TD (\$1,000)
15	Total NPV Lifetime Electric Capacity Benefits	\$3,392	\$17,020
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)	\$3,392	\$17,020
19	TRC Benefit-Cost Ratio ^[8]	2.02	2.65

[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

Table 3-106 shows the findings from the PY12 impact evaluation activities. Guidehouse has no recommendations at this time.

Table 3-106. 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,"²⁷ 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	

Source: Guidehouse analysis

²⁷ 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>

4. Portfolio Finances and Cost Recovery

This section summarizes the expenditures associated with Duquesne Light's portfolio and the recovery of those costs from ratepayers.

4.1 Program Finances

Table 4-1 shows program-specific and portfolio total finances for PY12. The columns in Table 4-2 are adapted from the Direct Program Cost categories in the PA PUC's EE&C Plan template²⁸ 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 in Table 4-1 and Table 4-2 are based on Duquesne Light tracking of expenditures with no adjustments to account for inflation.²⁹

Table 4-1. PY12 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*	\$278	\$41	\$638	\$119	\$1,076
Residential Appliance Recycling	\$38	\$41	\$173	\$10	\$262
Residential Behavioral Savings	\$0	\$41	\$74	\$17	\$132
Residential Whole House Retrofit	\$0	\$40	\$584	\$9	\$633
Low-Income Energy Efficiency	\$195	\$41	\$1,061	\$47	\$1,344
Express Efficiency	\$569	\$40	\$627	\$61	\$1,297
Small/Medium Midstream Lighting	\$473	\$32	\$145	\$33	\$683
Small Commercial Direct Install	\$124	\$15	\$9	\$11	\$159
Multifamily Housing Retrofit	\$441	\$16	\$1,202	\$34	\$1,693
Commercial Efficiency	\$834	\$32	\$720	\$70	\$1,656
Large Midstream Lighting	\$250	\$31	\$166	\$53	\$500
Industrial Efficiency	\$2,313	\$33	\$2,360	\$116	\$4,822
Public Agency Partnership	\$1,266	\$41	\$892	\$65	\$2,264
Community Education	\$0	\$10	\$211	\$15	\$236

²⁸ <http://www.puc.pa.gov/pcdocs/1372426.doc>, Section 10

²⁹ 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
Large Curtailable Load	\$834	\$11	\$936	\$76	\$1,857
Common Portfolio Costs**					
Portfolio Total	\$7,614	\$465	\$9,798	\$736	\$18,613
SWE Costs***	N/A	N/A	N/A	N/A	\$300
Total	\$7,614	\$465	\$9,798	\$736	\$18,913

* 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 under the 2% spending cap.

Source: Guidehouse analysis

Table 4-2 shows program-specific and portfolio total finances since the inception of Phase III.

Table 4-2. 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*	\$5,296	\$542	\$9,876	\$593	\$16,307
Residential Appliance Recycling	\$336	\$181	\$1,382	\$53	\$1,952
Residential Behavioral Savings	\$0	\$198	\$1,445	\$82	\$1,725
Residential Whole House Retrofit	\$0	\$194	\$836	\$47	\$1,077
Low-Income Energy Efficiency	\$1,082	\$265	\$4,150	\$246	\$5,743
Express Efficiency	\$2,823	\$686	\$3,505	\$382	\$7,395
Small/Medium Midstream Lighting	\$973	\$183	\$524	\$129	\$1,809
Small Commercial Direct Install	\$124	\$167	\$3,014	\$149	\$3,454
Multifamily Housing Retrofit**	\$1,315	\$183	\$2,384	\$174	\$4,056
Commercial Efficiency	\$3,235	\$261	\$3,566	\$371	\$7,433
Large Midstream Lighting	\$710	\$231	\$911	\$272	\$2,124
Industrial Efficiency	\$4,169	\$336	\$5,805	\$614	\$10,924
Public Agency Partnership	\$3,535	\$255	\$3,752	\$341	\$7,883
Community Education	\$428	\$67	\$1,327	\$80	\$1,902
Large Curtailable Load	\$3,269	\$165	\$4,047	\$394	\$7,875

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Common Portfolio Costs**					
Portfolio Total	\$27,294	\$3,914	\$46,524	\$3,927	\$81,658
SWE Costs***	N/A	N/A	N/A	N/A	\$2,205
Total	\$27,294	\$3,914	\$46,524	\$3,927	\$83,864

* 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 four 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 tied to the way customers are metered and charged for electric service. Readers should be mindful of the differences between Table 4-3 and Section 2.4. For example, the low-income customer segment is a subset of Duquesne Light's residential tariff(s) and is not listed in Table 4-3.

Table 4-3. EE&C Plan Expenditures by Cost Recovery Category (\$1,000)

Cost Recovery Sector	Rate Classes Included	PYTD Spending	P3TD Spending
Residential	RS, RH, RA	\$3,522	\$27,356
Small/Medium Commercial and Industrial	GS, GM, GMH	\$4,176	\$19,405
Large Commercial	GL, GLH, L	\$4,785	\$18,143
Large Industrial	GL, GLH, L, HVPS	\$6,430	\$18,960
Portfolio Total		\$18,913	\$83,864

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.

Source: Guidehouse analysis

Appendix A. Upstream Lighting Cross-Sector Sales

Upstream Lighting was discontinued in PY12.

Appendix B. Site Inspection Summary

Table B-1 summarizes the PY12 site visit activities carried out for the evaluation and informing these PY12 verification results. Guidehouse performed more phone verifications and fewer site visits in PY12 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 PY12 results. Table B-2 is included for reference.

Table B-1. PY12 Site Visit Summary

Program	Inspection Firm	Number of In-Person Inspections Conducted*	Number of Virtual Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies
Commercial Efficiency (Large Commercial)	Karpinski Engineering	0	4	3	HOU, Post Retrofit Fixture Wattage
Express Efficiency	Karpinski Engineering	0	1	1	
Large Nonresidential Upstream Lighting	Karpinski Engineering	0	4	4	HOU, ISR, Fixture Wattage
Industrial Efficiency (Large Industrial)	Karpinski Engineering, Guidehouse	3**	4	6	HOU, Fixture Wattage, Custom Calculations
Public Agency Partnership Program	Karpinski Engineering, Guidehouse	1	4	5	HOU, Baseline Fixture Wattage, Custom
Total		4	17	18	

* In December, Guidehouse suspended all site visits companywide. This restriction was not lifted until July, 2021.

**Two of these site visits represent four sample points

Source: Guidehouse analysis

Table B-2. PY11 Site Visit Summary (informing PY12 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	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

Program	Inspection Firm	Number of Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies
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

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 2020	13,274	36,465	9,464	2,505
Jul 2020	13,242	36,310	9,410	2,485
Aug 2020	13,176	36,032	9,336	2,455
Sep 2020	13,113	35,789	9,269	2,425
Oct 2020	13,059	35,558	9,186	2,389
Nov 2020	13,018	35,369	9,109	2,362
Dec 2020	12,974	35,174	9,041	2,331
Jan 2021	12,923	34,993	8,973	2,304
Feb 2021	12,881	34,882	8,913	2,287
Mar 2021	12,845	34,757	8,839	2,256
Apr 2021	12,800	34,588	8,774	2,228
May 2021	12,759	34,394	8,698	2,201

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 2020	-0.66	0.15	-0.44	0.13	-0.52	0.21	-0.40	0.25
Jul 2020	-0.64	0.20	-0.42	0.17	-0.65	0.36	-0.09	0.55
Aug 2020	-0.60	0.19	-0.45	0.17	-0.83	0.38	-0.02	0.58
Sep 2020	-0.49	0.14	-0.36	0.12	-0.65	0.28	-0.01	0.44
Oct 2020	-0.48	0.11	-0.39	0.10	-0.35	0.23	0.19	0.39
Nov 2020	-0.53	0.13	-0.44	0.11	-0.44	0.25	0.22	0.42
Dec 2020	-0.77	0.16	-0.38	0.13	-0.76	0.28	0.43	0.44
Jan 2021	-0.86	0.17	-0.40	0.13	-0.51	0.29	0.54	0.46
Feb 2021	-0.89	0.18	-0.42	0.14	-0.50	0.30	0.42	0.50
Mar 2021	-0.68	0.13	-0.41	0.11	-0.68	0.24	0.34	0.34
Apr 2021	-0.60	0.11	-0.30	0.10	-0.62	0.18	0.01	0.27
May 2021	-0.52	0.12	-0.32	0.10	-0.55	0.18	-0.09	0.26

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 2020	1.63%	0.72%	1.39%	0.78%	1.95%	1.56%	1.58%	1.96%
Jul 2020	1.23%	0.76%	1.01%	0.81%	1.74%	1.91%	0.25%	3.01%
Aug 2020	1.30%	0.81%	1.20%	0.87%	2.33%	2.08%	0.07%	3.28%
Sep 2020	1.48%	0.85%	1.40%	0.91%	2.48%	2.09%	0.05%	3.33%
Oct 2020	1.89%	0.85%	1.92%	0.95%	1.65%	2.07%	-0.91%	3.59%

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
Nov 2020	1.85%	0.87%	1.95%	0.96%	1.86%	2.09%	-0.93%	3.49%
Dec 2020	2.21%	0.89%	1.44%	0.97%	2.80%	2.03%	-1.59%	3.22%
Jan 2021	2.46%	0.95%	1.53%	1.01%	1.84%	2.09%	-1.95%	3.31%
Feb 2021	2.57%	1.02%	1.63%	1.04%	1.82%	2.15%	-1.53%	3.51%
Mar 2021	2.44%	0.95%	1.96%	1.06%	3.05%	2.10%	-1.55%	3.12%
Apr 2021	2.42%	0.90%	1.60%	1.00%	3.23%	1.86%	-0.08%	2.85%
May 2021	1.82%	0.84%	1.44%	0.91%	2.66%	1.69%	0.47%	2.62%

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 2020	264.58	486.42	148.89	30.02
Jul 2020	261.03	469.94	190.01	6.98
Aug 2020	246.48	503.35	241.27	1.84
Sep 2020	191.35	390.27	180.66	0.97
Oct 2020	195.06	429.37	100.88	-14.43
Nov 2020	208.31	462.75	120.94	-15.72
Dec 2020	311.56	412.37	212.49	-30.74
Jan 2021	345.98	433.63	140.51	-38.33
Feb 2021	322.62	410.49	125.48	-27.21
Mar 2021	270.51	445.53	187.38	-23.49
Apr 2021	228.52	313.34	163.27	-0.95
May 2021	207.24	343.51	149.13	6.35

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	33.7
2015 Market Rate	26.3
2015 Low-Income	25.8
2018 Low-Income	25.8

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 a given program among HER participants. This is also known as the overlap savings.

To estimate 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 PY12 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. Calculating 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%	-
3	2.25%	2018 Low-Income
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 (MW/yr)
2012 Market Rate	3,053.24	-563.87	-74.68	-84.51	2,330.17	0.266
2015 Market Rate	5,100.96	-1588.51	-105.37	-143.10	3,263.98	0.373
2015 Low-Income	1,960.92	-275.26	-50.57	227.61	1,862.70	0.213
2018 Low-Income	-104.71	-47.95	3.43	0.00	-149.23	-0.017

Source: Guidehouse analysis

Appendix D. PY12 and P3TD Summary by Customer Segment and Carveout

Table D-1 and Table D-2 breaks down the portfolio savings by customer segment for energy and demand savings, respectively. Table D-3 shows the breakdown of DR 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)	9,728	4,285	10,470	56,493	18,882	99,859
PYVTD Gross (MWh/yr)	7,934	4,462	13,305	55,849	21,936	103,486
RTD (MWh/yr)	171,862	19,303	65,349	148,257	57,994	462,765
VTD Gross (MWh/yr)	160,387	18,270	83,302	145,140	61,955	469,053

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)	1.27	0.41	1.60	7.90	2.98	14.16
PYVTD Gross (MW/yr)	1.06	0.44	2.66	6.86	3.91	14.93
RTD (MW/yr)	19.00	1.90	9.50	19.53	8.69	58.61
VTD Gross (MW/yr)	17.79	1.85	13.05	18.70	8.49	59.90

Source: Guidehouse analysis

Table D-3. Summary of Customer Segment DR Savings

DR 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	0.55	26.14	5.71	32.41
VTD (MW/yr)	N/A	N/A	0.72	49.12	5.32	55.16

Source: Guidehouse analysis

The PY12 low-income carveout in Table D-4 includes savings from three LIEEP components and a portion of the MFHR Program. Table D-5 shows the GNI carveout which includes savings from PAPP and CEEP.

Table D-4. Summary of Low-Income Carveout Savings

Low-Income Carveout	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Carryover from Phase II		3,266

Low-Income Carveout	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
LIEEP (LI Kits, LI HER, LI WHRP)	4,462	18,270
LI-MFHR (a portion of program savings)	1,614	4,858
Total	6,076	23,128
Total (VTD+CO)		26,394
Goal		24,250
Percent of Goal (including CO)		108.8%

Source: Guidehouse analysis

Table D-5. Summary of GNI Carveout Savings

GNI Carveout	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Carryover from Phase II		0
Public Agency Partnership	21,936	54,165
Community Education	0	7,789
Total	21,936	61,955
Total (VTD+CO)		61,955
Goal		15,432
Percent of Goal (including CO)		401.5%

Source: Guidehouse analysis

Table D-6 and Table D-7 summarizes the portfolio savings at the program level for energy and demand savings, respectively, for energy efficiency programs. Table D-8 details the DR savings for the DR 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	1,175	1,352	25,983	21,371
Residential Energy Efficiency (Upstream Lighting)	0	0	97,895	98,210
Residential Appliance Recycling	1,101	988	9,894	9,310
Residential Behavioral Savings	7,452	5,594	37,955	31,383
Residential Whole House Retrofit	0	0	134	114
Low-Income Energy Efficiency	4,285	4,462	19,303	18,270
Express Efficiency	6,339	8,456	39,126	55,463
Small/Medium Midstream Lighting	2,626	3,224	10,335	12,114
Small Commercial Direct Install	0	0	10,934	10,688
Multifamily Housing Retrofit	1,506	1,625	4,953	5,036
Commercial Efficiency	10,552	11,978	53,831	54,155

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)
Large Midstream Lighting	1,365	1,182	7,628	8,282
Industrial Efficiency	44,576	42,690	86,799	82,703
Public Agency Partnership	18,882	21,936	50,339	54,165
Community Education	0	0	7,655	7,789
Total	99,859	103,486	462,765	469,053

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	0.30	0.31	3.63	3.22
Residential Energy Efficiency (Upstream Lighting)	0.00	0.00	9.92	9.94
Residential Appliance Recycling	0.12	0.11	1.11	1.04
Residential Behavioral Savings	0.85	0.64	4.33	3.58
Residential Whole House Retrofit	0.00	0.00	0.01	0.01
Low-Income Energy Efficiency	0.41	0.44	1.90	1.85
Express Efficiency	0.96	1.86	5.84	9.02
Small/Medium Midstream Lighting	0.48	0.62	1.83	2.15
Small Commercial Direct Install	0.00	0.00	1.36	1.39
Multifamily Housing Retrofit	0.16	0.18	0.48	0.50
Commercial Efficiency	1.52	1.68	7.28	7.48
Large Midstream Lighting	0.25	0.19	1.38	1.47
Industrial Efficiency	6.12	4.99	10.87	9.76
Public Agency Partnership	2.98	3.91	7.38	7.16
Community Education	0.00	0.00	1.31	1.34
Total	14.16	14.93	58.61	59.90

Source: Guidehouse analysis

Table D-8. Summary of Demand Response Program

Program	PYVTD Gross (MW/yr)	VTD Gross* (MW/yr)
Large Curtailable Load	32.41	55.16

*DR participation was voluntary for PY12. Therefore, Phase III compliance is based on achieved impacts through PY11.

Source: Guidehouse analysis

Appendix E. Survey Dispositions

Guidehouse conducted two program participant surveys in PY12 for process and net evaluation of the Nonresidential Midstream Lighting Program and PAPP. The evaluation team attempted to reach a given contact via phone with up to six call attempts for the Nonresidential Midstream Lighting Program participants scheduled at different times of day and days of the week. For PAPP, the team reached out to participants up to four times via email. The team also relied on a gift card raffle for these programs to incentivize customers to complete these surveys. Table E-1 shows the final dispositions for the phone and online survey 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
Nonresidential Midstream Lighting (phone)	223	27	12%	15	5%	15%	62%	6%
PAPP (email)	135	31	23%	21	N/A	N/A	N/A	N/A

Source: Guidehouse analysis

Appendix F. Respondent Firmographics

Table F-1 shows firmographics for PY12 process and NTG survey participants for Nonresidential Midstream Lighting and PAPP.

Table F-1. PY12 Survey Firmographics for Nonresidential Midstream Lighting and PAPP

Program		PAPP		C&I Midstream Lighting	
		31		27	
Sample Size		Count	%	Count	%
Facility type	Office	0	0%	6	22%
	Retail	0	0%	3	11%
	Restaurant/bar	0	0%	0	0%
	Food store	0	0%	0	0%
	Warehouse/wholesale	0	0%	1	4%
	Hotel/motel	0	0%	4	15%
	Personal service	0	0%	0	0%
	Elementary/secondary schools	9	29%	1	4%
	College/trade schools	2	6%	0	0%
	Hospital	1	3%	0	0%
	Other health services	1	3%	2	7%
	Miscellaneous/other commercial	6	19%	4	15%
	Government service/public service	4	13%	0	0%
	Manufacturing	0	0%	0	0%
	Apartment complexes	1	3%	1	4%
	Other	7	23%	5	19%
	Do Not Know	0	0%	0	0%
Ownership	I am the owner or operator of the facility	2	6%	0	0%
	Our organization owns and occupies this facility	23	74%	20	74%
	Our organization owns this facility but it is rented to someone else	0	0%	3	11%
	Our organization rents this facility	2	6%	1	4%
	Other	3	10%	2	7%
	Do Not Know	1	3%	1	4%
Employees	1 to 99	17	55%	14	52%
	100 to 499	5	16%	5	19%
	500 to 749	2	6%	0	0%
	750 to 999	0	0%	0	0%
	1,000 or more	5	16%	1	4%
	Do Not Know	2	6%	7	26%

Source: Guidehouse analysis

Note: Some percentages may not add up exactly to a 100% due to rounding.