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

Program Year 14
(June 1, 2022-May 31, 2023)

For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Prepared for:

DUQUESNE LIGHT CO.

Duquesne Light Company

Submitted by:

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Acronyms

C&I	Commercial and Industrial
CDD	Cooling Degree Days
CHP	Combined Heat and Power
CSP	Conservation Service Provider or Curtailment Service Provider
CV	Coefficient of Variation
DLC	Direct Load Control
DDR	Dispatchable Demand Response
EAP	Energy Association of Pennsylvania
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE&C	Energy Efficiency and Conservation
EFLH	Equivalent Full Load Hours
EM&V	Evaluation, Measurement, and Verification
ER	Early Replacement
EUL	Effective Useful Life
FCM	Forward Capacity Market
FE	FirstEnergy
GNI	Government, Nonprofit, Institutional
HDD	Heating Degree Days
HER	Home Energy Report
HIM	High-Impact Measure
HOU	Hours of Use
HPWH	Heat Pump Water Heater
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
IDI	In-Depth Interview
IMP	Interim Measure Protocol
kW	Kilowatt
kWh	Kilowatt-hour
LBVCx	Large Business Virtual Commissioning
LED	Light-Emitting Diode
LI	Low-Income
LI-BEEP	LI Behavioral Energy Efficiency Program
LIEEP	LI Energy Efficiency Program
LLF	Line Loss Factor
MW	Megawatt
MW/yr	Megawatt per year
MWh	Megawatt-hour
MWh/yr	Megawatt-hour per year
NPV	Net Present Value
NTG	Net-to-Gross
O&M	Operation and Maintenance
P4TD	Phase IV to Date
PA PUC	Pennsylvania Public Utility Commission
PJM	Pennsylvania-Jersey-Maryland Interconnection LLC
PMRS	Program Management and Reporting System (Duquesne's Tracking Database)
POP	Point-of-Purchase
PSA	Phase IV to Date Preliminary Savings Achieved; equal to VTD + PYRTD

PSA+CO	PSA savings plus Carryover from Phase III
PY	Program Year: e.g., PY13, from June 1, 2021, to May 31, 2022
PYRTD	Program Year Reported to Date
PYVTD	Program Year Verified to Date
R-BEEP	Residential Behavioral Energy Efficiency Program
RCT	Randomized Control Trial
RDIP	Residential Downstream Incentives Program
ROB	Replace on Burnout
RPM	Reliability Pricing Model
RTD	Phase IV to Date Reported Gross Savings
RTO	Regional Transmission Organization
SBDI	Small Business Direct Install
SBVCx	Small Business Virtual Commissioning
SO	Spillover
SWE	Statewide Evaluator
TA	Trade Ally
TRC	Total Resource Cost
TRM	Technical Reference Manual
VTD	Phase IV to Date Verified Gross Savings
WACC	Weighted Average Cost of Capital

Types of Savings

Gross Savings: The change in energy consumption 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 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 (ICSPs) and stored in the program tracking system.

Unverified Reported Gross: The Phase IV 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 measurement and verification 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 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 (TRM) 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 (EUL). 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. Program Year to Date (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 IV to Date (P4TD): The energy and peak demand savings achieved by an EE&C program or portfolio within Phase IV of Act 129. Reported in several permutations described below.

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

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

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

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

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

DUQUESNE LIGHT CO.

Guidehouse

PORTFOLIO

Duquesne Light offers 17 energy efficiency programs to nonresidential, residential, and low-income customers

Reported Energy Savings

Phase IV has so far been reported to save **199,872 MWh** (VTD+CO)

57% of compliance target

154% of projected PY14 total

PY14 saved **122,634 MWh/yr**

Reported Demand Savings

Phase IV has so far been reported to save **33.02 MW** (VTD)

53% of compliance target

163% of projected PY14 total

PY14 saved **23.57 MW/yr**

PY14 Participation

A total of **193,520** participants:

32,794 Low Income

157,308 Residential

3,418 Nonresidential

Actual Expenditures ($1,000)

Phase IV expenditures: **$41,006**

43% of projected Phase IV

136% of projected PY14 total

PY14 expenditures: **$27,647**

1. Introduction

Pennsylvania Act 129 of 2008, signed on October 15, 2008, mandated energy savings and demand reduction goals for the largest electric distribution companies (EDCs) in Pennsylvania for Phases I (2008 through 2013), II (2013 through 2016), and III (2016 through 2021). In late 2020, each EDC filed a new energy efficiency and conservation (EE&C) plan with the Pennsylvania Public Utility Commission (PA PUC) detailing the proposed design of its portfolio for Phase IV. These plans were updated based on stakeholder input and subsequently approved by the PUC in 2021.

Implementation of Phase IV of the Act 129 programs began on June 1, 2021. This report documents the progress and effectiveness of the Phase IV EE&C accomplishments for Duquesne Light Company (Duquesne Light) in program year 14 (PY14), as well as the cumulative accomplishments of the Phase IV programs since inception. This report additionally documents the energy savings carried over from Phase III. The Phase III carryover savings count toward EDC savings compliance targets for Phase IV.

This report details the participation, spending, reported gross, verified gross energy (MWh) and peak demand (MW), and verified net impacts of the energy efficiency programs in PY14. Compliance with Act 129 savings goals are ultimately based on verified gross savings. This report also includes estimates of cost-effectiveness accorded to the Total Resource Cost (TRC) Test.[1] Duquesne Light has retained Guidehouse Inc. (Guidehouse) as an independent evaluation contractor for Phase IV of Act 129. Guidehouse is responsible for the measurement and verification of the savings and calculation of gross verified and net verified savings.

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

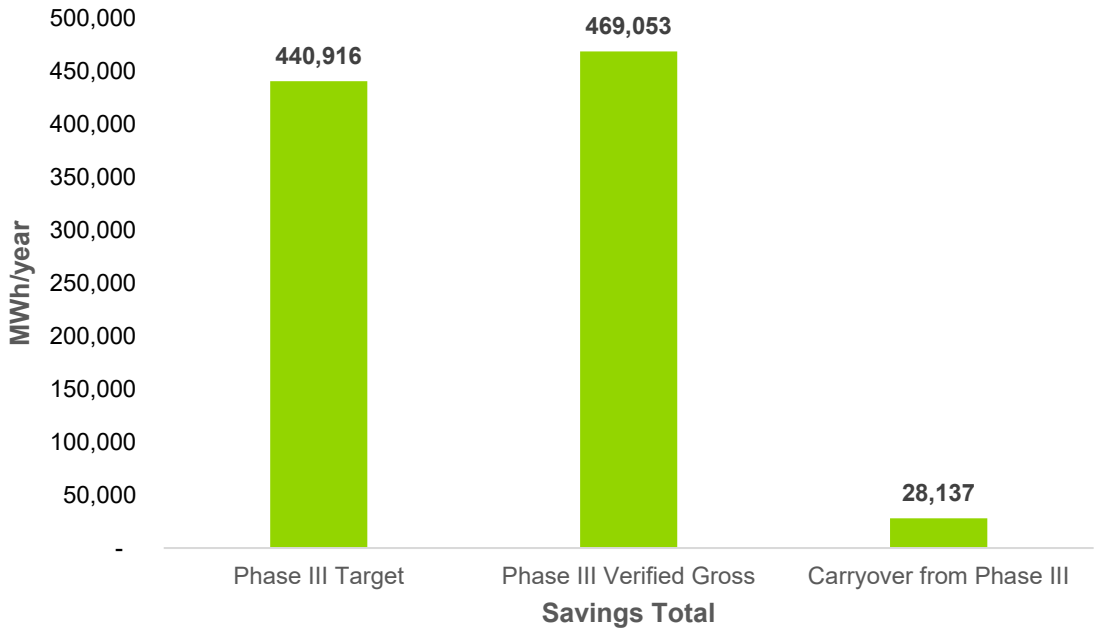
[1] The Pennsylvania TRC Test for Phase I was adopted by PUC Order at Docket No. M-2009-2108601 on June 23, 2009 (*2009 PA TRC Test Order*). The TRC Test Order for Phase I later was refined in the same docket on August 2, 2011 (*2011 PA TRC Test Order*). The 2013 TRC Order for Phase II of Act 129 was 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. The 2021 TRC Test Order for Phase IV of Act 129 was adopted by PUC Order at Docket No. M-2019-3006868 on December 19, 2019.

2. Summary of Achievements

2.1 Carryover Savings from Phase III of Act 129

Duquesne Light has a total of 28,137 MWh/yr of portfolio-level carryover savings from Phase III. Figure 2-1 compares Duquesne Light's Phase III verified gross savings total with the Phase III compliance target to illustrate the carryover calculation.

Figure 2-1: Carryover Savings from Phase III of Act 129



Source: SWE Phase III Report[2]

The Commission's Phase IV Implementation Order[3] also allowed EDCs to carry over savings in excess of the Phase III low-income (LI) savings goal.[4] With the carrying over of 3,266 MWh/yr of Phase II LI savings, Duquesne Light achieved the Phase III compliance target. However, with 23,128 MWh/yr of VTD LI energy savings achieved during Phase III, Duquesne Light does not have LI carryover energy savings from Phase III to Phase IV. Figure 2-2 shows the calculation of carryover savings for the LI customer segment.

[2] PA SWE, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

[3] Pennsylvania Public Utility Commission, *Energy Efficiency and Conservation Program Implementation Order* at Docket No. M-2020-3015228 (*Phase IV Implementation Order*), entered June 18, 2020.

[4] Proportionate to those savings achieved by dedicated LI programs in Phase III.

Figure 2-2: LI Carryover from Phase III

Source: SWE Phase III Report[5]

2.2 Phase IV Energy Efficiency Achievements to Date

Phase IV energy savings targets (MWh) were established at the meter level and peak demand reduction targets (MW) were set at the system level. Accordingly, the MWh totals in this report are presented at the meter level, while peak demand savings are adjusted for transmission and distribution losses to reflect system-level savings. Since the beginning of PY14 on June 1, 2022, Duquesne Light has claimed:

- 112,313 MWh/yr of reported gross electric energy savings (PYRTD)
- 21.18 MW/yr of reported gross peak demand savings (PYRTD)
- 122,634 MWh/yr of verified gross electric energy savings (PYVTD)
- 23.57 MW/yr of verified gross peak demand savings (PYVTD)

Since the beginning of Phase IV of Act 129 on June 1, 2021, Duquesne Light has achieved:

- 159,806 MWh/yr of reported gross electric energy savings (RTD)
- 29.52 MW/yr of reported gross peak demand savings (RTD)
- 171,735 MWh/yr of verified gross electric energy savings (VTD)
- 33.02 MW/yr of verified gross peak demand savings (VTD)
    - This represents 53% of the May 31, 2026, peak demand savings compliance target of 62 MW/yr

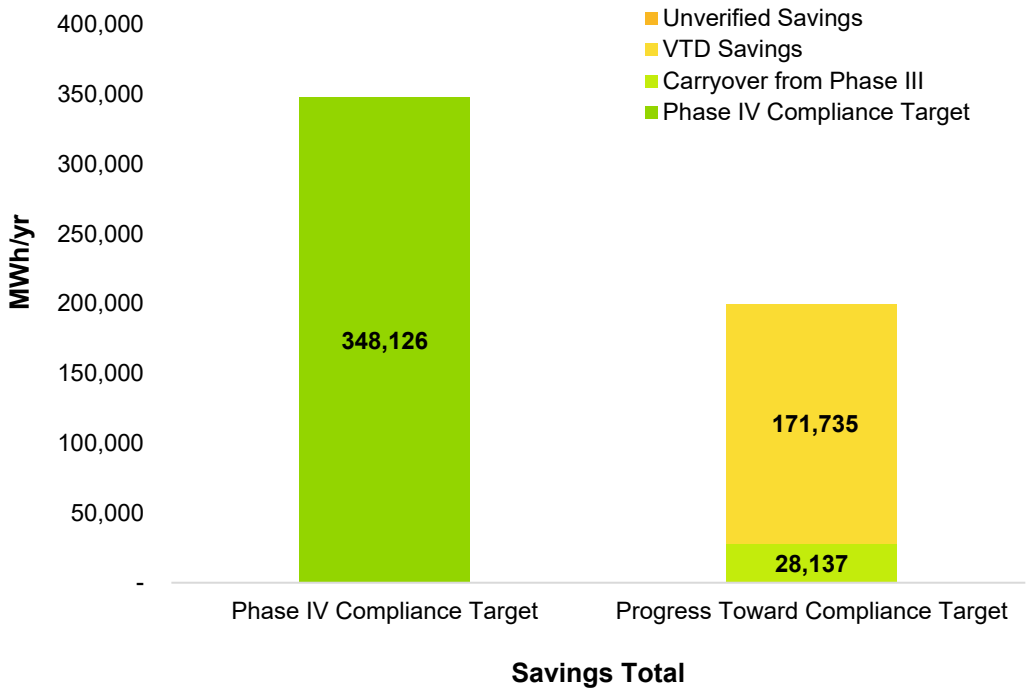
[5] PA SWE, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

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

- 199,872 MWh/yr of VTD + portfolio-level carryover energy savings
    - This represents 57% of the May 31, 2026, energy savings compliance target of 348,126 MWh/yr.

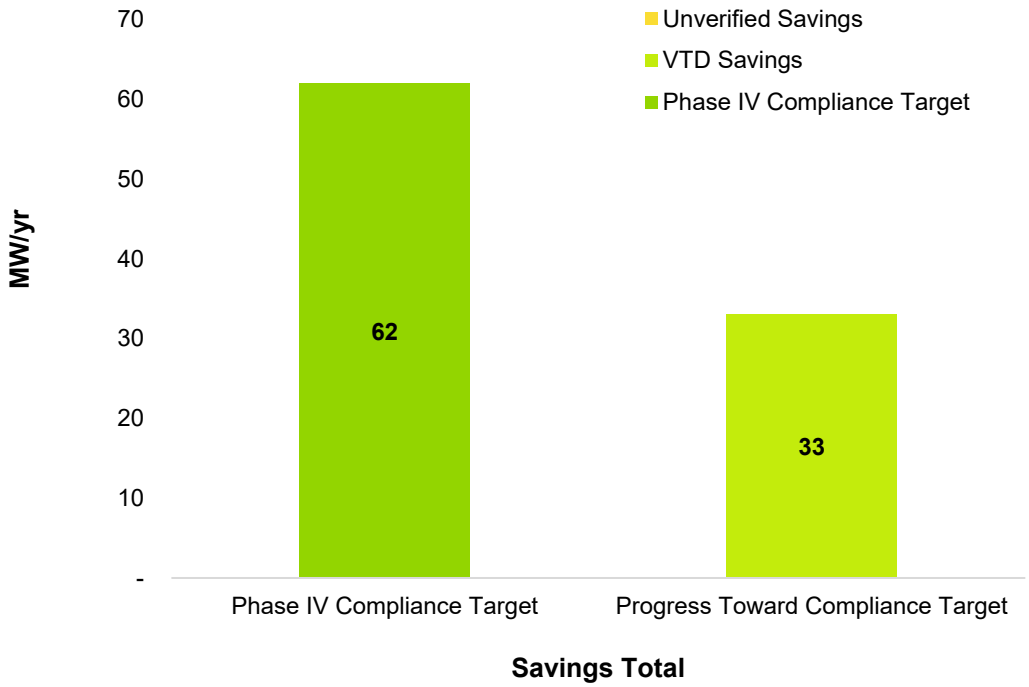
Figure 2-3 summarizes Duquesne Light's progress toward the Phase IV MWh portfolio compliance target, and Figure 2-4 summarizes progress toward the Phase IV MW portfolio compliance target. In PY14, there were a number of Virtual Commissioning projects that were considered unverified due to only a partial year's worth of data being available. This equated to a projected 1,755 MWh/yr and 0.13 MW/yr worth of savings. Therefore, the evaluation for these projects was deferred and will be completed in PY15. Figure 2-3 and Figure 2-4 do not show these unverified savings because all associated costs and reported savings have been moved to PY15.

Figure 2-3: EE&C Plan Performance Toward Phase IV Portfolio Compliance Target



Source: Guidehouse analysis

Figure 2-4: EE&C Plan Performance Toward Phase IV Portfolio Compliance Target

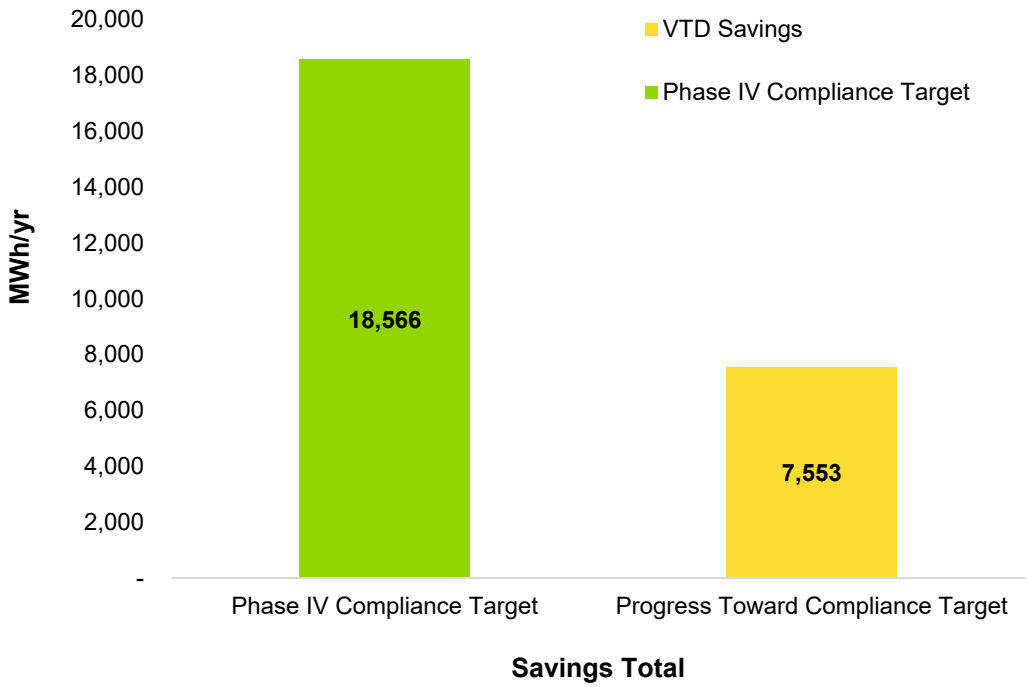


Source: Guidehouse analysis

The Phase IV Implementation Order directed EDCs to offer conservation measures to the LI customer segment based on the proportion of electric sales attributable to LI households. The proportionate number of measures target for Duquesne Light is 8.4%. Duquesne Light offers a total of 72 EE&C measures to its residential and nonresidential customer classes. There are 31 measures available to the LI customer segment at no cost to the customer. This represents 43.1% of the total measures offered in the EE&C plan and exceeds the proportionate number of measures target.

The PA PUC also established an LI energy savings target of 5.8% of the portfolio savings goal. The LI savings target for Duquesne Light is 18,566 MWh/yr and is based on verified gross savings. Figure 2-5 compares the VTD performance for the LI customer segment with the Phase IV savings target. Based on the latest available information, Duquesne Light has achieved 41% of the Phase IV LI energy savings target.

Figure 2-5: EE&C Plan Performance Toward Phase IV LI Compliance Target



Source: Guidehouse analysis

2.2.1 Phase IV Performance, Multifamily Housing

Duquesne Light has achieved 612 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing, including 293 MWh/yr of verified gross electric energy savings (PYVTD) from LI households. For Phase IV, Duquesne Light has achieved 1,248 MWh/yr of verified gross electric energy savings (VTD) for multifamily housing, including 929 MWh/yr of verified gross electric energy savings (VTD) from LI households. These savings are reported under the Small Business Direct Install (SBDI) program.

2.3 Phase IV Performance by Customer Segment

Table 2-1 presents the participation, savings, and spending by customer sector for PY14. The residential, small commercial and industrial (C&I), and large C&I sectors are defined by EDC tariff and the residential LI and governmental/educational/nonprofit sector were defined by statute (66 Pa. C.S. § 2806.1). The residential LI segment is a subset of the residential customer class and the government, nonprofit, institutional (GNI) segment will include customers who are part of the small C&I or large C&I rate classes. The savings, spending, and participation values for the LI segments have been removed from the parent sectors in Table 2-1. Pursuant to the Commission's Implementation Order for Phase IV, Duquesne Light will not offer a specialized program, but will report the savings associated with the GNI customers participating in the nonresidential programs. Table 2-1 shows the savings, spending, and participation values for the GNI segment but have not been removed from the parent sectors.

Table 2-1: PY14 Summary Statistics by Customer Segment

Parameter	Residential (Non-LI)	LI	Small C&I	Large C&I	GNI*	Total
Number of participants**	157,308	32,794	2,617	801	388	193,520
PYVTD MWh/yr	13,852	3,542	59,788	45,452	16,655	122,634
PYVTD MW/yr	2.63	0.39	13.45	7.10	3.12	23.57
Incentives ($1,000)	$694	$1,458	$9,025	$4,450	$2,878	$15,627

**Small C&I and large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-ante savings (PYRTD).*

***See Section 2.4 for the per program definition of a participant.*

Source: Guidehouse analysis

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

Table 2-2: Phase IV Summary Statistics by Customer Segment

Parameter	Residential (Non-LI)	LI	Small C&I	Large C&I	GNI*	Total
Number of Participants	348,347	57,603	3,337	991	592	410,279
VTD MWh/yr	22,074	7,553	75,456	66,652	22,422	171,735
VTD MW/yr	3.65	0.73	17.76	10.88	4.11	33.02
Incentives ($1,000)	$913	$2,433	$11,339	$5,987	$3,620	$20,672

*Small C&I and large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).

Source: Guidehouse analysis

2.4 Summary of Participation by Program

Participation is defined differently for certain programs and program components depending on the program delivery channel and data tracking practices. The nuances of the participant definition vary by program and are summarized by program in the following bullets. Table 2-3 provides the current participation totals for PY14 and Phase IV:

- For customers participating in the Rebate and Audit component of the Residential Downstream Incentives Program (RDIP), it is the number of distinct account numbers in the program tracking data within a given program year. For the Educational Kits component of RDIP, it is the number of kits distributed within a given program year.
- For the Residential Midstream Incentives Program (RMIP), it is the number of distinct account numbers in the program tracking data within a given program year.

- For the Residential Upstream Incentives Program (RUIP), participation cannot be accurately collected due to the nature of the program and therefore are not counted. Guidehouse used guidance listed in the applicable Pennsylvania Technical Reference Manual (TRM) sections for a census of projects implemented during PY14.
- For the Residential Appliance Recycling Program (RARP), it is the number of distinct measures in the program tracking data within a given program year.
- For the Low Income Energy Efficiency Program (LIEEP), customers participating in the Audit component, it is the number of distinct account numbers in the tracking data within a given program year. For the Kits component of LIEEP, it is the number of kits distributed within a given program year. For the Giveaway component of LIEEP, it is the number of measures distributed within a given year.
- For the Residential and LI Behavior program, it is the number of distinct account numbers in the tracking data within a given program year.
- For Small Business Direct Install (SBDI), it is the number of unique participants (defined as unique account numbers).
- For the Small Business Solutions (SBS) and Large Business Solutions (LBS) programs, including industrial, it is the number of unique participants (defined as unique account numbers).
- For the Small Business Midstream Solutions (SBMS) and Large Business Midstream Solutions (LBMS) programs, including industrial, it is the number of unique participants (defined as unique account numbers).

Table 2-3: EE&C Portfolio Participation by Program

Program	PY14 Participation	P4TD Participation
Downstream Incentives	29,179	33,827
Midstream Incentives	1	1
Upstream Incentives	N/A	N/A
Appliance Recycling	3,339	3,884
Residential Total	**32,519**	**37,712**
LI Total	**13,227**	**17,438**
Residential Behavior Total	**124,789**	**310,635**
LI Behavior Total	**19,567**	**40,165**
Small Business Direct-Install	252	293
Small Business Solutions	167	358
Small Business Midstream Solutions	2,191	2,679
Small Business Virtual Commissioning	7	7
Commercial - Large Business Solutions	48	97
Industrial - Large Business Solutions	8	21

Program	PY14 Participation	P4TD Participation
Commercial - Large Business Midstream Solutions	573	662
Industrial - Large Business Midstream Solutions	166	205
Large Business Virtual Commissioning*	6	6
Nonresidential Total	**3,418**	**4,328**
Portfolio Total	**193,520**	**410,278**

**Note: The PY14 Semiannual report misreported the population of LBVCx as 1,300 participants, but it was actually zero.*

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY14, Guidehouse completed impact evaluations for several program components in the portfolio. Table 2-4 summarizes the realization rates and net-to-gross (NTG) ratios by evaluation component.

Table 2-4: Impact Evaluation Results Summary

Program and Initiative	Energy Realization Rate	Demand Realization Rate	NTG Ratio
Downstream Incentives	84%	95%	80%
Midstream Incentives	100%	100%	100%
Upstream Incentives	115%	129%	62%
Appliance Recycling	112%	109%	47%
Residential Total	**105%**	**112%**	**63%**
LI Total	**97%**	**98%**	**100%**
Residential Behavior Total	**95%**	**96%**	**100%**
LI Behavior Total	**75%**	**76%**	**100%**
Small Business Direct-Install	81%	102%	93%
Small Business Solutions	97%	105%	66%
Small Business Midstream Solutions	122%	122%	67%
Small Business Virtual Commissioning	94%	494%	100%
Commercial - Large Business Solutions	98%	96%	43%
Industrial - Large Business Solutions	100%	100%	43%
Commercial - Large Business Midstream Solutions	111%	110%	67%
Industrial - Large Business Midstream Solutions	122%	99%	67%
Large Business Virtual Commissioning	97%	183%	100%
Nonresidential Total	**111%**	**113%**	**64%**
Portfolio Total	**109%**	**111%**	**66%**

Source: Guidehouse analysis

2.6 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/yr). Each program year, the annual savings achieved by EE&C program activity are recorded as incremental annual, or first-year, savings and added to an EDC's progress toward compliance. Incremental annual savings estimates are presented in Section 2.6.1. Lifetime energy savings incorporate the effective useful life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC Test by program participants when assessing the economics of upgrades and by the statewide evaluator (SWE) when calculating the emissions benefits of Act 129 programs. Section 2.6.2 presents the lifetime energy savings by program.

2.6.1 Incremental Annual Energy Savings by Program

Table 2-5 presents a summary of the PY14 and Phase IV to date (P4TD) energy savings by program. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. The verified gross savings are adjusted by the energy recent realization rate and the verified net savings are adjusted by both the realization rate and the NTG ratio.

Table 2-5: 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 Downstream Incentives	2,225	1,860	1,493	3,759	2,959	2,242
Residential Midstream Incentives	3	3	3	3	3	3
Residential Upstream Incentives	2,936	3,378	2,207	4,163	4,883	3,224
Residential Appliance Recycling	2,014	2,262	1,056	2,361	2,653	1,239
Low Income Energy Efficiency	2,605	2,519	2,519	5,139	4,698	4,698
Residential Behavioral Savings	6,660	6,350	6,350	11,797	11,577	11,577
Low Income Residential Behavioral	971	730	730	1,902	1,926	1,926
Small Business Direct Install	3,740	3,029	2,802	5,038	4,372	4,135
Small Business Solutions	8,610	8,360	5,489	14,898	16,883	12,146

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Small Business Midstream Solutions*	39,669	48,220	32,308	50,334	54,658	36,943
Small Business Virtual Commissioning	500	472	472	500	472	472
Commercial Large Business Solutions	6,633	6,515	2,801	15,822	16,957	11,025
Industrial Large Business Solutions	15,058	15,065	6,478	17,200	16,998	7,653
Large Business Midstream Solutions – Commercial*	6,510	7,253	4,860	9,869	11,980	8,263
Large Business Midstream Solutions – Industrial*	11,665	14,176	9,498	14,506	18,274	12,449
Large Business Virtual Commissioning	2,515	2,442	2,442	2,515	2,442	2,442
Portfolio Total	**112,313**	**122,634**	**81,508**	**159,806**	**171,735**	**120,437**

Source: Guidehouse analysis

The previously reported VTD savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- Residential Appliance Recycling – SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the incorrect cooling degree days (CDD) and heating degree days (HDD) in our evaluation of savings. This caused a negligible effect to energy savings but was incorporated into future evaluations for this program.
- Small Business Midstream Solutions – 3,238 MWh/yr of savings were reported, but not verified in the PY13 final annual report. Those savings have since been verified with an energy realization rate of 114% and an NTGR of 67%, which yields an additional 3,708 MWh/yr of gross verified energy savings and an additional 2,485 MWh/yr of net verified energy savings. These verified gross savings are attributed to the Small C&I VTD savings in Table 2-2.
- Large Business Midstream Solutions – 569 MWh/yr of savings were reported, but not verified in the PY13 final annual report. Those savings have since been verified with an energy realization rate of 23% and an NTGR of 67%, which yields an additional 109 MWh/yr of gross verified energy savings and an additional 73 MWh/yr of net verified energy savings. These verified gross savings are attributed to the Large C&I VTD savings in Table 2-2.

2.6.2 Lifetime Energy Savings by Program

Table 2-6 presents the PYTD and P4TD 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 2-6: Lifetime Energy Savings by Program (MWh)

Program Name	PYVTD Gross Lifetime (MWh)	PYVTD Net (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential Downstream Incentives	20,175	16,199	31,257	23,753
Residential Midstream Incentives	44	44	44	44
Residential Upstream Incentives	42,139	27,538	65,641	42,883
Residential Appliance Recycling	10,701	4,997	12,575	5,872
Low Income Energy Efficiency	16,045	16,045	29,278	29,278
Residential Behavioral Savings	12,699	12,699	20,635	20,635
Low Income Residential Behavioral	1,460	1,460	3,359	3,359
Small Business Direct Install	45,419	42,012	65,559	62,011
Small Business Solutions	124,171	81,517	248,956	179,791
Small Business Midstream Solutions	723,226	484,561	819,794	554,091
Small Business Virtual Commissioning	7,080	7,080	7,080	7,080
Commercial Large Business Solutions	96,212	41,371	252,666	164,585
Industrial Large Business Solutions	225,981	97,172	254,783	114,678
Large Business Midstream Solutions - Commercial	108,799	72,895	179,705	123,948
Large Business Midstream Solutions - Industrial	212,646	142,473	274,111	186,728
Large Business Virtual Commissioning	36,630	36,630	36,630	36,630
Portfolio Total	**1,683,428**	**1,084,696**	**2,302,072**	**1,555,365**

Source: Guidehouse analysis

The previously reported VTD lifetime savings from prior years, for the following programs, have not changed since the PY13 final annual report was submitted.

2.7 Summary of Peak Demand Reduction Impacts by Program

Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2:00 p.m. to 6:00 p.m. EDT on non-holiday weekdays from June through August. Peak demand impacts from energy efficiency in this report are presented at the system level, meaning they have been adjusted to account for transmission and

distribution losses. Duquesne Light uses the following line loss percentages/multipliers by sector:

- Residential = 1.0741
- Small and Large C&I = 1.0741
- Large C&I High Voltage = 1.0081

Table 2-7Table presents a summary of the peak demand impacts by energy efficiency program through the current reporting period.

Table 2-7: 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 Downstream Incentives	0.31	0.29	0.22	0.61	0.58	0.41
Residential Midstream Incentives	0.00	0.00	0.00	0.00	0.00	0.00
Residential Upstream Incentives	0.41	0.53	0.36	0.61	0.81	0.58
Residential Appliance Recycling	0.49	0.54	0.25	0.56	0.61	0.28
Low Income Energy Efficiency	0.25	0.24	0.24	0.52	0.48	0.48
Residential Behavioral Savings	1.31	1.27	1.27	1.71	1.65	1.65
Low Income Residential Behavioral	0.19	0.15	0.15	0.22	0.25	0.25
Small Business Direct Install	0.70	0.71	0.66	0.90	0.94	0.88
Small Business Solutions	1.97	2.07	1.36	3.26	4.62	3.35
Small Business Midstream Solutions	8.66	10.55	7.07	10.79	12.09	8.18
Small Business Virtual Commissioning	0.02	0.12	0.12	0.02	0.12	0.12
Commercial Large Business Solutions	1.47	1.41	0.61	3.30	3.58	2.32

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Industrial Large Business Solutions	1.17	1.17	0.50	1.52	1.50	0.70
Large Business Midstream Solutions – Commercial	1.27	1.40	0.94	1.89	2.04	1.40
Large Business Midstream Solutions – Industrial	2.70	2.68	1.79	3.36	3.32	2.26
Large Business Virtual Commissioning	0.24	0.44	0.44	0.24	0.44	0.44
Portfolio Total	**21.18**	**23.57**	**15.97**	**29.52**	**33.02**	**23.29**

Source: Guidehouse analysis

The previously reported VTD savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- Residential Appliance Recycling – SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the wrong cooling degree days (CDD) and heating degree days (HDD) in our evaluation of savings. This caused a negligible effect to demand savings, but was incorporated into future evaluations for this program.
- Small Business Midstream Solutions – 0.61 MW/yr of savings were reported, but not verified in the PY13 final annual report. Those savings have since been verified with demand realization rate of 154% and an NTGR of 67%, which yields an additional 0.95 MW/yr of gross verified demand savings and an additional 0.63 MW/yr of net verified demand savings. These verified gross savings are attributed to the Small C&I VTD savings in Table 2-2.
- Large Business Midstream Solutions – 0.10 MW/yr of savings were reported, but not verified in the PY13 final annual report. Those savings have since been verified with demand realization rate of 37% and an NTGR of 67%, which yields an additional 0.036 MW/yr of gross verified demand savings and an additional 0.024 MW/yr of net verified demand savings. These verified gross savings are attributed to the Large C&I VTD savings in Table 2-2.

2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market

For Phase IV of Act 129, EDCs are expected to retain the capacity rights to Act 129 projects and nominate a portion of the resources acquired to PJM Forward Capacity Market (FCM). If the resources clear, proceeds flow back to the rate class that generated the Act 129 savings to offset cost recovery via riders. Interior lighting measures savings from certain Non-Residential

programs may contribute to Duquesne Light's collective EE Resource for nomination into PJM FCM Reliability Pricing Model (RPM) Base Residual Auction. Duquesne Light did not nominate any projects to PJM in PY14. Table 2-8. summarizes key fuel switching metrics in PY14 and to date in Phase IV.

Table 2-8. Fuel Switching Summary

Metric	PY14
Fuel Switching Measures Offered	None
Fuel Switching Measures Implemented	0
VTD Energy Savings Achieved via Fuel Switching (MWh/yr)	N/A
P4TD Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	N/A
P4TD Incentive Payments for Fuel Switching Measures ($1,000)	N/A

Source: Guidehouse analysis

2.8 Summary of Cost-Effectiveness Results

A detailed breakdown of portfolio finances and cost-effectiveness is presented in Table 2-9. TRC benefits in Table 2-9 were calculated using gross verified impacts. Net present value (NPV) PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 2-9: Summary of Portfolio Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 24,526		$ 29,134	
2	Rebates to Participants and Trade Allies	$ 4,322		$ 9,088	
3	Upstream/Midstream Incentives	$ 9,217		$ 8,622	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 2,088		$ 1,953	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 8,899		$ 9,471	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 176	$ 135
8	Administration and Management	$ 573	$ 1,197	$ 979	$ 1,120
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 9,581	$ -	$ 16,341
11	EDC Evaluation Costs	$ 668		$ 807	
12	SWE Audit Costs	$ 68		$ 460	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 12,087		$ 20,017	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 36,614		$ 49,151	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
15	Total NPV Lifetime Electric Energy Benefits	$ 49,842	$ 65,005
16	Total NPV Lifetime Electric Capacity Benefits	$ 23,586	$ 31,562
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 4,178	$ 5,528
18	Total NPV Lifetime Fossil Fuel Impacts	$ (6,653)	$ (8,351)
19	Total NPV Lifetime Water Impacts	$ 555	$ 632
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 71,507	$ 94,376
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.95	1.92

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

TRC benefit-cost ratios are calculated by comparing the total NPV TRC benefits and the total NPV TRC costs. It is important to note that TRC costs are materially different from the EDC spending and rate recovery tables presented later in the report. TRC costs include estimates of the full cost incurred by program participants to install efficient equipment, not just the portion covered by the EDC rebate. Appendix D shows the TRC ratios by program and for the portfolio.

2.9 Comparison of Performance to Approved EE&C Plan

Table 2-10 presents PY14 expenditures compared with the budget estimates set forth in the EE&C plan for PY14 and P4TD. PY14 values are presented in 2022 dollars and P4TD values are presented in 2021 dollars. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 2-10: Comparison of Expenditures to Phase IV EE&C Plan ($1,000)

Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
PY14 Portfolio	$20,324	$27,647	1.36
P4TD	$37,480	$41,006	1.09

Source: Guidehouse analysis

Table 2-11 compares PY14 and P4TD verified gross program savings compared with the energy savings projections set forth in the EE&C plan.

Table 2-11: Comparison of Actual Program Savings to EE&C Plan Projections

Savings	EE&C Plan Projections	VTD Gross MWh Savings	Ratio (Actual/Plan)
PY14 Portfolio MWh	79,571	122,634	1.54
P4TD MWh	144,938	171,735	1.18
PY14 Portfolio MW	14.42	23.57	1.63
P4TD MW	26.19	33.02	1.26

Source: Guidehouse analysis

The following list discusses key reasons programs exceeded or fell short of projected gross energy savings in PY14:

- Both Residential and Non-Residential Programs were slow to ramp up and launch in PY13, as well as getting customers familiar with and participating in the program. As familiarity in the programs has increased, so has program activity in PY14.
- The CSP for the Residential Programs had technical issues getting program activity uploaded into Duquesne Light's tracking database in PY13, and therefore some program activity that took place in PY13 was reported in PY14.
- The Non-Residential Midstream programs, saw several large projects were the reported hours of use (HOU) were reflective of a warehouse or two shift manufacturing facility, consistent with the building type corresponding with the projects' account numbers. However, the verified HOU were 24 hours a day, seven days a week, which greatly increased the verified savings. This caused a realization rate greater than 1.0 for some of the largest programs in the portfolio.
- Some programs, specifically Virtual Commissioning, require inherently long pre and post installation data collection periods to verify savings, therefore Guidehouse was unable to verify savings in PY13 for many of these projects. These programs have now started claiming savings in PY14.

2.10 Findings and Recommendations

The impact and process evaluation activities completed by Guidehouse led to specific recommendations for program improvement. Table 2-12 provides the section number for the findings and recommendations of each program. Due to the early stage of programs in the phase, Guidehouse makes no overarching program recommendations in PY14.

Table 2-12: Findings and Recommendations Sections by Program

Program	Findings and Recommendations Section
Residential Downstream Incentives	No findings in PY14
Residential Midstream Incentives	No findings in PY14
Residential Upstream Incentives	3.3.7
Residential Appliance Recycling	No findings in PY14
Residential Low Income Energy Efficiency	3.5.7

Program	Findings and Recommendations Section
Residential Behavioral	3.6.7
Low Income Behavioral	3.7.7
Small Business Direct Install	3.8.7
Small Business Solutions	3.9.7
Small Business Midstream Solutions	3.10.7
Small Business Virtual Commissioning	3.11.7
Large Business Solutions	3.12.7
Large Business Midstream Solutions	3.13.7
Large Business Virtual Commissioning	3.14.7

Source: Guidehouse analysis

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY14 along with the outcomes of those activities. Not every program receives an evaluation every year. Table 3-1 provides an impact evaluation overview for Phase IV. Each row indicates how savings from the individual component will be presented in that year's final annual report, where:

V = verified using the results of the impact evaluation completed that year.

H = verified using realization rate values from the most recent evaluation activities based on previous years.

U = unverified until the results of the impact evaluation are available.

Table 3-1: Proposed Gross Impact Overview

Component	PY13	PY14	PY15	PY16	PY17
Residential					
Downstream Incentives	V	H	V	H	V
Midstream Incentives	U	H[6]	V	H	H
Upstream Incentives	V	V	V	V	V
Appliance Recycling	V	H	V	H	H
LI Energy Efficiency	H	V	H	V	H
Residential Behavioral	V	V	V	V	V
LI Behavioral	V	V	V	V	V
Small/Medium C&I					
Small Business Direct Install	V[7] (2-year rolling sample)		H	V	H
Small Business Solutions	Uses a 2-year rolling sample approach				
Small Business Midstream	V	V	H	V	H
Small Virtual Commissioning	U	V	H	V	H
Large C&I					

[6] The Residential Midstream Incentives program saw limited activity in PY14. Therefore, the program was not verified as originally scheduled.

[7] SBDI showed low participation in the first three quarters of PY13. Guidehouse verified several projects for PY13 and completed a rolling 2-year evaluation of this program in PY14.

Component	PY13	PY14	PY15	PY16	PY17
Large Business Solutions			Uses a 2-year rolling sample approach		
Large Business Midstream	V	V	H	V	H
Large Virtual Commissioning	U	V	H	V	H

Source: Guidehouse analysis

3.1 Residential Downstream Incentives

The Residential Downstream Incentives Program (RDIP) includes incentives for a wide variety of energy efficiency products, including ENERGY STAR appliances; high efficiency heating, cooling, and water heating equipment; and other products. There are three components of the program: customers who received rebates for purchasing and installing energy efficient equipment (Rebate), customers who received a comprehensive energy efficiency audit (Audit), and students and teachers who participate in a K-12 Energy Efficiency Education program (Education).

The CSP for RDIP is CLEAResult. CLEAResult processes the rebate applications as well as performs marketing, verification, and calculation of energy savings for the three components.

For customers participating in the Rebate component of the program, participation is equal to the number of distinct account numbers in the program tracking data within a given program year. Participating customers fill out and submit applications for rebates for qualifying products online or by mail.

Customers participating in the Audit component of the program are counted based on the number of distinct account numbers in the program tracking data within a given year. This component provides comprehensive in-home audits, which when applicable will directly install measures such as LED bulbs, Advanced Power Strips, Faucet Aerators, and Nightlights. The in-home audits will also provide incentives for air sealing; basement, exterior wall, floor, and attic insulation; and additional water heating measures. In lieu of the in-person audit, the program also offers an online home energy audit, which allows customers to first obtain instant results by answering questions regarding their home energy use. Customers receive educational materials and a menu of approved measures and rebate amounts to reduce the cost of replacing inefficient equipment. The online home energy audit simplifies the in-person audit process, should the customer choose to continue in the program. In addition to direct-install measures, which are provided at no cost, the program provides up to a $250 home energy credit for installation of audit recommended measures.

Finally, the program provides an Education component for K-12 students and teachers. The Education component offers educational materials, kits, presentations with hands-on activities, poster contests, and a data collection and tracking process. The data collection and tracking process is used to compile, analyze, and report energy savings. The Education component of the program influences and reinforces the energy efficiency behavioral changes geared toward students, their families, and teachers.[8] The kits are distributed to students and teachers with

[8] Guidehouse does not report any behavioral savings for the education component.

measures intended to be installed in the home. The population of the Education component is counted by classroom.

3.1.1 Participation and Reported Savings by Customer Segment

Table 3-2 presents the participation counts, reported energy and demand savings, and incentive payments for RDIP in PY14 by customer segment.

Table 3-2: Residential Downstream Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY14 # Participants	29,179	29,179
PYRTD MWh/yr	2,225	2,225
PYRTD MW/yr	0.31	0.31
PY14 Incentives ($1,000)	$60	$60

Source: Guidehouse analysis

3.1.2 Gross Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a gross impact evaluation for RDIP in PY14 and applied the historic realization rates from PY13 for the different stratum. Table 3-3 shows the reported energy savings in PY14, and Table 3-4 shows the reported demand savings in PY14.

Table 3-3: Residential Downstream Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audits	536	102%	0.14	3%
Rebates	510	98%	0.03	1%
Energy Efficiency Education	1,179	69%	-	0%
Program Total	**2,225**	**84%**		**1%**

Source: Guidehouse analysis

Table 3-4: Residential Downstream Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audits	0.04	106%	0.14	3%
Rebates	0.08	85%	0.49	9%
Energy Efficiency Education	0.18	97%	-	0%
Program Total	**0.31**	95%		**2%**

Source: Guidehouse analysis

3.1.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for RDIP in PY14. Guidehouse will complete an NTG evaluation in PY15 for this program. Table 2-4 shows the NTG ratio applied to RDIP projects, which was caried over from the PY13 NTG evaluation.

3.1.3.1 High-Impact Measure Research

Guidehouse did not conduct high-impact measure (HIM) research for RDIP in PY14.

3.1.4 Verified Savings Estimates

In Table 3-5, the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RDIP in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-5: Residential Downstream PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,225	0.31
PYVTD Gross	1,860	0.29
PYVTD Net	1,493	0.22
RTD	3,759	0.61
VTD Gross	2,959	0.58
VTD Net	2,242	0.41

Source: Guidehouse analysis

3.1.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RDIP in PY14 and plans to complete it in PY15.

3.1.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-6. TRC benefits in Table 3-6 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-6: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 865		$ 885	
2	Rebates to Participants and Trade Allies	$ 60		$ 67	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 805		$ 817	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 10	$ 8
8	Administration and Management	$ 65	$ 72	$ 88	$ 67
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 717	$ -	$ 1,541
11	EDC Evaluation Costs	$ 40		$ 48	
12	SWE Audit Costs	$ -		$ 24	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 894		$ 1,786	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,759		$ 2,671	
15	Total NPV Lifetime Electric Energy Benefits	$ 620		$ 924	
16	Total NPV Lifetime Electric Capacity Benefits	$ 233		$ 444	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (42)		$ (45)	
19	Total NPV Lifetime Water Impacts	$ 461		$ 456	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,272		$ 1,779	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.72		0.67	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-7 presents program financials and cost-effectiveness on a net savings basis.

Table 3-7: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 695		$ 701	
2	Rebates to Participants and Trade Allies	$ 48		$ 53	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 519		$ 515	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 10	$ 8
8	Administration and Management	$ 65	$ 72	$ 88	$ 67
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 717	$ -	$ 1,541
11	EDC Evaluation Costs	$ 40		$ 48	
12	SWE Audit Costs	$ -		$ 24	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 894		$ 1,786	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,589		$ 2,487	
15	Total NPV Lifetime Electric Energy Benefits	$ 498		$ 700	
16	Total NPV Lifetime Electric Capacity Benefits	$ 187		$ 329	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (34)		$ (36)	
19	Total NPV Lifetime Water Impacts	$ 370		$ 363	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,021		$ 1,357	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.64		0.55	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.1.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY14.

3.2 Residential Midstream Incentives

The Residential Midstream Incentives Program (RMIP) includes rebates for select HVAC, hot water, and auxiliary equipment for residential Duquesne Light customers paid directly to program participating distributors. This program eliminates the burden of customers filling out rebate applications, leading to reduced program participation barriers for customers. For RMIP,

participation is equal to the number of distinct account numbers in the program tracking data, within a given program year. There was minimal activity in RMIP in PY14.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-8 presents the participation counts, reported energy and demand savings, and incentive payments for RMIP in PY14 by customer segment.

Table 3-8: Residential Midstream Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY14 # Participants	1	1
PYRTD MWh/yr	3	3
PYRTD MW/yr	0.00	0.00
PY14 Incentives ($1,000)	$1	$1

Source: Guidehouse analysis

3.2.2 Gross Impact Evaluation

Due to limited program activity, Guidehouse did not conduct a gross impact evaluation for RMIP in PY14. Guidehouse plans to complete this evaluation in PY15.

3.2.3 Net Impact Evaluation

Guidehouse did not conduct net impact evaluation research for RMIP in PY14 due to low program participation thus far in Phase IV. Guidehouse plans to complete this activity in PY15.

3.2.3.1 HIM Research

Guidehouse did not conduct HIM research for the RMIP in PY14.

3.2.4 Verified Savings Estimates

In Table 3-9, 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 RMIP in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-9: Residential Midstream PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	3	0.00
PYVTD Gross	3	0.00
PYVTD Net	3	0.00
RTD	3	0.00

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	3	0.00
VTD Net	3	0.00

Source: Guidehouse analysis

3.2.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RMIP in PY14 due to low program participation thus far in Phase IV. Guidehouse plans to complete this research in PY15.

3.2.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-10. TRC benefits in Table 3-10 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-10: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 12		$ 12	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ 1		$ 1	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 12		$ 11	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ 15	$ 1	$ 41	$ 1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 18	$ -	$ 61
11	EDC Evaluation Costs	$ 1		$ 2	
12	SWE Audit Costs	$ 1		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 36		$ 108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 48		$ 119	
15	Total NPV Lifetime Electric Energy Benefits	$ 1		$ 1	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1		$ 1	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3		$ 2	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.05	0.02

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-11 presents program financials and cost-effectiveness on a net savings basis.

Table 3-11: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 12		$ 12	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ 1		$ 1	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 12		$ 11	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ 15	$ 1	$ 41	$ 1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 18	$ -	$ 61
11	EDC Evaluation Costs	$ 1		$ 2	
12	SWE Audit Costs	$ 1		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 36		$ 108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 48		$ 119	
15	Total NPV Lifetime Electric Energy Benefits	$ 1		$ 1	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1		$ 1	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3		$ 2	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.05		0.02	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.2.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY14.

3.3 Residential Upstream Incentives

The Residential Upstream Incentives Program (RUIP) offers point of sale incentives for qualified energy efficient lighting and appliances[9] to Duquesne Light's residential customers, which are paid directly to manufacturers. Customers purchase discounted products at participating retailers without having to complete rebate applications. This program eliminates the burden of customers filling out rebate applications, leading to reduced program participation barriers for customers. RUIP fosters a partnership among the CSP, manufacturers, and retailers through the CSP's delivery team that supports retailers and manufacturers throughout the product promotion and rebate processing journey. The CSP for this program is CLEAResult.

For RUIP, participation cannot be accurately collected due to the nature of the program and therefore is not counted. Guidehouse used guidance listed in the applicable Pennsylvania TRM sections for a census of projects implemented during PY14.

3.3.1 Participation and Reported Savings by Customer Segment

Table 3-12 presents the participation counts, reported energy and demand savings, and incentive payments for RUIP in PY14 by customer segment.

Table 3-12: Residential Upstream Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY14 # Participants	N/A	N/A
PYRTD MWh/yr	2,936	2,936
PYRTD MW/yr	0.41	0.41
PY14 Incentives ($1,000)	$470	$470

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

In PY14, Guidehouse conducted a gross impact evaluation of RUIP. The evaluation included a tracking database review and recalculation of savings for a census of participants to verify that data was transferred correctly between the CSP's database and Duquesne Light's data. This was completed for both Upstream Lighting and Upstream Appliance components. Table 3-13 presents the gross impact results for energy, and Table 3-14 presents the gross impact results for demand.

[9] Non-lighting upstream measures may include heat pump water heaters, ENERGY STAR dehumidifiers, advanced power strips, and ENERGY STAR room air conditioners.

Table 3-13: Residential Upstream Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Appliances	1,132	138%	-	0%
LEDs	1,804	100%	-	0%
Program Total	**2,936**	**115%**		**0%**

Source: Guidehouse analysis

Table 3-14: Residential Upstream Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Appliances	0.21	156%	-	0%
LEDs	0.20	100%	-	0%
Program Total	**0.41**	**129%**		**0%**

Source: Guidehouse analysis

3.3.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse conducted a net impact evaluation for RUIP in PY14. Guidehouse estimated NTG factors for RUIP based on results from phone interviews of participating manufacturers. In total, seven manufacturers completed the battery of NTG questions. Two of the manufacturers answered the NTG questions for both lighting and non-lighting measures, and five answered for just lighting measures. Table 3-15 shows the free ridership, spillover, and NTG ratio applied to RUIP projects based on the net impact evaluation. Please refer to Appendix F for the free ridership evaluation methodology used for this program and to Section 3.3.5 for sample design.

Table 3-15. Residential Upstream Net Impact Evaluation Results

Stratum	Free Ridership	Spillover	NTG Ratio	Relative Precision at 85% CL
RUIP Lighting	43%	0%	57%	17%
RUIP Non-Lighting	25%	0%	75%	5%
Program Total	**38%**	**0%**	**62%**	**10%**

Source: Guidehouse analysis

3.3.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY14. The team reviewed the PY14 residential program activities and identified ENERGY STAR lighting fixtures

and Reflector Lamps as HIMs. Table 3-16 presents estimated free ridership, spillover, and NTG ratios for these HIMs for the RUIP program.

Table 3-16. PY14 Residential Upstream High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
Residential Upstream	ENERGY STAR Lighting Fixtures	49%	0%	51%
	Reflector Lamps	32%	0%	68%

Source: Guidehouse analysis

3.3.4 Verified Savings Estimates

In Table 3-17, 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 RUIP in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-17: Residential Upstream PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,936	0.41
PYVTD Gross	3,378	0.53
PYVTD Net	2,207	0.36
RTD	4,163	0.61
VTD Gross	4,883	0.81
VTD Net	3,224	0.58

Source: Guidehouse analysis

3.3.5 Process Evaluation

Guidehouse completed a process evaluation for RUIP in PY14. As part of this evaluation, the team interviewed participating manufacturer representatives to obtain feedback about their experience and satisfaction with the program processes and opportunities for program improvement. Guidehouse also asked a battery of NTG questions. The team also conducted interviews with program managers and the CSPs, which aided the development of the interview questions. The following sections discuss the approach, results, and findings for each evaluation activity.

3.3.5.1 Manufacturer Interview Methodology

Guidehouse attempted a census of all 18 manufacturer representatives who participated in RUIP in PY14 for whom contact information was available. The evaluation team obtained these contacts from the CSP and reached out to participants via email up to five times each to schedule phone interviews. After exhausting the available outreach attempts, Guidehouse was able to complete seven interviews—five with manufacturers that produced only lighting measures and two that produced both lighting and non-lighting measures in PY14. Table 3-18 provides an overview of the sample design and the completed interviews.

Table 3-18: PY14 Residential Upstream Participating Manufacturer Interview Sample Design*

Component	Population Count	Evaluation Method	Targeted Sample Interviews	Completed Interviews	Response Rate
Lighting	15	Phone Interview	Census attempt (14)	7	47%
Non-Lighting	5	Phone Interview		2	40%
Total	**18**		**14**	**7**	**39%**

**The population is representative of unique manufacturers who participated in the program in PY14. Some participating manufacturers produced both lighting and non-lighting measures and are counted twice in this table. Only seven total manufacturer interviews were conducted, with two of them producing both lighting and non-lighting measures in PY14 and are counted in both the lighting and non-lighting rows. This population counting methodology differs from the gross impact evaluation methodology described in Section 2.4 that was used to arrive at a population.*

Source: Guidehouse analysis

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

- Program awareness
- Program satisfaction
- Program marketing and signage

3.3.5.2 Manufacturer Interview Findings

The following sections detail the findings from these interviews for each research area.

Program Awareness

Manufacturers learned about RUIP through different sources depending on when they joined the program. Half of the interviewed manufacturers either recall learning about the program through previous work with Duquesne Light or have participated in the program for a very long time and they do not recall the initial source of awareness. The other half of interviewed manufacturers joined the program in Phase IV and reported learning about this program through the CSP or Duquesne Light. The CSP utilized their channel delivery team's existing relationships to recruit manufacturers to the program based on the products that the CSP already knew were manufactured by these companies.

Program Satisfaction

Overall, the interviewed manufacturers reported very high satisfaction with the program, rating it on average 9.4 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied. There were only two manufacturers who scored the program lower than 10. One manufacturer who scored the program as a 7 reported that they would have scored the program a 10 if the incentives were higher based on feedback they received from their stores. Another manufacturer who scored the program as an 8 reported that they would have scored the program as a 10 if it was not for slow responses and delays in communication with program contacts.

Although there was no reported impact on program satisfaction, the lighting manufacturers expressed concerns and confusion about the future measure offerings that will be available through this program. Since the number of lighting measures that will qualify will be greatly reduced starting in PY15, the five interviewees who only manufacture lighting measures were uncertain whether there were opportunities for them to continue to participate in the program.

Program Marketing and Signage

During program manager interviews, Duquesne Light was concerned that marketing point-of-purchase (POP) materials used to advertise the program were not displayed when field auditors visited participating retailer locations. When Guidehouse inquired about the POP materials provided to retailers for the program, a majority of the manufacturers believed it was the CSP's responsibility to set up and monitor the POP materials at participating retail locations. Two manufacturers were uncertain if displaying these materials was a contractual requirement for the retailers. Only one interviewee reported to have their own field representatives that monitor whether the marketing materials are displayed. This finding indicates that not all manufacturers are aware of the need to communicate to retailers the importance of displaying POP marketing materials, which is likely contributing to the missing POP marketing materials reported by Duquesne Light's program managers.

Additionally, one manufacturer noted that utility-specific program signage is not part of the layout plan that stores receive from their corporate offices when products are moved in the store. If store managers are not provided instructions on where to move the RUIP signage, these marketing materials may be thrown out. This reasoning could also be a plausible explanation as to why POP materials have been reported as missing when Duquesne Light's field auditors visited participating retail locations. This manufacturer noted it is challenging to include third-party marketing regionally in the corporate layout plan, but they are hoping to provide general marketing materials that can be used in the future and potentially incorporated in their layout plans.

3.3.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-19. TRC benefits in Table 3-19 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-19: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 766		$ 1,344	
2	Rebates to Participants and Trade Allies	$ -		$ 178	
3	Upstream/Midstream Incentives	$ 470		$ 440	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 296		$ 726	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 5

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
8	Administration and Management	$ 40	$ 47	$ 64	$ 44
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 777	$ -	$ 1,071
11	EDC Evaluation Costs	$ 26		$ 31	
12	SWE Audit Costs	$ 3		$ 19	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 893		$ 1,241	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,659		$ 2,585	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,246		$ 1,858	
16	Total NPV Lifetime Electric Capacity Benefits	$ 489		$ 776	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (176)		$ (261)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,558		$ 2,374	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.94		0.92	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-20 presents program financials and cost-effectiveness on a net savings basis.

Table 3-20: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 501		$ 878	
2	Rebates to Participants and Trade Allies	$ -		$ 116	
3	Upstream/Midstream Incentives	$ 307		$ 287	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 126		$ 310	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 5
8	Administration and Management	$ 40	$ 47	$ 64	$ 44
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 777	$ -	$ 1,071
11	EDC Evaluation Costs	$ 26		$ 31	
12	SWE Audit Costs	$ 3		$ 19	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 893	$ 1,241
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,394	$ 2,119
15	Total NPV Lifetime Electric Energy Benefits	$ 814	$ 1,214
16	Total NPV Lifetime Electric Capacity Benefits	$ 319	$ 507
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ (115)	$ (170)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,018	$ 1,551
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.73	0.73

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.3.7 Status of Recommendations

The impact evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-21 presents a summary of the findings with a response from Duquesne Light and their plans to address the recommendation in program delivery.

Table 3-21. Residential Upstream Incentives Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Duquesne Light's tracking data (PMRS) is claiming Tier 1 and Tier 2 Smart Strip demand savings for "home office" in 164 instances instead of "unknown location". All smart strips are claiming energy savings for "Unknown Location", including the aforementioned 164 instances with the demand discrepancy. This discrepancy increased verified demand savings resulting in a corrected realization rate greater than 1.0.	• Per the PA TRM, Duquesne Light should use "Unknown Location" for both energy and demand savings for all Smart Strips in the Upstream program.
Duquesne Light Response: Duquesne Light will ensure that all measures are matching the prescribed methodology in the TRM.	
Reported Savings	
• The CSP was using an erroneous UEF calculation from the TRM for 80 gallon Heat Pump Water Heaters that was identified and an IMP issued to correct it. This caused a reduction in verified savings.	• Duquesne Light should ensure that the CSP is using the most up-to-date IMP for calculating savings.
Duquesne Light Response: Acknowledged.	
Reported Savings	

Findings	Recommendations
• There were multiple instances where the CSP used the incorrect lumen and wattages for the corresponding ENERGY STAR ID in the tracking data. This caused a discrepancy in verified savings vs. reported savings, but was not large enough to affect the total realization rate.	• The CSP should ensure that inputs align with the corresponding ENERGY STAR ID.
Duquesne Light Response: Acknowledged.	
Program Awareness and Marketing	
• Program managers reported that program auditors visit participating retail locations to check whether program-eligible products are available for purchase and whether POP marketing materials are displayed to increase customers' awareness of discounted products by Duquesne Light. Program managers became aware of a number of missing POP materials at participating locations via these audits. • Majority of the seven manufacturers interviewed believed it was CSP's responsibility to set up and monitor the POP marketing materials at participating retail locations. Two manufacturers were uncertain if displaying these materials was a contractual requirement for the retailers. Only one interviewee reported having their own field representatives monitor whether the POP materials are displayed.	• Duquesne Light should consider including in the annual contract with the manufacturers a requirement that POP marketing materials are displayed for all program-discounted products. • Duquesne Light should consider establishing a direct working relationship with retail store managers to communicate to participating retailers a requirement for displaying POP marketing materials for program eligible products. • Duquesne Light should consider redefining the auditors' role to be focused on program implementation and assistance to develop working relationships with retail store managers to increase awareness of the program, communicate requirements to display the POP marketing materials, and understand any product stocking and availability issues.
Duquesne Light Response: Duquesne Light will add a clause to the contract between the CSP and the manufacturers requiring that all program-discounted products are accompanied by POP marketing signage indicating that Duquesne Light is providing a discount for these products. Additionally, Duquesne Light will also consider establishing a working relationship with retail store managers via auditors who periodically visit the participating retail locations.	
Satisfaction	
• The interviewed manufacturers reported very high satisfaction with the program, rating it on average 9.4 on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied.	• No recommendations.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

3.4 Residential Appliance Recycling

The Residential Appliance Recycling Program (RARP) helps customers become more energy efficient by educating them about the amount of energy consumed by and the costs associated with operating inefficient refrigerators, freezers, dehumidifiers, and room air conditioners. It then provides access to a no-cost service that removes and recycles the operational but inefficient appliance. Customer motivation is enhanced by providing a cash incentive for program participation. For RARP, participation is equal to the number of distinct measures in the program tracking data within a given program year.

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 RARP in PY14 by customer segment.

Table 3-22: Appliance Recycling Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY14 # Participants	3,339	3,339
PYRTD MWh/yr	2,014	2,014
PYRTD MW/yr	0.49	0.49
PY14 Incentives ($1,000)	$163	$163

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a gross impact evaluation for RARP in PY14 and applied the historic realization rates from PY13 for the different stratum. Table 3-23 shows the reported energy savings in PY14, and Table 3-24 shows the reported demand savings in PY14.

Table 3-23: Appliance Recycling Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Freezers	268	95%	0.68	27%
Other	211	100%	-	0%
Refrigerators	1,535	117%	0.39	8%
Program Total	**2,014**	**112%**		**7%**

Source: Guidehouse analysis

Table 3-24: Appliance Recycling Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Freezers	0.05	95%	0.68	27%
Other	0.18	100%	-	0%
Refrigerators	0.27	117%	0.39	8%
Program Total	**0.49**	**109%**		**5%**

Source: Guidehouse analysis

3.4.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for RARP in PY14. Guidehouse will complete an NTG evaluation in PY15 for this program. Table2-4 shows the NTG ratio applied to RARP projects, which was caried over from the PY13 NTG evaluation.

3.4.3.1 HIM Research

Guidehouse did not conduct HIM research for RARP in PY14.

3.4.4 Verified Savings Estimates

In Table 3-25, the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings for RARP in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-25: Appliance Recycling PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,014	0.49
PYVTD Gross	2,262	0.54
PYVTD Net	1,056	0.25
RTD	2,361	0.56
VTD Gross	2,653	0.61
VTD Net	1,239	0.28

Source: *Guidehouse analysis*

3.4.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RARP in PY14 and plans to complete it in PY15.

3.4.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-26. TRC benefits in Table 3-26 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-26: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 164		$ 156	
2	Rebates to Participants and Trade Allies	$ 163		$ 182	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 1		$ (27)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 5	$ 3
8	Administration and Management	$ 40	$ 33	$ 64	$ 31
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 542	$ -	$ 1,256
11	EDC Evaluation Costs	$ 19		$ 23	
12	SWE Audit Costs	$ 2		$ 13	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 636		$ 1,395	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 800		$ 1,551	
15	Total NPV Lifetime Electric Energy Benefits	$ 316		$ 351	
16	Total NPV Lifetime Electric Capacity Benefits	$ 196		$ 213	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 512		$ 564	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.64		0.36	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-27 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY14 comes from the PY11 NTG evaluation conducted in Phase III.

Table 3-27: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 76		$ 73	
2	Rebates to Participants and Trade Allies	$ 76		$ 85	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 0		$ (13)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 5	$ 3
8	Administration and Management	$ 40	$ 33	$ 64	$ 31
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 542	$ -	$ 1,256
11	EDC Evaluation Costs	$ 19		$ 23	
12	SWE Audit Costs	$ 2		$ 13	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 636		$ 1,395	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 712		$ 1,468	
15	Total NPV Lifetime Electric Energy Benefits	$ 148		$ 164	
16	Total NPV Lifetime Electric Capacity Benefits	$ 92		$ 99	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 239		$ 263	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.34		0.18	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.4.7 Status of Recommendations

There were no impact- or process-related findings for this program in PY14.

3.5 Residential Low Income Energy Efficiency

The Residential LI Energy Efficiency Program (LIEEP) is a direct-install program that includes walkthrough and comprehensive audits, provides energy efficiency education, and installs energy efficient products and equipment at no cost to the participant. Additionally, the program mailed out energy efficient kits to prospective participants and distributed a number of giveaway measures at local events. The program provides these services to residential households at or below 150% of the federal poverty income guidelines who reside in single-family or multifamily housing.

Under LIEEP, income-qualified residential customers will be scheduled for a virtual assessment or in-home energy audit that will include direct-install measures and energy education. For the virtual assessment, the direct-install measures will be drop-shipped to the customer in the form of a customized energy efficiency kit and customers may be referred for installation of eligible HVAC, water heat, health and safety, and insulation or air sealing measures. Participation for this program is equal to the number of distinct account numbers in the tracking data within a given program year.

Multifamily facilities are eligible for cost-share common area lighting and management-owned appliance recycling or replacement measures. The upgrade cost-share and savings are based on the percentage of LI occupants dwelling in the multifamily facility.

3.5.1 Participation and Reported Savings by Customer Segment

Table 3-28 presents the participation counts, reported energy and demand savings, and incentive payments for LIEEP in PY14 by customer segment.

Table 3-28: Low Income Energy Efficiency Participation and Reported Impacts

Parameter	Residential LI	Total
PY14 # Participants	13,227	13,227
PYRTD MWh/yr	2,605	2,605
PYRTD MW/yr	0.25	0.25
PY14 Incentives ($1,000)	$1,458	$1,458

Source: Guidehouse analysis

3.5.2 Gross Impact Evaluation

In PY14, Guidehouse conducted an impact evaluation of the Kits, Event Giveaway, and Audit components of LIEEP. For the Kits and Event Giveaway components, Guidehouse did a tracking database review and recalculation of savings. For the Audit component, Guidehouse did an online survey for a sample of participating customers. Table 3-29 shows the reported energy savings in PY14, and Table 3-30 shows the reported demand savings in PY14.

Table 3-29: Low Income Energy Efficiency Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audit – Aerators	131	100%	0.01	0%
Audit – Appliances	0	100%	-	-
Audit – LEDs	771	96%	0.24	2%
Audit – Night Lights	563	94%	0.23	4%
Audit – Smart Strips	661	95%	0.18	4%
Giveaways	35	100%	-	0%
Kits	70	99%	-	0%
Appliance Recycling	372	103%	0.01	0%
Program Total	**2,605**	**97%**		**-**

Source: Guidehouse analysis

Table 3-30: Low Income Energy Efficiency Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audit – Aerators	0.02	100%	0.00	0%
Audit – Appliances	0.00	100%	-	-
Audit – LEDs	0.09	96%	0.22	2%
Audit – Night Lights	-	-	-	-
Audit – Smart Strips	0.07	95%	0.18	4%
Giveaways	0.00	100%	-	0%
Kits	0.01	100%	-	0%
Appliance Recycling	0.06	103%	0.01	0%
Program Total	**0.25**	**98%**		**-**

Source: Guidehouse analysis

3.5.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for Residential LIEEP in PY14. Guidehouse does not plan to conduct an NTG assessment during Phase IV for the LIEEP. Per SWE's Phase IV Evaluation Framework Section 3.4 guidance, Guidehouse will assume and assign an NTG ratio of 1.0 for LI programs because free ridership and spillover are not anticipated among LI participants due to income constraints.

3.5.3.1 HIM Research

Guidehouse did not conduct HIM research for LIEEP in PY14.

3.5.4 Verified Savings Estimates

In Table 3-31, 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 PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-31: Low Income Energy Efficiency PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,605	0.25
PYVTD Gross	2,519	0.24
PYVTD Net	2,519	0.24
RTD	5,139	0.52
VTD Gross	4,698	0.48
VTD Net	4,698	0.48

Source: Guidehouse analysis

3.5.5 Process Evaluation

Guidehouse completed a process evaluation for LIEEP in PY14. The evaluation team interviewed the Duquesne Light program manager and program implementer to gather insights and feedback on program implementation to aid in developing the online participant surveys. The evaluation team fielded two surveys to LIEEP participants to gather feedback about customer experience, satisfaction, marketing, program barriers, and opportunities for program improvement. Although both online surveys covered the same process topics, they were fielded as two surveys to gather feedback from customers who received a no-cost energy efficiency kit separately from those who received an audit and direct-install measures. The results and findings of these two surveys are discussed separately in the sections below.

3.5.5.1 Participant Survey Methodology

The participant survey focused on customers who participated in LIEEP in PY14 by receiving a no-cost audit and direct-install measures and/or an energy efficiency kit. Guidehouse stratified by which component of the program the customer participated. The audit component included customers who received an audit, which included direct-install measures and may or may not have also received a kit. The kit component included customers who received only a kit but did not receive an audit. Table 3-32 shows the population count of PY14 LIEEP program participants, survey method, sample targets, and completed surveys.

Table 3-32: PY14 Low Income Energy Efficiency Participant Survey Sample Design

Component	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
Audit participants	5,070	Online survey	46	79	6%
Kit recipients	2,800	Online survey	46	148	12%
Total	**7,870**		**92**	**227**	**9%**

Source: Guidehouse analysis

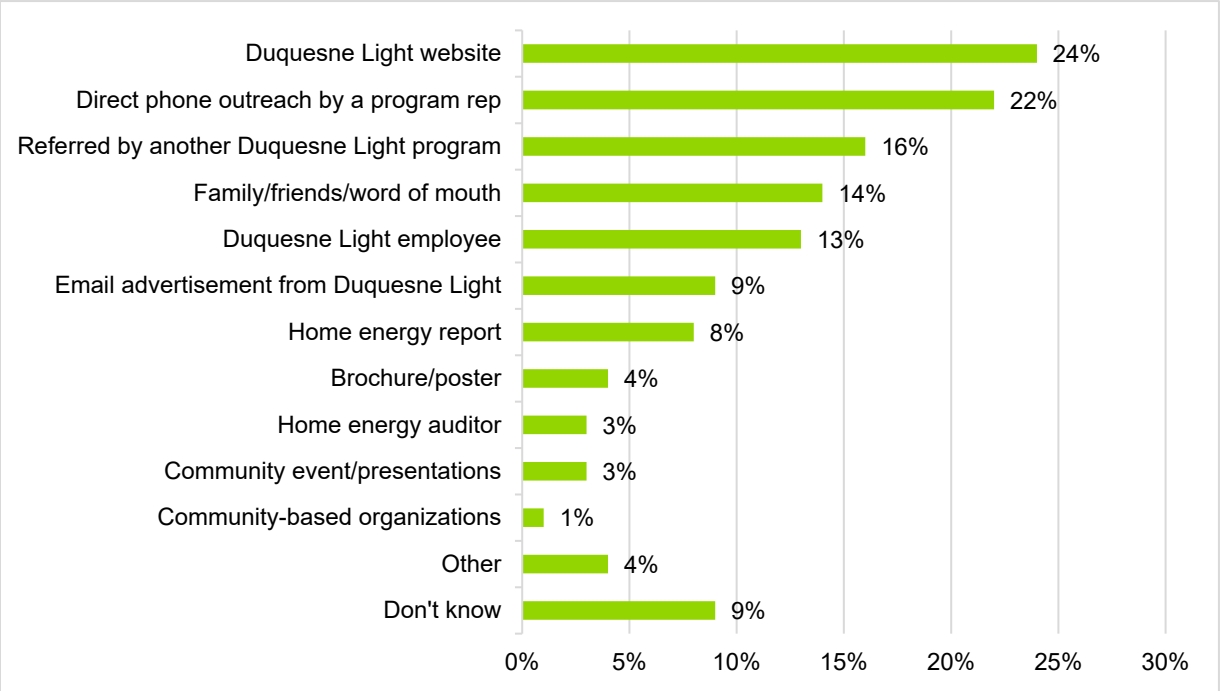
3.5.5.2 Audit Participant Survey Findings

The following sections present the findings collected via the audit participant survey for participants' experience with the program, program satisfaction, marketing, program barriers, and opportunities for program improvement.

Program Awareness and Marketing

Guidehouse asked participants to identify how they learned about LIEEP. As Figure 3-1 shows, respondents indicated the most common sources of program awareness are the Duquesne Light website (24%), direct phone outreach by a program representative (22%) and "referred by another Duquesne Light program" (16%). Family and friends also played a major role in making customers aware of the LI program (14%), along with Duquesne Light employees (13%). Email advertisements and home energy reports (HERs) did not play as significant of a role as the aforementioned sources, but they were able to bring in a few participants, 9% and 8%, respectively. The three participants (4%) who selected "other" reported that they became aware of the program through mailings or through their health insurance company. Notably, there were few respondents who heard about the program through their home energy auditor (3%), community events/presentation (3%), and community-based organizations (1%). These results show that the program successfully utilized a variety of marketing and outreach methods along with significant cross-promotion opportunities via other programs, which resulted in successful recruitment into the program.

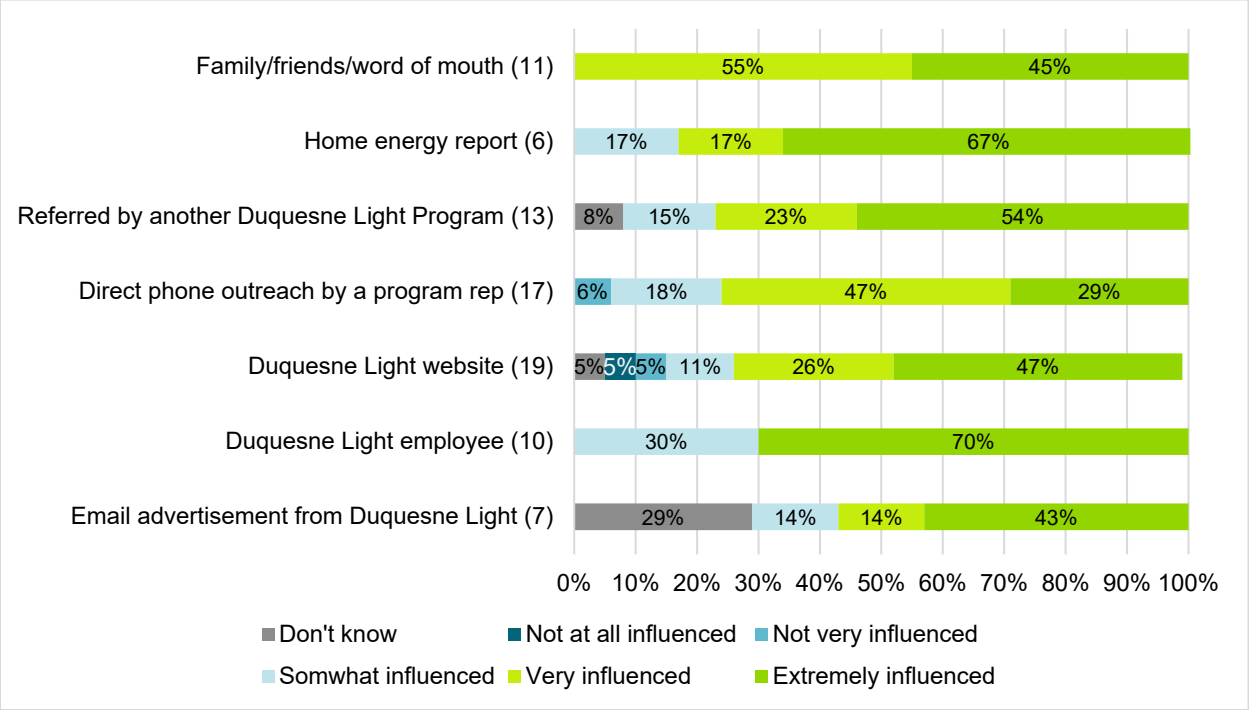
Figure 3-1: How did you learn about the program?
(n = 79; multiple options allowed)



Source: Guidehouse analysis

Additionally, Guidehouse inquired about how influential each source of program awareness was on their decision to participate in the program. Figure 3-2 shows customers reported that family/friends/word of mouth had the greatest influence on their decision to participate, and all participants who selected this awareness option reported being very or extremely influenced. This indicates the program has built strong roots with the community by successfully marketing and implementing the program such that customers are now recommending the program to their network. This sets up the program for success in this and future years. HERs (84%), referral by other programs (77%), phone outreach (76%), the program website (73%), and Duquesne Light's employees (70%) also had strong influence on participation with the large majority of survey respondents reporting being very or extremely influenced by these methods. The weakest sources of awareness were email advertisements, however, they still managed to strongly influence more than half of survey respondents who learned about the program via this method. These results indicate that an outreach approach that relies on a variety of direct outreach, online and in-person marketing methods will be successful in generating significant savings for the program.

Figure 3-2: To what extent was your decision to participate in this Duquesne Light Program influenced by the following?
(multiple options allowed)*

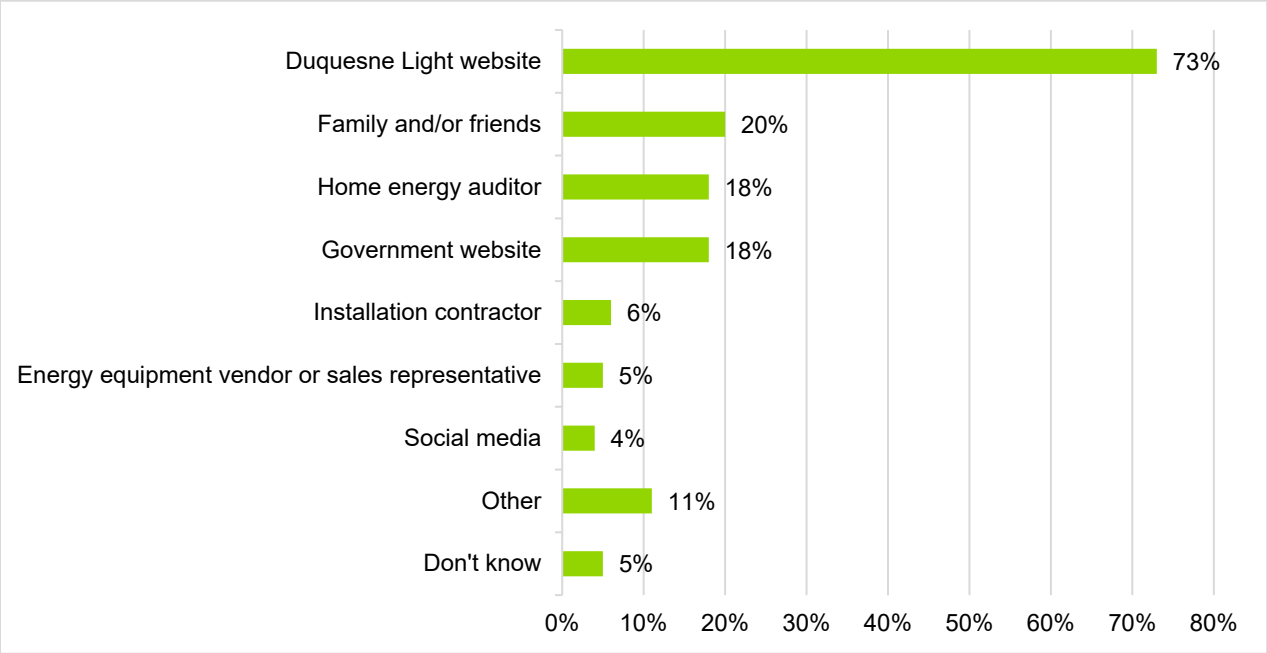


**The number in parenthesis indicates the number of survey respondents who selected each option; the figure only includes response options with five or more responses.*

Source: Guidehouse analysis

When asked where program participants would typically look for additional information about ways to save energy, 73% of participants selected the Duquesne Light website, followed by family and/or friends (20%), home energy auditor (18%), and government website (18%), as shown in Figure 3-3. Based on these findings, the Duquesne Light website will continue to be one of the most valuable tools for increasing awareness of energy conservation and program options to LI customers. Additionally, although home energy auditors are one of the top three sources that customers would go to for additional information on energy efficiency, few customers reported learning about this program through an auditor (3%, Figure 3-1).

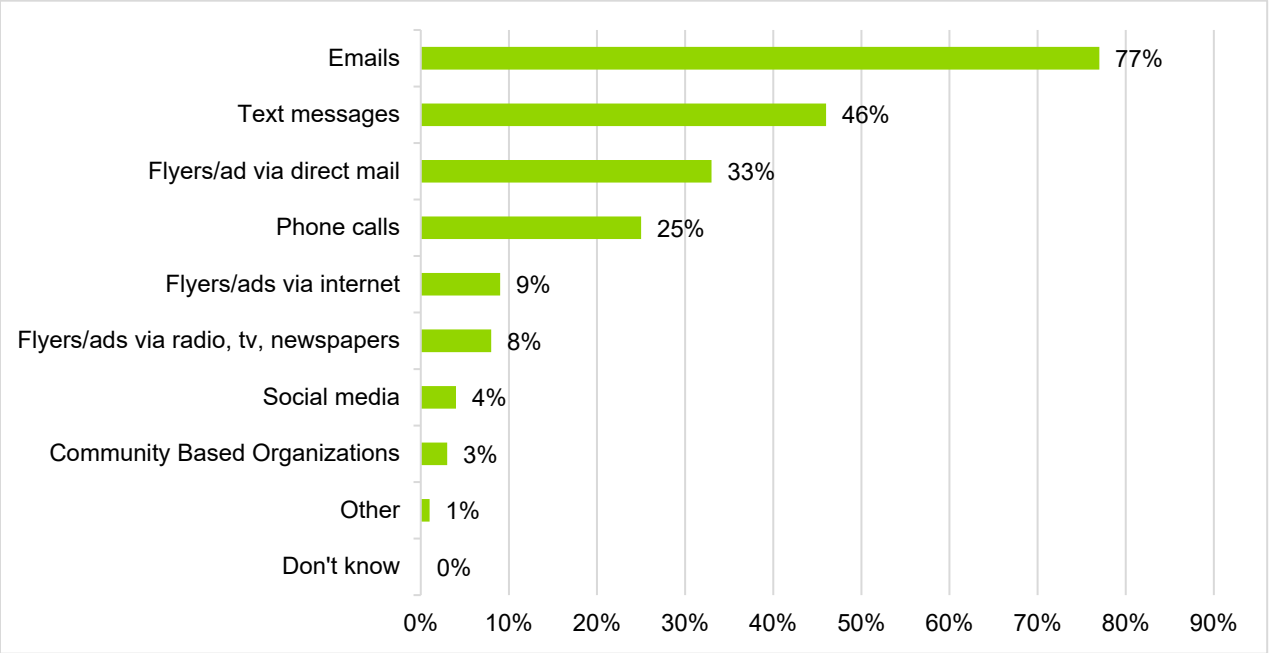
Figure 3-3: If you wanted additional information about ways to save energy, where would you typically look for this information?
(n = 79; multiple options allowed)



Source: Guidehouse analysis

Guidehouse also inquired how program participants prefer to be contacted by Duquesne Light to learn about EE programs. Most participants said they preferred emails (77%), followed by text messages (46%), and direct mail flyers/ads (33%), as shown in Figure 3-4. Given that only 9% of customers reported learning about the program via email (Figure 3-1), these findings indicate that email outreach may be currently underutilized for this program and is a low-cost method of communication to which participants could be receptive.

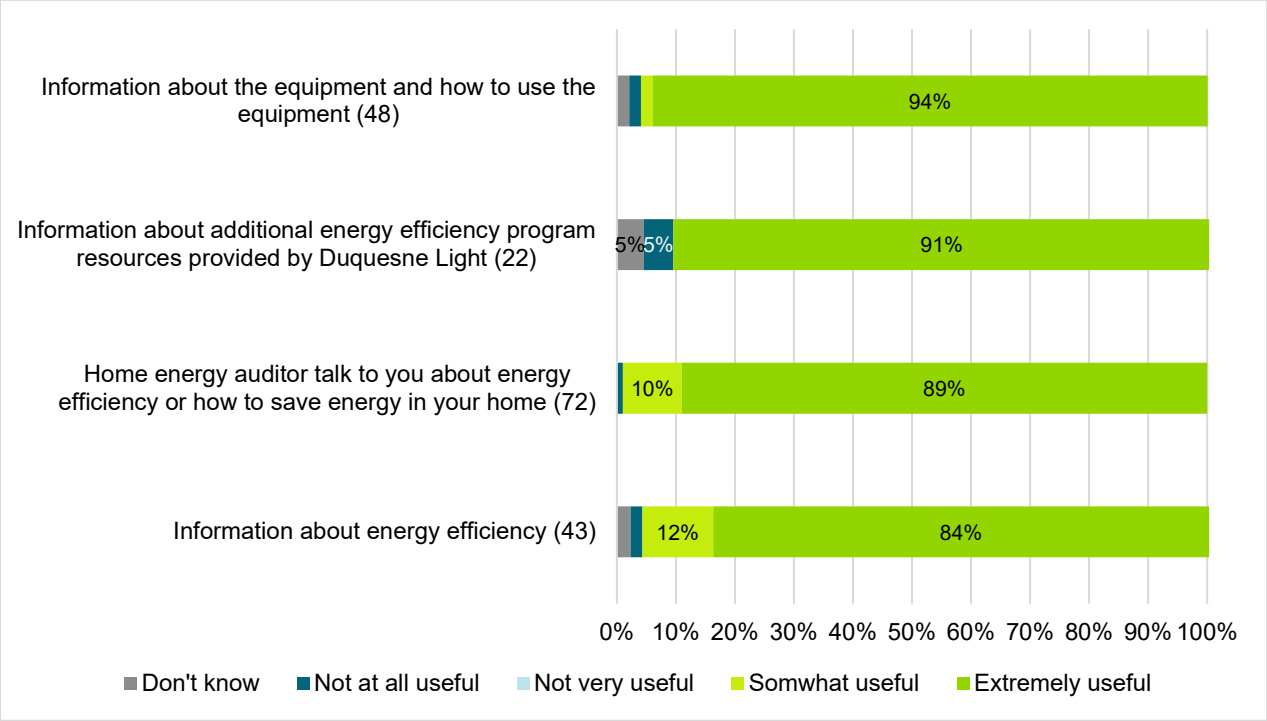
Figure 3-4: How do you prefer Duquesne Light reach out to you to provide information about their programs?
(n = 79; multiple options allowed)



Source: Guidehouse analysis

Guidehouse also asked participants about whether their home energy auditor provided them with any printed resources during their visit. Most respondents (91%) recall their auditor talking to them about energy efficiency or how to save energy in their home, and 84% of survey respondents recall receiving some type of printed information from their auditor. Those participants were then asked how useful this information was to them. As Figure 3-5 shows, most participants found this information to be useful with 99% of participants reporting that the verbal information from the auditor about their energy efficiency and how to save energy in your home was either somewhat or extremely useful. Similarly, most participants found the printed information provided by the auditors to be useful including information about the equipment (96%), information about how to save energy in your home (96%), and information about additional energy efficiency program resources provided by Duquesne Light (91%).

Figure 3-5: How useful was the information provided by auditors to you?
(multiple options allowed)*



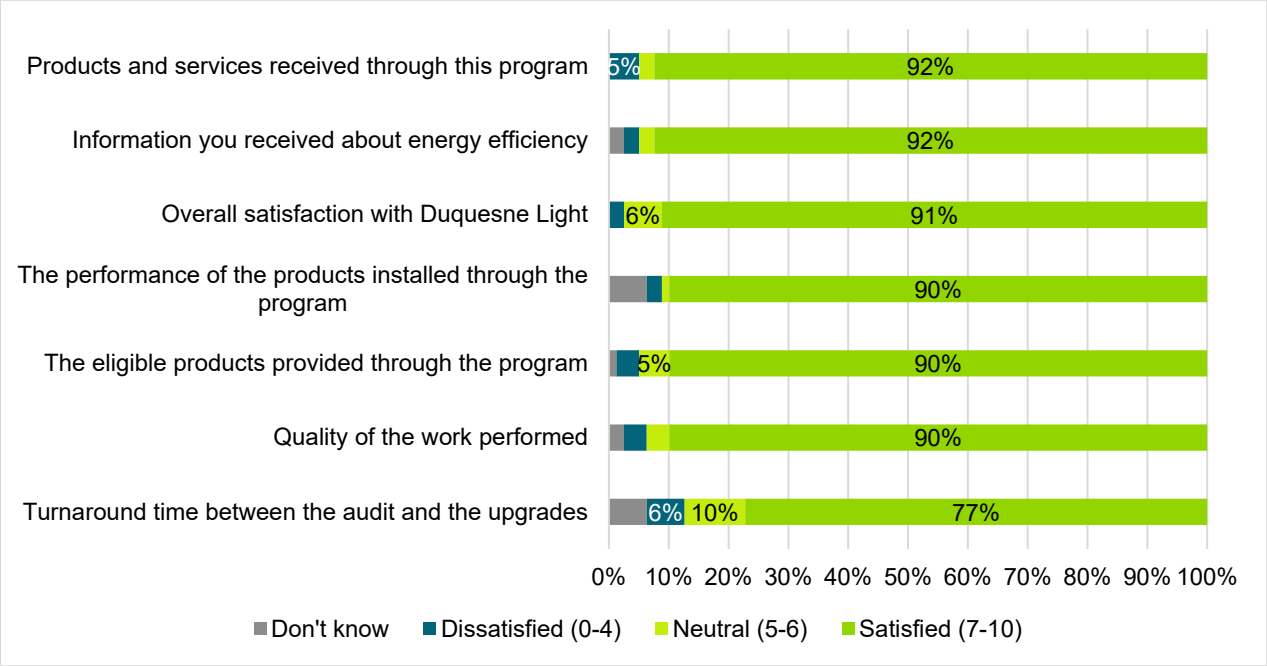
**The number in parenthesis indicates the number of survey respondents who selected each option; the figure only includes response options with five or more responses.*

Source: Guidehouse analysis

Satisfaction

Guidehouse asked participants about their satisfaction with Duquesne Light and the LIEEP audit program components. Most participants rated each of the program components 7 or higher on a scale from 0-10, where 0 means not at all satisfied and 10 means very satisfied. Most participants (92%) rated the products and services received through the program 7 or higher. Participants also provided high ratings for information received about energy efficiency (92%) and Duquesne Light as a company (91%). Turnaround time between the audit and the upgrades provided by the program had comparatively the lowest satisfaction with 77% reporting satisfaction of 7 or higher. Figure 3-6 shows the results of customer satisfaction with the program.

Figure 3-6: Please rate your satisfaction with each of the following elements.
(n=79)

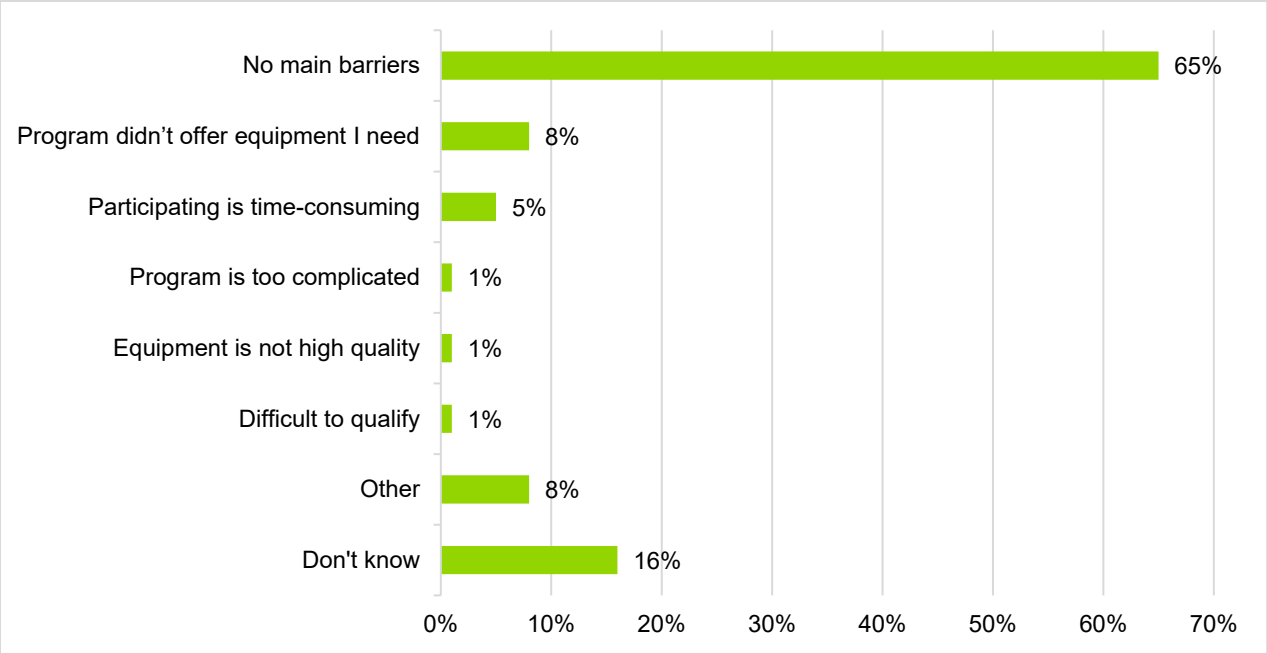


Source: Guidehouse analysis

Program Barriers

Guidehouse asked participants about program barriers and challenges associated with program participation. As Figure 3-7 shows, most respondents (65%) reported no barriers to participating in this program. Among customers who reported on program barriers, 8% of respondents indicated that the program did not offer equipment they needed, and 5% of respondents believed participating was too time-consuming.

Figure 3-7: What do you see as the main barriers to participating in this program?
(n = 79; multiple options allowed)



Source: Guidehouse analysis

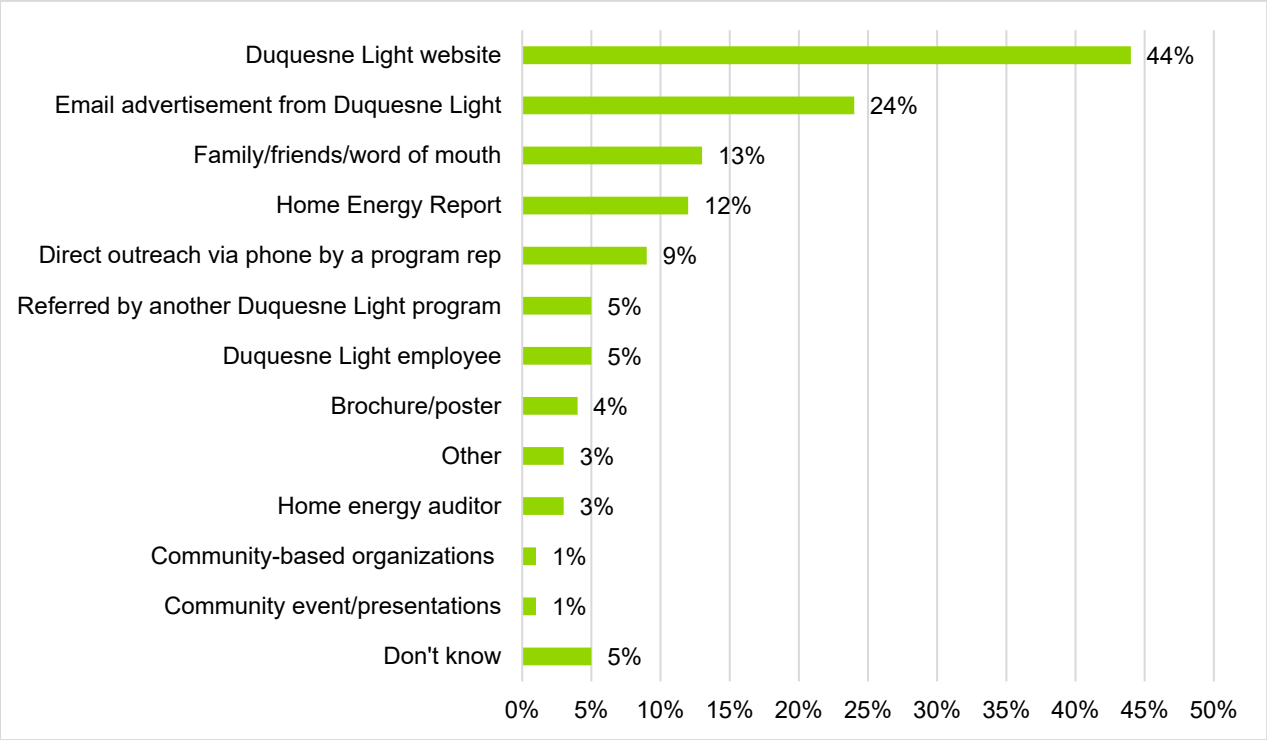
3.5.5.3 Kit Participant Survey Findings

The following sections present the findings collected via the kit participant survey for participants' experience with the program, program satisfaction, marketing, program barriers, and opportunities for program improvement.

Program Awareness and Marketing

Guidehouse asked participants to identify how they learned they could receive a no-cost energy efficiency kit. As Figure 3-8 shows, respondents indicated the most common sources of program awareness were the Duquesne Light website (44%), email advertisements from Duquesne Light (24%), friends and family (13%), and their HERs (12%). Direct outreach by a phone representative also played a role in making customers aware of the energy efficiency kits (9%). Referrals by another Duquesne Light program, Duquesne Light employees, and the program brochures did not play as significant role in program awareness, only bringing in between 4% and 5% of participants each. Notably, there were few respondents who heard about the program through their home energy auditor (3%), other sources (3%), community-based organizations (1%), and/or community events/presentations (1%). These results show that the program successfully utilized a variety of marketing and outreach methods, which resulted in successful recruitment into the program.

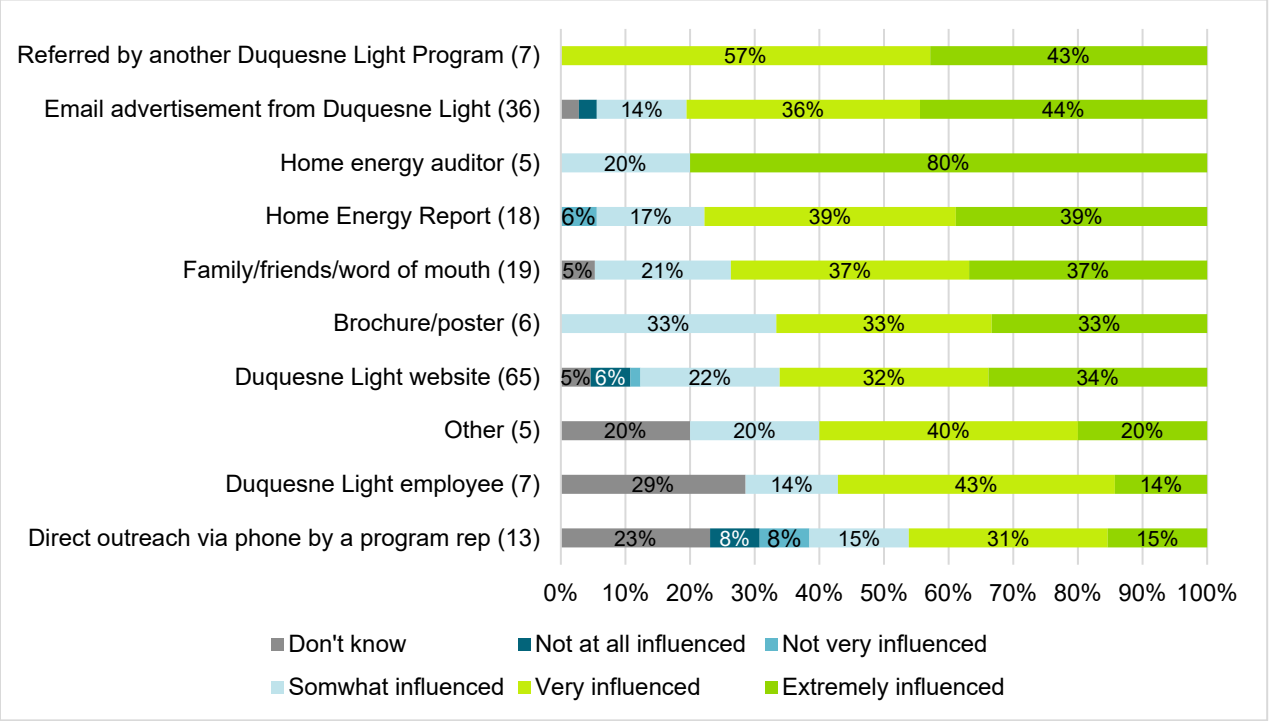
Figure 3-8: How did you learn that you could receive a no-cost energy efficiency kit?
(n = 148; multiple options allowed)



Source: Guidehouse analysis

Guidehouse also inquired about how influential each source of program awareness was on their decision to participate in the program. Figure 3-9 shows survey respondents reported that referrals by another Duquesne Light program had the greatest influence on their decision to participate, where all participants who selected this awareness option reported being very or extremely influenced. Email advertisements (80%), home energy auditors (80%), HER (78%), and friends and family (74%) also had strong influence on participation with the large majority of survey respondents reporting being very or extremely influenced by these methods. Brochures and the Duquesne Light website also have strong influence with 66% of respondents reporting being very or extremely influenced. Although Duquesne Light employees and direct outreach through program representatives have the lowest influence rating, many participants still reported being very or extremely influenced (57% and 46%, respectively).

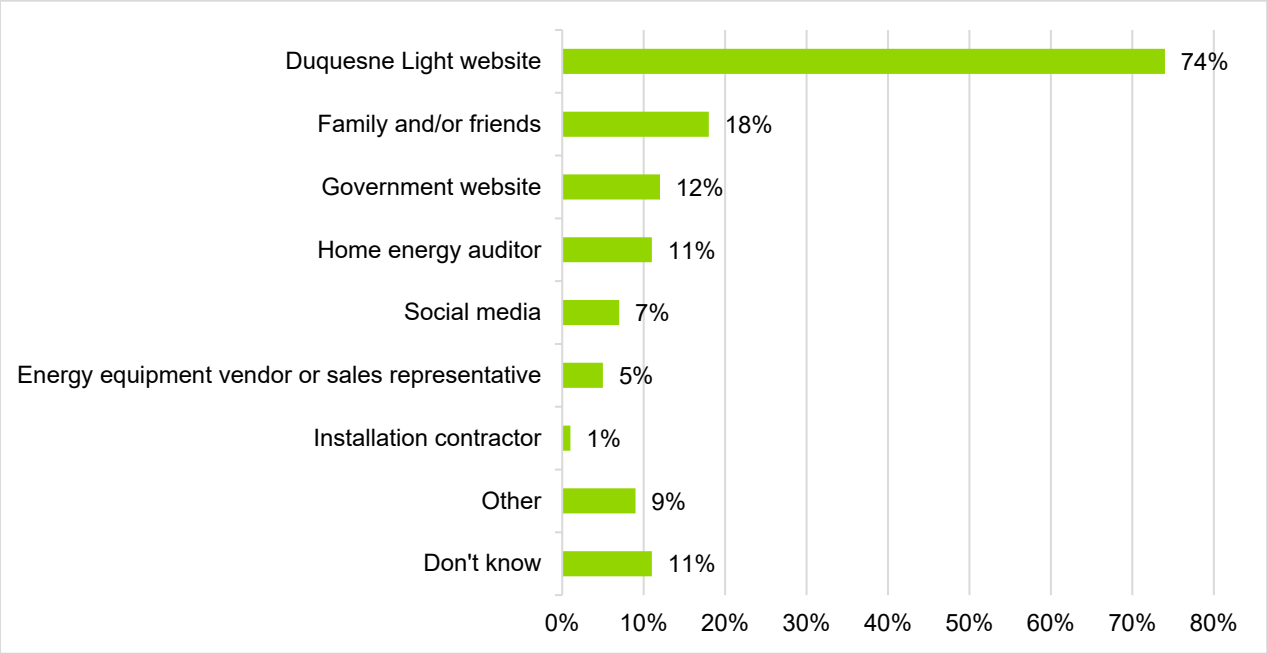
Figure 3-9: To what extent was your decision to participate in this Duquesne Light Program influenced by the following?
(multiple options allowed)*



**The number in parenthesis indicates the number of survey respondents who selected each option; the figure only includes response options with five or more responses.*
Source: Guidehouse analysis

When asked where program participants would typically look for additional information about ways to save energy, 74% of participants selected the Duquesne Light website, followed by family and/or friends (18%), government website (12%), and home energy auditor (11%), as shown in Figure 3-10. Based on these findings, the Duquesne Light website will continue to be one of the most valuable tools for increasing awareness of energy conservation and program options to LI customers. Additionally, although home energy auditors are one of the top four sources that customers would go to for additional information on energy efficiency, few customers reported learning about this program through an auditor (3%, Figure 3-8).

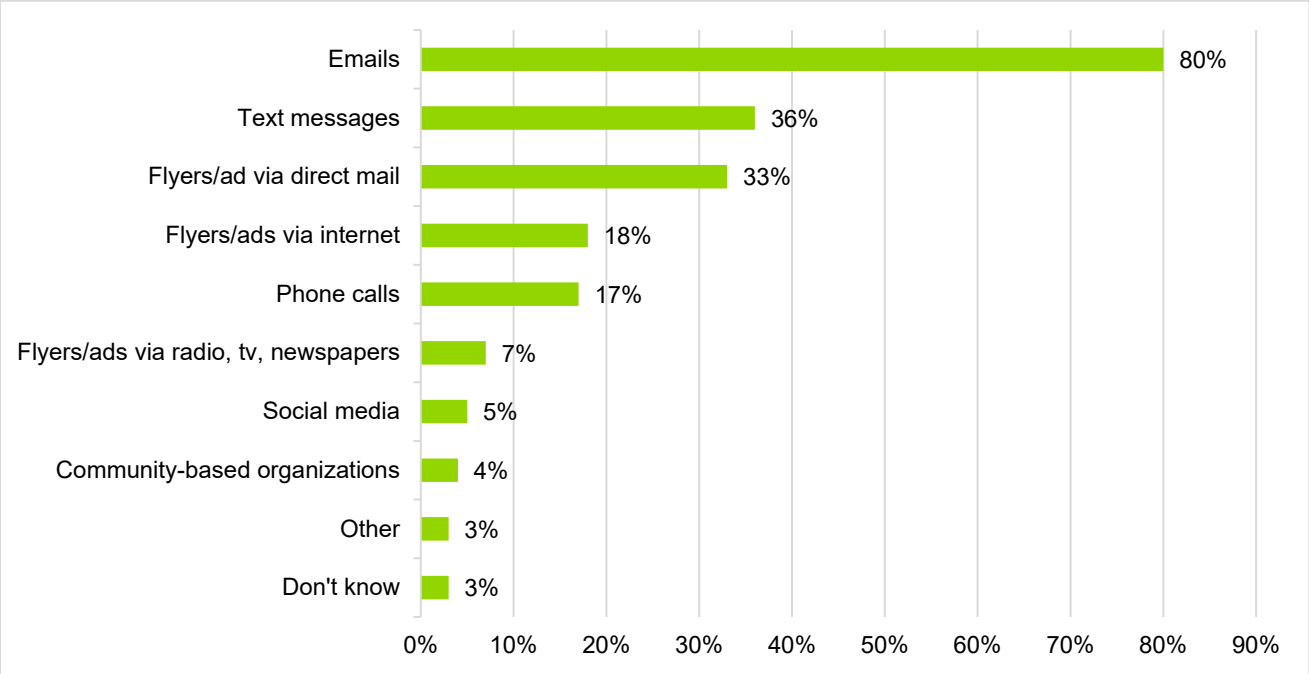
Figure 3-10: If you wanted additional information about ways to save energy, where would you typically look for this information?
(n = 148; multiple options allowed)



Source: Guidehouse analysis

Guidehouse also inquired how program participants prefer to be contacted by Duquesne Light to learn about EE programs. Most participants said they preferred emails (80%), followed by text messages (36%), and direct mail flyers/ads (33%), as shown in Figure 3-11. Flyers/ads via the internet and phone calls are also many customers preferred way of contact (18% and 17%, respectively).

Figure 3-11: How do you prefer Duquesne Light reach out to you to provide information about their programs?
(n = 148; multiple options allowed)

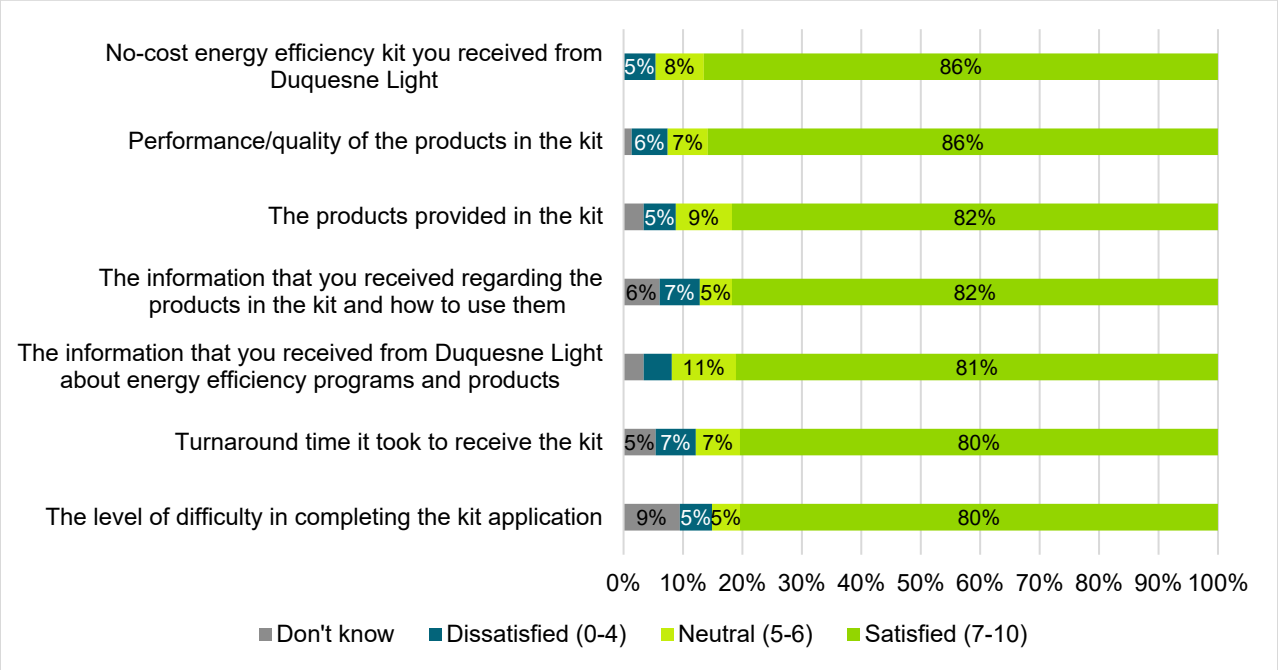


Source: Guidehouse analysis

Satisfaction

Guidehouse asked participants about their satisfaction with Duquesne Light and the no-cost energy efficiency kit component. Participants reported the highest satisfaction with Duquesne Light as a company, where 90% of survey respondents provided a score of 7 or higher on a scale from 0-10, where 0 means not at all satisfied and 10 means very satisfied. Participants also reported high satisfaction with the energy efficiency kits, where 86% of survey respondents gave the program component a score of 7 or higher. Participants provided high ratings for the performance/quality of the products in the kit (86%), the products provided in the kit (82%), and the information regarding the products in the kit and how to use them (82%). Turnaround time to receive a kit and the level of difficulty in completing the kit application had slightly lower satisfaction with 80% reporting satisfaction of 7 or higher. Figure 3-12 shows the results of customer satisfaction with the kit program component.

Figure 3-12: Please rate your satisfaction with each of the following elements.
(n = 148)

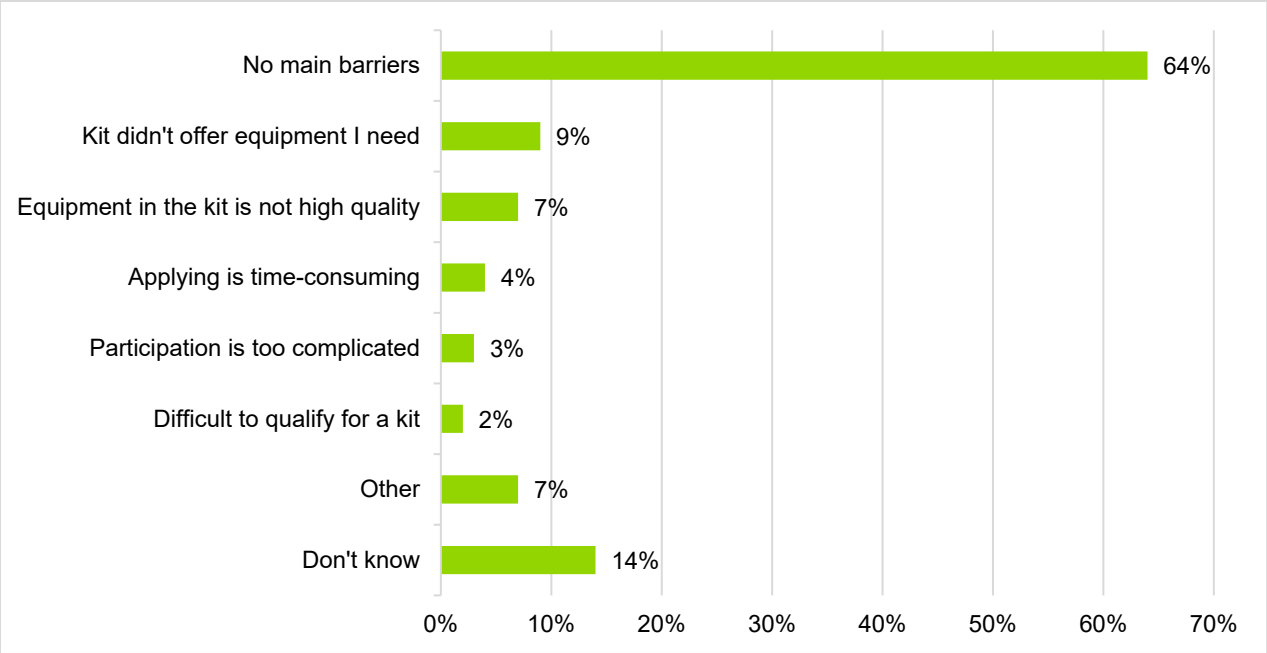


Source: Guidehouse analysis

Program Barriers

Guidehouse asked participants about program barriers and challenges associated with program participation. As Figure 3-13 shows, most respondents (64%) reported no barriers to participating in this program. Among customers who reported on program barriers, 9% of respondents indicated that the kit did not offer equipment they needed, and 7% mentioned the equipment not being high quality. Some participants reported the application being too time-consuming (4%), participation being too complicated (3%), and the kits being difficult to qualify for (2%). Several respondents (7%) reported “other” barriers such as delivery time being too long (2), application issues (1), and the program being difficult to find out about (1).

Figure 3-13: What do you see as the main barriers to participating in this program?
(n = 148; multiple options allowed)



Source: Guidehouse analysis

3.5.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-33. TRC benefits in Table 3-33 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-33: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 43		$ 40	
2	Rebates to Participants and Trade Allies	$ 302		$ 1,258	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 1,156		$ 1,081	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (1,415)		$ (2,299)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 32	$ 17
8	Administration and Management	$ 40	$ 187	$ 64	$ 175
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 121	$ -	$ 1,190
11	EDC Evaluation Costs	$ 105		$ 126	
12	SWE Audit Costs	$ 11		$ 72	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 464	$ 1,677
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 507	$ 1,717
15	Total NPV Lifetime Electric Energy Benefits	$ 483	$ 849
16	Total NPV Lifetime Electric Capacity Benefits	$ 119	$ 226
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ (64)	$ (98)
19	Total NPV Lifetime Water Impacts	$ 94	$ 176
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 631	$ 1,153
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.25	0.67

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-34 presents program financials and cost-effectiveness on a net savings basis. Per the SWE's guidance, NTGR for LI programs will be a deemed value of 1.0 due to the assumption that there is no free ridership or spillover due to cost constraints.

Table 3-34: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 43		$ 40	
2	Rebates to Participants and Trade Allies	$ 302		$ 1,258	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 1,156		$ 1,081	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (1,415)		$ (2,299)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 32	$ 17
8	Administration and Management	$ 40	$ 187	$ 64	$ 175
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 121	$ -	$ 1,190
11	EDC Evaluation Costs	$ 105		$ 126	
12	SWE Audit Costs	$ 11		$ 72	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 464		$ 1,677	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 507		$ 1,717	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
15	Total NPV Lifetime Electric Energy Benefits	$ 483	$ 849
16	Total NPV Lifetime Electric Capacity Benefits	$ 119	$ 226
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ (64)	$ (98)
19	Total NPV Lifetime Water Impacts	$ 94	$ 176
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 631	$ 1,153
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.25	0.67

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.5.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-35 provides a summary of audit component findings, along with Duquesne Light's plan to address the recommendation in program delivery.

Table 3-35. Low Income Energy Efficiency Audit Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Based on the inputs provided in the tracking data, it was discovered that the CSP for the LIEEP Audit component was underreporting savings for all Refrigerator Recycling and Replacement. This caused a slight increase in verified savings.	• The CSP should ensure that savings calculations are based off inputs reported in the tracking data, and that the inputs reported accurately reflect data that is collected in the field.
Duquesne Light Response: Acknowledged.	
Reported Savings	
• The CSP was erroneously claiming savings for a showerhead installed in multifamily setting instead of a single family setting. This caused a slight increase to verified savings.	• Duquesne Light should ensure that the CSP is calculating the appropriate savings based on the program's implementation methodology.
Duquesne Light Response: Duquesne Light will ensure that all measures are being calculated correctly based on the implementation methodology of the program.	
Program Awareness	

Findings	Recommendations
• The most common sources of program awareness are the Duquesne Light website (24%), direct phone outreach by a program representative (22%) and referred by another Duquesne Light program (16%). Family and friends also played a major role in making customers aware of the LI program (14%) along with Duquesne Light employees (13%). • Family/friends/word of mouth had the greatest influence on customers' decision to participate, where all participants who selected this awareness option reported being very or extremely influenced. Home energy reports (84%), referral by other programs (77%), phone outreach (76%), the program website (73%), and Duquesne Light's employees (70%) also had strong influence on participation with large majority of survey respondents reporting being very or extremely influenced by these sources.	• Guidehouse recommends continuing to utilize a variety of marketing and direct outreach methods via program representatives, Duquesne Light employees, home energy reports, cross-promotions through other programs, outreach via email, along with the program website, to continue to bring in new eligible customers into the program.
Duquesne Light Response: Acknowledged.	
Program Awareness	
• Most participants reported their preferred contact method to learn about EE programs is via email (77%), text messages (46%), and direct mail flyers/ads (33%). Given that only 9% of customers reported learning about the program via email, these findings indicate that email outreach may be currently underutilized for this program and is a low-cost method of communication the participants could be receptive to.	• If Duquesne Light is interested in continuing to increase program awareness and participation for this program, Duquesne Light should consider focusing on outreach via email, text messages, and direct mail (e.g., postcards).
Duquesne Light Response: Acknowledged.	
Satisfaction and Barriers	
• Among survey respondents, 92% reported high satisfaction for the LIEEP's products and services and with the information received about energy efficiency (ratings of 7 or higher). • Turnaround time between the audit and the upgrades provided by the program had the lowest satisfaction with 77% of survey respondents reporting satisfaction of 7 or higher.	• To further increase program satisfaction and decrease program dropout rates of customers, Guidehouse recommends Duquesne Light look for ways to reduce the time between audit completion and installation of upgrades by increasing the number of approved installation contractors and reducing the time it takes to review and approve projects.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

Table 3-36 provides a summary of kit component findings, along with Duquesne Light's plan to address the recommendation in program delivery.

Table 3-36. Low Income Energy Efficiency Kit Findings and Recommendations

Findings	Recommendations
Reported Savings	
• For electroluminescent Night Lights issued in Kits, the CSP was using the wrong baseline HOU (12 instead of 24) which caused a minor drop in verified savings.	• Duquesne Light should ensure that the night lights used in LIEEP kits are using the proper HOU prescribed by the TRM.
Duquesne Light Response: Duquesne Light will ensure that all measures are matching the prescribed methodology in the TRM.	
Program Awareness and Influence	

• The most common sources of program awareness were the Duquesne Light website (44%), email advertisements from Duquesne Light (24%), friends and family (13%), and the home energy report (12%). • Survey respondents reported that referrals by another Duquesne Light program (100%), email advertisements (80%), the home energy auditors (80%), and home energy report (78%) had the strongest influence on participation in the kits component of the program. • Participants reported they preferred emails (80%), text messages (36%), and direct mail flyers/ads (33%) for Duquesne Light to use to contact them about the program.	• Guidehouse recommends continuing to utilize a variety of marketing and direct outreach methods via cross-promotions through other programs, email advertisements, auditors, home energy reports, along with brochures and the program website, to continue to bring in new eligible customers into the program. • If Duquesne Light is interested in continuing to increase program awareness and participation in this program, Duquesne Light should consider focusing on outreach via email, text messages, and direct mail (e.g., postcards).
Duquesne Light Response: Acknowledged	
Satisfaction	
• Participants reported high satisfaction with the energy efficiency kits, with 86% of survey respondents rating the program a score of 7 or higher. Participants also provided high ratings for the performance/quality of the products in the kit (86%), the products provided in the kit (82%), and the information regarding the products in the kit and how to use them (82%).	• No recommendation.
Duquesne Light Response: N/A	
Barriers	
• Most respondents (64%) reported no barriers to participating in this program. Among customers who reported on program barriers, 9% of respondents indicated that the kit didn't offer equipment they needed, and 7% mentioned the equipment not being high enough quality.	• No recommendation.
Duquesne Light Response: N/A	

Source: Guidehouse analysis

3.6 Residential Behavioral

The Residential Behavioral Energy Efficiency Program (R-BEEP) influences behavior changes in customers by providing information via personalized HERs to participants. The program provides these HERs to participants via mail, email, and access through the Duquesne Light web account portal. These reports provide participants information about their recent and historic energy use and compare it with electricity use of similar homes. The reports also provide participants with energy-saving tips, some of which are tailored to participants' home characteristics if they filled out the Home Energy Analysis survey with Duquesne Light. Furthermore, these reports provide information on other Duquesne Light energy efficiency programs, which helps increase awareness of those programs among Duquesne Light's customers.

Duquesne Light launched the R-BEEP in PY14 to target high use residential customers. The current program participation levels include 7,410 customers from the 2015 LI wave; 1,756 customers from the 2018 LI wave; 62,934 customers from the 2021 digital wave; 10,402 customers from the 2021 LI wave; and 61,855 customers from the 2021 non-digital wave (based on PY14 monthly averages). The 2021 digital and 2021 non-digital waves are both market rate (MR) waves. The 2012 and 2015 MR waves did not receive reports in PY14, and therefore, are excluded from this report. Savings for the 2015, 2018, and 2021 LI waves are reported and

verified under the LI Behavioral Energy Efficiency Program (LI-BEEP). The administration, implementation, and evaluation for those LI participants is similar to their MR participant counterparts. Section 3.7 details the LI evaluation results.

A participant is defined as a customer who received HERs during the program year (i.e., PY14). The participant count represents the average number of unique participants who received HERs across each month of PY14. 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. To preserve the RCT design, opt-out customers are included in the analysis.

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.

3.6.1 Participation and Reported Savings by Customer Segment

Table 3-37 presents the participation counts, reported energy and demand savings, and incentive payments for HERs in PY14 by customer segment for the MR waves. LI-BEEP participant results are reflected in LI-BEEP, as Section 3.7 shows.

Table 3-37: Residential Behavioral Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY14 # Participants	124,789	124,789
PYRTD MWh/yr	6,660	6,660
PYRTD MW/yr	1.31	1.31
PY14 Incentives ($1,000)	-	-

Source: Guidehouse analysis

3.6.2 Gross Impact Evaluation

The main methodological issue for the impact evaluation is to estimate the counterfactual energy use by households participating in R-BEEP. 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 R-BEEP.

Guidehouse estimated program savings by adhering to the SWE's guidance described by the Framework.[10] The evaluation team used a monthly lagged dependent variable (LDV) model.

[10] SWE Framework, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

This model uses only post-enrollment program observations 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 1 shows.

Equation 1. LDV Model Specification

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

Where:

kWh_{im}	is customer *i*'s average daily energy usage in bill *m*.
β_{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-program usage term, which is interacted with bill month.
kWh_{im-12}	is customer *i*'s average daily energy usage from the 12-month period prior to the program launch.
β_{3m}	is the estimated treatment effect in kilowatt-hours per day per customer. This is the main parameter of interest. Estimated separately for each month and year.
$treatment_{im}$	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, clustered by customer.

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 2 presents the equation for this model.

Equation 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 customer-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.

All other variables are defined above.

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 generally corroborated the savings found from the LDV model, though some differences in the magnitude of savings existed for smaller waves[11].

The evaluation team deployed specific data management methodologies to prepare billing data for the regressions. These methodologies are informed by Section 6.1.4 of the Phase IV Evaluation Framework and feedback Guidehouse received from the SWE during evaluations in Phase III. Before calendarization, Guidehouse removed accounts with an inactive date prior to the PY14 evaluation period. A small number of accounts had multiple inactive dates. Guidehouse corrected for this by taking the maximum of inactive dates per account, consistent with the approach used in Phase III. 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 PY14 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 is used to obtain an average participant count across all months of the program year. A customer is considered a participant through their latest bill in PY14 so long as their account was still active.

Table 3-38 summarizes the sampling strategy for the PY14 evaluation. Both regression models use billing data from all treatment and control households enrolled in R-BEEP. The sampling strategy is a census approach where data from all households are used in the analysis.

Table 3-38. Residential Behavioral Gross Impact Sample Design for PY13

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
R-BEEP	124,789	124,789	Regression analysis
Program Total	**124,789**	**124,789**	

Source: Guidehouse analysis

The verified ex post energy savings for R-BEEP in PY14 were 6,350 MWh, after accounting for double-counted savings with other Duquesne Light energy efficiency programs and persistence from prior years. Guidehouse calculated the peak demand savings by dividing the total energy savings for the year (in megawatt-hours) by 8,760 hours, then multiplying by the peak demand multiplier. After applying the line loss factor (LLF), this yields 1.27 MW of peak demand savings.

[11] The LDV and LFER treatment coefficient estimates differ by approximately 60% for the 2018 LI wave, on average. None of these estimates are statistically different from zero.

Table 3-39 and Table 3-40 summarize ex ante R-BEEP energy and demand savings, respectively. Appendix B provides additional details.

Table 3-39: Residential Behavioral Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
R-BEEP	6,660	95%	0.00	0.0%
Program Total	**6,660**	**95%**		**0.0%**

Source: Guidehouse analysis

Table 3-40: Residential Behavioral Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
R-BEEP	1.31	96%	0.00	0.0%
Program Total	**1.31**	**96%**		**0.0%**

Source: Guidehouse analysis

Energy savings per participant home were verified slightly lower than the CSP's reported estimate. The following factors led to variation between the reported and verified savings and to the observed realization rates:

- The CSP did not complete a detailed double-counted savings analysis. Instead, they made assumptions based on Phase III evaluations. Double-counted savings made up 5% of measured savings from the regression analysis.

Based on SWE guidance, Guidehouse counts verified savings regardless of statistical significance. Confidence intervals are large relative to the magnitude of verified savings, which can result in high or low realization rates despite no statistically significant difference between the CSP's reported estimate and Guidehouse's verified estimate.

Behavioral Program and Component Absolute Precision

Guidehouse calculated the absolute precision results for the R-BEEP waves. Section 6.1.1.1 of the Phase IV Evaluation Framework requires the program-level verification for these behavioral programs to achieve an absolute precision of ±0.5% at the 95% confidence level (two-tailed), while individual waves may have a wider margin of error. Appendix B provides regression details, precisions, and error estimates.

Table 3-39 or Table 3-40 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 R-BEEP data via a census approach and did not use sampling. There is no sampling uncertainty.

3.6.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for R-BEEP in PY14. Guidehouse does not plan to conduct an NTG assessment during Phase IV for this program.

Free ridership and participant spillover are incorporated in the results of the regression analysis due to the RCT design of R-BEEP. 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 R-BEEP 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 R-BEEP is 100%. As a result, the net and gross savings estimates are the same for R-BEEP. There is no NTG sample for R-BEEP.

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%.

3.6.3.1 HIM Research

Guidehouse did not conduct HIM research for R-BEEP in PY14.

3.6.4 Verified Savings Estimates

In Table 3-41, 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

R-BEEP in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-41: Residential Behavioral PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	6,660	1.31
PYVTD Gross	6,350	1.27
PYVTD Net	6,350	1.27
RTD	11,797	1.71
VTD Gross	11,577	1.65
VTD Net	11,577	1.65

Source: Guidehouse analysis

3.6.5 Process Evaluation

Guidehouse completed a process evaluation for R-BEEP (i.e., HERs) in PY14. The evaluation team interviewed the Duquesne Light program manager and program implementer to gather insights and feedback on program implementation and to aid in updating the online participant survey. With this survey, Guidehouse gathered feedback from PY14 program participants about their level of engagement with the HERs, satisfaction with the report delivery process, reports' influence on their decision-making and behavior, and opportunities for program improvement. A qualified survey participant was a Duquesne Light residential customer with an active electric account who received reports in PY14 via mail, email, or through an online portal via Duquesne Light's website.

The following sections present the combined results of the completed process evaluation for R-BEEP and LI-BEEP to provide easy comparisons between survey results for MR and LI HER participants.

3.6.5.1 Participant Survey Methodology

Guidehouse conducted a participant survey via email for a sample of residential customers who received HERs. The evaluation team stratified by LI and MR customers. The results throughout this section are organized by income status and report receipt method. Table 3-42 shows the population count of PY14 HER program participants, survey method, sample targets, and completed surveys.

Table 3-42: PY14 Residential Behavioral Participant Survey Sample Design

Component	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
MR	77,313	Online survey	20	163	4%
LI	14,863	Online survey	20	181	3%
Total	**92,176**		**40**	**344**	**4%**

**The population is representative of program participants who have chosen to not opt out of the program at the time of surveying. This population count, related to the participant survey, differs from the gross impact evaluation population count where a specific counting method (described in Section 3.6.2) is used to arrive at a population.*

Source: Guidehouse analysis

3.6.5.2 Participant Survey Findings

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

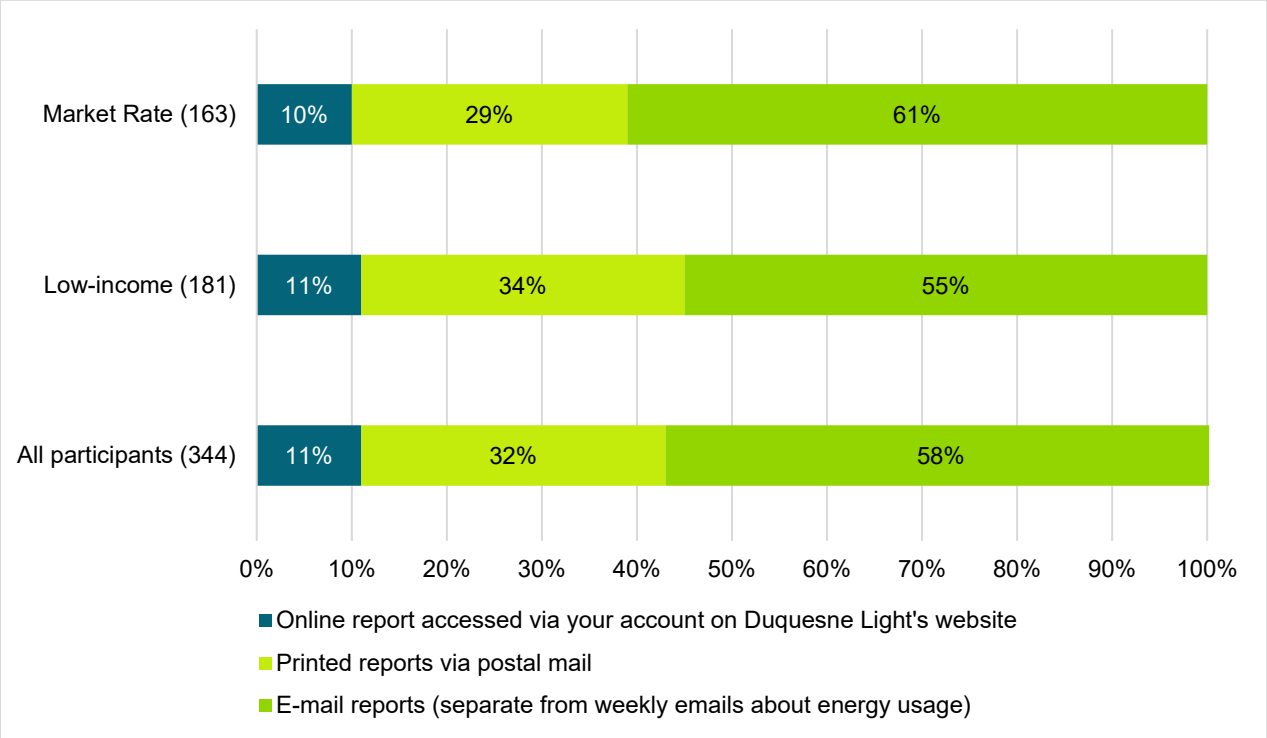
Level of Engagement

During PY14, Duquesne Light distributed HERs to participating customers via email and printed mail and provided access to reports via an online account portal. Duquesne Light sent printed HERs three to four times per year (dependent on customer wave) and sent HERs via email monthly. The web-based report was available to customers on a continuous basis if they decided to log into their web account portal.

To better understand customer engagement with these reports, Guidehouse asked participants how they received or accessed the reports, how many reports they recalled receiving in the previous year, and how frequently they read the reports. Upon fielding the survey, Guidehouse identified 90 active program participants who responded to the survey and, when presented with a picture of a typical HER, reported to not recall receiving the HERs. These participants represented 17% of the active participants who responded to the HER survey. These survey respondents were screened out of the survey.

The remaining survey respondents reported receiving their reports through email, mail, or their web account portal, as shown in Figure 3-14. The percentage of participants who accessed the report through Duquesne Light's online account portal was 11% among all participants, which is more than double compared with the last time this program was evaluated in PY11. These findings show that customers are starting to engage more with the HERs via their account portal than in previous years.

Figure 3-14: Through which method does your household receive its HERs?
(multiple options allowed)*



**The number in parenthesis indicates the number of survey respondents who selected each option.*

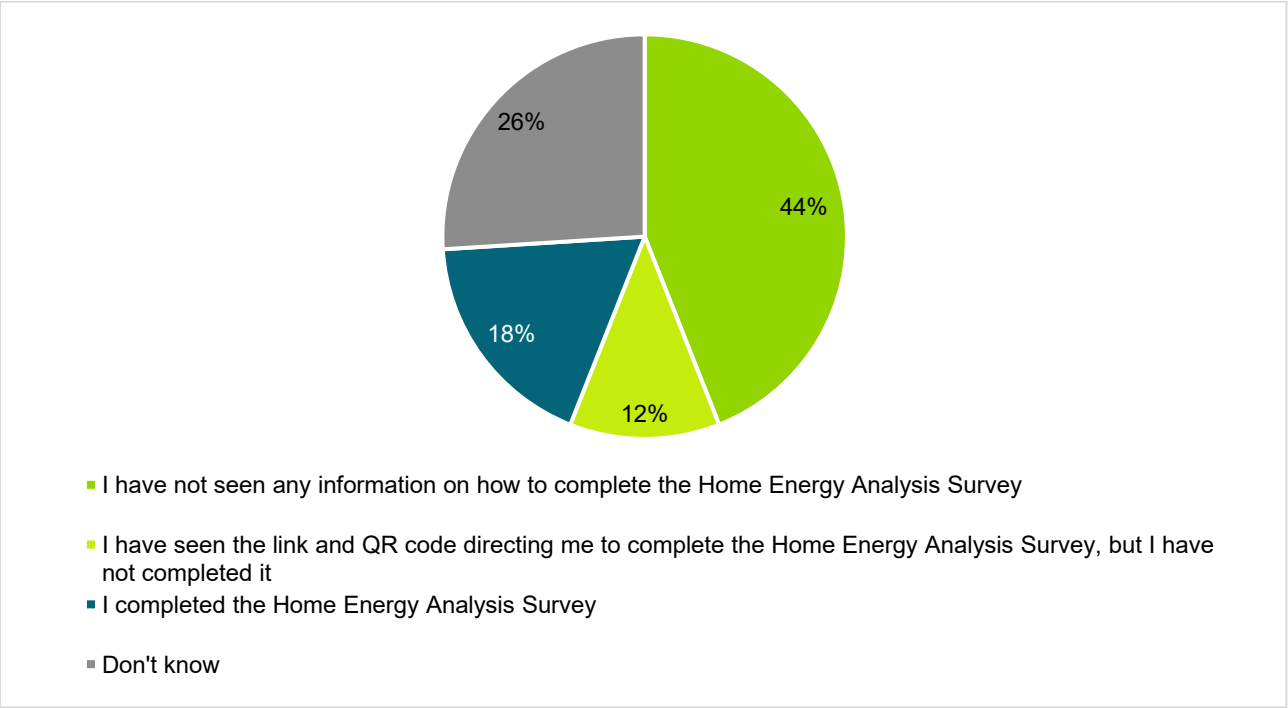
Source: Guidehouse analysis

Guidehouse also inquired about how many reports participants recall receiving. Forty-five percent recall receiving ten or more reports via email and 41% recall accessing web reports ten or more times over the past year. Among printed reports, many LI customers (43%) didn't know how many reports they received in the last year, and about 49% reported they received three or more reports. Among MR participants, 55% reported that they received three or more printed reports, and 27% could not recall. Among participants who access reports via their online account portal, almost a third of MR participants (31%) and almost half of LI participants (48%) reported to access the HERs ten or more times over the last year.

Guidehouse also asked participants who in the household reads the reports. Among MR and LI customers, the large majority (over 84%) reported personally reading the report with very little variation in whether the report is sent via mail, printed, or accessed via online account portal. At most, 5% of respondents reported that no one reads them (2% printed, 2% emailed, 5% online account portal).

Guidehouse also inquired whether participants had seen or completed the Home Energy Analysis Survey on Duquesne Light's website. The Home Energy Analysis Survey asks Duquesne Light customers questions about their home's characteristics to provide more personalized tips and recommendations for saving energy in the home via the HERs. The Home Energy Analysis Survey is advertised in every HER. As Figure 3-15 shows, 18% of survey respondents reported that they had completed the Home Energy Analysis Survey (13% of MR respondents, 22% of LI respondents). Nearly half (44%) of respondents reported that they had not seen any information on how to complete the Home Energy Analysis Survey, and 26% responded to not know if they have seen the survey.

Figure 3-15: Have you seen or completed the Home Energy Analysis Survey on Duquesne Light's website?
(n = 344)

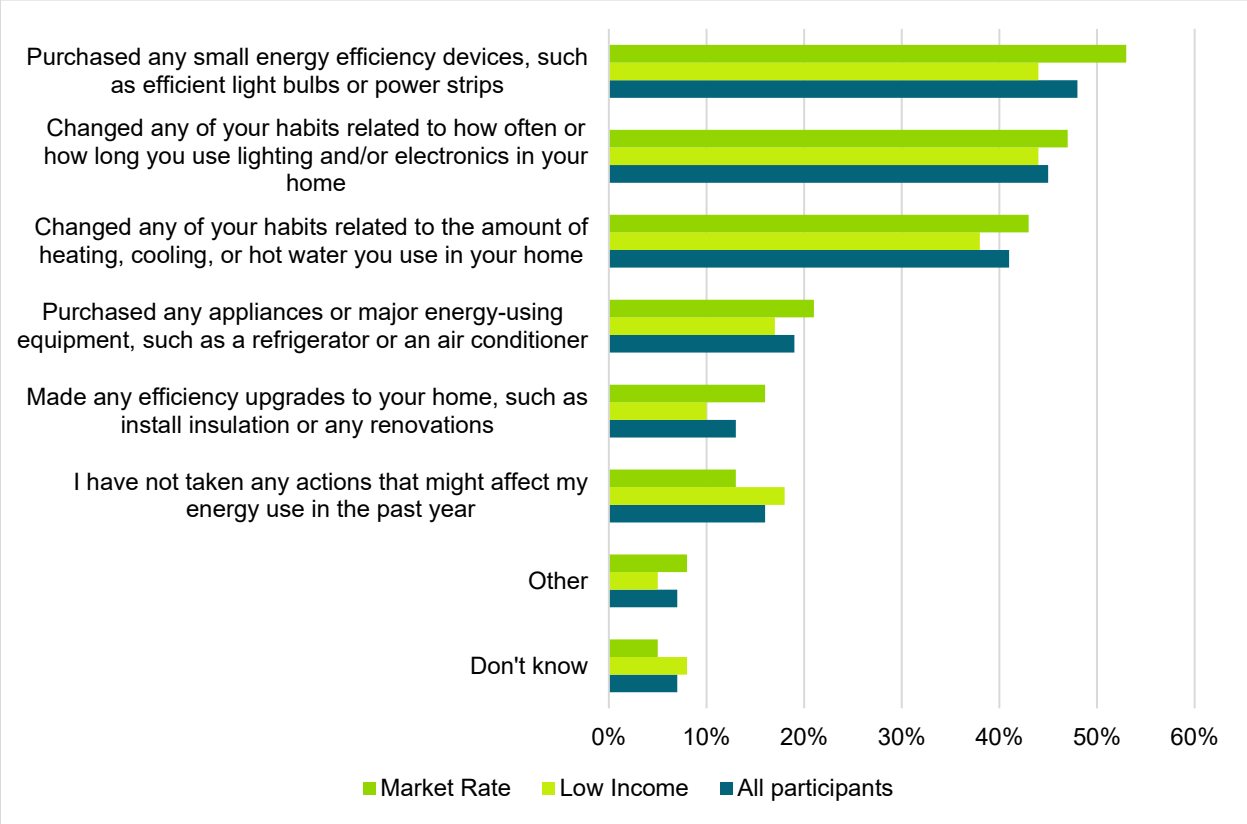


Source: Guidehouse analysis

Program's Influence on Customer Behavior and Purchasing Decisions

Guidehouse asked HER participants if they had changed their habits related to conserving energy, purchased any energy efficient products, or made any energy efficiency upgrades in the past year. Among survey respondents, 77% reported taking some form of action toward conserving energy within the past year. As shown in Figure 3-16, these actions included modifying their habits related to how often or how long they use lighting and electronics (45%) and changing habits on the use of heating, cooling, and hot water (41%) in their homes. About 53% of MR participants and 44% of LI participants purchased small energy efficiency devices, such as efficient light bulbs or power strips. Some MR and LI customers also purchased appliances and major energy-using equipment such as furnaces and computers (21% MR and 17% LI). A few also made major energy efficiency upgrades related to insulation or renovation (16% MR and 10% LI). These findings show that the majority of program participants are taking actions that impact their energy use while receiving HERs.

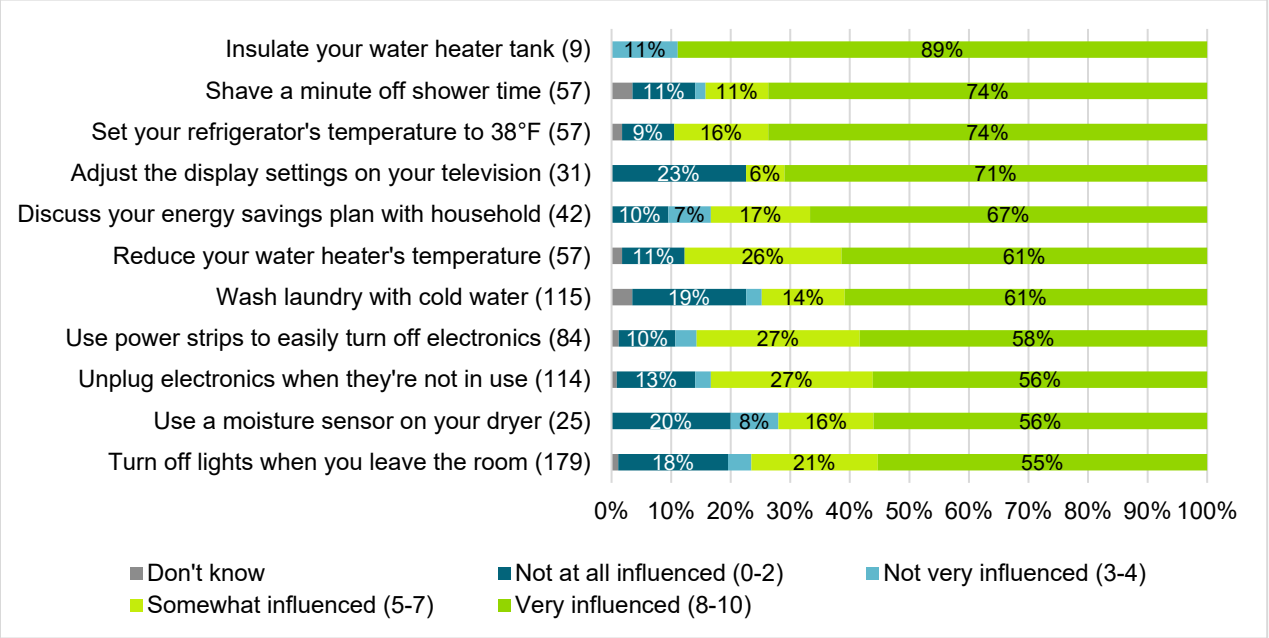
Figure 3-16: Have you, or anyone in your household, completed any of these actions that might affect your energy use in the past year?
($n_{market\ rate}$ = 163, $n_{low\text{-}income}$ = 181, n_{total} = 344; multiple options allowed)



Source: Guidehouse analysis

To understand the influence of the program on participants' decision-making process, Guidehouse asked participants how influential the HERs were in making these changes in their behavior to reduce their energy usage (see Figure 3-17). Guidehouse inquired about program influence on a scale of 0-10, where 10 was very influential and 0 was not at all influential. Depending on the action, 55%-89% of participants who reduced energy usage in their home claimed that the reports had a major influence on their decisions, rating their influence 8 or higher on a scale of 0-10. The influence increased from PY11 when only 14%-75% of respondents claimed the reports had a major influence on their decision to take energy saving actions. Participants reported the highest influence of the reports on their decisions to insulate their water heater tank, shave a minute off of shower time, and set the refrigerator's temperature to 38°F. Although turning off lights when leaving the room had the lowest influence (55%) among participants who provided 'Very influenced' responses, it was the most commonly reported energy conservation activity, representing 52% of the survey respondents. These survey results show the HERs significantly influence participants' energy use behavior.

Figure 3-17: To what extent did the Home Energy Reports influence you to make these changes to your behavior to reduce your energy use?
(multiple options allowed)*

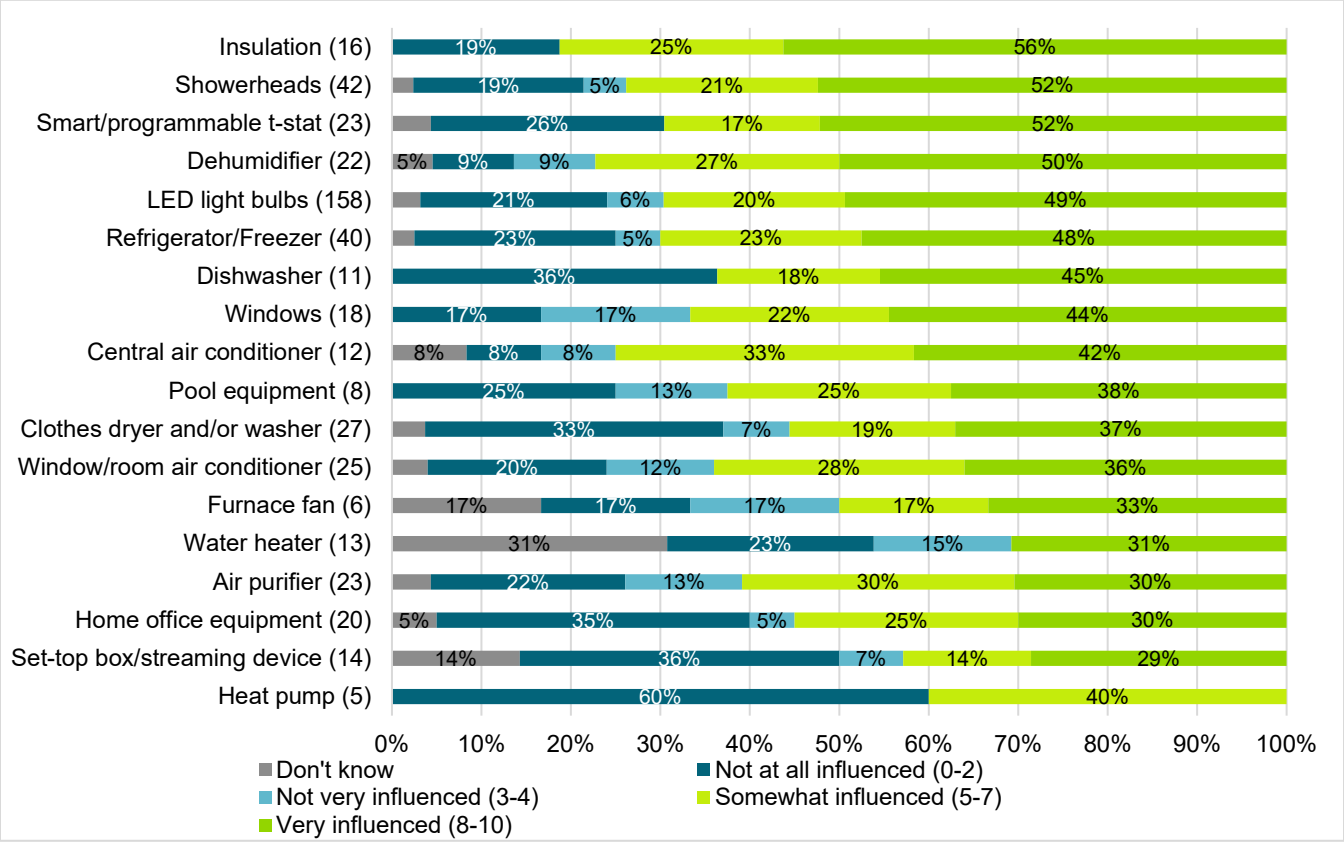


**The number in parenthesis indicates the number of survey respondents who selected each option; the figure only includes response options with five or more responses.*

Source: Guidehouse analysis

Guidehouse also asked participants about how influential the program was on their decision to purchase and install energy efficiency equipment in their homes. As shown in Figure 3-18, HER had the highest influence on the purchase of insulation with 81% of respondents being somewhat or very influenced by the reports. Respondents also reported that they were very influenced by the program on their purchase of showerheads (52%), smart/programmable thermostats (52%), and dehumidifiers (50%). The lowest influence ratings were reported for heat pumps (0% very influenced) and set-top box/streaming devices (29% very influenced). These survey results indicate HERs play a significant role in influencing participants' decisions to purchase energy efficient appliances and equipment, although not as strongly as they influenced participants' behavioral changes.

Figure 3-18: To what extent did the Home Energy Reports you received influence you to make these energy-efficient purchases or upgrades in the past year?*



** The number in parenthesis indicates the number of survey respondents who selected each option; the figure only includes response options with five or more responses.*

Source: Guidehouse analysis

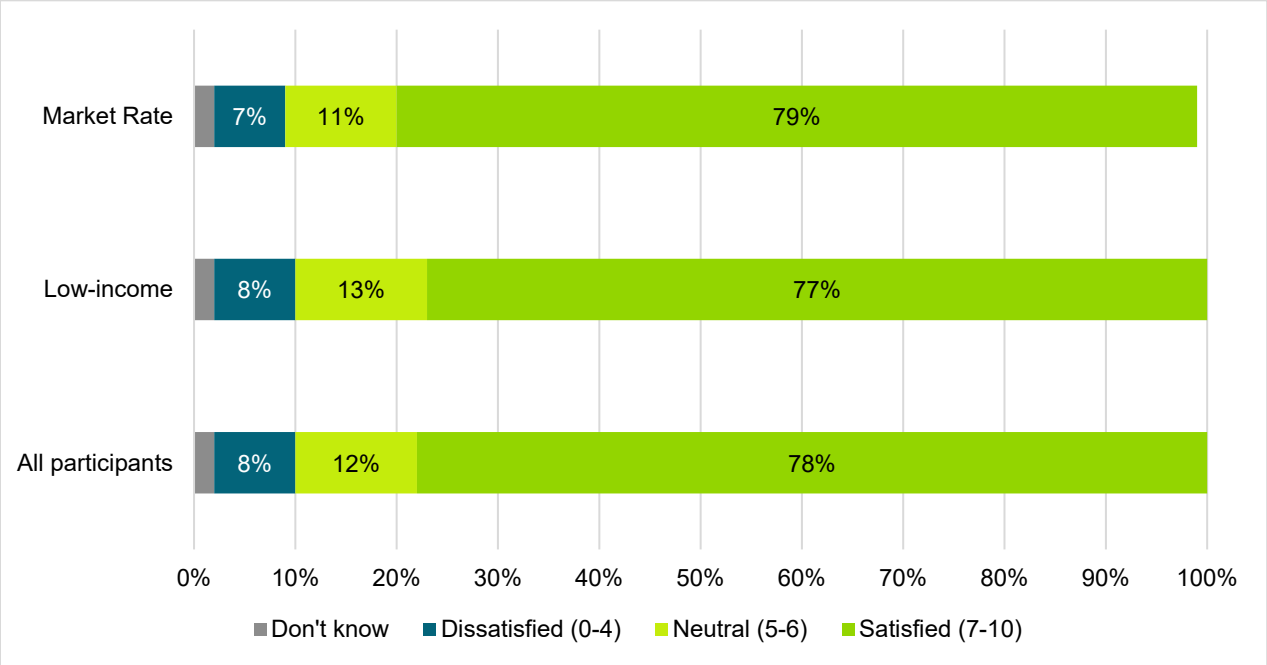
Additionally, Guidehouse asked participants to rank how valuable the information provided in the HERs was to their household. LI customers found the comparison of the home's energy use to similar homes as the most valuable, and the comparison of the home's energy use to efficient homes as the least valuable based on average rankings. Meanwhile, MR customers reported the home's energy use comparison to last year as most valuable, and the energy saving tips as least valuable. MR customers likely find the tips less valuable since a smaller percentage of MR customers (compared to LI customers) reported completing the Home Energy Analysis survey which would tailor their tips to their home.

Satisfaction

Guidehouse inquired about participants' satisfaction with the HERs. As Figure 3-19 shows, 79% of MR and 77% of LI participants were satisfied with their reports, rating them as 7 or above on a 0-10 scale. In the PY11 evaluation, 75% of all respondents reported satisfaction with their reports (77% of MR customers and 73% of LI customers), which shows a slight increase in participants' satisfaction in PY14. Of the PY14 respondents, 8% expressed some level of dissatisfaction with the report (defined by rating the program as 4 or below). Dissatisfied PY14 respondents reported that the information in their reports was not helpful at reducing their energy usage/bills (33), included inaccurate information about their energy usage or home (9), they feel they already were doing everything they could to reduce their energy usage (5), or they did not want to receive the reports anymore (2). The average satisfaction rating for the HER

Program was 8.2 on a scale of 0-10 with 50% of respondents rating the program a 10, indicating that most participants were highly satisfied with the HERs.

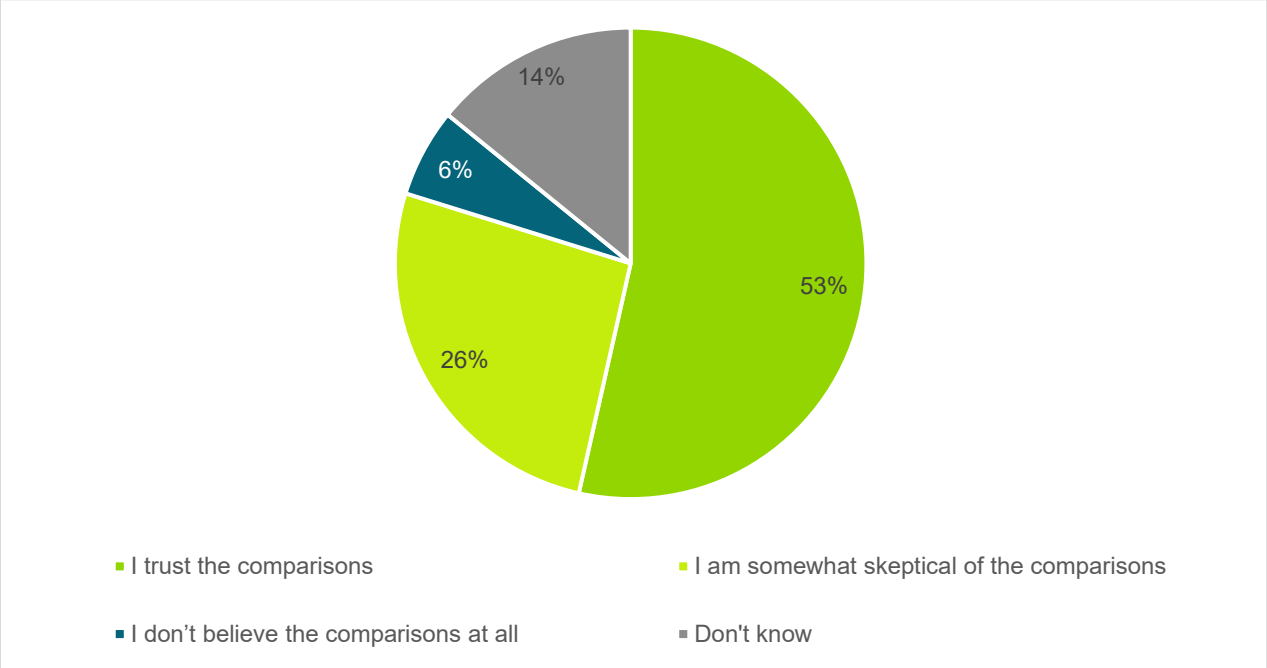
Figure 3-19: How satisfied are you with the Home Energy Reports overall?
($n_{market\ rate}$ = 163, $n_{low\text{-}income}$ = 181, n_{total} = 344)



Source: Guidehouse analysis

Additionally, Guidehouse asked participants if they have confidence in the HER's comparison data of their home's energy usage. Most respondents indicated that they trust that the report accurately compares their household with similar homes. Figure 3-20 shows 53% of participants reported they trust the comparisons, 26% were somewhat skeptical, while only 6% don't believe the comparisons at all. There was not a distinctive difference between MR and LI responses.

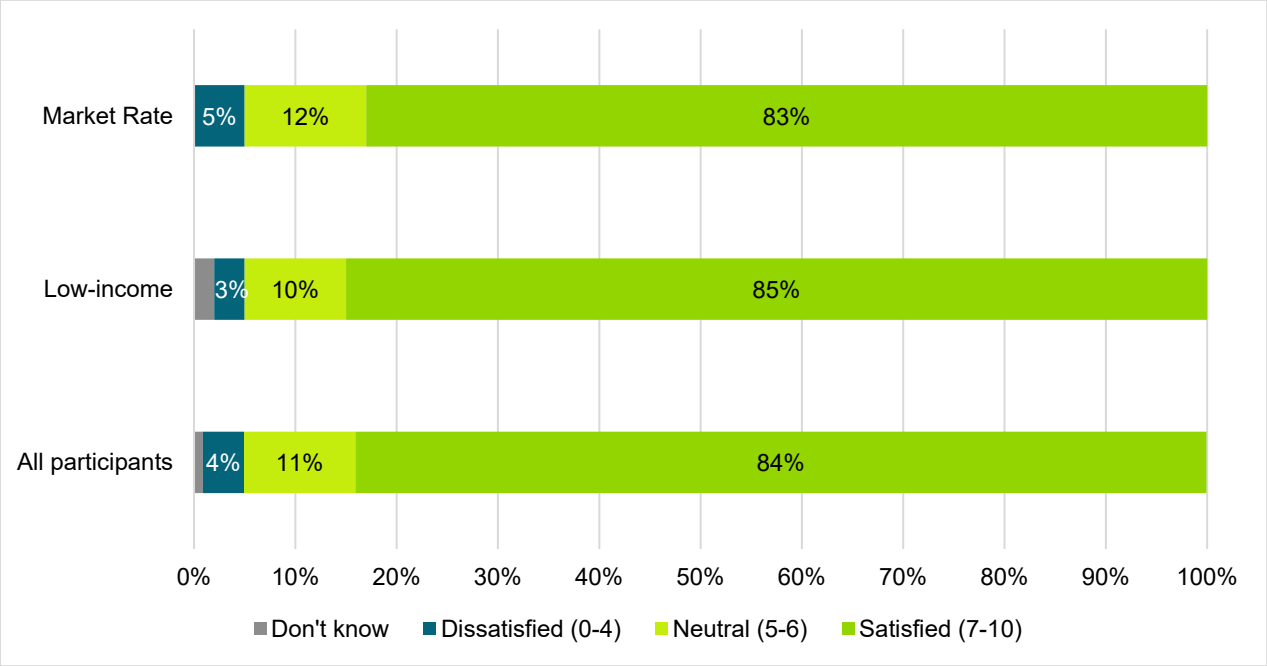
Figure 3-20: Do you have confidence in the report's comparisons - in other words, do you believe that your household is being accurately compared with similar homes?
(n = 277)



Source: Guidehouse analysis

Guidehouse also asked about customers' satisfaction with Duquesne Light as a company, and 84% of survey respondents reported being satisfied with the company, as shown in Figure 3-21. Only 4% of respondents reported some level of dissatisfaction with Duquesne Light. The most common reasons for dissatisfaction included comments about electricity rates being too high (12), difficulty with customer service or Duquesne Light's website (3), and infrastructure is unreliable (2). The average satisfaction rating for Duquesne Light as a company was 8.6 on a scale of 0-10.

Figure 3-21: How satisfied are you with Duquesne Light as a company?
($n_{market\ rate}$ = 163, $n_{low\text{-}income}$ = 181, n_{total} = 344)



Source: Guidehouse analysis

3.6.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-43. TRC benefits in Table 3-43 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-43: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 6	$ 5
8	Administration and Management	$ 60	$ 42	$ 101	$ 39
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 507	$ -	$ 973
11	EDC Evaluation Costs	$ 23		$ 29	
12	SWE Audit Costs	$ 2		$ 16	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 634	$ 1,169
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 634	$ 1,169
15	Total NPV Lifetime Electric Energy Benefits	$ 397	$ 596
16	Total NPV Lifetime Electric Capacity Benefits	$ 235	$ 289
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ -	$ -
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 631	$ 885
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.00	0.76

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-44 presents program financials and cost-effectiveness on a net savings basis.

Table 3-44: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 6	$ 5
8	Administration and Management	$ 60	$ 42	$ 101	$ 39
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 507	$ -	$ 973
11	EDC Evaluation Costs	$ 23		$ 29	
12	SWE Audit Costs	$ 2		$ 16	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 634		$ 1,169	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 634		$ 1,169	
15	Total NPV Lifetime Electric Energy Benefits	$ 397		$ 596	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
16	Total NPV Lifetime Electric Capacity Benefits	$ 235	$ 289
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ -	$ -
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 631	$ 885
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.00	0.76

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.6.7 Status of Recommendations

The impact evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-45 presents a summary of the findings with a response from Duquesne Light and their plans to address the recommendation in program delivery.

Table 3-45. Residential Behavioral Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Accounting for persistence has no impact on first-year savings for MR HER waves active in PY14, because no active waves have reached their third year of exposure to HER messaging. Upstream dual participation savings are defaulted to 1.5% of gross savings based on the number of years since cohort inception.	• Guidehouse and Duquesne Light should consider the default upstream dual participation factors to determine if a more representative figure exists for use in the remainder of Phase IV.
Duquesne Light Response: Duquesne Light and Guidehouse will discuss the default upstream adjustment factors, taking into consideration the status of residential lighting programs and propose an adjusted methodology to the SWE.	
Level of Engagement	
• Only 18% of survey respondents reported that they completed the Home Energy Analysis Survey, while 44% said they had not seen any information on how to complete the survey, and 26% reported they didn't know if they had seen the survey. • There were fewer MR participants who completed the Home Energy Analysis survey than LI participants (13% of MR respondents and 22% of LI respondents). • MR customers reported the energy saving tips as the least valuable feature included in the HER. • Majority of survey respondents (53%) reported they trust the data provided in HERs comparing home energy usage, 26% were somewhat skeptical, while only 6% don't believe the comparisons at all.	• Duquesne Light should consider new, more prominent methods of advertising the Home Energy Analysis Survey to increase customer awareness and completion rates of this survey. This could include placing a QR code and a URL to the survey in the most visible part of the HER (e.g., the top right or middle right of the first page of the HER). Additionally, it would be important to include a note of why it is important for customers to complete the survey, and how their responses would improve the quality and accuracy of the reports, which may increase participant's confidence in HER's comparisons.
Duquesne Light Response: Duquesne Light will work with the CSP to understand the feasibility of placing the QR code or the link to the survey in a more noticeable position on the HER.	

Findings	Recommendations
Satisfaction	
• Among survey respondents, 77% of LI and 79% or MR respondents reported they were satisfied with their HERs, rating them a 7 or above on a 0-10 scale.	• No recommendations
Duquesne Light Response: Acknowledged.	
Program Influence	
• Among survey respondents, 77% reported taking some form of action toward conserving energy within the past year. • Depending on the action, 55%-89% of participants who reduced energy usage in their home claimed that the HERs had a major influence on their decisions, rating their influence 8 or higher on a scale of 0-10. • Survey results indicate HERs play a significant role in influencing participants' decisions to purchase energy efficient appliances and equipment, although not as strongly as they influenced participants' behavioral changes.	• Duquesne Light should consider increasing the frequency of tips with referrals to other Duquesne Light's programs to align recommended actions with a rebate or service to reduce customer cost.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

3.7 Low Income Behavioral

The Low Income Behavioral (LI-BEEP) targets qualified LI customers, who's household is at or below 150% of federal poverty income guidelines. For LI-BEEP, verified savings attributable to the LI sector are reflected in Duquesne Light's progress toward the Phase IV LI carveout goal.

In the same manner as the market rate R-BEEP, LI-BEEP influences behavior changes in customers by providing information via HERs to participants. The administration, implementation, and evaluation for LI participants is similar to their MR participant counterparts. Section 3.6 details the MR evaluation results.

LI-BEEP participation is defined as a customer under the LI rate class and receiving HERs during the program year. The participant count represents the average number of unique participants who received HERs across each month of PY14. Current program participation levels include 7,410 customers from the 2015 LI wave, 1,756 customers from the 2018 LI wave, and 10,402 customers from the 2021 LI wave (based on PY14 monthly averages).

3.7.1 Participation and Reported Savings by Customer Segment

Table 3-46 presents the participation counts, reported energy and demand savings, and incentive payments for LI-BEEP in PY14 by customer segment.

Table 3-46: Low Income Behavioral Participation and Reported Impacts

Parameter	Residential LI	Total
PY14 # Participants	19,567	19,567
PYRTD MWh/yr	971	971
PYRTD MW/yr	0.19	0.19
PY14 Incentives ($1,000)	-	-

Source: Guidehouse Analysis

3.7.2 Gross Impact Evaluation

Guidehouse completed LI-BEEP activities in coordination with the R-BEEP MR program and applied the same methodologies Section 3.6 details.

The verified ex post energy savings for LI-BEEP in PY14 were 730 MWh, after accounting for double-counted savings with other Duquesne Light energy efficiency programs and persistence from prior years. Guidehouse calculated the peak demand savings by dividing the total energy savings for the year (in megawatt-hours) by 8,760 hours, then multiplying by the peak demand multiplier. After applying the LLF, this yields 0.15 MW of peak demand savings. Table 3-47 and Table 3-48 summarize ex ante LI behavioral energy efficiency energy and demand savings, respectively. Appendix B provides additional details.

Table 3-47: Low Income Behavioral Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LI-BEEP	971	75%	0.00	0.0%
Program Total	**971**	**75%**		**0.0%**

Source: Guidehouse analysis

Table 3-48: Low Income Behavioral Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LI HER	0.19	76%	0.00	0.0%
Program Total	**0.19**	**76%**		**0.0%**

Source: Guidehouse analysis

The energy realization rate for LI-BEEP is 75%. Energy savings per participant home were verified lower than the CSP's reported estimate. The following factors led to variation between the reported and verified savings and to the observed realization rates:

- The CSP did not complete a detailed double-counted savings analysis. Instead, they made assumptions based on Phase III evaluations. Double-counted savings made up 15% of measured savings from the regression analysis.
- The CSP did not account for persistence from prior years using an identical method as Guidehouse. Persistence made up 44% of measured savings from the regression analysis, impacting legacy waves only.

Based on SWE guidance, Guidehouse counts verified savings regardless of statistical significance. Confidence intervals are large relative to the magnitude of verified savings, contributing to a high realization rate despite no statistical difference between the CSP and Guidehouse estimates.

Behavioral Program and Component Absolute Precision

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

Table 3-50 or Table 3-51 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 LI-BEEP data via its census approach and did not use sampling. There is no sampling uncertainty to report.

3.7.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for LI-BEEP in PY14. Guidehouse does not plan to conduct NTG assessment during Phase IV for this program. Consistent with SWE's guidance, Guidehouse assumes NTG ratios to be 100% for this program due to the nature of the RCT approach (see Section 3.6).

3.7.3.1 HIM Research

Guidehouse did not conduct HIM research for LI-BEEP in PY14.

3.7.4 Verified Savings Estimates

In Table 3-49 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 LI behavioral energy efficiency in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-49: PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	971	0.19
PYVTD Gross	730	0.15
PYVTD Net	730	0.15
RTD	1,902	0.22

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	1,926	0.25
VTD Net	1,926	0.25

Source: Guidehouse analysis

3.7.5 Process Evaluation

Given the similarities in program structure of LI HER and Residential HER, Guidehouse combined the process evaluation discussion and results of LI HER with the Residential HER process evaluation section. Refer to Section 3.6.5 for the results.

3.7.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-50. TRC benefits in Table 3-50 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-50: Summary of Program Finances – Gross Verified

$	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 1
8	Administration and Management	$ 60	$ 8	$ 100	$ 7
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 238	$ -	$ 299
11	EDC Evaluation Costs	$ 5		$ 7	
12	SWE Audit Costs	$ 1		$ 4	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 312		$ 419	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 312		$ 419	
15	Total NPV Lifetime Electric Energy Benefits	$ 46		$ 96	
16	Total NPV Lifetime Electric Capacity Benefits	$ 27		$ 43	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	

$	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 73	$ 139
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.23	0.33

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-51 presents program financials and cost-effectiveness on a net savings basis.

Table 3-51: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 1
8	Administration and Management	$ 60	$ 8	$ 100	$ 7
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 238	$ -	$ 299
11	EDC Evaluation Costs	$ 5		$ 7	
12	SWE Audit Costs	$ 1		$ 4	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 312		$ 419	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 312		$ 419	
15	Total NPV Lifetime Electric Energy Benefits	$ 46		$ 96	
16	Total NPV Lifetime Electric Capacity Benefits	$ 27		$ 43	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 73		$ 139	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.23		0.33	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.7.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-52 presents a summary of the findings with a response from Duquesne Light and their plans to address the recommendation in program delivery. See Section 3.6.7 for the process evaluation related findings and recommendations for the LI-BEEP program.

Table 3-52. Low Income Behavioral Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Persistence for LI HER waves represents 52% of net savings in PY14. Over half of total first year energy savings come from the 2021 LI wave, which did not accrue any persistence in PY14 because it is in its second year of exposure to HER messaging. Consistent with prior years, savings from the 2018 LI wave are close to zero. Upstream dual participation savings are defaulted to 1.5% for the 2021 LI wave and 3% for the 2015 and 2018 LI waves, contributing to the total uplift reduction to gross savings of 15%.	• The CSP should plan for significant reductions in savings as the 2021 LI wave enters their third year of exposure to HER messaging. The introduction and retirement of waves should be structured accordingly, particularly for waves with low or no savings. In addition, Guidehouse and Duquesne should consider the default upstream dual participation factors to determine if a more representative figure exists for use in the remainder of the Phase.
Duquesne Light Response: Duquesne Light and Oracle are aware of the anticipated reduction in savings in PY15 for LI waves. Duquesne Light may want to discuss with Oracle the status of the 2018 LI wave.	

Source: Guidehouse analysis

3.8 Small Business Direct Install

The Small Business Direct Install (SBDI) program targets Duquesne Light C&I customers and municipalities with monthly demand less than 300 kW. The SBDI program is designed to address sector-specific barriers to small and medium C&I customers and municipalities. Barriers to program participation included limited capital resources, high cost of capital (interest rates), lack of expertise, communication barriers, and conflicting priorities. Customers in these segments are often subject to split-incentives, where electric bill-paying customers are tenants but not the owners of the properties at which they conduct their businesses. Owners do not pay the electric bills, so they are not motivated to upgrade energy-using equipment to save on electric bills; electric bill-paying tenants are not motivated to upgrade properties they do not own. The Phase III direct-install program design successfully addressed these barriers by providing no-cost efficiency upgrades, whereby landlords received no-cost building upgrades and small business tenants benefited from lower electric bills. For Phase IV, participating customers will receive a no-cost energy assessment and incentives that cover up to 80% of the resulting equipment and installation costs.[12] A limited quantity of energy savings products may be provided at the time of assessment at no cost.

During Phase IV, this program emphasizes very small businesses (micro-businesses), such as small local bakeries or hardware stores. This program works with cities and towns through community and economic development offices, and with local chambers of commerce and business associations to encourage customers to take part in the SBDI program. Third-party

[12] Measures include lighting, VFDs, and a variety of refrigeration measures. A full list of measures is available at https://www.duqenergyefficiency.com/sbdi.

contractors then survey a customer's site, obtain written approval from the customer, and install energy efficiency equipment at their site. Used equipment is properly disposed of according to all relevant state, local, and federal regulations. Duquesne Light conducts random inspections of completed sites. This program is projected to account for approximately 6% of nonresidential program savings during Phase IV.

In addition to the SBDI program, Guidehouse is reporting the common area portion of the Small Multifamily Housing Retrofit Program (SMHR) under SBDI. This program consists of cost-share measures, including lighting, ventilation, and whole-building measures, installed in the common area portions of small multifamily buildings. In PY14, 48% of these savings were reported as part of the LI carveout.

3.8.1 Participation and Reported Savings by Customer Segment

Table 3-53 presents the participation counts, reported energy and demand savings, and incentive payments for SBDI in PY14 by customer segment.

Table 3-53: Small Business Direct Install Participation and Reported Impacts

Parameter	Small C&I*	GNI**	Total
PY14 # Participants	252	51	252
PYRTD MWh/yr	3,740	1,197	3,740
PYRTD MW/yr	0.70	0.19	0.70
PY14 Incentives ($1,000)	$2,141	$598	$2,141

**SBDI has a Multifamily component associated with it, which a percentage of savings can be claimed under Residential LI. In PY14, this component reported 295 MWh/yr of LI savings. These LI savings are not broken out in this table.*

***Small C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

3.8.2 Gross Impact Evaluation

In addition to the SBDI program, Guidehouse is currently evaluating the Multifamily Housing Retrofit Program, consisting of common area energy efficiency measures in multifamily buildings, under the SBDI initiative. Both SBDI and the Multifamily Housing Retrofit Program showed lower-than-anticipated participation in PY13 and, consistent with the evaluation plan, Guidehouse chose to evaluate PY13 and PY14 as a single evaluation effort to ensure that there were enough projects to provide a representative sample moving forward. As a result, PY13 utilized historical realization rates from Phase III, while realization rates for PY14 were developed based on filed work conducted in PY14 as well as field work from three projects Guidehouse sampled in PY13.

Table 3-54 presents the gross impact results for energy, and Table 3-55 provides the gross impact results for demand. Despite numerous contact attempts and attempting to verify every single alternate site for SBDI, this program did not meet its statistical precision requirements. Difficulty contacting sites, including with the help of Duquesne Light representatives, combined

with an unexpectedly high variance and low realization rate compared to prior evaluations of similar programs, led to a precision for the program of 29%.

Table 3-54: Small Business Direct Install Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Large	1,886	74%	0.46	60%
Medium	1,236	82%	0.91	73%
Multifamily	618	99%	0.01	2%
Program Total	**3,740**	**81%**		**29%**

Source: Guidehouse analysis

Table 3-55: Small Business Direct Install Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Large	0.32	106%	0.07	9%
Medium	0.19	95%	0.24	19%
Multifamily	0.19	101%	0.00	1%
Program Total	**0.70**	**102%**		**5%**

Source: Guidehouse analysis

Nearly all projects sampled in PY14 (n=5) had realization rates very close to (or exceeding) 100% for both energy and demand, indicating that the implementer is accurately reporting savings for this program.

One site had major discrepancies between customer-reported HOU and the ex-ante HOU used to calculate savings (particularly for the exterior fixtures), as well as a low fixture count for one line item. This led to a realization rate of 52% for energy but 102% for demand.

For another site, the customer noted that all interior fixtures were only in use during the pool hours through the summer. This significantly lowered HOU and resulted in a realization rate of 34% for energy.

3.8.3 Net Impact Evaluation

Per Guidehouse's PY14 Evaluation Plan, the team conducted free ridership and spillover research in PY14 for the SBDI program. The evaluation team's free ridership and spillover

research aligned to the methodologies required by the SWE Evaluation Framework.[13] Guidehouse attempted a census of all PY13 and PY14 program participants using online surveys. The evaluation team attempted to contact participants up to four times via email, achieving 23 survey completes for the net impact portion of the survey, as Table 3-56 shows. Each participant was asked about one project and up to three measures, with one question on whether their decision-making was the same for any other projects if they participated in the program multiple times during PY13 and PY14. The estimated free ridership, spillover, and NTG results are shown in Table 3-57.

Table 3-56. PY13 and PY14 Small Business Direct Install Net Impact Sample Design

Stratum Name	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys**	Response Rates
PY13 SBDI participants	19	Online survey	Census attempt (12)	4	21%
PY14 SBDI participants	150		Census attempt (21)	19	13%
Total	**165**			**23**	14%

**The total population count between PY13 and PY14 is based on the number of unique customers between the two years. Some customers participated in the program in both PY13 and PY14 but were only counted once.*
***Although 24 total participants completed the survey, one did not respond to the NTG questions, resulting in 23 completed NTG surveys.*

Source: Guidehouse analysis

Table 3-57. PY14 Small Business Direct Install Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTG Ratio	Sample C_v	Relative Precision at 85% CL
PY13 and PY14 SBDI Participants	7%	0%	93%	0.15	5.0%

Source: Guidehouse analysis

3.8.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY14. The team reviewed the PY14 nonresidential program activities and identified LED interior and exterior lighting as HIMs. Table 3-58 presents estimated free ridership, spillover and NTG ratios for these HIMs for the SBDI program.

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

Table 3-58. PY14 Small Business Direct Install High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
SBDI	LED Interior Lighting Fixtures	9%	0%	91%
	LED Exterior Lighting Fixtures	13%	0%	87%

Source: Guidehouse analysis

3.8.4 Verified Savings Estimates

In Table 3-59, 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 SBDI in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-59: Small Business Direct Install PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	3,740	0.70
PYVTD Gross	3,029	0.71
PYVTD Net	2,802	0.66
RTD	5,038	0.90
VTD Gross	4,372	0.94
VTD Net	4,135	0.88

Source: Guidehouse analysis

3.8.5 Process Evaluation

Guidehouse conducted process evaluation research for the SBDI program in PY13 and PY14. This research focused on program awareness, satisfaction, and barriers to participation. The team deployed an online survey to 19 participants in PY13 and 150 participants in PY14 to obtain feedback about their experiences with the program delivery processes and opportunities for program improvement.[14] Due to significantly lower program participation than expected in PY13 and low response rates, Guidehouse extended the online participant surveys into PY14 to collect additional data and provided cumulative results in the section below. The evaluation team also interviewed the program manager and the CSP in PY13 and PY14. These interviews aided survey question updates.

3.8.5.1 Participant Survey Methodology

The participant survey focused on customers who participated in SBDI in PY13 and/or PY14. Guidehouse attempted a census and distributed the survey to 165 participants. The team received 20 completed surveys among PY14 participants and four completed surveys from the PY13 evaluation activities. Table 3-60 provides an overview of the sample design.

[14] During PY13 sample design stages the team estimated 60 unique participants for this program with a target of 23 completed surveys. Guidehouse received 4 completed surveys from the SBDI program's participants.

Table 3-60: PY14 Small Business Direct Install Participant Survey Sample Design

Component	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
PY13 SBDI participants	19	Online survey	Census attempt (12)	4	21%
PY14 SBDI participants	150		Census attempt (21)	20	13%
Total	**165****		**33**	**24**	**15%**

**This population count, related to the participant survey, differs from the gross impact evaluation population count where the population is defined as the number of unique project IDs.*

***The total population count between PY13 and PY14 is based on the number of unique customers between the two years. Some customers participated in the program in both PY13 and PY14 but were only counted once.*

Source: Guidehouse analysis

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

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

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

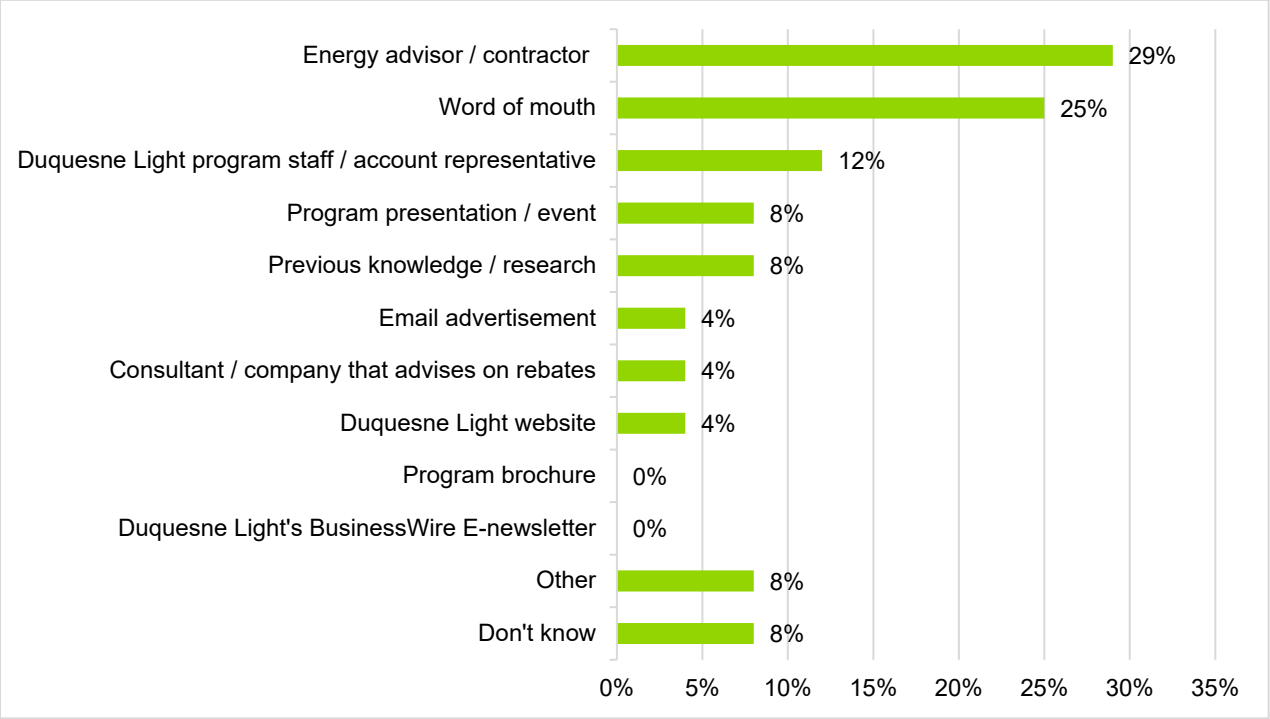
3.8.5.2 Participant Survey Findings

The following sections present the responses collected through this survey for participant awareness, program's influence on customers' decision-making and behavior, customer satisfaction ratings, and barriers and challenges with the program.

Program Awareness

Guidehouse asked participants to identify how they first heard about the SBDI program. Figure 3-22 shows the most common sources of program awareness are through the energy advisor/contractor who conducted the audit and installed equipment (29%) and through word of mouth (25%). The two participants (8%) who selected "other" reported that they became aware of the program through directly emailing Duquesne Light or through other Duquesne Light's programs. Duquesne Light website, a consultant advising on rebates, and email advertisements were the least common sources of awareness, with only one respondent each reporting to learn about the program through these sources. Notably, there were no respondents who learned about the program via program brochure or Duquesne Light's E-Newsletter.

Figure 3-22: How did you learn about the Small Business Direct Install Program?
(n=24; multiple response options allowed)

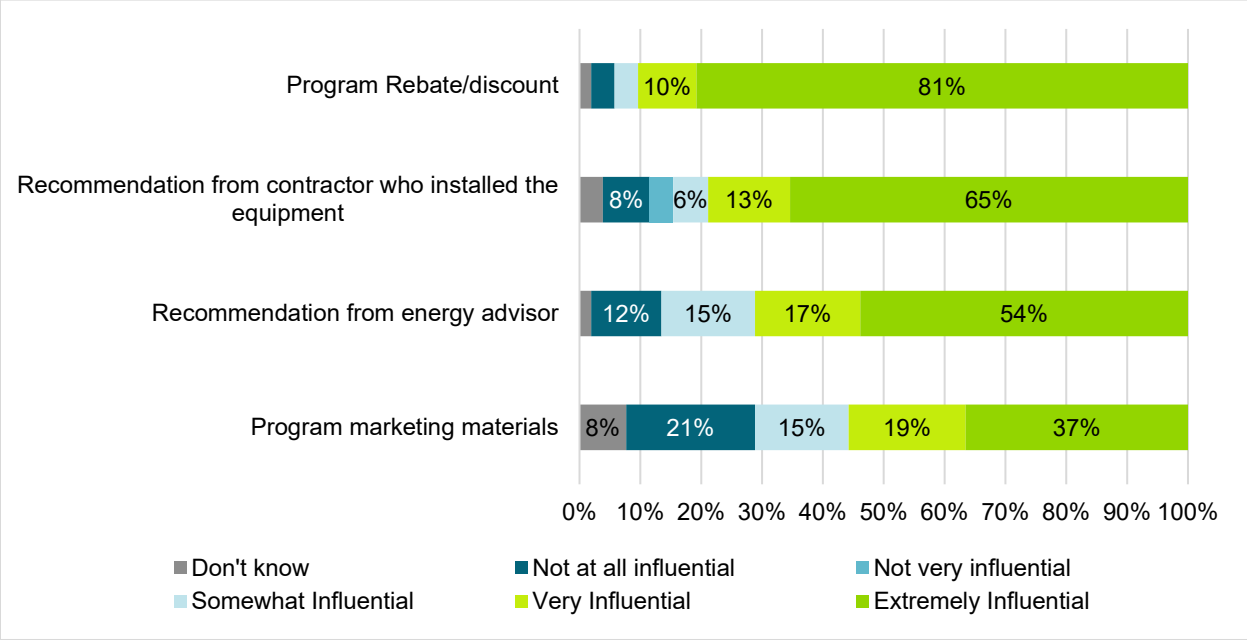


Source: Guidehouse analysis

Program Influence

Guidehouse asked participants how influential different elements of the program were on their decision to install the energy efficient equipment. In general, responses show that multiple program components played a critical role in influencing customer behavior. As Figure 3-23 shows, the program rebate and the recommendation from the contractor were the most influential in their decision to purchase energy efficient equipment with 91% and 78% of respondents, respectively, reporting being very or extremely influenced in their decision. The program marketing materials were the least influential in promoting program participation of the options provided; however, 56% of respondents still reported they were very or extremely influential in their decision. These results indicate that program rebates and information provided by installation contractors had the strongest influence on participants, while current program marketing has the least influence.

Figure 3-23: How influential were the following on your decision to install this energy efficient equipment?
(n = 52)[15]



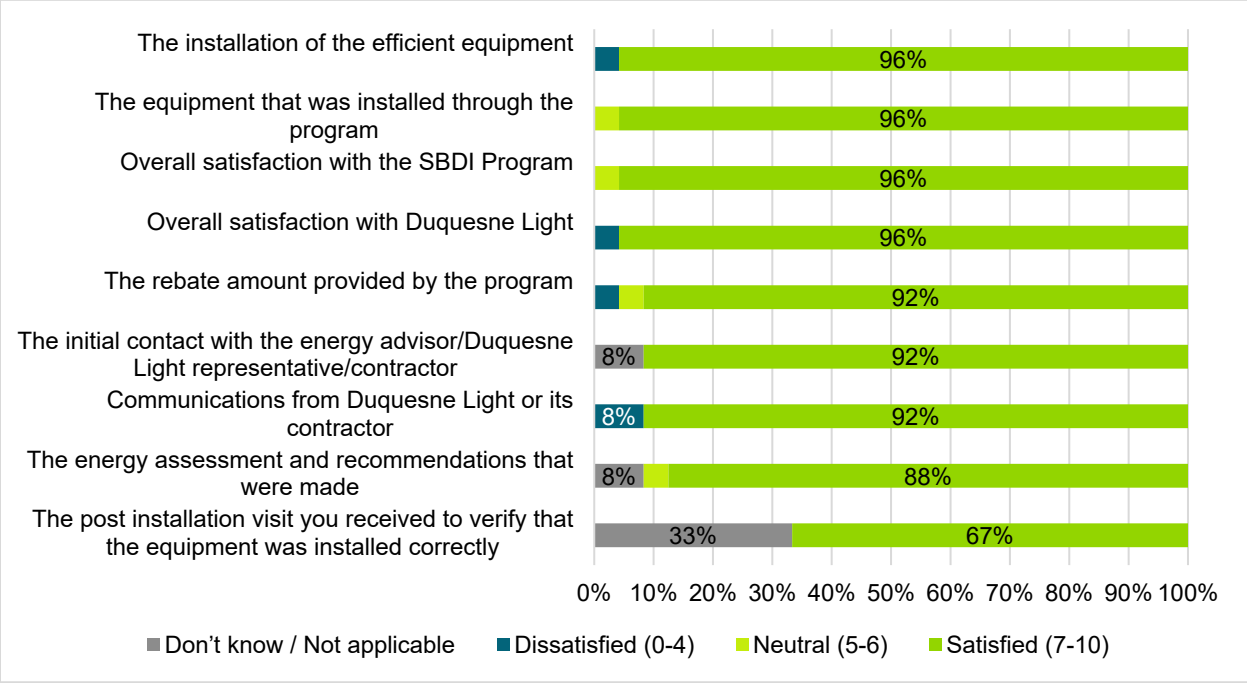
Source: Guidehouse analysis

Satisfaction

Guidehouse also gauged participants' satisfaction toward various aspects of the program to understand how the program can be improved in the future. Most participants (96%) rated the SBDI program 7 or higher on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied, with an average score of 9.3. Most respondents also rated each step of the program participation process 7 or higher. Participants provided the highest ratings for the installation of the equipment, the equipment installed, satisfaction with the program, and satisfaction with Duquesne Light, with 96% of respondents providing a score of 7 or higher for all items. Participants also reported high satisfaction with the rebate amount provided by the program (92%), the initial contact with the energy advisor or Duquesne Light representative (92%), and communication from Duquesne Light or its contractors (92%). While it may appear that satisfaction was lower for the post installation visit, this is due to 33% of respondents not receiving the post installation visit because these visits are only performed for a sample of participating customers. All customers who received the post installation visit reported a rating of 7 or higher. Figure 3-24 shows the results of customer satisfaction with the program. Based on these results, overall, participants are very satisfied with the program and Duquesne Light.

[15] Participants responded to this question at the measure level. Therefore, if customers installed more than one measure through the program, they answered this question separately for each measure.

Figure 3-24: Please rate your satisfaction with each of the following elements.
(n = 24)



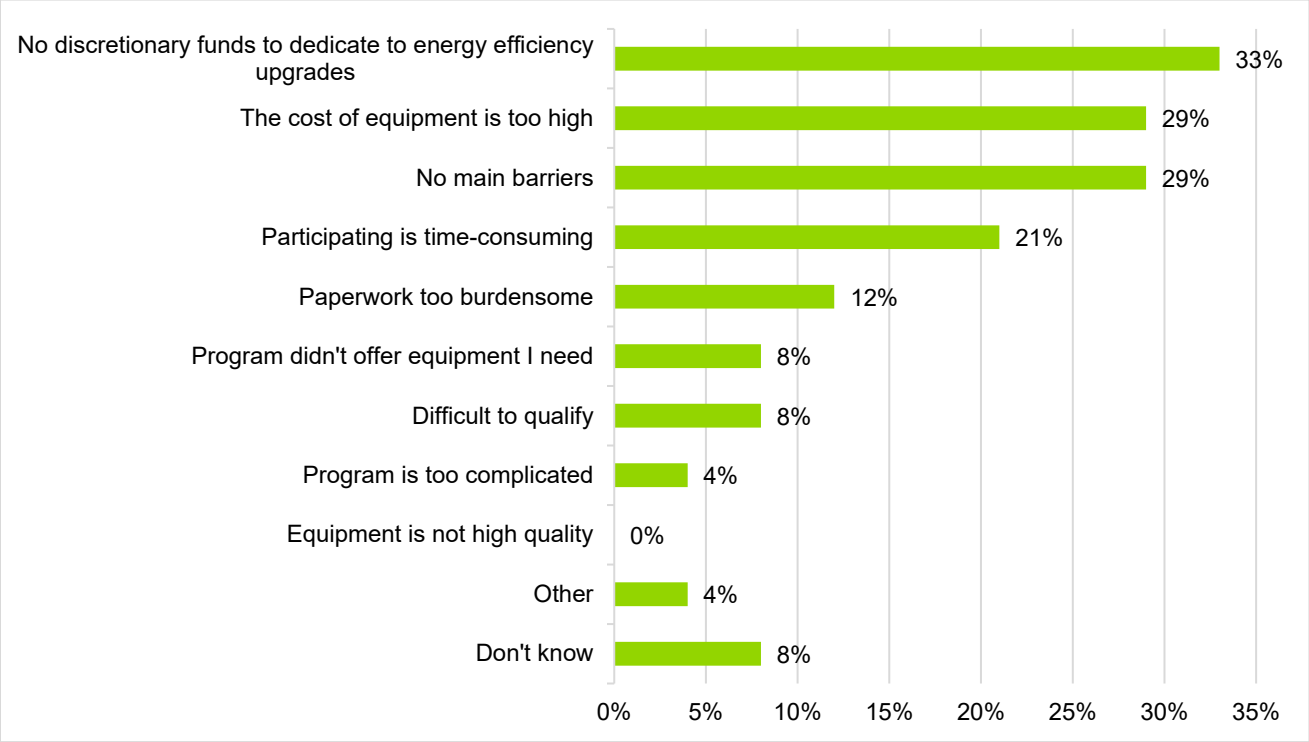
Source: Guidehouse analysis

Three respondents who expressed some dissatisfaction with the program mentioned a few opportunities to improve the program, which represent isolated incidents or unique circumstances of their projects. For instance, one customer was dissatisfied due to not receiving a rebate yet. Another customer stated their contractor was late and took longer than expected to complete the installation. The same customer shared that they had to talk to multiple companies to schedule the installation work. Lastly, a customer was dissatisfied with the program due to demand charges being high in their area compared to another area in PA they lived in previously. These comments provide insight into potential areas Duquesne Light can improve and continue to provide a great program experience for its customers.

Program Barriers and Challenges

Guidehouse also asked participants about program barriers and challenges associated with program participation. As Figure 3-25 shows, 29% of respondents reported that there were no main barriers to participate in the program. Customers indicated common barriers for participation include businesses not having discretionary funds to dedicate to energy efficiency upgrades (33%) and the cost of equipment being too high (29%). Other barriers include participation being too time-consuming (21%), paperwork being too burdensome (12%), the program not offering the necessary equipment (8%), and difficulty qualifying for the program (8%). One respondent stated the only barrier for participating was not knowing about the program. While many participants did not find any barriers to participation, these responses illustrate that small businesses and municipalities struggle with financial barriers most frequently.

Figure 3-25: What do you see as the main barriers for organizations like yours to participating in this Program?
(n = 24; up to 3 options allowed)

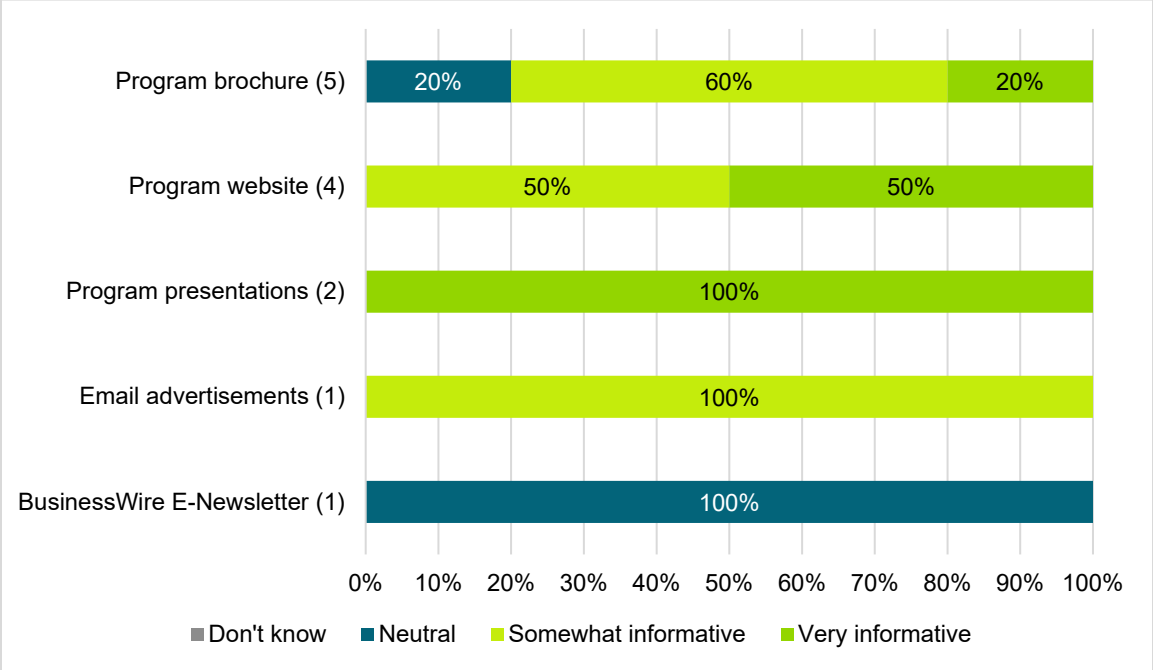


Source: Guidehouse analysis

Program Marketing

Guidehouse asked participants about their awareness of any program marketing materials as well as how informative those materials were. Most respondents (63%) had either not seen any marketing materials or did not know if they had seen them. The most commonly seen marketing materials were the program brochure (21%) and the Duquesne Light website (17%). Among the five respondents who specified they had seen the program brochure, 80% of them believed it to be somewhat or very informative, as shown in Figure 3-26. Of the four customers who were aware of the Duquesne Light website, 100% of respondents reported it was somewhat or very informative. Additionally, the two respondents who had seen the program presentations both reported them to be very informative. These responses indicate that while the program marketing is generally viewed as informative, not many participants have seen these materials.

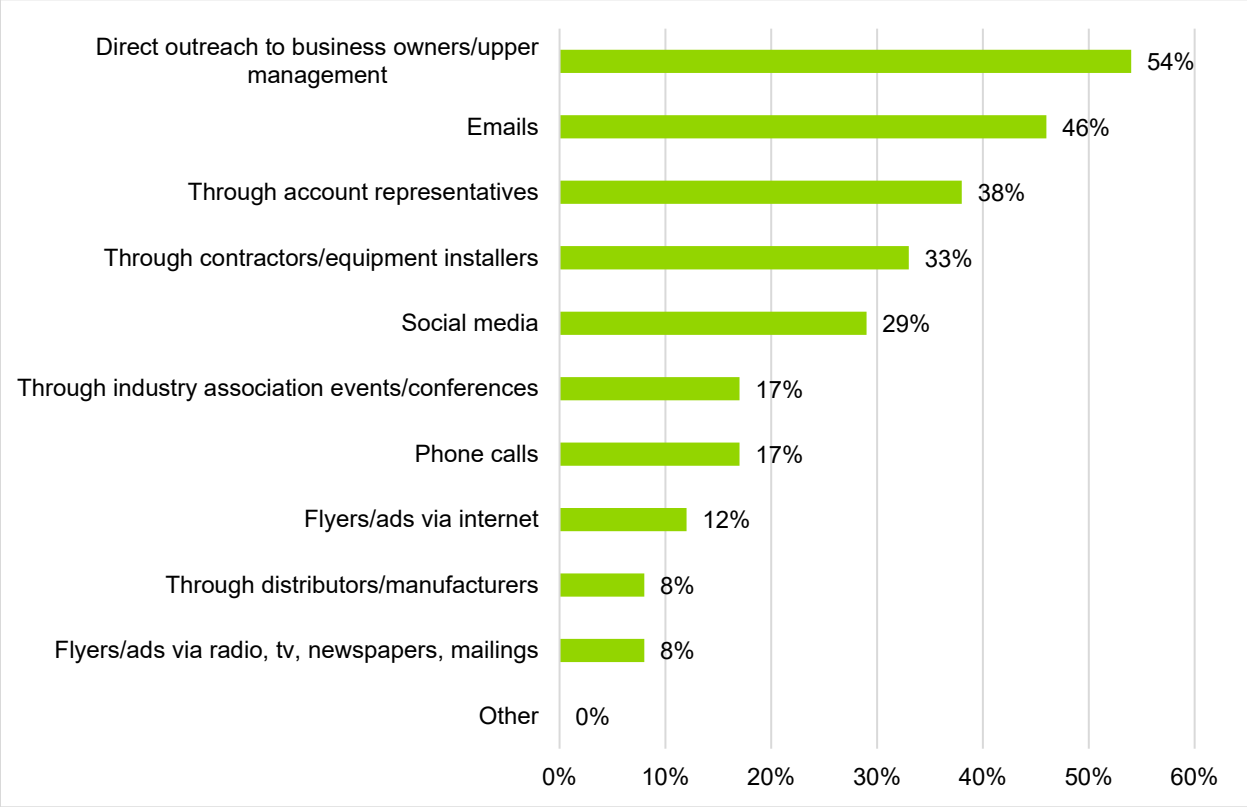
Figure 3-26: How informative were the program marketing efforts that you were aware of, if any?
(multiple options allowed)*



**The number in parenthesis indicates the number of survey respondents who selected each option.*
Source: Guidehouse analysis

Guidehouse also asked survey respondents what would be the best way for Duquesne Light to reach out to customers like themselves to get them to participate in the program. Respondents reported the best methods of outreach were direct outreach to the business owners or upper management (54%), emails (46%), and via account representatives (38%), as shown in Figure 3-27. However, email outreach is not one of the most common ways that customers reported learning about the program (Figure 3-22). This finding demonstrates that email outreach is currently underutilizing and could be a method of contact to which customers are receptive. Recommendations resulting from the survey findings are included in Section 3.8.7.

Figure 3-27: What do you think are the best ways for Duquesne Light to reach out to customers, such as yourself, to get them to participate in the Small Business Direct Install Program?
(n=24; up to three options allowed)



Source: Guidehouse analysis

3.8.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-61. TRC benefits in Table 3-61 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-61: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,811		$ 2,027	
2	Rebates to Participants and Trade Allies	$ 1,209		$ 1,492	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 932		$ 872	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (330)		$ (336)	
		EDC	**CSP**	**EDC**	**CSP**

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
7	Program Design	$ -	$ -	$ 17	$ 15
8	Administration and Management	$ 24	$ 121	$ 44	$ 113
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 67	$ -	$ 319
11	EDC Evaluation Costs	$ 68		$ 81	
12	SWE Audit Costs	$ 7		$ 47	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 287		$ 635	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,098		$ 2,663	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,343		$ 1,837	
16	Total NPV Lifetime Electric Capacity Benefits	$ 770		$ 965	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 233		$ 289	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (173)		$ (201)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,173		$ 2,890	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.04		1.09	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-62 presents program financials and cost-effectiveness on a net savings basis.

Table 3-62: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,675		$ 1,898	
2	Rebates to Participants and Trade Allies	$ 1,118		$ 1,405	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 862		$ 806	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (283)		$ (291)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 17	$ 15
8	Administration and Management	$ 24	$ 121	$ 44	$ 113
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 67	$ -	$ 319
11	EDC Evaluation Costs	$ 68		$ 81	
12	SWE Audit Costs	$ 7		$ 47	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 287	$ 635
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,962	$ 2,533
15	Total NPV Lifetime Electric Energy Benefits	$ 1,243	$ 1,738
16	Total NPV Lifetime Electric Capacity Benefits	$ 712	$ 910
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 216	$ 272
18	Total NPV Lifetime Fossil Fuel Impacts	$ (160)	$ (188)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,010	$ 2,731
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.02	1.08

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.8.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-63 provides a summary of findings, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-63. Small Business Direct Install Findings and Recommendations

Findings	Recommendations
Reported Savings	
• As a direct-install program, Guidehouse anticipates fixture counts and hours of use found on site to closely track ex ante values, and this has generally been the case in prior evaluations. This was not the case for two of the sites sampled in PY14, reducing realization rates.	• Duquesne Light and the CSP should work with the subcontractors involved in this program to improve the accuracy of reported savings, including collecting site-specific data and implementing improved QA/QC procedures.
Duquesne Light Response: Duquesne Light is working with Franklin to improve QA of the projects in this program.	
Reported Savings	
• All projects evaluated in the Small Multifamily Housing Retrofit component of the program saw 100% or near-100% realization rate.	• Duquesne Light and the CSP should continue their efforts in this program.
Duquesne Light Response: Acknowledged.	
Marketing	

Findings	Recommendations
• Although the program participants who saw them viewed the program marketing materials as informative, most of the survey respondents (63%) reported they had not seen any marketing materials or did not know whether they had seen them. • Survey respondents reported the best methods of outreach were direct outreach to the business owners or upper management (54%), emails (46%), and via account representatives (38%). • Forty-six percent of customers reported that emails were the best ways for Duquesne Light to contact customers, but only 4% of respondents learned about the program through an email advertisement.	• Duquesne Light should consider collecting e-mails for SBDI customers and increasing the use of email outreach to contact potential customers about the SBDI program. • Duquesne Light should consider use of additional marketing materials, including leave-behind materials/brochures and follow up emails from the contractors to recommend additional EE measures or respond to any questions.
Duquesne Light Response: Acknowledged.	
Barriers	
• Nearly one third of the survey respondents reported there were no major barriers to participate in the program. Of the reported barriers, the most common barriers were financial barriers, such as lack of discretionary funds to dedicate to EE upgrades (33%) and the high cost of equipment (29%).	• To assist customers in overcoming financial barriers, Duquesne Light should consider adding information on payback periods after program discount is applied for the recommended EE measures in leave-behind materials/brochures or follow-up emails, along with auditor's recommendations, after an initial audit and free measure installation is complete. Additionally, consider including available third-party financing resources prominently in the leave-behind materials, post-visit email communications, and other program resources such as the website.
Duquesne Light Response: Acknowledged.	
Satisfaction	
• Most participants (96%) rated the SBDI program 7 or higher on a scale of 0-10. Participants also reported high satisfaction with the program rebate amount (92%), the initial contact with the energy advisor or Duquesne Light representative (92%), and communication from Duquesne Light or its contractors (92%).	• No recommendations.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

3.9 Small Business Solutions

The Small Business Solutions (SBS) program offers rebates to offset the higher cost of high efficiency equipment 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. The program's primary objective is to provide C&I customers an expedited, quantifiable, and simple-to-understand incentive offering that helps them save energy and money.

The SBS program targets C&I customers having annual demand less than 300 kW, and customer engagement channels to assist customers to overcome unique, segment specific barriers to energy efficiency program participation. The program offers two core participation tracks: prescriptive and custom. The prescriptive track offers a simplified method on predefined

measures without requiring complex analysis and will generally include deemed and partially deemed measures[16] from the TRM. The custom track makes it possible to include more complex, site-specific measures and projects in the programs. Custom projects must be able to show specific and verifiable energy savings and costs using TRM protocols.

3.9.1 Participation and Reported Savings by Customer Segment

Table 3-64 presents the participation counts, reported energy and demand savings, and incentive payments for SBS in PY14 by customer segment.

Table 3-64: Small Business Solutions Participation and Reported Impacts

Parameter	Small C&I	GNI*	Total
PY14 # Participants	167	14	167
PYRTD MWh/yr	8,610	349	8,610
PYRTD MW/yr	1.97	0.08	1.97
PY14 Incentives ($1,000)	$395	$36	$395

**Small C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

3.9.2 Gross Impact Evaluation

The Business Solutions programs (SBS/LBS) are projected to account for approximately 47% of all Duquesne Light's Phase IV savings (residential and nonresidential). The realization rate for all three of its predecessor programs (Commercial Energy Program, Industrial Energy Program, and Express Efficiency) was consistently close to 100% during Phase III. To date, the SBS and LBS programs have achieved a lower percentage of the portfolio savings than anticipated, due in large part to the overperformance of the midstream programs.

Similar to other nonresidential programs, Guidehouse is evaluating the SBS program on a specified schedule. As detailed in the evaluation plan, Guidehouse applied the PY12 realization rate for Express Efficiency to the PY13 SBS program. Guidehouse evaluated a sample of projects in PY13, and the realization rates for these projects combined with projects evaluated in PY14 have been applied in PY14.

Because of the size of this initiative, Guidehouse is targeting an 85/15 confidence/precision level for the small and large programs individually over a 2-year period.

Table 3-65 presents the gross impact results for energy, and Table 3-66 presents the gross impact results for demand.

[16] A list of measures considered prescriptive is available at https://www.duqenergyefficiency.com/business-solutions.

Table 3-65: Small Business Solutions Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Medium	5,119	92%	0.09	7%
Small	3,170	105%	0.22	13%
LED	321	100%	-	0%
Program Total	**8,610**	**97%**		**6%**

Source: Guidehouse analysis

Table 3-66: Small Business Solutions Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Medium	1.15	99%	0.02	2%
Small	0.72	116%	0.74	42%
LED	0.10	100%	-	0%
Program Total	**1.97**	**105%**		**15%**

Source: Guidehouse analysis

Nine of the thirteen sampled projects had energy realization rates within 5% of 100%. Ten of thirteen sampled projects had demand realization rates within 5% of 100%. All three projects from PY13 that were included in the PY14 realization rate calculations were had realization rates very near 100% for both energy and demand.

For the four sites that had realization rates differing by more than 5%, the primary factor affecting savings was verified differences in hours of use, which also changed the coincidence factors for these sites. This led to higher verified savings for two sites and lower savings for the other two. Minor discrepancies in fixture quantities were reported in three of the four sites, but this had minimal affect on realization rate.

3.9.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY14 for the Small (SBS) and Large (LBS) Business Solutions Programs together. The evaluation team's free ridership and spillover research aligned to the methodologies required by the SWE Evaluation Framework.[17] Guidehouse attempted a census of all PY14 program participants using online surveys. The

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

evaluation team attempted to contact participants up to four times via email, achieving 21 survey completes for the net impact portion of the survey, as shown in Table 3-70 of Section 3.9.5.1. Each participant was asked about one project and up to three measures, with one question on whether their decision-making was the same for any other projects if they participated in the program multiple times during PY14. The estimated free ridership, spillover, and NTG results are shown in Table 3-67.

Table 3-67. PY14 Small Business Solutions and Large Business Solutions Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTG Ratio	Sample C_v	Relative Precision at 85% CL
SBS	35%	1%	66%	0.22	7.8%
LBS	57%	0%	43%	0.07	8.7%
Total	**51%**	**0%**	**50%**		**3.5%**

Source: Guidehouse analysis

3.9.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY14. The team reviewed the PY14 nonresidential program activities and identified LED interior Lighting Fixtures and LED Exterior Lighting Fixtures as HIMs. Table 3-68 presents estimated free ridership, spillover, and NTG ratios for these HIMs for the SBS and LBS programs.

Table 3-68. PY14 Small Business Solutions and Large Business Solutions High Impact Measures

Program	HIM	Free Ridership	Spillover	NTG Ratio
SBS	LED Interior Lighting Fixture	56%	0%	44%
LBS	LED Exterior Lighting Fixture	25%	0%	75%

Source: Guidehouse analysis

3.9.4 Verified Savings Estimates

In Table 3-69, 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 SBS in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-69: Small Business Solutions PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	8,610	1.97
PYVTD Gross	8,360	2.07
PYVTD Net	5,489	1.36

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
RTD	14,898	3.26
VTD Gross	16,883	4.62
VTD Net	12,146	3.35

Source: Guidehouse analysis

3.9.5 Process Evaluation

Guidehouse completed process evaluation for SBS and LBS in PY14. As part of this evaluation, the team fielded online surveys to program participants to obtain feedback about their experience and satisfaction with the program delivery processes and opportunities for program improvement. The team also conducted interviews with program managers and the CSPs. These interviews aided survey question updates. The evaluation team combined the findings for these two programs in one section because of similarities in how these programs are implemented and the findings that resulted from this evaluation. The following sections discuss the approach, results, and findings for process evaluation of SBS and LBS.

3.9.5.1 Participant Survey Methodology

The participant survey focused on customers who participated in SBS and LBS in PY14. Guidehouse attempted a census and distributed the survey via email to 111 participants. The team received 21 fully completed surveys and three partially completed surveys. Table 3-70 provides an overview of the sample design.

Table 3-70: PY14 Small Business Solutions and Large Business Solutions Participant Survey Sample Design

Component	Population Count*	Evaluation Method	Targeted Sample Surveys	Completed Surveys	Response Rate
Small Business	84	Online survey	10	19	23%
Large Business	27	Online survey	10	2	7%
Total	**111**		**20**	**21**	**19%**

**The population is representative of program participants who have chosen to not opt out of the program at the time of surveying. This population count, related to the participant survey, differs from the gross impact evaluation population count where the population is defined as the number of unique project IDs.*

Source: Guidehouse analysis

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

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

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

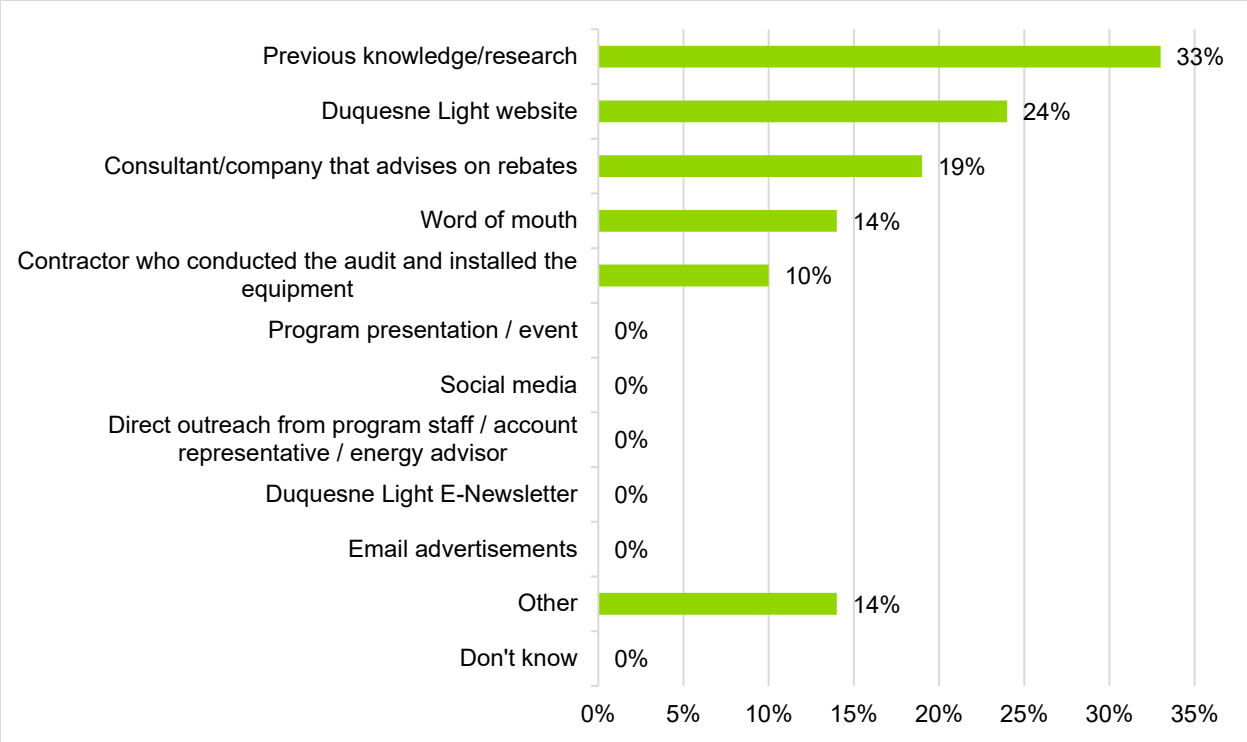
3.9.5.2 Participant Survey Findings

The following sections present the responses collected through this survey for participant awareness, program's influence on customers' decision-making and behavior, customer satisfaction ratings, and barriers and challenges with the program.

Program Awareness

Guidehouse asked participants to identify how they first heard about the SBS and LBS programs. As Figure 3-28 shows, respondents indicated the most common sources of program awareness are previous knowledge or research (33%), Duquesne Light website (24%), and a consultant or company that advises on rebates (19%). The three participants (19%) who selected "other" reported that they became aware of the program through lighting vendors. Notably, there were no respondents who first heard about the program through email advertisements, Duquesne Light's E-Newsletter, direct outreach from program staff, social media, or a program presentation or event. In PY11, respondents indicated the most common source of program awareness was the contractor who conducted the audit and installed the equipment (28%). However, in PY14, only 10% of respondents reported learning about the program through the contractor, indicating that contractors play a less significant role in recruiting participants than they have in the past. Additionally, given that a large portion of participation is due to participants' previous knowledge, these results indicate a low focus on marketing and outreach to new customers for this program.

Figure 3-28: How did you learn about the Small and Large Business Solutions Program?
(n = 21; multiple options allowed)

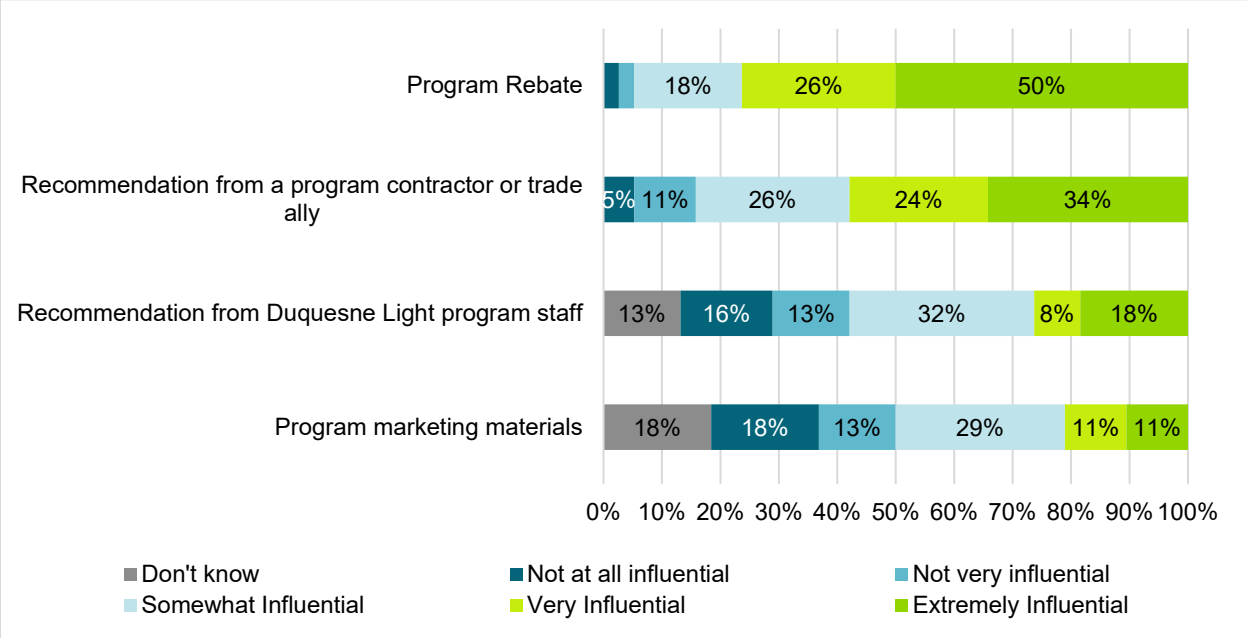


Source: Guidehouse analysis

Program Influence

Guidehouse asked participants how much the program influenced them to purchase and install energy efficient equipment. In general, responses show that multiple program components played a critical role in influencing customer behavior. The program rebate and recommendations from a program contractor or trade ally were the most influential in their decision to purchase energy efficient equipment with 76% and 58% of respondents, respectively, reporting being very or extremely influenced in their decision. The program marketing materials were the least influential in promoting program participation of the options provided; however, 22% of respondents still reported they were very or extremely influential in their decision. These results indicate that monetary incentives and information provided by trusted advisors have the strongest influence on participants, while current program marketing has the least influence. Figure 3-29 provides an overview of the responses.

Figure 3-29: How influential were the following on your decision to install this energy efficient equipment?
(n = 38)[18]



Source: Guidehouse analysis

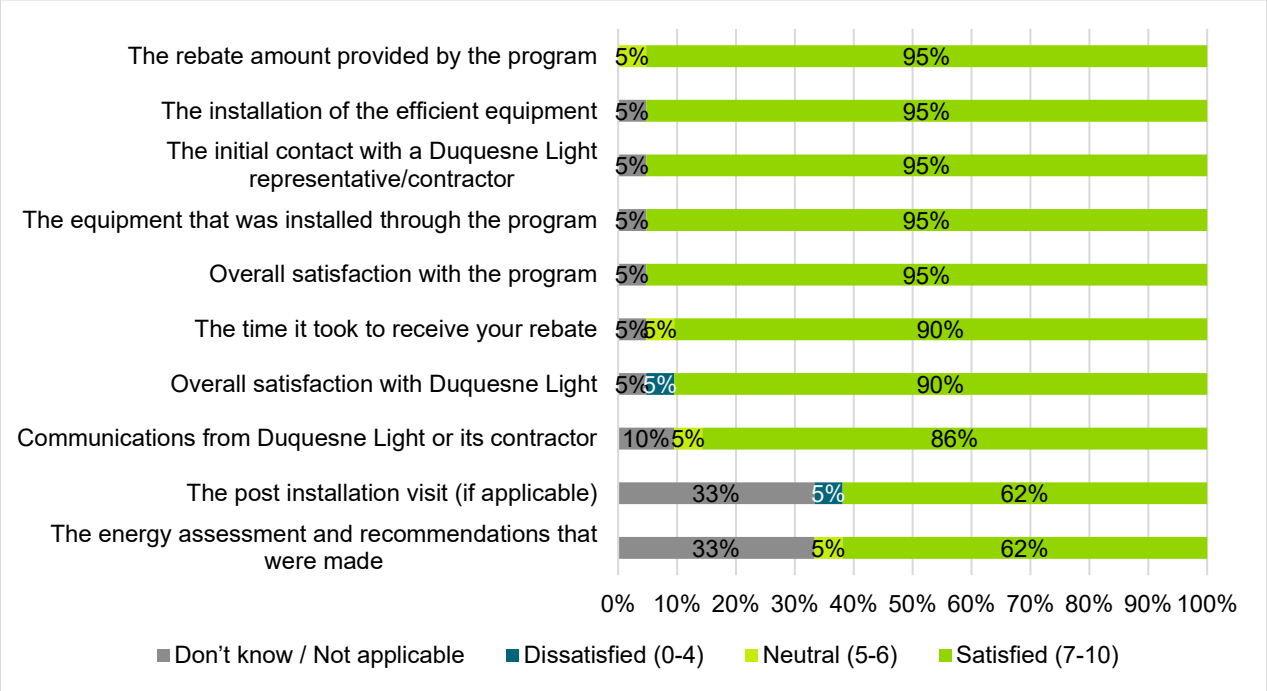
Satisfaction

Guidehouse also gauged participants' sentiments toward various aspects of the program to understand how the program can be improved in the future. Most participants (95%) rated the program 7 or higher on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied, with an average score of 9.3. Most respondents also rated each step of the program participation process 7 or higher. Participants provided the highest ratings for the overall program satisfaction, the initial contact with Duquesne Light, the installation of the equipment, the equipment installed, and the rebate provided, with 95% of respondents providing a score of 7 or higher. Participants also reported high satisfaction with Duquesne Light overall (90%) and communication from Duquesne Light (86%). Although it may appear that satisfaction was lower

[18] This question was asked at the measure level. Therefore, if customers received more than one measure through the program, they answered this question separately for each measure.

for the energy assessment and post installation visit, this is due to participants not receiving a post installation visit or an energy assessment as shown by a large percentage of respondents (33%) who reported the elements were not applicable or the customer did not know about it. Figure 3-30 shows the results of customer satisfaction with the program. Based on these results, overall, participants are very satisfied with the program.

Figure 3-30: Please rate your satisfaction with each of the following elements.
(n = 21)



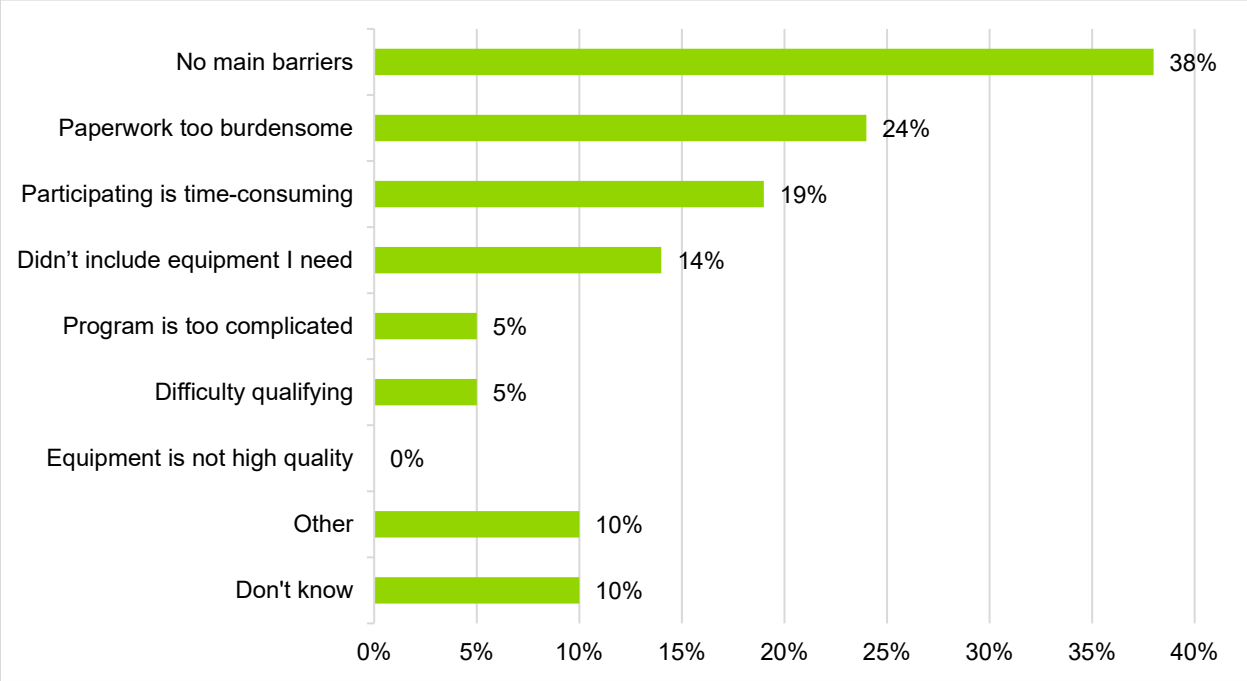
Source: Guidehouse analysis

Two respondents who expressed some dissatisfaction with the program mentioned a few opportunities to improve the program, which represent isolated incidents or unique circumstances of their projects. For instance, one customer was dissatisfied due to the post installation visit conducted by the CSP being time-consuming. Another customer stated they were frustrated with billing and payment application issues.

Program Barriers and Challenges

Guidehouse also asked participants about program barriers and challenges associated with program participation. As Figure 3-31 shows, 38% of respondents reported that there were no main barriers to participate in the program. Roughly one-quarter (24%) of customers indicated that paperwork is too burdensome, and one-fifth (19%) reported that participating is time-consuming. Additionally, 14% of survey respondents reported that the program did not include equipment they needed. Guidehouse also inquired about if participants were considering other EE upgrades in their facilities besides lighting, and more than half of the respondents (57%) reported they were. While many participants did not find any barriers to participation, these responses illustrate that Duquesne Light could consider further streamlining program processes by reducing paperwork, where and if possible, identifying methods to reduce the time commitment required to participate in this program, and extending additional rebate offers to other energy efficient equipment.

Figure 3-31: What do you see as the main barriers for organizations like yours to participating in the program?
(n = 21; three options allowed)



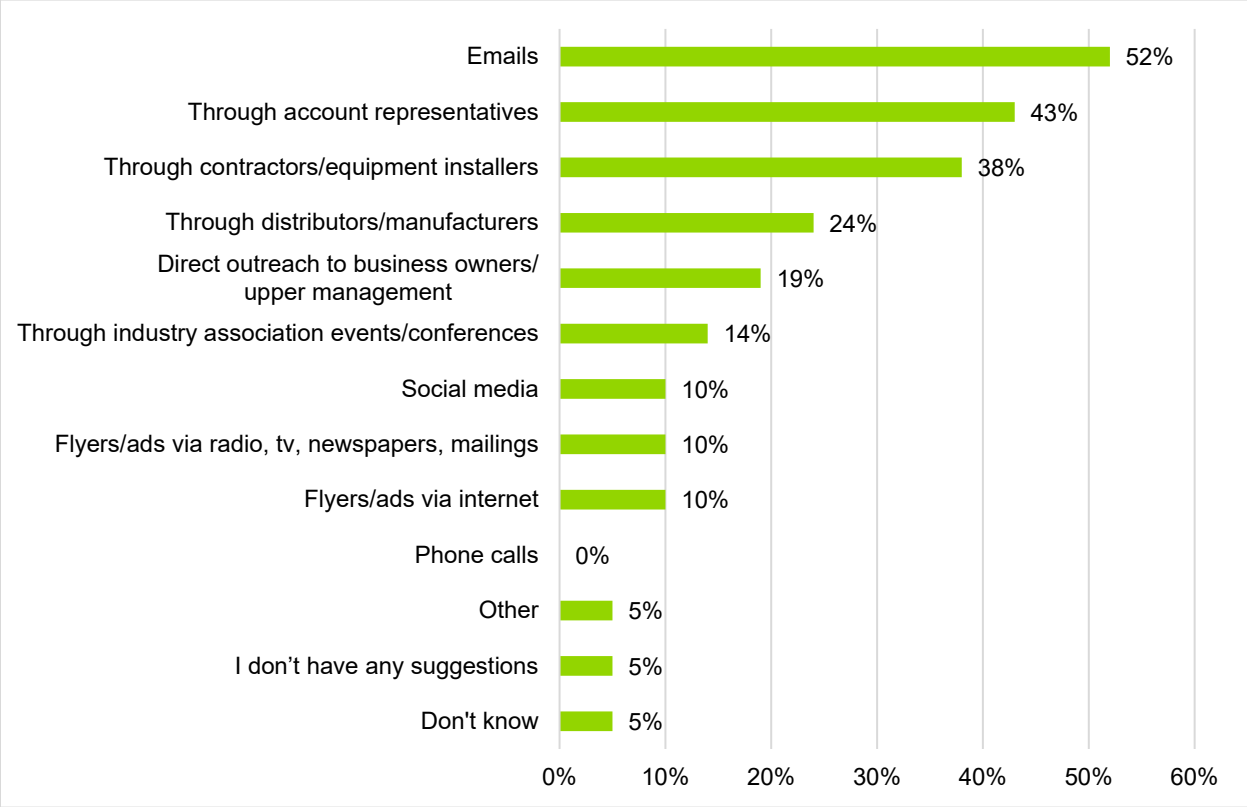
Source: Guidehouse analysis

Marketing

Guidehouse asked participants what marketing materials they were aware of and to indicate how informative those materials were. Most survey respondents (90%) reported to have seen the Duquesne Light's website and information about energy efficiency opportunities. Of those who have seen the website, 79% reported that it was either very or somewhat useful to them. When considering other program marketing materials, only about 29% of survey respondents were aware of other marketing materials aside from the program website, such as the program brochure, email advertisements, Duquesne Light E-newsletter, and application form. When excluding the Duquesne Light website, more than half (52%) of respondents said they had not seen any marketing materials for the program.

Guidehouse also asked survey respondents what would be the best way for Duquesne Light to reach out to customers like themselves to get them to participate in the program. More than half of the respondents said email is the best method (52%), followed by through their account representatives (43%) and contractors/equipment installers (38%), as shown in Figure 3-32. These best contact methods do not align with how customers reported learning about the program (Figure 3-28). These findings demonstrate that outreach via email, account representative, and contractor is currently underutilized and could be methods of contact to which customers are receptive. Recommendations resulting from the survey findings are included in Section 3.9.7.

Figure 3-32: What do you think are the best ways for Duquesne Light to reach out to customers like you to get them to participate in the program?
(n = 21, multiple option allowed)



Source: Guidehouse analysis

3.9.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-71. TRC benefits in Table 3-71 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-71: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,331		$ 2,208	
2	Rebates to Participants and Trade Allies	$ 395		$ 821	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 936		$ 1,387	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 14	$ 15

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
8	Administration and Management	$ 27	$ 117	$ 47	$ 109
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 634	$ -	$ 1,104
11	EDC Evaluation Costs	$ 65		$ 79	
12	SWE Audit Costs	$ 7		$ 47	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 850		$ 1,415	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,181		$ 3,623	
15	Total NPV Lifetime Electric Energy Benefits	$ 3,729		$ 7,186	
16	Total NPV Lifetime Electric Capacity Benefits	$ 2,226		$ 4,774	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 360		$ 665	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (547)		$ (894)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 5,768		$ 11,731	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.65		3.24	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-72 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY14 comes from the PY14 Net Impact Evaluation.

Table 3-72: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 878		$ 1,580	
2	Rebates to Participants and Trade Allies	$ 261		$ 599	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 408		$ 699	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 14	$ 15
8	Administration and Management	$ 27	$ 117	$ 47	$ 109
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 634	$ -	$ 1,104
11	EDC Evaluation Costs	$ 65		$ 79	
12	SWE Audit Costs	$ 7		$ 47	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 850	$ 1,415
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,728	$ 2,995
15	Total NPV Lifetime Electric Energy Benefits	$ 2,461	$ 5,215
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,469	$ 3,494
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 238	$ 481
18	Total NPV Lifetime Fossil Fuel Impacts	$ (361)	$ (639)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,807	$ 8,551
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.20	2.86

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.9.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-73 provides a summary of findings, along with Duquesne Light's plans to address program recommendations.

Table 3-73. Small Business Solutions Findings and Recommendations

Findings	Recommendations
Reported Savings	
• The SBS and LBS programs showed realization rates very close to 100%, indicating that the CSP has accurately estimated savings for this program based on participation and project information.	• Duquesne Light and the CSP should continue their strong efforts in this program.
Duquesne Light Response: Acknowledged.	
Program Awareness, Influence, and Marketing	
• Survey respondents indicated the most common sources of program awareness are previous knowledge or research (33%), Duquesne Light website (24%), and a consultant or company that advises on rebates (19%). Installation contractors accounted for 10% of awareness for the program. • Recommendations from a program contractor or trade ally had substantial influence on participants' decision to install EE equipment (58% were either somewhat or extremely influenced), indicating customers are very receptive to recommendations made by their installation contractors. • The best methods of outreach, as reported by survey respondents, were via email (52%), account representatives (43%), and installation contractors (38%). • Most survey respondents (90%) reported to have seen the Duquesne Light website and information about energy efficiency opportunities. However, only about 29% of survey respondents	• If Duquesne Light would like to bring in new customers into the program, Duquesne Light should consider additional or improved marketing methods, such as email advertisements, direct outreach by account representatives or program staff, and through installation contractors, to increase awareness of the program to C&I customers and municipalities across the Duquesne Light territory. • Duquesne Light should consider expanding their trade ally network and work directly with installation contractors in the Duquesne Light territory, providing them with

Findings	Recommendations
were aware of other marketing materials aside from the program website, such as the program brochure, email advertisements, Duquesne Light E-newsletter, etc. Excluding the program website, more than half (52%) of respondents reported they had not seen any other marketing materials for the program.	program information and marketing materials, which they can use to inform customers about the program when providing price quotes to customers.
Duquesne Light Response: Acknowledged.	
Program Awareness and Marketing	
• More than half of all survey respondents (57%) reported they are considering other energy efficiency upgrades for their facility besides lighting.	• If Duquesne Light would like to see greater participation of measures beyond lighting in this program, Guidehouse recommends increasing marketing of other measures being offered through the program.
Duquesne Light Response: Acknowledged.	
Satisfaction	
• Nearly all participants (95%) rated the program 7 or higher on a scale of 0-10, where 0 means not at all satisfied and 10 means very satisfied, with an average score of 9.3.	• No recommendations.
Duquesne Light Response: Acknowledged.	
Satisfaction	
• Most participants (95%) rated the program 7 or higher on a scale of 0-10. Participants provided the highest ratings for the overall program satisfaction, the initial contact with Duquesne Light, the installation of the equipment, the equipment installed, and the rebate provided, with 95% of respondents providing a score of 7 or higher.	• No recommendations.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

3.10 Small Business Midstream Solutions

The Nonresidential Midstream Lighting program delivers incentives to end-use customers via C&I product distributors or manufacturers. End-use customers, property/facility managers, and installation contractors acting on behalf of C&I end-use customers purchase qualified products from a participating distributor. The program shows the impact of a midstream delivery method of energy efficient lighting using a buy-down pricing strategy. The participating distributors discount targeted product wholesale prices at the POS and in turn receive an incentive payment. The program design removes barriers to participation by providing a streamlined, simple solution for C&I customers and their contractors to receive the incented price for qualifying products with no additional effort on their part. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, to the customer and distributor, there is only one program.

End-use customers installing the discounted equipment were identified by the participating distributors (based on self-reports from the buyers) to enable evaluation at the customer level. However, some of the end-use customers are not cognizant of their participation in a program and the normal level of cooperation with the evaluation's verification may be challenging. Further, customers may or may not keep track of where they have installed specific equipment that was obtained from the individual purchase selected for verification by the evaluation team.

In Phase III, this has led to more difficulty in contacting and verifying midstream customers. Guidehouse addresses this issue by oversampling this program to ensure that statistical targets are met and working directly with the CSP and Duquesne Light to identify points of contact for this program.

3.10.1 Participation and Reported Savings by Customer Segment

Table 3-74 presents the participation counts, reported energy and demand savings, and incentive payments for Small Business Midstream Solutions (SBMS) in PY14 by customer segment.

Table 3-74: Small Business Midstream Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY14 # Participants	2,191	238	2,191
PYRTD MWh/yr	39,669	5,916	39,669
PYRTD MW/yr	8.66	1.14	8.66
PY14 Incentives ($1,000)	$6,394	$939	$6,394

**Small C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

3.10.2 Gross Impact Evaluation

The Phase IV evaluation plan did not call for an evaluation of the midstream programs in PY14. However, the SBMS and LBMS programs combined contributed to more than 50% of portfolio savings. This level of savings, and the unique situation of a large percentage of savings being reported as unverified in PY13, Guidehouse, in consultation with the SWE, decided to move the planned PY15 evaluation to PY14. The Phase IV plan for evaluating the program impacts includes sampling stratified by level of energy savings to achieve 85/15 confidence/precision for the initiative as a whole (i.e., the small and large C&I programs combined).

Guidehouse assigned each project to various strata based on that project's energy savings. The large stratum includes projects in the upper portion of the Midstream program component's energy savings; the medium stratum includes projects in the middle portion of the Midstream energy savings; and the small stratum represents the bottom portion of the Midstream energy savings. Appendix E details the sample design for SBMS and LBMS. To date, there have only been three non-lighting projects included in SBMS, and since these projects account for <1% of program savings, Guidehouse has excluded these from sampling and applied the program-level realization rates to these measures.

When randomly selecting sample projects, Guidehouse selected projects based on the energy savings (MWh) stratification of each project. Projects selected in the random sample received a site verification visit unless the project included 10 or fewer bulbs, in which case they received a phone verification.

Table 3-75 presents the gross impact results for energy, and Table 3-76 provides the gross impact results for demand.

Table 3-75: Small Business Midstream Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBMS - Large	12,945	133%	0.63	43%
SBMS - Medium	22,871	121%	0.29	12%
SBMS - Small	3,853	86%	0.72	50%
Program Total*	**39,669**	**122%**		**13%***

**SBMS and LBMS were evaluated as one program, and as such rolled up together. The relative precision value reported is for SBMS and LBMS combined.*

Source: Guidehouse analysis

Table 3-76: Small Business Midstream Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBMS - Large	3.07	110%	0.42	29%
SBMS - Medium	4.86	134%	0.47	20%
SBMS - Small	0.73	90%	0.36	25%
Program Total*	**8.66**	**122%**		**11%***

**SBMS and LBMS were evaluated as one program, and as such rolled up together. The relative precision value reported is for SBMS and LBMS combined.*

Source: Guidehouse analysis

Unlike previous years of Duquesne Light's Midstream Lighting programs, site visits for the PY13 evaluation found that many bulbs purchased through the program had not yet been installed as required by the program. The primary reason indicated by site contacts for uninstalled bulbs was difficulty finding the labor to install the bulbs after purchasing them. In all cases where lights were not yet installed, the lights were found on site in storage awaiting installation. Nearly half of sites (n=6) in Small Business Midstream had a portion of the purchased bulbs installed, with the remainder in storage awaiting installation.

After discussing the situation with the SWE, Guidehouse considered the lights that were not yet installed as unverified savings, and installed fixtures as verified savings. The unverified savings percentage from the evaluated projects was applied to the overall ex-ante savings for the program. These unverified savings, representing 38% of ex-ante energy savings and 42% of ex-ante demand savings, were included in the reported (ex-ante) savings, but not to the verified savings. Guidehouse revisited these sites during the first half of PY14 to confirm if these bulbs had been installed. For the lights that had been installed, the updated and increased savings have been applied in PY14, increasing the realization rates. Those bulbs that had not been

installed at the time of the follow-up visit were considered to have zero verified savings and the realization rates for that site remained unchanged.

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

- At approximately 50% of evaluated Small Business Midstream sites (n=8), Guidehouse found minor discrepancies in hours of use, fixture quantities, and coincidence factors. These resulted in realization rates between 90% and 110% for both energy and demand.
- One site was listed in the database as a warehouse but was found to be a 3-shift manufacturing facility that runs 24 hours a day, 7 days a week. This discrepancy led to a high realization rate of 364% for energy and 185% for demand. This was the largest project in the PY14 Small Business Midstream sample and was a main driver of program realization rate.
- Similarly, another site was reported originally as a 2-shift manufacturing site, but the site contact noted that the facility runs 24 hours a day, 5 days a week. Updating the hours of use resulted in a realization rate of 138% for energy and 105% for demand.
- One site was found to have lower fixture quantities and significantly lower hours of use than the deemed value in the TRM. This led to a 57% realization rate for energy and 45% for demand.

3.10.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBMS and LBMS in PY14. Guidehouse will complete an NTG evaluation in PY15 for this program.

3.10.3.1 HIM Research

Guidehouse did not conduct HIM research for measures implemented during PY14 for the Midstream program.

3.10.4 Verified Savings Estimates

Due to program design, distributors serve customers of all sizes regardless of which program customers participate. Therefore, Guidehouse applied realization rates and NTG ratios to the energy and demand savings for both Large (LBMS) and Small (SBMS) Midstream Solutions to calculate verified savings estimates. Table 3-77 presents the verified savings estimates for SBMS in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-77: Small Business Midstream PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	39,669	8.66
PYVTD Gross	48,220	10.55
PYVTD Net	32,308	7.07
RTD	50,334	10.79

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	54,658	12.09
VTD Net	36,943	8.18

Source: Guidehouse analysis

3.10.5 Process Evaluation

Guidehouse did not conduct a process evaluation for Nonresidential SBMS in PY14 and plans to complete it in PY15.

3.10.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-78. TRC benefits in Table 3-78 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-78: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 12,119		$ 13,036	
2	Rebates to Participants and Trade Allies	$ -		$ 1,502	
3	Upstream/Midstream Incentives	$ 6,394		$ 5,981	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 5,725		$ 5,553	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 12	$ 9
8	Administration and Management	$ 25	$ 80	$ 44	$ 75
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 2,849	$ -	$ 3,557
11	EDC Evaluation Costs	$ 44		$ 53	
12	SWE Audit Costs	$ 5		$ 31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 3,003		$ 3,781	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 15,122		$ 16,817	
15	Total NPV Lifetime Electric Energy Benefits	$ 21,714		$ 23,186	
16	Total NPV Lifetime Electric Capacity Benefits	$ 11,468		$ 12,398	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 2,419		$ 2,752	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (3,386)		$ (3,553)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 32,215	$ 34,783
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.13	2.07

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-79 presents program financials and cost-effectiveness on a net savings basis.

Table 3-79: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 8,120		$ 8,819	
2	Rebates to Participants and Trade Allies	$ -		$ 1,081	
3	Upstream/Midstream Incentives	$ 4,284		$ 4,007	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 2,570		$ 2,506	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 12	$ 9
8	Administration and Management	$ 25	$ 80	$ 44	$ 75
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 2,849	$ -	$ 3,557
11	EDC Evaluation Costs	$ 44		$ 53	
12	SWE Audit Costs	$ 5		$ 31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 3,003		$ 3,781	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 11,123		$ 12,600	
15	Total NPV Lifetime Electric Energy Benefits	$ 14,548		$ 15,678	
16	Total NPV Lifetime Electric Capacity Benefits	$ 7,683		$ 8,391	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 1,621		$ 1,868	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (2,268)		$ (2,400)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 21,584		$ 23,537	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.94		1.87	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.10.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-80 summarizes the findings and recommendations for SBMS; each table also includes summaries of how Duquesne Light plans to address the recommendation in program delivery.

Table 3-80. Small Business Midstream Program Findings and Recommendations

Findings	Recommendations
Impact	
• In PY13, approximately 25% of projects (n=6, representing ~20% of evaluated savings) had some or all light fixtures/bulbs remaining in storage at the time of evaluation. The most commonly cited reason for this was a lack of labor availability for installation. Two sites also had equipment (lift) issues resulting in delayed installation. Guidehouse recommended that the CSP revisit these sites and increase QA/QC activity. PY14 saw no SBMS sites with a significant number of bulbs awaiting installation.	• The CSP should continue with the enhanced QA/QC process.
Duquesne Light Response: Accepted.	

Source: Guidehouse analysis

3.11 Small Business Virtual Commissioning

The Virtual Commissioning (VCx) programs use a turnkey approach that targets system-based no- to low-cost operational savings for commercial customers and public facilities. These 100% pay-for-performance programs do not fit a traditional model that uses trade allies, mass marketing, or standardized prescriptive retrofits; rather, they provide a targeted, data-driven approach to energy efficiency engagement that effectively eliminates the need for enrollment forms, incentives, or administrative costs. This program is filed as two programs in Duquesne Light's Phase IV plan—one as a small C&I program and one as a large C&I program. However, to the customer and implementer there is only one program.

The Small Business Virtual Commissioning (SBVCx) program targets customers having annual maximum demand less than 300kW. The CSP for this program is Franklin Energy, who subcontracts out to a Virtual Commissioning specialist, Power TakeOff. The program used advanced metering infrastructure (AMI) data analytics to identify and qualify customers with significant potential for energy savings. The identification process uses data modeling techniques to selectively pinpoint individual meters with significant potential for operational energy savings. Customers are then contacted by the CSP to help them understand their energy usage and provide them with personalized recommendations for low- to no-cost energy savings opportunities. Facilities that are confirmed to have implemented changes based on their recommendations are continuously monitored after participation to ensure savings persistence, and if a pre-determined level of savings drift is detected, the customer is re-engaged.

3.11.1 Participation and Reported Savings by Customer Segment

Table 3-81 presents the participation counts, reported energy and demand savings, and incentive payments for SBVCx in PY14 by customer segment.

Table 3-81: Small Business Virtual Commissioning Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY14 # Participants	7	2	7
PYRTD MWh/yr	500	108	500
PYRTD MW/yr	0.02	-	0.02
PY14 Incentives ($1,000)	$95	$19	$95

Source: Guidehouse analysis

3.11.2 Gross Impact Evaluation

SBVCx reported savings for 23 projects in PY14. Of these, 7 had more than one year (365 days) of post-intervention data, which the SWE requires for inclusion in reported savings. Guidehouse evaluated all 7 of these projects. Table 3-82 and Table 3-83 show the realized verified energy and demand savings, respectively, for the program.

Table 3-82: Small Business Virtual Commissioning Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx – Small	500	94%	-	0%
Program Total	**500**	**94%**		**0%**

Source: Guidehouse analysis

Table 3-83: Small Business Virtual Commissioning Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx – Small	0.02	494%	-	0%
Program Total	**0.02**	**494%**		**0%**

Source: Guidehouse analysis

Most projects showed realization rates near 100% for energy. Guidehouse used an hourly analysis where the implementer used a daily energy model. This led to a low (72%) realization rate for that site. However, Guidehouse found that four of the seven sites had significant demand savings that was not claimed, leading to the high realization rate for demand.

3.11.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBVCx in PY14. Guidehouse plans to complete an NTG evaluation in PY15 for this program.

3.11.3.1 HIM Research

Guidehouse did not conduct HIM research for SBVCx in PY14.

3.11.4 Verified Savings Estimates

In Table 3-84, the realization rates determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBVCx in PY14. There were no program savings in PY13, so the savings reported this year will be the only savings in P4TD.

Table 3-84: Small Business Virtual Commissioning PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	500	0.02
PYVTD Gross	472	0.12
PYVTD Net	472	0.12
RTD	500	0.02
VTD Gross	472	0.12
VTD Net	472	0.12

Source: Guidehouse analysis

3.11.5 Process Evaluation

Guidehouse did not conduct a process evaluation for the SBVCx program in PY14 and plans to complete it in PY15.

3.11.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-85. TRC benefits in PY14 Table 3-85 were calculated using gross verified impacts. NPV costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-85: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
1	**Incremental Measure Costs (IMCs)**	$ -	$ -
2	Rebates to Participants and Trade Allies	$ 95	$ 89
3	Upstream/Midstream Incentives	$ -	$ -
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -	$ -
5	Direct Installation Program Materials and Labor	$ -	$ -

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (95)		$ (89)	
		EDC	CSP	EDC	CSP
7	Program Design	$ -	$ -	$ 1	$ 4
8	Administration and Management	$ 24	$ 20	$ 44	$ 19
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 28	$ -	$ 58
11	EDC Evaluation Costs	$ 11		$ 13	
12	SWE Audit Costs	$ 1		$ 4	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 84		$ 144	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 84		$ 144	
15	Total NPV Lifetime Electric Energy Benefits	$ 210		$ 196	
16	Total NPV Lifetime Electric Capacity Benefits	$ 126		$ 118	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 336		$ 315	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	4.00		2.19	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-86 presents program financials and cost-effectiveness on a net savings basis.

Table 3-86:Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ 95		$ 89	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (95)		$ (89)	
		EDC	CSP	EDC	CSP
7	Program Design	$ -	$ -	$ 1	$ 4
8	Administration and Management	$ 24	$ 20	$ 44	$ 19
9	Marketing	$ -	$ -	$ -	$ -

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
10	Program Delivery	$ - $ 28	$ - $ 58
11	EDC Evaluation Costs	$ 11	$ 13
12	SWE Audit Costs	$ 1	$ 4
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 84	$ 144
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 84	$ 144
15	Total NPV Lifetime Electric Energy Benefits	$ 210	$ 196
16	Total NPV Lifetime Electric Capacity Benefits	$ 126	$ 118
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ -	$ -
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 336	$ 315
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	4.00	2.19

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.11.7 Status of Recommendations

The impact evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-87 provides a summary of findings, along with Duquesne Light's plan to address to recommendation in program delivery.

Table 3-87: Small Business Virtual Commissioning Program Findings and Recommendations

Findings	Recommendations
Impact	
• Guidehouse found that four of the seven SBVCx projects included in the PY14 evaluation did not report demand savings. When Guidehouse calculated savings for these projects, there was significant demand savings, leading to a demand realization rate of 494%.	• Duquesne Light and the CSP should ensure that demand savings are reported for each project where the intervention leads to statistically significant reduction in peak demand for the site.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

3.12 Large Business Solutions

The Large Business Solutions (LBS) program offers rebates to offset the higher cost of high efficiency equipment 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. The programs' primary objective is to provide C&I customers an expedited, quantifiable, and simple-to-understand incentive offering that helps them save energy and money. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, to the customer there is only one program.

The LBS program targets C&I customers having annual demand savings greater than or equal to 300 kW. The LBS program will employ targeted customer engagement channels to assist customers to overcome unique, segment specific barriers to energy efficiency program participation. The program offers two core participation tracks: prescriptive and custom. The prescriptive track offers a simplified method on predefined measures without requiring complex analysis and will generally include deemed and partially deemed measures[19]from the TRM. The custom track makes it possible to include more complex, site-specific measures and projects in the programs. Custom projects must be able to show specific and verifiable energy savings and costs using TRM protocols.

3.12.1 Participation and Reported Savings by Customer Segment

Table 3-88 and Table 3-89 present the participation counts, reported energy and demand savings, and incentive payments for LBS Commercial and LBS Industrial, respectively, in PY14 by customer segment.

Table 3-88: Large Business Solutions Participation and Reported Impacts (Commercial)

Parameter	Large C&I	GNI	Total
PY14 # Participants	48	13	48
PYRTD MWh/yr	6,633	4,326	6,633
PYRTD MW/yr	1.47	0.95	1.47
PY14 Incentives ($1,000)	$561	$395	$561

**Large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

[19] A list of measures considered prescriptive is available at https://www.duqenergyefficiency.com/business-solutions.

Table 3-89. Large Business Solutions Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY14 # Participants	8	0	8
PYRTD MWh/yr	15,058	0	15,058
PYRTD MW/yr	1.17	0	1.17
PY14 Incentives ($1,000)	$1,072	$0	$1,072

*Large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).

Source: Guidehouse analysis

3.12.2 Gross Impact Evaluation

The Business Solutions programs (SBS/LBS) are projected to account for approximately 47% of all Duquesne Light's Phase IV savings (residential and nonresidential). The realization rate for all three of its predecessor programs (Commercial Energy Program, Industrial Energy Program, and Express Efficiency) was consistently close to 100% during Phase III. To date, the SBS and LBS programs have achieved a lower percentage of the portfolio savings than anticipated, due in large part to the overperformance of the midstream programs.

Similar to other nonresidential programs, the LBS program will be evaluated on a specified schedule. As detailed in the evaluation plan, Guidehouse applied the PY12 realization rate for large C&I to the PY13 LBS program. Guidehouse evaluated a sample of projects in PY13, and the results for these projects combined with projects evaluated in PY14 have been applied in PY14.

Because of the size of this initiative, the evaluation team is targeting an 85/15 confidence/precision level for the small and large programs individually over the 2-year periods. Table 3-90 presents the gross impact results for energy, and Table 3-91 presents the gross impact results for demand.

Table 3-90: Large Business Solutions Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Commercial - Large	2,185	99%	0.01	2%
Commercial – Medium	3,123	98%	0.04	3%
Commercial - Small	1,324	99%	0.03	9%
Industrial - Certainty	12,072	100%	-	0%
Industrial - Large	1,743	100%	-	0%
Industrial - Medium	1,243	101%	0.01	2%
Program Total	**21,691**	**99%**		**0%**

Source: Guidehouse analysis

Table 3-91: Large Business Solutions Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Commercial - Large	0.58	98%	0.01	1%
Commercial – Medium	0.69	94%	0.11	11%
Commercial - Small	0.21	99%	0.00	1%
Industrial - Certainty	0.79	100%	-	0%
Industrial - Large	0.21	100%	-	0%
Industrial - Medium	0.17	101%	0.01	2%
Program Total	**2.64**	**98%**		**2%**

Source: Guidehouse analysis

Fifteen of the sixteen projects evaluated in PY14 had realization rates within 5% of 100% for both energy and demand, indicating that the implementer is accurately reporting savings for this program. However, Guidehouse verified slightly lower hours of use and slightly lower fixture quantities for one site, resulting in a realization rate of 91% for energy and 82% for demand.

3.12.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY14 for the SBS and LBS programs together. Please refer to Section 3.9.3 for the results of the PY14 LBS net impact evaluation.

3.12.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY14. Please refer to Section 3.9.3.1 for the results of the PY14 LBS HIM Research.

3.12.4 Verified Savings Estimates

In Table 3-92 and Table 3-93, 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 LBS Commercial and LBS Industrial, respectively, in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-92: Large Business Solutions (Commercial) PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	6,633	1.47
PYVTD Gross	6,515	1.41
PYVTD Net	2,801	0.61
RTD	15,822	3.30

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	16,957	3.58
VTD Net	11,025	2.32

Source: Guidehouse analysis

Table 3-93. Large Business Solutions (Industrial) PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	15,058	1.17
PYVTD Gross	15,065	1.17
PYVTD Net	6,478	0.50
RTD	17,200	1.52
VTD Gross	16,998	1.50
VTD Net	7,653	0.70

Source: Guidehouse analysis

3.12.5 Process Evaluation

Given the similarities in program structure of SBS and LBS, Guidehouse combined the process evaluation discussion and results of LBS with the SBS process evaluation section. Refer to Section 3.9.5 for the results.

3.12.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-94 and Table 3-95 for LBS Commercial and LBS Industrial, respectively. TRC benefits in Table 3-94 and Table 3-95 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-94. Summary of Program Finances – Gross Verified (Large Business Solutions Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,461		$ 2,668	
2	Rebates to Participants and Trade Allies	$ 561		$ 1,170	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 900		$ 1,498	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 45	$ 18
8	Administration and Management	$ 28	$ 243	$ 48	$ 227
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 610	$ -	$ 1,572

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
11	EDC Evaluation Costs	$ 135	$ 162
12	SWE Audit Costs	$ 15	$ 95
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,031	$ 2,167
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,492	$ 4,835
15	Total NPV Lifetime Electric Energy Benefits	$ 2,863	$ 7,326
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,522	$ 3,780
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 410	$ 739
18	Total NPV Lifetime Fossil Fuel Impacts	$ (421)	$ (901)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 4,374	$ 10,945
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.75	2.26

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-95: Summary of Program Finances – Gross Verified (Large Business Solutions Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 2,628		$ 2,593	
2	Rebates to Participants and Trade Allies	$ 1,072		$ 1,086	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 1,556		$ 1,507	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 15	$ 14
8	Administration and Management	$ 28	$ 107	$ 48	$ 100
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 1,022	$ -	$ 1,347
11	EDC Evaluation Costs	$ 60		$ 73	
12	SWE Audit Costs	$ 6		$ 45	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,223		$ 1,642	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 3,851		$ 4,235	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
15	Total NPV Lifetime Electric Energy Benefits	$ 6,143	$ 6,629
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,270	$ 1,543
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 45	$ 76
18	Total NPV Lifetime Fossil Fuel Impacts	$ (252)	$ (386)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 7,206	$ 7,862
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.87	1.86

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-96 and Table 3-97 presents program financials and cost-effectiveness on a net savings basis for LBS Commercial and LBS Industrial, respectively.

Table 3-96: Summary of Program Finances – Net Verified (Large Business Solutions Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 628		$ 1,612	
2	Rebates to Participants and Trade Allies	$ 241		$ 734	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 166		$ 563	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 45	$ 18
8	Administration and Management	$ 28	$ 243	$ 48	$ 227
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 610	$ -	$ 1,572
11	EDC Evaluation Costs	$ 135		$ 162	
12	SWE Audit Costs	$ 15		$ 95	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,031		$ 2,167	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,659		$ 3,780	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,231		$ 4,812	
16	Total NPV Lifetime Electric Capacity Benefits	$ 654		$ 2,468	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 176		$ 445	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (181)		$ (569)	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,881	$ 7,156
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.13	1.89

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-97. Summary of Program Finances – Net Verified (Large Business Solutions Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,130		$ 1,139	
2	Rebates to Participants and Trade Allies	$ 461		$ 482	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 288		$ 288	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 15	$ 14
8	Administration and Management	$ 28	$ 107	$ 48	$ 100
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 1,022	$ -	$ 1,347
11	EDC Evaluation Costs	$ 60		$ 73	
12	SWE Audit Costs	$ 6		$ 45	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,223		$ 1,642	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,353		$ 2,781	
15	Total NPV Lifetime Electric Energy Benefits	$ 2,642		$ 3,007	
16	Total NPV Lifetime Electric Capacity Benefits	$ 546		$ 727	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 19		$ 38	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (108)		$ (192)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,099		$ 3,580	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.32		1.29	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.12.7 Status of Recommendations

The impact and process evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-98 provides a summary of findings, along with Duquesne Light's plans to address the recommendation in program delivery. See Section 3.9.7 for the process evaluation related findings and recommendations for the SBS and LBS programs.

Table 3-98. Large Business Solutions Findings and Recommendations

Findings	Recommendations
Reported Savings	
• The Large Business Solutions program showed realization rates very close to 100%, indicating that the CSP has accurately estimated savings for this program based on participation and project information.	• No recommendation
Duquesne Light Response: Accepted	

Source: Guidehouse analysis

3.13 Large Business Midstream Solutions

The Large Business Midstream Solutions (LBMS) program delivers incentives to end-use customers via C&I product distributors or manufacturers. End-use customers, property/facility managers, and installation contractors acting on behalf of C&I end-use customers to purchase qualified products from a participating distributor. The participating distributors discount targeted product wholesale prices at the POS and in turn receive an incentive payment. The program design removes barriers to participation by providing a streamlined, simple solution for C&I customers and their contractors to receive the incented price for qualifying products with no additional effort on their part. This program is filed as two programs in Duquesne Light's Phase IV—one as a small C&I program and one as a large C&I program. However, to the customer and distributor, there is only one program.

End-use customers installing the discounted equipment are identified by the participating distributors (based on self-reports from the buyers) to enable evaluation at the customer level. However, some of the end-use customers may not be cognizant of their participation in a program and the normal level of cooperation with the evaluation's verification may be challenging. Further, customers may or may not keep track of where they have installed specific equipment that was obtained from the individual purchase selected for verification by the evaluation team. In the past, this has led to more difficulty in contacting and verifying midstream customers. Guidehouse has addressed this issue by oversampling this program to ensure that statistical targets are met and working directly with the CSP and Duquesne Light to identify points of contact for this program.

3.13.1 Participation and Reported Savings by Customer Segment

Table 3-99 and Table 3-100 present the participation counts, reported energy and demand savings, and incentive payments for LBMS Commercial and LBMS Industrial, respectively, in PY14 by customer segment.

Table 3-99: Large Business Midstream Participation and Reported Impacts (Commercial)

Parameter	Large C&I	GNI	Total
PY14 # Participants	573	64	573
PYRTD MWh/yr	6,510	3,326	6,510
PYRTD MW/yr	1.27	0.62	1.27
PY14 Incentives ($1,000)	$894	$448	$894

**Large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

Table 3-100. Large Business Midstream Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY14 # Participants	166	0	166
PYRTD MWh/yr	11,665	0	11,665
PYRTD MW/yr	2.70	0	2.70
PY14 Incentives ($1,000)	$1,458	$0	$1,458

**Large C&I are the total savings associated with their respective sector, including projects that fall under GNI. GNI values have been provided for informational purposes only and are presented as ex-anti savings (PYRTD).*

Source: Guidehouse analysis

3.13.2 Gross Impact Evaluation

The Phase IV evaluation plan did not call for an evaluation of the midstream programs in PY14. However, the SBMS and LBMS programs combined contributed to more than 50% of portfolio savings. This level of savings, and the unique situation of a large percentage of savings being reported as unverified in PY13, Guidehouse, in consultation with the SWE, decided to move the planned PY15 evaluation to PY14. The Phase IV plan for evaluating the program impacts includes sampling stratified by level of energy savings to achieve 85/15 confidence/precision for the initiative as a whole (i.e., SBMS and LBMS combined).

Guidehouse assigned each project to various strata based on that project's energy savings. The large stratum includes projects in the upper portion of the Midstream program component's energy savings; the medium stratum includes projects in the middle portion of the Midstream energy savings; and the small stratum represents the bottom portion of the Midstream energy savings. Appendix E details the sample design for SBMS and LBMS. To date, there has only been one non-lighting project included in the LBMS program, and as this project accounts for <1% of program savings, Guidehouse has excluded this site from sampling and applied the program-level realization rates to these measures.

When randomly selecting sample projects, Guidehouse selected projects based on the energy savings (MWh) stratification of each project. Projects selected in the random sample received a site verification visit unless the project included 10 or fewer bulbs.

Table 3-101 presents the gross impact results for energy, and Table 3-102 presents the gross impact results for demand. Although C&I LBMS savings are reported separately, they were evaluated as one initiative, with realization rates calculated at the stratum level (Large, Medium, and Small) but not separated between C&I.

Table 3-101: Large Business Midstream Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LBMS – Large (Commercial)	2,666	128%	0.86	49%
LBMS – Medium (Commercial)	3,023	94%	0.15	19%
LBMS – Small (Commercial)	820	123%	0.56	39%
LBMS – Large (Industrial)	9,399	128%	0.86	49%
LBMS – Medium (Industrial)	2,065	94%	0.15	19%
LBMS – Small (Industrial)	201	123%	0.56	39%
Program Total	**18,174**	**118%**		**13%***

**SBMS and LBMS were evaluated as one program, and as such rolled up together. The relative precision value reported is for SBMS and LBMS combined.*

Source: Guidehouse analysis

Table 3-102: Large Business Midstream Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LBMS – Large (Commercial)	0.51	94%	0.55	31%
LBMS – Medium (Commercial)	0.59	123%	0.47	62%
LBMS – Small (Commercial)	0.18	116%	0.89	61%
LBMS – Large (Industrial)	2.20	94%	0.55	31%
LBMS – Medium (Industrial)	0.47	123%	0.47	62%
LBMS – Small (Industrial)	0.04	116%	0.89	61%
Program Total	**3.98**	**103%**		**11%***

**SBMS and LBMS were evaluated as one program, and as such rolled up together. The relative precision value reported is for SBMS and LBMS combined.*

Source: Guidehouse analysis

Unlike previous years of Duquesne Light's Midstream Lighting programs, site visits for the PY13 evaluation found that many bulbs purchased through the program had not yet been installed as required by the program. The primary reason indicated by site contacts for uninstalled bulbs was difficulty finding the labor to install the bulbs after purchasing them. In all cases where lights were not yet installed, the lights were found onsite in storage awaiting installation.

After discussing the situation with the SWE, Guidehouse considered the lights that were not yet installed as unverified savings, and installed fixtures as verified savings. The unverified savings percentage from the evaluated projects was applied to the overall ex-ante savings for the program in PY13. These unverified savings, representing 16% of ex-ante energy and demand savings, were included in the reported (ex-ante) savings but not to the verified savings. Guidehouse revisited these sites during the first half of PY14 to confirm whether these bulbs had been installed. For the lights that had been installed, the updated, increased savings have been applied in PY14, increasing the realization rates for that year. If the bulbs had still not been installed at the time of the follow-up visit, they were considered to have zero verified savings and the realization rates for that site remained unchanged.

The following factors are examples of the evaluated details that led to variation between the reported and verified savings and led to the observed realization rates. This variation is expected in a midstream program where minimal ex ante data is required from the customer and CSP.

- One large site was reported originally as a large warehouse, but Guidehouse found that it is a 2-shift manufacturing site, resulting in a realization rate of 66% for energy and 89% for demand.
- Another large site was reported originally as a 2-shift manufacturing site, but the site contact reported that it is a 3-shift manufacturing site, and the fixtures operate 24 hours a day, 365 days a year. This resulted in a realization rate of 196% for energy and 92% for demand.
- A third large site had lights that would normally be installed in the exterior of the building in interior spaces. This led to a 218% realization rate for energy and a 934% realization rate in demand since all lights were on 24/7 rather than primarily during off-peak hours as would be expected for exterior fixtures, leading to the exceptional demand realization rate.
- Despite variation, many sites had realization rates close to 100%, and had minor discrepancies in wattages, fixture control type, and hours of use.

3.13.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBMS and LBMS in PY14. Guidehouse will complete an NTG evaluation in PY15 for this program.

3.13.3.1 HIM Research

Guidehouse did not conduct HIM research for measures implemented during PY14 for the Midstream program.

3.13.4 Verified Savings Estimates

Due to program design, distributors serve customers of all sizes regardless of which program customers participate. Therefore, Guidehouse applied realization rates and NTG ratios to the energy and demand savings for both Large and Small Midstream Solutions to calculate verified savings estimates. Table 3-103 present the verified savings estimates for LBMS in PY14. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-103: Large Business Midstream PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	18,174	3.98
PYVTD Gross	21,430	4.08
PYVTD Net	14,358	2.73
RTD	24,374	5.25
VTD Gross	30,255	5.36
VTD Net	20,712	3.66

Source: Guidehouse analysis

3.13.5 Process Evaluation

Guidehouse did not conduct a process evaluation for the LBMS program in PY14 and plans to complete it in PY15.

3.13.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-104 and Table 3-105 for LBMS Commercial and LBMS Industrial, respectively. TRC benefits in Table 3-104 and Table 3-105 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-104: Summary of Program Finances – Gross Verified (Large Business Midstream Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,417		$ 2,023	
2	Rebates to Participants and Trade Allies	$ -		$ 439	
3	Upstream/Midstream Incentives	$ 894		$ 836	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 523		$ 748	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 12
8	Administration and Management	$ 25	$ 73	$ 45	$ 68

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 515	$ -	$ 842
11	EDC Evaluation Costs	$ 41		$ 49	
12	SWE Audit Costs	$ 4		$ 28	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 658		$ 1,052	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,075		$ 3,075	
15	Total NPV Lifetime Electric Energy Benefits	$ 3,214		$ 5,075	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,522		$ 2,116	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 444		$ 674	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (457)		$ (656)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 4,724		$ 7,208	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.28		2.34	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-105. Summary of Program Finances – Gross Verified (Large Business Midstream Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,910		$ 2,143	
2	Rebates to Participants and Trade Allies	$ -		$ 370	
3	Upstream/Midstream Incentives	$ 1,458		$ 1,364	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 452		$ 409	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 3	$ 5
8	Administration and Management	$ 24	$ 30	$ 44	$ 28
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 843	$ -	$ 1,040
11	EDC Evaluation Costs	$ 17		$ 21	
12	SWE Audit Costs	$ 2		$ 12	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 916		$ 1,153	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,826	$ 3,296
15	Total NPV Lifetime Electric Energy Benefits	$ 6,431	$ 7,878
16	Total NPV Lifetime Electric Capacity Benefits	$ 2,910	$ 3,432
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 265	$ 334
18	Total NPV Lifetime Fossil Fuel Impacts	$ (1,135)	$ (1,356)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 8,471	$ 10,288
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	3.00	3.12

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-106 and Table 3-107 presents program financials and cost-effectiveness on a net savings basis for LBMS Commercial and LBMS Industrial, respectively.

Table 3-106: Summary of Program Finances – Net Verified (Large Business Midstream Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 949		$ 1,390	
2	Rebates to Participants and Trade Allies	$ -		$ 316	
3	Upstream/Midstream Incentives	$ 599		$ 560	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 235		$ 354	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 12
8	Administration and Management	$ 25	$ 73	$ 45	$ 68
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 515	$ -	$ 842
11	EDC Evaluation Costs	$ 41		$ 49	
12	SWE Audit Costs	$ 4		$ 28	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 658		$ 1,052	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,607		$ 2,442	
15	Total NPV Lifetime Electric Energy Benefits	$ 2,153		$ 3,504	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,020		$ 1,452	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 298	$ 464
18	Total NPV Lifetime Fossil Fuel Impacts	$ (306)	$ (451)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,165	$ 4,969
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.97	2.03

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-107. Summary of Program Finances – Net Verified (Large Business Midstream Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,280		$ 1,454	
2	Rebates to Participants and Trade Allies	$ -		$ 266	
3	Upstream/Midstream Incentives	$ 977		$ 914	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 203		$ 183	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 3	$ 5
8	Administration and Management	$ 24	$ 30	$ 44	$ 28
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 843	$ -	$ 1,040
11	EDC Evaluation Costs	$ 17		$ 21	
12	SWE Audit Costs	$ 2		$ 12	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 916		$ 1,153	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,196		$ 2,606	
15	Total NPV Lifetime Electric Energy Benefits	$ 4,309		$ 5,371	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,950		$ 2,335	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 178		$ 228	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (760)		$ (923)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 5,676		$ 7,011	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.59	2.69

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.13.7 Status of Recommendations

The impact and NTG evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-108 summarizes the findings and recommendations for the program, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-108. Large Business Midstream Program Findings and Recommendations

Findings	Recommendations
Impact	
• Approximately 25% of projects (n=5, representing ~17% of evaluated savings for LBMS) had some or all light fixtures/bulbs remaining in storage at the time of evaluation. The most commonly cited reason for this was a lack of labor availability for installation. Two sites also had equipment (lift) issues resulting in delayed installation. Guidehouse recommended that the CSP revisit these sites and increase QA/QC activity. PY14 saw only one LBMS sites with a significant number of bulbs awaiting installation.	• The CSP should continue with the enhanced QA/QC process
Duquesne Light Response: Accepted	

Source: Guidehouse analysis

3.14 Large Business Virtual Commissioning

The Virtual Commissioning (VCx) programs use a turnkey approach that targets system-based no- to low-cost operational savings for commercial customers and public facilities. These 100% pay-for-performance programs do not fit a traditional model that uses trade allies, mass marketing, or standardized prescriptive retrofits; rather, they provide a targeted, data-driven approach to energy efficiency engagement that effectively eliminates the need for enrollment forms, incentives, or administrative costs. This program is filed as two programs in Duquesne Light's Phase IV plan—one as a small C&I program and one as a large C&I program. However, to the customer and implementer there will be only one program.

The Large Business Virtual Commissioning (LBVCx) program targets customers having annual maximum demand equal to or greater than 300 kW. Similar to the SBVCx program, the CSP is Franklin Energy, who subcontracts out to a Virtual Commissioning specialist, Power TakeOff. The programs use AMI data analytics to identify and qualify customers with significant potential for energy savings. The identification process uses data modeling techniques to selectively pinpoint individual meters with significant potential for operational energy savings. Customers are then contacted by the CSP to help them understand their energy usage and provide them with personalized recommendations for low- to no-cost energy savings opportunities. Facilities that are confirmed to have implemented changes based on their recommendations are

continuously monitored after participation to ensure savings persistence, and if a pre-determined level of savings drift is detected, the customer is re-engaged.

3.14.1 Participation and Reported Savings by Customer Segment

Table 3-109 presents the participation counts, reported energy and demand savings, and incentive payments for LBVCx in PY14 by customer segment.

Table 3-109: Large Business Virtual Commissioning Participation and Reported Impacts

Parameter	Large C&I	GNI	Total
PY14 # Participants	6	6	6
PYRTD MWh/yr	2,515	2,515	2,515
PYRTD MW/yr	0.24	0.24	0.24
PY14 Incentives ($1,000)	$465	$465	$465

Source: Guidehouse analysis

3.14.2 Gross Impact Evaluation

LBVCx reported savings for nine projects in PY14. Of these, six had more than one year (365 days) of post-intervention data, which the SWE requires for inclusion in reported savings. Guidehouse evaluated all six of these projects. Table 3-110 and Table 3-111 show the resulting verified energy and demand savings, respectively, for the program.

Table 3-110: Large Business Virtual Commissioning Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx - Large	2,515	97%	-	0%
Program Total	**2,515**	**97%**		**0%**

Source: Guidehouse analysis

Table 3-111: Large Business Virtual Commissioning Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
VCx - Large	0.24	183%	-	0%
Program Total	**0.24**	**183%**		**0%**

Source: Guidehouse analysis

Most projects showed realization rates near 100% for energy. However, Guidehouse found that four of the six sites had significant demand savings that was not claimed, leading to the high realization rate for demand.

3.14.3 Net Impact Evaluation

Per the PY14 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for LBVCx in PY14. Guidehouse plans to complete NTG evaluation in PY15 for this program.

3.14.3.1 HIM Research

Guidehouse did not conduct HIM research for LBVCx in PY14.

3.14.4 Verified Savings Estimates

In Table 3-112, the realization rates determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LBVCx in PY14. There were no program savings reported in PY13, so the savings reported this year will be the only savings in P4TD.

Table 3-112: Large Business Virtual Commissioning PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,515	0.24
PYVTD Gross	2,442	0.44
PYVTD Net	2,442	0.44
RTD	2,515	0.24
VTD Gross	2,442	0.44
VTD Net	2,442	0.44

Source: Guidehouse analysis

3.14.5 Process Evaluation

Guidehouse did not conduct process evaluation research for the LBVCx program in PY14 and plans to complete it in PY15.

3.14.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness are presented in Table 3-113 and Table 3-114 for LBVCx Commercial and LBVCx Industrial, respectively. TRC benefits in Table 3-113 and Table 3-114 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-113: Summary of Program Finances – Gross Verified (Large Business Virtual Commissioning Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ 465		$ 435	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (465)		$ (435)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 2
8	Administration and Management	$ 24	$ 11	$ 44	$ 10
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 91	$ -	$ 102
11	EDC Evaluation Costs	$ 6		$ 7	
12	SWE Audit Costs	$ 1		$ 3	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 133		$ 170	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 133		$ 170	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,087		$ 1,017	
16	Total NPV Lifetime Electric Capacity Benefits	$ 473		$ 442	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,560		$ 1,459	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	11.69		8.59	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-114. Summary of Program Finances – Gross Verified (Large Business Virtual Commissioning Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ 24	$ 5	$ 44	$ 5
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 2	$ -	$ 10
11	EDC Evaluation Costs	$ 2		$ 3	
12	SWE Audit Costs	$ -		$ -	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 33		$ 63	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 33		$ 63	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$ -	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$ -	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$ -	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.00	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-115 and Table 3-116 present program financials and cost-effectiveness on a net savings basis for LBVCx Commercial and LBVCx Industrial, respectively.

Table 3-115: Summary of Program Finances – Net Verified (Large Business Virtual Commissioning Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ 465		$ 435	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (465)		$ (435)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 2
8	Administration and Management	$ 24	$ 11	$ 44	$ 10
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 91	$ -	$ 102
11	EDC Evaluation Costs	$ 6		$ 7	
12	SWE Audit Costs	$ 1		$ 3	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 133		$ 170	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 133		$ 170	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,087		$ 1,017	
16	Total NPV Lifetime Electric Capacity Benefits	$ 473		$ 442	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,560		$ 1,459	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	11.69		8.59	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

Table 3-116: Summary of Program Finances – Net Verified (Large Business Virtual Commissioning Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ -		$ -	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ -		$ -	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ 24	$ 5	$ 44	$ 5
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 2	$ -	$ 10
11	EDC Evaluation Costs	$ 2		$ 3	
12	SWE Audit Costs	$ -		$ -	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 33		$ 63	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 33		$ 63	
15	Total NPV Lifetime Electric Energy Benefits	$ -		$ -	
16	Total NPV Lifetime Electric Capacity Benefits	$ -		$ -	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ -		$ -	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.00		0.00	

** Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = $2021*

Source: Guidehouse analysis

3.14.7 Status of Recommendations

The impact evaluation activities in PY14 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-117 provides a summary of findings, along with Duquesne Light's plan to address to recommendation in program delivery.

Table 3-117: Large Business Virtual Commissioning Program Findings and Recommendations

Findings	Recommendations
Impact	
• Guidehouse found that four of the six LBVCx projects included in the PY14 evaluation did not report demand savings. When Guidehouse calculated savings for these projects, there was significant demand savings, leading to a demand realization rate of 183%.	• Duquesne Light and the CSP should ensure that demand savings are reported for each project where the intervention leads to statistically significant reduction in peak demand for the site.
Duquesne Light Response: Acknowledged.	

Source: Guidehouse analysis

4. Portfolio Finances and Cost Recovery

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

4.1 Program Finances

Program-specific and portfolio total finances for PY14 are shown in Table 4-1. The columns in Table 4-1 and Table 4-2 are adapted from the Direct Program Cost categories in the Commission's EE&C Plan template[20] for Phase IV. Non-incentives include EDC Materials, Labor, and Administration costs (including costs associated with an EDC's own employees) as well as ICSP Materials, Labor, and Administration costs (including both the program implementation contractor and the costs of any other outside vendors the EDC employs to support program delivery). The dollar figures shown in Table 4-1 and Table 4-2 are based on EDC tracking of expenditures with no adjustments to account for inflation.[21]

Table 4-1: PY14 Program and Portfolio Total Finances

Program	Incentives	Non-Incentives	Total Cost
Residential Downstream Incentives	$60	$894	$954
Residential Midstream Incentives	$1	$35	$36
Residential Upstream Lighting	$470	$890	$1,360
Appliance Recycling	$163	$634	$797
Low Income Energy Efficiency	$1,458	$453	$1,911
Residential Behavioral Energy Efficiency	$0	$632	$632
Low Income Behavioral Energy Efficiency	$0	$311	$311
Small Business Direct Install	$2,141	$280	$2,421
Small Business Downstream	$395	$843	$1,238
Small Business Midstream	$6,394	$2,998	$9,392
Small Business VCx	$95	$83	$178
Large Commercial Downstream	$561	$1,016	$1,577
Large Commercial Midstream	$894	$654	$1,548
Large Commercial VCx	$465	$132	$597
Large Industrial Downstream	$1,072	$1,217	$2,289
Large Industrial Midstream	$1,458	$914	$2,372
Large Industrial VCx	$0	$33	$33
Common Portfolio Costs			**N/A**

[20] Pennsylvania Public Utility Commission, Implementation of Act 129 of 2008—Phase IV, Energy Efficiency and Conservation Plan Template (Docket No. M-2020-3015228), https://www.puc.pa.gov/pcdocs/1676672.docx.

[21] 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	Non-Incentives	Total Cost
Portfolio Total	**$15,627**	**$12,019**	**$27,647**
SWE Costs	**N/A**	**N/A**	**$68**
Total	**$15,627**	**$12,019**	**$27,715**

Source: Guidehouse analysis

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

Table 4-2: P4TD Program and Portfolio Total Finances

Program	Incentives	Non-Incentives	Total Cost
Residential Downstream Incentives	$71	$1,820	$1,891
Residential Midstream Incentives	$1	$108	$109
Residential Upstream Lighting	$648	$1,280	$1,928
Appliance Recycling	$193	$1,423	$1,616
Low Income Energy Efficiency	$2,433	$1,634	$4,067
Residential Behavioral Energy Efficiency	$0	$1,194	$1,194
Low Income Behavioral Energy Efficiency	$0	$435	$435
Small Business Direct Install	$2,502	$607	$3,109
Small Business Downstream	$846	$1,423	$2,269
Small Business Midstream	$7,896	$3,944	$11,840
Small Business VCx	$95	$145	$240
Large Commercial Downstream	$1,206	$2,138	$3,344
Large Commercial Midstream	$1,333	$1,066	$2,399
Large Commercial VCx	$465	$175	$640
Large Industrial Downstream	$1,155	$1,676	$2,831
Large Industrial Midstream	$1,828	$1,200	$3,028
Large Industrial VCx	$0	$65	$65
Common Portfolio Costs			**N/A**
Portfolio Total	**$20,672**	**$20,333**	**$41,006**
SWE Costs	**N/A**	**N/A**	**$464**
Total	**$20,672**	**$20,333**	**$41,470**

Source: Guidehouse analysis

4.2 Cost Recovery

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 conservation benefits. Cost recovery is governed by tariffed rate

class, so it is necessarily tied to the way customers are metered and charged for electric service. Readers should be mindful of the differences between Table 4-3 and Section 2.3. For example, the LI customer segment is a subset of Duquesne Light's residential tariff(s) and therefore not listed in Table 4-3.

Table 4-3: EE&C Plan Expenditures by Cost-Recovery Category[22] ($1,000)

Cost Recovery Sector	Rate Classes Included	PY14 Spending	P4TD Spending
Residential	RS, RH, RA	$ 6,019	$ 11,383
Small/Medium C&I	GS, GM, GMH	$ 13,248	$ 17,591
Large Commercial	GL, GLH, L	$ 3,881	$ 6,653
Large Industrial	GL, GLH, L, HVPS	$ 4,567	$ 5,843
Portfolio Total		**$ 27,716**	**$ 41,471**

Source: Guidehouse analysis

[22] Includes SWE costs.

Appendix A. Site Inspection Summary

Table A-1: PY14 Site Visit Summary

Program	Inspection Firm	Number of Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies and Explanation of Discrepancy
SBMS	Karpinski	19	19	HOU (deemed vs customer-confirmed, database building type v. confirmed building type), Control Type (unknown in ex ante calculations)
LBMS	Karpinski	12	12	HOU (deemed vs customer-confirmed, database building type v. confirmed building type), Control Type (unknown in ex ante calculations),
SBS*	Karpinski	11	7	HOU (reported vs verified), Fixture Quantities (minor discrepancies)
LBS*	Karpinski	7*	4	HOU (different space type than recorded), Fixture QTY (within 5% of reported)
SBDI*	Karpinski	7	5	HOU (customer-reported/posted hours much lower for two sites), Control Type (Occupancy Sensors were not detailed in ex ante calculations for 1 site)
TOTAL		**56**	**47**	

**One site was desk review only and not included in this table.*

Source: Guidehouse analysis

Appendix B. Behavioral Energy Efficiency Program Impact Evaluation Detail

B.1 Data Preparation and Participant Counts

The evaluation team deployed specific data management methodologies to prepare billing data for the regressions, consistent with the steps outlined in Section 6.1.4 of the Phase IV Evaluation Framework. These methodologies are partially informed by feedback Guidehouse received from the SWE during previous evaluations. Based on an issue of multiple inactive dates for some accounts identified in PY12, Guidehouse removed accounts with a maximum inactive date prior to the start of the evaluation period. 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 PY14 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 is used to obtain an average participant count across all months of the program year. Table B-1 shows the number of treatment group homes by cohort and month.

Table B-1: Active Participant Counts by Wave

Month	2021 Digital	2021 Non-Digital	2015 LI	2018 LI	2021 LI
Jun 2022	67,957	65,179	7,770	1,870	11,503
Jul 2022	66,654	64,403	7,678	1,848	11,275
Aug 2022	65,371	63,643	7,614	1,822	11,048
Sep 2022	64,039	62,778	7,537	1,796	10,807
Oct 2022	63,220	62,213	7,477	1,772	10,591
Nov 2022	62,555	61,764	7,409	1,761	10,396
Dec 2022	62,027	61,328	7,350	1,737	10,211
Jan 2023	61,567	60,954	7,308	1,727	10,072
Feb 2023	61,154	60,573	7,263	1,713	9,942
Mar 2023	60,749	60,227	7,219	1,696	9,821
Apr 2023	60,213	59,804	7,167	1,675	9,646
May 2023	59,704	59,394	7,124	1,654	9,506
Average	**62,934**	**61,855**	**7,410**	**1,756**	**10,402**

Source: Guidehouse analysis

B.2 Regression Output

The following tables in Appendix B show the regression results for the two waves that compose R-BEEP and the three waves that compose LI-BEEP.

Table B-2: Residential Behavioral Wave Regression Savings Details

Month	2021 Digital		2021 Non-Digital	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2022	-0.14	0.06	-0.08	0.06
Jul 2022	-0.16	0.07	-0.14	0.06
Aug 2022	-0.20	0.07	-0.16	0.06
Sep 2022	-0.14	0.05	-0.14	0.05
Oct 2022	-0.17	0.06	-0.09	0.05
Nov 2022	-0.18	0.07	-0.10	0.05
Dec 2022	-0.30	0.08	-0.10	0.06
Jan 2023	-0.25	0.08	-0.04	0.06
Feb 2023	-0.22	0.07	-0.06	0.06
Mar 2023	-0.14	0.07	-0.09	0.06
Apr 2023	-0.15	0.06	-0.11	0.05
May 2023	-0.22	0.06	-0.12	0.06

Source: Guidehouse analysis

Table B-3: Low Income Behavioral Wave Regression Savings Details

Month	2015 LI		2018 LI		2021 LI	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2022	-0.37	0.24	-0.11	0.33	-0.14	0.06
Jul 2022	-0.31	0.28	-0.02	0.42	-0.16	0.07
Aug 2022	-0.38	0.26	-0.17	0.39	-0.20	0.07
Sep 2022	-0.47	0.20	-0.19	0.32	-0.14	0.05
Oct 2022	-0.47	0.19	0.03	0.31	-0.17	0.06
Nov 2022	-0.70	0.23	-0.24	0.36	-0.18	0.07
Dec 2022	-0.62	0.28	-0.13	0.44	-0.30	0.08
Jan 2023	-0.62	0.29	0.00	0.44	-0.25	0.08
Feb 2023	-0.50	0.27	0.03	0.42	-0.22	0.07
Mar 2023	-0.61	0.25	-0.01	0.38	-0.14	0.07
Apr 2023	-0.40	0.20	0.08	0.30	-0.15	0.06
May 2023	-0.26	0.19	0.07	0.29	-0.22	0.06

Source: Guidehouse analysis

Table B-4: Residential Behavioral Wave Regression Savings Percentage Details

Month	2021 Digital		2021 Non-Digital	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2022	0.54%	0.48%	0.35%	0.48%
Jul 2022	0.51%	0.46%	0.51%	0.45%
Aug 2022	0.74%	0.46%	0.67%	0.46%
Sep 2022	0.65%	0.50%	0.77%	0.49%
Oct 2022	1.04%	0.68%	0.63%	0.64%
Nov 2022	0.97%	0.70%	0.61%	0.65%
Dec 2022	1.37%	0.72%	0.54%	0.67%
Jan 2023	1.17%	0.73%	0.20%	0.69%
Feb 2023	1.16%	0.76%	0.37%	0.72%
Mar 2023	0.79%	0.75%	0.59%	0.71%
Apr 2023	0.94%	0.71%	0.77%	0.70%
May 2023	1.27%	0.73%	0.79%	0.73%

Source: Guidehouse analysis

Table B-5: Low Income Behavioral Wave Regression Savings Percentage Details

Month	2015 LI		2018 LI		2021 LI	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2022	1.47%	1.85%	0.46%	2.73%	0.46%	0.92%
Jul 2022	1.07%	1.87%	0.06%	2.99%	0.37%	0.89%
Aug 2022	1.43%	1.89%	0.67%	3.01%	1.01%	0.90%
Sep 2022	2.14%	1.83%	0.92%	3.00%	0.90%	0.94%
Oct 2022	2.51%	1.96%	-0.15%	3.40%	0.69%	1.56%
Nov 2022	3.23%	2.08%	1.11%	3.33%	0.54%	1.57%
Dec 2022	2.44%	2.19%	0.51%	3.44%	0.40%	1.47%
Jan 2023	2.44%	2.24%	-0.01%	3.42%	0.15%	1.46%
Feb 2023	2.16%	2.30%	-0.12%	3.54%	0.10%	1.50%
Mar 2023	2.86%	2.31%	0.06%	3.51%	0.31%	1.50%
Apr 2023	2.13%	2.11%	-0.42%	3.26%	0.58%	1.35%
May 2023	1.47%	2.05%	-0.40%	3.33%	1.02%	1.28%

Source: Guidehouse analysis

Table B-6: Behavioral Wave Monthly Regression Savings (MWh/yr)*

Month	2021 Digital	2021 Non-Digital	2015 LI	2018 LI	2021 LI
Jun 2022	291	158	87	6	41
Jul 2022	321	274	74	1	39
Aug 2022	415	319	90	10	96
Sep 2022	269	271	105	10	65
Oct 2022	336	176	109	-1	43
Nov 2022	336	184	156	12	37
Dec 2022	573	194	142	7	33
Jan 2023	470	68	140	0	12
Feb 2023	380	104	102	-1	6
Mar 2023	267	175	138	1	21
Apr 2023	277	199	85	-4	32
May 2023	408	218	58	-4	55

**Savings are prior to any overlap or persistence adjustments.*

Source: Guidehouse analysis

Table B-7: Behavioral Wave Average Daily Use

Wave	Average Daily Use (kWh)
2021 Digital	18.4
2021 Non-Digital	16.1
2015 LI	22.5
2018 LI	22.1
2021 LI	22.0

Source: Guidehouse analysis

B.3 Overlap Analysis Detail

To the extent that the behavioral energy efficiency waves increase participation in other programs, 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 R-BEEP and LI-BEEP participants. This is also known as the overlap savings.

To estimate uplift, Guidehouse followed the Phase IV Evaluation Framework guidance on completing dual participation analyses. The Phase IV Evaluation Framework conveys that exposure to the HER messaging often motivates participants to take advantage of other Duquesne Light program offerings that might 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 IV 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 R-BEEP (or LI-BEEP for the LI behavioral energy efficiency waves) or the other program involved in its realization because 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 6.1.8.1 of the Phase IV 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 PY14 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 the R-BEEP. 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 6.1.8.2 of the Phase IV 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 B-8 shows the upstream reduction factors. Table B-9 shows how adjustments are applied to the regression results to arrive at the final verified savings values. Table B-9 also separates incremental first-year savings from persistent savings from prior years, as described in Section 3.6, in addition to incremental peak demand impacts.

Table B-8: Upstream Adjustment Factors

Years Since Cohort Inception	Default Upstream Reduction Factor	Waves
1	0.75%	-
2	1.50%	2021 Digital, 2021 LI, 2021 Non-Digital
3	2.25%	-
4 and beyond	3.00%	2015 LI, 2018 LI

Source: Phase IV Evaluation Framework

Table B-9. Savings Adjustments and Final Savings

Wave	Regression Savings (MWh/yr)	Downstream Dual Participation Savings (MWh/yr)	Upstream Dual Participation Savings (MWh/yr)	Persistence (MWh/yr)	Incremental Savings (MWh/yr)	Incremental Peak Demand Savings* (MW/yr)
2021 Digital	4,343.41	-124.44	-63.28	0.00	4,155.69	0.83
2021 Non-Digital	2,339.98	-112.75	-33.41	0.00	2,193.81	0.44
2015 LI	1,285.24	-197.95	-32.62	-770.50	284.18	0.06
2018 LI	36.83	-27.67	-0.27	-29.19	-20.31	0.00
2021 LI	479.51	-6.34	-7.10	0.00	466.07	0.09

** Column 7 represents incremental peak demand savings after adjusting for transmission and distribution losses.*

Source: Guidehouse analysis

B.4 Peak Demand Analysis

To estimate peak demand savings, Guidehouse used an energy-to-demand factor derived from historical load shapes, as described in Section 6.1.6.1 of the Phase IV Evaluation Framework. Guidehouse obtained the historical 8760 reference load shape averaged across all residential customers in the Duquesne Light service territory for the five calendar years including 2017 to 2021. Guidehouse then calculated the reference load shape as total usage for all residential

customers divided by the total number of residential customers for each hour of the year. Oracle calculates the reference load shape using customer AMI data provided by Duquesne Light.[23, 24]

From the refence load shape, the peak demand multiplier is calculated by first calculating the average annual load (kW), during all hours and days in the year. Then, average summer peak load (kW), during the TRM-defined peak period of non-holiday weekdays from 2:00 p.m. to 6:00 p.m. in June, July, and August is calculated. Finally, the peak demand multiplier is calculated as the ratio of the average summer peak load to average annual load.

Guidehouse calculated the peak demand multiplier individually for each calendar year, then calculated the 5-year simple average of the peak demand multipliers.

Values for average annual load, average summer peak load, and peak demand multiplier from 2017 to 2021 are presented in Table B-10.

Table B-10: Peak Demand Multiplier, 2017 to 2021

Year	Average Annual Load (kW)	Average Summer Peak Load (kW)	Peak Demand Multiplier
2017	0.88	1.37	1.57
2018	0.93	1.40	1.50
2019	0.89	1.39	1.57
2020	0.91	1.67	1.83
2021	0.92	1.54	1.67
5-Year Average	**0.91**	**1.48**	**1.63**

Source: Guidehouse analysis

Because the methodology uses the same reference load shape for all R-BEEP and LI-BEEP cohorts, the peak demand multiplier will be identical for all cohorts throughout Phase IV. The Phase IV Duquesne Light peak demand multiplier is 1.63.

[23] The reference load shape data is calculated from the customer AMI data provided to Oracle by Duquesne Light to be consistent with the data used for selecting tips that appear in the HERs and the billing data used for the energy impact evaluation. Publicly available data, such as that available at https://www.duquesnedsp.com/Documents/LoadandOtherData.aspx, may undergo a different data cleaning process.

[24] The reference load shape data was 99.7% complete. Missing observations tended to occur in groups by day (e.g., all 24 hours of a day were missing). Guidehouse identified eight observations with an abnormally high customer count and 89 observations with an abnormally low customer count, representing 0.2% of all observations. Guidehouse did not remove these observations from the calculation.

Appendix C. PY14 and P4TD Summary by Customer Segment and LI Carveout

Table C-1 presents a summary of the programs, components/initiatives, and customer segments that contribute to the LI carveout in PY14 and P4TD.

Table C-1: Summary of Low Income Carveout Energy Savings (MWh/yr)

Program	Customer Segment	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
LIEEP	LI	2,519	4,698
LI-BEEP	LI	730	1,926
SBDI	Small Business Multifamily	293	929
Total		**3,542**	**7,553**

Source: Guidehouse analysis

Appendix D. Summary of Program-Level Impacts, Cost-Effectiveness and HIM NTG

D.1 Program and Component-Level Impacts Summary

A summary of energy impacts by program and component through PY14 are presented in Table D-1.

Table D-1: Incremental Annual Energy Savings by Program & Component (MWh/yr)

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential Downstream Incentives	Rebates	510	500	410	662	649	532
Residential Downstream Incentives	Audits	536	547	547	536	547	547
Residential Downstream Incentives	Energy Efficiency Education	1,179	813	537	2,561	1,763	1,164
Residential Midstream Incentives		3	3	3	3	3	3
Residential Upstream Incentives	Appliances	1,132	1,567	1,175	1,503	2,216	1,824
Residential Upstream Incentives	LEDs	1,804	1,811	1,032	2,660	2,667	1,400
Residential Appliance Recycling	Freezers	268	255	119	323	307	143
Residential Appliance Recycling	Refrigerators	1,535	1,796	839	1,812	2,120	990
Residential Appliance Recycling	Other	211	211	99	226	226	106
Residential Low Income Energy Efficiency	Audits	2,500	2,414	2,414	5,034	4,593	4,593
Residential Low Income Energy Efficiency	Kits	70	69	69	70	69	69
Residential Low Income Energy Efficiency	Giveaways	35	35	35	35	35	35
Residential Behavioral		6,660	6,350	6,350	11,797	11,577	11,577

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Low Income Behavioral		971	730	730	1,902	1,926	1,926
Small Business Direct Install	Large	1,886	1,403	1,298	2,056	1,572	1,466
Small Business Direct Install	Medium	1,236	1,013	937	1,236	1,013	937
Small Business Direct Install	Small	-	-	-	435	417	414
Small Business Direct Install	MF	618	612	567	1,216	1,258	1,208
Small Business Direct Install	PAPP	-	-	-	96	111	110
Small Business Solutions	Medium	5,119	4,699	3,101	6,294	5,948	4,085
Small Business Solutions	Small	3,170	3,338	2,203	8,129	10,458	7,810
Small Business Solutions	Upstream Lighting-CCS	321	322	184	475	476	250
Small Business Midstream Solutions	Large	12,945	17,263	11,566	16,151	18,555	12,497
Small Business Midstream Solutions	Medium	22,871	27,641	18,520	28,702	31,303	21,156
Small Business Midstream Solutions	Small	3,853	3,316	2,222	5,481	4,800	3,290
Small Business Virtual Commissioning		500	472	472	500	472	472
Large Business Solutions	Commercial - Large	2,185	2,154	926	5,380	5,779	3,781
Large Business Solutions	Commercial - Medium	3,123	3,051	1,312	7,927	8,159	5,335
Large Business Solutions	Commercial - Small	1,324	1,309	563	2,514	3,018	1,909
Large Business Solutions	Industrial - Large	13,816	13,814	5,940	14,638	14,630	6,436
Large Business Solutions	Industrial - Medium	1,243	1,252	538	2,203	2,013	1,001
Large Business Solutions	Industrial - Small	-	-	-	359	355	216
Large Business Midstream Solutions	Commercial - Large	2,666	3,400	2,278	3,855	5,225	3,592
Large Business Midstream Solutions	Commercial - Medium	3,023	2,847	1,908	4,766	5,077	3,513

Program	Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Large Business Midstream Solutions	Commercial - Small	820	1,006	674	1,247	1,678	1,158
Large Business Midstream Solutions	Industrial - Large	9,399	11,985	8,030	10,945	14,359	9,739
Large Business Midstream Solutions	Industrial - Medium	2,065	1,945	1,303	3,131	3,308	2,284
Large Business Midstream Solutions	Industrial - Small	201	246	165	431	608	426
Large Business Virtual Commissioning		2,515	2,442	2,442	2,515	2,442	2,442
Portfolio Total		**112,313**	**122,634**	**81,508**	**159,806**	**171,735**	**120,437**

Source: Guidehouse analysis

A summary of the peak demand impacts by energy efficiency program and Component through the current reporting period are presented in Table D-2.

Table D-2: Peak Demand Savings by Energy Efficiency Program & Component (MW/yr)

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Downstream Incentives	Rebates	0.08	0.07	0.06	0.09	0.08	0.07
Residential Downstream Incentives	Audits	0.04	0.05	0.05	0.04	0.05	0.05
Residential Downstream Incentives	Energy Efficiency Education	0.18	0.18	0.12	0.47	0.46	0.30
Residential Midstream Incentives		0.00	0.00	0.00	0.00	0.00	0.00
Residential Upstream Incentives	Appliances	0.21	0.33	0.25	0.31	0.51	0.43
Residential Upstream Incentives	LEDs	0.20	0.20	0.12	0.30	0.30	0.16
Residential Appliance Recycling	Freezers	0.05	0.04	0.02	0.06	0.05	0.02
Residential Appliance Recycling	Refrigerators	0.27	0.31	0.15	0.32	0.37	0.18

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential Appliance Recycling	Other	0.18	0.18	0.08	0.19	0.19	0.08
Residential Low Income Energy Efficiency	Audits	0.24	0.24	0.24	0.51	0.48	0.48
Residential Low Income Energy Efficiency	Kits	0.01	0.01	0.01	0.01	0.01	0.01
Residential Low Income Energy Efficiency	Giveaways	0.00	0.00	0.00	0.00	0.00	0.00
Residential Behavioral		1.31	1.27	1.27	1.71	1.65	1.65
Low Income Behavioral		0.19	0.15	0.15	0.22	0.25	0.25
Small Business Direct Install	Large	0.32	0.34	0.31	0.32	0.34	0.31
Small Business Direct Install	Medium	0.19	0.19	0.17	0.19	0.19	0.17
Small Business Direct Install	Small	-	-	-	0.06	0.06	0.06
Small Business Direct Install	MF	0.19	0.19	0.17	0.31	0.32	0.30
Small Business Direct Install	PAPP	-	-	-	0.02	0.03	0.03
Small Business Solutions	Medium	1.15	1.14	0.75	1.35	1.36	0.92
Small Business Solutions	Small	0.72	0.83	0.55	1.77	3.11	2.35
Small Business Solutions	Upstream Lighting-CCS	0.10	0.10	0.06	0.14	0.14	0.08
Small Business Midstream Solutions	Large	3.07	3.37	2.26	3.69	3.52	2.37
Small Business Midstream Solutions	Medium	4.86	6.53	4.37	6.04	7.55	5.10
Small Business Midstream Solutions	Small	0.73	0.66	0.44	1.05	1.03	0.71
Small Business Virtual Commissioning		0.02	0.12	0.12	0.02	0.12	0.12
Large Business Solutions	Commercial - Large	0.58	0.57	0.24	1.04	1.00	0.59
Large Business Solutions	Commercial - Medium	0.69	0.64	0.28	1.83	1.89	1.26
Large Business Solutions	Commercial - Small	0.21	0.20	0.09	0.43	0.69	0.47

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Large Business Solutions	Industrial - Large	1.00	1.00	0.43	1.10	1.08	0.47
Large Business Solutions	Industrial - Medium	0.17	0.17	0.07	0.33	0.33	0.17
Large Business Solutions	Industrial - Small	-	-	-	0.09	0.09	0.06
Large Business Midstream Solutions	Commercial - Large	0.51	0.47	0.32	0.73	0.70	0.48
Large Business Midstream Solutions	Commercial - Medium	0.59	0.72	0.48	0.89	1.02	0.70
Large Business Midstream Solutions	Commercial - Small	0.18	0.21	0.14	0.27	0.32	0.22
Large Business Midstream Solutions	Industrial - Large	2.20	2.06	1.38	2.57	2.42	1.64
Large Business Midstream Solutions	Industrial - Medium	0.47	0.57	0.38	0.71	0.81	0.55
Large Business Midstream Solutions	Industrial - Small	0.04	0.04	0.03	0.08	0.09	0.07
Large Business Virtual Commissioning		0.24	0.44	0.44	0.24	0.44	0.44
Portfolio Total		**21.18**	**23.57**	**15.97**	**29.52**	**33.02**	**23.29**

Source: Guidehouse analysis

D.2 Program-Level Cost-Effectiveness Summary

Table D-3 shows the TRC ratios by program and for the portfolio. The benefits in Table D-3 were calculated using gross verified impacts. Costs and benefits are expressed in 2022 dollars.

Table D-3: PY14 Gross TRC Ratios by Program ($1,000)*

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Downstream Incentives	$1,272	$1,759	0.72	($487)
Residential Midstream Incentives	$3	$48	0.05	($46)
Residential Upstream Lighting	$1,558	$1,659	0.94	($101)
Appliance Recycling	$512	$800	0.64	($287)
Low Income Energy Efficiency	$631	$507	1.25	$124
Residential Behavioral Energy Efficiency	$631	$634	1.00	($3)

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Low Income Behavioral Energy Efficiency	$73	$312	0.23	($239)
Residential Subtotal	**$4,680**	**$5,719**	**0.82**	**($1,040)**
Small Business Direct Install	$2,173	$2,098	1.04	$76
Small Business Downstream	$5,768	$2,181	2.65	$3,587
Small Business Midstream	$32,215	$15,122	2.13	$17,093
Small Business VCx	$336	$84	4.00	$252
Large Commercial Downstream	$4,374	$2,492	1.75	$1,882
Large Commercial Midstream	$4,724	$2,075	2.28	$2,649
Large Commercial VCx	$1,560	$133	11.69	$1,426
Large Industrial Downstream	$7,206	$3,851	1.87	$3,355
Large Industrial Midstream	$8,471	$2,826	3.00	$5,646
Large Industrial VCx	$0	$33	0.00	($33)
Nonresidential Subtotal	**$66,827**	**$30,895**	**2.16**	**$35,933**
Portfolio Total	**$71,507**	**$36,614**	**1.95**	**$34,893**

[*] *Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025*
Source: Guidehouse analysis

Table D-4 presents PY14 cost-effectiveness using net verified savings to calculate benefits.

Table D-4: PY14 Net TRC Ratios by Program ($1,000)[*]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Downstream Incentives	$1,021	$1,589	0.64	($567)
Residential Midstream Incentives	$3	$48	0.05	($46)
Residential Upstream Lighting	$1,018	$1,394	0.73	($376)
Appliance Recycling	$239	$712	0.34	($473)
Low Income Energy Efficiency	$631	$507	1.25	$124
Res Behavioral Energy Efficiency	$631	$634	1.00	($3)
Low Income Behavioral Energy Efficiency	$73	$312	0.23	($239)
Residential Subtotal	**$3,616**	**$5,196**	**0.70**	**($1,580)**
Small Business Direct Install	$2,010	$1,962	1.02	$49
Small Business Downstream	$3,807	$1,728	2.20	$2,079
Small Business Midstream	$21,584	$11,123	1.94	$10,462
Small Business VCx	$336	$84	4.00	$252
Large Commercial Downstream	$1,881	$1,659	1.13	$221
Large Commercial Midstream	$3,165	$1,607	1.97	$1,558
Large Commercial VCx	$1,560	$133	11.69	$1,426

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Large Industrial Downstream	$3,099	$2,353	1.32	$745
Large Industrial Midstream	$5,676	$2,196	2.59	$3,480
Large Industrial VCx	$0	$33	0.00	($33)
Nonresidential Subtotal	**$43,117**	**$22,878**	**1.88**	**$20,239**
Portfolio Total	**$46,734**	**$28,075**	**1.66**	**$18,659**

**Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025*

Source: Guidehouse analysis

Table D-5: summarizes cost-effectiveness by program for Phase IV of Act 129. Cost and benefits are expressed in 2021 dollars.

Table D-5: P4TD Gross TRC Ratios by Program ($1,000)*

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Downstream Incentives	$1,779	$2,671	0.67	($892)
Residential Midstream Incentives	$2	$119	0.02	($117)
Residential Upstream Lighting	$2,374	$2,585	0.92	($212)
Appliance Recycling	$564	$1,551	0.36	($987)
Low Income Energy Efficiency	$1,153	$1,717	0.67	($565)
Residential Behavioral Energy Efficiency	$885	$1,169	0.76	($284)
Low Income Behavioral Energy Efficiency	$139	$419	0.33	($280)
Residential Subtotal	**$6,895**	**$10,231**	**0.67**	**($3,336)**
Small Business Direct Install	$2,890	$2,663	1.09	$227
Small Business Downstream	$11,731	$3,623	3.24	$8,108
Small Business Midstream	$34,783	$16,817	2.07	$17,966
Small Business VCx	$315	$144	2.19	$171
Large Commercial Downstream	$10,945	$4,835	2.26	$6,109
Large Commercial Midstream	$7,208	$3,075	2.34	$4,133
Large Commercial VCx	$1,459	$170	8.59	$1,289
Large Industrial Downstream	$7,862	$4,235	1.86	$3,627
Large Industrial Midstream	$10,288	$3,296	3.12	$6,993
Large Industrial VCx	$0	$63	0.00	($63)
Nonresidential Subtotal	**$87,481**	**$38,920**	**2.25**	**$48,561**
Portfolio Total	**$94,376**	**$49,151**	**1.92**	**$45,224**

**Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025*

Source: Guidehouse analysis

Table D-6 presents P4TD cost-effectiveness results using net verified savings to calculate benefits. Cost and benefits are expressed in 2021 dollars.

Table D-6: P4TD Net TRC Ratios by Program ($1,000)*

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential Downstream Incentives	$1,357	$2,487	0.55	($1,131)
Residential Midstream Incentives	$2	$119	0.02	($117)
Residential Upstream Lighting	$1,551	$2,119	0.73	($569)
Appliance Recycling	$263	$1,468	0.18	($1,204)
Low Income Energy Efficiency	$1,153	$1,717	0.67	($565)
Residential Behavioral Energy Efficiency	$885	$1,169	0.76	($284)
Low Income Behavioral Energy Efficiency	$139	$419	0.33	($280)
Residential Subtotal	**$5,350**	**$9,499**	**0.56**	**($4,149)**
Small Business Direct Install	$2,731	$2,533	1.08	$198
Small Business Downstream	$8,551	$2,995	2.86	$5,556
Small Business Midstream	$23,537	$12,600	1.87	$10,937
Small Business VCx	$315	$144	2.19	$171
Large Commercial Downstream	$7,156	$3,780	1.89	$3,377
Large Commercial Midstream	$4,969	$2,442	2.03	$2,527
Large Commercial VCx	$1,459	$170	8.59	$1,289
Large Industrial Downstream	$3,580	$2,781	1.29	$799
Large Industrial Midstream	$7,011	$2,606	2.69	$4,405
Large Industrial VCx	$0	$63	0.00	($63)
Nonresidential Subtotal	**$59,309**	**$30,114**	**1.97**	**$29,195**
Portfolio Total	**$64,659**	**$39,613**	**1.63**	**$25,046**

**Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025*

Source: Guidehouse analysis

D.3 HIM NTG

Findings from NTG research are not used to adjust compliance savings in Pennsylvania. Instead, NTG research provides directional information for program planning purposes. Table D-7 presents NTG findings for HIMs studied in PY14. [25]

Table D-7: HIM NTG

HIM	Program	Free ridership	Spillover	NTG Ratio
ENERGY STAR Lighting Fixtures	RUIP (Residential)	49%	0%	51%
Reflector Lamps	RUIP (Residential)	32%	0%	68%
LED Interior Lighting Fixtures	SBDI (Nonresidential)	9%	0%	91%
LED Exterior Lighting Fixtures	SBDI (Nonresidential)	13%	0%	87%
LED Interior Lighting Fixture	SBS (Nonresidential)	56%	0%	44%
LED Exterior Lighting Fixture	LBS (Nonresidential)	25%	0%	75%

Source: Guidehouse analysis

D.4 Program-Level Comparison of Performance to Approved EE&C Plan

Table D-8 presents PY14 expenditures, by program, compared with the budget estimates set forth in the EE&C plan for PY14. All the dollars in Table D-8 are presented in 2022 dollars.

Table D-8: Comparison of PY14 Expenditures to Phase IV EE&C Plan ($1,000)

Program	PY14 Budget from EE&C Plan	PY14 Actual Expenditures	Ratio (Actual/Plan)
Residential Downstream Incentives	$1,124	$954	0.85
Residential Midstream Incentives	$43	$36	0.84
Residential Upstream Lighting	$752	$1,360	1.81
Appliance Recycling	$517	$797	1.54
Low Income Energy Efficiency	$2,997	$1,911	0.64
Residential Behavioral Energy Efficiency	$772	$632	0.82
Low Income Behavioral Energy Efficiency	$145	$311	2.15
Small Business Direct Install	$2,077	$2,421	1.17

[25] The Phase IV Evaluation Framework provides guidance to the EDCs to oversample measure categories (technologies) of high importance, called HIMs, to help program planners make decisions concerning those measures. The SWE suggests that for each program year, each EDC identify three to five HIMs for study based on energy impact, level of uncertainty, prospective value, funding, or other parameters. The intent is to prioritize measure-level NTGRs for HIMs, but the EDCs are encouraged to also provide program-level NTG information (i.e., to oversample HIMs), but they may also include non-HIMs in the research, as appropriate.

Program	PY14 Budget from EE&C Plan	PY14 Actual Expenditures	Ratio (Actual/Plan)
Small Business Downstream	$1,995	$1,238	0.62
Small Business Midstream	$1,354	$9,392	6.94
Small Business VCx	$341	$178	0.52
Large Commercial Downstream	$4,239	$1,577	0.37
Large Commercial Midstream	$1,290	$1,548	1.20
Large Commercial VCx	$190	$597	3.15
Large Industrial Downstream	$1,876	$2,289	1.22
Large Industrial Midstream	$524	$2,372	4.53
Large Industrial VCx	$88	$33	0.37
TOTAL	**$20,324**	**$27,647**	**1.36**

Source: Guidehouse analysis

Table D-10 presents P4TD expenditures, by program, compared with the budget estimates set forth in the EE&C plan through PY14. All the dollars in Table D-10 are presented in nominal dollars.

Table D-9: Comparison of P4TD Expenditures to Phase IV EE&C Plan ($1,000)

Program	Phase IV Budget from EE&C Plan through PY14	P4TD Actual Expenditures	Ratio (Actual/Plan)
Residential Downstream Incentives	$2,191	$1,891	0.86
Residential Midstream Incentives	$83	$109	1.30
Residential Upstream Lighting	$1,467	$1,928	1.31
Appliance Recycling	$1,009	$1,616	1.60
Low Income Energy Efficiency	$5,845	$4,067	0.70
Residential Behavioral Energy Efficiency	$1,315	$1,194	0.91
Low Income Behavioral Energy Efficiency	$245	$435	1.77
Small Business Direct Install	$3,765	$2,913	0.77
Small Business Downstream	$3,616	$2,465	0.68
Small Business Midstream	$2,454	$11,840	4.83
Small Business VCx	$619	$240	0.39
Large Commercial Downstream	$7,682	$3,344	0.44
Large Commercial Midstream	$2,338	$2,399	1.03
Large Commercial VCx	$344	$640	1.86
Large Industrial Downstream	$3,399	$2,831	0.83
Large Industrial Midstream	$949	$3,028	3.19
Large Industrial VCx	$160	$65	0.41
TOTAL	**$37,480**	**$41,006**	**1.09**

Source: Guidehouse analysis

Table D-11 compares PY14 verified gross program savings compared with the energy savings projections set forth in the EE&C plan.

Table D-10: Comparison of PY14 Actual Program Savings to EE&C Plan Projections for PY14

Program	EE&C Plan Projections for PY14	PY14 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Downstream Incentives	4,740	1,860	0.39
Residential Midstream Incentives	119	3	0.02
Residential Upstream Lighting	2,721	3,378	1.24
Appliance Recycling	2,488	2,262	0.91
Low Income Energy Efficiency	3,317	2,519	0.76
Residential Behavioral Energy Efficiency	9,209	6,350	0.69
Low Income Behavioral Energy Efficiency	973	730	0.75
Small Business Direct Install	4,949	3,029	0.61
Small Business Downstream	10,743	8,360	0.78
Small Business Midstream	5,882	48,220	8.20
Small Business VCx	1,295	472	0.36
Large Commercial Downstream	18,256	6,515	0.36
Large Commercial Midstream	3,774	7,253	1.92
Large Commercial VCx	601	2,442	4.06
Large Industrial Downstream	8,473	15,065	1.78
Large Industrial Midstream	1,752	14,176	8.09
Large Industrial VCx	279	0	0.00
TOTAL	**79,571**	**122,634**	**1.54**

Source: Guidehouse analysis

Table D-12 compares Phase IV verified gross program savings with the energy savings projections set forth in the EE&C plan.

Table D-11: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV

Program	EE&C Plan Through PY14	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential Downstream Incentives	9,243	2,959	0.32
Residential Midstream Incentives	233	3	0.01
Residential Upstream Lighting	5,306	4,883	0.92
Appliance Recycling	4,851	2,653	0.55
Low Income Energy Efficiency	6,469	4,698	0.73
Residential Behavioral Energy Efficiency	15,695	11,577	0.74
Low Income Behavioral Energy Efficiency	1,650	1,926	1.17

Program	EE&C Plan Through PY14	VTD Gross MWh Savings	Ratio (Actual/Plan)
Small Business Direct Install	8,970	4,372	0.49
Small Business Downstream	19,470	16,883	0.87
Small Business Midstream	10,660	54,658	5.13
Small Business VCx	2,347	472	0.20
Large Commercial Downstream	33,082	16,957	0.51
Large Commercial Midstream	6,838	11,980	1.75
Large Commercial VCx	1,090	2,442	2.24
Large Industrial Downstream	15,355	16,998	1.11
Large Industrial Midstream	3,174	18,274	5.76
Large Industrial VCx	506	0	0.00
TOTAL	**144,938**	**171,735**	**1.18**

Source: Guidehouse analysis

Appendix E. Evaluation Detail

E.1 Midstream Component – Small and Large Business Midstream Solutions

Guidehouse evaluated the SBMS and LBMS programs collectively as one initiative. Guidehouse calculated the minimum sample size needed to achieve at least 15% relative precision at 85% confidence level for calculating verified energy and demand savings. The population counts and sample sizes for the initiative are based on counts of unique projects identified by a unique Job ID (project) in the tracking database.

Guidehouse applied stratification based on total energy savings and assigned each project to various strata based on that project's energy savings. The large stratum includes projects in the upper portion of the Midstream program component's energy savings; the medium stratum includes projects in the middle portion of the Midstream energy savings; and the small stratum represents the bottom portion of the Midstream energy savings. Further, due to historical sampling practices, these programs were further sub-stratified into LBMS and SBMS. When randomly selecting sample projects, Guidehouse selected projects based on the energy savings (MWh) stratification of each project.

Due to changes associated with Phase IV with implementation contractors and TRM updates and taking into consideration historic coefficient of variation (CV) values from the PY13 evaluation of energy and demand savings for this program component, Guidehouse sampled a higher number of SBMS projects, primarily due to high participation and savings.

Table E-1: Midstream Sample Design

Stratum	Stratum Boundaries	Population (Projects)	Historical CV (Energy)	Historical CV (Demand)	Sampled Projects
LBMS - Large	MWh > 100	43	0.65	0.41	5
LBMS - Medium	10 ≤ MWh <100	142	0.25	0.12	3
LBMS - Small	MWh < 10	549	1.74	2.65	6
SBMS - Large	MWh > 100	72	0.70	0.78	7
SBMS - Medium	10 ≤ MWh <100	809	0.46	0.17	6
SBMS - Small	MWh < 10	1,310	0.97	0.55	10
Program Total		**2,930**			**38**

Source: Guidehouse analysis

Table E-2: Midstream Initiative Results (Energy)

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBMS - Large	17,263	133%	0.63	43%
SBMS - Medium	27,641	121%	0.29	12%
SBMS - Small	3,316	86%	0.72	50%
LBMS – Large (Commercial)	3,400	128%	0.86	49%
LBMS – Medium (Commercial)	2,847	94%	0.15	19%
LBMS – Small (Commercial)	1,006	123%	0.56	39%
LBMS – Large (Industrial)	11,985	128%	0.86	49%
LBMS – Medium (Industrial)	1,945	94%	0.15	19%
LBMS – Small (Industrial)	246	123%	0.56	39%
Program Total*	**57,844**	**120%**		**13%**

Source: Guidehouse analysis

Table E-3: Midstream Initiative Results (Demand)

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBMS - Large	3.07	110%	0.42	29%
SBMS - Medium	4.86	134%	0.47	20%
SBMS - Small	0.73	90%	0.36	25%
LBMS – Large (Commercial)	0.51	94%	0.55	31%
LBMS – Medium (Commercial)	0.59	123%	0.47	62%
LBMS – Small (Commercial)	0.18	116%	0.89	61%
LBMS – Large (Industrial)	2.20	94%	0.55	31%
LBMS – Medium (Industrial)	0.47	123%	0.47	62%
LBMS – Small (Industrial)	0.04	116%	0.89	61%
Program Total	**12.6**	**116%**		**11%**

Source: Guidehouse analysis

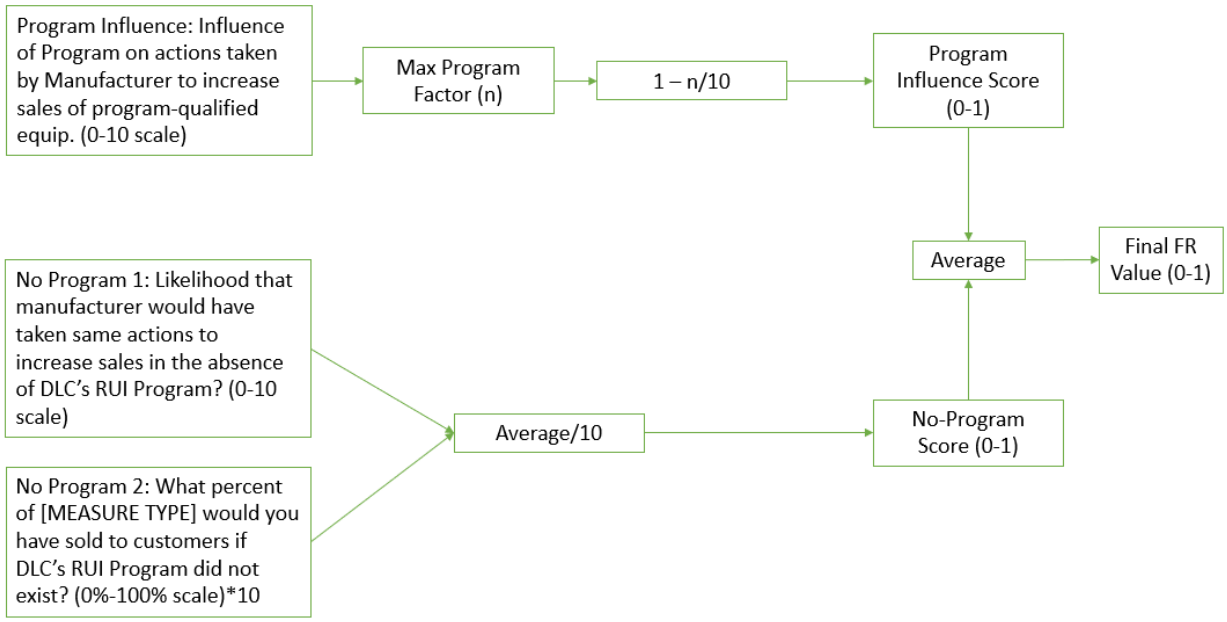
Appendix F. Free Ridership Evaluation for Residential Upstream Incentives Program

This section describes the evaluation method that Guidehouse used for assessing free ridership for RUIP. It follows general guidelines provided in the SWE's Phase IV Evaluation Framework, Section 3.4 Net Impact Evaluation and Section 3.4.1.5 Approaches for Midstream and Upstream Programs. Guidehouse conducted manufacturer interviews to assess the program's level of impact on sales and business activities regarding the incentivized energy efficient products.

Guidehouse designed the following method to assess participant free ridership from a manufacturer's perspective, demonstrated in diagram Figure F-1. Based on manufacturer responses, Guidehouse estimated a Program Influence score and a No Program score. The obtained free ridership estimates for each manufacturer were then weighted by the energy savings claimed by each manufacturer in PY14.

- **Program Influence (PI) score:** An estimate of the program's influence on the manufacturer.
    - Influence of the program on the actions taken by a manufacturer to increase the sales of high efficiency measures to their customers.
- **No Program (NP) score:** An estimate of the percentage of measures manufacturers would have sold to their customers if the program did not exist. This score is composed of two parameters:
    - Likelihood of taking actions reported to increase the sales of high efficiency measures if the program did not exist.
    - Percentage of program measures sold that would have been sold to customers if the program did not exist.

Figure F-1: TA Free Ridership Protocol



Source: Guidehouse analysis

Appendix G. Respondent Demographics and Firmographics

Table G-1 shows respondents' demographics for all the residential participant surveys conducted in PY14.

Table G-1: PY14 Survey Demographics for Residential Programs

Program		Behavioral Energy Efficiency		Low Income Energy Efficiency (audit)		Low Income Energy Efficiency (kits)	
Sample Size (n)		**344**		**79**		**148**	
		Count	**%**	**Count**	**%**	**Count**	**%**
Household	Members in Household (Average)	1.8		2.1		1.8	
Age	18 or younger	2	1%	2	3%	1	1%
	19 to 24	1	0%	1	1%	1	1%
	25 to 34	16	5%	7	9%	2	1%
	35 to 44	42	12%	9	11%	18	12%
	45 to 54	53	15%	11	14%	25	17%
	55 to 64	82	24%	27	34%	49	33%
	65 or over	119	34%	21	27%	45	30%
	Don't Know	0	0%	0	0%	0	0%
	Prefer not to answer	29	9%	1	1%	7	5%
Home Size	Less than 1,000 SF	55	16%	12	15%	15	10%
	1,000 SF to 1,500 SF	74	21%	17	22%	38	26%
	1,500 SF to 2,000 SF	34	10%	5	6%	14	9%
	2,000 SF to 2,500 SF	25	7%	2	3%	4	3%
	2,500 SF to 3,000 SF	11	3%	3	4%	1	1%
	3,000 SF or more	9	3%	1	1%	3	2%
	Don't Know	120	35%	34	43%	63	43%
	Prefer not to answer	16	5%	5	6%	10	7%
Household Income	Under $15,000	82	24%	27	34%	45	30%
	$15,000 to $17,999	13	4%	7	9%	18	12%
	$18,000 to $23,999	30	9%	10	13%	20	14%
	$24,000 to $29,999	12	3%	5	6%	10	7%
	$30,000 to $36,999	16	5%	4	5%	8	5%
	$37,000 to $42,999	15	4%	5	6%	4	3%
	$43,000 to $49,999	15	4%	1	1%	2	1%
	$50,000 to $74,999	18	5%	1	1%	3	2%
	$75,000 to $99,999	14	4%	0	0%	0	0%
	$100,000 or more	30	9%	0	0%	2	1%
	Don't Know	7	2%	4	5%	4	3%
	Prefer not to answer	92	27%	15	19%	32	22%

Source: Guidehouse analysis

Table G-2 shows respondents' firmographics for the Small Business Solutions (SBS) and Large Business Solutions (LBS) participant survey conducted in PY14.

Table G-2: PY14 Survey Firmographics for Small Business Solutions and Large Business Solutions

Program		SBS and LBS	
Sample Size (n)		**21**	
		Count	**%**
Facility type	Office	5	24%
	Retail	5	24%
	Restaurant/bar	2	10%
	Food store	1	5%
	Warehouse/wholesale	2	10%
	Hotel/motel	0	0%
	Personal service	2	10%
	Elementary/secondary schools	0	0%
	College/trade schools	1	5%
	Hospital	0	0%
	Other health services	0	0%
	Miscellaneous/other commercial	1	5%
	Government service/public service	0	0%
	Manufacturing	0	0%
	Apartment complexes	2	10%
	Don't know	0	0%
Ownership	I am the owner or operator of the facility	5	24%
	Our organization owns and occupies this facility	6	29%
	Our organization owns this facility, but it is rented to someone else	3	14%
	Our organization rents this facility	2	10%
	Other	4	19%
	Don't know	1	5%
Facility Age	Less than 2 years	1	5%
	2 to 4 years	1	5%
	5 to 9 years	2	10%
	10 to 19 years	2	10%
	20 to 29 years	1	5%
	30 years or more	11	52%
	Don't know	3	14%
Employees	1 to 4 employees	2	10%
	5 to 9 employees	2	10%
	10 to 19 employees	5	24%

Program		SBS and LBS	
Sample Size (n)		21	
		Count	%
	20 to 99 employees	3	14%
	100 to 499 employees	4	19%
	500 to 749 employees	1	5%
	750 to 999 employees	0	0%
	1,000 employees or more	0	0%
	Don't know	4	19%

Source: Guidehouse analysis

Table G-3 shows respondents' firmographics for the Small Business Direct Install (SBDI) participant survey conducted in PY13 and PY14.

Table G-3: PY13 and PY14 Survey Firmographics for Small Business Direct Install

Program		SBDI	
Sample Size (n)		24	
		Count	%
Facility type	Office	2	8%
	Retail	4	17%
	Restaurant/bar	2	8%
	Food store	1	4%
	Warehouse/wholesale	0	0%
	Hotel/motel	2	8%
	Personal service	1	4%
	Elementary/secondary schools	0	0%
	College/trade schools	1	4%
	Hospital	0	0%
	Other health services	0	0%
	Miscellaneous/other commercial	2	8%
	Government service/public service	4	17%
	Manufacturing	0	0%
	Apartment complexes	0	0%
	Other	5	21%
	Don't Know	0	0%
Ownership	I am the owner or operator of the facility	6	25%
	Our organization owns and occupies this facility	14	58%
	Our organization leases/rents this space from the facility owner	3	13%
	Other	1	4%

Program		SBDI	
Sample Size (n)		**24**	
		Count	**%**
	Don't Know	0	0%
Respondent's role	Owner	10	42%
	General office manager	2	8%
	Facility manager	4	17%
	Director of engineering	0	0%
	Corporate sustainability manager/officer	1	4%
	Other	6	25%
	Prefer not to answer	1	4%
Employees	Less than 20	16	67%
	20 to 49	0	0%
	50 to 99	1	4%
	100 to 999	7	29%
	1,000 or more	0	0%

Source: Guidehouse analysis

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