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

Program Year 15
(June 1, 2023-May 31, 2024)

For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Prepared for:

DUQUESNE LIGHT CO.

Duquesne Light Company

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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
LBS	Large Business Solutions
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
NTGR	Net-to-Gross Ratio
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
RUL	Remaining Useful Life
SBDI	Small Business Direct Install
SBS	Smal Business Solutions
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 (NTGR).

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.

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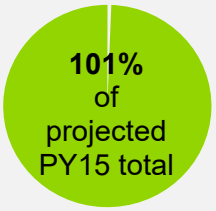
PORTFOLIO

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

Reported Energy Savings

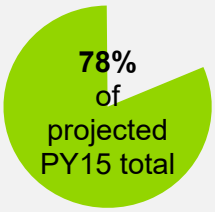
Phase IV has so far been reported to save **267,842 MWh** (VTD+CO)



PY15 saved **67,970 MWh/yr**

Reported Demand Savings

Phase IV has so far been reported to save **45.41 MW** (VTD)



PY15 saved **12.39 MW/yr**

PY15 Participation

A total of **263,847** participants:

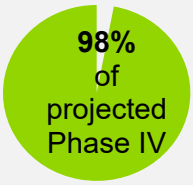
29,898 Low Income

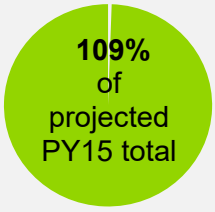
233,307 Residential

642 Nonresidential

Actual Expenditures ($1,000)

Phase IV expenditures: **$58,957**





PY15 expenditures: **$17,951**

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 15 (PY15), 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 PY15. 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.

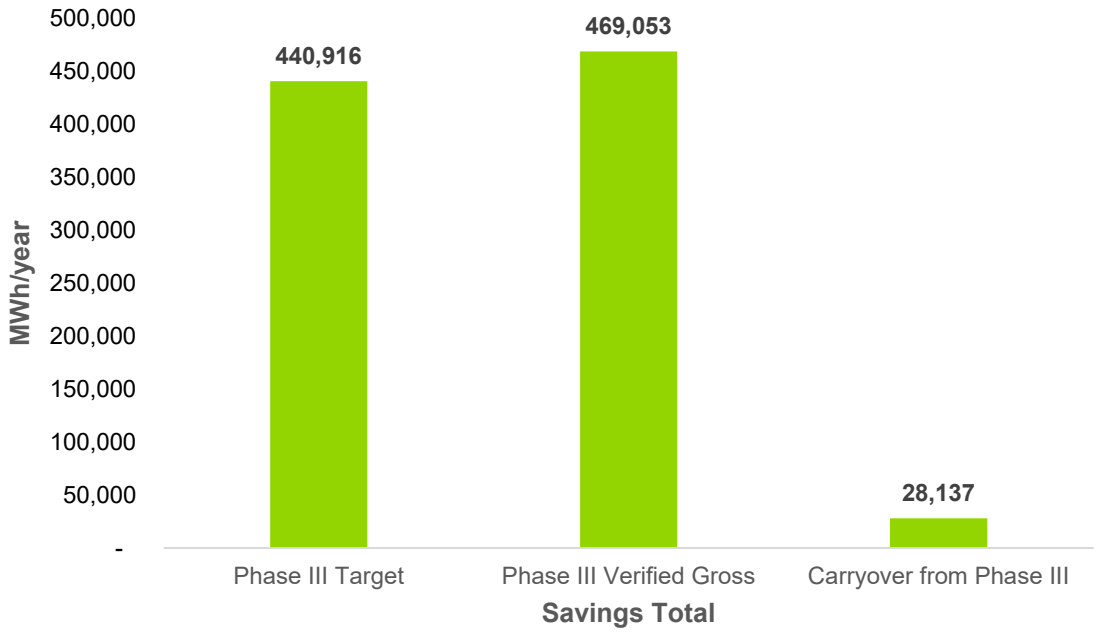
[1] The Pennsylvania TRC Test for Phase I was adopted by PUC Order at Docket No. M-2009-2108601 on June 23, 2009 (*2009 PA TRC Test Order*). The TRC Test Order for Phase I later was refined in the same docket on August 2, 2011 (*2011 PA TRC Test Order*). The 2013 TRC Order for Phase II of Act 129 was 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] Pennsylvania Statewide Evaluator, *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 PY15 on June 1, 2023, Duquesne Light has claimed:

- 67,044 MWh/yr of reported gross electric energy savings (PYRTD)
- 12.64 MW/yr of reported gross peak demand savings (PYRTD)
- 67,970 MWh/yr of verified gross electric energy savings (PYVTD)
- 12.39 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:

- 226,849 MWh/yr of reported gross electric energy savings (RTD)
- 42.17 MW/yr of reported gross peak demand savings (RTD)
- 239,705 MWh/yr of verified gross electric energy savings (VTD)

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

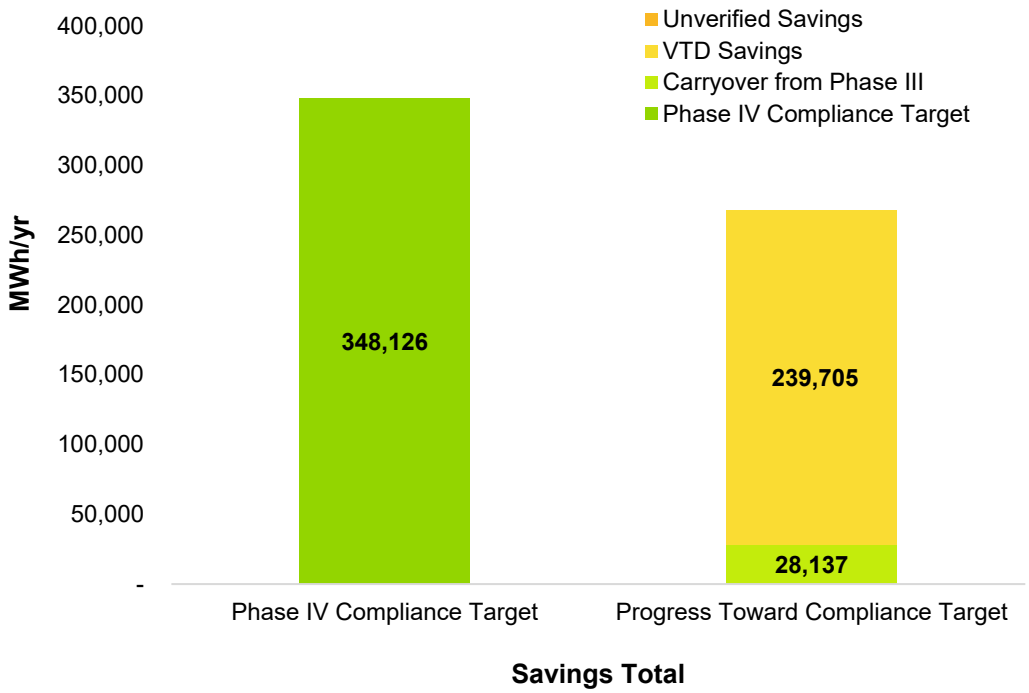
- 45.41 MW/yr of verified gross peak demand savings (VTD)
    - This represents 73% of the May 31, 2026, peak demand savings compliance target of 62 MW/yr

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

- 267,842 MWh/yr of VTD + portfolio-level carryover energy savings
    - This represents 77% of the May 31, 2026, energy savings compliance target of 348,126 MWh/yr.

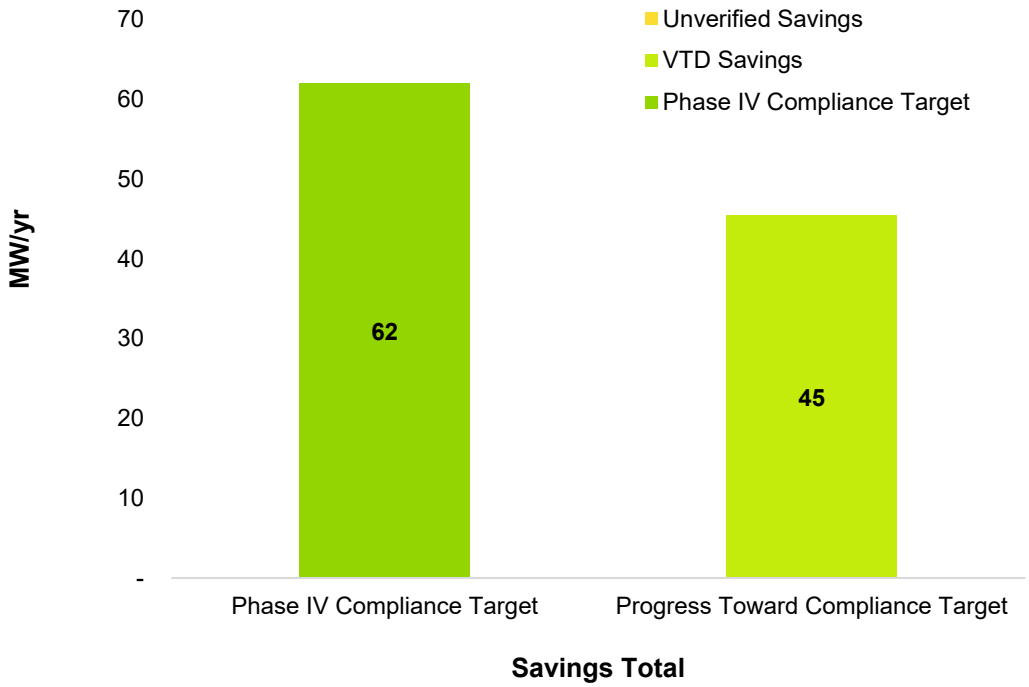
Figure 2-3 summarizes Duquesne Light's progress toward the Phase IV MWh portfolio compliance target, and Figure 2-4 summarizes progress toward the Phase IV MW portfolio compliance target. At the very end of PY15, new guidance was issued by the statewide evaluator (SWE) on how to calculate savings for canned spray foam that was distributed via a large air sealing kit. Therefore, the savings for these kits, which equates to 561 MWh/yr and 0.01 MW/yr, will be considered unverified until a complete impact evaluation can be completed in PY16. Figure 2-3 and Figure 2-4 do not show these unverified savings because all associated costs and reported savings have been moved to PY16.

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

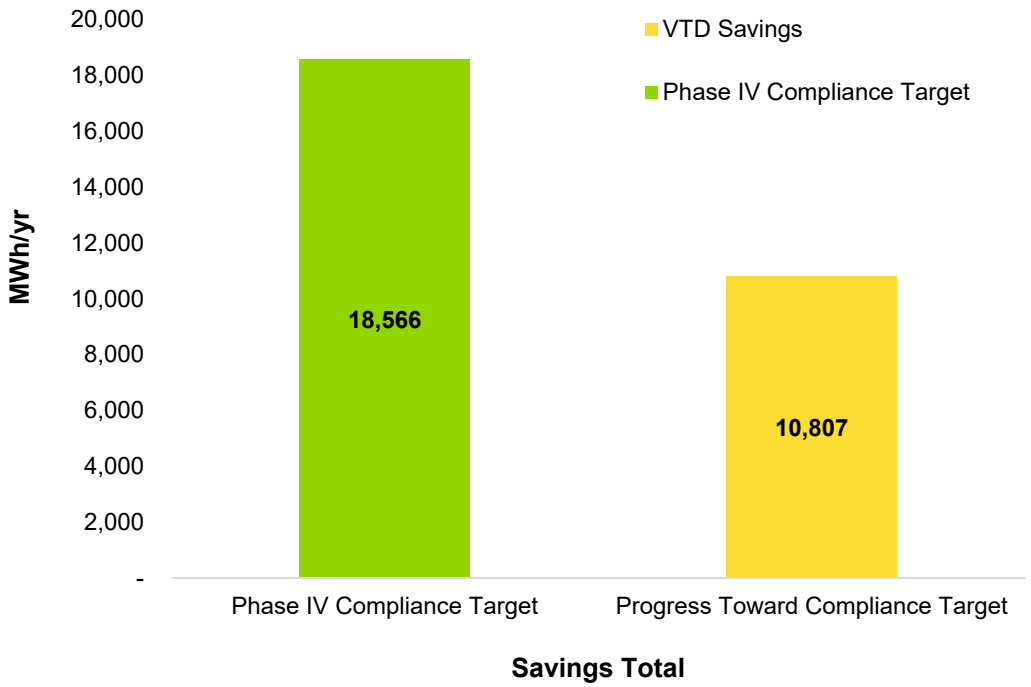


Source: Guidehouse analysis

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 targeted for Duquesne Light is 8.4%. Duquesne Light offers a total of 82 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 37.8% 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 5.3% 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 58% 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 750 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing, including 705 MWh/yr of verified gross electric energy savings (PYVTD) from LI households. For Phase IV, Duquesne Light has achieved 1,998 MWh/yr of verified gross electric energy savings (VTD) for multifamily housing, including 1,634 MWh/yr of verified gross electric energy savings (VTD) from LI households. These savings are reported under the Small Business Direct Install (SBDI) program and Large Business Solutions – Commercial program. The LI household savings are also reported under the Residential LI sector.

2.3 Phase IV Performance by Customer Segment

Table 2-1 presents the participation, savings, and spending by customer sector for PY15. 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 includes 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.

Table 2-1: PY15 Summary Statistics by Customer Segment

Parameter	Residential (Non-LI)	LI*	Small C&I	Large C&I	GNI	Total
Number of participants**	233,307	29,903	342	113	182	263,847
PYVTD MWh/yr	18,804	3,245	13,986	18,575	13,360	67,970
PYVTD MW/yr	3.82	0.37	2.75	2.90	2.55	12.39
Incentives ($1,000)	$1,616	$163	$2,584	$1,266	$2,227	$7,856

* The low income segment is reporting savings from residential, small commercial, and large commercial programs.
**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**	581,654	87,506	3,679	1,104	774	674,125
VTD MWh/yr	40,879	10,807	78,533	70,903	38,592	239,705
VTD MW/yr	7.47	1.27	18.22	11.20	7.41	45.41
Incentives ($1,000)	$2,529	$2,596	$13,923	$7,253	$5,847	$28,528

* The low income segment is reporting savings from residential, small commercial, and large commercial programs.
**See Section 2.4 for the per program definition of a participant.
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 PY15 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 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 PY15.

- 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 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).
- For the Small Business Virtual Commissioning (SBVCx) and Large Business Virtual Commissioning (LBVCx) programs, it is the number of unique participants (defined as unique account numbers).

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

Program	PY15 Participation	P4TD Participation
Downstream Incentives	18,646	52,473
Midstream Incentives	2	3
Upstream Incentives	N/A	N/A
Appliance Recycling	1,755	5,639
Residential Total	**20,403**	**58,115**
LI Total	**5,377**	**22,815**
Residential Behavior Total	**212,904**	**523,539**
LI Behavior Total	**24,521**	**64,686**
Small Business Direct-Install	116	409
Small Business Solutions	178	536

Program	PY15 Participation	P4TD Participation
Small Business Midstream Solutions	122	2,801
Small Business Virtual Commissioning	39	46
Commercial - Large Business Solutions	32	129
Industrial - Large Business Solutions	9	30
Commercial - Large Business Midstream Solutions	120	782
Industrial - Large Business Midstream Solutions	21	226
Large Business Virtual Commissioning	5	11
Nonresidential Total	**642**	**4,970**
Portfolio Total	**263,847**	**674,125**

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY15, Guidehouse completed impact evaluations for several program components in the portfolio. Table 2-4 summarizes the realization rates and net-to-gross (NTG) ratios (NTGRs) by evaluation component.

Table 2-4: Impact Evaluation Results Summary

Program and Initiative	Energy Realization Rate	Demand Realization Rate	NTGR
Downstream Incentives	109%	91%	82%
Midstream Incentives	100%	100%	100%
Upstream Incentives	99%	166%	74%
Appliance Recycling	101%	104%	72%
Residential Total	**105%**	**106%**	**78%**
LI Total	**98%**	**99%**	**100%**
Residential Behavior Total	**98%**	**93%**	**100%**
LI Behavior Total	**263%**	**-86%**	**100%**
Small Business Direct-Install	98%	102%	93%
Small Business Solutions	98%	89%	66%
Small Business Midstream Solutions	110%	114%	88%
Small Business Virtual Commissioning	99%	90%	94%
Commercial - Large Business Solutions	100%	87%	43%
Industrial – Large Business Solutions	105%	104%	43%
Commercial - Large Business Midstream Solutions	105%	113%	88%
Industrial - Large Business Midstream Solutions	101%	117%	88%
Large Business Virtual Commissioning	97%	80%	94%
Nonresidential Total	**101%**	**96%**	**64%**

Portfolio Total	**101%**	**98%**	**72%**

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 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 PY15 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 NTGR.

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	5,308	5,791	4,757	9,067	8,750	7,000
Residential Midstream Incentives	4	4	4	7	7	7
Residential Upstream Incentives	2,593	2,573	1,884	6,756	7,456	5,108
Residential Appliance Recycling	1,262	1,269	909	3,623	3,922	2,148
Low-Income Energy Efficiency	2,352	2,308	2,308	7,491	7,007	7,007
Residential Behavioral Savings	9,395	9,168	9,168	21,192	20,744	20,744
Low-Income Residential Behavioral	88	231	231	1,990	2,157	2,157
Small Business Direct Install	5,701	5,587	5,196	10,739	9,959	9,353
Small Business Solutions	7,333	7,204	4,751	22,231	24,087	16,896
Small Business Midstream Solutions*	2,527	2,773	2,441	52,861	57,431	39,383

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 Virtual Commissioning	2,259	2,232	2,091	2,759	2,704	2,563
Commercial Large Business Solutions	12,534	12,480	5,367	28,356	29,437	16,392
Industrial Large Business Solutions	9,669	10,172	4,374	26,869	27,170	12,027
Large Business Midstream Solutions – Commercial*	3,897	4,083	3,593	13,766	16,064	11,856
Large Business Midstream Solutions – Industrial*	717	723	636	15,223	18,997	13,085
Large Business Virtual Commissioning	1,407	1,371	1,284	3,921	3,813	3,726
Portfolio Total	**67,044**	**67,970**	**48,994**	**226,849**	**239,705**	**169,453**

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:

- RARP: SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the incorrect cooling degree days (CDDs) and heating degree days (HDDs) in the evaluation of savings. This caused a negligible effect to energy savings but was incorporated into future evaluations for this program. These verified gross savings are attributed to the Residential (Non-LI) sector VTD savings in Table 2-2.
- SBMS: In the PY13 final annual report, 3,238 MWh/yr of savings were reported but not verified. 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 sector VTD savings in Table 2-2.
- LBMS: In the PY13 final annual report, 569 MWh/yr of savings were reported but not verified. 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 sector 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 life (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	51,343	42,131	82,599	65,883
Residential Midstream Incentives	59	59	104	104
Residential Upstream Incentives	18,340	13,425	83,981	56,308
Residential Appliance Recycling	6,037	4,326	18,612	10,199
Low-Income Energy Efficiency	14,727	14,727	44,005	44,005
Residential Behavioral Savings	18,335	18,335	38,970	38,970
Low-Income Residential Behavioral	462	462	3,821	3,821
Small Business Direct Install	83,712	77,853	149,271	139,864
Small Business Solutions	106,045	69,591	355,001	249,382
Small Business Midstream Solutions	41,575	36,586	861,370	590,677
Small Business Virtual Commissioning	33,483	31,372	40,563	38,452
Commercial Large Business Solutions	184,216	80,874	436,882	245,458
Industrial Large Business Solutions	152,136	65,419	406,919	180,096
Large Business Midstream Solutions - Commercial	61,229	53,881	240,934	177,829
Large Business Midstream Solutions - Industrial	10,835	9,535	284,946	196,263
Large Business Virtual Commissioning	20,563	19,266	57,193	55,896
Portfolio Total	**803,099**	**537,843**	**3,105,171**	**2,093,208**

Source: Guidehouse analysis

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

- No changes have been made since the PY13 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 2-7 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	1.38	1.25	1.02	1.99	1.83	1.43
Residential Midstream Incentives	0.00	0.00	0.00	0.00	0.00	0.00
Residential Upstream Incentives	0.35	0.59	0.44	0.97	1.40	1.02
Residential Appliance Recycling	0.27	0.28	0.20	0.83	0.89	0.48
Low-Income Energy Efficiency	0.25	0.24	0.24	0.76	0.73	0.73
Residential Behavioral Savings	1.82	1.70	1.70	3.53	3.34	3.34
Low-Income Residential Behavioral	-0.03	0.03	0.03	0.19	0.28	0.28
Small Business Direct Install	0.92	0.94	0.87	1.83	1.87	1.75
Small Business Solutions	1.64	1.46	0.96	4.90	6.07	4.31
Small Business Midstream Solutions	0.60	0.69	0.60	11.39	12.78	8.78
Small Business Virtual Commissioning	0.47	0.42	0.39	0.49	0.54	0.51
Commercial Large Business Solutions	2.56	2.23	0.96	5.86	5.82	3.28
Industrial Large Business Solutions	1.29	1.34	0.58	2.80	2.84	1.28
Large Business Midstream Solutions – Commercial	0.74	0.83	0.73	2.63	2.87	2.13
Large Business Midstream Solutions – Industrial	0.21	0.24	0.21	3.57	3.56	2.48

Program Name	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Large Business Virtual Commissioning	0.19	0.15	0.14	0.43	0.59	0.58
Portfolio Total	**12.64**	**12.39**	**9.09**	**42.17**	**45.41**	**32.38**

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:

- RARP: SWE audit activities recommended an adjustment to the PY13 gross/net verified savings because of the use of the wrong CDDs and HDDs in the evaluation of savings. This caused a negligible effect to demand savings but was incorporated into future evaluations for this program. These verified gross savings are attributed to the Residential (Non-LI) sector VTD savings in Table 2-2.
- SBMS: In the PY13 final annual report, 0.61 MW/yr of savings were reported but not verified. Those savings have since been verified with a 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 sector VTD savings in Table 2-2.
- LBMS: In the PY13 final annual report, 0.10 MW/yr of savings were reported but not verified. Those savings have since been verified with a 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 sector 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 nonresidential programs may contribute to Duquesne Light's collective EE Resource for nomination into the PJM FCM Reliability Pricing Model Base Residual Auction. Duquesne Light did not nominate any projects to PJM in PY15.

2.8 Summary of Fuel Switching Impacts

Act 129 allows EDCs to achieve electric savings by converting electric equipment to non-electric equipment. Table 2-8. summarizes key fuel switching metrics in PY15 and to date in Phase IV.

Table 2-8. Fuel Switching Summary

Metric	PY15
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

2.9 Summary of Cost-Effectiveness Results

Table 2-9 presents a detailed breakdown of portfolio finances and cost-effectiveness. TRC benefits in Table 2-9 were calculated using gross verified impacts. Net present value (NPV) PY15 costs and benefits are expressed in 2023 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)**	$ 10,030		$ 37,911	
2	Rebates to Participants and Trade Allies	$ 4,113		$ 12,687	
3	Upstream/Midstream Incentives	$ 830		$ 9,348	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 4,216		$ 5,643	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ 871		$ 10,233	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 176	$ 135
8	Administration and Management	$ 527	$ 1,924	$ 1,440	$ 2,803
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 5,650	$ -	$ 21,285
11	EDC Evaluation Costs	$ 691		$ 1,412	
12	SWE Audit Costs	$ 528		$ 922	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 9,320		$ 28,173	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 19,350		$ 66,084	
15	Total NPV Lifetime Electric Energy Benefits	$ 24,569		$ 86,339	
16	Total NPV Lifetime Electric Capacity Benefits	$ 10,870		$ 40,938	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 1,501	$ 6,842
18	Total NPV Lifetime Fossil Fuel Impacts	$ (2,132)	$ (10,201)
19	Total NPV Lifetime Water Impacts	$ 1,091	$ 1,587
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 35,899	$ 125,504
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.86	1.90

* 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.

2.10 Comparison of Performance with Approved EE&C Plan

Table 2-10 presents PY15 expenditures compared with the budget estimates set forth in the EE&C plan for PY15 and P4TD. PY15 values are presented in 2023 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 with Phase IV EE&C Plan ($1,000)

Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
PY15 Portfolio	$16,462	$17,951	1.09
P4TD	$60,425	$58,957	0.98

Source: Guidehouse analysis

Table 2-11 compares PY15 and P4TD verified gross program savings with the energy savings projections set forth in the EE&C plan.

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

Savings	EE&C Plan Projections	VTD Gross MWh Savings	Ratio (Actual/Plan)
PY15 Portfolio MWh	67,054	67,970	1.01
P4TD MWh	221,261	239,705	1.08
PY15 Portfolio MW	15.87	12.39	0.78
P4TD MW	42.21	45.41	1.08

Source: Guidehouse analysis

The following list highlights key reasons programs exceeded or fell short of projected gross energy savings in PY15:

- The Residential Downstream program introduced a kit in PY15 that was focused on air sealing products. This kit included canned spray foam, but due to guidance from the SWE late in PY15, it was determined that a verification of savings would not be able to be completed until PY16. Therefore, the savings from these kits was removed from PY15 and moved to PY16.
- The Nonresidential Midstream program ran strong in PY14, therefore overshooting the PY14 projections. As a result, program activity in PY15 was reduced.

2.11 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 PY15.

Table 2-12: Findings and Recommendations Sections by Program

Program	Findings and Recommendations Section
Residential Downstream Incentives	3.1.7
Residential Midstream Incentives	3.2.7
Residential Upstream Incentives	3.3.7
Residential Appliance Recycling	3.4.7
Residential Low-Income Energy Efficiency	3.5.7
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 PY15 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	H	H	H[6]	H	H
Upstream Incentives	V	V	V	V	V
Appliance Recycling	V	H	V	H	H
Low-Income Energy Efficiency	H	V	H	V	H
Residential Behavioral	V	V	V	V	V
Low-Income Behavioral	V	V	V	V	V
Small/Medium C&I					
Small Business Direct Install	V[7] (2-year rolling sample)		V	H	V
Small Business Solutions	Uses a 2-year rolling sample approach				
Small Business Midstream	V	V	H	V	H
Small Business Virtual Commissioning	U	V	V	H	V
Large C&I					

[6] RMIP saw limited activity in PY15. 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 Business Virtual Commissioning	U	V	V	H	V

Source: Guidehouse analysis

3.1 Residential Downstream Incentives

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 either at the point-of-purchase (PoP) or following an application (Rebate), customers who received a comprehensive energy efficiency audit (Audit), and customers who received or purchased a kit including energy efficient equipment (Kits).

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. RDIP also offers PoP rebates through the online marketplace.

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, directly install measures such as LED bulbs, Advanced Power Strips, Faucet Aerators, and Nightlights. The in-home audits 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 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 a Kits component in which participation is counted by distinct project numbers. The Kits component includes an education element for elementary, middle, and high school students and teachers that 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 component also offers Air Sealing and Smart Home kits to customers for purchase. These kits include equipment to help make customer homes more efficient, such as smart thermostats, advanced power strips, outlet gaskets, and other air sealing measures.

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 PY15 by customer segment.

Table 3-2: RDIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY15 # Participants	18,646	18,646
PYRTD MWh/yr	5,308	5,308
PYRTD MW/yr	1.38	1.38
PY15 Incentives ($1,000)	$1,657	$1,657

Source: Guidehouse analysis

3.1.2 Gross Impact Evaluation

In PY15, Guidehouse conducted an impact evaluation of the Rebate, Audit, and Kits components of RDIP. For the Kits component, Guidehouse did a tracking database review and recalculation of savings. For the Rebate and Audit components, Guidehouse did an online survey for a sample of participating customers. Table 3-3 shows the reported energy savings in PY15, and Table 3-4 shows the reported demand savings in PY15.

Table 3-3: RDIP 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	307	90%	0.21	3%
Rebates	514	131%	1.00	14%
Kits	4,487	108%	-	0%
Program Total	**5,308**	**109%**		**2%**

Source: Guidehouse analysis

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

Table 3-4: RDIP 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	0.03	90%	0.22	4%
Rebates	0.66	82%	0.47	6%
Kits	0.69	99%	-	0%
Program Total	**1.38**	**91%**	**0.21**	**3%**

Source: Guidehouse analysis

3.1.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse conducted a net impact evaluation for the Audit component of RDIP in PY15. Guidehouse estimated NTG factors for RDIP based on results from the online participant survey. In total, 82 RDIP participants who received an audit completed the battery of NTG questions. Table 3-5 shows the estimated free ridership, spillover, and NTGR resulting from the PY15 survey of RDIP participants.

Table 3-5: PY15 RDIP Net Impact Evaluation Results

Program	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
Downstream Incentives – Audits Component	23%	43%	120%	0.91	5%

Source: Guidehouse analysis

3.1.3.1 High-Impact Measure Research

Guidehouse did not conduct high-impact measure (HIM) research for RDIP in PY15.

3.1.4 Verified Savings Estimates

In Table 3-6, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RDIP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-6: Residential Downstream PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	5,308	1.38
PYVTD Gross	5,791	1.25
PYVTD Net	4,757	1.02
RTD	9,067	1.99
VTD Gross	8,750	1.83

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Net	7,000	1.43

Source: Guidehouse analysis

3.1.5 Process Evaluation

Guidehouse completed a process evaluation for the Audits component of RDIP in PY15. As part of this process, the evaluation team conducted customer surveys to obtain feedback about their experience and satisfaction with program delivery processes and opportunities for program improvement. The following section discusses the approach, results, and findings for this evaluation activity.

3.1.5.1 Participant Survey Methodology

The participant survey focused on customers who had participated in RDIP in PY15 including receiving a home audit. The survey instrument included process, NTG, and net impact evaluation questions in one online survey. Table 3-7 provides an overview of the sample design and survey disposition.

Table 3-7: PY15 Audit Program Participant Survey Sample Design and Disposition

Stratum	Population	Evaluation Method	Sample Target	Achieved Sample	Response Rate
Large (Project Savings ≥ 754 kWh)	101	Online Survey	12	14	17%
Medium (754 kWh > Project Savings ≥ 425 kWh)	183		13	18	17%
Small (425 kWh > Project Savings)	338		14	50	19%
Total	**622**		**39**	**82**	**18%**

Source: Guidehouse analysis

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

- Program awareness and influence
- Program marketing
- Program satisfaction
- Program participation motivation and barriers

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

3.1.5.2 Participant Survey Findings

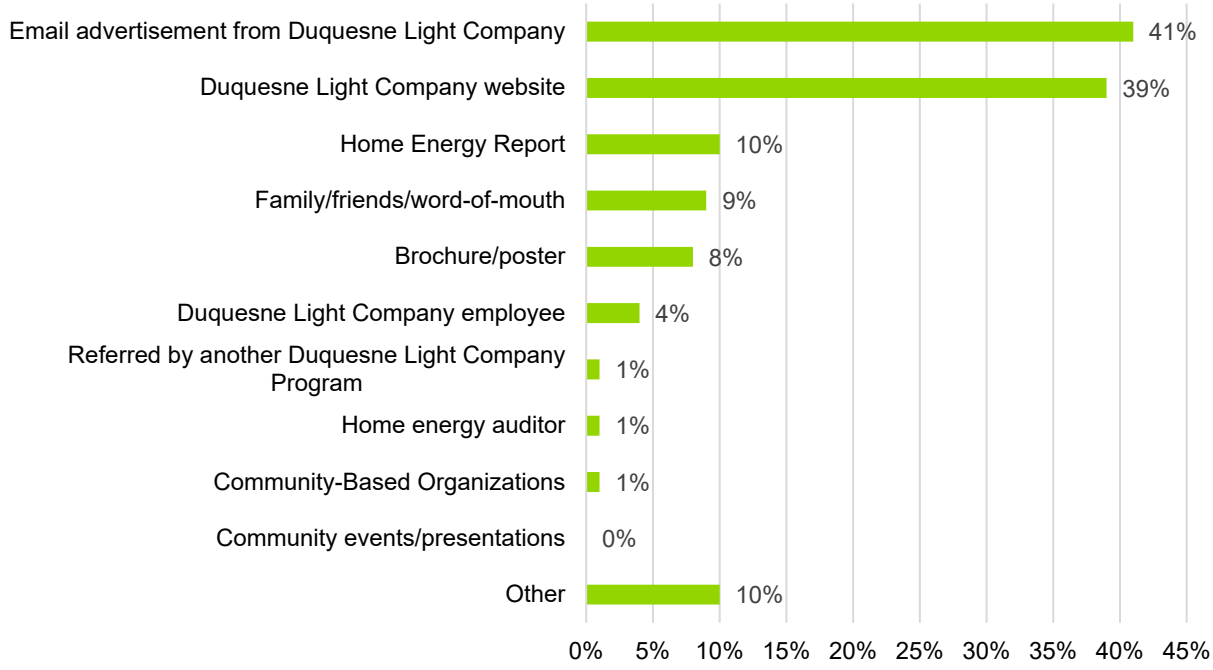
The following sections present survey responses for program awareness, program marketing, customer satisfaction ratings, and barriers and challenges with the program.

Program Awareness and Influence

Guidehouse asked participants how they learned about the Audit program. Figure 3-1 shows that the most common method was via email marketing from Duquesne Light (41%) and the Duquesne Light website (39%). Awareness via home energy reports ([HERs] 10%), word of mouth (9%), and posters or brochures (8%) was also reported.

Respondents were then asked how influential each was in their decision to participate in the program on a 1-5 scale. Among the five most common routes of awareness previously mentioned, respondents reported that HERs were the most influential (4.5), followed by email advertisements (4.4), word of mouth (4.3), the Duquesne Light website (3.9), and brochures and posters (3.5). Results show that email advertising is an effective mode of awareness creation and that HERs can be a significant driver of program participation.

Figure 3-1: How did you learn about this energy efficiency program?
(n=80; multiple responses allowed)

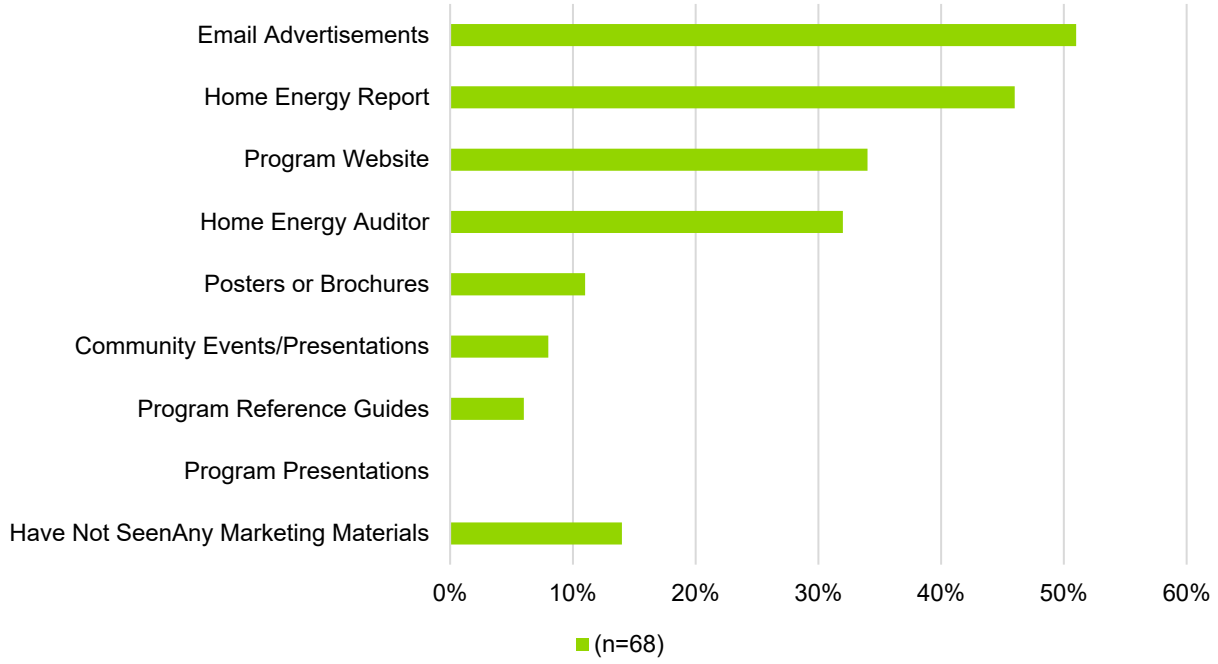


Source: Guidehouse analysis

Program Marketing

When asked what marketing efforts they were aware of that promote the program, over half of respondents reported that they were aware of email advertisements (51%), while many reported being aware of HER marketing (46%), the program website (34%), marketing via the home energy auditor (32%), and program brochures and posters (11%). Figure 3-2 shows the results. When asked how informative these materials were overall on a 1-5 scale, with 5 being “very informative,” responses averaged just over 4.1, indicating an opportunity to evaluate the clarity and comprehensiveness of marketing materials.

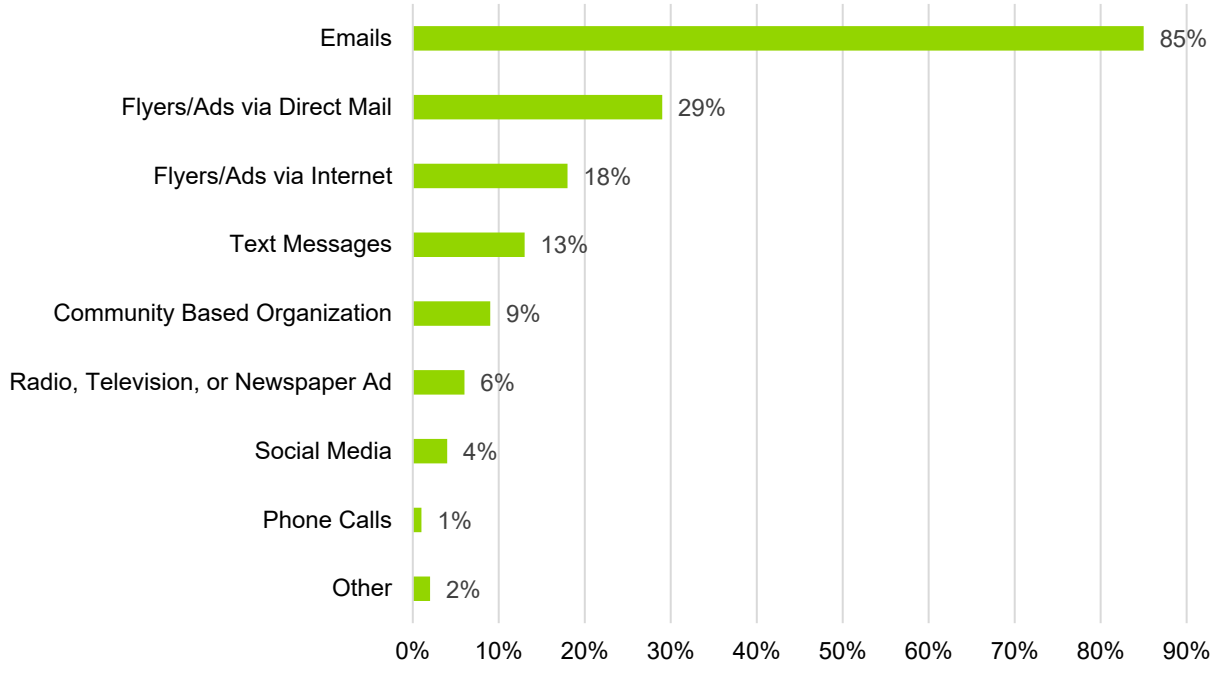
Figure 3-2: What marketing efforts or materials are you aware of that promote this or other Duquesne Light Company energy efficiency programs?
(n=71; multiple responses allowed)



Source: Guidehouse analysis

Respondents were also asked how they would prefer Duquesne Light reach out to them to provide information about their programs. As Figure 3-3 shows, respondents reported that they strongly preferred email (85%), followed by flyers/ads in direct mail (29%), flyers/ads on the internet (18%), and text message (13%). Radio, television, or newspaper ads were unpopular (6%), as was social media (4%), and telephone (1%). These findings further indicate that current Duquesne Light marketing efforts reflect customer preferences.

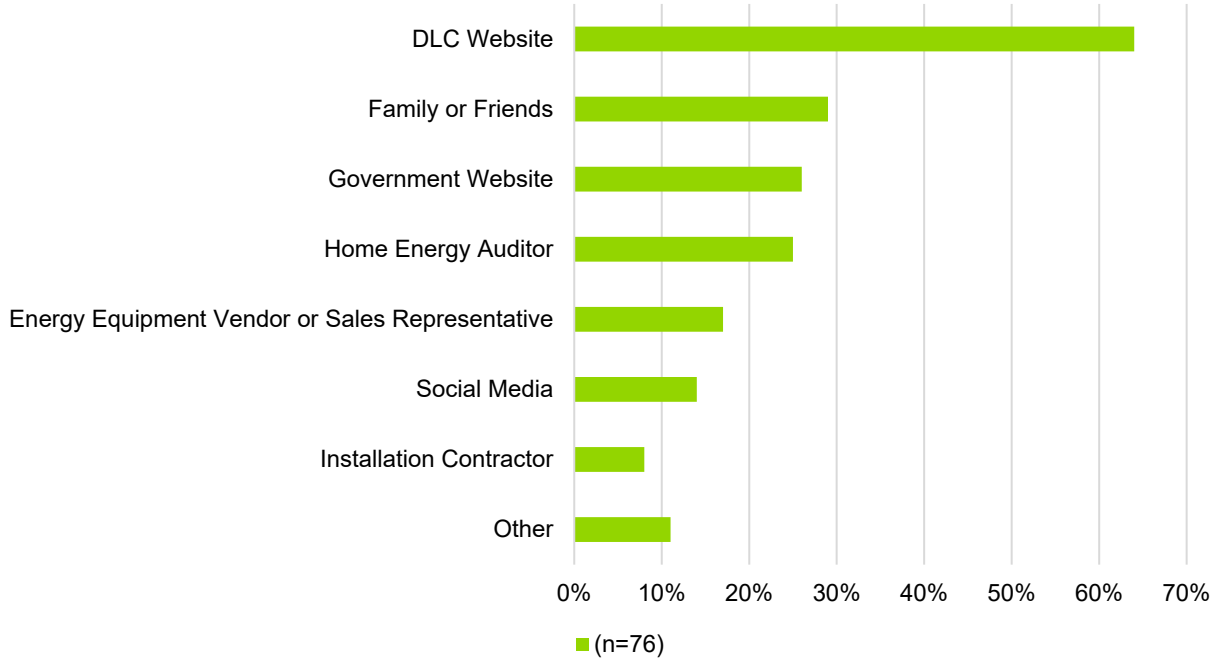
Figure 3-3: How do you prefer Duquesne Light Company reach out to you to provide information about their programs?
(n=82; multiple responses allowed)



Source: Guidehouse analysis

In addition, 64% of respondents reported that they would go to the Duquesne Light website if they needed additional information about how to save energy. This finding compares favorably to the 29% who would go to family or friends for this information, the 26% who said they would go to government websites, and the 25% who would seek this information from a home energy auditor. These results in Figure 3-4 indicate that Duquesne Light is the most trusted resource for customers when they are seeking information about reducing their energy use, which will drive program enrollment.

Figure 3-4: If you wanted additional information about ways to save energy, where would you typically look for this information?
(n=76; multiple responses allowed)



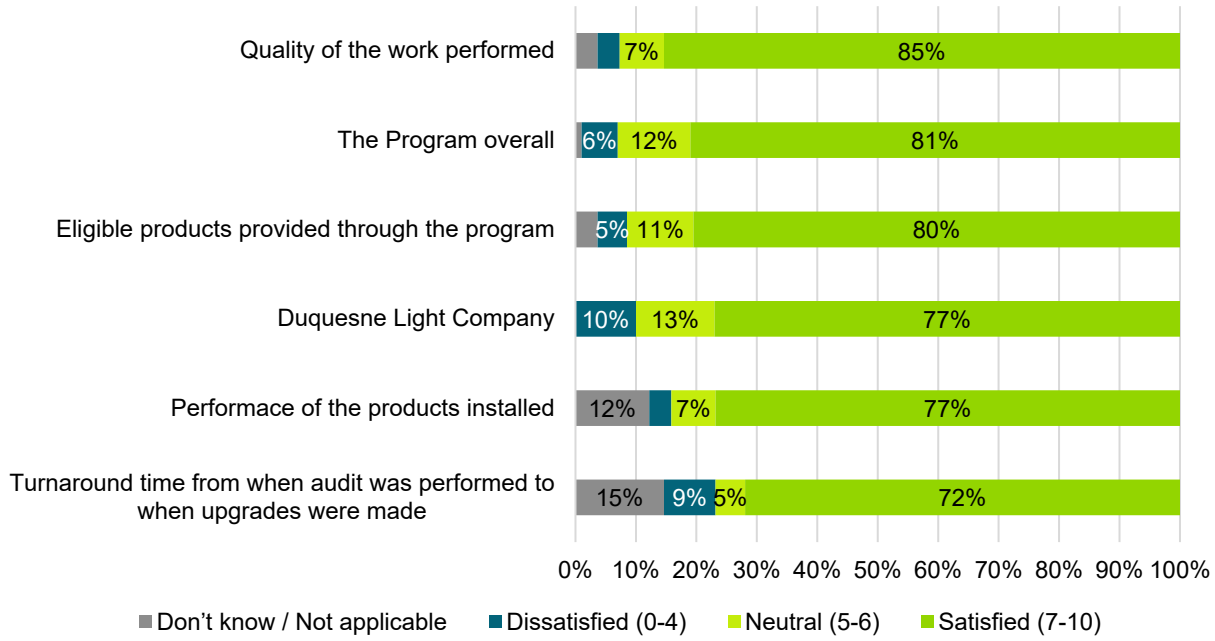
Source: Guidehouse analysis

Program Satisfaction

Guidehouse asked participants who received audits how satisfied they were with Duquesne Light, the program, and various program aspects. As Figure 3-5 shows, 77% of respondents reported satisfaction with the program overall with ratings of 7 or above on a 0-10 scale. Respondents were most satisfied with the quality of the work performed through the program (85%), followed by the satisfaction with the eligible products provided through the program (80%), performance of the products installed (77%), and turnaround time from when the audit was performed to when energy efficiency upgrades were made (72%). Seventy-seven percent of customers reported satisfaction of 7 or higher with Duquesne Light as a company overall.

Importantly, when asked if their participation in the program had changed how favorably they view Duquesne Light, 60% of respondents reported that they viewed Duquesne Light more favorably, 39% rated this view as “about the same.” Only 1% of respondents reported viewing the company less favorably than before participating.

Figure 3-5: How satisfied are you with each of the following aspects of this program?
(n=82)



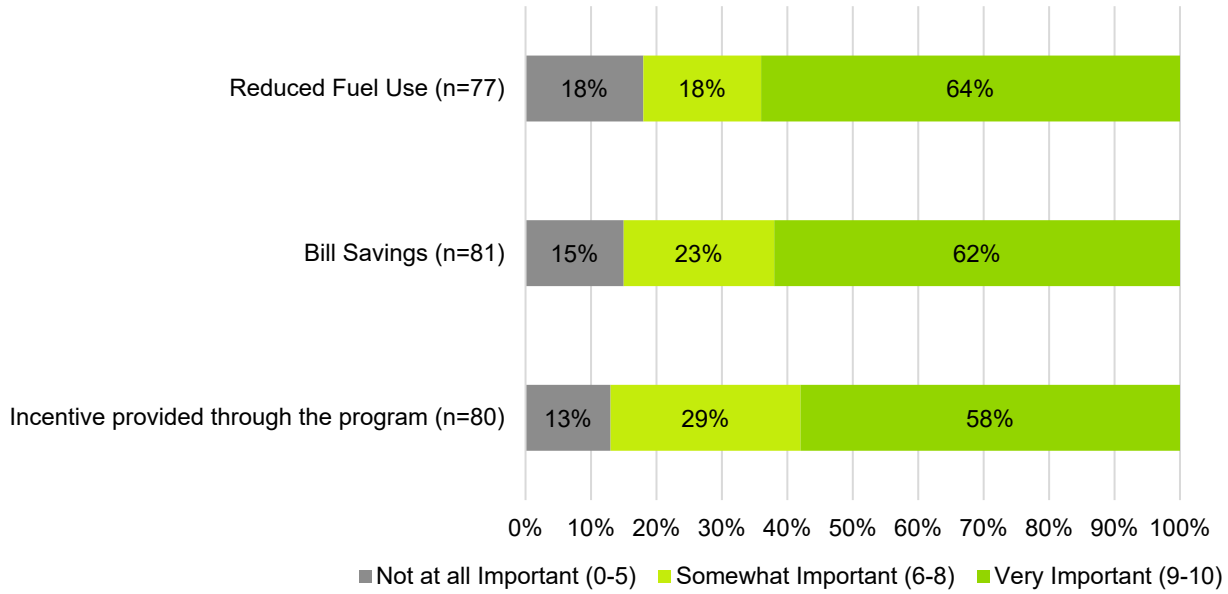
Source: Guidehouse analysis

Guidehouse asked respondents about any information they received from their home energy auditor. Almost all respondents (98%) noted hearing from their auditor about energy efficiency and how to save energy in their home. Seventy-eight percent of these respondents found this information useful, rating it a 7 or higher on a 0-10 scale. The average usefulness rating was a 7.8, indicating an opportunity to further evaluate how evaluator training addresses this customer need. Additionally, 47% of respondents reported receiving information about how to use their new equipment or about other Duquesne Light programs from their auditor. Most recipients found this information useful as well (88% and 82%, respectively).

Program Participation Motivation and Barriers

Respondents were asked how important several factors were in motivating their participation in the program: incentive levels, bill savings, and reduced fuel usage. As Figure 3-6 shows, respondents reported reduced fuel use as the strongest motivator with 64% providing a rating of 9 or higher, followed by bill savings (62%) and program incentives (58%). Some respondents noted other factors that were important in their decision to participate such as curiosity about the energy efficiency of their home (4 responses) and environmental issues (2 responses).

Figure 3-6: How would you rate how important the following factors were in your decision to participate in the program?

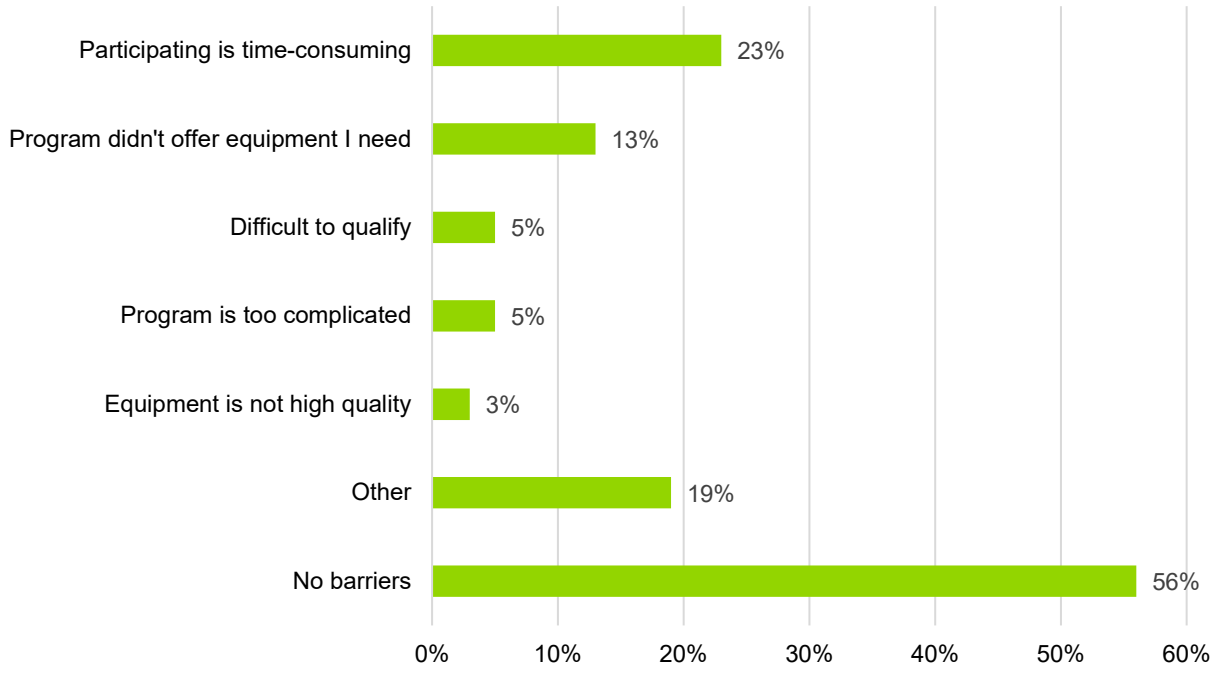


Source: Guidehouse analysis

When asked to rate the ease of participation in the program on a 0-10 scale, with 0 meaning "very difficult" and 10 meaning "very easy," 65% of respondents reported participation ease of 9 or 10, while a further 27% of respondents reported a score of 6 to 8. Scores averaged 8.7 with only two respondents reporting that participation was difficult (4 or below).

Guidehouse also asked participants about potential barriers to participation in the program. Most respondents (56%) reported that there were no barriers, as shown in Figure 3-7. The most common barrier noted was that participation was time-consuming (23%), followed by the program not offering the equipment needed (13%). Other barriers noted included difficulty qualifying (5%), the program being too complicated (5%), and the equipment not being high quality (3%). Respondents provided other barriers of note including that implementing recommendations for the program was cost-prohibitive for them (5 responses) and the time it took for the audit to be scheduled (3 responses). Overall, these findings indicate that some barriers warrant consideration, but customers generally find the program easy to participate in.

Figure 3-7: What do you see as the main barriers to participating in this program?
(n=78; multiple responses allowed)



Source: Guidehouse analysis

3.1.6 Program Finances and Cost-Effectiveness Reporting

Table 3-8 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-8 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-8: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 867		$ 1,643	
2	Rebates to Participants and Trade Allies	$ 1,657		$ 1,517	
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)	$ (790)		$ 126	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 10	$ 8
8	Administration and Management	$ 63	$ 117	$ 143	$ 170
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 1,101	$ -	$ 2,504
11	EDC Evaluation Costs	$ 42		$ 85	
12	SWE Audit Costs	$ 32		$ 52	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,355		$ 2,972	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,222		$ 4,615	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,626		$ 2,347	
16	Total NPV Lifetime Electric Capacity Benefits	$ 949		$ 1,275	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (25)		$ (67)	
19	Total NPV Lifetime Water Impacts	$ 852		$ 1,202	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,403		$ 4,757	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.53		1.03	

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

Source: Guidehouse analysis

Table 3-9 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied to the audits component of the program in PY15 comes from the PY15 Net

Impact Evaluation (Section 3.1.3). The NTGR applied to other program components in PY15 comes from PY13 Net Impact Evaluation.

Table 3-9: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 711		$ 1,323	
2	Rebates to Participants and Trade Allies	$ 1,360		$ 1,242	
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)	$ (532)		$ 50	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 10	$ 8
8	Administration and Management	$ 63	$ 117	$ 143	$ 170
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 1,101	$ -	$ 2,504
11	EDC Evaluation Costs	$ 42		$ 85	
12	SWE Audit Costs	$ 32		$ 52	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,355		$ 2,972	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,066		$ 4,295	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,335		$ 1,868	
16	Total NPV Lifetime Electric Capacity Benefits	$ 779		$ 1,011	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (20)		$ (54)	
19	Total NPV Lifetime Water Impacts	$ 699		$ 975	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,793		$ 3,800	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.35		0.88	

* 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

The impact and process evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-10 provides a summary of audit component findings, along with Duquesne Light's plan to address the recommendations in program delivery.

Table 3-10: RDIP Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Smart strips saw a moderate drop in verified savings due to several factors. From the sample of 23 survey participants who received smart strips, 34 strips were reported as installed and claimed entertainment savings. However, survey results verified that only 16 strips were being used with entertainment equipment. Of the remaining 18 smart strips, eight were being used with home office equipment, which achieve fewer savings, and 10 were being used in a manner that does not achieve savings or were not being used at all.	• The CSP should consider ensuring that the customer understands how the Advanced Power Strip saves energy or claim savings for "unspecified use."
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into program operations**.**	
Reported Savings	
• Of the sampled measures, the reported savings for one dehumidifier, two freezers, and 19 HVAC measures could not be replicated using the ENERGY STAR or Air Conditioning, Heating, and Refrigeration Institute (AHRI) data associated with the reported IDs.	• The CSP should ensure that all input variables match the measure specifications.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with CSP to ensure valid ENERGY STAR and AHRI IDs are collected.	
Program Awareness, Influence, and Marketing	
• The two most common ways for participants to learn about the program are email advertisements from Duquesne Light (41%) and the Duquesne Light website (39%). Awareness via HERs (10%), brochures and posters (8%), and word of mouth (9%) were also reported. Only one respondent reported being referred to the program via their participation in another Duquesne Light energy efficiency program.	• Consider evaluating the feasibility and value of cross-promoting programs and take appropriate action to do so.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will incorporate into future program operations.	
Program Awareness, Influence, and Marketing	
• Of the most common routes of awareness, HERs were reported to be the most influential by respondents in motivating participation in the program, averaging 4.5 on 5-point scale, followed by email advertisements (4.4), word-of-mouth referrals (4.3), the Duquesne Light website (4.3), and posters/brochures (3.5).	• Continue to use HERs to raise awareness of the program.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	
Program Awareness, Influence, and Marketing	
• When asked how informative marketing materials for Duquesne Light energy efficiency programs are, 52 of 68 respondents (76%) rated it as informative (4 or 5, on a 5-point scale), while 15 (22%) rated them a 3, and only one respondent reported a 0 or 1.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Program Awareness, Influence, and Marketing	

Findings	Recommendations
• Respondents reported preferring to be notified by Duquesne Light about energy efficiency offerings via email (70 of 82; 85%), though only 31 of 80 (39%) reported their awareness came from emails. Direct mail (29%) and text messages (13%) were also preferred.	• Consider evaluating marketing campaigns to increase the role of email in customer awareness. This may include increasing the frequency of emails, increasing Duquesne Light's focus on gathering customer contact information, or re-evaluating targeting procedures for customer recruitment.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
Program Satisfaction	
• Seventy-two of 81 respondents (89%) reported being satisfied (6 or higher on a 0-10 scale) with the overall program, while 46 (57%) of these respondents reported being highly satisfied (9 or 10 on 0-10 scale). Only five respondents reported being dissatisfied, answering 0-4. This resulted in an overall average satisfaction rate of 8.3/10.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Program Satisfaction	
• Respondents reported being highly satisfied with the performance of the products provided through the program, with 72 respondents rating this program factor an average of 8.7/10.	• Continue to offer the products currently included in the program.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	
Program Satisfaction	
• Forty-nine of 82 (60%) respondents reported that they viewed Duquesne Light more favorably as a result of their participation in the program, while 32 (39%) reported this view was "about the same," and only one reported a less favorable view of Duquesne Light.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Program Satisfaction	
• Respondents rated "bill savings" as the most important factor in their choice to participate in the program, with an average score of 8.3/10, followed by incentive payments (8.1) and reduced fuel use (8.1).	• Continue to emphasize the amount customers can save on their bills by participating; consider including calculation tools to help make their savings opportunities clear.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	
Program Satisfaction	
• Respondents (n=82) generally found the program easy to participate in, rating this ease an average of 8.7/10. Only two respondents rated ease of participation below 5, indicating that they found it difficult to participate.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
NTG	
• The NTGR for the Audit component of RDIP is 120% with program free ridership of 23% and a fairly high spillover of 43%.	• Continue to provide audits as they have the potential to generate high spillover savings.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	

3.2 Residential Midstream Incentives

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, reducing 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 PY15.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-11 presents the participation counts, reported energy and demand savings, and incentive payments for RMIP in PY15 by customer segment.

Table 3-11: RMIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY15 # Participants	2	2
PYRTD MWh/yr	4	4
PYRTD MW/yr	0.00	0.00
PY15 Incentives ($1,000)	$0	$0

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 PY15. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.3 Net Impact Evaluation

Guidehouse did not conduct net impact evaluation research for RMIP in PY15 due to low program participation thus far in Phase IV. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.3.1 HIM Research

Guidehouse did not conduct HIM research for the RMIP in PY15.

3.2.4 Verified Savings Estimates

In Table 3-12, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RMIP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-12: RMIP PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	4	0.00
PYVTD Gross	4	0.00
PYVTD Net	4	0.00
RTD	7	0.00
VTD Gross	7	0.00
VTD Net	7	0.00

Source: Guidehouse analysis

3.2.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RMIP in PY15 due to low program participation thus far in Phase IV. Guidehouse will continue to monitor program participation and plans to complete this research if participation picks up to a significant level.

3.2.6 Program Finances and Cost-Effectiveness Reporting

Table 3-13 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-13 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-13: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 6		$ 17	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ 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)	$ 6		$ 16	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ -	$ -	$ 41	$ 1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$ 61
11	EDC Evaluation Costs	$ -		$ 2	
12	SWE Audit Costs	$ -		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ -		$ 108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 6		$ 125	
15	Total NPV Lifetime Electric Energy Benefits	$ 2		$ 3	
16	Total NPV Lifetime Electric Capacity Benefits	$ 2		$ 3	
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)**	$ 4		$ 6	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.57		0.05	

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

Source: Guidehouse analysis

Table 3-14 presents program financials and cost-effectiveness on a net savings basis. Since this program was not included in Phase III and NTG research has not been conducted yet for this program in Phase IV, the NTGR is assumed to be 1.0.

Table 3-14: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 6		$ 17	
2	Rebates to Participants and Trade Allies	$ -		$ -	
3	Upstream/Midstream Incentives	$ -		$ 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)	$ 6		$ 16	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ -	$ 1
8	Administration and Management	$ -	$ -	$ 41	$ 1
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$ 61
11	EDC Evaluation Costs	$ -		$ 2	
12	SWE Audit Costs	$ -		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ -		$ 108	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 6		$ 125	
15	Total NPV Lifetime Electric Energy Benefits	$ 2		$ 3	
16	Total NPV Lifetime Electric Capacity Benefits	$ 2		$ 3	
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)**	$ 4		$ 6	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.57		0.05	

* 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 PY15.

3.3 Residential Upstream Incentives

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 PY15.

3.3.1 Participation and Reported Savings by Customer Segment

Table 3-15 presents the participation counts, reported energy and demand savings, and incentive payments for RUIP in PY15 by customer segment.

Table 3-15: RUIP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY15 # Participants	N/A	N/A
PYRTD MWh/yr	2,593	2,593
PYRTD MW/yr	0.35	0.35
PY15 Incentives ($1,000)	$50	$50

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

In PY15, 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 review and recalculation was completed for both the Upstream Lighting and Upstream Appliance components. Table 3-16 presents the gross impact results for energy, and Table 3-17 presents the gross impact results for demand.

Table 3-16: RUIP 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	2,316	100%	-	0%

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

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
LEDs	277	93%	-	0%
Program Total	**2,593**	**99%**		**0%**

Source: Guidehouse analysis

Table 3-17: RUIP 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	0.32	173%	-	0%
LEDs	0.03	90%	-	0%
Program Total	**0.35**	**166%**		**0%**

Source: Guidehouse analysis

3.3.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for RUIP in PY15. Table 2-4 shows the NTGR applied to RUIP projects that was carried over from the PY14 NTG evaluation.

3.3.3.1 HIM Research

Guidehouse did not conduct HIM research for RUIP in PY15.

3.3.4 Verified Savings Estimates

In Table 3-18, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for RUIP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-18: RUIP PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,593	0.35
PYVTD Gross	2,573	0.59
PYVTD Net	1,884	0.44
RTD	6,756	0.97
VTD Gross	7,456	1.40
VTD Net	5,108	1.02

Source: Guidehouse analysis

3.3.5 Process Evaluation

Guidehouse did not conduct process evaluation research for RUIP in PY15.

3.3.6 Program Finances and Cost-Effectiveness Reporting

Table 3-19 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-19 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 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)**	$ 599		$ 1,868	
2	Rebates to Participants and Trade Allies	$ -		$ 178	
3	Upstream/Midstream Incentives	$ 50		$ 483	
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)	$ 549		$ 1,207	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 5
8	Administration and Management	$ 32	$ 75	$ 92	$ 110
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 511	$ -	$ 1,518
11	EDC Evaluation Costs	$ 27		$ 55	
12	SWE Audit Costs	$ 21		$ 37	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 666		$ 1,824	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,265		$ 3,692	
15	Total NPV Lifetime Electric Energy Benefits	$ 562		$ 2,350	
16	Total NPV Lifetime Electric Capacity Benefits	$ 364		$ 1,094	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (23)		$ (280)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 903		$ 3,164	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.71		0.86	

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

Source: Guidehouse analysis

Table 3-20 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY15 comes from the PY14 Net Impact Evaluation.

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

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 439		$ 1,262	
2	Rebates to Participants and Trade Allies	$ -		$ 116	
3	Upstream/Midstream Incentives	$ 37		$ 319	
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)	$ 294		$ 567	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 5
8	Administration and Management	$ 32	$ 75	$ 92	$ 110
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 511	$ -	$ 1,518
11	EDC Evaluation Costs	$ 27		$ 55	
12	SWE Audit Costs	$ 21		$ 37	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 666		$ 1,824	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,105		$ 3,086	
15	Total NPV Lifetime Electric Energy Benefits	$ 411		$ 1,574	
16	Total NPV Lifetime Electric Capacity Benefits	$ 266		$ 740	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (17)		$ (185)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 661		$ 2,129	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.60		0.69	

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

Source: Guidehouse analysis

3.3.7 Status of Recommendations

The impact evaluation activities in PY15 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: RUIP Incentives Findings and Recommendations

Findings	Recommendations
Reported Savings	
• The efficient wattage and lumens were reported incorrectly for 11 out of 240 model numbers, affecting the savings of 112 projects.	• The CSP should ensure that all input variables match the measure specifications.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with CSP to ensure correct inputs are used.	
Reported Savings	
• The kW savings were underreported for participants who purchased multiple dehumidifiers because kW savings were not multiplied by the quantity of measures purchased (i.e., projects with two dehumidifiers had a 200% kW realization rate).	• The CSP should ensure that all savings are being multiplied by quantity of measures associated with each project.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure correct inputs are used.	

Source: Guidehouse analysis

3.4 Residential Appliance Recycling

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 PY15 by customer segment.

Table 3-22: RARP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY15 # Participants	1,755	1,755
PYRTD MWh/yr	1,262	1,262
PYRTD MW/yr	0.27	0.27
PY15 Incentives ($1,000)	$51	$51

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

In PY15, Guidehouse conducted an impact evaluation of RARP, sampling participating customers through an online survey. Table 3-23 shows the reported energy savings in PY15, and Table 3-24 shows the reported demand savings in PY15.

Table 3-23: RARP 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	156	91%	0.75	22%
Other	129	105%	0.15	5%
Refrigerators	977	102%	0.49	10%
Program Total	**1,262**	**101%**	**-**	**8%**

Source: Guidehouse analysis

Table 3-24: RARP 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	0.03	91%	0.75	22%
Other	0.07	116%	0.56	20%
Refrigerators	0.17	102%	0.49	10%
Program Total	**0.27**	**104%**		**8%**

Source: Guidehouse analysis

3.4.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse conducted a net impact evaluation for ARP in PY15. Guidehouse estimated NTG factors for ARP based on results from the online participant survey. In total, 79 ARP participants completed the battery of NTG questions. Free ridership research was stratified by measure type. Table 3-25 shows the estimated free ridership, spillover, and NTGRs resulting from the PY15 survey of ARP participants.

Table 3-25: PY15 RARP Net Impact Evaluation Results

Stratum	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
Refrigerator	54%	21%	67%	0.93	20%
Freezer	50%		71%	0.95	24%
Room AC	39%		82%	1.29	35%
Dehumidifier	9%		112%	3.00	13%

Stratum	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
Total	**50%**	**21%**	**72%**		**13%**

Source: Guidehouse analysis

3.4.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY15. The team reviewed the PY15 residential program activities and identified Refrigerator Recycling as a HIM. Table 3-26 presents estimated free ridership, spillover, and NTGR for this HIM for RARP.

Table 3-26: PY15 RARP HIMs

Program	HIM	Free Ridership	Spillover	NTGR
Appliance Recycling	Refrigerator Recycling	54%	21%	67%

Source: Guidehouse analysis

3.4.4 Verified Savings Estimates

In Table 3-27, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings for RARP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-27: RARP PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,262	0.27
PYVTD Gross	1,269	0.28
PYVTD Net	909	0.20
RTD	3,623	0.83
VTD Gross	3,922	0.89
VTD Net	2,148	0.48

Source: *Guidehouse analysis*

3.4.5 Process Evaluation

Guidehouse completed a process evaluation for ARP in PY15. As part of this process, the evaluation team conducted customer surveys to obtain feedback about their experience and satisfaction with 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 following section discusses the approach, results, and findings for this evaluation activity.

3.4.5.1 Participant Survey Methodology

The participant survey focused on customers who had participated in RARP in PY15. The survey instrument included process, NTG, and net impact evaluation questions in one online survey. See Table 3-28 for sample design and disposition information.

Table 3-28: RARP Sample Design and Disposition

Stratum	Population (Unique Customers)	Evaluation Method	Sample Target	Achieved Sample (Achieved/Target)	Response Rate
ARCA	235	Online participant survey	4	24	27%
Appliance Warehouse	1255		14	55	19%
Total	**1,490**		**18**	**79**	**21%**

Source: Guidehouse analysis

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

- Program awareness
- Program influence and engagement
- Program satisfaction

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

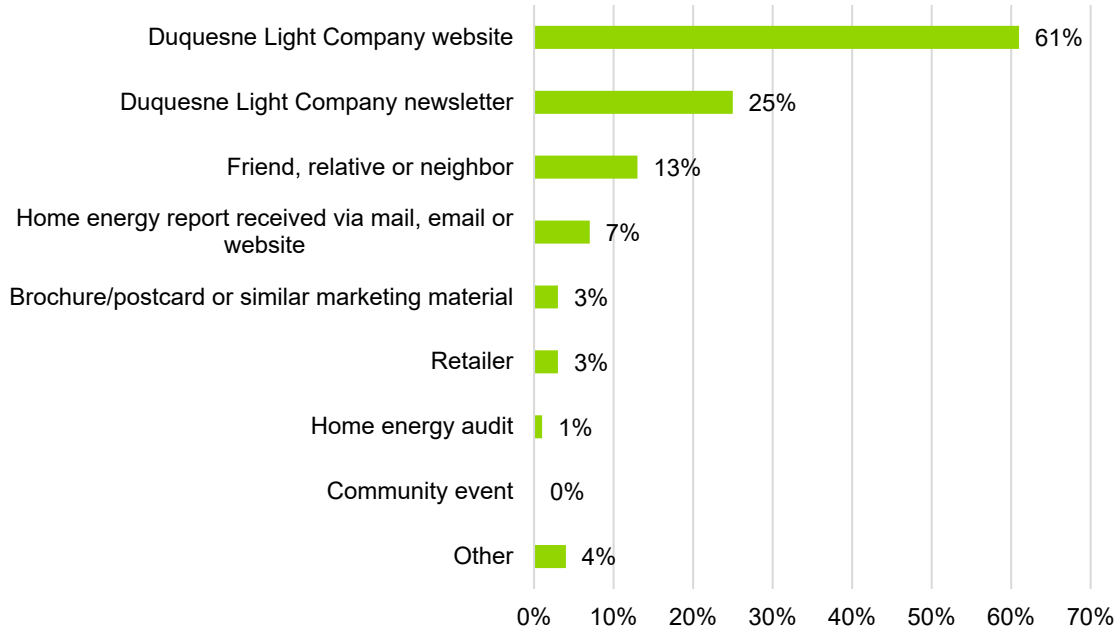
3.4.5.2 Participant Survey Findings

The following sections present the responses collected through this survey for program awareness, program influence, customer satisfaction ratings, and barriers and challenges with the program.

Program Awareness

Guidehouse asked participants to identify how they learned about ARP. The three most common way for participants to hear about the program were the Duquesne Light website (61%), Duquesne Light newsletter (25%) and from a friend, relative or neighbor (13%). Complete results may be seen in Figure 3-8. Of the three most common sources of awareness, word of mouth was cited by respondents as the most influential on their decision to participate with an average influence score of 9.5 on a 0-10 scale. The Duquesne Light website average was 9.0 and the Duquesne Light newsletter was 7.4.

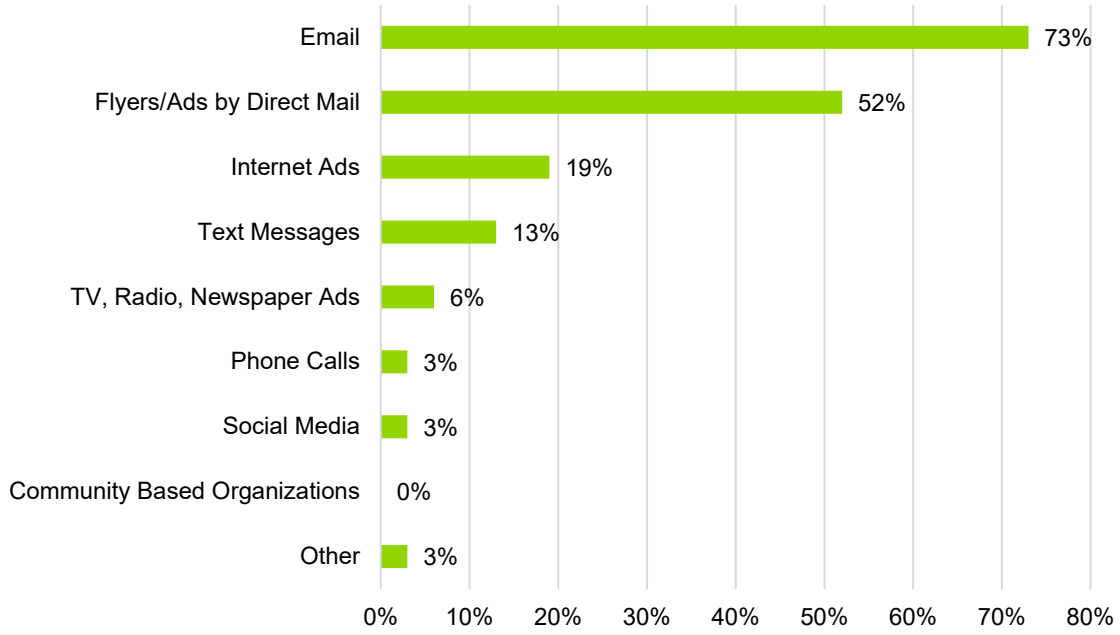
Figure 3-8: How did you learn about the Duquesne Light Company Appliance Recycling Program?
(n = 75; multiple responses allowed)



Source: Guidehouse analysis

Respondents reported a strong preference (73%) for being contacted by email about energy efficiency programs. Respondents also noted preference for receiving information via direct mail flyers/ads (52%), internet flyers/ads (19%), and text messages (13%). Figure 3-9 shows the results.

Figure 3-9: How do you prefer Duquesne Light Company reach out to you to provide information about their energy efficiency programs?
(n=77; multiple responses allowed)

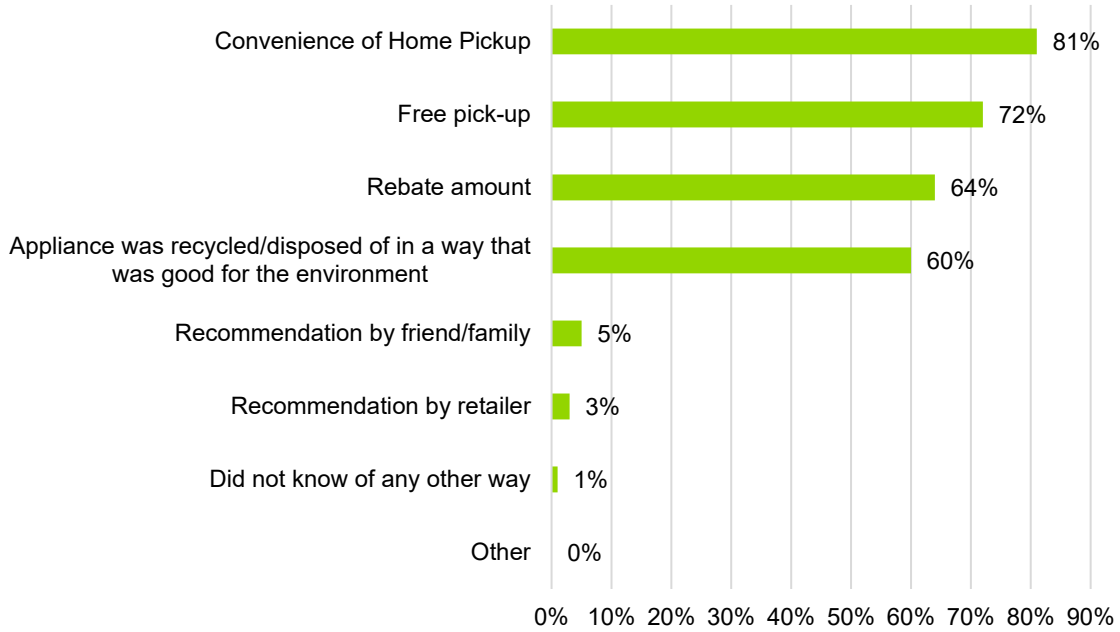


Source: Guidehouse analysis

Program Influence

Respondents were asked what motivated them to participate in the program. The most frequently reported factor was the convenience of the home pick of the appliance, reported by 81% of respondents. Other motivational factors included free pickup (72%), the amount of the rebate (64%), and that the appliance was disposed of in an environmentally responsible way (60%). Figure 3-10 shows responses to this question.
In addition, respondents were asked on a scale of 0-10 how motivational each of these factors were on their decision. The free pickup was reported as the most influential, averaging a 9.8, followed by the convenience of the home pickup (9.7), the fact that pickup was free (9.6), and the recommendation from family or friends (9.5).

Figure 3-10: What was your reason for choosing the Duquesne Light Company Appliance Recycling Program to get rid of your appliance(s) instead of some other way?
(n=78; multiple responses allowed)



Source: Guidehouse analysis

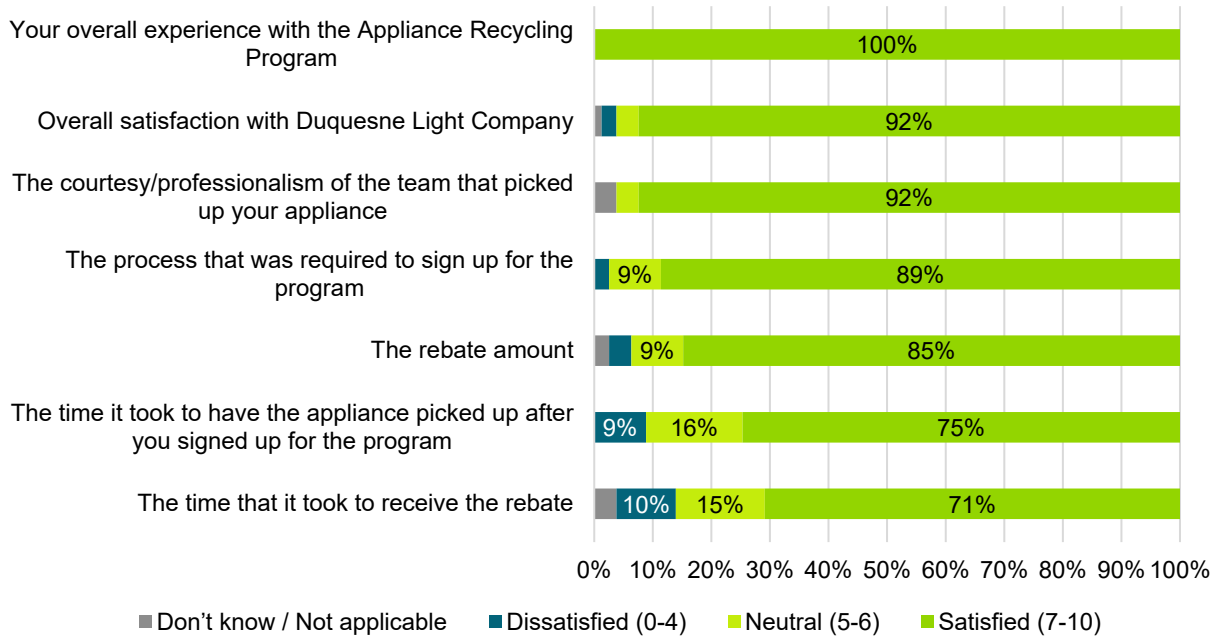
Program Satisfaction

Respondents were asked about their satisfaction with the program overall, some program elements, and their overall satisfaction with Duquesne Light on a scale from 0-10. All respondents reported high satisfaction with the ARP program overall with everyone rating the program a 7 or higher. Satisfaction with Duquesne Light as a company was also high with 94% of respondents reporting satisfaction of 7 or higher.

In terms of program elements, respondents were most satisfied with the professionalism of the appliance pickup team (92%). Followed by the program sign-up process (89%) and the rebate amount (85%). The lowest reported satisfaction was the for the rebate wait time (71%). Figure 3-11 shows satisfaction results.

Figure 3-11. Please rate your satisfaction with the following elements.

(n=79)



Source: Guidehouse analysis

3.4.6 Program Finances and Cost-Effectiveness Reporting

Table 3-29 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-29 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-29: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 85		$ 230	
2	Rebates to Participants and Trade Allies	$ 51		$ 227	
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)	$ 34		$ 3	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 5	$ 3
8	Administration and Management	$ 32	$ 52	$ 92	$ 76
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 113	$ -	$ 1,355
11	EDC Evaluation Costs	$ 19		$ 39	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
12	SWE Audit Costs	$ 15	$ 26
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 231	$ 1,597
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 316	$ 1,827
15	Total NPV Lifetime Electric Energy Benefits	$ 183	$ 511
16	Total NPV Lifetime Electric Capacity Benefits	$ 106	$ 305
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)**	$ 289	$ 816
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.91	0.45

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

Source: Guidehouse analysis

Table 3-30 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY15 comes from the PY15 Net Impact Evaluation (Section 3.4.3).

Table 3-30: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 61		$ 126	
2	Rebates to Participants and Trade Allies	$ 37		$ 117	
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)	$ 25		$ 9	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 5	$ 3
8	Administration and Management	$ 32	$ 52	$ 92	$ 76
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 113	$ -	$ 1,355
11	EDC Evaluation Costs	$ 19		$ 39	
12	SWE Audit Costs	$ 15		$ 26	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 231		$ 1,597	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 292		$ 1,723	
15	Total NPV Lifetime Electric Energy Benefits	$ 131		$ 279	
16	Total NPV Lifetime Electric Capacity Benefits	$ 76		$ 165	
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)**	$ 207		$ 444	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.71		0.26	

* 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

The impact and process evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-31 presents a summary of the findings with a response from Duquesne Light and their plans to address the recommendations in program delivery.

Table 3-31: RARP Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Survey data determined that customers use their refrigerator more frequently than the TRM-deemed part use factor of 72.8%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Reported Savings	
• Survey data determined that customers use their freezer less frequently than the TRM-deemed part use factor of 84.5%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Reported Savings	
• Savings for recycled room AC were underreported due to unknown reasons. It was determined savings should be higher based on EDC data gathered and other deemed values in the TRM.	• The CSP should use EDC data gathered values and the appropriate deemed values in the TRM to calculate savings.
Duquesne Light Response: Duquesne Light will collect algorithm inputs and perform savings calculations within its tracking system to enforce calculation consistency.	
Reported Savings	
• A subcontracting CSP closed its business during PY15, which lead to challenges with accurate and timely data submissions, discrepancies between CSP and Duquesne Light tracking data, and ultimately underreported savings for the program. However, the participant responses from the customer survey conducted by Guidehouse aligned with Duquesne Light tracking data, indicating that Duquesne Light tracking data was accurate. The survey results also revealed additional projects not included in Duquesne Light's tracking data, indicating that savings were underreported due to missing project data.	• The CSP should be diligent with maintaining its tracking data and uploading it to Duquesne Light's tracking data in a timely manner.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	
Program Satisfaction	

Findings	Recommendations
• Respondents were highly satisfied with RARP, reporting an average satisfaction level of 9.2/10. Though this average is down slightly from the previous customer satisfaction data collected in PY11, all 100% participants reported a score of 7 or higher, an increase of 5% from that year. The highest rated program component was customer interactions with the refrigerator pickup staff (9.5), while opportunities for improvement are illustrated in the lowest rated program components—the time it took to receive the rebate and the time it took to pick up the appliance from when customers signed up for the program (both 7.8).	• Consider reviewing application and rebate procedures and assessing common barriers related to these processes to better understand opportunities to decrease rebate turnaround and appliance pickup times.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
Program Satisfaction	
• When asked how likely they would be to recommend the program to others, all 79 respondents reported this likelihood, on a 0-10 scale, as 7 or above, while 25 (81%) reported a likelihood of 10. Ten of the 79 respondents reported learning about the program from a friend, relative, or neighbor.	• Consider offering a referral incentive for past participants who recommend the program to others.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Satisfaction	
• Of the 79 respondents, 72 (91%) reported that they would like to see the program also recycle televisions.	• Consider adding other appliances to the program.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Awareness	
• 73% of respondents reported that they prefer to learn about Duquesne Light energy efficiency offerings via email.	• Consider integrating email awareness into the program marketing strategy.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
NTG	
• The weighted NTGR for ARP is 72% with program free ridership of 50% and spillover of 21%. Refrigerators had the highest measure-level free ridership (54%) while dehumidifiers had the lowest (9%).	• Continue offering dehumidifier recycling through ARP and “upselling” the opportunity to recycle them once the contractor is already onsite to recycle a larger appliance.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	

Source: Guidehouse analysis

3.5 Residential Low-Income Energy Efficiency

The Residential 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 3-32 presents the participation counts, reported energy and demand savings, and incentive payments for LIEEP in PY15 by customer segment.

Table 3-32: LIEEP and Reported Impacts

Parameter	Residential LI	Total
PY15 # Participants	5,377	5,377
PYRTD MWh/yr	2,352	2,352
PYRTD MW/yr	0.25	0.25
PY15 Incentives ($1,000)	$1,125	$1,125

Source: Guidehouse analysis

3.5.2 Gross Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a gross impact evaluation for LIEEP in PY15 and applied the historic realization rates from PY14 for the different stratum. Table 3-33 shows the reported energy savings in PY15, and Table 3-34 shows the reported demand savings in PY15.

Table 3-33: LIEEP 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	133	100%	0.01	0%

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
Audit – Appliances	55	100%	-	0%
Audit – LEDs	572	96%	0.24	2%
Audit – Night Lights	145	94%	0.23	4%
Audit – Smart Strips	251	95%	0.18	4%
Giveaways	24	100%	-	0%
Kits	853	99%	-	0%
Appliance Recycling	319	103%	0.01	0%
Program Total	**2,352**	**98%**	**-**	**1%**

Source: Guidehouse analysis

Table 3-34: LIEEP 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%
Audit – Appliances	0.00	100%	-	0%
Audit – LEDs	0.06	96%	0.22	2%
Audit – Night Lights	-	0%	-	0%
Audit – Smart Strips	0.03	95%	0.18	4%
Giveaways	0.00	100%	-	0%
Kits	0.07	100%	-	0%
Appliance Recycling	0.06	103%	0.01	0%
Program Total	**0.25**	**99%**	**0.06**	**1%**

Source: Guidehouse analysis

3.5.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for Residential LIEEP in PY15. 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 NTGR 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 PY15.

3.5.4 Verified Savings Estimates

In Table 3-35, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for LIEEP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-35: LIEEP PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,352	0.25
PYVTD Gross	2,308	0.24
PYVTD Net	2,308	0.24
RTD	7,491	0.76
VTD Gross	7,007	0.73
VTD Net	7,007	0.73

Source: Guidehouse analysis

3.5.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LIEEP in PY15.

3.5.6 Program Finances and Cost-Effectiveness Reporting

Table 3-36 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-36 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-36: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ 40	
2	Rebates to Participants and Trade Allies	$ -		$ 1,258	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 1,125		$ 2,066	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (1,125)		$ (3,283)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 32	$ 17
8	Administration and Management	$ 32	$ 301	$ 92	$ 438
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 338	$ -	$ 1,486
11	EDC Evaluation Costs	$ 109		$ 222	
12	SWE Audit Costs	$ 83		$ 145	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 863	$ 2,432
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 863	$ 2,472
15	Total NPV Lifetime Electric Energy Benefits	$ 457	$ 1,249
16	Total NPV Lifetime Electric Capacity Benefits	$ 122	$ 333
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -	$ -
18	Total NPV Lifetime Fossil Fuel Impacts	$ (36)	$ (130)
19	Total NPV Lifetime Water Impacts	$ 238	$ 385
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 781	$ 1,836
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.91	0.74

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

Source: Guidehouse analysis

Table 3-37 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 3-37: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ 40	
2	Rebates to Participants and Trade Allies	$ -		$ 1,258	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 1,125		$ 2,066	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (1,125)		$ (3,283)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 32	$ 17
8	Administration and Management	$ 32	$ 301	$ 92	$ 438
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 338	$ -	$ 1,486
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Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
15	Total NPV Lifetime Electric Energy Benefits	$ 457	$ 1,249
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19	Total NPV Lifetime Water Impacts	$ 238	$ 385
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 781	$ 1,836
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.91	0.74

* 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

There were no impact- or process-related findings for this program in PY15.

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 PY4 to target high use residential customers. The current program participation levels include:

- 11,453 customers from the 2012 MR wave
- 29,858 customers from the 2015 MR wave
- 6,726 customers from the 2015 LI wave
- 1,537 customers from the 2018 LI wave
- 55,834 customers from the 2021 digital wave
- 56,586 customers from the 2021 non-digital wave
- 44,915 customers from the 2023 digital wave

- 14,259 customers from the 2023 non-digital wave
- 16,258 customers from the 2023 LI wave (based on PY15 monthly averages)

The 2021 and 2023 digital and non-digital waves are all market rate (MR) waves. The 2021 LI wave did not receive reports in PY15, and therefore, is excluded from this report. Savings for the 2015, 2018, and 2023 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., PY15). The participant count represents the average number of unique participants who received HERs across each month of PY15. 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 3-38 presents the participation counts, reported energy and demand savings, and incentive payments for HERs in PY15 by customer segment for the MR waves. LI-BEEP participant results are reflected in LI-BEEP, as Section 3.7 shows.

Table 3-38: R-BEEP Participation and Reported Impacts

Parameter	Residential (Non-LI)	Total
PY15 # Participants	212,904	212,904
PYRTD MWh/yr	9,395	9,395
PYRTD MW/yr	1.82	1.82
PY15 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. 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.

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

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 PY15 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 PY15 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 PY15 so long as their account was still active.

Table 3-39 summarizes the sampling strategy for the PY15 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.

[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: R-BEEP Gross Impact Sample Design for PY15

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
R-BEEP	212,904	212,904	Regression analysis
Program Total	**212,904**	**212,904**	

Source: Guidehouse analysis

The verified ex post energy savings for R-BEEP in PY15 were 9,168 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 1.70 MW of peak demand savings. Table 3-40 and Table 3-41 summarize ex ante R-BEEP energy and demand savings, respectively. Appendix B provides additional details.

Table 3-40: R-BEEP 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	9,395	98%	0.00	0.0%
Program Total	9,395	**98%**		**0.0%**

Source: Guidehouse analysis

Table 3-41: R-BEEP 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	1.82	93%	0.00	0.0%
Program Total	**1.82**	**93%**		**0.0%**

Source: Guidehouse analysis

Energy and demand savings per participant home were verified slightly lower than the CSP's reported estimates. 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 and previous Phase IV evaluations. Double-counted savings made up 16% 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 34% 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, 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 3-40 or Table 3-41 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 PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for R-BEEP in PY15. 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 NTGR 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 NTGR is assumed to be 100%.

3.6.3.1 HIM Research

Guidehouse did not conduct HIM research for R-BEEP in PY15.

3.6.4 Verified Savings Estimates

In Table 3-42, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for R-BEEP in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-42: R-BEEP PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	9,395	1.82
PYVTD Gross	9,168	1.70
PYVTD Net	9,168	1.70
RTD	21,192	3.53
VTD Gross	20,744	3.34
VTD Net	20,744	3.34

Source: Guidehouse analysis

3.6.5 Process Evaluation

Guidehouse did not conduct process evaluation research for R-BEEP (i.e., HERs) in PY15.

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 PY15 costs and benefits are expressed in 2023 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	$ 54	$ 67	$ 148	$ 98
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 532	$ -	$ 1,439
11	EDC Evaluation Costs	$ 24		$ 50	
12	SWE Audit Costs	$ 19		$ 32	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 696		$ 1,778	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 696		$ 1,778	
15	Total NPV Lifetime Electric Energy Benefits	$ 574		$ 1,098	
16	Total NPV Lifetime Electric Capacity Benefits	$ 296		$ 548	
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)**	$ 871		$ 1,647	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.25		0.93	

* 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. The NTGR applied in PY15 comes from the PY14 Net Impact Evaluation.

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	$ 54	$ 67	$ 148	$ 98
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 532	$ -	$ 1,439
11	EDC Evaluation Costs	$ 24		$ 50	
12	SWE Audit Costs	$ 19		$ 32	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 696		$ 1,778	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 696		$ 1,778	
15	Total NPV Lifetime Electric Energy Benefits	$ 574		$ 1,098	
16	Total NPV Lifetime Electric Capacity Benefits	$ 296		$ 548	
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)**	$ 871		$ 1,647	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.25		0.93	

* 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 PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-45 summarizes 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	
• Persistence for MR HER waves represents 40% of net savings in PY15. Over 30% of first year energy savings come from the 2021 Non-Digital wave, despite a significant reduction in savings due to accounting for persistence. Per participant first year savings from the 2023 waves are relatively low, but are expected to increase throughout the remainder of the Phase given that they were in their first year of exposure in PY15.	• Guidehouse has no recommendations for the MR HER program in PY15.
Duquesne Light Response: Duquesne Light acknowledges the finding.	

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 MR 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 0 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 PY15. Current program participation levels include 6,726 customers from the 2015 LI wave, 1,537 customers from the 2018 LI wave, and 16,258 customers from the 2023 LI wave (based on PY15 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 PY15 by customer segment.

Table 3-46: LI-BEEP Participation and Reported Impacts

Parameter	Residential LI	Total
PY15 # Participants	24,521	24,521
PYRTD MWh/yr	88	88
PYRTD MW/yr	-0.03	-0.03
PY15 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 PY15 were 231 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 0.03 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: LI-BEEP 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	88	263%	0.00	0.0%
Program Total	**88**	**263%**		**0.0%**

Source: Guidehouse analysis

Table 3-48: LI-BEEP 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	-0.03	-86%*	0.00	0.0%
Program Total	**-0.03**	**-86%***		**0.0%**

* Realization rates for HER and LI HER are provided for reference only, as the program is evaluated on an annual basis. The negative realization rate is a result of the program reporting a negative number, but Guidehouse determined a positive verified savings value.

Source: Guidehouse analysis

The energy realization rate for LI-BEEP is 263%. Energy savings per participant home were verified higher 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 24% 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 53% 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 3-47 or Table 3-48 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 PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct net impact evaluation for LI-BEEP in PY15. Guidehouse does not plan to conduct NTG assessment during Phase IV for this program. Consistent with SWE's guidance, Guidehouse assumes NTGRs to be 100% for this program due to the nature of the RCT approach (see Section 0).

3.7.3.1 HIM Research

Guidehouse did not conduct HIM research for LI-BEEP in PY15.

3.7.4 Verified Savings Estimates

In Table 3-49 the realization rates and NTGRs 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 PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-49: PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	88	-0.03
PYVTD Gross	231	0.03
PYVTD Net	231	0.03
RTD	1,990	0.19
VTD Gross	2,157	0.28
VTD Net	2,157	0.28

Source: Guidehouse analysis

3.7.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LI-BEEP (i.e., HERs) in PY15.

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 PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-50: 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	$ -	$ -	$ 1	$ 1
8	Administration and Management	$ 54	$ 14	$ 147	$ 20
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 213	$ -	$ 485
11	EDC Evaluation Costs	$ 5		$ 11	
12	SWE Audit Costs	$ 4		$ 7	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 290		$ 673	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 290		$ 673	
15	Total NPV Lifetime Electric Energy Benefits	$ 14		$ 109	
16	Total NPV Lifetime Electric Capacity Benefits	$ 5		$ 48	
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)**	$ 20		$ 156	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.07		0.23	

* 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. 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 3-51: 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	$ 54	$ 14	$ 147	$ 20
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 213	$ -	$ 485
11	EDC Evaluation Costs	$ 5		$ 11	
12	SWE Audit Costs	$ 4		$ 7	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 290		$ 673	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 290		$ 673	
15	Total NPV Lifetime Electric Energy Benefits	$ 14		$ 109	
16	Total NPV Lifetime Electric Capacity Benefits	$ 5		$ 48	
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)**	$ 20		$ 156	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	0.07		0.23	

* 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 PY15 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: LI Behavioral Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Persistence for LI HER waves represents 70% of net savings in PY15. Almost all first year energy savings come from the 2023 LI wave, which did not accrue any persistence in PY15 because it is in its first year of exposure to HER messaging. Consistent with prior years, savings from the 2018 LI wave are close to zero. First year energy savings from the 2015 LI wave are negative due to persistence and uplift exceeding regression estimated savings. Peak demand impacts follow a similar pattern, with nearly all demand savings contributed by the 2023 LI wave.	• Guidehouse recommends that Duquesne Light continue monitoring the performance of LI HER waves in PY16 and consider adjustments to the treatment schedule in future years if negative savings persist for any waves.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	

Source: Guidehouse analysis

3.8 Small Business Direct Install

The 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. 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 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

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

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 PY15, 9% 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 PY15 by customer segment.

Table 3-53: SBDI Participation and Reported Impacts

Parameter	Small C&I*	GNI**	Total
PY15 # Participants	116	40	116
PYRTD MWh/yr	5,701	1,497	5,701
PYRTD MW/yr	0.92	0.31	0.92
PY15 Incentives ($1,000)	$3,091	$1,011	$3,091

*SBDI has a Multifamily component associated with it, which a percentage of savings can be claimed under Residential LI. In PY15, this component reported 488 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 ante 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.

Table 3-54 presents the gross impact results for energy, and Table 3-55 provides the gross impact results for demand.

Table 3-54: SBDI 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	4,319	97%	0.05	2%
Small	850	104%	0.17	12%
Multifamily	533	99%	0.07	22%

Program Total	**5,701**	98%		**3%**

Source: Guidehouse analysis

Table 3-55: SBDI 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	0.72	97%	0.05	3%
Small	0.15	104%	0.28	19%
Multifamily	0.05	166%	0.31	90%
Program Total	**0.92**	**102%**		**5%**

Source: Guidehouse analysis

Most SBDI projects sampled in PY15 (n=18) 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.

However, realization rates for a number of sites exceeded the expected variance (+/- 10%), all involving lighting or lighting control improvement projects. Guidehouse verified three projects (one in Small Multifamily and two SBDI sites) with energy realization rates ranging between 82% and 88%, due to discrepancies in verified HOU or lighting control types pre- and post-retrofit.

Guidehouse also calculated energy realization rates exceeding 110% for three lighting improvement projects; primary drivers of realization rate included differences in HOU, coincidence factor, verified lighting control types, or installed fixture counts.

3.8.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBDI in PY15. Table 3-56 shows the NTGR applied to SBDI projects, which was carried over from the PY14 NTG evaluation.

Table 3-56: PY15 SBDI Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTGR	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 did not conduct HIM research for SBDI in PY15.

3.8.4 Verified Savings Estimates

In Table 3-57, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBDI in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-57: SBDI PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	5,701	0.92
PYVTD Gross	5,587	0.94
PYVTD Net	4,746	0.80
RTD	10,444	1.79
VTD Gross	9,666	1.84
VTD Net	8,610	1.65

Source: Guidehouse analysis

3.8.5 Process Evaluation

Guidehouse did not conduct process evaluation research for the SBDI program in PY15.

3.8.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-58. TRC benefits in Table 3-58 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-58: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 777		$ 2,708	
2	Rebates to Participants and Trade Allies	$ -		$ 1,492	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 3,091		$ 3,577	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (2,314)		$ (2,361)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 17	$ 15
8	Administration and Management	$ 26	$ 195	$ 67	$ 284
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 277	$ -	$ 561
11	EDC Evaluation Costs	$ 70		$ 142	
12	SWE Audit Costs	$ 53		$ 93	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 621		$ 1,179	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,398		$ 3,887	
15	Total NPV Lifetime Electric Energy Benefits	$ 2,545		$ 4,064	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,023		$ 1,861	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 349		$ 594	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (274)		$ (441)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,643		$ 6,077	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.61		1.56	

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

Source: Guidehouse analysis

Table 3-59 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY15 comes from the PY14 Net Impact Evaluation.

Table 3-59: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 723		$ 2,531	
2	Rebates to Participants and Trade Allies	$ -		$ 1,405	
3	Upstream/Midstream Incentives	$ -		$ -	
4	Material Cost for Self-Install Programs (EE&C Kits)	$ -		$ -	
5	Direct Installation Program Materials and Labor	$ 2,875		$ 3,322	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	$ (2,001)		$ (2,042)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 17	$ 15
8	Administration and Management	$ 26	$ 195	$ 67	$ 284
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 277	$ -	$ 561
11	EDC Evaluation Costs	$ 70		$ 142	
12	SWE Audit Costs	$ 53		$ 93	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 621		$ 1,179	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,344		$ 3,710	
15	Total NPV Lifetime Electric Energy Benefits	$ 2,367		$ 3,810	
16	Total NPV Lifetime Electric Capacity Benefits	$ 951		$ 1,742	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 325		$ 556	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (255)		$ (412)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,388		$ 5,696	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.52		1.54	

* 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 evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-60 provides a summary of findings, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-60: SBDI Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Guidehouse found that fourteen sites had control type discrepancies for pre- and/or post-retrofit controls. This led to a higher variation in realization rates for SBDI.	• CSPs should verify carefully both pre- and post-retrofit control lights.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
Reported Savings	
• Demand savings have higher variation in savings realization rate across all Nonresidential programs.	• Duquesne Light should reinforce the demand savings methodology for CSPs.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure that the correct demand savings methodology is used.	
Program Influence	
• Aside from energy savings, the most common reason cited, during on site visits, for undertaking a project was the lower anticipated maintenance requirements of the efficiency measures (e.g., due to the longer lifetime of LED fixtures compared to fluorescent fixtures).	• CSP/Duquesne Light should consider adding "maintenance considerations" when marketing programs to potential participants.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	

Source: Guidehouse analysis

3.9 Small Business Solutions

The 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[13] 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.

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

3.9.1 Participation and Reported Savings by Customer Segment

Table 3-61 presents the participation counts, reported energy and demand savings, and incentive payments for SBS in PY15 by customer segment.

Table 3-61: SBS Participation and Reported Impacts

Parameter	Small C&I	GNI*	Total
PY15 # Participants	178	23	178
PYRTD MWh/yr	7,333	469	7,333
PYRTD MW/yr	1.64	0.12	1.64
PY15 Incentives ($1,000)	$563	$ 41	$563

*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 ante 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). To date, the SBS and LBS programs have achieved a slightly lower percentage of the portfolio savings than anticipated, due in large part to the overperformance of the midstream programs.

As with other nonresidential programs, Guidehouse is evaluating the SBS program on a specified schedule. As detailed in the evaluation plan, Guidehouse combined both the PY14 and PY15 SBS populations when determining the PY15 evaluation sample and included the realization rates of the sites sampled in PY14 in determining the rolling 2-year realization rate. 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 3-62 presents the gross impact results for energy, and Table 3-63 presents the gross impact results for demand.

Table 3-62: SBS 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	3,601	93%	0.13	7%
Small	3,682	103%	0.19	8%
LEDs	49	95%	-	0%
Program Total	**7,333**	**98%**		**5%**

Source: Guidehouse analysis

Table 3-63: SBS 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	0.83	80%	0.63	34%
Small	0.79	99%	0.06	3%
LEDs	0.02	95%	-	0%
Program Total	**1.64**	**89%**		**14%**

Source: Guidehouse analysis

Guidehouse sampled nine sites for PY15 and all but two had realization rates close to 100%.

One site had an overall energy realization rate of 82% and demand realization rate of 39%. Guidehouse verified a different building type (Warehouse) compared to what was originally assumed in App C (Industrial/Manufacturing – 1 Shift); this was the primary driver of realization rate. Additionally, Guidehouse found that the warehouse did not have a tenant in place at the time of the site visit (the customer noted that they did not have an estimated timeline for an expected tenant) but did not adjust the HOU or coincidence factor as the customer expects any potential tenants to use the building for warehousing and distribution.

The other site had energy and demand realization rates of 90% and 85%, respectively. The largest discrepancy was a large number of fixture quantities (approximately 100 fixtures) that were included in the project invoices but that Guidehouse was unable to verify in observed spaces or storage areas. Guidehouse also verified different HOU for all interior spaces; the customer reported that the offices are generally open from 6 a.m. to 10 p.m., 7 days a week (equating to 5,840 annual HOU) whereas the App C assumes 3,650 annual HOU.

3.9.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for SBS in PY15. Table 3-64 shows the NTGR applied to SBS projects, which was carried over from the PY14 NTG evaluation.

Table 3-64: PY15 SBS and LBS Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTGR	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 did not conduct HIM research for SBS in PY15.

3.9.4 Verified Savings Estimates

In Table 3-65, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for SBS in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-65: SBS PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	7,333	1.64
PYVTD Gross	7,204	1.46
PYVTD Net	4,724	0.95
RTD	22,231	4.90
VTD Gross	24,087	6.07
VTD Net	16,870	4.30

Source: Guidehouse analysis

3.9.5 Process Evaluation

Guidehouse did not conduct process evaluation research for SBS in PY15.

3.9.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-66. TRC benefits in Table 3-66 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2022 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-66: Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,279		$ 3,327	
2	Rebates to Participants and Trade Allies	$ 563		$ 1,313	
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)	$ 716		$ 2,014	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 14	$ 15
8	Administration and Management	$ 54	$ 315	$ 95	$ 385
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 522	$ -	$ 1,561
11	EDC Evaluation Costs	$ 113		$ 178	
12	SWE Audit Costs	$ 87		$ 123	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,091	$ 2,370
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,370	$ 5,697
15	Total NPV Lifetime Electric Energy Benefits	$ 3,283	$ 10,060
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,572	$ 6,149
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 316	$ 941
18	Total NPV Lifetime Fossil Fuel Impacts	$ (412)	$ (1,255)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 4,759	$ 15,896
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.01	2.79

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

Source: Guidehouse analysis

Table 3-67 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY15 comes from the PY14 Net Impact Evaluation.

Table 3-67: Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 839		$ 2,314	
2	Rebates to Participants and Trade Allies	$ 369		$ 922	
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)	$ 308		$ 968	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 14	$ 15
8	Administration and Management	$ 54	$ 315	$ 95	$ 385
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 522	$ -	$ 1,561
11	EDC Evaluation Costs	$ 113		$ 178	
12	SWE Audit Costs	$ 87		$ 123	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,091		$ 2,370	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,930		$ 4,684	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
15	Total NPV Lifetime Electric Energy Benefits	$ 2,153	$ 7,099
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,031	$ 4,396
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 207	$ 662
18	Total NPV Lifetime Fossil Fuel Impacts	$ (270)	$ (875)
19	Total NPV Lifetime Water Impacts	$ -	$ -
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,121	$ 11,281
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.62	2.41

* 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 PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-68 provides a summary of findings, along with Duquesne Light's plans to address program recommendations.

Table 3-68: SBS Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Demand savings have higher variation in savings realization rate across all Nonresidential programs.	• Duquesne Light should reinforce the demand savings methodology for CSPs.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure that the correct demand savings methodology is used.	

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 3-69 presents the participation counts, reported energy and demand savings, and incentive payments for SBMS in PY15 by customer segment.

Table 3-69: SBMS Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY15 # Participants	122	31	122
PYRTD MWh/yr	2,527	472	2,527
PYRTD MW/yr	0.6	0.09	0.6
PY15 Incentives ($1,000)	$302	$ 57	$302

*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 ante savings (PYRTD).

Source: Guidehouse analysis

3.10.2 Gross Impact Evaluation

The Phase IV evaluation plan originally called for an evaluation of the midstream programs in PY15. However, the SBMS and LBMS programs combined contributed to more than 50% of portfolio savings in PY14. 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). Consistent with the updated evaluation plan, as approved by the SWE, Guidehouse applied the results from the PY14 evaluation to the PY15 program savings to determine verified savings values for PY15.

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. Table 3-70 presents the gross impact results for energy, and Table 3-71 provides the gross impact results for demand.

Table 3-70: SBMS 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	483	123%	0.63	43%
SBMS - Medium	1,716	111%	0.29	12%
SBMS - Small	327	86%	0.72	50%
Program Total*	**7,141**	**106%**		**11%**

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.
Source: Guidehouse analysis

Table 3-71: SBMS 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	0.12	96%	0.42	29%
SBMS - Medium	0.41	123%	0.47	20%
SBMS - Small	0.07	90%	0.36	25%
Program Total*	**1.55**	**114%**		**22%**

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.
Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and led to the observed realization rates for the evaluated PY14 projects.

- At approximately 50% of evaluated SBMS sites (n=8), Guidehouse found minor discrepancies in HOU, 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 SBMS 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 HOU 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 HOU 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 Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY15 for the Small (SBMS) and Large (LBMS) Business Midstream Solutions Programs together. Guidehouse estimated NTG factors for SBS and LBMS based on results from the online participant survey and the distributor interviews. Spillover research was only conducted for participants. In total, 14 participants (7 SBMS, 7 LBMS) and 9 distributors completed the respective battery of NTG questions. Table 3-72 shows the estimated free ridership, spillover, and NTGR resulting from the PY15 survey of SBMS and LBMS participants and the PY15 interviews of participating distributors. The free ridership values for these two groups were combined into a weighted average.

Table 3-72: PY15 Small and Large Business Midstream Solutions Net Impact Evaluation Results

Program Stakeholder	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
Participant	8%	8%	100%	0.90	7%
Distributor	31%	--	69%	0.43	10%
Total	20%	8%	88%	0.72	7%

Source: Guidehouse analysis

3.10.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY15. The team reviewed the PY15 nonresidential program activities and identified LED Interior Lighting Fixtures, LED High Bay Lighting Fixtures and LED Exterior Lighting Fixtures as HIMs. Table 3-73 presents the estimated free ridership, spillover, and NTGR for these HIMs for the SBMS and LBMS programs. The free ridership values for both participants and distributors were combined into a weighted average.

Table 3-73: PY15 SBMS and LBMS HIMs

Program	HIM	Free Ridership	Spillover	NTGR
SBMS and LBMS	LED Interior Lighting Fixture	25%	8%	83%
	LED High Bay Lighting Fixture	19%	8%	89%
	LED Exterior Lighting Fixture	17%	8%	91%

Source: Guidehouse analysis

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 NTGRs to the energy and demand savings for both Large (LBMS) and Small (SBMS) Midstream Solutions to calculate verified savings estimates. Table 3-74 presents the verified savings estimates for SBMS in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-74: SBMS PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	7,141	1.55
PYVTD Gross	7,580	1.76
PYVTD Net	6,670	1.55
RTD	57,475	12.34
VTD Gross	62,238	13.85
VTD Net	43,613	9.73

**Savings include both SBMS and LBMS, as they are evaluated as a single initiative.*

Source: Guidehouse analysis

3.10.5 Process Evaluation

Guidehouse completed process evaluation for SBMS and LBMS in PY15. As part of this evaluation, the team fielded online surveys to program participants and conducted interviews with participating distributors 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 SBMS and LBMS.

3.10.5.1 Research Methodology

Participant Survey

The participant survey focused on customers who participated in SBMS and LBMS in PY15. Guidehouse attempted a census and distributed the survey via email to 118 participants. The team received 14 completed surveys. Table 3-75 provides an overview of the sample design.

Table 3-75: SBMS and LBMS Participant Survey Sample Design and Disposition

Stratum	Population (Unique customers)	Evaluation Method	Sample Target	Achieved Sample	Response Rate
Lighting	234	Online participant survey	27	14	6%
Non-Lighting	34		6	0	0%

Stratum	Population (Unique customers)	Evaluation Method	Sample Target	Achieved Sample	Response Rate
Total	**268**		**33**	**14**	**5%**

The process sections of the survey included questions on 3 main research topics:

- Program awareness
- Program satisfaction
- Program motivations, benefits and barriers

Guidehouse aimed to understand participants' experiences with the program and identify areas for improvement.

Distributor Interview

The distributor interview research focused on distributors who participated in SBMS and LBMS in PY15. Guidehouse attempted a census and contacted 36 participants via phone to schedule a phone interview. The team conducted 10 interviews. Table 3-76 provides an overview of the sample design.

Table 3-76: SBMS and LBMS Distributor Interview Sample Design and Disposition

Stratum	Population	Evaluation Method	Sample Target	Achieved Sample	Response Rate
Lighting	36	Phone Interviews	(Census Attempt) 9	10	28%
Non-Lighting	3		(Census Attempt) 5	0	0%
Total	**39**		**14**	**10**	**26%**

The process sections of the interview included questions on 3 main research topics:

- Program satisfaction
- Program marketing to distributors
- Barriers to distributor participation
- Program influence

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

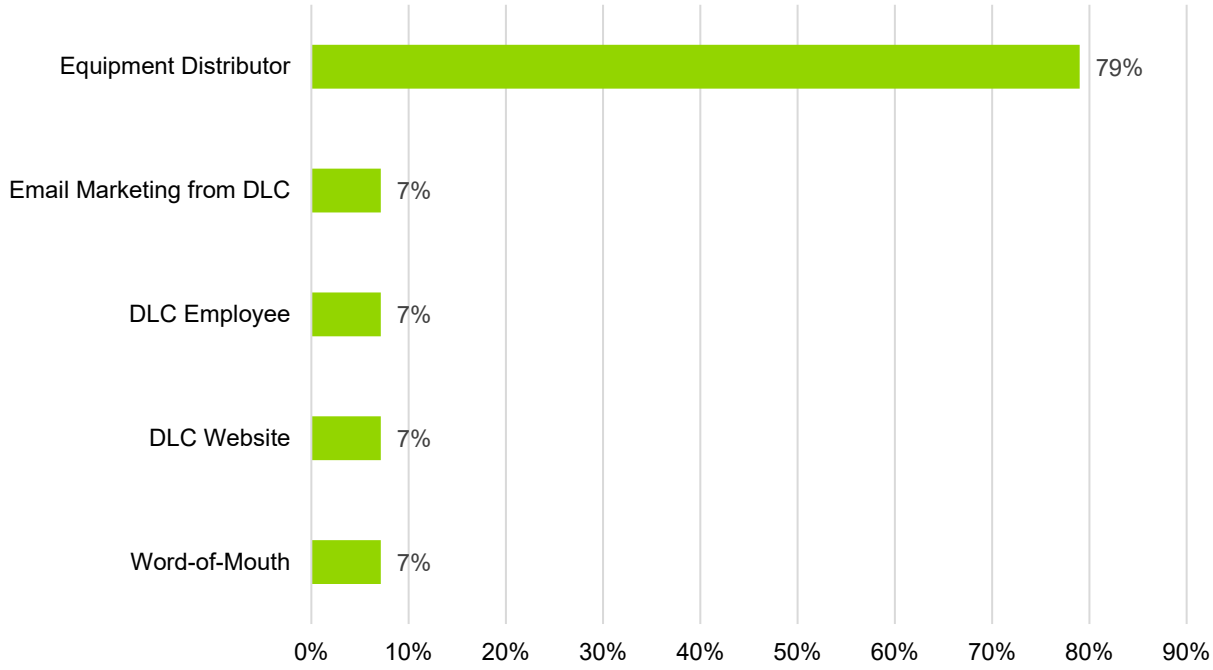
3.10.5.2 Participant Survey Findings

The following sections present the responses collected through the participant survey for program awareness, customer satisfaction ratings, and benefits and barriers of the program.

Participant Program Awareness

Guidehouse asked participants how they became aware of the discounted products available through the program. As seen in Figure 3-12, most participants (79%) became aware of the discounted products offered through the program via an equipment distributor. Respondents also noted hearing about the program discounts via family and friends (7%), the Duquesne Light website (7%), a coworker (7%), a Duquesne Light account representative (7%), and an email from Duquesne Light (7%). Some respondents (36%) were not aware that the products they purchased were discounted by Duquesne Light.

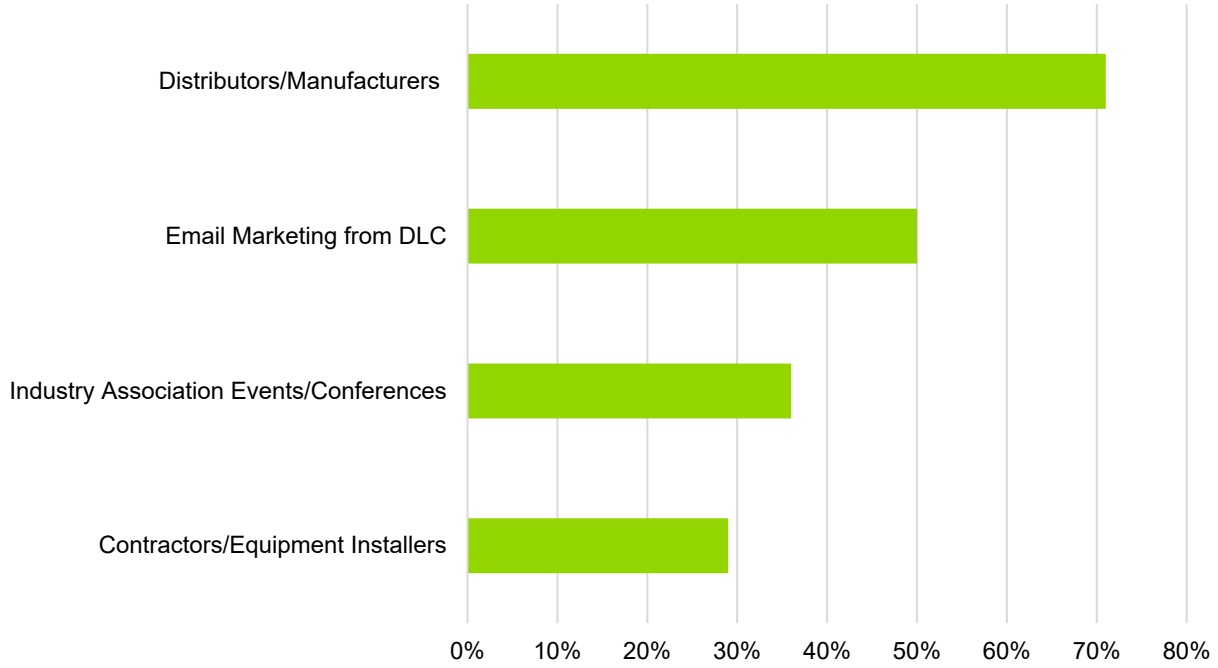
Figure 3-12: How did you learn about the discounted products offered through the program?
(n=14; multiple response options allowed)



Source: Guidehouse analysis

Guidehouse also asked participants what the best ways are to contact customers about the program; 71% of respondents preferred hearing information through their distributors/manufacturers. Additional preferred methods for outreach included email (50%), industry association events/conferences (36%), direct outreach to business owners/management, and contractor/installers (29%). Full results may be seen in Figure 3-13. In general, results indicate that there may be an opportunity to increase participation in the program by increasing the amount of marketing conducted via email and at trade conferences.

Figure 3-13: What do you think are the best ways for Duquesne Light Company to reach out to customers like you to get them to participate in the program?
(n=14; multiple response options allowed)



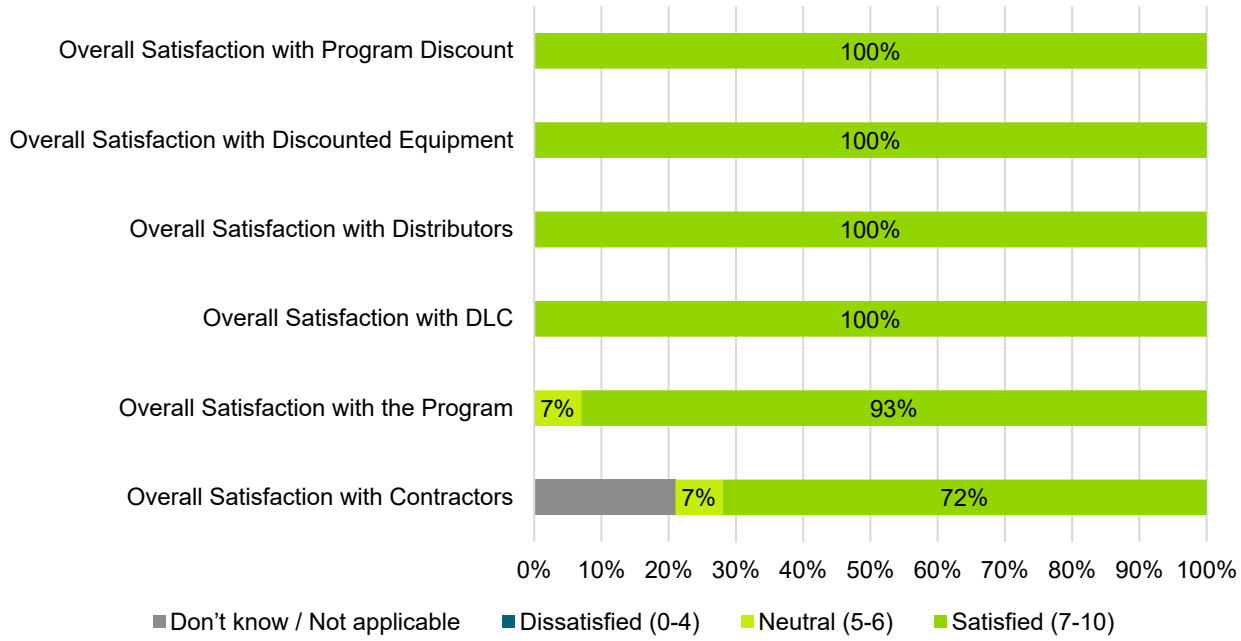
Source: Guidehouse analysis

Program Satisfaction

Guidehouse also gauged participants' satisfaction toward various aspects of the program to understand how the program could be improved in the future. On a 0-10 scale where 0 is not at all satisfied and 10 is very satisfied, all respondents reported a rating of 7 or higher on a 0-10 scale with Duquesne Light with an average rating of about 9.3. Ninety-three percent of respondents rated the SBMS/LBMS programs as a 7 or higher, averaging a 9.5. All respondents said they would recommend the program to others in the future, rating their likelihood as a 9 or 10 on a 0-10 likelihood scale.

All participants reported they were satisfied with the program discount, the discounted equipment and their distributor. Respondents noted lower satisfaction with their contractors (73%). Full satisfaction results can be seen in Figure 3-14, which taken together indicate a very high level of participant satisfaction with the program.

Figure 3-14: Please rate your satisfaction with each of the following elements.
(n=14)

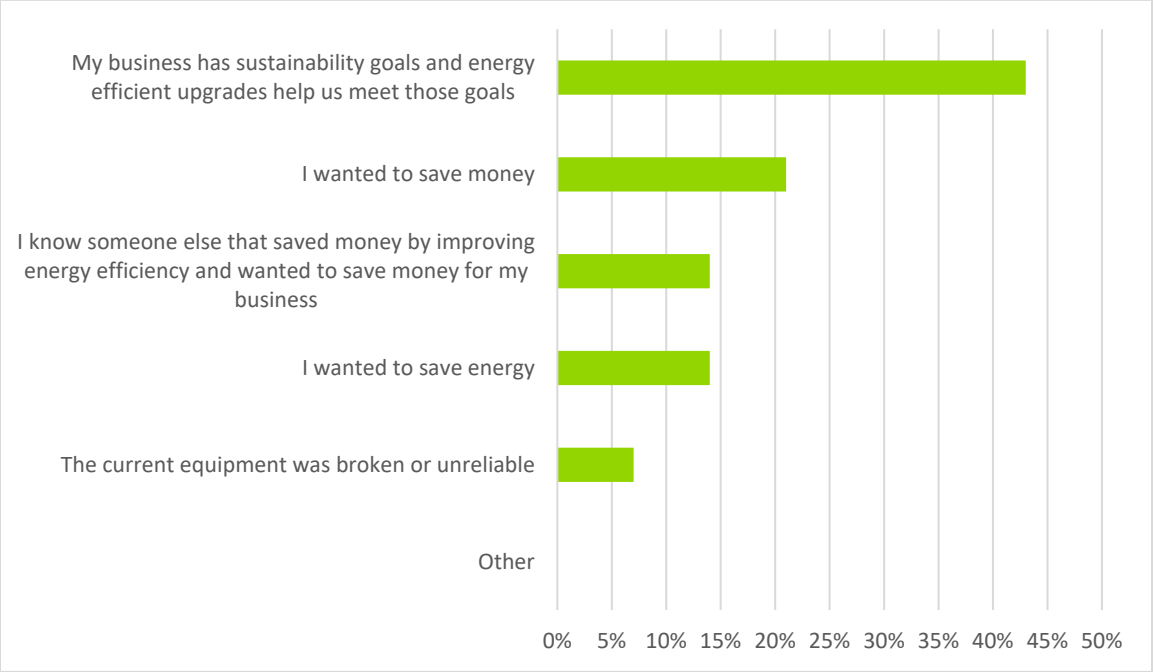


Source: Guidehouse analysis

Program Motivations, Benefits and Barriers

Guidehouse asked participants about their motivation to participate in the program as well as benefits and barriers of program participation. Forty-three percent of respondents reported that their business' sustainability goals were the most important factor motivating them to participate. Other respondents reported that their primary motivation was saving money (21%), energy savings (14%) and hearing about a positive experience pursuing energy efficiency via word of mouth (14%) were the most important factors. Full results may be seen in Figure 3-15.

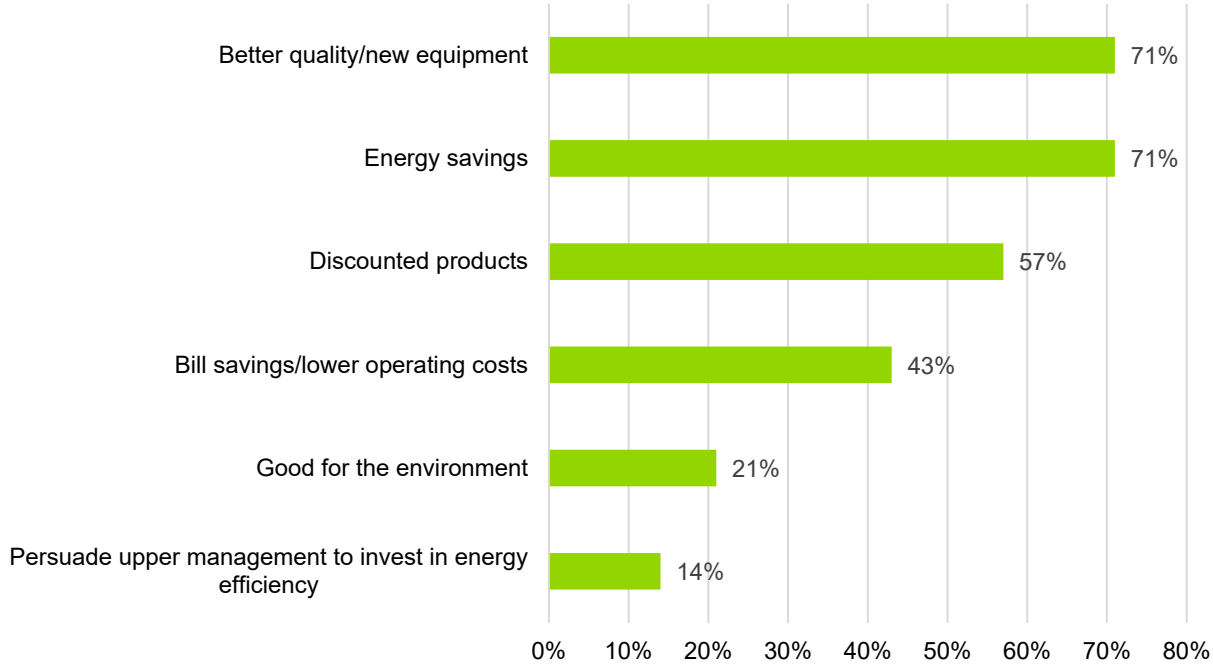
Figure 3-15: What was the most important factor in your decision to purchase and install the discounted equipment at your business? (n=14)



Source: Guidehouse analysis

Similarly, respondents reported that the main benefits to participation in the program are energy savings (71%) and better quality/new equipment (71%). As seen in Figure 3-16, other noted benefits were discounted products (57%), bill savings (43%), environmental benefits (21%) and persuading upper management to invest in energy efficiency (14%).

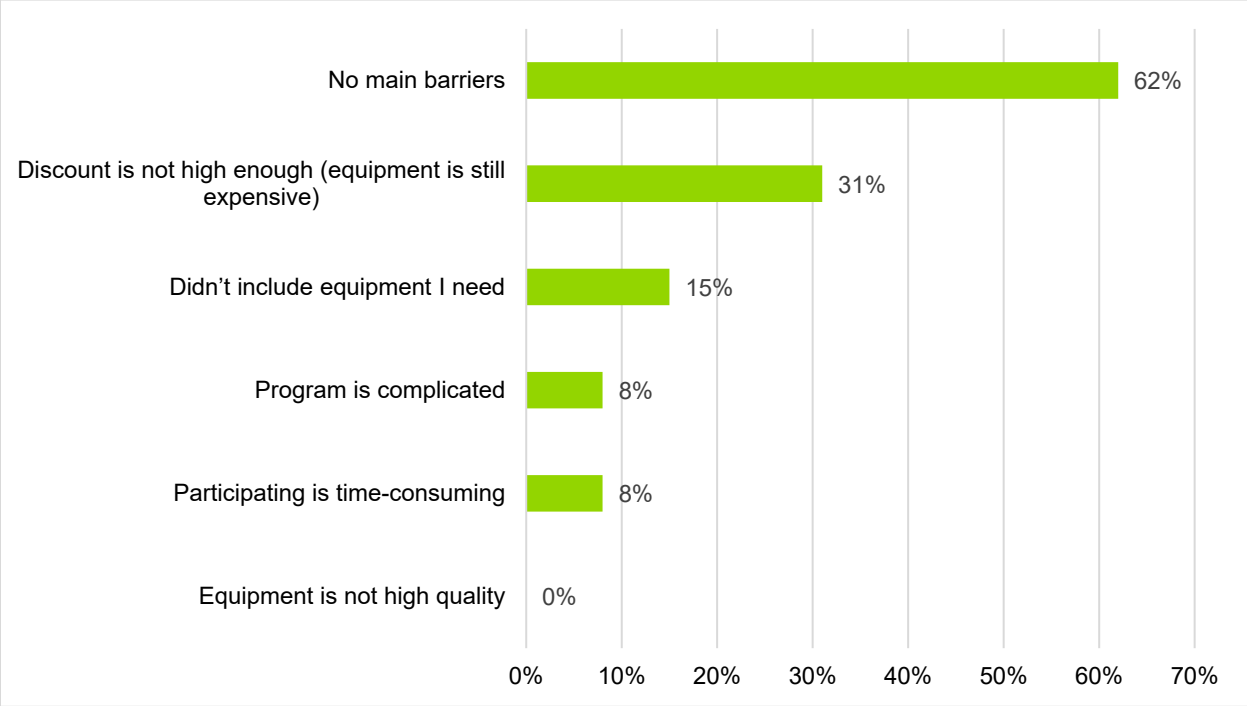
Figure 3-16: What do you see as the main benefits to participating in the Instant Discount Program?
(n=14; multiple responses allowed)



Source: Guidehouse analysis

Most respondents (62%) reported that they saw no primary barriers to participation. As shown in Figure 3-17, noted barriers included discount was not high enough (31%), the equipment they needed was not program-qualified (15%), participation was time-consuming (8%) or the program was too complicated (8%).

Figure 3-17: What do you see as the main barriers for organizations like yours to participating in the program?
(n=14; multiple responses allowed)



Source: Guidehouse analysis

3.10.5.3 Distributor Interview Findings

The following sections present the responses collected through the distributor interviews for, distributor satisfaction ratings, program marketing to distributors, and barriers to distributor participation in the program.

Program Satisfaction

Guidehouse asked participating distributors how satisfied they were with the program on a 0-10 scale. Seven of the interviewed distributors reported satisfaction at 7 or higher. Four distributors reported dissatisfaction with the removal of smaller customers from program qualification, some of the noting that this change has dramatically reduced their ability to participate in the program. Alternatively, 3 of the interviewed distributors reported high satisfaction with the efforts of Energy Solutions in implementing the program, and were generally pleased with how the portal operates.

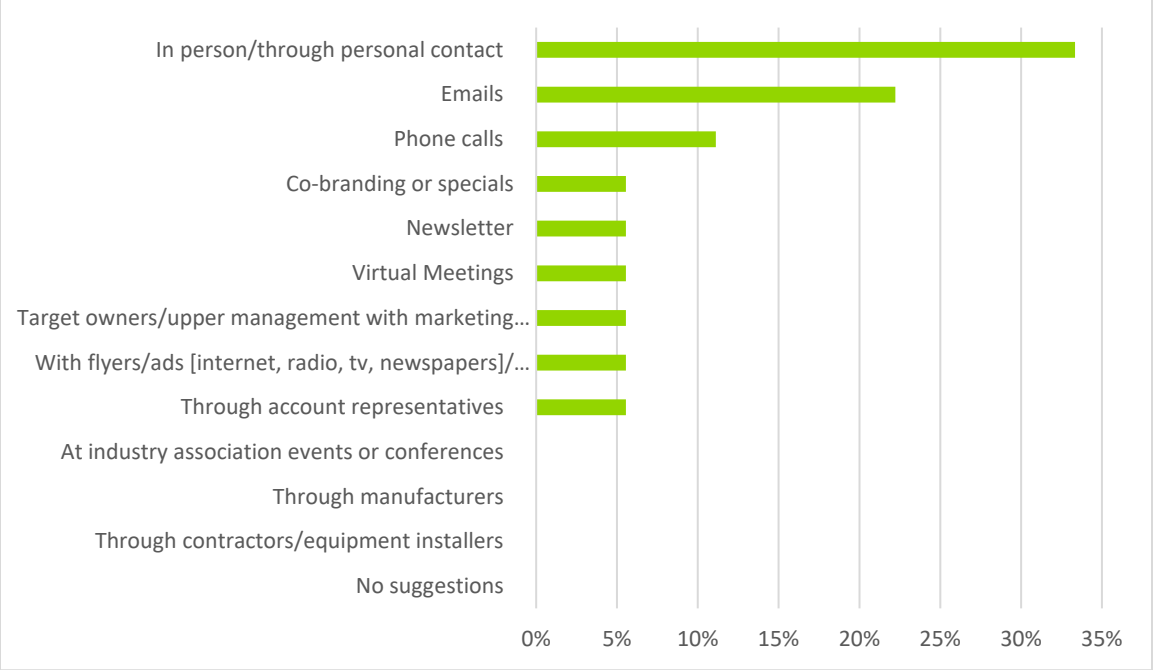
Guidehouse also asked participating distributors for suggestions on measures to add to the program in the future. Distributors suggested linear fixtures (3), exit signs (2), downlight kits (2), controls (2), LED plug-in bulbs (1), lamp retrofits (1), and backup exterior solar fixtures (1).

Distributors provided other programmatic suggestions during their interviews. Several distributors (3) mentioned that increased incentives would be welcome. One distributor suggested an expansion of measures into batteries and drives. One distributor also noted that more advanced notice of program changes would be appreciated given that the process of project pricing, bidding, and winning can drag on sometimes and changes in the middle of this process can make project costs unpredictable and thus unexpectedly prohibitive.

Program Marketing to Distributors

Guidehouse also asked participating distributors for the best way to communicate with distributors like themselves to encourage them to participate in the program. The two most popular preferences here were personal contact and email. See Figure 3-18 for full results.

Figure 3-18: Regarding program outreach and marketing, what are the best ways for Duquesne Light to reach out to distributors such as yourself to encourage them to participate? (n=10; multiple responses allowed)



Barriers to Distributor Participation

Guidehouse also inquired about any barriers to distributors participating in this program. Distributors did not report any supply chain issues. Some did reference past difficulties, primarily during COVID-19 and in its wake, but none had current concerns about the supply chain moving forward. In addition, the distributors were asked if they had encountered barriers of any type in their participation in the program. Several distributors (3) noted concern about the changes in qualification standards for the program as a barrier to their participation in the program.

Program Influence

Distributors reported that the primary reasons they participated in the program was to increase their sales. The discounts made their prices more competitive, and the program's design was very attractive to distributors, as the instant incentive makes participation generally straightforward.

Guidehouse asked the respondents what kind of program-qualified measure types they carry (tubes, troffers, high/low bay, exterior, moguls, lamps, and controls), then asked how many they carried prior to the program. Most distributors carried all of these measures, and did so prior to participation. In addition, distributors estimated that if the program didn't exist, they would sell

about 61% of the program-eligible measures they did in the past year. in general, these results indicate that the program is generally not influential in getting distributors to carry more measure types, but does significantly increase their sales of qualified products.

The evaluation team also asked the distributors whether or not they had taken a number of program-relevant actions in their workplace practice since their participation began:

- Upsell contractors to purchase program-qualified efficient units
- Conduct training workshops for contractors
- Conduct training workshops for customers
- Increase marketing of program-qualified units
- Reduce the prices of program-qualified units
- Reduce the prices of program-qualified units
- Discuss the benefits of program-qualified units with design professionals

A strong majority (8 or more of 10 distributors) reported that they undertook these behaviors, except for discussing the program with design professionals (6 reported doing so), and the training of contractors or customers (3 and 4 distributors, respectively, reported doing so). They were then asked how influential the program was in their decision to undertake these behaviors, and the likelihood that their organization would have undertaken them in the absence of the program. Results are presented in Table 3-77.

Table 3-77: On a scale of 0 to 10, where 0 is "Not at all influential" and 10 is "Extremely influential", how influential was the program on your organization's decision to take the actions you just identified? AND Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program, had not been available, what is the likelihood that your organization would have taken these same actions? (n=10)

Practice	Average Influence Score	Average Likelihood Score
Upsell contractors to purchase program-qualified efficient units	8.8	7
Conduct training workshops for contractors	10	9
Conduct training workshops for customers	9.8	8.8
Increase marketing of program-qualified units	7.4	6.9
Reduce the prices of program-qualified units	7.4	5.4
Reduce the prices of program-qualified units	8.6	5.3
Discuss the benefits of program-qualified units with design professionals	6.5	5.5

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 PY15 costs and benefits are expressed in 2023 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)**	$ 707		$ 13,654	
2	Rebates to Participants and Trade Allies	$ -		$ 1,502	
3	Upstream/Midstream Incentives	$ 302		$ 6,246	
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)	$ 405		$ 5,907	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 12	$ 9
8	Administration and Management	$ -	$ -	$ 44	$ 75
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 176	$ -	$ 3,711
11	EDC Evaluation Costs	$ -		$ 53	
12	SWE Audit Costs	$ -		$ 31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 176		$ 3,935	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 883		$ 17,590	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,292		$ 24,317	
16	Total NPV Lifetime Electric Capacity Benefits	$ 750		$ 13,055	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 144		$ 2,878	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (191)		$ (3,720)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,995		$ 36,530	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.26		2.08	

* 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. The NTGR applied in PY15 comes from the PY15 Net Impact Evaluation (Section 3.10.3).

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

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 622		$ 9,363	
2	Rebates to Participants and Trade Allies	$ -		$ 1,081	
3	Upstream/Midstream Incentives	$ 266		$ 4,240	
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)	$ 313		$ 2,781	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 12	$ 9
8	Administration and Management	$ -	$ -	$ 44	$ 75
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 176	$ -	$ 3,711
11	EDC Evaluation Costs	$ -		$ 53	
12	SWE Audit Costs	$ -		$ 31	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 176		$ 3,935	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 798		$ 13,298	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,137		$ 16,674	
16	Total NPV Lifetime Electric Capacity Benefits	$ 660		$ 8,968	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 127		$ 1,979	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (168)		$ (2,547)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 1,756		$ 25,074	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.20		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

3.10.7 Status of Recommendations

The impact and process evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-80 summarizes the findings and recommendations for the program, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-80: SBMS Findings and Recommendations

Findings	Recommendations
Program Awareness, Influence, and Marketing	
• Five of 14 survey respondents (participants) were not aware that Duquesne Light provided a discount on the energy efficient equipment they purchased, and eleven of the 14 heard about the program for the first time from distributors.	• Encourage distributors make participants aware of Duquesne Light's sponsorship of the program.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
Program Awareness, Influence, and Marketing	
• One survey respondent, of 14, reported becoming aware of the program via email, while seven respondents reported that this would be one of the best ways for customers to learn about the program.	• Evaluate the possibility of increasing the prevalence of email marketing in awareness efforts.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Awareness, Influence, and Marketing	
• Six of 14 survey respondents reported that their primary motivation for participation in the program was to help them achieve their business' sustainability goals.	• Include messaging in marketing materials to address the benefits of the program in regards to meeting efficiency or sustainability goals. This may include bill savings and greenhouse gas avoidance calculations.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Satisfaction	
• Participant satisfaction with the program was high, with 13 of 14 survey respondents rating their satisfaction with the program as a 9 or 10 on a 0-10 scale. Regarding program components, survey respondents were most satisfied with their interactions with distributors, with an average rating of 9.7.	• No recommendations.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Program Satisfaction	
• In interviews, distributors rated their satisfaction with the program as a 6.9/10 on a 0-10 scale. The most commonly reported concern on behalf of distributors was the changed program qualifications that make some smaller customers ineligible. The most common explanation for higher satisfaction for distributors was positive experiences with the CSP, Energy Solutions.	• Continue to evaluate participation qualifications to be sure they are optimal for the pursuit of program goals and communicate any changes to qualification standards to distributors as early as possible.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
NTG	
• The NTGR for participants in the Nonresidential Midstream program is 100% with program free ridership of 8% and spillover of 8%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	

Source: Guidehouse analysis

3.11 Small Business Virtual Commissioning

The 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 SBVCx program targets customers having annual maximum demand less than 300kW. The CSP for this program is Franklin Energy, which subcontracts to a VCx 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 PY15 by customer segment.

Table 3-81: SBVCx Participation and Reported Impacts

Parameter	Small C&I	GNI	Total
PY15 # Participants	39	14	39
PYRTD MWh/yr	2,259	894	2,259
PYRTD MW/yr	0.47	0.17	0.47
PY15 Incentives ($1,000)	$398	$ 157	$398

Source: Guidehouse analysis

3.11.2 Gross Impact Evaluation

SBVCx reported savings for 39 projects in PY15. Table 3-82 and Table 3-83 show the realized verified energy and demand savings, respectively, for the program.

Table 3-82: SBVCx 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	2,259	99%	0.01	0%
Program Total	**2,259**	**99%**	**-**	**0%**

Source: Guidehouse analysis

Table 3-83: SBVCx 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	0.47	90%	0.06	1%
Program Total	0.47	90%		1%

Source: Guidehouse analysis

Most projects showed realization rates near 100% for energy, and no sites showed realization rates <80% or >120% for energy. This led to a low (72%) realization rate for that site. However, Guidehouse found that two of the sites had significant demand savings that was not claimed, leading to the high realization rate for demand. One site with zero claimed demand savings had significantly increased demand, lowering realization rate for the program.

While Guidehouse targets evaluating a census of VCx projects, one project from the program did not have a project file associated with it. Rather than remove this project from the savings, Guidehouse applied the realization rate for the evaluated projects to that site.

3.11.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY15 for the SBVCx and LBVCx programs together. Guidehouse estimated NTG factors for SBVCx and LBVCx based on results from the online participant survey. In total, five participants completed the battery of NTG questions. Table 3-84 shows the estimated free ridership, spillover, and NTGR resulting from the PY15 survey of SBVCx and LBVCx participants.

Table 3-84: PY15 SBVCx and LBVCx Net Impact Evaluation Results

Programs	Free Ridership	Participant Spillover	NTGR	Sample C_v	Relative Precision at 85% CL
SBVCx and LBVCx	8%	1%	94%	1.63	13%

Source: Guidehouse analysis

3.11.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY15. The team reviewed the PY15 nonresidential program activities and identified Custom C&I equipment as a HIM. As all measures within the SBVCx and LBVCx programs are considered Custom C&I equipment measures, the free ridership, spillover, and NTGR for this HIM are the same as the program-level values. Table 3-85 presents these values.

Table 3-85: SBVCx and LBVCx HIMs

Program	HIM	Free Ridership	Spillover	NTGR
SBVCx and LBVCx	Custom C&I Equipment	8%	1%	94%

Source: Guidehouse analysis

3.11.4 Verified Savings Estimates

In Table 3-86, 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 PY15.

Table 3-86: SBVCx PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	2,259	0.47
PYVTD Gross	2,232	0.42
PYVTD Net	2,091	0.39
RTD	2,759	0.49
VTD Gross	2,704	0.54
VTD Net	2,563	0.51

Source: Guidehouse analysis

3.11.5 Process Evaluation

Guidehouse completed process evaluation for SBVCx and LBVCx in PY15. 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 SBVCx and LBVCx.

3.11.5.1 Participant Survey Methodology

The participant survey focused on customers who had participated in SBVCx and LBVCx in PY15. The survey instrument included both process and NTG questions in one online survey. Guidehouse attempted a census and distributed the survey via email to 20 participants. The team received five completed surveys. Table 3-87 provides an overview of the sample design and disposition.

Table 3-87: VCx Sample Design and Disposition

Stratum	Projected Population (Unique customers)	Evaluation Method	Sample Target	Achieved Sample	Response Rate
PY14 & PY15 VCx participants	29	Online participant survey	Census attempt (17)	5	17%

Source: Guidehouse analysis

The process sections of the interview included questions on 2 main research topics:

- Program satisfaction
- Program participation motivation, barriers, and operations

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

3.11.5.2 Participant Survey Findings

The following sections present the responses collected through the participant survey for customer satisfaction ratings and benefits and barriers of the program.

Program Satisfaction

Guidehouse asked participants about their satisfaction with the VCx program, elements of the program, as well as with Duquesne Light overall. On a 0-10 scale where 0 is not at all satisfied and 10 is very satisfied, all respondents reported a satisfaction rating of 7 or higher on a 0-10 scale with Duquesne Light, the VCx program overall. Additionally, all respondents reported satisfaction of 7 or higher for each program aspect: initial outreach from the program, the process used to identify energy saving operational changes, and support from the program during and after implementation of these changes, with average scores of 10, 9.6, and 10, respectively. In addition, when asked how likely, they would be to recommend the program to others, 80% of respondents reported a likelihood of 10, with the remaining 20% reporting a 9. Taken together, these results are a solid indicator of high levels of satisfaction with the program for participants.

Program Participation Motivation, Barriers, and Operations

Guidehouse asked participants which of four characteristics of the program was the most important in their decision to participate in the program. Sixty percent of respondents reported that the most important motivation for their company to participate was the opportunity to save money on energy bills. The other 40% of respondents reported that it was the opportunity to reduce their firm's energy use that was the primary motivator.

Most respondents (80%) reported that program staff gave them a list of potential energy-saving operational changes that were relevant to their facility.

Guidehouse also asked participants about program barriers and challenges associated with program participation. One respondent reported receiving incomplete data from Duquesne Light while another reported having some difficulty with in-house staff in adjusting thermostats. However, based on the reported customer satisfaction with the program, these barriers were not substantial. Additionally, respondents did not report any barriers that they felt would prevent facilities from participating in the future.

Guidehouse asked participants about who had implemented the changes recommended through the program. Most respondents (60%) reported that in-house staff made changes, with other respondents reporting changes were completed by Duquesne Light program staff (20%) and service technicians (20%).

3.11.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-88. TRC benefits in PY15 were calculated using gross verified impacts. NPV costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-88: 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	$ 209		$ 272	
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)	$ (209)		$ (272)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 4
8	Administration and Management	$ 26	$ 32	$ 67	$ 47
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 40	$ -	$ 93
11	EDC Evaluation Costs	$ 12		$ 24	
12	SWE Audit Costs	$ 9		$ 12	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 119		$ 248	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 119		$ 248	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,027		$ 1,095	
16	Total NPV Lifetime Electric Capacity Benefits	$ 460		$ 521	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ -		$ -	
18	Total NPV Lifetime Fossil Fuel Impacts	$ -		$ -	
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)**	$ 1,487	$ 1,616
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	12.50	6.52

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

Source: Guidehouse analysis

Table 3-89 presents program financials and cost-effectiveness on a net savings basis. The NTGR applied in PY15 comes from the PY15 Net Impact Evaluation (Section 3.11.3).

Table 3-89: 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	$ 196		$ 261	
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)	$ (183)		$ (250)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 4
8	Administration and Management	$ 26	$ 32	$ 67	$ 47
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 40	$ -	$ 93
11	EDC Evaluation Costs	$ 12		$ 24	
12	SWE Audit Costs	$ 9		$ 12	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 119		$ 248	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 119		$ 248	
15	Total NPV Lifetime Electric Energy Benefits	$ 962		$ 1,039	
16	Total NPV Lifetime Electric Capacity Benefits	$ 431		$ 495	
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)**	$ 1,393		$ 1,534	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	11.71		6.19	

* 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 PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-90 provides a summary of findings, along with Duquesne Light's plan to address to recommendation in program delivery.

Table 3-90: SBVCx Program Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Demand savings have higher variation in savings realization rate across all Nonresidential programs.	• Duquesne Light should reinforce the demand savings methodology for CSPs.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure that the correct demand savings methodology is used.	
Program Satisfaction	
• Respondents (n=5) were highly satisfied with the program, with all five reporting a program satisfaction score of 10 on a 0-10 scale. In addition, two of the three program components respondents were asked about received a score of 10/10, with the third earning a 9.6/10.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
NTG	
• The NTGR for the VCx program is 93.7% with program free ridership of 7.6% and spillover of 1.3%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	

Source: Guidehouse analysis

3.12 Large Business Solutions

The 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[14] 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 3-91 and Table 3-92 present the participation counts, reported energy and demand savings, and incentive payments for LBS Commercial and LBS Industrial, respectively, in PY15 by customer segment.

Table 3-91: LBS Participation and Reported Impacts (Commercial)

Parameter	Large C&I*	GNI**	Total
PY15 # Participants	32	10	32
PYRTD MWh/yr	12,534	7,465	12,534
PYRTD MW/yr	2.56	1.60	2.56
PY15 Incentives ($1,000)	$970	$ 605	$970

*LBS has a Multifamily component associated with it, which a percentage of savings can be claimed under Residential LI. In PY15, this component reported 175 MWh/yr of LI savings. These LI savings are not broken out in this table.
**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).
Source: Guidehouse analysis

Table 3-92: LBS Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY15 # Participants	9	0	9
PYRTD MWh/yr	9,669	0	9,669
PYRTD MW/yr	1.29	0.00	1.29
PY15 Incentives ($1,000)	$511	$0	$511

*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).
Source: Guidehouse analysis

3.12.2 Gross Impact Evaluation

The Business Solutions programs (SBS/LBS) are projected to account for approximately 32.86% of all Duquesne Light's Phase IV savings (residential and nonresidential). To date, the

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

SBS and LBS programs have achieved a slightly lower percentage of the portfolio savings than anticipated, due in large part to the strong performance of the midstream programs in PY14.

Similar to other nonresidential programs, the LBS program will be evaluated on a specified schedule. As detailed in the evaluation plan, Guidehouse combined both the PY14 and PY15 LBS populations when determining the PY15 evaluation sample and included the realization rates of the sites sampled in PY14 in determining the rolling 2-year realization rate.

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 3-93 presents the gross impact results for energy, and Table 3-94 presents the gross impact results for demand.

Table 3-93: LBS 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 - Certainty	7,516	100%	0.02	2%
Commercial - Large	1,479	98%	0.02	5%
Commercial - Medium	2,844	99%	0.03	2%
Commercial - Small	520	96%	0.08	7%
Commercial - Multifamily	175	126%	-	0%
Industrial - Certainty	9,238	106%	-	0%
Industrial - Large	-	100%	-	0%
Industrial - Medium	333	99%	0.03	2%
Industrial - Small	98	96%	0.08	7%
Program Total	**22,203**	**102%**	**-**	**1%**

Source: Guidehouse analysis

Table 3-94: LBS 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 - Certainty	1.69	80%	0.31	40%
Commercial - Large	0.42	100%	-	0%
Commercial - Medium	0.34	104%	0.07	5%
Commercial - Small	0.09	92%	0.20	16%
Commercial - Multifamily	0.02	120%	-	0%
Industrial - Certainty	1.15	104%	-	0%
Industrial - Large	-	100%	-	0%
Industrial - Medium	0.12	104%	0.07	5%
Industrial - Small	0.01	92%	0.20	16%
Program Total	**3.85**	**93%**	**0.12**	**10%**

Source: Guidehouse analysis

Thirteen of the 16 projects evaluated in PY15 had realization rates within 10% of 100% for both energy and demand, indicating that the implementer is accurately reporting savings for this program. Three sites fell outside of the acceptable realization rate range, with one reporting an energy realization rate of 63% and the two others reporting energy realization rates over 120%.

The primary driver for the site with an energy realization rate of 63% was due to difference in verified lighting control type. The submitted App C stated wall switches but the site contact was adamant that the majority of the lights were controlled by occupancy sensors. This adjustment resulted in an energy realization rate of 63% and demand realization rate of 76%.

Of the two sites reporting greater than 110% realization rate, the first was driven by differences in verified HOU. Guidehouse installed five lighting loggers in different spaces within the facility, and three loggers showed 8,736 HOU (significantly higher than the hours submitted in App C). This resulted in an energy realization rate of 140%.

The other site originally utilized trend data that had been collected prior to full plant commissioning and assumed an average between the customer-expected operation and the metered operation. Guidehouse requested additional trend data from the customer and found that the ex ante trend data was more consistent with the operation after the plant started full operation. This state produced much higher savings for the BOG compressors when compared to the ex ante calculations. As both sets of trend data agreed, Guidehouse utilized the ex post trend data as the most representative period, which raised both energy and demand savings by 20%.

3.12.3 Net Impact Evaluation

Per the PY15 Guidehouse Evaluation Plan, Guidehouse did not conduct a net impact evaluation for LBS in PY15. Table 2-4 shows the NTGR applied to LBS projects, which was carried over from the PY14 NTG evaluation.

3.12.3.1 HIM Research

Guidehouse did not conduct HIM research for LBS in PY15.

3.12.4 Verified Savings Estimates

In Table 3-95 and Table 3-96, the realization rates and NTGRs 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 PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-95: LBS (Commercial) PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	12,534	2.56
PYVTD Gross	12,480	2.23
PYVTD Net	5,271	0.95
RTD	28,356	5.86
VTD Gross	29,437	5.82
VTD Net	16,297	3.27

Source: Guidehouse analysis

Table 3-96: LBS (Industrial) PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	9,669	1.29
PYVTD Gross	10,172	1.34
PYVTD Net	4,374	0.58
RTD	26,869	2.80
VTD Gross	27,170	2.84
VTD Net	12,027	1.28

Source: Guidehouse analysis

3.12.5 Process Evaluation

Guidehouse did not conduct process evaluation research for LBS in PY15.

3.12.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-97 and Table 3-98 for LBS Commercial and LBS Industrial, respectively. TRC benefits in Table

3-97 and Table 3-98 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-97: Summary of Program Finances – Gross Verified (LBS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 3,186		$ 5,456	
2	Rebates to Participants and Trade Allies	$ 970		$ 2,019	
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)	$ 2,216		$ 3,437	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 45	$ 18
8	Administration and Management	$ 26	$ 391	$ 71	$ 569
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 811	$ -	$ 2,281
11	EDC Evaluation Costs	$ 140		$ 285	
12	SWE Audit Costs	$ 107		$ 189	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,475		$ 3,458	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 4,661		$ 8,914	
15	Total NPV Lifetime Electric Energy Benefits	$ 5,625		$ 12,249	
16	Total NPV Lifetime Electric Capacity Benefits	$ 2,424		$ 5,901	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 192		$ 907	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (459)		$ (1,303)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 7,782		$ 17,754	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.67		1.99	

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

Source: Guidehouse analysis

Table 3-98: Summary of Program Finances – Gross Verified (LBS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,510		$ 3,914	
2	Rebates to Participants and Trade Allies	$ 511		$ 1,533	
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)	$ 999		$ 2,381	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 15	$ 14
8	Administration and Management	$ 26	$ 173	$ 71	$ 251
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 671	$ -	$ 1,934
11	EDC Evaluation Costs	$ 62		$ 127	
12	SWE Audit Costs	$ 47		$ 86	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 979		$ 2,499	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,489		$ 6,413	
15	Total NPV Lifetime Electric Energy Benefits	$ 4,552		$ 10,446	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,457		$ 2,682	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 59		$ 127	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (437)		$ (752)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 5,631		$ 12,503	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.26		1.95	

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

Source: Guidehouse analysis

Table 3-99 and Table 3-100 presents program financials and cost-effectiveness on a net savings basis for LBS Commercial and LBS Industrial, respectively. The NTGR applied in PY15 comes from the PY14 Net Impact Evaluation.

Table 3-99: Summary of Program Finances – Net Verified (LBS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 1,370		$ 2,811	
2	Rebates to Participants and Trade Allies	$ 417		$ 1,099	
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)	$ 410		$ 921	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 45	$ 18
8	Administration and Management	$ 26	$ 391	$ 71	$ 569
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 811	$ -	$ 2,281
11	EDC Evaluation Costs	$ 140		$ 285	
12	SWE Audit Costs	$ 107		$ 189	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 1,475		$ 3,458	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 2,845		$ 6,269	
15	Total NPV Lifetime Electric Energy Benefits	$ 2,419		$ 6,929	
16	Total NPV Lifetime Electric Capacity Benefits	$ 1,042		$ 3,380	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 83		$ 517	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (198)		$ (742)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 3,346		$ 10,085	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.18		1.61	

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

Source: Guidehouse analysis

Table 3-100: Summary of Program Finances – Net Verified (LBS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 649		$ 1,707	
2	Rebates to Participants and Trade Allies	$ 220		$ 674	
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)	$ 185		$ 450	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 15	$ 14
8	Administration and Management	$ 26	$ 173	$ 71	$ 251
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 671	$ -	$ 1,934
11	EDC Evaluation Costs	$ 62		$ 127	
12	SWE Audit Costs	$ 47		$ 86	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 979		$ 2,499	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,628		$ 4,206	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,957		$ 4,649	
16	Total NPV Lifetime Electric Capacity Benefits	$ 626		$ 1,216	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 25		$ 61	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (188)		$ (350)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,421		$ 5,576	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.49		1.33	

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

Source: Guidehouse analysis

3.12.7 Status of Recommendations

The impact and process evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-101 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 3-101: LBS Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Nine large projects with savings exceeding 1 million kWh account for 36% of the Nonresidential savings in PY15.	• Duquesne Light and the CSP should continue pursuing these projects, as they provide a large proportion of savings and showed a nearly 100% realization rate for both energy and demand in PY15.
Duquesne Light Response: Duquesne Light acknowledges the recommendation.	
Reported Savings	
• Demand savings have higher variation in savings realization rate across all Nonresidential programs, with one large project using an incorrect savings calculation that does not match the PJM peak demand periods.	• Duquesne Light should reinforce the demand savings methodology for CSPs.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure that the correct demand savings methodology is used.	

Source: Guidehouse analysis

3.13 Large Business Midstream Solutions

The 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 3-102 and Table 3-103 present the participation counts, reported energy and demand savings, and incentive payments for LBMS Commercial and LBMS Industrial, respectively, in PY15 by customer segment.

Table 3-102: LBMS Participation and Reported Impacts (Commercial)

Parameter	Large C&I	GNI	Total
PY15 # Participants	120	60	120
PYRTD MWh/yr	3,897	1,590	3,897
PYRTD MW/yr	0.74	0.29	0.74
PY15 Incentives ($1,000)	$425	$182	$425

*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).

Source: Guidehouse analysis

Table 3-103: LBMS Participation and Reported Impacts (Industrial)

Parameter	Large C&I	GNI	Total
PY15 # Participants	21	0	21
PYRTD MWh/yr	717	0	717
PYRTD MW/yr	0.21	0.00	0.21
PY15 Incentives ($1,000)	$53	$0	$53

*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).

Source: Guidehouse analysis

3.13.2 Gross Impact Evaluation

The Phase IV evaluation plan originally called for an evaluation of the midstream programs in PY15. However, the SBMS and LBMS programs combined contributed to more than 50% of portfolio savings in PY14. 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). Consistent with the updated evaluation plan, as approved by the SWE, Guidehouse applied the results from the PY14 evaluation to the PY15 program savings to determine verified savings values for PY15.

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.

Table 3-104 presents the gross impact results for energy, and Table 3-105 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 3-104: LBMS 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)	706	128%	0.86	49%
LBMS – Medium (Commercial)	2,272	94%	0.15	19%
LBMS – Small (Commercial)	919	113%	0.56	39%
LBMS – Large (Industrial)	109	128%	0.86	49%
LBMS – Medium (Industrial)	549	94%	0.15	19%
LBMS – Small (Industrial)	59	113%	0.56	39%
Program Total*	**7,141**	**106%**		**11%**

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.

Source: Guidehouse analysis

Table 3-105: LBMS 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)	0.12	94%	0.55	31%
LBMS – Medium (Commercial)	0.42	123%	0.47	62%
LBMS – Small (Commercial)	0.19	102%	0.89	61%
LBMS – Large (Industrial)	0.03	94%	0.55	31%
LBMS – Medium (Industrial)	0.16	123%	0.47	62%
LBMS – Small (Industrial)	0.02	102%	0.89	61%
Program Total*	**1.55**	**114%**		**22%**

*Program Total includes both SBMS and LBMS, as they are evaluated as a single initiative.

Source: Guidehouse analysis

The following factors are examples of the evaluated details from the projects evaluated in PY14 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 HOU.

3.13.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY15 for the SBMS and LBMS programs together. Please refer to Section for the results of the PY15 LBMS net impact evaluation.

3.13.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY15. Please refer to Section 3.10.3.1 for the results of the PY15 LBMS HIM Research.

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 NTGRs to the energy and demand savings for both Large and Small Midstream Solutions to calculate verified savings estimates. Table 3-106 present the verified savings estimates for LBMS in PY15. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 3-106: LBMS PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	7,141	1.55
PYVTD Gross	7,580	1.76
PYVTD Net	6,670	1.55
RTD	57,475	12.34
VTD Gross	62,238	13.85
VTD Net	43,613	9.73

**Savings include both SBMS and LBMS, as they are evaluated as a single initiative.*

Source: Guidehouse analysis

3.13.5 Process Evaluation

Given the similarities in program structure of SBMS and LBMS, Guidehouse combined the process evaluation discussion and results of LBMS with the SBMS process evaluation section. Refer to Section 3.10.5 for the results.

3.13.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-107 and Table 3-108 for LBMS Commercial and LBMS Industrial, respectively. TRC benefits in Table 3-107 and Table 3-108 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-107: Summary of Program Finances – Gross Verified (LBMS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 866		$ 2,781	
2	Rebates to Participants and Trade Allies	$ -		$ 439	
3	Upstream/Midstream Incentives	$ 425		$ 1,208	
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)	$ 441		$ 1,134	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 12
8	Administration and Management	$ 26	$ 119	$ 68	$ 172
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 268	$ -	$ 1,076
11	EDC Evaluation Costs	$ 43		$ 87	
12	SWE Audit Costs	$ 32		$ 56	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 488		$ 1,479	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,354		$ 4,260	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,854		$ 6,697	
16	Total NPV Lifetime Electric Capacity Benefits	$ 908		$ 2,911	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 415		$ 1,036	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (217)		$ (846)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,960		$ 9,799	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.19		2.30	

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

Source: Guidehouse analysis

Table 3-108: Summary of Program Finances – Gross Verified (LBMS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 147		$ 2,272	
2	Rebates to Participants and Trade Allies	$ -		$ 370	
3	Upstream/Midstream Incentives	$ 53		$ 1,410	
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)	$ 94		$ 491	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 3	$ 5
8	Administration and Management	$ 26	$ 48	$ 67	$ 70
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 46	$ -	$ 1,080
11	EDC Evaluation Costs	$ 17		$ 36	
12	SWE Audit Costs	$ 13		$ 23	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 150		$ 1,284	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 297		$ 3,556	
15	Total NPV Lifetime Electric Energy Benefits	$ 341		$ 8,176	
16	Total NPV Lifetime Electric Capacity Benefits	$ 266		$ 3,665	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 26		$ 357	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (59)		$ (1,408)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 574		$ 10,791	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.93		3.03	

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

Source: Guidehouse analysis

Table 3-109 and Table 3-110 presents program financials and cost-effectiveness on a net savings basis for LBMS Commercial and LBMS Industrial, respectively. The NTGR applied in PY15 comes from the PY15 Net Impact Evaluation (Section 3.13.3).

Table 3-109: Summary of Program Finances – Net Verified (LBMS Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 762		$ 2,057	
2	Rebates to Participants and Trade Allies	$ -		$ 316	
3	Upstream/Midstream Incentives	$ 374		$ 888	
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)	$ 342		$ 653	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 7	$ 12
8	Administration and Management	$ 26	$ 119	$ 68	$ 172
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 268	$ -	$ 1,076
11	EDC Evaluation Costs	$ 43		$ 87	
12	SWE Audit Costs	$ 32		$ 56	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 488		$ 1,479	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 1,250		$ 3,536	
15	Total NPV Lifetime Electric Energy Benefits	$ 1,631		$ 4,931	
16	Total NPV Lifetime Electric Capacity Benefits	$ 799		$ 2,152	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 365		$ 784	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (191)		$ (618)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 2,605		$ 7,249	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	2.08		2.05	

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

Source: Guidehouse analysis

Table 3-110: Summary of Program Finances – Net Verified (LBMS Industrial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ 130		$ 1,567	
2	Rebates to Participants and Trade Allies	$ -		$ 266	
3	Upstream/Midstream Incentives	$ 47		$ 955	
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)	$ 73		$ 246	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 3	$ 5
8	Administration and Management	$ 26	$ 48	$ 67	$ 70
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 46	$ -	$ 1,080
11	EDC Evaluation Costs	$ 17		$ 36	
12	SWE Audit Costs	$ 13		$ 23	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 150		$ 1,284	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 280		$ 2,851	
15	Total NPV Lifetime Electric Energy Benefits	$ 300		$ 5,634	
16	Total NPV Lifetime Electric Capacity Benefits	$ 234		$ 2,540	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	$ 23		$ 249	
18	Total NPV Lifetime Fossil Fuel Impacts	$ (52)		$ (969)	
19	Total NPV Lifetime Water Impacts	$ -		$ -	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	$ 505		$ 7,453	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	1.81		2.61	

* 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 PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-111 summarizes the findings and recommendations for the program, along with Duquesne Light's plans to address the recommendation in program delivery.

Table 3-111: LBMS Program Findings and Recommendations

Findings	Recommendations
Program Awareness, Influence, and Marketing	
• Five of 14 survey respondents (participants) were not aware that Duquesne Light provided a discount on the energy efficient equipment they purchased, and eleven of the 14 heard about the program for the first time from distributors.	• Encourage distributors make participants aware of Duquesne Light's sponsorship of the program.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
Program Awareness, Influence, and Marketing	
• One survey respondent, of 14, reported becoming aware of the program via email, while seven respondents reported that this would be one of the best ways for customers to learn about the program.	• Evaluate the possibility of increasing the prevalence of email marketing in awareness efforts.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Awareness, Influence, and Marketing	
• Six of 14 survey respondents reported that their primary motivation for participation in the program was to help them achieve their business' sustainability goals.	• Include messaging in marketing materials to address the benefits of the program in regards to meeting efficiency or sustainability goals. This may include bill savings and greenhouse gas avoidance calculations.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will take it under advisement.	
Program Satisfaction	
• Participant satisfaction with the program was high, with 13 of 14 survey respondents rating their satisfaction with the program as a 9 or 10 on a 0-10 scale. Regarding program components, survey respondents were most satisfied with their interactions with distributors, with an average rating of 9.7.	• No recommendations.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
Program Satisfaction	
• In interviews, distributors rated their satisfaction with the program as a 6.9/10 on a 0-10 scale. The most commonly reported concern on behalf of distributors was the changed program qualifications that make some smaller customers ineligible. The most common explanation for higher satisfaction for distributors was positive experiences with the CSP, Energy Solutions.	• Continue to evaluate participation qualifications to be sure they are optimal for the pursuit of program goals, and communicate any changes to qualification standards to distributors as early as possible.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to incorporate into future program operations.	
NTG	

Findings	Recommendations
• The NTGR for participants in the Nonresidential Midstream program is 100% with program free ridership of 8% and spillover of 8%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	

Source: Guidehouse analysis

3.14 Large Business Virtual Commissioning

The 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 LBVCx program targets customers having annual maximum demand equal to or greater than 300 kW. As with the SBVCx program, the CSP is Franklin Energy, which subcontracts to a VCx 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 3-112 presents the participation counts, reported energy and demand savings, and incentive payments for LBVCx in PY15 by customer segment. The LBVCx program

Table 3-112: LBVCx Participation and Reported Impacts

Parameter	Large C&I	GNI*	Total
PY15 # Participants	5	4	5
PYRTD MWh/yr	1,407	988	1,407
PYRTD MW/yr	0.19	0.19	0.19
PY15 Incentives ($1,000)	$152	$174	$152

*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).

Source: Guidehouse analysis

3.14.2 Gross Impact Evaluation

LBVCx reported savings for four projects in PY15. Table 3-113 and Table 3-114 show the resulting verified energy and demand savings, respectively, for the program.

Table 3-113: LBVCx 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	1,407	97%	-	0%
Program Total	**1,407**	**97%**	**-**	**0%**

Source: Guidehouse analysis

Table 3-114: LBVCx 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	0.19	80%	-	0%
Program Total	0.19	80%	-	0%

Source: Guidehouse analysis

Most projects showed realization rates near 100% for energy. However, Guidehouse found that one site had a realization rate of 80% for demand, and one site that claimed zero demand savings showed an increase in peak demand usage, reducing savings.

3.14.3 Net Impact Evaluation

Per Guidehouse's Evaluation Plan and the identical methodologies in program design, the team conducted free ridership and spillover research in PY15 for the SBVCx and LBVCx programs together. Please refer to Section 3.11.3 for the results of the PY15 LBVCx net impact evaluation.

3.14.3.1 HIM Research

Guidehouse conducted HIM research for measures implemented during PY15. Please refer to Section 3.11.3.1 for the results of the PY15 LBVCx HIM Research.

3.14.4 Verified Savings Estimates

In Table 3-115, the realization rates determined by Guidehouse are applied to the reported energy and demand savings estimates to calculated the verified savings estimates for LBVCx in PY15.

Table 3-115: LBVCx PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)

PYRTD	1,407	0.19
PYVTD Gross	1,371	0.15
PYVTD Net	1,284	0.14
RTD	3,921	0.43
VTD Gross	3,813	0.59
VTD Net	3,726	0.58

Source: Guidehouse analysis

3.14.5 Process Evaluation

Given the similarities in program structure of SBVCx and LBVCx, Guidehouse combined the process evaluation discussion and results of LBVCx with the SBVCx process evaluation section. Refer to Section 3.11.5 for the results.

3.14.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness are presented in Table 3-116 and Table 3-117 for LBVCx Commercial and LBVCx Industrial, respectively. TRC benefits in Table 3-116 and Table 3-117 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 3-116: Summary of Program Finances – Gross Verified (LBVCx Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ 152		$ 568	
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)	$ (152)		$ (568)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 2
8	Administration and Management	$ 26	$ 18	$ 67	$ 26
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 31	$ -	$ 130
11	EDC Evaluation Costs	$ 6		$ 12	
12	SWE Audit Costs	$ 4		$ 6	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 85		$ 244	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 85		$ 244	
15	Total NPV Lifetime Electric Energy Benefits	$ 631		$ 1,569	
16	Total NPV Lifetime Electric Capacity Benefits	$ 167		$ 589	
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)**	$ 798		$ 2,157	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	9.39		8.84	

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

Source: Guidehouse analysis

Table 3-117: Summary of Program Finances – Gross Verified (LBVCx 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	$ 7	$ 65	$ 11
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$ 10
11	EDC Evaluation Costs	$ 2		$ 5	
12	SWE Audit Costs	$ 2		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 35		$ 93	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 35		$ 93	
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 3-118 and Table 3-119 present program financials and cost-effectiveness on a net savings basis for LBVCx Commercial and LBVCx Industrial, respectively. The NTGR applied in PY15 comes from the PY15 Net Impact Evaluation (Section 3.14.3).

Table 3-118: Summary of Program Finances – Net Verified (LBVCx Commercial)

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	$ -		$ -	
2	Rebates to Participants and Trade Allies	$ 142		$ 559	
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)	$ (133)		$ (552)	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$ -	$ -	$ 1	$ 2
8	Administration and Management	$ 26	$ 18	$ 67	$ 26
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ 31	$ -	$ 130
11	EDC Evaluation Costs	$ 6		$ 12	
12	SWE Audit Costs	$ 4		$ 6	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 85		$ 244	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 85		$ 244	
15	Total NPV Lifetime Electric Energy Benefits	$ 591		$ 1,534	
16	Total NPV Lifetime Electric Capacity Benefits	$ 157		$ 579	
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)**	$ 748		$ 2,113	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	8.79		8.65	

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

Source: Guidehouse analysis

Table 3-119: Summary of Program Finances – Net Verified (LBVCx 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	$ 7	$ 65	$ 11
9	Marketing	$ -	$ -	$ -	$ -
10	Program Delivery	$ -	$ -	$ -	$ 10
11	EDC Evaluation Costs	$ 2		$ 5	
12	SWE Audit Costs	$ 2		$ 2	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	$ 35		$ 93	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	$ 35		$ 93	
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 PY15 led to the following findings and recommendations from Guidehouse to Duquesne Light. Table 3-120 provides a summary of findings, along with Duquesne Light's plan to address to recommendation in program delivery.

Table 3-120: LBVCx Program Findings and Recommendations

Findings	Recommendations
Reported Savings	
• Demand savings have higher variation in savings realization rate across all Nonresidential programs.	• Duquesne Light should reinforce the demand savings methodology for CSPs.
Duquesne Light Response: Duquesne Light acknowledges the recommendation and will work with the CSP to ensure that the correct demand savings methodology is used.	
Program Satisfaction	
• Respondents (n=5) were highly satisfied with the program, with all five reporting a program satisfaction score of 10 on a 0-10 scale. In addition, two of the three program components respondents were asked about received a score of 10/10, with the third earning a 9.6/10.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	
NTG	
• The NTGR for the VCx program is 93.7% with program free ridership of 7.6% and spillover of 1.3%.	• No recommendation.
Duquesne Light Response: Duquesne Light acknowledges the finding.	

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

Table 4-1 shows program-specific and portfolio total finances for PY15. 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[15] 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.[16]

Table 4-1: PY15 Program and Portfolio Total Finances

Program	Incentives	Non-Incentives	Total Cost
Res Downstream Incentives	$1,657	$1,323	$2,980
Res Midstream Incentives	$0	$0	$0
Residential Upstream Lighting	$50	$645	$695
Appliance Recycling	$51	$216	$267
Low-Income Energy Efficiency	$1,125	$780	$1,905
Res Behavioral EE	$0	$677	$677
Low-Income Behavioral EE	$0	$286	$286
Small Business Direct Install	$3,091	$568	$3,659
Small Business Downstream	$563	$1,004	$1,567
Small Business Midstream	$302	$176	$478
Small Business VCx	$209	$110	$319
Large Commercial Downstream	$970	$1,368	$2,338
Large Commercial Midstream	$425	$456	$881
Large Commercial VCx	$152	$81	$233
Large Industrial Downstream	$511	$932	$1,443
Large Industrial Midstream	$53	$137	$190
Large Industrial VCx	$0	$33	$33
Common Portfolio Costs[17]			**N/A**
Portfolio Total	**$9,159**	**$8,792**	**$17,951**

[15] 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.

[16] 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.

[17] Common Portfolio costs could include costs associated with the tracking system, legal resources, and IT systems.

Program	Incentives	Non-Incentives	Total Cost
SWE Costs[18]	**N/A**	**N/A**	**$ 528**
Total	**$9,159**	**$8,792**	**$18,479**

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
Res Downstream Incentives	$1,728	$3,143	$4,871
Res Midstream Incentives	$1	$108	$109
Residential Upstream Lighting	$698	$1,925	$2,623
Appliance Recycling	$244	$1,639	$1,883
Low-Income Energy Efficiency	$3,558	$2,414	$5,972
Residential Behavioral EE	$0	$1,871	$1,871
LI Behavioral EE	$0	$721	$721
Small Business Direct Install	$5,593	$1,175	$6,768
Small Business Downstream	$1,409	$2,427	$3,836
Small Business Midstream	$8,198	$4,120	$12,318
Small Business VCx	$304	$255	$559
Large Commercial Downstream	$2,176	$3,506	$5,682
Large Commercial Midstream	$1,758	$1,522	$3,280
Large Commercial VCx	$617	$256	$873
Large Industrial Downstream	$1,666	$2,608	$4,274
Large Industrial Midstream	$1,881	$1,337	$3,218
Large Industrial VCx	$0	$98	$98
Common Portfolio Costs[19]			**N/A**
Portfolio Total	**$29,831**	**$29,125**	**$58,957**
SWE Costs[20]	**N/A**	**N/A**	**$992**
Total	**$29,831**	**$29,125**	**$59,949**

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

[18] SWE costs are outside of the 2% spending cap.
[19] Common Portfolio costs could include costs associated with the tracking system, legal resources, and IT systems.
[20] Statewide Evaluation costs are within the 2% spending cap.

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[21] ($1,000)

Cost Recovery Sector	Rate Classes Included	PY15 Spending	P4TD Spending
Residential	RS, RH,RA	$6,980	$18,363
Small/Medium C&I	GS, GM, GMH	$6,169	$23,760
Large Commercial	GL, GLH, L	$3,596	$10,249
Large Industrial	GL, GLH, L, HVPS	$1,734	$7,577
Portfolio Total		**$18,479**	**$59,950**

* The portfolio total includes the SWE costs.

Source: Guidehouse analysis

[21] Includes SWE costs.

Appendix A. Site Inspection Summary

Table A-1: PY15 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
SBS*	Karpinski	4	4	Lighting Control Type, HOU (reported vs verified), Fixture Quantities (minor discrepancies)
LBS*	Karpinski	11	4	Lighting Control Type (different than recorded), Heating Fuel Type (different than recorded), Incorrect Peak Demand Period
SBDI*	Karpinski	16	13	Lighting Control Type (different than recorded), HOU (customer-reported/posted higher hours for two sites), Fixture Quantities (minor discrepancies)
TOTAL		**31**	**21**	

**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 PY15 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	2012 MR	2015 MR	2021 Digital	2021 Non-Digital	2023 Digital	2023 Non-Digital	2015 LI	2018 LI	2023 LI
Jun 2022	11,651	30,531	58,870	58,819	-	-	7,049	1,634	-
Jul 2022	11,605	30,394	58,056	58,319	50,632	14,956	6,968	1,616	17,874
Aug 2022	11,568	30,248	57,283	57,830	48,645	14,784	6,914	1,597	17,369
Sep 2022	11,533	30,108	56,643	57,345	46,884	14,617	6,855	1,571	16,885
Oct 2022	11,493	29,986	56,199	56,973	45,915	14,455	6,793	1,554	16,616
Nov 2022	11,455	29,859	55,742	56,565	45,002	14,316	6,730	1,539	16,331
Dec 2022	11,424	29,758	55,371	56,240	44,367	14,199	6,683	1,519	16,116
Jan 2023	11,404	29,671	55,057	55,980	43,782	14,112	6,643	1,508	15,956
Feb 2023	11,368	29,586	54,685	55,692	43,130	14,009	6,595	1,497	15,751
Mar 2023	11,345	29,497	54,402	55,418	42,537	13,903	6,550	1,489	15,563
Apr 2023	11,308	29,389	54,083	55,100	41,991	13,821	6,503	1,470	15,348
May 2023	11,276	29,273	53,612	54,752	41,176	13,677	6,433	1,446	15,026
Average	**11,453**	**29,858**	**55,834**	**56,586**	**44,915**	**14,259**	**6,726**	**1,537**	**16,258**

Source: Guidehouse analysis

B.2 Regression Output

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

Table B-2: Residential Behavioral Wave Regression Savings Details

Month	2012 MR		2015 MR		2021 D		2021 ND		2023 D		2023 ND	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2022	-0.64	0.15	-0.24	0.13	-0.21	0.08	-0.22	0.06	-	-	-	-
Jul 2022	-0.79	0.18	-0.36	0.15	-0.24	0.09	-0.37	0.08	-0.04	0.08	-0.08	0.07
Aug 2022	-0.80	0.17	-0.33	0.15	-0.26	0.08	-0.38	0.07	-0.03	0.08	-0.07	0.07
Sep 2022	-0.68	0.14	-0.26	0.12	-0.18	0.07	-0.28	0.06	-0.01	0.07	-0.10	0.06
Oct 2022	-0.53	0.11	-0.25	0.10	-0.20	0.06	-0.20	0.05	-0.08	0.06	-0.05	0.05
Nov 2022	-0.45	0.13	-0.32	0.11	-0.19	0.07	-0.22	0.06	-0.15	0.07	-0.05	0.06
Dec 2022	-0.56	0.16	-0.33	0.13	-0.32	0.09	-0.21	0.07	-0.10	0.08	-0.11	0.07
Jan 2023	-0.67	0.17	-0.36	0.13	-0.34	0.09	-0.20	0.07	-0.17	0.08	-0.15	0.08
Feb 2023	-0.64	0.15	-0.39	0.12	-0.26	0.08	-0.16	0.07	-0.19	0.08	-0.14	0.07
Mar 2023	-0.57	0.13	-0.35	0.12	-0.20	0.07	-0.17	0.06	-0.14	0.07	-0.13	0.06
Apr 2023	-0.54	0.12	-0.31	0.11	-0.28	0.07	-0.15	0.06	-0.11	0.06	-0.08	0.06
May 2023	-0.65	0.14	-0.32	0.13	-0.35	0.08	-0.20	0.07	-0.16	0.07	-0.08	0.06

Source: Guidehouse analysis

Table B-3: LI-BEEP Wave Regression Savings Details

Month	2015 LI		2018 LI		2023 LI	
	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error	Treatment Coefficient	Cluster Robust Standard Error
Jun 2022	-0.44	0.22	-0.16	0.33	-	-
Jul 2022	-0.54	0.28	0.12	0.44	-0.04	0.12
Aug 2022	-0.45	0.27	-0.13	0.42	-0.02	0.11
Sep 2022	-0.25	0.21	-0.20	0.34	-0.08	0.10
Oct 2022	-0.33	0.19	-0.03	0.30	-0.14	0.10
Nov 2022	-0.29	0.24	-0.02	0.38	-0.05	0.12
Dec 2022	-0.29	0.29	0.17	0.44	0.01	0.14
Jan 2023	-0.18	0.30	0.17	0.47	-0.02	0.15
Feb 2023	-0.21	0.27	0.15	0.43	-0.07	0.14
Mar 2023	-0.33	0.25	-0.14	0.38	0.03	0.12
Apr 2023	-0.17	0.21	-0.25	0.32	-0.01	0.10
May 2023	-0.05	0.22	-0.19	0.34	-0.14	0.11

Source: Guidehouse analysis

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

Month	2012 MR		2015 MR		2021 D		2021 ND		2023 D		2023 ND	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2022	2.10%	0.98%	0.99%	1.08%	0.93%	0.67%	1.17%	0.67%	-	-	-	-
Jul 2022	2.00%	0.88%	1.16%	0.97%	0.81%	0.58%	1.47%	0.58%	0.17%	0.67%	0.46%	0.81%
Aug 2022	2.14%	0.89%	1.11%	0.98%	0.92%	0.59%	1.61%	0.59%	0.14%	0.66%	0.44%	0.83%
Sep 2022	2.33%	0.93%	1.12%	1.01%	0.85%	0.64%	1.54%	0.61%	0.07%	0.70%	0.77%	0.89%
Oct 2022	2.28%	0.94%	1.39%	1.03%	1.21%	0.75%	1.38%	0.71%	0.58%	0.78%	0.47%	1.00%
Nov 2022	1.75%	0.98%	1.62%	1.06%	1.07%	0.79%	1.38%	0.75%	0.98%	0.84%	0.42%	1.05%
Dec 2022	1.84%	1.00%	1.44%	1.08%	1.54%	0.80%	1.15%	0.76%	0.55%	0.84%	0.78%	1.05%
Jan 2023	2.14%	1.06%	1.51%	1.11%	1.58%	0.83%	1.09%	0.78%	0.88%	0.83%	1.07%	1.06%
Feb 2023	2.35%	1.09%	1.87%	1.16%	1.39%	0.87%	0.96%	0.82%	1.12%	0.87%	1.08%	1.08%
Mar 2023	2.35%	1.09%	1.87%	1.22%	1.19%	0.85%	1.13%	0.79%	0.91%	0.86%	1.09%	1.06%
Apr 2023	2.33%	1.05%	1.75%	1.22%	1.65%	0.83%	1.03%	0.78%	0.75%	0.78%	0.71%	1.02%
May 2023	2.39%	1.04%	1.50%	1.18%	1.67%	0.80%	1.15%	0.78%	0.93%	0.77%	0.65%	1.06%

Source: Guidehouse analysis

Table B-5: LI-BEEP Wave Regression Savings Percentage Details

Month	2015 LI		2018 LI		2023 LI	
	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision	Treatment Coefficient	Absolute Precision
Jun 2022	2.05%	2.07%	0.79%	3.21%	-	-
Jul 2022	1.99%	2.03%	-0.49%	3.40%	0.19%	1.02%
Aug 2022	1.74%	2.04%	0.53%	3.39%	0.08%	1.01%
Sep 2022	1.19%	2.00%	1.00%	3.33%	0.43%	1.06%
Oct 2022	1.85%	2.05%	0.20%	3.38%	0.93%	1.26%
Nov 2022	1.38%	2.31%	0.09%	3.75%	0.25%	1.34%
Dec 2022	1.23%	2.37%	-0.75%	3.80%	-0.06%	1.35%
Jan 2023	0.72%	2.41%	-0.72%	3.77%	0.08%	1.38%
Feb 2023	0.97%	2.42%	-0.71%	3.84%	0.36%	1.39%
Mar 2023	1.64%	2.48%	0.71%	3.76%	-0.16%	1.34%
Apr 2023	0.93%	2.24%	1.41%	3.55%	0.09%	1.22%
May 2023	0.24%	2.27%	1.00%	3.50%	0.81%	1.22%

Source: Guidehouse analysis

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

Month	2012 MR	2015 MR	2021 Digital	2021 Non-Digital	2023 Digital	2023 Non-Digital	2015 LI	2018 LI	2023 LI
Jun 2022	224	217	362	392	-	-	93	8	-
Jul 2022	284	342	427	672	67	36	116	-6	24
Aug 2022	286	313	454	687	50	33	97	6	10
Sep 2022	235	233	312	490	19	44	51	9	39
Oct 2022	188	235	356	356	118	23	70	2	75
Nov 2022	155	290	324	371	208	21	58	1	22
Dec 2022	197	304	551	362	134	46	60	-8	-6
Jan 2023	238	328	587	356	225	66	37	-8	9
Feb 2023	212	335	419	256	240	57	41	-7	32
Mar 2023	201	319	344	292	182	55	66	6	-14
Apr 2023	182	276	451	248	141	32	32	11	6
May 2023	227	289	575	339	208	33	9	8	65

*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)
2012 MR	26.0
2015 MR	20.1
2021 Digital	18.7
2021 Non-Digital	16.1
2023 Digital	16.3
2023 Non-Digital	12.1
2015 LI	21.5
2018 LI	21.0
2023 LI	18.2

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 PY15 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 0, 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%	2023 D, 2023 LI, 2023 ND
2	1.50%	-
3	2.25%	2021 D, 2021 ND
4 and beyond	3.00%	2012 MR, 2015 LI, 2015 MR, 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)
2012 MR	2,628.66	-489.08	-64.19	-597.79	1,477.61	0.29
2015 MR	3,480.89	-1410.65	-62.11	-726.85	1,281.29	0.26
2021 Digital	5,161.62	-340.34	-108.48	-3118.08	1,594.72	0.32
2021 Non Digital	4,821.30	-216.31	-103.61	-1697.39	2,803.99	0.56
2023 Digital	1,592.51	-11.22	-11.86	0.00	1,569.43	0.21
2023 Non Digital	445.68	-1.69	-3.33	0.00	440.67	0.06
2015 LI	729.64	-177.66	-16.56	-555.19	-19.78	0.00
2018 LI	22.91	-27.95	0.15	15.03	10.14	0.00
2023 LI	261.49	-18.95	-1.82	0.00	240.72	0.03

* 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.[22, 23]

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.

[22] 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.

[23] 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. PY15 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 PY15 and P4TD.

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

Program	Customer Segment	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
LIEEP	LI	2,308	7,006
LI-BEEP	LI	231	2,157
SBDI*	Small Business Multifamily	484	1,422
LBS- Commercial	Large Business Multifamily	221	221
Total		**3,245**	**10,807**

* It was discovered that the PY14 Annual Report was underreporting the LI savings for Small Business Multifamily by 10 MWh. Those savings have been added to the VTD Gross savings in this table.

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 PY15 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	514	674	552	1,176	1,323	1,084
Residential Downstream Incentives	Audits	307	276	332	843	823	879
Residential Downstream Incentives	Kits	4,487	4,841	3,873	7,048	6,604	5,037
Residential Midstream Incentives		4	4	4	7	7	7
Residential Upstream Incentives	Appliances	2,316	2,316	1,737	3,819	4,532	3,561
Residential Upstream Incentives	LEDs	277	257	147	2,937	2,924	1,547
Residential Appliance Recycling	Freezers	156	142	102	479	449	245
Residential Appliance Recycling	Refrigerators	977	992	711	2,789	3,112	1,701
Residential Appliance Recycling	Other	129	135	97	355	361	203
Residential Low Income Energy Efficiency	Audits	1,156	1,111	1,111	6,190	5,704	5,704
Residential Low Income Energy Efficiency	Kits	853	844	844	923	913	913
Residential Low Income Energy Efficiency	Giveaways	24	24	24	59	59	59
Residential Low Income Energy Efficiency	Appliance Recycling	319	329	329	319	329	329

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 Behavioral		9,395	9,168	9,168	21,192	20,745	20,745
Low Income Behavioral		88	231	231	1,990	2,157	2,157
Small Business Direct Install	Large	4,319	4,176	3,884	6,375	5,748	5,350
Small Business Direct Install	Medium	-	-	-	1,236	1,013	937
Small Business Direct Install	Small	850	883	821	1,285	1,300	1,235
Small Business Direct Install	MF	45	45	42	1,261	1,303	1,250
Small Business Direct Install	MF LI	488	484	450	488	484	450
Small Business Direct Install	PAPP	-	-	-	96	111	110
Small Business Solutions	Medium	3,601	3,360	2,217	9,895	9,308	6,302
Small Business Solutions	Small	3,682	3,798	2,507	11,811	14,256	10,317
Small Business Solutions	Upstream Lighting-CCS	49	46	26	524	522	276
Small Business Midstream Solutions	Large	483	593	522	16,634	19,148	13,019
Small Business Midstream Solutions	Medium	1,716	1,898	1,671	30,418	33,201	22,827
Small Business Midstream Solutions	Small	327	282	248	5,808	5,082	3,538
Small Business Virtual Commissioning		2,259	2,232	2,091	2,759	2,704	2,563
Large Business Solutions	Commercial - Certainty	7,516	7,493	3,222	7,516	7,493	3,222
Large Business Solutions	Commercial - Large	1,479	1,451	624	6,859	7,230	4,405
Large Business Solutions	Commercial - Medium	2,844	2,818	1,212	10,771	10,977	6,547
Large Business Solutions	Commercial - Small	520	496	213	3,034	3,514	2,122
Large Business Solutions	Commercial - MF LI	175	221	95	175	221	95
Large Business Solutions	Industrial - Large	9,238	9,749	4,192	23,876	24,379	10,628
Large Business Solutions	Industrial - Medium	333	330	142	2,536	2,343	1,143

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 Solutions	Industrial - Small	98	93	40	457	448	256
Large Business Midstream Solutions	Commercial - Large	706	900	792	4,561	6,125	4,384
Large Business Midstream Solutions	Commercial - Medium	2,272	2,140	1,883	7,038	7,217	5,396
Large Business Midstream Solutions	Commercial - Small	919	1,043	918	2,166	2,721	2,076
Large Business Midstream Solutions	Industrial - Large	109	138	122	11,054	14,497	9,861
Large Business Midstream Solutions	Industrial - Medium	549	517	455	3,680	3,825	2,739
Large Business Midstream Solutions	Industrial - Small	59	67	59	490	675	485
Large Business Virtual Commissioning		1,407	1,371	1,284	3,922	3,813	3,726
Portfolio Total*		67,044	67,970	48,994	226,850	239,702	169,430

*Totals might not match other tables in this report due to rounding

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	0.66	0.55	0.45	0.75	0.63	0.52
Residential Downstream Incentives	Audits	0.69	0.68	0.54	0.73	0.73	0.59
Residential Downstream Incentives	Kits	0.03	0.03	0.03	0.50	0.49	0.33
Residential Midstream Incentives		0.00	0.00	0.00	0.00	0.00	0.00
Residential Upstream Incentives	Appliances	0.32	0.56	0.42	0.63	1.07	0.85

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 Upstream Incentives	LEDs	0.03	0.03	0.02	0.33	0.33	0.18
Residential Appliance Recycling	Freezers	0.03	0.02	0.02	0.09	0.07	0.04
Residential Appliance Recycling	Refrigerators	0.17	0.17	0.12	0.49	0.54	0.30
Residential Appliance Recycling	Other	0.07	0.08	0.06	0.26	0.27	0.14
Residential Low Income Energy Efficiency	Audits	0.11	0.11	0.11	0.62	0.59	0.59
Residential Low Income Energy Efficiency	Kits	0.07	0.07	0.07	0.08	0.08	0.08
Residential Low Income Energy Efficiency	Giveaways	0.00	0.00	0.00	0.00	0.00	0.00
Residential Low Income Energy Efficiency	Appliance Recycling	0.06	0.06	0.06	0.06	0.06	0.06
Residential Behavioral		1.82	1.70	1.70	3.53	3.35	3.35
Low Income Behavioral		(0.03)	0.03	0.03	0.19	0.28	0.28
Small Business Direct Install	Large	0.72	0.70	0.65	1.04	1.04	0.96
Small Business Direct Install	Medium	-	-	-	0.19	0.19	0.17
Small Business Direct Install	Small	0.15	0.16	0.15	0.21	0.22	0.21
Small Business Direct Install	MF	0.01	0.01	0.01	0.32	0.33	0.31
Small Business Direct Install	MF LI	0.04	0.07	0.07	0.04	0.07	0.07
Small Business Direct Install	PAPP	-	-	-	0.02	0.03	0.03
Small Business Solutions	Medium	0.83	0.66	0.44	2.18	2.02	1.36
Small Business Solutions	Small	0.79	0.78	0.52	2.56	3.89	2.87
Small Business Solutions	Upstream Lighting-CCS	0.02	0.01	0.01	0.16	0.15	0.09
Small Business Midstream Solutions	Large	0.12	0.12	0.10	3.81	3.64	2.47

Program	Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Small Business Midstream Solutions	Medium	0.41	0.50	0.44	6.45	8.05	5.54
Small Business Midstream Solutions	Small	0.07	0.06	0.06	1.12	1.09	0.77
Small Business Virtual Commissioning		0.47	0.42	0.39	0.49	0.54	0.51
Large Business Solutions	Commercial - Certainty	1.69	1.35	0.58	1.69	1.35	0.58
Large Business Solutions	Commercial - Large	0.42	0.42	0.18	1.46	1.42	0.77
Large Business Solutions	Commercial - Medium	0.34	0.35	0.15	2.17	2.24	1.41
Large Business Solutions	Commercial - Small	0.09	0.09	0.04	0.52	0.78	0.51
Large Business Solutions	Commercial - MF LI	0.02	0.03	0.01	0.02	0.03	0.01
Large Business Solutions	Industrial - Large	1.15	1.20	0.52	2.25	2.28	0.99
Large Business Solutions	Industrial - Medium	0.12	0.13	0.06	0.45	0.46	0.23
Large Business Solutions	Industrial - Small	0.01	0.01	0.01	0.10	0.10	0.07
Large Business Midstream Solutions	Commercial - Large	0.12	0.12	0.10	0.85	0.82	0.58
Large Business Midstream Solutions	Commercial - Medium	0.42	0.52	0.46	1.31	1.54	1.16
Large Business Midstream Solutions	Commercial - Small	0.19	0.19	0.17	0.46	0.51	0.39
Large Business Midstream Solutions	Industrial - Large	0.03	0.03	0.02	2.60	2.45	1.66
Large Business Midstream Solutions	Industrial - Medium	0.16	0.20	0.18	0.87	1.01	0.73
Large Business Midstream Solutions	Industrial - Small	0.02	0.02	0.02	0.10	0.11	0.09
Large Business Virtual Commissioning		0.19	0.15	0.14	0.43	0.59	0.58
Portfolio Total		**12.64**	**12.39**	**9.09**	**42.14**	**45.44**	**32.41**

*Totals might not match other tables in this report due to rounding

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 2023 dollars.

Table D-3: PY15 Gross TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$3,403	$2,222	1.53	$1,182
Res Midstream Incentives	$4	$6	0.57	($3)
Res Upstream Lighting	$903	$1,265	0.71	($362)
Appliance Recycling	$289	$316	0.91	($28)
Low-Income Energy Efficiency	$781	$863	0.91	($82)
Res Behavioral EE	$871	$696	1.25	$175
Low-Income Behavioral EE	$20	$290	0.07	($270)
Residential Subtotal	**$6,270**	**$5,658**	**1.11**	**$612**
Small Business Direct Install	$3,643	$1,398	2.61	$2,245
Small Business Downstream	$4,759	$2,370	2.01	$2,389
Small Business Midstream	$1,995	$883	2.26	$1,113
Small Business VCx	$1,487	$119	12.50	$1,368
Large Commercial Downstream	$7,782	$4,661	1.67	$3,120
Large Commercial Midstream	$2,960	$1,354	2.19	$1,606
Large Commercial VCx	$798	$85	9.39	$713
Large Industrial Downstream	$5,631	$2,489	2.26	$3,142
Large Industrial Midstream	$574	$297	1.93	$277
Large Industrial VCx	$0	$35	0.00	($35)
Nonresidential Subtotal	**$29,629**	**$13,692**	**2.16**	**$15,937**
Portfolio Total	**$35,899**	**$19,350**	**1.86**	**$16,549**

[1] *Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025Source: Guidehouse analysis*

Table D-4 presents PY15 cost-effectiveness using net verified savings to calculate benefits.

Table D-4: PY15 Net TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$2,793	$2,066	1.35	$727
Res Midstream Incentives	$4	$6	0.57	($3)
Res Upstream Lighting	$661	$1,105	0.60	($444)
Appliance Recycling	$207	$292	0.71	($85)
Low-Income Energy Efficiency	$781	$863	0.91	($82)
Res Behavioral Energy Efficiency	$871	$696	1.25	$175
Low-Income Behavioral Energy Efficiency	$20	$290	0.07	($270)
Residential Subtotal	**$5,336**	**$5,318**	**1.00**	**$18**
Small Business Direct Install	$3,388	$1,344	2.52	$2,044
Small Business Downstream	$3,121	$1,930	1.62	$1,191
Small Business Midstream	$1,756	$798	2.20	$958
Small Business VCx	$1,393	$119	11.71	$1,274
Large Commercial Downstream	$3,346	$2,845	1.18	$501
Large Commercial Midstream	$2,605	$1,250	2.08	$1,355
Large Commercial VCx	$748	$85	8.79	$663
Large Industrial Downstream	$2,421	$1,628	1.49	$793
Large Industrial Midstream	$505	$280	1.81	$225
Large Industrial VCx	$0	$35	0.00	($35)
Nonresidential Subtotal	**$19,283**	**$10,314**	**1.87**	**$8,969**
Portfolio Total	**$24,619**	**$15,632**	**1.57**	**$8,987**

[1] 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)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$4,757	$4,615	1.03	$142
Res Midstream Incentives	$6	$125	0.05	($119)
Res Upstream Lighting	$3,164	$3,692	0.86	($529)
Appliance Recycling	$816	$1,827	0.45	($1,011)
Low-Income Energy Efficiency	$1,836	$2,472	0.74	($636)
Res Behavioral Energy Efficiency	$1,647	$1,778	0.93	($132)
Low-Income Behavioral Energy Efficiency	$156	$673	0.23	($516)
Residential Subtotal	**$12,382**	**$15,183**	**0.82**	**($2,801)**
Small Business Direct Install	$6,077	$3,887	1.56	$2,191
Small Business Downstream	$15,896	$5,697	2.79	$10,199
Small Business Midstream	$36,530	$17,590	2.08	$18,940
Small Business VCx	$1,616	$248	6.52	$1,368
Large Commercial Downstream	$17,754	$8,914	1.99	$8,840
Large Commercial Midstream	$9,799	$4,260	2.30	$5,539
Large Commercial VCx	$2,157	$244	8.84	$1,913
Large Industrial Downstream	$12,503	$6,413	1.95	$6,090
Large Industrial Midstream	$10,791	$3,556	3.03	$7,235
Large Industrial VCx	$0	$93	0.00	($93)
Nonresidential Subtotal	**$113,123**	**$50,901**	**2.22**	**$62,221**
Portfolio Total	**$125,504**	**$66,084**	**1.90**	**$59,421**

[1] 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)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Res Downstream Incentives	$3,800	$4,295	0.88	($495)
Res Midstream Incentives	$6	$125	0.05	($119)
Res Upstream Lighting	$2,129	$3,086	0.69	($957)
Appliance Recycling	$444	$1,723	0.26	($1,279)
Low-Income Energy Efficiency	$1,836	$2,472	0.74	($636)
Res Behavioral Energy Efficiency	$1,647	$1,778	0.93	($132)
Low-Income Behavioral Energy Efficiency	$156	$673	0.23	($516)
Residential Subtotal	**$10,019**	**$14,153**	**0.71**	**($4,134)**
Small Business Direct Install	$5,696	$3,710	1.54	$1,986
Small Business Downstream	$11,281	$4,684	2.41	$6,598
Small Business Midstream	$25,074	$13,298	1.89	$11,776
Small Business VCx	$1,534	$248	6.19	$1,286
Large Commercial Downstream	$10,085	$6,269	1.61	$3,815
Large Commercial Midstream	$7,249	$3,536	2.05	$3,713
Large Commercial VCx	$2,113	$244	8.65	$1,869
Large Industrial Downstream	$5,576	$4,206	1.33	$1,370
Large Industrial Midstream	$7,453	$2,851	2.61	$4,602
Large Industrial VCx	$0	$93	0.00	($93)
Nonresidential Subtotal	**$76,060**	**$39,139**	**1.94**	**$36,921**
Portfolio Total	**$86,079**	**$53,292**	**1.62**	**$32,787**

[1] 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 PY15. [24]

Table D-7: HIM NTG

HIM	Program	Free ridership	Spillover	NTGR
Refrigerator Recycling	ARP (Residential)	54%	21%	67%
LED Interior Lighting Fixtures	SBMS/LBMS (Nonresidential)	25%	8%	83%
LED High Bay Lighting Fixtures	SBMS/LBMS (Nonresidential)	19%	8%	89%
LED Exterior Lighting Fixtures	SBMS/LBMS (Nonresidential)	17%	8%	91%
Custom Equipment	SBVCx/LBVCx (Nonresidential)	8%	1%	94%

Source: Guidehouse analysis

D.4 Program-Level Comparison of Performance to Approved EE&C Plan

Table D-8 presents PY15 expenditures, by program, compared with the budget estimates set forth in the EE&C plan for PY15. All the dollars in Table D-8 are presented in 2023 dollars.

Table D-8: Comparison of PY15 Expenditures to Phase IV EE&C Plan ($1,000)

Program	PY15 Budget from EE&C Plan	PY15 Actual Expenditures	Ratio (Actual/Plan)
Res Downstream Incentives	$1,676	$2,980	1.78
Res Midstream Incentives	$61	$0	0.00
Res Upstream Lighting	$255	$695	2.73
Appliance Recycling	$535	$267	0.50
Low-Income Energy Efficiency	$2,698	$1,905	0.71
Res Behavioral Energy Efficiency	$724	$677	0.93
Low-Income Behavioral Energy Efficiency	$129	$286	2.22
Small Business Direct Install	$640	$3,659	5.71
Small Business Downstream	$1,923	$1,567	0.81

[24] 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	PY15 Budget from EE&C Plan	PY15 Actual Expenditures	Ratio (Actual/Plan)
Small Business Midstream	$240	$478	1.99
Small Business VCx	$24	$319	13.41
Large Commercial Downstream	$5,447	$2,338	0.43
Large Commercial Midstream	$867	$881	1.02
Large Commercial VCx	$28	$233	8.37
Large Industrial Downstream	$940	$1,443	1.54
Large Industrial Midstream	$140	$190	1.35
Large Industrial VCx	$134	$33	0.25
TOTAL	**$16,462**	**$17,951**	**1.09**

Source: Guidehouse analysis

Table D-9 presents P4TD expenditures, by program, compared with the budget estimates set forth in the EE&C plan through PY15. All the dollars in Table D-9 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 PY15	P4TD Actual Expenditures	Ratio (Actual/Plan)
Res Downstream Incentives	$3,590	$4,871	1.36
Res Midstream Incentives	$85	$109	1.28
Res Upstream Lighting	$2,097	$2,623	1.25
Appliance Recycling	$1,256	$1,883	1.50
Low-Income Energy Efficiency	$7,262	$5,972	0.82
Res Behavioral Energy Efficiency	$1,887	$1,871	0.99
Low-Income Behavioral Energy Efficiency	$435	$721	1.66
Small Business Direct Install	$3,600	$6,572	1.83
Small Business Downstream	$5,563	$4,032	0.72
Small Business Midstream	$11,562	$12,318	1.07
Small Business VCx	$578	$559	0.97
Large Commercial Downstream	$8,572	$5,682	0.66
Large Commercial Midstream	$4,077	$3,280	0.80
Large Commercial VCx	$887	$873	0.98
Large Industrial Downstream	$4,369	$4,274	0.98
Large Industrial Midstream	$4,472	$3,218	0.72
Large Industrial VCx	$134	$98	0.73
TOTAL	**$60,425**	**$58,957**	**0.98**

Source: Guidehouse analysis

Table D-10 compares PY15 verified gross program savings compared with the energy savings projections set forth in the EE&C plan.

Table D-10: Comparison of PY15 Actual Program Savings to EE&C Plan Projections for PY15

Program	EE&C Plan Projections for PY15	PY15 VTD Gross MWh Savings	Ratio (Actual/Plan)
Res Downstream Incentives	6,407	5,791	0.90
Res Midstream Incentives	109	4	0.04
Res Upstream Lighting	411	2,573	6.26
Appliance Recycling	1,453	1,269	0.87
Low-Income Energy Efficiency	3,202	2,308	0.72
Res Behavioral Energy Efficiency	8,643	9,168	1.06
Low-Income Behavioral Energy Efficiency	865	231	0.27
Small Business Direct Install	694	5,808	8.37
Small Business Downstream	8,481	7,204	0.85
Small Business Midstream	897	2,773	3.09
Small Business VCx	63	2,232	35.23
Large Commercial Downstream	27,264	12,259	0.45
Large Commercial Midstream	2,768	4,083	1.48
Large Commercial VCx	112	1,371	12.26
Large Industrial Downstream	4,658	10,172	2.18
Large Industrial Midstream	496	723	1.46
Large Industrial VCx	532	0	0.00
TOTAL	**67,054**	**67,970**	**1.01**

Source: Guidehouse analysis

Table D-11 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 PY15	VTD Gross MWh Savings	Ratio (Actual/Plan)
Res Downstream Incentives	9,547	8,750	0.92
Res Midstream Incentives	112	7	0.06
Res Upstream Lighting	3,384	7,456	2.20
Appliance Recycling	3,574	3,922	1.10
Low-Income Energy Efficiency	8,616	7,007	0.81
Res Behavioral Energy Efficiency	22,512	20,744	0.92
Low-Income Behavioral Energy Efficiency	2,925	2,157	0.74

Program	EE&C Plan Through PY15	VTD Gross MWh Savings	Ratio (Actual/Plan)
Small Business Direct Install	3,900	10,180	2.61
Small Business Downstream	24,533	24,087	0.98
Small Business Midstream	43,150	57,431	1.33
Small Business VCx	1,538	2,704	1.76
Large Commercial Downstream	42,908	29,216	0.68
Large Commercial Midstream	13,023	16,064	1.23
Large Commercial VCx	3,567	3,813	1.07
Large Industrial Downstream	21,648	27,170	1.26
Large Industrial Midstream	15,792	18,997	1.20
Large Industrial VCx	532	0	0.00
TOTAL	**221,261**	**239,705**	**1.08**

Source: Guidehouse analysis

Appendix E. Evaluation Detail

E.1 Large and Small Business Solutions

Guidehouse evaluated the SBS and LBS (C&I) programs individually. 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 program component's energy savings; the medium stratum includes projects in the middle portion of the energy savings; and the small stratum represents the bottom portion of the energy savings.

Table E-1: LBS and SBS Sample Design

Stratum	Stratum Boundaries	Population (Projects)	Historical CV (Energy)	Historical CV (Demand)	Sampled Projects (Inc PY15)
LBS - Certainty	MWh ≥ 1,000	9	-	-	10
LBS - Large	500 ≤ MWh < 1,000	2	0.01	0.01	3
LBS - Medium	100 ≤ MWh < 500	16	0.03	0.06	5
LBS - Small	MWh < 100	24	0.03	0.00	5
LBS Program Total		52			23
SBS - Large	MWh > 500	0	-	-	0
SBS - Medium	100 ≤ MWh < 500	22	0.09	0.02	9
SBS - Small	MWh < 100	162	0.22	0.74	12
SBS Program Total		184			**21**

Source: Guidehouse analysis

Table E-2: LBS and SBS Initiative Results (Energy)

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBS - Large	-	-	-	-
SBS - Medium	3,601	93%	0.13	7%

Component	PYRTD MWh/yr	Energy Realization Rate	Sample C_v or Error Ratio	Relative Precision at 85% C.L.
SBS - Small	3,682	103%	0.19	8%
SBS Program Total	**7,333**	**98%**		**5%**
LBS – Certainty (Commercial)	7,516	100%	0.02	2%
LBS – Large (Commercial)	1,479	98%	0.02	5%
LBS – Medium (Commercial)	2,844	99%	0.03	2%
LBS – Small (Commercial)	520	96%	0.08	7%
LBS – Certainty (Industrial)	9,238	106%	-	0%
LBS – Large (Industrial)	-	100%	-	0%
LBS – Medium (Industrial)	333	99%	0.03	2%
LBS – Small (Industrial)	98	96%	0.08	7%
LBS Program Total	**22,203**	**102%**		**1%**

Source: Guidehouse analysis

Table E-3: LBS and SBS Initiative Results (Demand)

Component	PYRTD MW/yr	Demand Realization Rate	Sample C_V or Error Ratio	Relative Precision at 85% C.L.
SBS - Large	-	-	-	-
SBS - Medium	0.83	80%	0.63	34%
SBS - Small	0.79	99%	0.06	3%
SBS Program Total	**1.64**	**89%**		**14%**
LBS – Certainty (Commercial)	1.69	80%	0.31	40%
LBS – Large (Commercial)	0.42	100%	-	0%
LBS – Medium (Commercial)	0.34	104%	0.07	5%
LBS – Small (Commercial)	0.09	92%	0.20	16%
LBS – Certainty (Industrial)	1.15	104%	-	0%
LBS – Large (Industrial)	-	100%	-	0%
LBS – Medium (Industrial)	0.12	104%	0.07	5%
LBS – Small (Industrial)	0.01	92%	0.20	16%
LBS Program Total	**3.85**	**93%**		**10%**

Source: Guidehouse analysis

Appendix F. Free Ridership Evaluation for Small Business and Large Business Midstream Solutions Programs – Triangulation Methodology

This section describes the triangulation method that Guidehouse used for combining the free ridership research for SBMS and LBMS. Guidehouse estimated NTG factors for SBMS and LBMS based on results from the online participant survey and the distributor interviews. To calculate a program-level free ridership score, Guidehouse combined the two groups' free ridership scores into a weighted average. This strategy is based on a triangulation methodology provided in the Illinois Statewide Technical Reference Manual v12.0 Volume 4 - Attachment A Section 5.1.2. [25] The weighting takes into consideration aspects like bias, accuracy and representativeness of the sample. Guidehouse rated the participant and distributor NTG research on a scale of 0 to 10 for each of the questions listed Table F-1. The weight for each free ridership value is the average score for that estimate (0-10 based on the weighting questions) divided by the sum of the averages scores of both free ridership values.

Table F-1 shows the questions used to determine the SBMS and LBMS free ridership weighting. The scores and calculations shown are examples and not reflective of Guidehouse's research.

Table F-1: Free Ridership Triangulation Methodology

Question	Participant Score	Distributor Score
How accurate is this method to provide free ridership?	6	5
How valid is the data collection and analysis?	8	9
How representative is the sample?	9	9
How involved were the participants in the program?	9	9
How non-biased are the survey/interview responses?	7	8
How aware was the customer of program specifics and offerings	8	8
Average Sores	7.8	8
Sum of Averages	15.8	15.8
Weight	49%	51%

Source: Guidehouse and Illinois Statewide Technical Reference Manual

[25] 2024 Illinois Statewide Technical Reference Manual for Energy Efficiency Version 12.0, Volume 4: Cross-Cutting Measures and Attachments, September 22, 2023, IL-TRM_Effective_010124_v12.0_Vol_4_X-Cutting_Measures_and_Attach_09222023_FINAL.pdf.

Appendix G. Respondent Demographics and Firmographics

Table G-1 shows respondents' demographics for all the residential participant surveys conducted in PY15.

Table G-1: PY15 Survey Demographics for Residential Programs

	Program	Appliance Recycling		Downstream Incentives (audit)	
	Sample Size (n)	79		82	
		Count	%	Count	%
Household	Members in Household (Average)	2.6		2.4	
Age	18 or younger	0	0%	0	3%
	19 to 24	0	0%	0	1%
	25 to 34	5	6%	9	9%
	35 to 44	5	6%	20	11%
	45 to 54	20	25%	11	14%
	55 to 64	15	19%	16	34%
	65 or over	29	37%	22	27%
	Don't Know	0	0%	0	0%
	Prefer not to answer	5	6%	4	1%
Home Size	Less than 1,000 SF	2	3%	2	15%
	1,000 SF to 1,500 SF	16	20%	22	22%
	1,500 SF to 2,000 SF	29	37%	22	6%
	2,000 SF to 2,500 SF	9	11%	11	3%
	2,500 SF to 3,000 SF	4	5%	6	4%
	3,000 SF or more	4	5%	9	1%
	Don't Know	12	15%	8	43%
	Prefer not to answer	3	4%	2	6%
Household Income	Under $15,000	0	0%	0	34%
	$15,000 to $17,999	1	1%	0	9%
	$18,000 to $23,999	1	1%	2	13%
	$24,000 to $29,999	3	4%	3	6%
	$30,000 to $36,999	4	5%	1	5%
	$37,000 to $42,999	4	5%	2	6%
	$43,000 to $49,999	2	3%	2	1%
	$50,000 to $74,999	8	10%	13	1%
	$75,000 to $99,999	4	5%	12	0%
	$100,000 or more	26	33%	30	0%
	Don't Know	0	0%	0	5%
	Prefer not to answer	26	33%	17	19%

Source: Guidehouse analysis

Table G-2 shows respondents' firmographics for the SBMS, LBMS, SBVCx and LBVCx participant surveys conducted in PY15.

Table G-2: PY15 Survey Firmographics for Nonresidential Programs

Program		SBMS and LBMS		SBVCx and LBVCx	
		Sample Size (n)	15		5
		Count	%	Count	%
Facility type	Office	3	20%	0	0%
	Retail	1	7%	1	20%
	Restaurant/bar	1	7%	0	0%
	Food store	0	0%	0	0%
	Warehouse/wholesale	2	13%	1	20%
	Hotel/motel	0	0%	0	0%
	Personal service	0	0%	0	0%
	Elementary/secondary schools	2	13%	1	20%
	College/trade schools	0	0%	0	0%
	Hospital	0	0%	0	0%
	Other health services	0	0%	0	0%
	Miscellaneous/other commercial	3	20%	0	0%
	Government service/public service	0	0%	0	0%
	Manufacturing	1	7%	0	0%
	Apartment complexes	0	0%	0	0%
	Other	0	0%	2	40%
	Don't know	1	7%	0	0%
	Prefer not to answer	1	7%	0	0%
Ownership	I am the owner or operator of the facility	2	13%	1	20%
	Our organization owns and occupies this facility	10	67%	3	60%
	Our organization owns this facility, but it is rented to someone else	0	0%	0	0%
	Our organization rents this facility	0	0%	1	20%
	Other	2	13%	0	0%
	Don't know	1	7%	0	0%
Facility Age	Less than 2 years	0	0%	0	0%
	2 to 4 years	0	0%	0	0%
	5 to 9 years	1	7%	0	0%
	10 to 19 years	1	7%	1	20%
	20 to 29 years	1	7%	0	0%
	30 years or more	11	73%	3	60%
	Don't know	1	7%	1	20%
Employees	1 to 4 employees	0	0%	2	40%
	5 to 9 employees	1	7%	0	0%
	10 to 19 employees	1	7%	1	20%

Program	SBMS and LBMS		SBVCx and LBVCx	
20 to 99 employees	4	27%	1	20%
100 to 499 employees	4	27%	1	20%
500 to 749 employees	1	7%	0	0%
750 to 999 employees	0	0%	0	0%
1,000 employees or more	0	0%	0	0%
Don't know	3	20%	0	0%
Prefer not to answer	1	7%	0	0%

Source: Guidehouse analysis

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