



# 2019 Interim Framework Refrigeration Efficiency Program Evaluation Report

Submitted to IESO  
November 25th, 2020

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## Acknowledgement

The evaluation team would like to thank Jessei Kanagarajan, Alice Herrera, and Gavin Zheng at the Independent Electricity System Operator (IESO) for their assistance in coordinating this evaluation effort. With their support and guidance, the evaluation team was able to complete their activities as efficiently and successfully as possible.

The evaluation team would also like to thank the program delivery vendor, assessors, and contractors that the evaluation team interviewed. Their insights have been invaluable to the evaluation team's efforts to improve the program.

Finally, but definitely not least, the evaluation team would like to thank the hundreds of participants who supported the evaluation team's impact and process outreach. Their cooperation with the evaluation team's efforts has produced high quality data that will serve the program for years to come.

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# 1 Executive Summary

The Independent Electricity System Operator (IESO) retained Nexant, Inc., and their sub-contractor, NMR Group, Inc., to conduct an evaluation of the Refrigeration Efficiency Program (REP) for the 2019 Interim Framework evaluation cycle. This Executive Summary provides a high-level overview of the impact and process evaluation results for the REP during the April 1, 2019 through December 31, 2019 evaluation period.

The Refrigeration Efficiency program provides facility assessments to identify potential electricity savings opportunities and installation of commercial refrigeration upgrades aimed at reducing electricity consumption. Participants in this program are non-residential electricity customers with a General Service Account who utilize commercial product refrigeration and have an average annual peak demand of less than 250 kilowatts (kW).

## 1.1 Evaluation Goals and Objectives

The goals and objectives of the 2019 REP evaluation are as follows:

- Verify energy and demand savings with a high degree of confidence and precision
- Assess free-ridership (FR) and participant spillover (SO) to determine an appropriate net-to-gross (NTG) ratio
- Review and compare key program elements as informed by program delivery vendor staff, auditors and contractors, and participants
- Provide recommendations on program improvements based on feedback obtained through the evaluations

## 1.2 Results

### 1.2.1 Impact Evaluation

The 2019 REP was administered by Peterborough Distribution Inc. and offered by two (2) additional Local Distribution Companies (LDCs): London Hydro Inc. and Orillia Power. There were 201 projects completed under the 2019 REP initiative. Majority of the projects (55%) were implemented in London Hydro service territory and accounted for 53% of the program net verified energy savings, followed by Peterborough Distribution (38% of net savings) and Orillia Power (9%).

The net verified impact results of the 2019 REP are presented in Table 1-1 and Table 1-2.

**Table 1-1: 2019 REP Impact Results: Energy**

Reported Energy Savings (MWh)	Energy Realization Rate	Gross Verified Energy Savings (MWh)	Gross Verified Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Energy Savings (MWh)	Net Verified Energy Savings in 2022 (MWh)
769	94%	725	7%	96%	694	512

**Table 1-2: 2019 REP Impact results: Summer Peak Demand**

Reported Peak Demand Savings (MW)	Demand Realization Rate	Gross Verified Demand Savings (MW)	Gross Verified Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Demand Savings (MW)	Net Verified Demand Savings in 2022 (MW)
0.04	210%	0.09	25%	140%	0.13	0.13

The 2019 REP savings were primarily produced by Electronically Commutated Fan Motors (ECM) and condenser coil cleaning. The two measures made up 52% and 26%, respectively, of the total program net energy savings. Condenser coil cleaning was the most adopted measure among the 2019 REP participants, as it was implemented in 179 out of the 201 completed projects (~89%), followed by the ECM fan motor measure which was installed in 164 projects (~82%).

### 1.2.2 Process Evaluation

To better understand the program design and delivery in PY2019, a process evaluation was carried out. Primary data was collected to support this evaluation through interviews with the IESO staff and program delivery staff, and surveys with applicant representatives, contractors, and participants. Key insights from the process evaluation are summarized in Section 1.3 and presented in detail in Section 5.

## 1.3 Key Findings and Recommendations

### Finding 1: Improve REP Measure Definitions and Reported Savings

**Recommendation 1:** Separate currently used broad measure types into measure sub-types to appropriately capture unique savings estimates. For example, expand ECM fan motor to provide additional details that are relevant to energy savings, such as 1/20 horsepower ECM evaporator freezer fan motor.

### Finding 2: Capture and Document Measure Baseline Data

**Recommendation 2:** Start collecting and reporting baseline information, specifically for ECM fan motors (for example, horsepower and baseline motor type), and adjust reported savings accordingly.

### Finding 3: Report Summer Peak Demand

**Recommendation 3:** Start reporting summer peak demand savings for all measures offered in the REP and attribute these savings to peak demand reductions.

### Finding 4: Program free-ridership was moderately high in PY2019 at 17.7%

**Recommendation 4:** Maintain focus on minimizing FR. Key areas of focus include (1) identifying and targeting customers who would not make upgrades without program support and (2) identifying applicants who have not already begun implementing measures.

**Finding 5: Satisfaction with the program and its processes is high overall, but there is room for improvement**

**Recommendation 5:** Provide additional training to auditors and contractors to ensure professionalism during assessments and contractor visits, coordinate with participants to identify suitable times for visits, and shorten the time it takes to complete the assessment and contractor visits.

## 2 Evaluation Goals and Objectives

The goals and objectives of the 2019 REP evaluation are as follows:

- Verify energy and demand savings with a 10% precision at 90% confidence while considering the following:
  - Measures installed through the program
  - Spillover savings and program-enabled savings
  - Savings from lighting interactive effects
- Assess free-ridership (FR) and participant spillover (SO) to determine an appropriate net-to-gross (NTG) ratio
- Review and compare key program elements as informed by program delivery vendor staff, auditors and contractors, and participants
- Provide recommendations on program improvements based on feedback obtained through the evaluations

A summary of the evaluation methodologies is presented in Section 3, with results of the impact and process evaluations presented and discussed in Sections 4 and 5, and findings and recommendations in Section 6.

# 3 Evaluation Methodology

The energy and demand savings were verified by conducting the following impact evaluation activities:

- Sampling projects
- Performing desk reviews on sampled sites
- Comparing the gross reported savings to verified savings established by desk reviews to determine the realization rate
- Estimating net-to-gross ratios and net savings using attribution surveys

## 3.1 Impact Evaluation Methodology

Independently verifying the energy and demand savings and attributing these savings to the program requires selecting a sample of projects that represent the program's population. Creation of a representative sample ensured that sample results can be applied to the program's population reported savings to verify gross and net impacts with minimal uncertainty. A random sampling of projects was completed by studying the population and developing a sampling plan based on the following factors:

- Participation levels provided in the 2019 program database extract
- Overall confidence/precision targets of 90/10 at the program level for each program year, assuming a coefficient of variation ( $C_v$ ) of 0.5

The total 2019 targeted sample size was 52 projects out of a full program population of 201 projects.

### 3.1.1 Project Audits

Subsequent to the sampling process, project audits were completed on a subset (52 projects) of the entire REP population (201 projects) as determined through the sampling plan. Sampled REP projects received Level 1 audits. Level 1 audits consist of desk reviews of project documentation available from the program delivery vendor and include project applications, equipment specification sheets, auditors' notes on equipment installed, invoices for equipment, and any other documentation submitted to the program. Evaluation of the REP program often includes Level 2 audits with on-site visits and extensive metering of motor performance to estimate hours of use. However, the 2019 evaluation cycle was disrupted by the COVID-19 pandemic with related facility closures and social distancing requirements resulting in the replacement of on-site visits by desk reviews.

### 3.1.2 Reported Savings

Gross reported savings are the energy and summer peak demand savings that are derived from information submitted on participant applications and reflect the equipment installed throughout the Program. This information was provided to the evaluation team through the program participation data extract provided by IESO.

### 3.1.3 Verified Savings

The data collected during the project audit activities was used to calculate energy and summer peak demand savings for each measure in an evaluated project. The sum of these verified energy and demand savings represent estimates of the project level savings due to the REP incentivized equipment.

The energy and demand realization rates were then calculated for the evaluation sample by comparing the sum of the verified savings for each evaluated project to the program reported savings for the same sampled projects. Equation 3-1 shows the formula for calculating the program realization rate.

#### Equation 3-1: Realization Rate

$$Realization\ Rate = \frac{\sum_i^n Savings_{verified}}{\sum_i^n Savings_{reported}}$$

Where:

$Savings_{verified}$  = Energy (kWh) or demand (kW) savings verified by the evaluation team for each project in the sample

$Savings_{reported}$  = Energy (kWh) or demand (kW) savings reported by the program team for each project in the sample

The realization rate is then applied to the reported savings from all of the program's projects to provide the gross verified savings attributable to the program. The total verified savings reflect the direct energy and demand impact of the program's operations. These savings do not account for customer or market behaviour impacts that may have been added to or subtracted from the program's direct results. These market effects are accounted for through the net impact analysis.

#### 3.1.3.1 Interactive Effects for Lighting Equipment

The REP incentivizes the installation of equipment that has higher efficiency levels compared to commonly installed equipment. Ideally, this high-efficiency equipment should consume less energy. However, the evaluation team understands that the equipment's energy consumption in an enclosed space cannot be viewed in isolation. Building systems interact with one another, and a change in one system can affect a separate system's energy consumption. This interaction should be considered when calculating the benefits provided by the program. Examining cross-system interactions provides a comprehensive view of building-level energy changes, rather than limiting the analysis solely to the energy change that directly relates to the modified equipment. The IESO Evaluation Measurement and Verification (EM&V) Protocols state that interactive energy changes should be quantified and accounted for whenever possible. Based on this guidance interactive effects were calculated for all energy-efficient lighting measures installed through the program to capture the refrigeration equipment's reduced operation due to lower heat loss.

### 3.1.4 Lifetime Savings

When performing the impact evaluation, it is important to consider the total amount of savings that occur over the lifetime of retrofitted equipment. This consideration is necessary given that energy savings, demand savings, avoided energy costs, avoided capacity costs, and other benefits continue to accrue each year the equipment is in service. A method of calculating lifetime energy savings of a measure is shown in Equation 3-2.

#### Equation 3-2: Lifetime Savings

$$\text{Lifetime Energy Savings} = EUL \times \text{Annual Energy Savings}$$

Where:

EUL = Estimated Useful Life of the retrofitted equipment

### 3.1.5 Net Verified Savings

To calculate the net verified savings, the portion of gross verified savings attributable to the program was calculated. The net verified savings were determined by multiplying the gross verified savings by the net-to-gross (NTG) ratio, as shown in Equation 3-3.

#### Equation 3-3: Net Verified Savings

$$\text{Savings}_{\text{net}} = \text{Savings}_{\text{verified}} \times \text{NTG}$$

Where:

Savings<sub>net</sub> = Net savings impact (kW or kWh)

Savings<sub>verified</sub> = Verified savings (kW or kWh)

NTG = Net-to-gross

To estimate the direct influence of the program in generating net verified energy savings, attribution surveys were implemented to calculate free-ridership (FR) and spillover (SO) rates. Both FR and SO are represented as percentages of the program's total reported savings and are estimated for each survey respondent. The results are then aggregated to develop total FR and SO estimates and are weighted by the percent of savings associated with each respondent's completed energy-efficiency project. Therefore, respondents with comparatively larger projects influence the total estimates more so than smaller projects, allowing for results that are reflective of the responding participants and their associated impact on the program.

FR refers to the program savings attributable to free-riders, which are program participants who would have implemented a program measure or practice in the program's absence. SO refers to additional reductions in energy consumption and demand due to program influences beyond those directly associated with program participation. SO represents installations of energy-efficient equipment that were influenced by the participant's experience with the program and that were completed without receiving any program incentives or other financial support.

The NTG ratio is defined by Equation 3-4, where FR is the participant free-ridership percentage, and SO is the participant spillover percentage.

### Equation 3-4: Net-to-gross Ratio

$$NTG = 100\% - FR + SO$$

FR and SO were calculated for a single incented project for each sampled participant. These results were then combined to develop overall FR, SO, and NTG values.

Additional details regarding the NTG evaluation methodology can be found in Appendix A.

## 3.2 Process Evaluation Methodology

### 3.2.1 Sampling, Interviews, and Surveys

The process evaluation focused on program design and delivery. Program processes were assessed through interviews and surveys with relevant program actors, including program delivery vendor staff, auditors and contractors, and participants. For each respondent type, a customized interview guide or survey instrument was developed to ensure responses produced comparable data and allow for meaningful conclusions to be drawn.

Table 3-1 shows the survey methodology, the total population invited to participate in the surveys or interviews, the total number of completed surveys, and the sampling error at the 90% confidence level for each respondent type. The following subsections provide context about each surveyed group.

Additional details regarding the process evaluation methodology can be found in Appendix B.

**Table 3-1: Process Evaluation Primary Data Sources**

Respondent Type	Methodology	Completed	Population	90% CI Error Margin
Program Delivery Vendor Staff	Phone In-depth Interviews (IDIs)	1	1	0%
Auditors and Contractors	Phone IDIs	2	2	0%
Participants	Web Survey	24	188	N/A*

**\*Error margin not displayed if the respondent count is below 30 unless census is achieved.**

#### 3.2.1.1 Program Delivery Vendor Staff Interviews

In-depth interviews (IDIs) were completed with one program delivery vendor staff member. The appropriate staff to interview were identified in consultation with the IESO EM&V staff. Interview topics addressed program roles and responsibilities, design and delivery, marketing and outreach, market actor engagement, program strengths and weaknesses, and suggestions for improvement.

### **3.2.1.2 Auditor and Contractor Interviews**

Two unique companies were e-mailed and called to request their participation in an IDI. Both companies responded to this request and completed the interviews. The sample list used to complete the auditor and contractor interviews was provided by the program delivery vendor staff. Interview topics addressed firmographics, program roles and responsibilities, audits and/or projects completed, training and education, how customers heard about the program, barriers to participation, satisfaction, program improvement suggestions, and impacts of the COVID-19 crisis.

### **3.2.1.3 Participant Survey**

A total of 188 unique companies were e-mailed to request their participation in a web-survey. A total of 24 participants completed the survey. The sample was developed from the program records provided by the IESO EM&V staff. Survey topics addressed firmographics, improvement suggestions about the initial site assessment, the follow-up visit, and the installation process overall, FR and SO, participation in other programs, and impacts of the COVID-19 crisis.

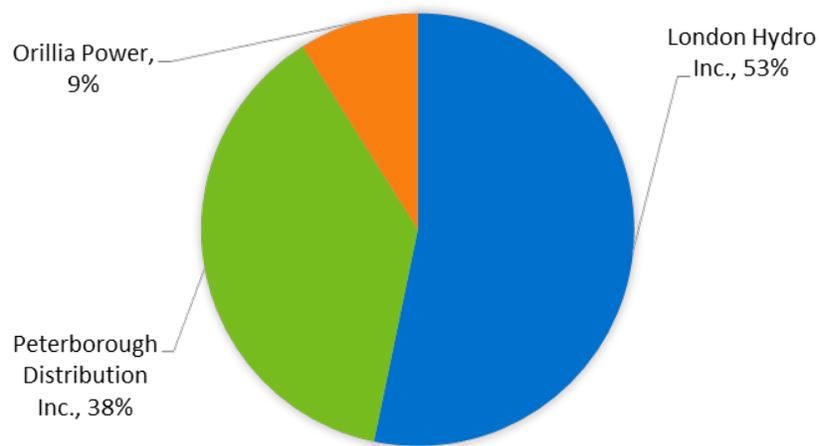
# 4 Impact Evaluation

## 4.1 Participation

The 2019 Refrigeration Efficiency Program (REP) was administered by Peterborough Distribution Inc. and offered by two (2) additional Local Distribution Companies (LDCs): London Hydro Inc. and Orillia Power. There were 201 projects completed under the 2019 REP initiative.

Majority of the projects (55%) were implemented in London Hydro service territory and accounted for 53% of the program’s net verified energy savings, followed by Peterborough Distribution and Orillia Power, respectively. Figure 4-1 shows the first year net verified energy savings contribution to the 2019 REP for each LDC territory.

**Figure 4-1: 2019 REP First Year Net Verified Energy Savings by LDC**



## 4.2 Impact Results

The first year net verified impact results of the 2019 REP are presented in Table 4-1 and Table 4-2.

**Table 4-1: Energy Impact Results**

Reported Energy Savings (MWh)	Energy Realization Rate	Gross Verified Energy Savings (MWh)	Gross Verified Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Energy Savings (MWh)	Net Verified Energy Savings in 2022 (MWh)
769	94%	725	7%	96%	694	512

**Table 4-2: Summer Peak Demand Impact**

Reported Peak Demand Savings (MW)	Demand Realization Rate	Gross Verified Demand Savings (MW)	Gross Verified Precision at 90% Confidence*	Net-to-Gross Ratio	Net Verified Demand Savings (MW)	Net Verified Demand Savings in 2022 (MW)
0.04	210%	0.09	25%	140%	0.13	0.13

\* The low precision is mainly due to all measures not reporting any demand savings, except ECM fan motors measure

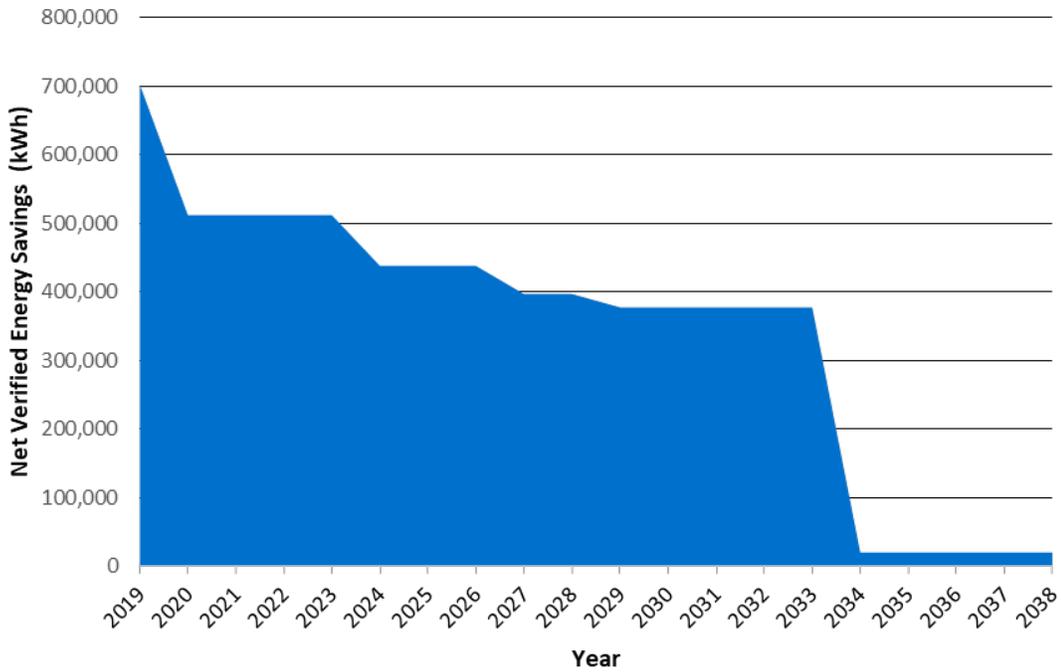
The 2019 REP is projected to achieve 6,839 MWh of lifetime net verified energy savings based on the installed measures and their respective effective useful lives (EUL). Table 4-1 and Table 4-2 also present the estimated net verified savings in 2022. The difference between the savings in 2019 and 2022 is due to the condenser coil cleaning measure reaching the end of its expected life before 2022. Annual savings of 512 MWh are projected to persist until 2022. The program savings achieved in a given year can decrease as measures with shorter EULs fall out of use and stop accruing savings to the REP. Each measure in the program was assigned an EUL based on the average rated life data provided in the program’s approved measures list. Table 4-3 presents the EULs for all 2019 REP measures.

**Table 4-3: REP Measures EUL**

Measure Type	EUL (years)
LED Case Lighting	20
ECM Fan Motor	15
LED A-19 Lamp	10
Door Auto Closers	8
Night Curtains	5
Strip Curtains	5
Condenser Coil Cleaning	1

Figure 4-2 illustrates the estimated net verified annual savings over a 20 – year horizon, which is the length of the longest measure life (LED case lighting) in the program. Fifty-four percent (54%) of the first year (2019) savings are expected to persist through year 15 (2033), mainly due to the strong influence of the ECM fan motor measure on the program’s overall savings.

**Figure 4-2: Net Verified Energy Savings by Year**

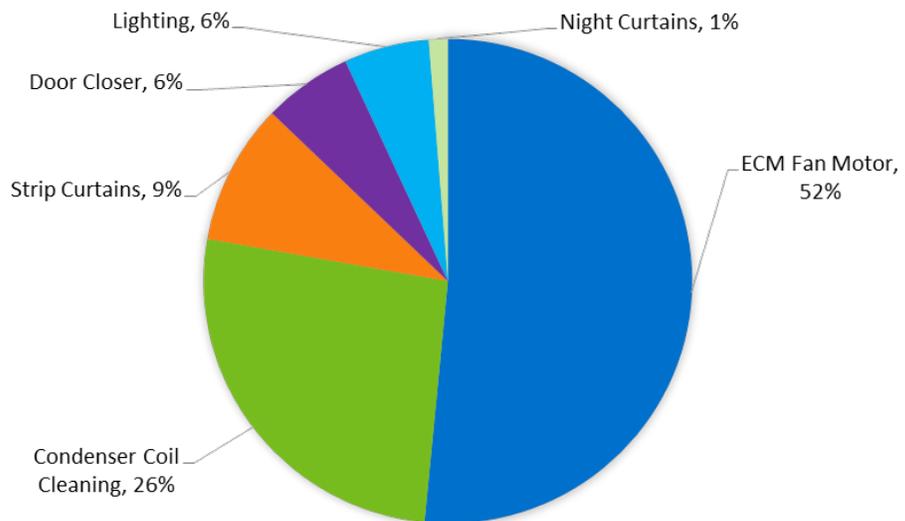


### 4.3 Impact Findings

#### 4.3.1 REP Measures

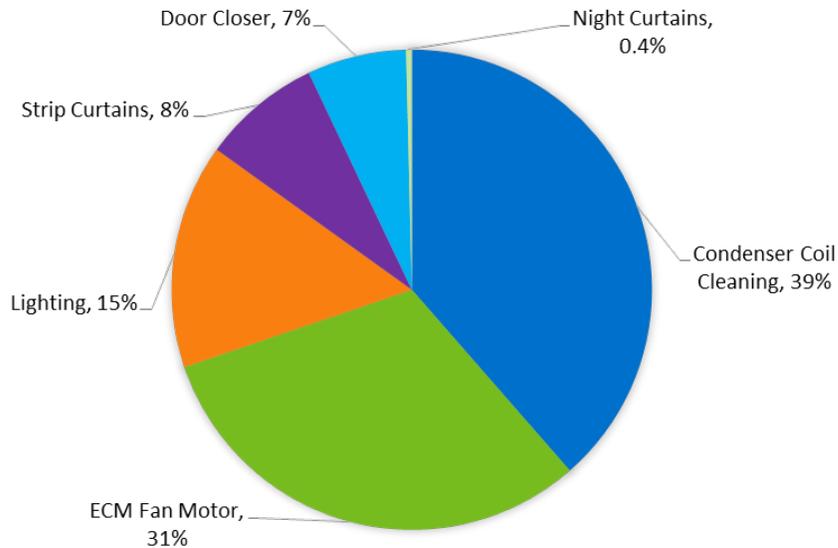
The 2019 REP savings were produced mainly by ECM fan motors and condenser coil cleaning, which made up 52% and 26% of the total program’s first year net energy savings, respectively. Figure 4-3 illustrates the first year net verified energy savings contribution of each measure category in the 2019 REP.

**Figure 4-3: First Year Net Verified Energy Savings by Measure Category**



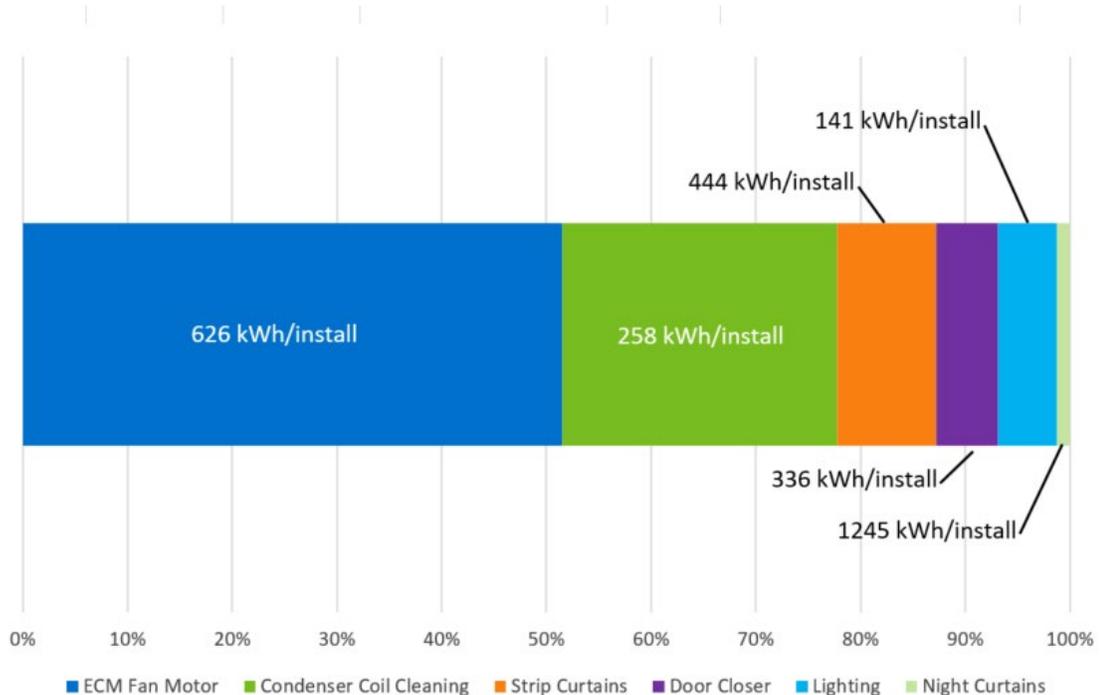
Similar to their energy savings contribution in the program, the same top two measures—ECM fan motors and condenser coil cleaning—account for 70% of the overall program’s implemented measure quantity. Figure 4-4 presents the relative quantity of each measure type to the overall program composition.

**Figure 4-4: Program Installed Measure Quantity (n = 1,830)**



A breakdown of the first year net verified energy savings produced per measure install for the 2019 REP is provided in Figure 4-5.

**Figure 4-5: First Year Net Verified Energy Savings Contribution by Measure**



Condenser coil cleaning was the most adopted measure among the 2019 REP participants, as it was implemented by 179 out of the 201 completed projects (~89%). This is likely due to the measure’s ease of implementation and simple requirements, where any existing reachable condenser would be eligible. The second most adopted measure was the ECM fan motor measure, where 164 projects (~82%) installed some form of an ECM fan motor. Table 4-4 below presents the percent of projects that implemented each measure in the 2019 REP.

**Table 4-4: Measure Adoption Rates**

REP Measure	Percent of the projects which implemented it
Condenser Coil Cleaning	89%
ECM Fan Motors	82%
Lighting	57%
Strip Curtains	54%
Door Closers	45%
Night Curtains*	1%

\* Only 2 projects installed night curtains

### 4.3.2 Realization Rates

Table 4-5 presents the average reported and gross verified first year energy savings per measure type. The 2019 REP energy realization rate is 94%. However, measure-level realization rates varied drastically, as they ranged from 19% to 367%.

Door closers and strip curtains had the highest realization rates, mainly due to higher gross verified energy savings per measure than reported savings. On the contrary, condenser coil cleaning had the lowest realization rate due to lower gross verified energy savings per measure and lower verified quantities.

The 2019 REP uses a deemed savings approach to report its savings. However, no measure-specific details are available for the evaluator to understand how those deemed savings estimates were derived.

**Table 4-5: Reported and Verified Savings by Measure<sup>1</sup>**

Measures	Reported kWh/Measure	Verified kWh /Measure	Realization Rate
Condenser Coil Cleaning	286 <sup>2</sup>	54	19%
ECM Fan Motors	694	503	72%
Lighting	156 <sup>3</sup>	119	76%
Strip Curtains	492 <sup>4</sup>	1,125	229%
Door Closers	372	1,368	367%

<sup>1</sup> No night curtain measures were captured in the evaluation sample

<sup>2</sup> Includes both freezer and cooler applications, with reported kWh savings of 243 and 289, respectively

<sup>3</sup> Includes both A-19 Lamps and LED display applications with reported kWh savings of 133 and 190, respectively

<sup>4</sup> Includes both freezer and cooler applications, with reported kWh savings of 548 and 480, respectively

The realization rates presented in Table 4-5 result from the total gross verified energy savings divided by the total reported energy savings for all sub-types within each measure category type in the sample. However, within each measure category, there are measure sub-types that more granularly define the measure – for example, motor horsepower or motor end-use. Generally, the 2019 REP reported savings within each measure category were almost identical, regardless of the equipment size or end-use. Table 4-6 presents the realization rate for each sampled measure sub-type within the general measure category.

**Table 4-6: Sampled Measures Realization Rates Comparison**

Measure Category	Measure	Quantity in Sample	Reported Savings/Unit (kWh)	Energy Realization Rate
ECM Fan Motor	1/15 HP ECM Fan Motor	41	693	127%
ECM Fan Motor	1/20 HP ECM Fan Motor	45	700	90%
ECM Fan Motor	16 watt ECM Fan Motor	8	692	57%
ECM Fan Motor	9 watt ECM Fan Motor	53	692	17%
Condenser Coil Cleaning	Condenser Coil Cleaning - Cooler	132	289	17%
Condenser Coil Cleaning	Condenser Coil Cleaning - Freezer	13	243	42%
Door Closers	Door Closers for Walk-in Cooler	27	268	419%
Door Closers	Door Closers for Walk-in Freezer	5	723	263%
Lighting	LED A-19 Lamp	27	133	50%
Lighting	LED Display Case	45	190	87%
Strip Curtains	Strip Curtains for Walk-in Cooler	32	480	172%
Strip Curtains	Strip Curtains for Walk-in Freezer	7	548	456%

As shown in Table 4-6, the reported savings for the ECM fan motor measure – which accounts for the majority of the programs net savings – and lighting measures are generally within the range of average verified savings estimates. For the remaining measures, the reported savings did not align with the range of verified savings. The evaluator cannot comment on the measure-level realization rates as documentation of how the reported savings were derived was requested but were unavailable. However, the following trends are observed:

- Equipment Size:** Within the same measure category, larger equipment (for example, motor horsepower) included in the measure produced higher realization rates. This trend can be explained if the used savings algorithms assume a single savings estimate or potentially do not fully account for consumption changes for different sized motors. Therefore, larger equipment that uses more energy would save more energy, which results in a higher realization rate. For example, within ECM fan motors, the energy realization ranged from 17% for 9-watt motors to 127% for 1/15HP motors.

- **Cooler vs. Freezer:** Measures installed in freezers generally result in higher savings than those installed inside coolers. This is expected, as freezers have a higher cooling load, which leads to more energy consumption. Condenser coil cleaning and strip curtains had higher realization rates for freezer installations than cooler installations. However, door closers had lower realization rates for freezer installation, mainly due to higher reported savings for the freezer's door closers.

#### 4.3.2.1 Energy

As previously explained, measure-specific savings details were unavailable to the evaluator to understand how the reported savings estimates were derived. Therefore, it is difficult to comment on the difference between the verified energy savings and the reported energy savings. However, below is a list of findings that contribute to the energy savings realization rates:

- Verified quantity of installed measures is lower than the reported quantity. This was predominantly observed for the condenser coil cleaning measure. In many instances, during phone interviews with participants, the evaluator verified fewer condensers at the site than the reported quantity. Specifically, 10 out of 45 sampled projects that had implemented condenser coil cleaning were found to have fewer condensers on-site than reported in the coil cleaning measure.
- Verified hours of operation for lighting measures are lower than deemed hours of operation. Reported energy savings for lighting measures in the 2019 REP assume 8,760 annual run hours for LED tubes installed in display cases and 4,380 annual run hours for LED A-19 lamps installed inside walk-in coolers and freezers. This influences the verified energy savings for LED A-19 lamps as they are often installed inside walk-in coolers and freezers, and their verified hours are limited to a few hours per day.
- Deemed savings for ECM fan motors do not consider the baseline motor type: Shaded Pole (SP) or Permanent Split Capacitor (PSC), and use a single deemed savings value. Nexant has verified the baseline motor type, where available, and calculated savings accordingly. This results in higher savings for projects where the baseline motor type was verified to be an SP motor, as they are less efficient than PSC motors.

#### 4.3.2.2 Summer Peak Demand

Apart from the ECM fan motor measure, all measures in the 2019 REP reported zero demand savings. This prevented the estimation of measure level summer peak demand realization rates for all non-motor measures. The estimated measure level demand realization rate for ECM fan motors is 83%. To account for demand savings derived from non-motor measures the evaluation calculated a program-level summer peak demand realization rate. This captured evaluated demand from all sample measures and compared it to the sample reported demand. The result was an inflated summer peak demand savings realization rate (210%) that is applied to the demand savings reported by the motor measures to account for all program demand savings.

Additionally, the summer peak demand savings reported for the ECM fan motor measure savings reflects a change in the connected load that is not adjusted for peak coincidence. The IESO requires reporting net verified savings based on the summer peak demand definition. Some of the variations in demand savings can be attributed to this difference between the reporting of connected demand savings and the evaluation verification of peak demand savings that considers the time of use and pre-defined summer demand periods.

## 4.4 Net-to-Gross (NTG)

The NTG evaluation results are presented in the following subsections and Appendix C presents additional detail.

### 4.4.1 Net-to-gross Results

Table 4-7 presents the results of the PY2019 REP NTG evaluation. Confidence and precision values of 90% confidence and 10% precision levels were targeted. However, due to low project volume and participation, 85% confidence and 15% precision levels were achieved when calculating the NTG for the program. The following subsections summarize the completed analyses for the interpretation of these values.

**Table 4-7: Net-to-gross Results**

Program Delivery Method	NTG Responses	Savings Weighted FR*	Energy SO*	Demand SO*	Energy Savings Weighted NTG*	Demand Savings Weighted NTG* %
LDC Local Program Delivery	24	17.7%	13.4%	57.3%	95.8%	139.6%

**\*Note: FR: Free-ridership, SO: Spillover; NTG: Net-to-gross**

### 4.4.2 Key Findings

Key findings from the NTG analysis include the following:

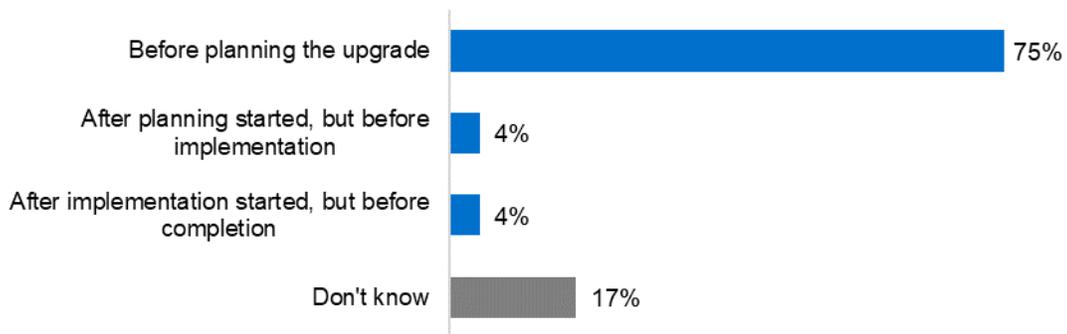
- Participant feedback indicates moderately high levels of FR at 17.7%.
  - The program helped more than one-half (59%) of participants with upgrades they otherwise would not have been able to implement (21%) or would have had to postpone (38%).
  - A total of 8% of participants indicated that they would have done the “exact same project” in the absence of the program and one-third (33%) were unsure about what they would have done. This suggests that there is still some room for FR improvements in future program years.
  - The availability of the program upgrades at no-cost had the greatest influence on the respondents’ decision to participate in the program (79%).
- Participation in the program resulted in a relatively high SO at 13.4%, which helped offset the FR. Close to one-fifth (17%) of respondents installed equipment with attributable SO savings.

### 4.4.3 Free-ridership (FR)

The extent of FR within the program was assessed by surveying the REP participants to understand their experiences and plans before learning about the program, what they would have done in the absence of the program, and how influential the program was on their decision to implement the energy-efficient upgrades.

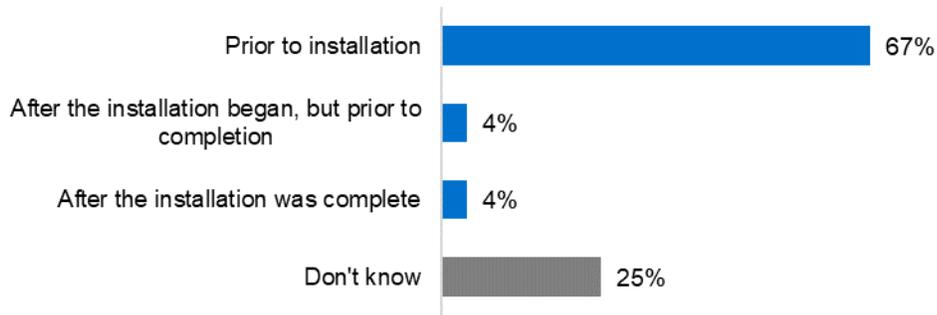
Three-fourths of respondents (75%) indicated that they first learned they could get no-cost energy-efficiency upgrades through the program before planning the equipment upgrade. In comparison, only 8% indicated learning about it after either the planning or implementation had started but before completion (Figure 4-6). This may suggest that the program was influential in many of these respondents' decisions to begin the project. While responses to this question do not directly impact the FR score, they provide additional context for understanding the participants' decision-making processes.

**Figure 4-6: When Participant First Learned About the Program (n=24)**



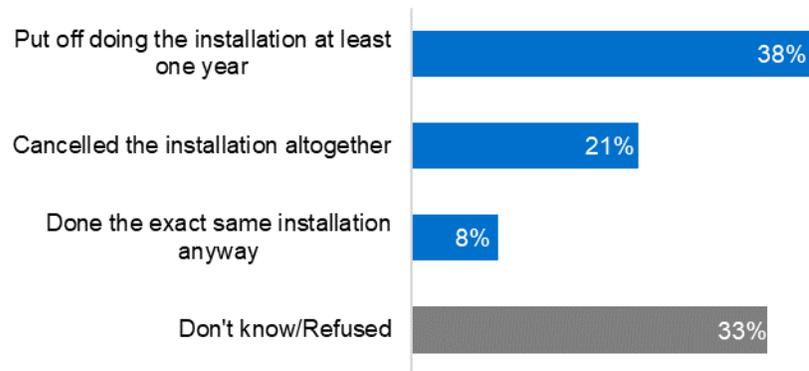
Participants were then asked about the timing of their application to the program in relation to the start of their energy-efficient upgrade project (Figure 4-7). Over two-thirds of respondents (67%) indicated they applied prior to installing the energy-efficient equipment through the program, suggesting that most apply to the program as intended. Those who reported applying after installation began (4%) or after the installation was complete (4%) said that they moved forward with the energy-efficiency project before applying because of the time needed to submit it through the program (1 respondent) or they reported they did not know the reason (1 respondent). The responses suggest that at least one respondent would have applied earlier if it had been possible. Like the previous question, this question is not used to calculate the FR score but provides additional context regarding participant intentions.

**Figure 4-7: Timing of Program Application (n=24)**



Participants were then asked what they would have done in the absence of the program's free audit and equipment installation process (Figure 4-8). Overall, their responses suggest moderate FR as over one-half (59%) would have either delayed the upgrade by at least one year or cancelled the equipment upgrade altogether. However, close to two-fifths (41%) would have either done the "exact same installation" anyway (8%) or were unsure of what they would have done (33%), which is indicative of partial or full FR for these respondents. Responses from this participant intent question were factored into the FR analysis.

**Figure 4-8: Actions in Absence of Program (n=24)**

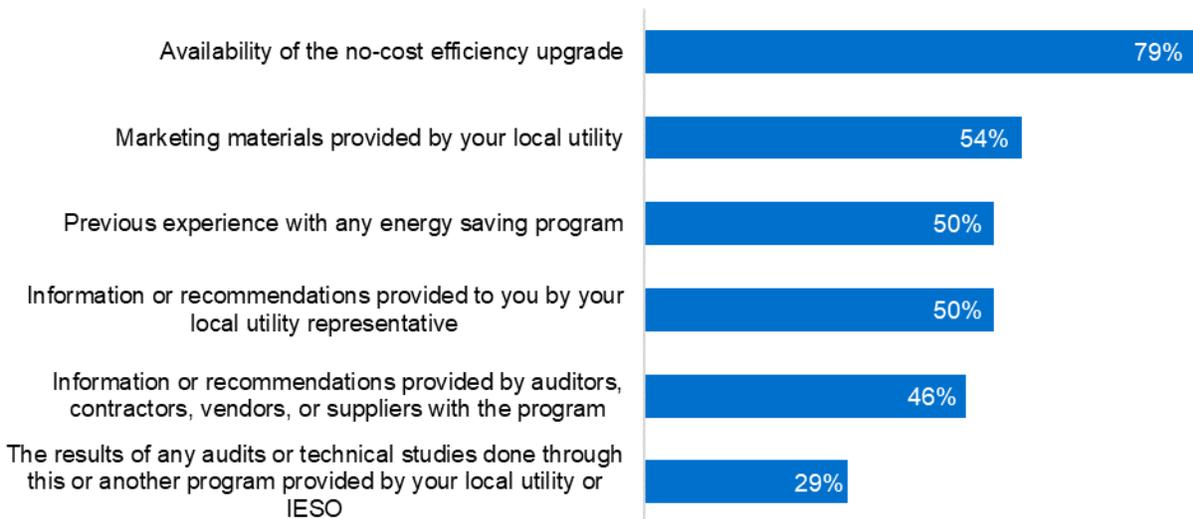


The two respondents who said they would have done the "exact same upgrade" in the program's absence were asked to confirm they would have had the funds to cover the project's entire cost without the program funding. Both said they might have had the funds to cover it independently, suggesting a degree of FR among these two respondents. However, the one-third (33%) of respondents who were unsure of what they would have done (as seen in Figure 4-8) had a greater impact on driving the FR because there was a higher percentage of participants who responded in this manner. This participant intent question was factored into the FR analysis.

Respondents were then asked how influential various program features were on their decision to install energy-efficient equipment (Figure 4-9). Participants rated each feature's influence on a scale from one (1) to five (5), where one means it had "no influence at all" and five means it was "extremely influential." Respondents rated the upgrades' availability at no-cost as the most influential feature (79% with a 4 or 5 rating). Respondents rated the marketing materials provided by the participant's local utility as the next most influential program feature (54% with a rating of 4 or 5).

Respondents said the least influential program features were the information or recommendations provided by the program’s representatives (auditors, contractors, vendors, or suppliers) and the results of audits/ technical studies done through the REP or other programs (42% and 29% rating a 4 or 5, respectively). This suggests a need to assess how effectively the program is reaching customers with expert recommendations and technical information. This question, which focuses on the program’s influence, along with the prior questions about customer intentions, was used to estimate the FR score.

**Figure 4-9: Influence of Program Features on Participation (n=24)**  
 (Rating of 4 or 5 on a scale from 1 to 5)



When respondents were asked an open-ended question about whether there were any other factors that played “a great role” in influencing their organization to install the energy-efficient equipment, thirteen provided answers, indicating the following:

- The prospect of saving energy/money on energy bills (6 respondents)
- The professionalism of the technician or service provider (3 respondents)
- The program recommended by a friend or a business peer (2 respondents)
- A desire to benefit the environment (2 respondents)

In summary, FR results among REP participants indicate moderate levels of FR at 17.7%. The program helped more than one-half of participants (59%) with upgrades they otherwise would not have been able to implement or would have had to postpone. However, 8% indicated that they would have done the “exact same project” in the absence of the program and one-third (33%) were unsure about what they would have done, suggesting that there is still some room for FR improvements in future program years.

#### 4.4.4 Spillover (SO)

To estimate the SO rate, participants were asked if they installed any energy-efficient equipment for which they did not receive an incentive following their participation in the REP. Nearly one-fifth (17%) reported installing new equipment.

Table 4-8 displays the types of non-incentivized equipment installed by companies after their REP project was completed. Some survey respondents installed multiple types of equipment. A total of six equipment installations occurred using five different equipment types.

Respondents were then asked what level of influence their participation in the REP had on their decision to install this additional energy-efficient equipment. Participants rated the program’s influence on a scale from one (1) to five (5), where one means the program had “no influence at all” and five means the program was “extremely influential.” As indicated in Table 4-8, all three respondents indicated that the program had some influence (a rating of 3 or higher) on their decision.

**Table 4-8: Program Influence on Efficient Equipment Installed Outside the Program**  
(Multiple response allowed; n=3)

Type of Upgrade Installed	Count of Respondents	Influence Score(s)
Fan	2	3, 5
ENERGY STAR Freezer	1	3
HVAC – air conditioner replacement, above code minimum	1	3
Lighting	1	5
Motor pump upgrade	1	5

Participants who indicated they installed the program-influenced non-incentivized equipment were then asked a series of follow-up questions (for example, capacity, efficiency, annual hours of operation). These detailed questions are displayed in Appendix C. These questions were used within the NTG algorithm to attribute SO savings to each equipment installation. SO savings were largely driven by the installation of 52 new un-incentivized lighting fixtures that a respondent reported installing after participating in the program. This respondent said their experience with the program played a great role in their decision to install these additional upgrades.

# 5 Process Evaluation

## 5.1 Program Delivery Vendor Staff Perspectives

The following subsections highlight the feedback received from the program delivery vendor staff.

### 5.1.1 Key Findings

Key findings from the program delivery vendor staff IDIs include the following:

- According to the program delivery vendor staff, program delivery and coordination among the various vendors involved with the program is working well. Additional staff resources were strategically brought on as needed to help drive participation in the program.
- The staff indicated direct customer outreach was the primary method for engaging customers in PY2019.
- The primary program barriers identified by the staff included:
  - A late start to the program in PY2019 due to the framework transition and contracting,
  - Fewer LDCs participating than expected,
  - Challenges in receiving customer lists,
  - Lack of available installation resources in some regions, and
  - Low interest from some larger contractors.
- Future opportunities exist to increase program engagement, potentially through utilizing a comprehensive array of marketing tactics, capitalizing on cross-program promotion opportunities, or identifying whether collaboration opportunities exist with companies that own leased equipment.

### 5.1.2 Design and Delivery

The program delivery vendor staff discussed the program's delivery, which they indicated has been successful, as it is designed to provide turn-key services and incentives for a market with a limited financial capacity to install energy-efficiency measures. They noted that coordination across the various vendors involved with the program has been working well. The staff also reported that the various vendors were clear on their roles and responsibilities.

### 5.1.3 Outreach and Marketing

In PY2019, program marketing and engagement primarily focused on direct customer calls. Initially, outbound calling to customers and pre-qualifications were coordinated and performed by the program delivery vendor staff and LDC staff. However, an alternate firm was brought on to assist with this later in the year. Other LDC staff had also performed limited outreach to customers and business associations.

According to the program delivery vendor staff, LDC support, including branding, is critical to the program's success. The program delivery vendor staff found endorsement letters from the LDCs helpful, which they bring onsite and post on their websites. The staff reported that customers often hear about the REP when they participate in the SBL program. Given the overlap in the customer type, there is a significant opportunity for cross-program promotion.

#### **5.1.4 Barriers and Opportunities**

Primary barriers to the program's success in PY2019, as identified by the staff, included the late start in mid-2019 and a short ramp-up period due to the transition to the Interim Framework and the contract award process. Additionally, one LDC did not participate in the program, and some LDCs did not provide complete and/or timely customer lists. The program delivery vendor staff strategically brought on additional resources throughout PY2019 to help with lead generation, customer qualifications, and project completion to meet their targets.

The program delivery vendor staff also indicated that it was challenging to operate in certain geographical regions that lacked service businesses. Additionally, some larger contractors were not interested in delivering the program and preferred to focus on service contracts that generated more work and revenue.

Leased equipment, such as beverage coolers, which beverage companies typically own, is not eligible for program participation. Only equipment that is owned by the participant is eligible under the current program design. This creates a gap in coverage for some customers, mainly because these beverage companies likely will not perform maintenance and upgrades. The program delivery vendor staff suggested that it may be worthwhile to explore whether there is potential for collaboration with these companies. The program could potentially perform maintenance or an assessment of the equipment.

## **5.2 Auditor and Contractor Perspectives**

The following subsections highlight the feedback received from the IDIs with the auditors and contractors.

### **5.2.1 Key Findings**

Two IDIs were conducted with auditors and contractors. The key findings from these IDIs include the following:

- Both interviewees reported either receiving training or clarifications to inquiries about the program rules, application process, and other aspects of the program.
- Both interviewees said they do not influence the customer's decision-making as they are provided with lists of eligible measures before site visits. This implies the program delivery vendor has the most influence on the customer's decision regarding the measures to install through the program since they provide the audit and contractors with the eligible measure list.
- The installation contractor expressed concerns that some audits incorrectly specified the number or types of equipment to be installed. Follow-up visits do not occur to install additional measures.

- To reach customers whose primary language is not English, one interviewee suggested developing information sheets in several languages and working with trusted community representatives to share information with them about the program.
- Satisfaction with the program and its elements was high across both interviewees.

### **5.2.2 Firmographics**

One interviewee participated in the program as both an auditor and a contractor in PY2019. The other interviewee participated as a contractor for businesses in the program.

One interviewee reported having six full-time employees and one part-time employee, and two to four of the employees were involved with the REP in the past year. The other interviewee reported having 40 full-time employees and five part-time employees. Including the interviewee, five staff members were involved with the program in PY2019. Both firms have been in business for over 45 years.

One firm reported conducting at least 100 audits and installs through REP in PY2019. Program activity represented less than 5% of their total sales. The other firm completed approximately 60 installation projects through the program in PY2019, representing 1% of their total sales for the year.

### **5.2.3 Outreach and Marketing**

One interviewee first became involved with the REP when the program's delivery vendor reached out to them. The other interviewee reported learning about the program from the IESO. Both interviewees experienced working with the Business Refrigeration Incentive (BRI) program under the Conservation First Framework.

One interviewee recalled receiving training from the LDC and the program delivery vendor on offerings associated with the program, program rules, application process and training from the program delivery vendor on the use of their software system. The interviewee indicated that staff does not require training on installation procedures and practices due to their professional certifications and experience in the field. The other interviewee specified that they did not require additional training in PY2019 but indicated they received clarifications to inquiries about the program during the year.

The interviewee, whose firm conducts both audits and installations through the program, indicated that customers primarily learned about the program through leads generated by the program delivery vendor.

One interviewee rated their advice and recommendations on the installed equipment as a five (5) on a scale from one (1) to five (5), where one means "no influence at all" and five means "extremely influential." This interviewee reported that the audit staff arrived at the assessment with a list of what they are eligible for and guided them through the process. The other interviewee was unsure how customers learned about the program because they were referred to the customer after an assessment was completed. As such, this interviewee indicated that his advice and recommendations had "no influence at all" on the installed equipment.

#### **5.2.4 Barriers**

The interviewees reported that it was rare for a customer not to agree to install some or all of the upgrades/ technologies recommended during the audit. One interviewee speculated that a refusal might occur if the equipment is leased. While the other interviewee did not have any issues with customers turning down any recommended equipment, they indicated that there might be situations where the recommended equipment might not be suitable for the site depending on the business type of the facility. The installation contractor expressed concerns that some audits incorrectly specified the quantity or types of equipment to be installed. The contractor would install the readily available equipment in these cases but would not adjust the recommendation list or return later with the correctly specified equipment.

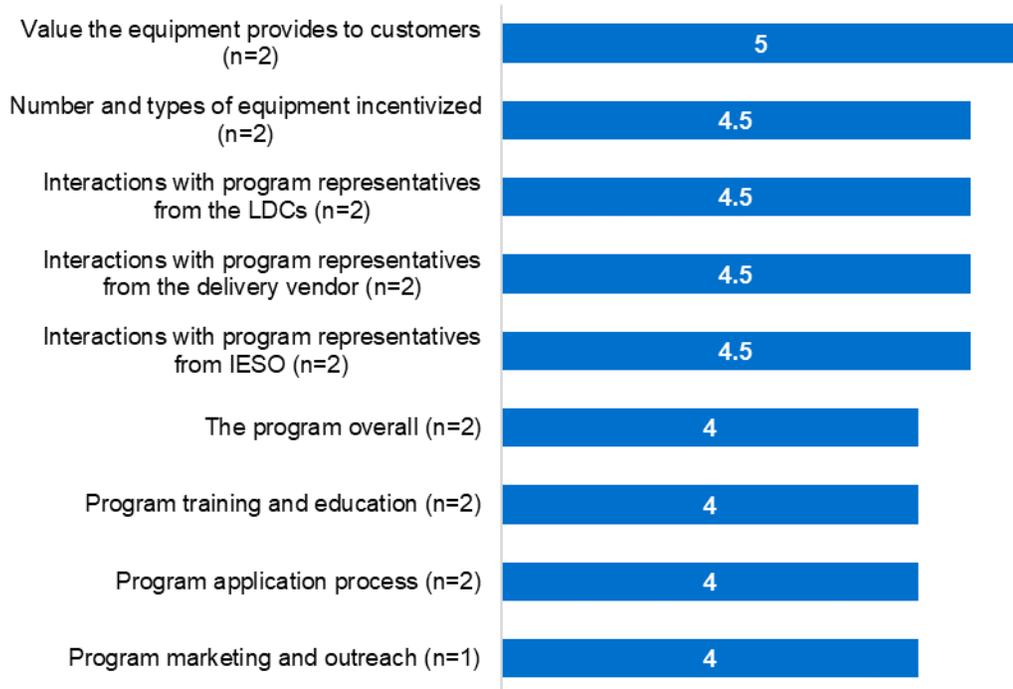
One interviewee discussed having difficulty convincing customers of the legitimacy of the program. Although this interviewee did not conduct any audits in PY2019, they relayed anecdotes from customers who were skeptical of receiving something for free. In particular, this interviewee suggested that the program was not successfully engaging first-generation immigrants. The interviewee suggested that the program prepares information sheets in several languages for the assessment. These customers should be contacted with a follow-up call in their preferred language. The interviewee suggested that it would be most effective if a trusted community representative could share information about the program.

#### **5.2.5 Satisfaction**

The two interviewees were asked to rate how satisfied they were with various aspects of the REP on a scale from one (1) to five (5), where one means “not at all satisfied” and five means “completely satisfied” (Figure 5-1). Both interviewees were completely satisfied with the value that the equipment provided to customers (rating of 5). On average, interviewees rated their satisfaction as a 4.5 with interactions with program representatives from the LDCs, the program delivery vendor, or the IESO program representatives. Interviewees rated their satisfaction with the program overall as a 4.

On average, interviewees rated the number and types of equipment incentivized through the program as a 4.5. One interviewee expressed a desire to see some controls incentivized through the program but said they are aware they might not be the best fit.

**Figure 5-1: Satisfaction with REP (n=2)**  
 (Average rating on a scale from 1 to 5)



### 5.3 Participant Perspectives

The following subsections highlight the feedback received from the participant survey.

#### 5.3.1 Key Findings

Key findings from participants' responses include the following:

- A majority of survey respondents had no suggestions for improving the initial site assessment (75%), the contractor visit(s) (79%), or the overall installation process (88%). This suggests a high level of satisfaction with the program.
- Of those with suggestions for improving the site assessment (13%), contractor visit(s) (16%), or the overall installation process (2 respondents), the most common were to:
  - Improve the professionalism of the assessor or contractor during the visits,
  - Contact the customer before the visit,
  - Increase flexibility in scheduling,
  - Shorten the length of the contractor's visit, and
  - Provide more information to help business owners make decisions.
- Nearly all respondents (96%) reported that program activity, including the site assessment and installation, did not cause any disruption to their business.

- Nearly two-thirds (63%) of respondents did not apply to any other programs besides the REP initiative. However, one-fourth (25%) had applied to the SBL program, which targets similar customers.
- COVID-19 had a significant impact on most respondents; seven saw sales decrease and four reported that their operations ceased. However, two participants who work in the frozen food industry reported an increase in business due to the crisis.

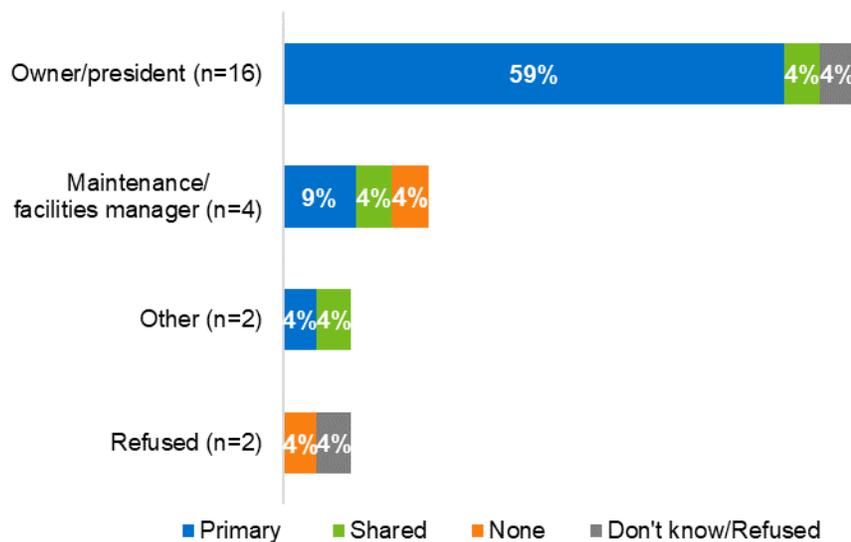
### 5.3.2 Firmographics

Participants were asked various questions to collect information on their job title ownership status, and their responsibilities in relation to the program. Details on participants' companies (for example, primary activities, chain or franchise status, facility floor space, and whether the facility had participated in other business programs) were also gathered during the survey.

Two-thirds (67%) of respondents indicated that they were the owner or president of their company, with 17% indicating that they were the maintenance or facilities manager, and 8% holding an alternate title or preferred not to answer. Respondents with other titles included "chef" and "treasurer."

Overall, nearly three-fourths (71%) of respondents reported that they had primary responsibility for the budget or expenditure decisions regarding the energy-efficient upgrades or retrofits completed through the program. Figure 5-2 shows responsibility for this decision by the job title of the respondent.

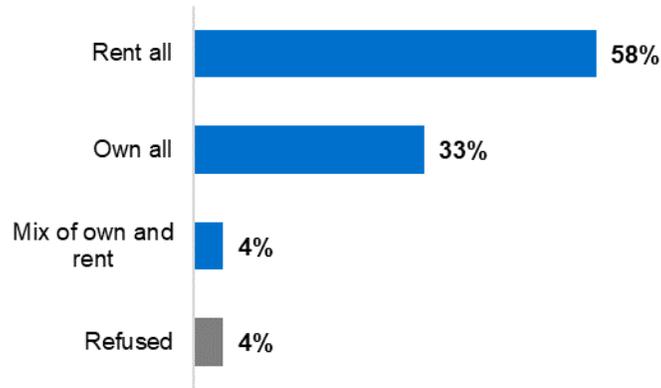
**Figure 5-2: Responsibility for Budget and Expenditures by Respondent Title (n=24)**



Most respondents reported renting the facility(ies) that received the energy-efficient upgrades through the program (58%), while one-third of respondents (33%) owned the facility(ies) (Figure 5-3).

**Figure 5-3: Ownership Status (n=24)\***

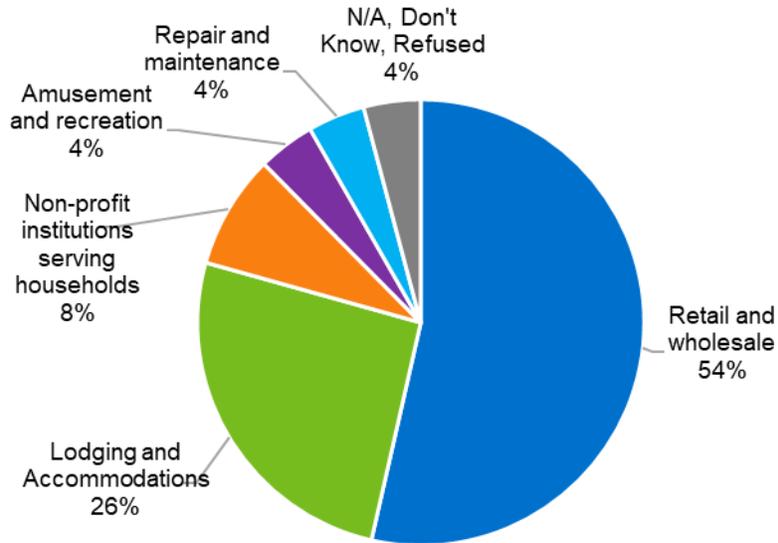
\*Does not sum to 100% due to rounding.



One-fourth of respondents (25%) indicated that the facility(ies) that received the energy-efficient upgrades was (were) a chain or franchise. The remainder said their business was not a chain or franchise (71%) or preferred not to answer (4%).

More than one-half (54%) of the respondents indicated that the primary business activity at the facility(ies) was (were) retail and wholesale (for example, food and beverage stores, general merchandise stores), followed by lodging and accommodations (26%). Other business activities at the surveyed facility(ies) included non-profit institutions (8%), amusement and recreation (4%), and repair and maintenance businesses (4%) (Figure 5-4).

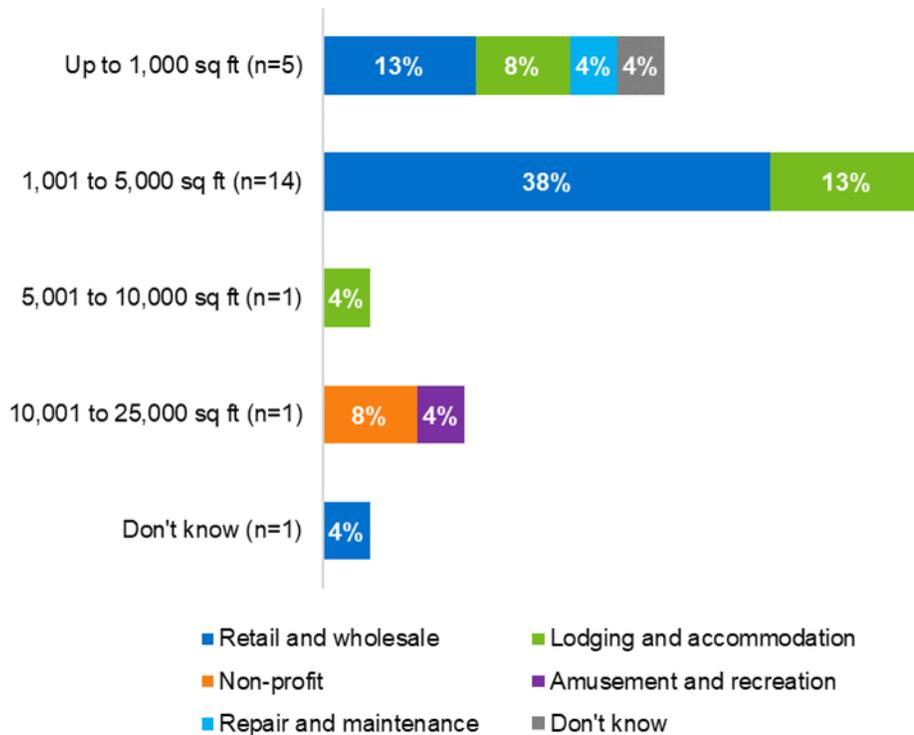
**Figure 5-4: Primary Activity at Facility(ies)**  
(Multiple response allowed; n=24)\*



**\*Does not sum to 100% due to multiple response.**

Most respondents reported having a facility size between 1,001 and 5,000 square feet (58%), while 21% of respondents reported a facility size of 1,000 square feet or less. Retail and wholesale businesses were reported to be 5,000 square feet or less. In comparison, the largest facilities (10,001 to 25,000 square feet) were used by respondents engaged in non-profit activities (8%) and amusement and recreation (4%) activities (Figure 5-5).

**Figure 5-5: Square Footage by Activity Type (n=24)**



Nearly two-thirds of respondents (63%) did not apply to any other programs besides the REP (Table 5-1). However, one-fourth (25%) had applied to the SBL program, which targets similar customers. A small number reported applying to the Retrofit program (4%) and the Process and Systems Upgrade program (4%).

**Table 5-1: Additional Energy-efficiency Programs Applications (Multiple response allowed; n=24)\***

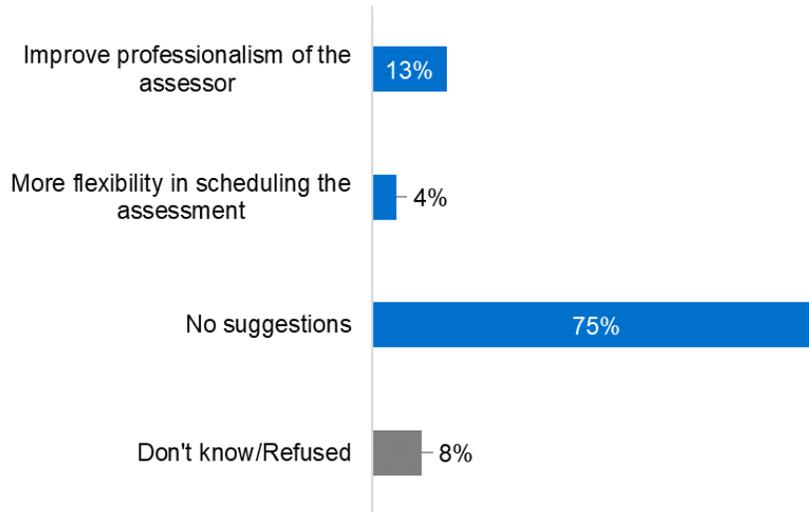
Program Name	Respondents
Small Business Lighting (SBL) Program	25%
Retrofit Program	4%
Process and Systems Upgrade (PSU) Program	4%
Don't know	8%
No other programs	63%

\*Does not sum to 100% due to multiple response

### 5.3.3 Improvement Suggestions

Three-fourths of respondents (75%) had no suggestions for improving the initial site assessment visit, indicating that a large majority were satisfied with the work done by their auditor (Figure 5-6). Of those that did suggest improvements, the most common suggestion was to improve the assessor's professionalism (13%).

**Figure 5-6: Suggestions for Improving the Initial Site Assessment Visit**  
(Multiple response allowed; n=24)



More than three-fourths of respondents (79%) had no suggestions for improving contractor visits, indicating that a large majority were satisfied with the work done by their contractor (Figure 5-7). Respondents who provided suggestions mentioned contacting the customer before the visit, improving the contractor’s professionalism, shortening the length of the contractor’s visit time, and increasing flexibility in scheduling (4% each).

**Figure 5-7: Suggestions for Improving Program Contractor Visits**  
(Multiple responses allowed; n=24)



Most respondents (88%) had no suggestions for improving the overall installation process, indicating a high level of satisfaction with the program. Two respondents provided multiple suggestions, including:

- Requiring that the program provide more information to help business owners make decisions (2 respondents);

- Providing additional clarification through program documents, letters, and/or emails (1 respondent); and
- Offering upgrade opportunities for all equipment regardless of size (one respondent).

Nearly all respondents (96%) reported that program activity, including the site assessment and installation, did not cause any disruption to their business.

### 5.3.4 Business Response to the COVID-19 Crisis

Respondents were asked an open-ended question about how the COVID-19 crisis had impacted their company and its operations. Of the thirteen respondents who answered this question, eight respondents reported no closures, one respondent reported a temporary closure, and four respondents reported that their businesses closed for an extended period. Table 5-2 shows responses by primary business activity. Of the respondents that did not report any closure, four reported having shorter hours, and two reported switching to take-out and delivery only.

**Table 5-2: Impacts to Business Operations of COVID-19**  
(Open end and multiple response allowed; n=13)

Primary Business Activity	No closure	Temporary Closure	Extended Closure
Retail and Wholesale (n=7)	6	--	1
Lodging and Accommodation (n=3)	2	1	--
Non-profit (n=2)	--	--	2
Amusement and Recreation (n=1)	--	--	1
<b>Total</b>	<b>8</b>	<b>1</b>	<b>4</b>

Table 5-3 illustrates the effect of the crisis on sales by primary business activity. Two respondents, both frozen food retailers, reported seeing an increase in business and demand for their products due to restaurants' closure. The other respondents either saw sales decline or had their business operations cease entirely. One respondent said, "We have been impacted greatly and do not seem to fall under any assistance programs. Our landlord refuses to apply for rent assistance [because] it will cost him too much time and money."

**Table 5-3: Impact to Sales of COVID-19**  
(Open end and multiple response allowed; n=13)

Primary Business Activity	Sales Increased	Sales Decreased	Operations Ceased
Retail and Wholesale (n=7)	2	4	1
Lodging and Accommodation (n=3)	--	3	--
Non-profit (n=2)	--	--	2
Amusement and Recreation (n=1)	--	--	1
<b>Total</b>	<b>2</b>	<b>7</b>	<b>4</b>

Three respondents indicated that their company had to lay off staff members. One respondent indicated that one-fourth of the staff had voluntarily chosen to stay home to protect their health. Respondents also mentioned suffering disruptions to their supply chains, difficulty stocking certain items, uncooperative landlords, and severe economic losses. One respondent in the amusement and recreation industry, who shuttered their business during the crisis, mentioned powering everything down – turning off lights and unplugging the refrigerators.

## 6 Key Findings and Recommendations

### **Finding 1: Improve REP Measure Definitions and Reported Savings**

Measure descriptions, such as ECM fan motor horsepower, were captured in the program's tracking database. However, the measures' end-use was not identified. The savings were not reflective of the differences within the broader measure type.

In particular, the ECM fan motor measure had a strong influence on the program (52% of verified energy savings), yet only used a narrow range of deemed values for reported savings (692kWh – 700kWh). Verified savings varied substantially per ECM fan motor measure depending on the motor's end-use (evaporator or condenser, cooler or freezer) and size.

**Recommendation 1:** Separate currently used broad measure types into measure sub-types to appropriately capture unique savings estimates. For example, separate ECM fan motor into 1/20 horsepower ECM evaporator freezer fan motor. Using a more granular measure description will allow for improved precision in savings estimates.

It is recommended to prioritize disaggregating the single ECM fan motor measure to distinguish sub-measure type key characteristics, as these variations have a significant influence on the measure's savings. The most influential characteristics of the measure on the savings are the motor's end-use (evaporator vs. condenser) and the motor's size (Watts or horsepower).

### **Finding 2: Capture and Document Measure Baseline Data**

Measures' baseline conditions impact measure savings significantly, specifically for ECM fan motor and lighting measure types. However, baseline information was not captured in the REP's tracking database and project files. Measures were listed in the program tracking database with no reference to a baseline type or description.

**Recommendation 2:** Start collecting and reporting baseline information, specifically for ECM fan motors (for example, horsepower, SP vs PSC), and adjust reported savings accordingly. Standardizing a menu of measures for program delivery vendors to select from when entering project data (such as Microsoft Excel's data validation feature) will help standardize measure names and ensure baseline information is included in the program tracking data.

### **Finding 3: Improved Baseline and Retrofit Photos**

The REP program delivery vendors submitted photos of the pre-existing baseline and retrofitted equipment. These photos are important and helpful when verifying the baseline and retrofit measure types and wattages. In many cases, the photos were close up images of the equipment and contained the make, model, and wattage information. In other instances, these photos did not capture enough detail of the equipment to determine the baseline or retrofit information.

**Recommendation 3:** Specify what information should be captured in the pre-retrofit and post-retrofit pictures taken by the REP assessors/installers. Specify that pictures of the replaced equipment should capture all available information, such as model and size. This is specifically critical for direct install programs. The participants of such programs often do not

possess sufficient information regarding the baseline and retrofit equipment. The photos collected by the delivery agent help provide the data required for evaluation.

#### **Finding 4: Report Summer Peak Demand**

With the exception of the ECM fan motor measure, all measures in the 2019 REP reported zero demand savings. This resulted in an inflated summer peak demand savings realization rate (210%) on the motor measure to account for all program demand saving.

Additionally, the demand savings reported for the ECM fan motor measure savings reflects a change in the connected load that is not adjusted for peak coincidence. The IESO requires reporting net verified savings based on the summer peak demand definition. Some of the variations in demand savings can be attributed to the difference between the reporting of connected demand savings and the evaluation verification of peak demand savings that considers the time of use and pre-defined demand periods.

**Recommendation 4:** Start reporting summer peak demand savings for all measures offered in the REP. The IESO has 8760 load shapes readily available that can be used to establish appropriate coincidence factors that can be utilized to report peak demand savings.

#### **Finding 5: REP Reporting and Tracking – Facility Type Data**

The 2019 REP database tracks the facility type where each project was implemented. However, the data provided have listed the majority (195 out of 201) of the projects as retail and did not break them into their respective facility type (for example, restaurant, convenience store).

**Recommendation 5:** Start collecting and reporting facility type information. Having access to facility type data will provide more insights for the evaluator to better understand and report on the program's performance within different facilities.

#### **Finding 6: Program free-ridership was moderately high in PY2019 at 17.7%**

The program's NTG was high in PY2019 at 95.8%. However, FR was also moderately high at 17.7%. The program's SO of 13.5% helped offset this and lead to a strong NTG. Survey feedback indicates that the program helped more than one-half of participants (59%) with upgrades they otherwise would not have been able to implement (21%) or would have had to postpone (38%). However, 8% indicated that they would have done the "exact same project" in the absence of the program and one-third (33%) were unsure about what they would have done, which suggests that there is still some room for FR improvements in future program years.

**Recommendation 6:** Maintain focus on minimizing FR. Key areas of focus include (1) identifying and targeting customers who would not make upgrades without program support and (2) identifying applicants who have not already begun implementing measures.

### **Finding 7: Satisfaction with the program and its processes is high overall, but there is room for improvement**

Most participants had no suggestions for improving the initial site assessment (75%), the contractor visit(s) (79%), or the overall installation process (88%). Of those with suggestions for improving the site assessment, contractor visit(s), or the overall installation process, the most common were to improve the assessor or contractor's professionalism during the visits, contact the customer before the visit, increase flexibility in scheduling, shorten the length of the contractor's visit, and provide more information to help business owners make decisions. Satisfaction with the program and its elements was also relatively high across the interviewed auditors and contractors. One contractor expressed concerns that some auditors incorrectly specified the number or types of equipment to be installed by the contractor during the follow-up visit and indicated the lack of a system in place to perform a follow-up visit to install missing equipment.

**Recommendation 7a:** Provide additional training to auditors and contractors to ensure professionalism during assessments and contractor visits.

**Recommendation 7b:** Provide more flexibility in scheduling the visits ( For example, coordinating with participants to identify suitable times for the visit).

**Recommendation 7c:** Shorten the time it takes to complete the assessment and contractor visits. Identify areas where additional program support or resources could make this easier for the auditors/contractors to accomplish.

**Recommendation 7d:** Ensure that auditors carefully identify and record the types and counts of all eligible measures for the contractor.

**Recommendation 7e:** Develop a process to allow for follow-up contractor visits in instances where contractors could not install all program measures because the audit incorrectly specified the number or types of equipment to be installed.

**Recommendation 7f:** Provide more information about the program to help business owners make decisions by ensuring all relevant materials reach customers and ensure the content is thorough and clear.

### **Finding 8: Customer interest in the program is high, but more could be done to engage hard-to-reach customers**

Overall, customer interest in the program is high, according to program staff, auditors, and contractors. However, one contractor indicated that some customers might have language barriers or other barriers that prevent them from learning the program's details. To build trust and facilitate knowledge transfer, the contractor suggested developing information sheets in several languages and working with trusted community representatives to share information about the program.

**Recommendation 8a:** Develop a variety of educational materials in multiple languages to facilitate knowledge transfer among hard-to-reach customers.

**Recommendation 8b:** Establish roles for community groups in program education so that they can help to address any questions or concerns that eligible hard-to-reach customers may have about the program.

**Finding 9: Additional cross-program promotion opportunities exist**

Given that nearly two-thirds of participants (63%) did not apply to any other energy-efficiency programs in PY2019 besides REP, opportunities exist to promote the Save on Energy programs to these customers. For example, the Small Business Lighting Program (SBL) also targets the small business market and could be promoted to REP participants during the application process and/or at the completion of the project.

***Recommendation 9:*** Continue to identify cross-program promotion opportunities, especially with programs like SBL, which target similar small business customers.

# 7 Appendix A: Detailed Net-to-gross Evaluation Methodology

This appendix provides detail on the sampling plans for collecting NTG data, the instruments used to assess FR and SO, the implementation of the data collection, and the analysis methods.

An effective questionnaire was developed to assess FR and SO. The approach has been used successfully in many previous evaluations. The NTG ratio is defined as follows (Equation 7-1).

### Equation 7-1: Net-to-gross Ratio

$$NTG = 100\% - FR + SO$$

Where FR is free-ridership, and SO is spillover.

## A.1 Free-ridership Methodology

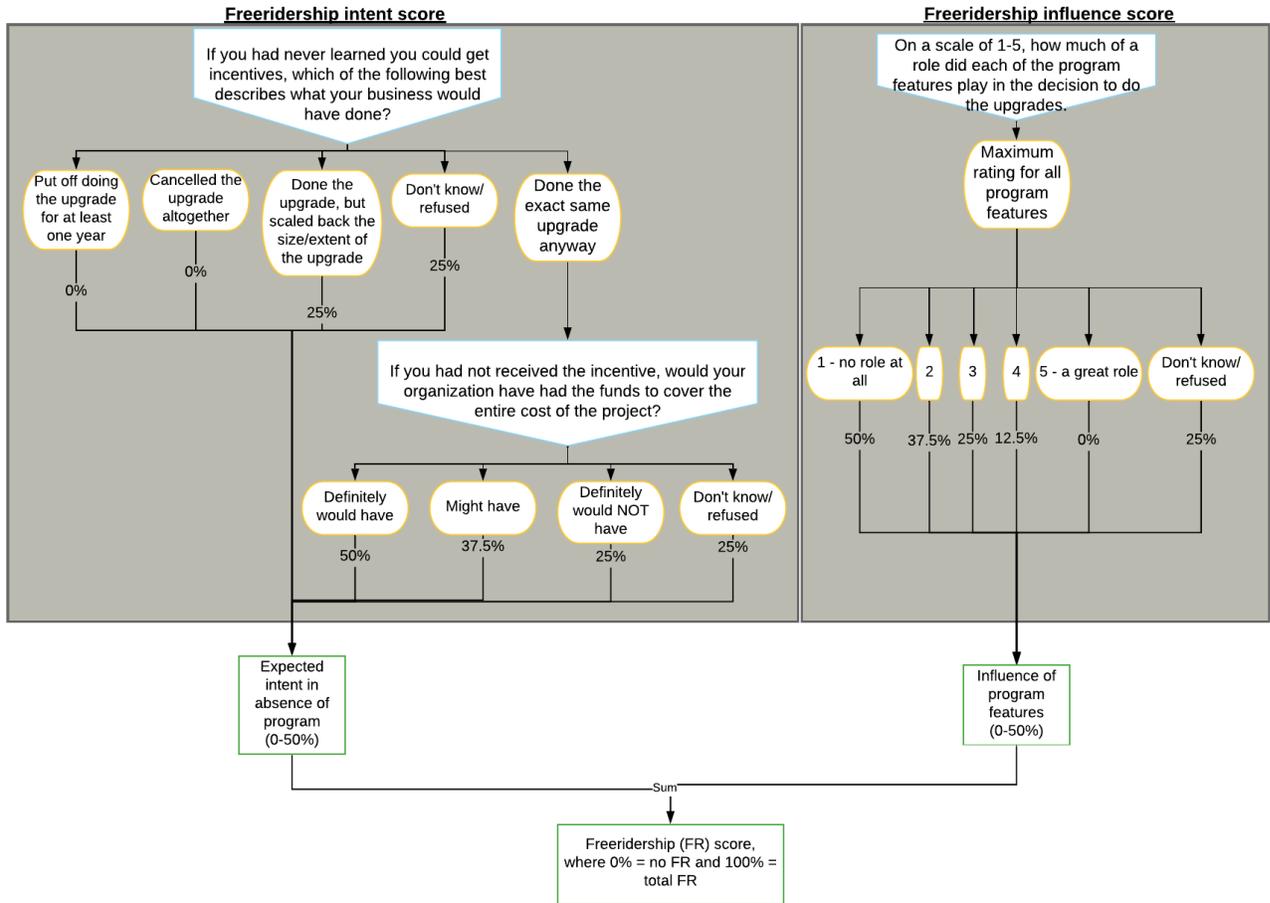
The survey addressed the attribution of savings for each sampled project or type of equipment through two main components:

- Intention of the expected behaviour in the absence of the program; and
- Influence of various program features, such as the incentive, program marketing and outreach, and any technical assistance received.

Each component produces scores ranging from 0 to 50. The two components are summed to produce a total FR score ranging from 0 (not a free rider) to 100 (complete free-rider). The total score is interpreted as a percentage (0% to 100%) to calculate the mean FR level for a given program.

Figure 7-1 illustrates the FR methodology.

**Figure 7-1: Free-ridership Methodology**



**Intention Component**

The FR score's intention component asks participants how the evaluated project would have been different in the program's absence. The two key questions that determine the intention score are as follows:

Question 1: If you had never learned you could get incentives/upgrades at no cost through the program, which of the following best describes what your business would have done?  
Your business would have

1. Put off doing the upgrade for at least one year.
2. Cancelled the upgrade altogether.
3. Done the upgrade, but scaled back the size or extent of the upgrade.
4. Done the exact same upgrade anyway → Ask Question 2
98. Don't know
99. Refused

[ASK ONLY IF RESPONSE TO QUESTION 1=4: Done the exact same upgrade anyway]

Question 2: If you had not received the incentive/upgrades at no cost from the program, would you say your organization definitely would have, might have, or definitely would not have had the funds to cover the entire cost of the project?

1. Definitely would have
2. Might have
3. Definitely would NOT have
98. Don't know
99. Refused

Table 7-1 indicates the possible intention scores a respondent could have received depending on their responses to these two questions.

If a respondent provided an answer of 1 or 2 (would postpone or cancel the upgrade), the respondent would receive an FR intention score of 0% (on a scale from 0% to 50%, where 0% is associated with no FR and 50% is associated with high FR). If a respondent answered 3 (would have done the project, but scaled back the size or extent of it) or said they did not know or refused the question, the respondent would receive an FR intention score of 25% (associated with moderate FR). If the respondent answered 4 (would have done the exact same project anyway), they are asked the second question before an FR intention score can be assigned.

The second question asks the participants who had said they would have done the exact same project, regardless of whether their organization would have had the funds available to cover the entire project cost. If the respondent answered 1 (definitely would have had the funds), the respondent would receive a score of 50% (associated with high FR). If the respondent answered 2 (might have had the funds), they would receive a slightly lower FR score of 37.5%. If the respondent answered 3 (definitely would not have had the funds) or did not know or refused the question, the respondent would receive an FR intention score of 25% (associated with moderate FR).

**Table 7-1: Key to Free-ridership Intention Score**

Question 1 Response	Question 2 Response	Intention Score (%)
1 or 2	Not asked	0 (no FR for intention score)
3, 98 (Don't Know), or 99 (Refused)	Not asked	25
4	3, 98 (Don't Know), or 99 (Refused)	25
4	2	37.5
4	1	50 (high FR for intention score)

The bullet points below display the same FR intention scoring approach in a list form. As mentioned above, for each respondent, an intention score was calculated, ranging from 0% to 50%, based on the respondent's report of how the project would have changed had there been no program:

- Project postponement or cancellation = 0%
- Reduction in size or scope or use of less energy efficient-equipment = 25%
- Respondent does not know what they would have done in the absence of the program = 25%
- No change and respondent states firm would not have made funds available = 25%
- No change but respondent is not sure whether firm would have made funds available = 37.5%
- No change and respondent confirms firm would have made funds available = 50%

### **Influence Component**

The influence component of the FR score asks each respondent to rate how much of a role various potential program-related influence factors had on their decision to do the upgrade(s) in question. Influence is reported using a scale from one (1) to five (5), where one means "it played no role at all" and five means "it played a great role." The potential influence includes the following:

- Availability of the incentives or the no-cost upgrades
- Information or recommendations provided to you by your local utility representative
- The results of any audits or technical studies done through this or another program provided by your local utility or the IESO
- Information or recommendations provided from auditors, contractors, vendors or suppliers associated with the program
- Marketing materials provided by your local utility about the program (email, direct mail, etc.)
- Previous experience with any energy-saving program
- Others (identified by the respondent)

Table 7-2 indicates the possible influence scores a respondent could receive depending on how they rated the influence factors above. For each respondent, the program influence is set equal to the maximum influence rating that a respondent reports across the various influence factors. For example, suppose the respondent provided a score of 5 (great role) to at least one of the influence factors. In that case, the program is considered to have had a great role in their decision to do the upgrade, and the influence component of FR is set to 0% (not a free rider).

**Table 7-2: Key to Free-ridership Influence Score**

Maximum Influence Rating	Influence Score (%)
5 - program factor(s) highly influential	0
4	12.5
3	25
2	37.5
1 - program factor(s) not influential	50
98 – Don't know	25
99 - Refused	25

The bullet points below display the same FR Influence scoring approach in a list form. As mentioned above, for each project, a program influence score was calculated, also ranging from 0% to 50%, based on the highest influence rating given, among the potential influence factors:

- Maximum rating of 1 (no influencing factor had a role in the decision to do the project) = 50%
- Maximum rating of 2 = 37.5%
- Maximum rating of 3 = 25%
- Maximum rating of 4 = 12.5%
- Maximum rating of 5 (at least one influence factor had a great role) = 0%
- Respondent does not know how much influence any factor had = 25%

The intention and program influence scores were summed for each project to generate an FR score ranging from 0 to 100. The scores are interpreted as % FR: a score of 0 means 0% FR (i.e., the participant was not at all a free rider), a score of 100 means 100% FR (the participant was a complete free rider), and a score between 0 and 100 means the participant was a partial free rider.

## A.2 Spillover Methodology

To assess the SO, respondents were asked about installing energy-efficient equipment or services that were done without a program incentive following their participation in the program. The equipment-specific details assessed are as follows:

- ENERGY STAR Appliance: type and quantity
- Fan: type, size, quantity
- HVAC: air conditioner replacement, above code minimum: tonnage and quantity
- Lighting: type, quantity, wattage, hours of operation, location, and fixture length
- Lighting – controls: type of control, type and quantity of lights connected to control, hours of operation, and percentage of time the timer turns off lights
- Motor/Pump Upgrade: type, end-use, horsepower, and efficiency quantity

- Motor/Pump Drive Improvement (VSD and Sync Belt): type, end-use, horsepower, and quantity
- Others (identified by the respondent): description of the upgrade, size, quantity, hours of operation

For each equipment type that the respondent reports installing without a program incentive, the survey instrument asks about the extent of influence that earlier involvement in the program had on the decision to carry out the upgrades. Influence is reported using a scale from one (1) to five (5), where one means "it played no role at all" and five means "it played a great role." Suppose the influence score is between 3 to 5 for a particular equipment type. In that case, the survey instrument solicits details about the upgrades to estimate the quantity of energy savings that the upgrade produced.

For each upgrade, the program influence rating was converted to an influence score ranging from 0% to 100%, as follows:

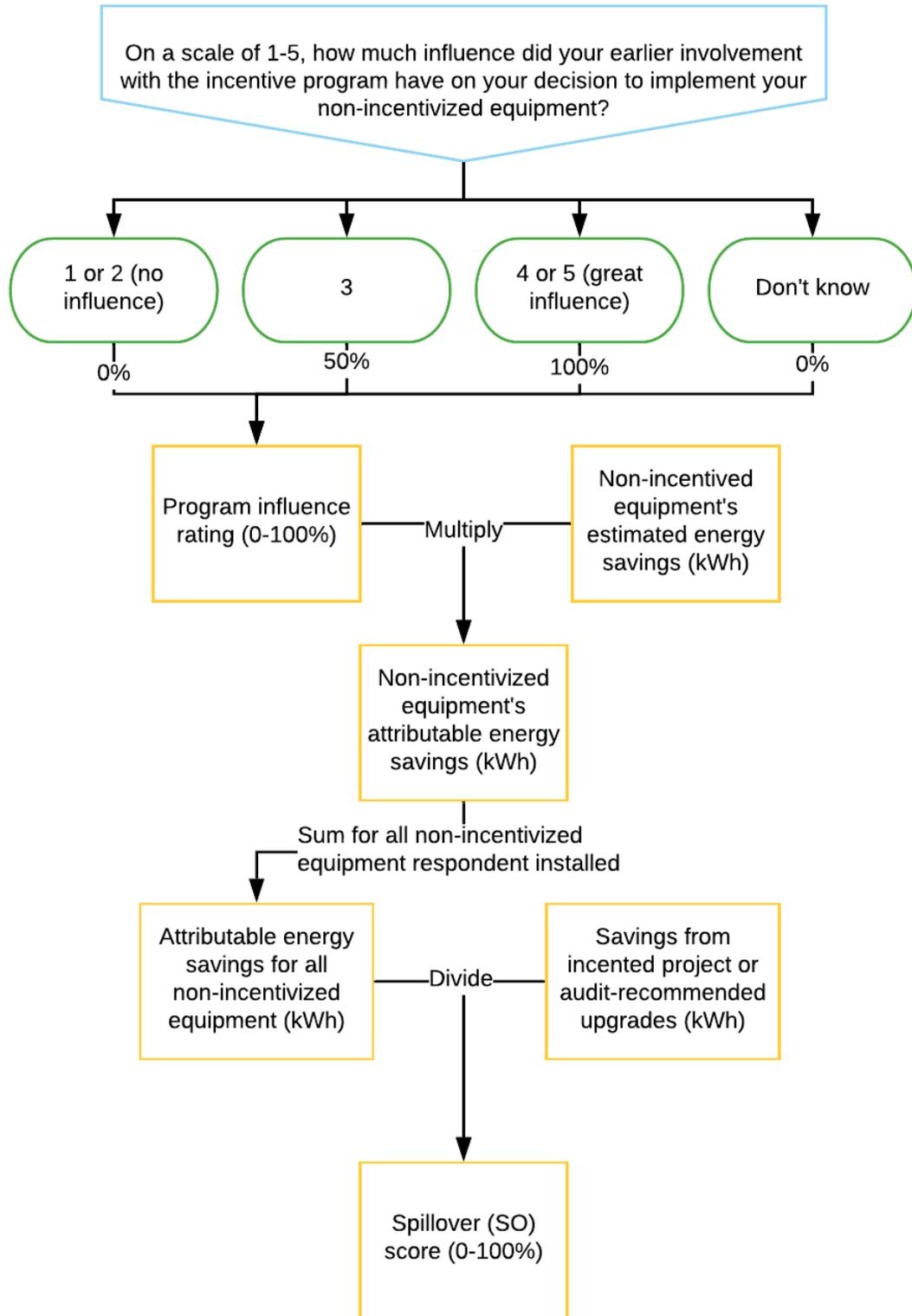
- Maximum rating of 1 or 2 (no influence) = 0%
- Maximum rating of 3 = 50%
- Maximum rating of 4 or 5 (great influence) = 100%
- Respondent does not know how much influence any factor had = 0%

The following procedure was used to calculate an SO percentage for each respondent:

- Multiplying the estimated energy savings for each upgrade by the influence percentage to calculate the upgrade's program-attributable energy savings.
- Summing program-attributable energy savings from all identified upgrades for each respondent to calculate the respondent's total SO savings.
- Dividing each respondent's total SO savings by the savings from the incented project.

Figure 7-2 illustrates the SO methodology,

**Figure 7-2: Spillover Methodology**



### A.3 Identification of Project or Upgrade for NTG Assessment

Participants were asked to consider all their completed projects in PY2019 through the particular program in question. This approach allowed for the respondent's NTG value across all the projects they completed in PY2019 to be applied rather than just one.

### A.4 Other Survey Questions

In addition to the questions addressing FR and SO, the survey included the following topics to provide additional context:

- Whether the respondent is the person primarily involved in decisions about upgrading equipment at their company. Suppose the respondent is not the appropriate contact. In that case, they are asked by the interviewer to be transferred to or be provided contact information for the appropriate person in the case of a phone survey. In the case of a web survey, the weblink will be forwarded to the appropriate contact.
- Whether the respondent had primary or shared responsibility for the budget or expenditure decisions for the program-incentivized work completed at their company.
- The respondent's work title.
- When the respondent first learned about the program incentives, relative to the upgrade in question (before planning; after planning, but before implementation; after implementation began, but before project completion; or after project completion).
- When the respondent submitted their application to the program, and their reasons for submitting it after the work was started or completed, if applicable.
- How the respondent learned about the program.

The responses to these questions are not included in the algorithms for calculating FR or SO but do provide additional context. The first question ensures that the appropriate person responded to the survey. The other questions provide feedback about responsibility for budget and expenditure decisions, the respondent's job title, application submission process details, and how and when program influence occurs.

### A.5 Net-to-gross Survey Implementation

The survey was implemented over the web. It was assumed that all contacts who responded were the appropriate contacts to answer the questions. The introductory text in the survey asked the respondent to forward the survey weblink to the appropriate contact to fill it out if they were not the appropriate contact to do so.

## 8 Appendix B: Detailed Process Evaluation Methodology

This appendix provides additional details about the process evaluation methodology. A summary of the methodology was provided in Section 3.2. The process evaluation collected primary data from key program actors, including program delivery vendor staff, participants, auditors and contractors (Table 8-1). Data was collected using different methods, depending on what was most suitable for a particular respondent group (for example, web surveys, telephone-based IDIs). This data, when collected and synthesized, provides a comprehensive understanding of the program.

All process evaluation data collection activities were carried out or managed by the evaluators. All survey instruments, interview guides, and sample files were developed by the evaluators for interviews and surveys. The survey instruments and interview guides were approved by IESO EM&V staff, and the data used to develop the sample files was retained from program records supplied either by the IESO EM&V staff or the program delivery vendor.

**Table 8-1: Process Evaluation Primary Data Sources**

Respondent Type	Methodology	Fielding Firm	Completed	Population	90% CI Error Margin
Program Delivery Vendor Staff	Phone IDIs	NMR	1	1	0
Auditors and Contractors	Phone IDIs	NMR	2	2	0
Participants	Web Survey	NMR	24	188	N/A*

**\*Error margin not displayed if the respondent count is below 30 unless census is achieved.**

The following subsections provide additional detail about the process evaluation methodology.

### B.1 Program Delivery Vendor Staff Interviews

An IDI was completed with the program delivery vendor staff (Table 8-2). The purpose of the interview was to better understand the program delivery vendor staff's perspectives related to program design and delivery.

The interview topics covered included program roles and responsibilities, program design and delivery, marketing and outreach, market actor engagement, program strengths and weaknesses, and suggestions for improvement.

The appropriate staff to interview were identified in consultation with the IESO EM&V staff. The telephone IDI was conducted with the program delivery vendor staff using in-house staff (rather than through a survey lab). The interview was completed on July 21, 2020, and it took approximately 45 minutes to complete.

**Table 8-2: Program Delivery Vendor Staff IDI Disposition**

Disposition Report	Count
Completes	1
No Response	0
Unsubscribed	0
Partial Complete	0
Bad Contact Info (No Replacement Found)	0
Total Invited to Participate	1

## B.2 Auditor and Contractor Interviews

IDIs with two REP auditors and contractors were completed. (Table 8-3). The purpose of the interviews was to better understand the auditor and contractors' perspectives related to program delivery.

The interview topics included firmographics, program roles and responsibilities, audits and/or projects completed, training and education, how customers heard about the program, barriers to participation, satisfaction, program improvement suggestions, and impacts of the COVID-19 crisis.

The sample was developed from program records provided by program delivery vendor staff. A census-based approach was employed to reach the largest number of respondents possible, given the small number of unique contacts.

Telephone IDIs with the auditors and contractors were conducted using in-house staff (rather than through a survey lab) between July 15 and July 30 of 2020. The survey took an average of ten minutes to complete. Weekly e-mail reminders were sent to non-responsive contacts through web survey fielding.

**Table 8-3: Auditor and Contractor Survey Disposition**

Disposition Report	Count
Completes	2
No Response	0
Unsubscribed	0
Partial Complete	0
Bad Contact Info (No Replacement Found)	0
Total Invited to Participate	2

## B.3 Participant Survey

A total of 24 REP participants were surveyed from a sample of 188 unique companies (Table 8-4). The purpose of the survey was to better understand participant perspectives related to program experience.

The survey topics included firmographics; improvement suggestions about the initial site assessment, the follow-up visit, and the installation process overall; FR; SO; participation in other programs; and the impacts of the COVID-19 crisis.

The sample was developed from program records provided by the IESO staff. A census-based approach was employed to reach the largest number of respondents possible, given the small number of unique contacts.

The survey was delivered over the web by NMR staff using Qualtrics survey software. The survey implementation was conducted between June 2 and June 26 of 2020. The survey took an average of 11 minutes to complete after removing outliers.<sup>1</sup> Weekly e-mail reminders were sent to non-responsive contacts through web survey fielding.

**Table 8-4: Participant Survey Disposition**

<b>Disposition Report</b>	<b>Count</b>
Completes	24
No Response	134
Unsubscribed	1
Partial Complete	5
Screened Out	7
Bad Contact Info (No Replacement Found)	17
Total Invited to Participate	188

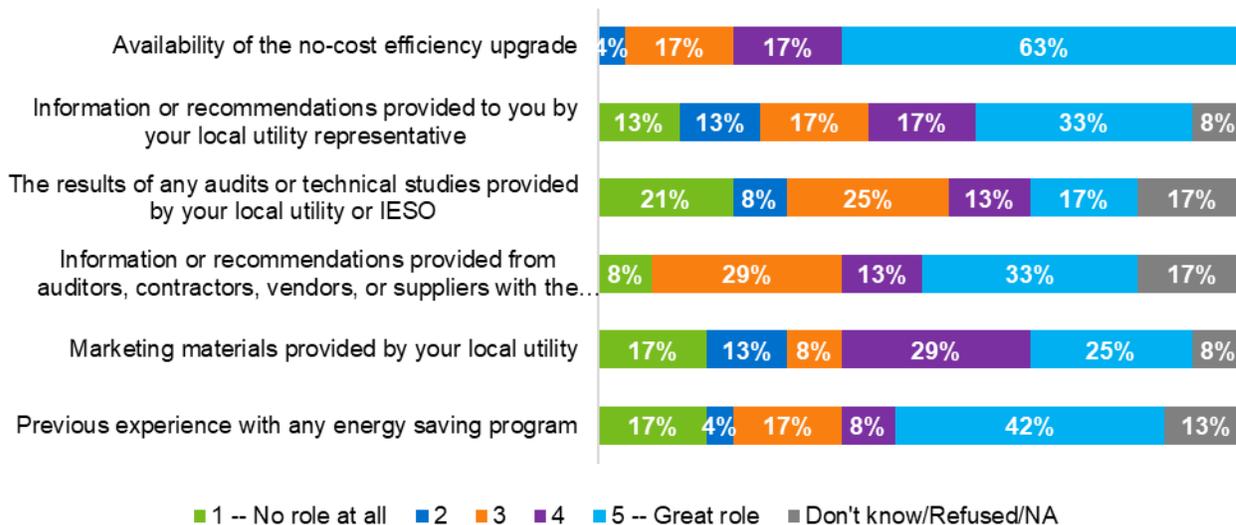
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<sup>1</sup> Note that the survey was designed to allow the respondent to come back to it later to complete it if they preferred. The average survey time was calculated with this in mind and assumed that any survey that took 40 minutes or more to complete was likely completed by a respondent who took a break before completing the survey.

# 9 Appendix C: Additional Net-to-gross Evaluation Results

This appendix provides additional results in support of the NTG evaluation.

**Figure 9-1: Influence of Program Features on Participation – Detailed Results**



**Table 9-1: Detailed Spillover Results (n=3)**

Type of Upgrade Installed	Size	Number Installed
Fan	1-1.99 ft. in diameter	2
Fan	1-1.99 ft. in diameter	4
ENERGY STAR Freezer	--	1
HVAC – Air conditioner replacement, above code minimum	Less than 5.4 tons (65,000 Btu/h)	1
Lighting	LED Linear	52
Motor pump upgrade (on HVAC fan)	5.1-15.0 horsepower, standard efficiency	1



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