Interim Framework Refrigeration Efficiency Program 2021 Evaluation Report

Submitted to IESO

in partnership with NMR Group

Date: 09.06.2022

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Acknowledgements

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 managing 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 all the IESO program staff, program delivery vendors, and contractors that the evaluation team interviewed or surveyed. Their insights have been invaluable to the evaluation team's efforts to improve the Conservation Programs.

Finally, the evaluation team would like to thank the hundreds of participants that supported the evaluation team's impact telephone surveys, and site visits. Their cooperation with the evaluation team's efforts has produced high quality data that will serve Ontario conservation efforts for years to come.

Acronyms and Abbreviations

EM&V	Evaluation, measurement, and verification
EUL	Effective useful life
FR	Free-Ridership
GW or GWh	Measurement of demand (GW) or energy (GWh) equivalent to 1,000,000,000 W or Wh
HOU	Hours of use
IDI	In-depth interview
IESO	Independent Electricity System Operator
IF	Interim Framework
kW or kWh	Measurement of demand (kW) or energy (kWh) equivalent to 1,000 W or Wh
LED	Light emitting diode
MW or MWh	Measurement of demand (MW) or energy (MWh) equivalent to 1,000,000 W or Wh
NTG	Net-to-gross
PY	Program year
SO	Spillover

1. Executive Summary

The Independent Electricity System Operator (IESO) retained Resource Innovations (formerly Nexant Inc.), and their sub-contractor NMR Group, Inc., to conduct an evaluation of the Refrigeration Efficiency Program (REP) for the 2021 Interim Framework (IF) evaluation cycle. The Program Year (PY) 2021 is the last year of delivery for the IF REP program. Subsequently, it was deemed that only an impact evaluation, including net-to-gross research and analyses are to be completed. This ensures accurately quantifying the savings attributable to the PY2021 REP while continuing to maintain efficient budget spending. This Executive Summary provides a high-level overview of the impact results, key findings and recommendations for the REP during the January 1, 2021, through December 31, 2021 evaluation period.

1.1. Program Description

The Refrigeration Efficiency Program (REP) is a local program administered by Peterborough Distribution Inc. (now a part of Hydro One Networks Inc.). The program provides facility assessments to identify potential electricity savings opportunities and enables the installation of commercial refrigeration upgrades to reduce electricity consumption. Non-residential electricity customers with a General Service Account who use commercial product refrigeration and have an average annual peak demand of fewer than 250 kilowatts (kW) are eligible to participate in the program.

1.2. Evaluation Goals and Objectives

The following are the goals and objectives of the PY2021 REP evaluation:

- Conduct audits of completed projects to verify the installation of equipment and evaluate operating parameters through desk reviews and site visits.
- Verify energy and summer peak 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;
- Conduct cost-effectiveness and greenhouse gas quantification analyses using IESO's Cost Effectiveness (CE) tool
- Provide recommendations on program improvements based on feedback obtained through the evaluations.

1.3. Summary of Results

1.3.1. Impact Evaluation

An impact evaluation was performed to analyze the impact of the program's improvements and quantify the savings generated as a result of implementing the REP projects in Ontario during 2021. During the evaluation period, 483 projects were completed, across nine Local Distribution

Companies (LDCs). London Hydro (43%) and Hydro One Networks (31%) accounted for the majority of the PY2021 REP net verified energy savings. The PY2021 REP achieved energy and summer peak demand realization rates of 106.56% and 112.66%, respectively, with both realization rates precision below the target 10%. The net verified impact results of the PY2021 REP are presented in Table 1-1.

Table 1-1: 2021 REP Impact Results

Savings	Reported Savings	Realization Rate	Gross Verified Savings	Gross Verified Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Savings	Net Verified Savings at 2022
Energy (MWh)	1,738.34	106.56%	1,8523.38	9.21%	88.63%	1,641.76	1,353.06
Summer Peak Demand (kW)	281.5	112.66%	317.17	9.06%	90.87%	288.21	226.64

1.4. Key Findings and Recommendations

Finding 1. Improve ECM Fan Motor Calculation. condenser and evaporator fans have the same reported energy and summer peak demand savings. This is not an accurate assumption as condenser fan operation depends on the compressor operation and outdoor temperature.

- **Recommendation 1.** It is recommended that a duty cycle or equivalent full load hours (EFLH) be incorporated in the calculation. Metering data collected since 2017(data collected during the CFF BRI evaluation and IF REP evaluation) indicate an evaporator fan duty cycle of 97%, and 57% for condenser fans.

Finding 2. Improve Strip Curtains measure implementation and data collection. On site verification and desk review interviews indicate issues with the strip curtain measures. In some instances, it was observed the base case already had a pre-existing strip curtain, strip curtains were found missing or damaged. It was also observed that the current calculation does not account for the accurate strip curtain area (size).

- **Recommendation 2.** It is recommended that an in-service rate be used to adjust/account for missing, un-installed or measures with pre-existing base case. It is also advised to use actual strip curtain size in savings calculation, and the size must be equal to the door opening area for the walk-in cooler/freezer.

Finding 3. Accurately Classify Refrigeration Equipment. In several instances, a misclassification of the equipment end use (i.e. condenser vs. evaporator) was reported for the condenser coil cleaning measure. Additionally, evaluation desk reviews and site visits found that the reported equipment type was misclassified (walk-in vs reach-in)

For condenser coil cleaning measure, the post case pictures clearly indicated that the evaporator coil was cleaned, but savings and incentives were claimed for condenser coil cleaning. (the program does not include an evaporator cleaning measure).

Occasional misclassification between walk-in freezers and coolers.

- Recommendation 3a. It is recommended to provide additional training to contractors to accurately identify the equipment type and end use.
- Recommendation 3b. Implement an internal QA/QC procedure for the program implementer to identify and correct these errors.

2. Introduction

The Refrigeration Efficiency Program (REP) is a local program administered by Peterborough Distribution Inc. (now a part of Hydro One Networks Inc.). The program provides facility assessments to identify potential electricity savings opportunities and enables the installation of commercial refrigeration upgrades to reduce electricity consumption. Non-residential electricity customers with a General Service Account who use commercial product refrigeration and have an average annual peak demand of fewer than 250 kilowatts (kW) are eligible to participate in this program. Since the REP inception in 2019, Peterborough Distribution Inc. was joined by other LDCs to offer the REP in their delivery regions. This expansion made the program available to more eligible customers and achieve additional savings outside the Peterborough Distribution Inc. region.

2.1. Goals and objectives

The goals and objectives of the PY2021 REP evaluation are as follows:

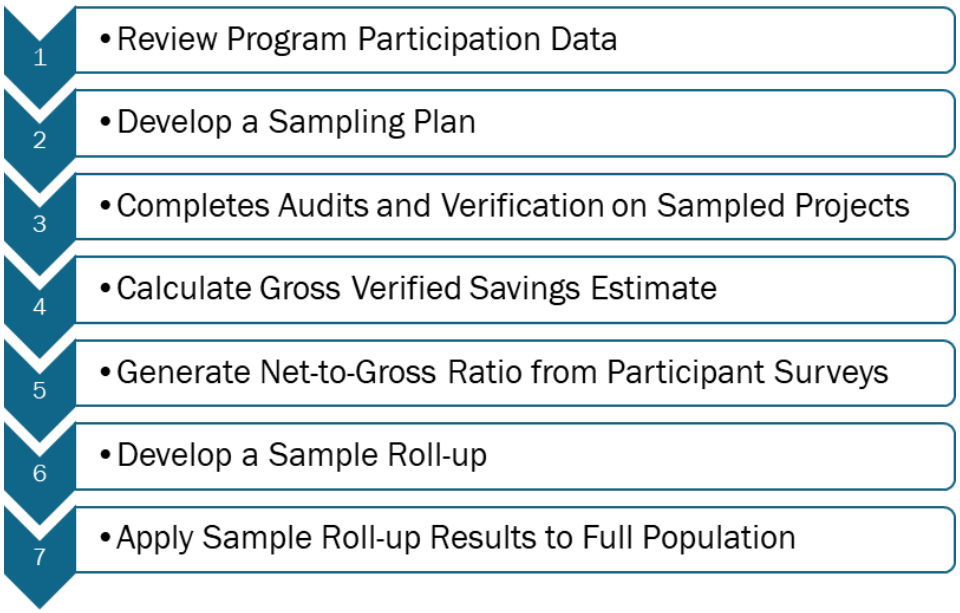
- Conduct audits of completed projects to verify the installation of equipment and evaluate operating parameters through desk reviews and site visits
- Verify energy and summer peak demand savings with a high degree of confidence and precision
- Assess free-ridership (FR) and participant spillover (SO) to determine an appropriate net-to-gross (NTG) ratio
- Conduct cost effectiveness and greenhouse gas quantification analyses using IESO's Cost Effectiveness tool
- Provide recommendations for program improvements based on feedback obtained from the evaluations

3. Evaluation Methodology

3.1. Impact Evaluation Methodology

The impact evaluation methodology is built upon a series of steps, as outlined in Figure 3-1. Additional detail the impact evaluation and NTG evaluation methodologies can be found in Appendix A and Appendix B.

Figure 3-1: Impact Evaluation Methodology

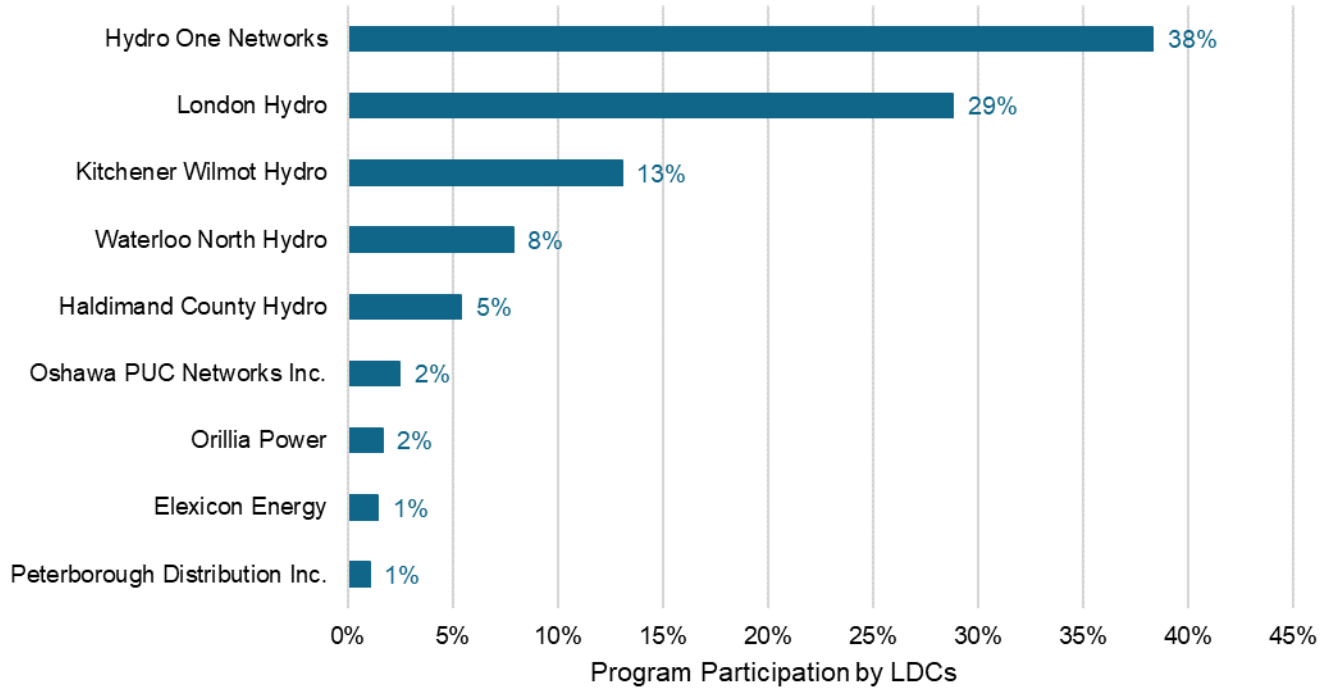


4. Impact Evaluation Results

4.1. Participation

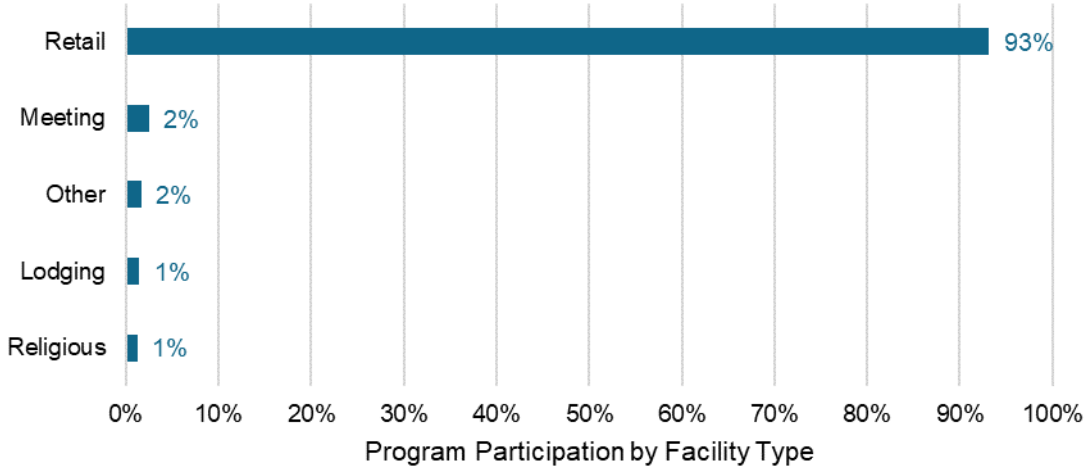
A total of 483 projects were completed under the REP in 2021. This indicates a 36% drop in participation level compared to 2020 program year (756 projects completed in 2020). The low participation level in 2021 is owed to the fact that the REP concluded on December 31st, 2020. PY2021 REP projects are those which were started in 2020 and were allowed to be completed in 2021. Figure 4-1 presents the project distribution in PY2021 by Local Distribution Companies (LDCs) territories. Majority of the projects were implemented in the Hydro One Networks (38%) and London Hydro (29%) service territories, which represents 67% of the completed projects in PY2021.

Figure 4-1: REP Program Participation by LDCs



The REP project database contained information on facility type of all completed projects, which had nine (9) unique facility types. Figure 4-2 displays the facility type distribution amongst the installed projects. Retail sector accounted for 93% of the completed projects. A further investigation into these projects suggested that retail facility types can be further classified into restaurants, grocery, and convenience stores. This indicates that the Retail facility type was a generic facility type assigned to most of the assessed REP facilities. Other facility category shown below mainly consisted of warehouses, educational, medical, and manufacturing facility types.

Figure 4-2 2021 REP Program Participation by Facility Type



4.2. Savings Results

The net verified impact results of the PY2021 REP are presented in Table 4-1. All savings discussed in the remainder of this report refer to first-year net verified savings unless otherwise specified. PY2019 through PY2021 results including true up projects are also provided in Table 4-2, for comparison.

Table 4-1: 2021 REP Impact Results

Savings	Reported Savings	Realization Rate	Gross Verified Savings	Gross Verified Precision at 90% Confidence	Net-to-Gross Ratio	Net Verified Savings	Net Verified Savings at 2022
Energy (MWh)	1,738.34	106.56%	1,852.38	9.21%	88.63%	1,641.76	1,353.06
Summer Peak Demand (kW)	281.5	112.66%	317.17	9.06%	90.87%	288.21	226.64

Table 4-2: 2019-2021 REP Net Results Comparison

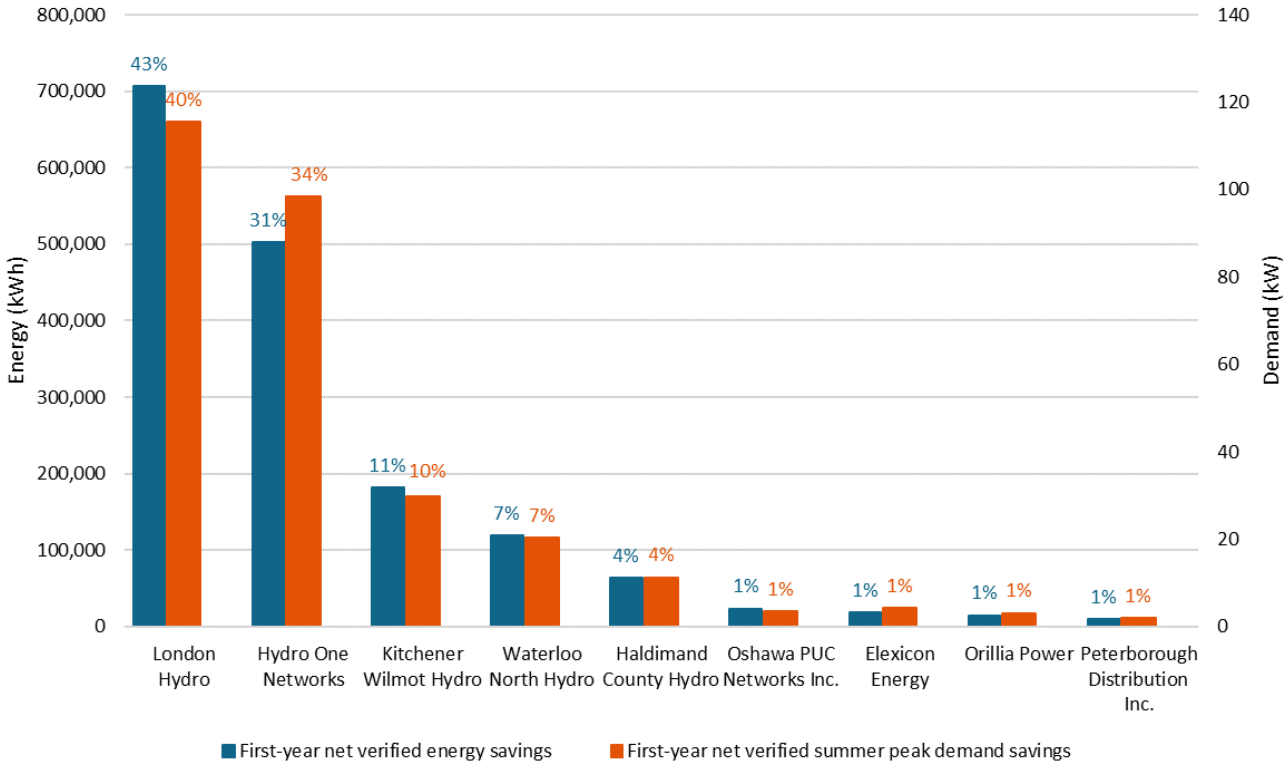
Measurement	2019	2020	2021	2019-2021
Projects	208	756	483	1,447
1st Year Savings				
Net Energy (MWh)	722.01	2,342.38	1,641.76	4,706.15
Net Summer Peak Demand (kW)	128.32	384.23	288.21	800.76
2022 Savings				
Net Energy (MWh)	529.09	1,980.01	1,353.1	3,862.2
Net Summer Peak Demand (kW)	131.05	309.07	226.64	535.71

The program realization rates for PY2021 are presented in Table 4-1. The methodology for calculating the realization rate is described in Appendix A.4, and the NTG ratio calculation is described in Appendix B.

As summarized in Table 4-2, participation levels in 2019 were significantly lower compared to PY2020 and PY2021 as it was program's first year in the market. Compared to 2019, the participation level and net verified savings increased by almost threefold in the year 2020. Between 2020 and 2021, the program savings and participation levels decreased by 29% and 36% respectively 2021. This is owed to the fact that the REP concluded on December 31st, 2020. PY2021 REP projects are those which were started in 2020 and were allowed to be completed in 2021.

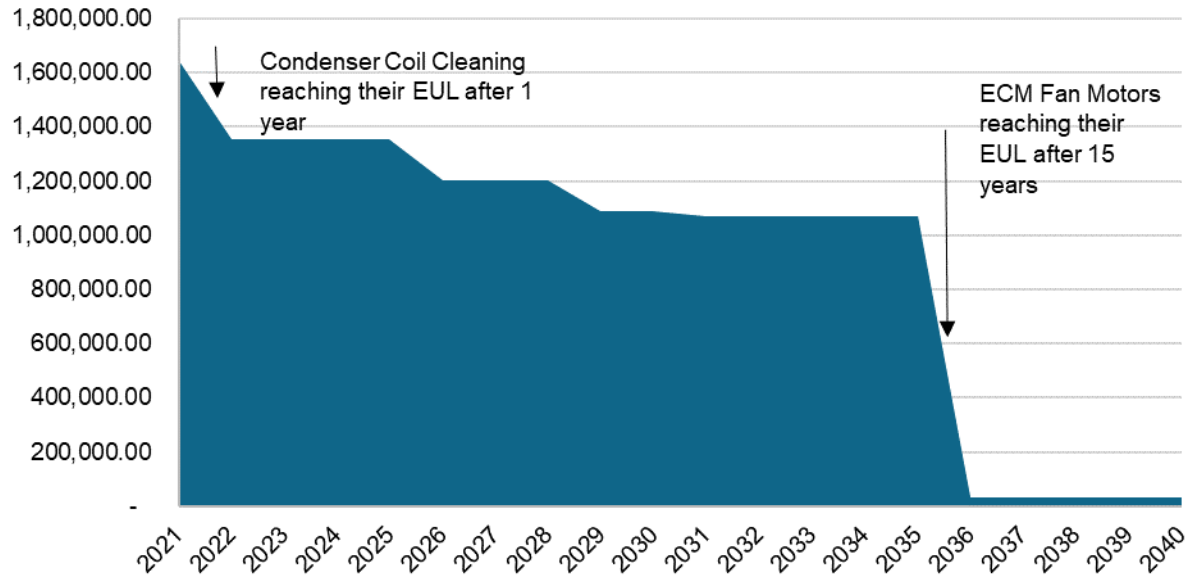
Figure 4-3 displays each LDC territory's contribution to the PY2021 REP first-year net verified energy and summer peak demand savings. The London Hydro (43% of REP energy savings, 40% of REP demand savings) and Hydro One Networks (31%/34%) service regions accounted for a combined 74% of the first-year net verified energy, and summer peak demand savings followed by Kitchener and Waterloo Hydro (11%/10%). While the projects implemented in the London Hydro service region accounted for highest share of first year net verified energy and demand savings (43%/40%), Hydro One Networks service region had the higher participation rate (38%) than the London Hydro (29%) service region. This can be partly attributed to the measures adopted in each region, where ECM fan motors accounted for 70% of net verified savings in London Hydro region, compared to 54% in Hydro One service region.

Figure 4-3: 2021 REP First Year Net Verified Savings by LDCs



The PY2021 REP is expected to achieve 18,361 MWh of lifetime net verified energy savings based on the installed measures and their respective effective useful lives (EULs). Figure 4-4 presents the projected net verified energy savings over a 20-year period, which is the length of the longest measure life (LED Case Lighting). 82% of the first-year net verified savings are expected to persist till 2022. This is due to condenser coil cleaning measure reaching the end of its expected life (1 year) before 2022. At minimum, 65% of the first-year (2021) savings are estimated to persist through year 15 (2035), mainly due to the strong influence of the ECM fan motor measure on the program's overall savings.

Figure 4-4 Net Verified Energy Savings Over Time



The program savings achieved in a given year can decrease as measures with shorter EULs fall out of use and stop accruing savings attributable to the REP. An EUL was assigned to each measure type based on the average rated life data provided in the program's authorized measure list. The PY2021 REP measures' EUL are presented in Table 4-3.

Table 4-3 REP Measures' EULs

Measure Type	EUL (Years)
Condenser Coil Cleaning	1
Strip Curtains	5
Nights Curtains	5
Door Auto Closers	8
LED A19 Lamp	10
ECM Fan Motor	15
LED Case Lighting	20

4.3. Impact Evaluation Findings

The following sections provide details on the impact findings of the installed measures, the first-year net savings, contribution by measure types, and program realization rates.

4.3.1. REP Measure Types

Figure 4-5 and Figure 4-6 represent the distribution of the net verified energy and summer peak demand savings for PY2021 by measure type. The majority of the net verified energy savings (63%) and summer peak demand savings (45%) were produced by ECM fan motors measure. This trend is consistent with PY2019 and PY2020, where the ECM motors

measures (66% in 2020 and 52% in 2019) contributed the most to the REP net verified savings. Lighting measures represented only a small portion of the net verified energy (3%) and summer peak demand (5%) savings. Door closers measure accounts for only 7% of the net verified energy savings yet represents 20% of the net verified summer peak demand savings.

Figure 4-5 First-Year Net Verified Energy Savings by Measure Type

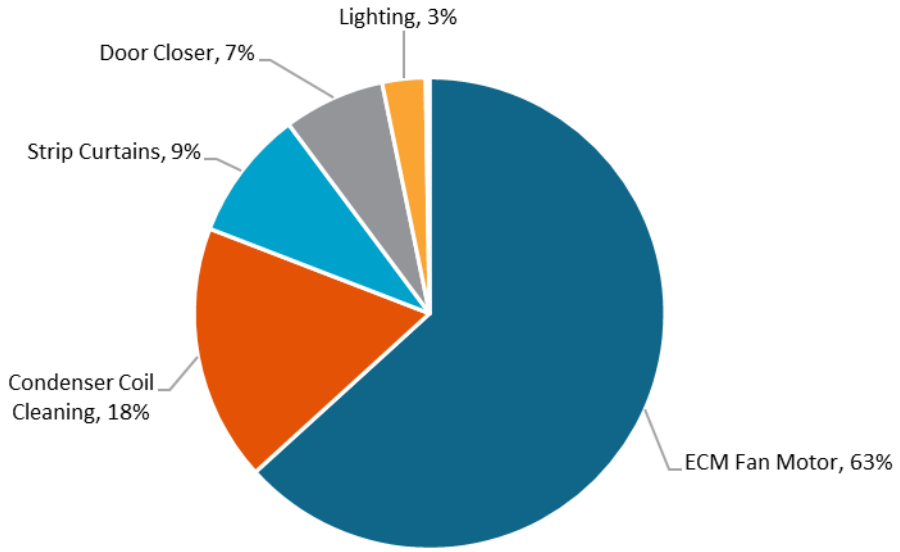


Figure 4-6 First-Year Net Verified Summer Peak Demand Savings by Measure Type

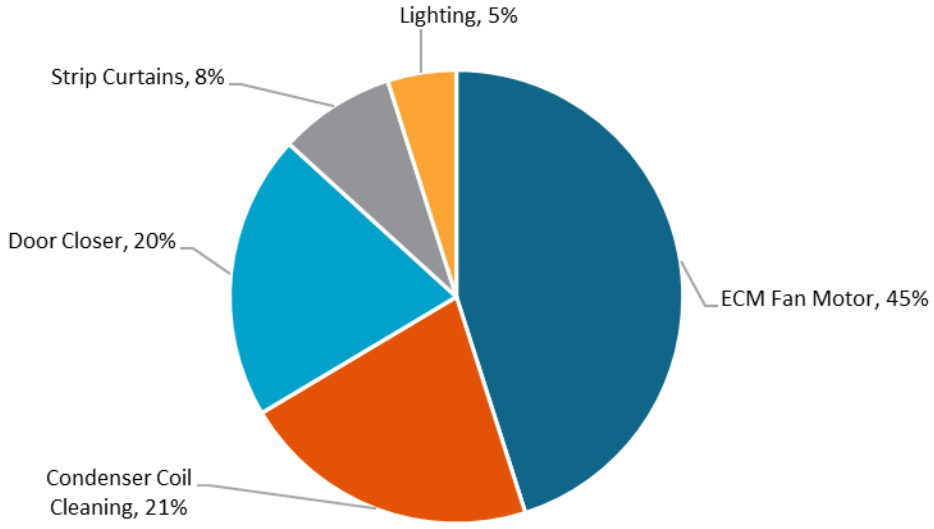


Figure 4-7 represents the overall composition of implemented measure for REP PY2021. Condenser coil cleaning and ECM fan motor accounts for majority (76%) of the programs installed measure quantity. Strip Curtain measure (9%) and Door Closer measure (6%) accounted for only 15% of the total installed measures which is close to their contribution of the program's energy savings.

Figure 4-7 Program Installed Measure Quantity

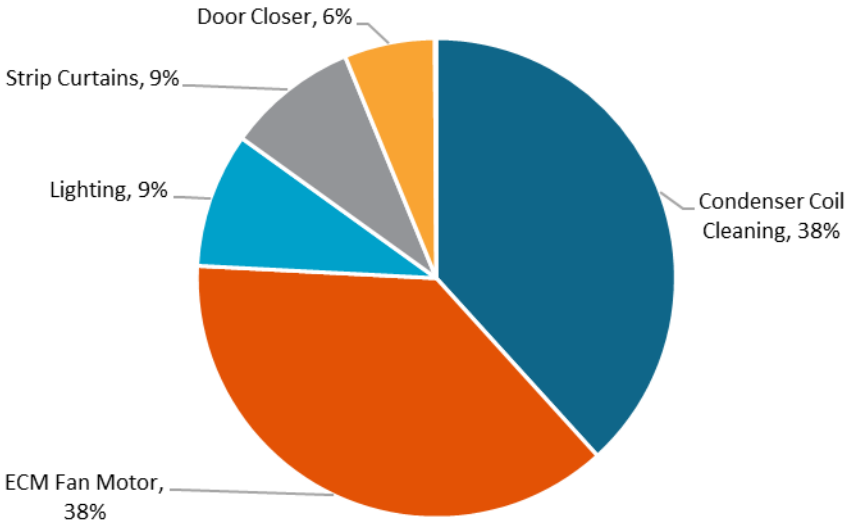


Table 4-4 below indicates the measure adoption rate for each measure type for PY2021. ECM fan motor (90%) and Condenser coil cleaning (89%) were the most adopted measures by the participants due their compatibility with different types of refrigeration systems (walk-in/reach-in, freezers or coolers, whereas curtains (58%) and door closers (42%) are limited to walk-in coolers/freezers only.

Table 4-4 REP Measure Adoption Rates

REP Measures	Percent of Projects Which Implemented It
ECM Fan Motor	90%
Condenser Coil Cleaning	89%
Curtains	58%
Door Closer	42%
Lighting	38%

4.3.2. Realization Rates

Table 4-1 presents the program-level savings and realization rates, whereas Table 4-5 and Table 4-6 present the average reported and gross verified summer peak demand savings per unit measure type along with measure-level realization rates. While the program-level energy realization rate is high at 106%, the measure-level realization rates ranged from 32% for condenser coil cleaning to 246% for door closers. Similarly, the measure-level summer peak demand realization rates deviated from the program level realization rate (113%) and ranged from 28% for condenser coil cleaning to 202% for door closers.

Table 4-5 Reported and Verified Gross Energy Savings Per Measure

Measures	Reported Energy Savings (kWh/Unit)	Verified Energy Savings kWh/unit	Energy Realization Rate
ECM Fan Motor	573	491	86%
Condenser Coil Cleaning	157	51	32%
Door Closer	387	952	246%
Lighting	111	81	73%
Strip Curtains	344	716	208%

Table 4-6 Reported and Verified Gross Peak Demand Savings Per Measure

Measures	Reported Demand Savings (kW/unit)	Verified Summer Peak Demand (kW/unit)	Summer Peak Demand Realization Rate
ECM Fan Motor	0.066	0.060	91%
Condenser Coil Cleaning	0.031	0.008	28%
Door Closer	0.183	0.370	202%
Lighting	0.030	0.018	60%
Strip Curtains	0.052	0.084	162%

The following sections discuss the detailed of the REP measures' reported and verified energy and summer peak demand savings and the factors contributing to their realization rates.

Condenser coil cleaning:

The measure-level energy realization rate is 32% and summer peak demand savings realization rate is 28%. Although, condenser coil cleaning measure energy and summer peak demand reported savings were updated in February 2020 to further consider the refrigeration case types (cooler or freezer), the change only resulted in a slight improvement on the realization rate. Measure specific savings estimate details were not available to the evaluator to understand the reported savings calculation methodology. Hence, it is difficult to comment on the approach and the correction that needs to be applied to get a realization rate closer to 100%.

As observed in previous program years, the verified quantities of the implemented measure are significantly lower than the reported quantities. The verified quantities were confirmed with the participants during the site visits or desk reviews. It was also confirmed with the REP implementer that the reported quantities refer to the quantities of cleaning products used to clean the condenser instead of the quantity of the actual condensers that were cleaned. The reported and verified savings are dependent on the verified quantities, as a result, the deviation between the reported and verified quantities had a significant impact on the realization rate.

ECM Fan Motor:

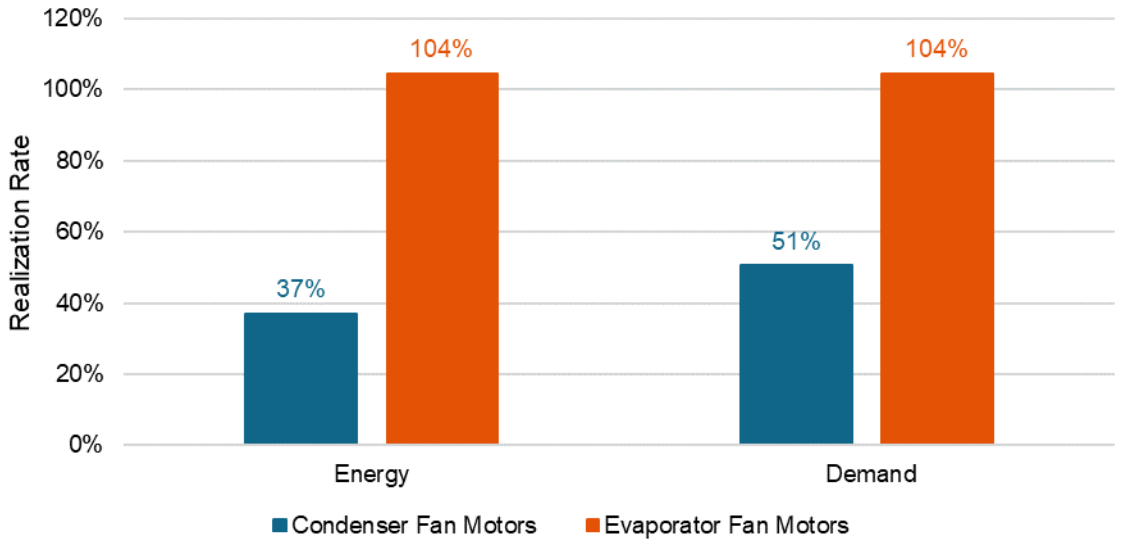
ECM fan motors measure-level energy savings realization rate improved from 63% in PY2020 to 86% in PY2021. This improvement can be mainly attributed to the measure updates that were made in June 2020. Prior to these updates, ECM fan motor measure was merely sub-categorized based on motor horsepower. The measure's update expanded the motor's specification, based on requirements to calculate energy and summer peak demand savings. The updated specifications include:

- Base case motor type (i.e., Shaded Pole (SP) or Permanent Split Capacitor (PSC)
- Condenser or evaporator end-use
- Cooler or Freezer
- Walk-in or reach-in

The new sub-categories contributed to reporting more accurate energy and summer peak demand savings, which led to improved realization rates. The energy realization rate improved from 63% in PY2020 to 86% in PY2021. Similarly, measure updates improved the overall ECM fan motor summer peak demand realization rate from 84% to 91%.

While the updated savings led to more accurate reported savings, the new measure sub-categories still report the same energy and summer peak demand savings regardless of the equipment end use (i.e. condenser vs evaporator). This is not an accurate assumption as condenser fan operation depend on the compressor operation and outdoor temperature. Hence, a duty cycle or equivalent full load hours (EFLH) should be used for condenser fan savings calculation. Figure 4-8 illustrates the ECM motor measures, where evaporator fans had higher energy realization rates (104%) compared to condenser fan motors (37%). Similarly, the reported summer peak demand for evaporator fans is verified to be almost accurate (104% realization rate), while the condenser fans had a lower realization rate at 51%.

Figure 4-8 ECM Fan Motor Realization Rate Comparison



Strip Curtains:

Strip curtains measure level energy (208%) and summer peak demand (162%) realization rates are high. The current reported savings are only dependent on the refrigeration type (walk-in cooler or freezer) and do not account for different facility types. Measure-specific deemed savings calculations need to consider facility type to either sub-categorize the savings and measures based on the facility type or improve the single deemed savings value, to be a true representation of savings based on the facility types.

Door Closers:

Measure-level energy and summer peak demand savings realization rates are 246% and 202%, respectively. As previously indicated during PY2020, an error was identified in the reported savings calculation where incorrect Cooling Degree Days (CDD) for the Waterloo region was selected for extrapolation in the deemed savings calculation from another climate zone. This has significantly impacted the energy and summer peak demand realization rates.

Additionally, during the desk reviews and site visits, it was identified that some projects had the strip curtain and door closers measure installed on the same walk-in freezer or cooler. Hence, the verified savings were adjusted to consider the interactive effects between the two measures.

Lighting:

Measure-level energy and summer peak demand realization rates for REP lighting measures are 73% and 60%, respectively. The main contributor to the low realization rates is that the verified Hours of Use (HOU) are lower than the REP deemed HOU.

Reported energy savings for lighting measures assume 8,760 annual run hours for LED tubes installed in display cases, whereas verified hours depend on each store's hours which are usually less than 8760 hours per year. The average verified HOU for the verified LED case lighting measure is around 4000 hours.

Similarly, the deemed HOU for LED A-19 lamps assumed to be 4,380 hours per year. The verified HOU are significantly lower than hours as this type of light is usually installed in walk-in coolers and freezers, and typically run for only few hours per day.

The reported demand savings for lighting measures reflect the change in the connected load and do not coincide with the IESO's summer peak demand definition (understood to be 1:00 PM through 7:00 PM on non-holiday weekdays in June through August).

4.3.2.1. Summary of Key Findings

The following is a summary of findings that contributed to the energy and summer peak demand savings realization rate for PY2021.

- Consistent with PY2019 and PY2020, the verified quantity of the implemented condenser coil cleaning measure is lower than the reported quantity. During phone interviews with participants and site visits, the evaluator verified fewer condensers at the site than the reported quantity. The implementer confirmed they provided the number of cleaning products as the reported quantity instead of the number of condensers actually cleaned. Additional cleaning products are used, depending on the dirtiness of the coils.
- The same reported savings for evaporator fan motors were used for condenser motors. Since condenser fans' operating hours are lower than evaporator fans' hours, verified savings for the ECM condenser fan motors are considerably lower than the reported savings.
- The deemed savings for strip curtains did not consider the facility type and used deemed values based on the refrigeration type (walk-in cooler and freezer). Resource Innovations has verified the facility type and calculated the savings accordingly. This resulted in higher savings for completed projects in restaurants and supermarkets, as they have higher refrigeration cooling loads.
- An incorrect input (inaccurate CDD) was identified for the calculation of the door closer deemed energy savings, which led to underestimating the reported energy savings for this measure significantly.
- For LED case lighting measures, the assumed deemed hours in the calculation are 8760 hours per year and for LED A-19 lamps assumed hours were 4380 hours per year. For LED case lights the actual hours observed were close to store hours and LED A-19 were usually installed at in walk-in coolers and freezer, with typical run hours limited to only few hours per day, when the walk-in refrigerators are in use.

4.4. Net-to-Gross

Table 4-7 presents the results of the PY2021 REP Net-to-Gross (NTG) evaluation. The evaluation team targeted and achieved 90% confidence and 10% precision levels in the savings results. The analyses performed to assist in the interpretation of these values are summarized in the following subsections.

Table 4-7 REP Net-to-Gross Results

Unique Participants	NTG Responses	Savings Weighted Free-ridership	Spillover – Energy	Spillover – Summer Demand	Weighted Net-to-gross – Energy	Weighted Net-to-gross – Summer Demand	Energy NTG Precision at 85% Confidence
420	38	12.8%	1.4%	3.6%	88.63%	90.87%	±8.0%

4.4.1. Key Findings

Key findings from the NTG analysis include the following:

- Participant feedback indicates moderately high levels of FR at 12.8%, with results slightly lower than the PY2020 FR of 14.5%.
  - One-fifth (21%) of respondents stated they would have done the "exact same upgrade" in the program's absence or were unsure of what they would have done, indicating full or partial FR among these respondents.
  - Nearly three-fifths (58%) of respondents reported they would not have completed an upgrade or would have postponed it in the program's absence, indicating low FR among these respondents.
  - Over four-fifths (82%) of respondents' decisions to participate in the program were influenced by the availability of the no-cost efficiency upgrade.
- Participation in the program resulted in a low SO at 1.4%, lower than the PY2020 SO of 8.2%. So, savings were primarily driven by the installation of a new ENERGY STAR freezer and fans.

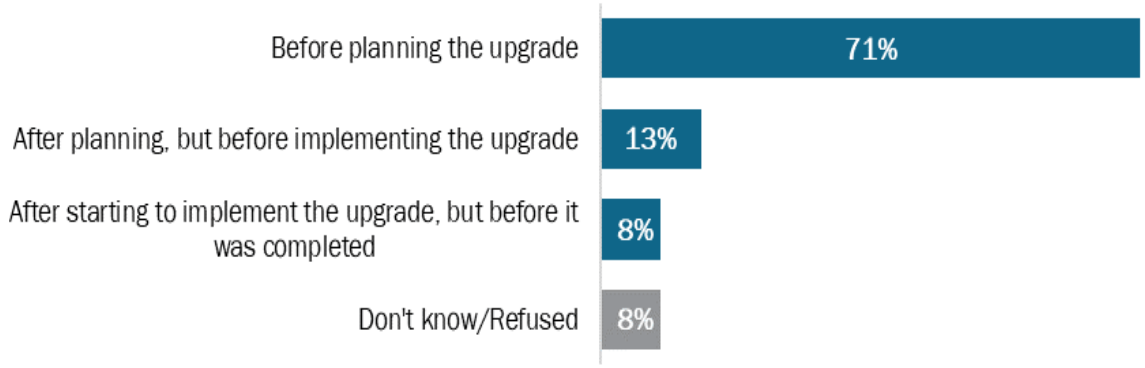
4.4.2. Free-Ridership (FR)

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

More than seven out of every ten respondents (71%) stated they first learned they could receive energy-efficiency incentives through the program before starting to plan their upgrades (Figure 4-9). This suggests that the program was likely influential in many of these respondents' decisions to begin the project. One in eight respondents (13%) learned about the program after planning had started but before beginning the upgrade. The remainder learned after beginning but before completing their projects (8%) or did not know or refused

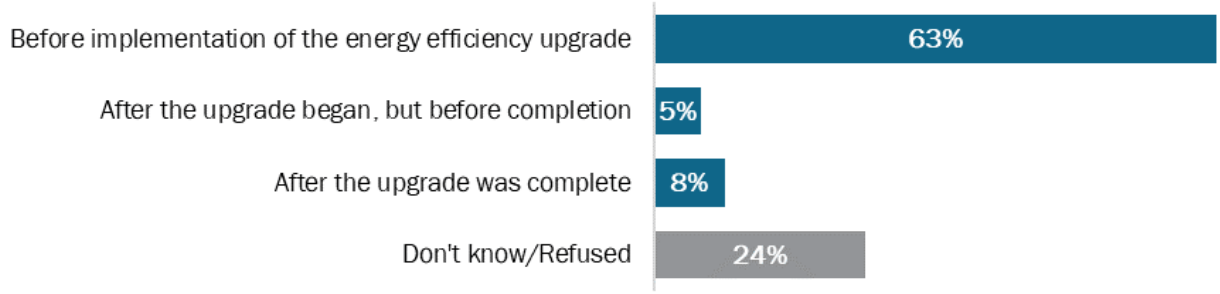
to answer (8%). While responses to this question did not directly impact the FR score, they provided additional context for understanding the participants' decision-making processes.

Figure 4-9 When Participants First Learned About the Program (n=38)



Participants were then asked about the timing of when they submitted their participation agreement in relation to the start of their energy-efficient upgrades (Figure 4-10). More than three out of five respondents (63%) indicated they applied before their company began implementing the upgrade, suggesting that most participants apply to the program as intended. One in twenty (5%) did so after their energy-efficiency upgrade began but before its completion. The remainder either did so after the upgrade was complete (8%) or did not know or refused to answer (24%). Similar to the previous question, this question was not used to calculate the FR score but provides additional context regarding participant intentions.

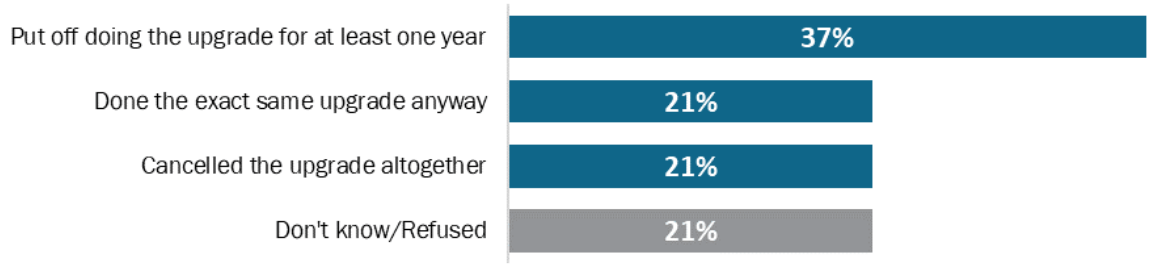
Figure 4-10 Timing of Participation Agreement (n=38)



The five respondents whose companies submitted their participation agreement after starting an energy-efficiency upgrade were asked their reasoning for doing so. Two respondents stated they were completing work for an unplanned replacement and one respondent indicated they were sticking to an internal schedule. The remaining two respondents did not know why their company chose to move forward with the project before submitting the participation agreement. The responses suggest that many of these respondents would have submitted their participation agreement earlier if it had been possible. While responses to this question did not directly impact the FR score, they provide additional context for understanding the participants' decision-making processes.

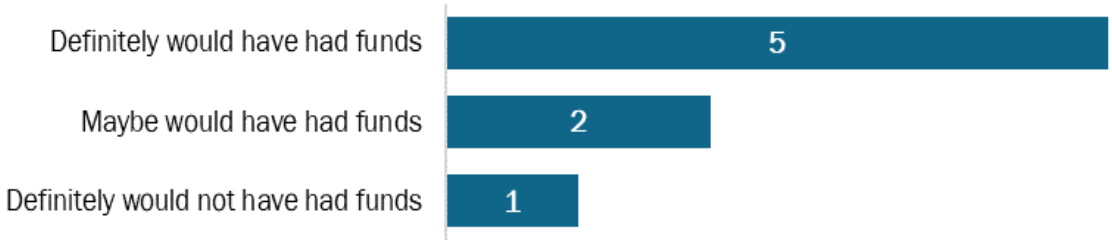
Respondents were then asked what they would have done in the program's absence (Figure 4-11). Overall, their responses suggest moderate FR as close to one-fifth would have done the "exact same upgrade" anyway (21%), which is indicative of partial or full FR for these respondents. However, close to three-fifths of the remaining respondents (58%) would have put off or cancelled the upgrade without the program's support. Responses from this participant intent question were factored into the FR analysis.

Figure 4-11 Actions in Absence of Program (n=38)



The eight respondents who stated 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 (Figure 4-12). Five respondents stated they definitely would have had the funds to cover all project costs, more than twice as many as the respondents who stated they might have had the funds (two respondents). Only one respondent stated they definitely would not have had the necessary funds. This feedback indicates some degree of FR and suggests the program may have helped a portion of these participants complete projects they might not have been able to independently. This participant intent question was factored into the FR analysis.

Figure 4-12 Availability of Funds in Absence of Program Incentives (n=8)*



* Counts displayed rather than percentage due to small n.

Of the eight respondents who stated they would have done the "exact same upgrade" in the program's absence four indicated they had a specific installation contractor in mind to hire to complete the project and four respondents indicated that they did not have a specific installation contractor in mind to complete the project.

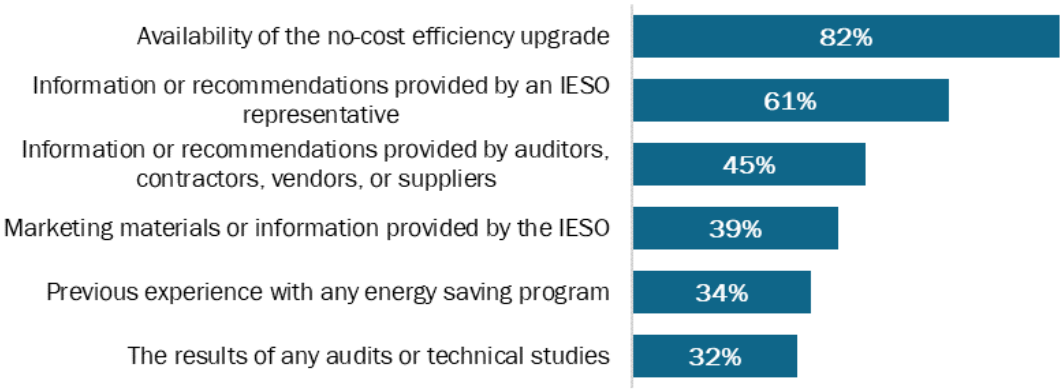
Respondents were asked how influential various program features were on their decision to install energy-efficient equipment (Figure 4-13). They rated each feature's influence on a scale from one (1) to five (5), where one indicates it was "not at all influential" and five indicates it was "extremely influential." The highest-rated response was the availability of

availability of the no-cost efficiency upgrade (82% with a rating of 4 or 5). The next most influential program features were information or recommendations from an IESO representative (61% with a rating of 4 or 5) and from contractors, vendors, or suppliers (45% with a rating of 4 or 5). This question, which focuses on the program's influence, along with the prior questions about customer intentions, was used to estimate the FR score.

The findings from this question emphasize the strength of recommendations from IESO representatives and auditor, contractor, vendor, and supplier networks in driving program engagement. Their interactions with customers are valuable on their own but more generally help familiarize customers with energy-saving programs and influence future participation beyond REP.

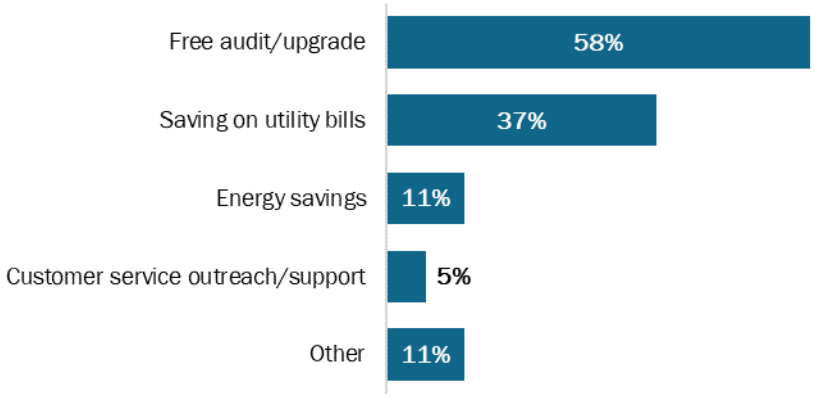
Figure 4-13 Influence of Program Features on Participation (n=38)

(Ratings of 4 or5 on a scale from 1 to 5)



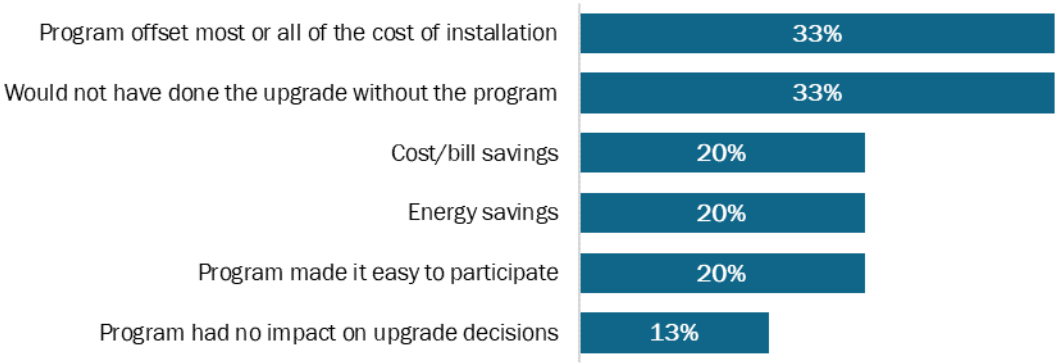
When respondents were asked whether any other factors played "a great role" in influencing their organization to install the energy-efficient equipment, the respondents' answers varied widely (Figure 4-14). Of the one-half (50%) of those who responded, the most common responses were related to the free audit or upgrade being influential (58%), followed by the possibility of achieving savings on utility bills (37%).

Figure 4-14 Other Influential Factors on Upgrade Decision (n=19)



Participants were then asked to explain in their own words what impact, if any, the financial support or technical assistance they received from the program had on their decision to install the program incentivized equipment at the time that they did (Figure 4-7). Of the more than three-fourths (79%) of those who responded, the most common responses were related to the financial incentive offsetting most or all the installation cost (33%) and not having done the upgrade without the program (33%).

Figure 4-15 Program Impact on Decision to Install Equipment (n=38)*



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

4.4.3. Spillover

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 REP. Over one-tenth (13%, or 5 respondents) reported installing new equipment.

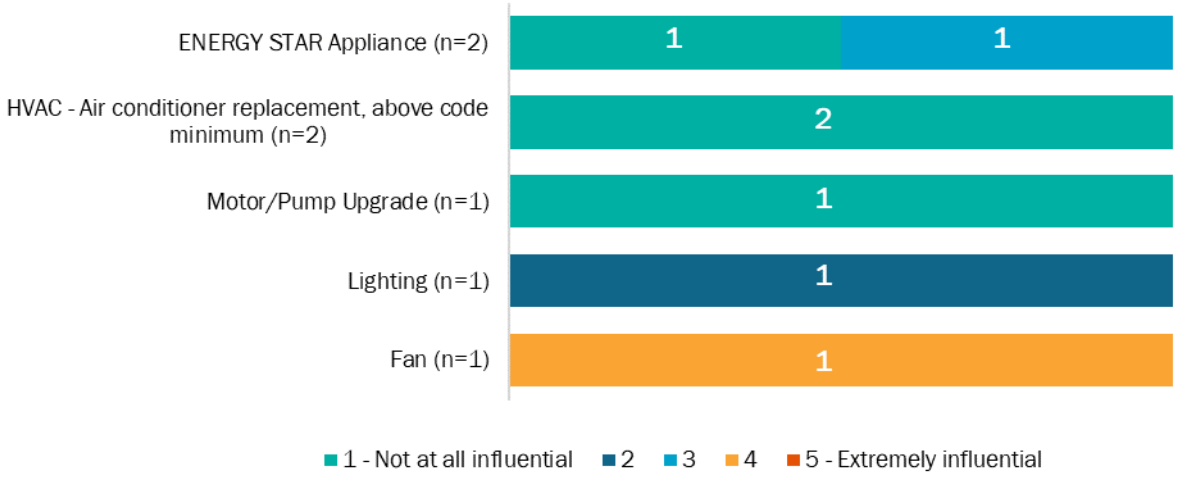
Figure 4-16 displays the types of non-incentivized equipment installed by participants after their REP project was completed. Some survey respondents installed multiple equipment types. A total of 5 equipment installations occurred across the different equipment types.

Respondents were then asked what level of influence their participation in 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 indicates the program was "not at all influential" and five indicates the program was "extremely influential." As indicated in Figure 4-8, the influence score for most equipment types was below a 3-rating, which suggests the program was not influential on most respondent's additional equipment installations. However, two respondents indicated the program had some influence (a rating of 3 or higher) on their decisions to install an ENERGY STAR appliance and fans.

Figure 4-16 Program Influence on Efficient Equipment Installed Outside the Program

(Open end and multiple responses allowed;n=5)*



*Does not sum to n=5 due to multiple response.

The two 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 details are used within the NTG algorithm to attribute SO savings to each equipment installation. So, savings were driven mainly by:

- the installation of four new fan upgrades completed by one respondent (Table 4-9), and
- the installation of one ENERGY STAR freezer completed by one respondent (Table 4-8).

Table 4-8 Type of ENERGY STAR® Appliance Installed

(Multiple response allowed; n=1)

Spillover Appliance	Respondents
Freezer	1

Table 4-9 Type of Fan Installed

(Multiple response allowed; n=1)

Spillover Appliance	Fan Diameter	Quantity	Respondents
Fan	3 feet	4	1

In summary, SO results among REP participants indicate a relatively low SO (1.4% Energy SO and 3.6% Summer Peak Demand SO). One-twentieth (5%, or two respondents) installed equipment with attributable SO savings.

4.5. REP Cost Effectiveness

A cost-effectiveness (CE) analysis for the REP was conducted using IESO's CE Tool V7.1. The cost-effectiveness results are presented in Table 4-10. The REP did not pass the Total Resource Cost (TRC) test and the Program Administrator Cost (PAC) test for PY2021 with both ratios below 1. The PY2021 CE is lower compared to 2020. This decrease is mainly due to additional administrative costs added to the PY2021 REP. Compared to PY2020 and PY2019, the PY2021 admin cost are 113%, and 128% higher, respectively.

Table 4-10: IF REP Program Cost Effectiveness Results

Total Resource Cost (TRC)	2019	2020	2021	2019-2021
TRC Costs ($)	$452,118	$1,074,642	$1,174,877	**$2,701,637**
TRC Benefits ($)	$298,192	$1,135,692	$797,773	**$2,231,657**
TRC Net Benefits ($)	($153,926)	$61,049	($377,104)	**($469,981)**
TRC Net Benefit (Ratio)	0.66	1.06	0.68	**0.83**
Program Administrator Cost (PAC)	**2019**	**2020**	**2021**	**2019-2021**
PAC Costs ($)	$459,381	$1,124,837	$1,233,604	**$2,817,822**
PAC Benefits ($)	$259,298	$987,558	$693,716	**$1,940,572**
PAC Net Benefits ($)	($200,083)	($137,278)	($539,888)	**($877,249)**
PAC Net Benefit (Ratio)	0.56	0.88	0.56	**0.69**
Levelized Unit Energy Cost (LUEC)	**2019**	**2020**	**2021**	**2019-2021**
$/kWh	$0.09	$0.06	$0.10	**$0.08**
$/kW	$508.69	$449.66	$795.00	**$568.53**

5. Other Energy-Efficiency Benefits

5.1. Avoided Greenhouse Gas Emissions

The evaluation team used the IESO CE Tool V7.1 to calculate the avoided GHG emissions. Avoided GHG emissions were calculated for the first years of PY 2019, 2020 and 2021 and for the lifetime of the implemented REP measures. Table 5-1 below represents the results of the avoided GHG emissions calculations. All GHG emissions below are in Tonnes of CO2 equivalent, unless otherwise mentioned.

Table 5-1: IF REP Avoided Greenhouse Gas Emissions

Program Year	Electric First Year GHG Avoided	Gas* First Year GHG Avoided	Total First Year GHG Avoided	Electric Lifetime GHG Avoided	Gas* Lifetime GHG Avoided	Total Lifetime GHG Avoided
2019	137.23	-	137.23	2,129.78	-	2,129.78
2020	247.24	-	247.24	4,014.29	-	4,014.29
2021	188.31	-	188.31	2,803.43	-	2,803.43
2019 - 2021	572.78	-	572.78	8,947.50	-	8,947.50

*Interactive gas penalty

6. Key Findings and Recommendations

Finding 1. Improve ECM Fan Motor Calculation. Condenser and evaporator fans have the same reported energy and summer peak demand savings. This is not an accurate assumption as condenser fan operation depends on the compressor operation and outdoor temperature.

- **Recommendation 1.** It is recommended that a duty cycle or equivalent full load hours (EFLH) be incorporated in the calculation. Metering data collected since 2017(data collected during the CFF BRI evaluation and IF REP evaluation) indicate an evaporator fan duty cycle of 97%, and 57% for condenser fans.

Finding 2. Improve Strip Curtains Measure Implementation and Data Collection. On site verification and desk review interviews indicate issues with the strip curtain measures. In some instances, it was observed the base case already had a pre-existing strip curtain, strip curtains were found missing or damaged. It was also observed that the current calculation does not account for the accurate strip curtain area (size).

- **Recommendation 2.** It is recommended that an in-service rate be used to adjust/account for missing, un-installed or measures with pre-existing base case. It is also advised to use actual strip curtain size in savings calculation, and the size must be equal to the door opening area for the walk-in cooler/freezer.

Finding 3. Accurately Classify Refrigeration Equipment. In several instances, a misclassification of the equipment end use (i.e. condenser vs. evaporators) was reported for the condenser coil cleaning measure. Additionally evaluation desk reviews and site visits found that the reported equipment type was misclassified (walk-in vs reach-in)

For condenser coil cleaning measure, the post case pictures clearly indicated that the evaporator coil was cleaned, but savings and incentives were claimed for condenser coil cleaning. (the program does not include an evaporator cleaning measure).

Occasional misclassification between walk-in freezers and coolers.

- **Recommendation 3a.** It is recommended to provide additional training to contractors to accurately identify the equipment type and end use
- **Recommendation 3b.** Implement an internal QA/QC procedure for the program implementor to identify and correct these errors

Finding 4. Improve Document Collection. The project documentation provided did not include sufficient information to accurately verify the baseline and retrofit case measures. Firstly, the documentation provided was often found to be insufficient to locate the measure at the sites or discuss it with the participants during the outreach process. Additionally, it was also noticed that no specification sheets are attached with the program documents.

Baseline equipment specification is particularly important for direct install programs since participants are usually unaware of what was retrofitted at their facilities.

- **Recommendation 4a.** It is recommended that the audit/assessment tool has the capability to record/list measures based on space type, location, and refrigeration case and type.
- **Recommendation 4b.** Ensure that the implementor collects the specification sheets for each installed projects/measure type or create a list of qualified product lists they plan to use for the program year and record the model number installed for a project from that qualified list. This would also allow for better tracking of products installed as part of the program.

Finding 5. Improved Baseline and Retrofit Photos. Photos submitted for the REP projects were mostly taken from wide angles and did not include close-up photos of nameplate information required to verify the baseline/retrofit equipment.

For example, most of the base case and retrofit photos for ECM fan motors did not include close-up photos. Close up photos of motors nameplates are critical to verify the nameplate horsepower ratings and the classification the baseline motor type (Shaded Pole (SP) motor or Permanent Split Capacitor (PSC))

Lighting picture lacked the close-up photos to identify the type or nameplate wattage.

A few of the strip curtains measure were missing pictures for the pre retrofit case to verify that the base case did not have any curtains.

- **Recommendation 5.** It is recommended that the program implementor collects and classifies pictures for both base and retrofit case with clear name identifiers that can be associated with the project measures.

Finding 6. Identify Building Type Accurately. Program participation data shows that 93 % of the participating facilities are classified as “Retail”. A further investigation into these projects indicated that the “Retail” category can be further classified into restaurant, grocery, or convenience stores.

- **Recommendation 6a:** It is recommended that project facility type be properly classified based on the primary function of the facility. Data collection tool need to be updated to account for facility types that are not currently being tracked.
- **Recommendation 6b:** Consider using the correct facility type information substantiate measures savings depending on the facility type. For example, strip curtains savings are highly dependent on the facility type.

Appendix A Impact Evaluation Methodology

This section describes in greater detail the specific tasks necessary and methodologies that will be used for the REP program impact evaluation. The REP program impact evaluation will include the following tasks:

A.1 Sample Plan

Independently verifying the energy and demand savings and attributing these savings first requires selecting sample projects that represent the program's population. The goal of a representative sample ensures results can be applied to the population's 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 program database extract
- Overall confidence/precision targets of 90/10 for the program assuming a coefficient of variation (C_V) of 0.5

A.2 Project Counts

Due to the similarity of measures installed through the REP the program applied a single sample based on completed projects.

A.3 Project Audits

Subsequent to the sampling process, project audits representing the REP population were completed. Sampled projects received Level 1 audits, which consist of desk reviews of project documentation available from the program delivery vendor. These documents include project applications, equipment specification sheets, notes on equipment installed, invoices for equipment, and any other documentation submitted to the program. Evaluation of the REP often includes Level 2 audits with on-site visits and extensive metering to estimate equipment hours of use and operational load. However, the PY20 evaluation cycle was disrupted by the COVID-19 pandemic with corresponding facility closures and social distancing requirements, leading to the suspension of on-site visits.

To maximize participant responses, we expanded the types of outreach conducted for the impact evaluation. In addition to verification phone calls, the evaluation added an option to complete virtual site visits through a software solution.

Virtual site visits permitted the EM&V staff to view through the phone, tablet, or computer camera with the approval of the participant. The software acts like a virtual meeting that allows screen sharing and can be moved around a facility to verify equipment installation, quantities, and operating parameters. However, we faced difficulty as many participants were still working from home, which

limits the opportunity to complete a virtual site visit or were uncomfortable sharing access through their mobile equipment.

A.4 Reported Savings

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

A.5 Verified Savings

Energy and demand savings are verified for all sampled projects and rely on data collected and verified during the project audit. This information is evaluated utilizing analytical tools to determine the savings attributable to each project. For each project the verified savings are compared to the reported savings to define the program realization rate. This realization rate is then applied to all projects' gross reported savings in the population to estimate the verified savings. Equation A-1 shows the formula for calculating the program realization rate.

Equation A-1: Realization Rate

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

Where:

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

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

The total verified savings reflect the direct energy and demand impact of the program's operations. However, these savings do not account for customer or market behavior 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.

A.6 Interactive Effects for Lighting Equipment

The REP incentivizes the installation of lighting equipment that has higher efficiency levels compared to commonly installed lamps and fixtures. Ideally, this high-efficiency equipment should consume less energy. However, it is understood 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 to solely 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 changes in the operation of heating, ventilation, and air-conditioning (HVAC) equipment due to lower heat loss from energy-efficient lighting equipment.

A.7 Lifetime Savings

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

Equation A-2: Lifetime Energy Savings

$$Lifetime\ Energy\ Savings = EUL \times Annual\ Energy\ Savings$$

Where:

EUL = Estimated useful life of the retrofitted equipment

Appendix B Detailed Net-to-Gross 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 presented in Equation B-1 is defined as follows:

Equation B-1: Net-to-gross Ratio

$$\boldsymbol{NTG} = \mathbf{100\%} - \boldsymbol{FR} + \boldsymbol{SO}$$

Where FR is free-ridership and SO is spillover.

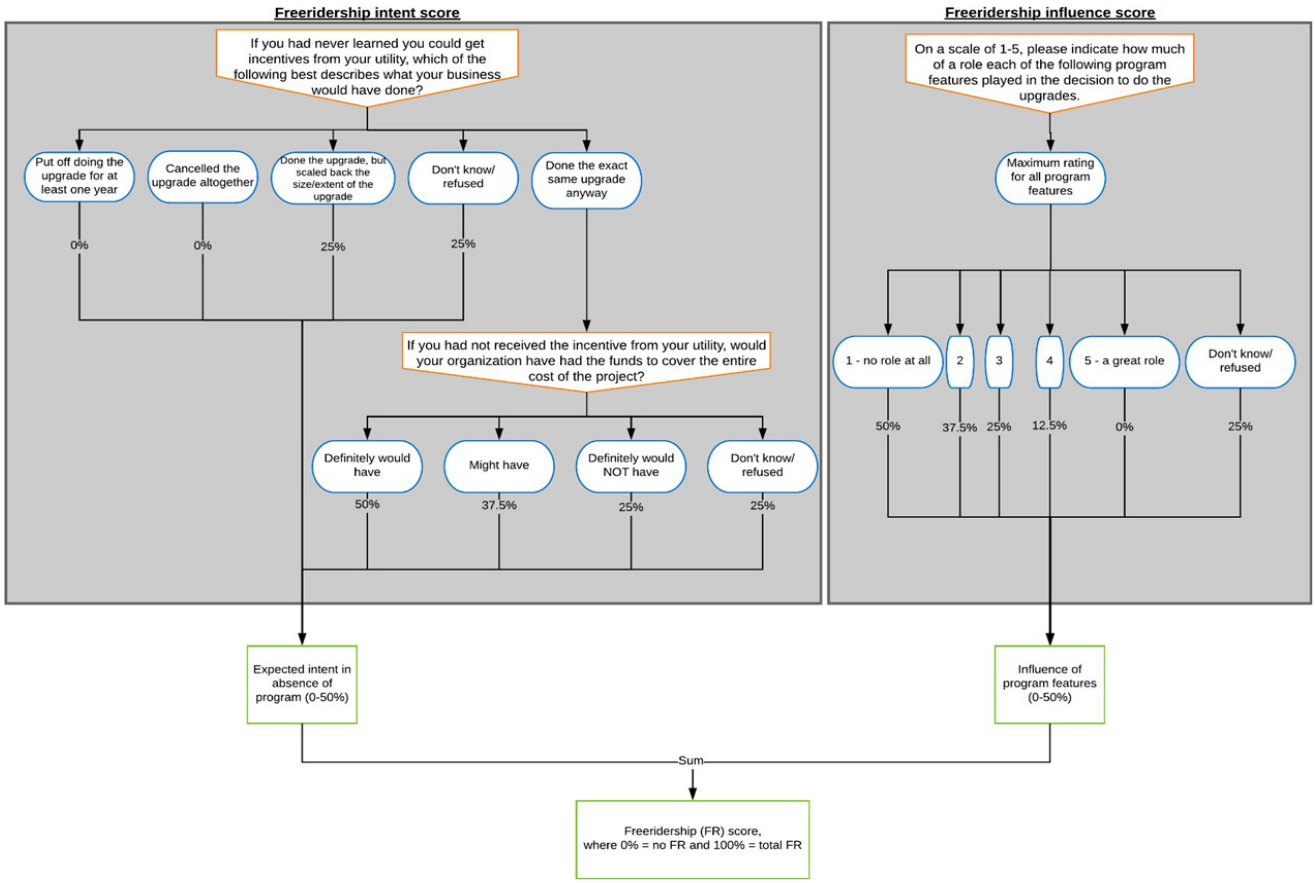
B.1 Free-Ridership Methodology

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 program's absence; 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 6-1 illustrates the FR methodology.

Figure 6-1 Free-Ridership Methodology



Intention Component

The FR score's intention component asks participants how the evaluated project would have differed 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 6-1 indicates the possible intention scores a respondent could have received depending on their responses to these two questions.

Table 6-1 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)

If a respondent provided an answer of 1 or 2 (would postpone or cancel the upgrade) to the first question, 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) or stated 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 stated 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 receives a score of 50% (associated with high FR). If the respondent answered 2 (might have had the funds), they 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).

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 indicates "it played no role at all" and five indicates "it played a great role." The potential influence includes the following:

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

Table 6-2 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 6-2 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 indicates 0% FR (the participant was not at all a free rider), a score of 100 indicates 100% FR (the participant was a complete free rider), and a score between 0 and 100 indicates the participant was a partial free rider.

B.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, 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 indicates "it played no role at all" and five indicates "it played a great role." Suppose the influence score is between 3 and 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:

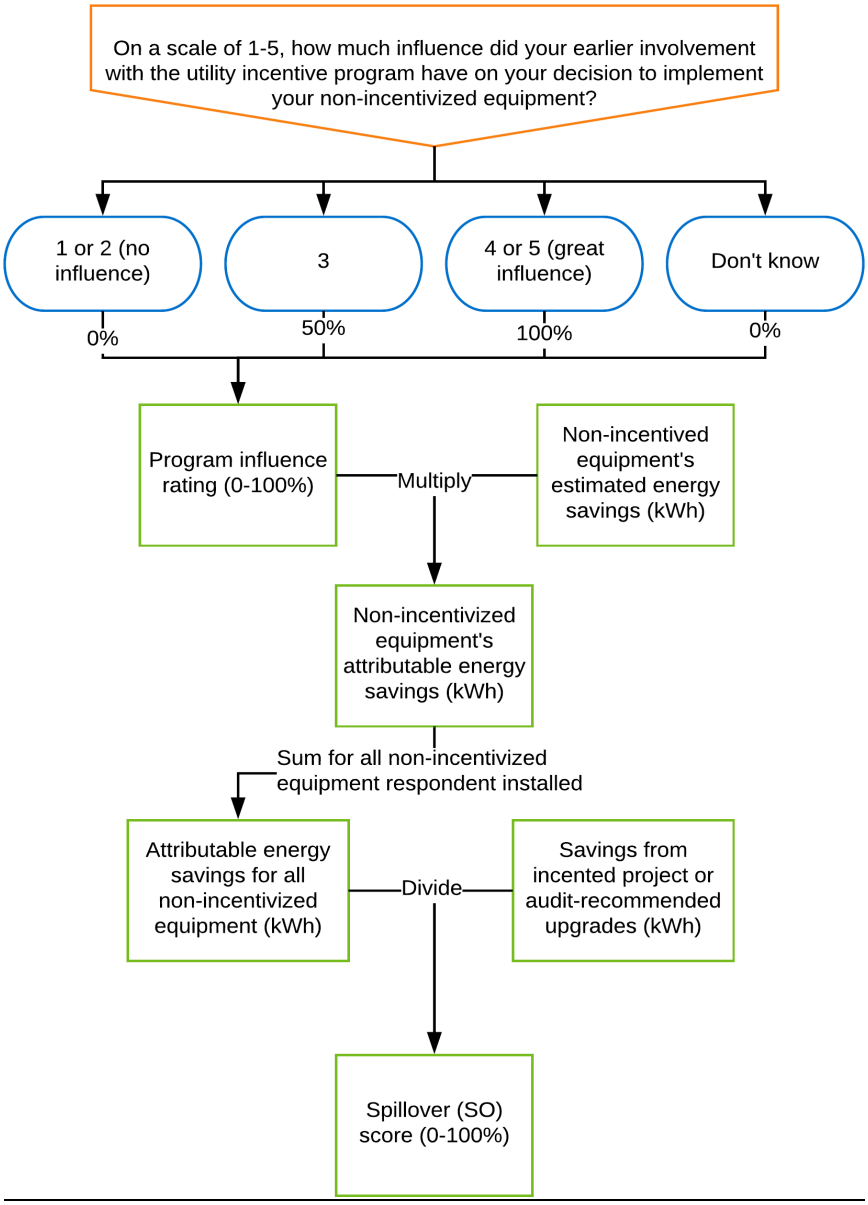
- Maximum rating of 1 or 2 (no influence) = 0%
- Maximum rating of 3 = 50%
- Maximum rating of 4 or 5 (great influence) = 100%
- Respondent does not know how much influence any factor had = 0%

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 6-2 illustrates the SO methodology.

Figure 6-2 Spillover Methodology



B.3 Identification of Project or Upgrade for NTG Assessment

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

B.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 web link 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 job 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 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.

B.5 Net-to-Gross Survey Implementation

The survey was implemented over the web and phone. The survey lab was instructed to avoid collecting duplicate responses by no longer calling on respondents if they had responded to the web survey or deactivating the respondent's survey web link if they had responded to the phone survey.

For each of the phone surveys, the survey lab called participants in a randomized order. After reaching the identified contact for a given participant, the interviewer explained the survey's purpose and identified the IESO as the sponsor. The interviewer asked if the contact was involved in decisions about upgrading equipment at that organization. If the contact was not involved in decisions about upgrading equipment, the interviewer asked to be transferred to or for the contact information of the

appropriate decision-maker. The interviewer then attempted to reach the identified decision-maker to complete the survey.

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

B.6 Participation Survey Methodology

The participant survey collected primary data from program participants to estimate the program's NTG (Table 6-3). All NTG evaluation data collection activities were carried out or managed by the evaluators. The survey instruments and samples were developed by the evaluators and were reviewed and approved by the IESO EM&V staff. The data used to develop the sample files was retained from program records supplied by the IESO EM&V staff.

Table 6-3 Net-to-Gross Evaluation Primary Data Source

Respondent Type	Methodology	Population	Completed	Response Rate	90% CI Error Margin
Participants	Web and Phone Survey	420	38	9%%	8.0%

A total of 38 participants were surveyed from a sample of 420 unique contacts (Table 6-4). The purpose of the survey was to better understand the participant perspectives related to program experience.

The survey topics included FR, SO, and firmographics. 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 both over the phone and over the web in partnership with the Resource Innovations survey lab using Qualtrics survey software. NMR staff worked closely with the Resource Innovations survey lab to test the programming of the surveys and to perform quality checks on all data collected.

The survey implementation was conducted between July 18 and August 1 of 2022. The survey took an average of 9 minutes to complete after removing outliers.[1] Weekly e-mail reminders were sent to non-responsive contacts through web survey fielding.

[1] Note that the survey was designed to allow the respondent to come back to it at a later time to complete it if they preferred. The average survey time was calculated with this in mind and assumed that any survey that

Table 6-4 Participation Survey Disposition

Disposition Report	Web	Phone	Total
Completes	31	7	38
Emails bounced	38	-	38
Bad Contact Info (No Replacement Found)	-	-	0
Unsubscribed	-	-	0
Partial Complete	10	-	10
Screened Out	4	-	4
Callback	-	26	26
Hard refusal	-	11	11
Soft refusal	-	14	14
No answer	-	38	38
No Eligible Respondent	-	16	16
Non-working #	-	15	15
Voicemail	-	89	89
Agreed to Complete Online	-	12	12
Wrong Number	-	6	6
Did not contact	-	156	156
No Response	337	0	337
Total Invited to Participate	420	390	810

took 40 minutes or more to complete was likely completed by a respondent who took a break before completing the survey.